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.

GRAZING OCCULTATION TRACKS IN THE 1975 OBSERVER'S HANDBOOK

Due to an unfortunate error at the printer's, the maps of the grazing occultation tracks for 1975 were not included in the 1975 *Observer's Handbook*; the maps which appear are actually those for 1974. We hope to publish the correct maps in the February Journal of the Royal Astronomical Society of Canada, and to send the maps to all interested observers. These maps will be available early in the new year; please write to me if you would like a copy.

John R. Percy
Editor: Observer's Handbook
R. A. S. C.
252 College Street
Toronto M5T 1R7, Canada

ERROR IN PARTIAL OCCULTATION PREDICTIONS

David W. Dunham

Several partial occultations of planets by the moon have been observed using predictions computed with my computer program, establishing the accuracy of most of the computed data. However, during preparations for the partial occultation of Mercury in October, I discovered that one of the interpolated points was about 3 miles in error. Observers should watch for possible similar errors by plotting at least four points; if a straight line or gentle curve can be drawn through them, they should be accurate enough for prediction purposes. If not, check for plotting errors. If one point is still out of line, plot two or three of the uninterpolated points, which should be accurate. The error is rare and seems to be due mainly to the interpolation procedure. Unfortunately, I will not have time to track down and correct this error during the next few months. The interpolation procedure for the calculation of occultation limits for stars is slightly improved so that the error probably does not occur with them.

OCCULTATIONS OF STARS BY (433) EROS

David W. Dunham

A map showing Brian Marsden's prediction for the path of the occultation of Kappa Geminorum by Eros across southern Quebec, the northern tip of New Hampshire, and southern Maine is shown on p. 9 of the January issue of Sky and Telescope. Another prediction was computed recently by Paul Herget at the Minor Planet Center at Cincinnati Observatory. According to Herget, the path is considerably farther southwest, passing near Ottawa, Ontario; Massena, New York; Rutland, Vermont; and about halfway between Boston and Providence, Rhode Island. Due to the prediction uncertainties, it seems that the approximately 15-mile-wide path could cross any part of New England, northern and eastern New York, southern Quebec, easternmost Ontario, Bermuda, any of the Caribbean islands south and east of the Virgin Islands, eastern Venezuela, etc. Thomas Van Flandern at U.S.N.O. will compute another prediction. Early in January, the predictions should be reconciled down to a 150-mile-wide corridor. Then, word will be disseminated to all known observers in the areas mentioned above and it should be feasible to coordinate observations along parallel tracks separated by 5 km, as described in the last issue.

Two regional coordinators are working through the A.A.V.S.O. to help plan observations in their areas. They are George L. Fortier, M.D., 63 Devon Rd., Baie d'Urfe, Quebec H9X 2W7, phone 514, 457-3533, and Alain C. Porter, 10 Sea Lea Dr., Narragansett, Rhode Island 02882, phone 401, 783-2336. The A.L.P.O. Minor Planet Bulletin 2, p. 23 gives John Allcock, 2050 Mountain St., Montreal, Quebec H3G 1Z7, phone 514, 844-1694, as a coordinator for Quebec, but since he and Fortier are both members of the Montreal Centre of the R.A.S.C., they are presumably communicating with each other. Dr. Edwin B. Weston, 80 Oak St., Lexington, Massachusetts 02173, phone 617, 862-6148 or 861-4040, is familiar with astronomical resources in Maine and New Hampshire and is trying to encourage observations there. Local coordinators might include Prof. Paul Marmet, Departement de Physique, Universite Laval, Cite Universitaire, Quebec 10, Quebec (a telephone number is not handy, but the phone for Gaetan Chevalier, another Quebec City R.A.S.C. member, is 418, 524-6918) and Dennis di Cicco, 94 Pierce Rd., Watertown, Mass. 02172, phone 617, 926-2678 or 864-7360. In order to catch the event, it will be necessary to have observers at roughly even intervals across the whole region of uncertainty. Observers are therefore urged to contact the above to coordinate plans.

Due to the relatively low altitude and bright moonlight, naked-eye observations will not be sufficient; at least small binoculars or opera glasses which can be firmly held against a post or other solid object will be needed to make reliable observations. Binoculars and opera glasses are common enough that appeals to the public for observations, via newspapers and television, could be quite productive. Dr. Clark R. Chapman, Planetary Science Institute, 252 W. Ina Rd., Suite D, Tucson, Arizona 85704, phone 602, 297-1176 or 297-4377, is preparing a suitable press release which will be distributed when the area to be covered is established. Local and regional coordinators can collect observations, and are encouraged to do so for observations by the general public, which will be more likely to respond if they can report with a free telephone call than by any other means. All reports should eventually reach Sky and Telescope, 49-50-51 Bay State Rd., Cambridge, Mass. 02138, phone 617, 864-7360. It should be stressed that negative as well as positive observations are wanted. The observing period for observers in eastern Canada to New England should be from 7:17 to 7:22 p.m. Eastern Standard Time on Thursday evening, Jan. 23rd. If Eros is visible in your telescope, start recording when the objects coalesce and stop when Eros is separated from the star again.

Dr. Seville Chapman, 94 Harper Rd., Buffalo, N.Y. 14226, phone 716, 839-1999, has designed and constructed rather inexpensive equipment which can record the Kappa Geminorum occultation to better than 0^{s}01. The crucial item in this design is a United Technology PIN 3DP photodiode, available for \$9.65 from Irondequoit Industries, P. O. Box 7637, Rochester, N.Y. 14622, phone 716, 544-6257. Also needed is a field effect transistor operational amplifier; Dr. Chapman used an \$18 Burr Brown 3522, but he says that a cheaper Fairchild type 740 could also be used. Some 22-Megohm (or greater) feedback resistors (cost about 10¢ apiece) and two 9-volt transistor radio batteries are also needed. The output could be recorded with a good-quality tape recorder, or (more likely) could be connected to a voltage-controlled oscillator connected to a small loud speaker (a small cassette tape recorder could record the resultant signal; WWV or CHU should also be recorded). Copies of plans to build the setup are available from Seville Chapman, Clark Chapman, me, and probably the regional coordinators listed above (they have been sent copies). The design is rather simple, so any amateur with a little knowledge of electronics, able to buy the parts, and with a suitable telescope and recorder, who is planning to attempt the occultation of Kappa Geminorum is encouraged to do so photoelectrically. With enough advance notice, Seville Chapman has also expressed a willingness to loan his prototype to a responsible amateur planning observations from a location within the predicted occultation zone with a 6-inch (or larger) telescope with drive. Dr. Chapman says that the equipment can be used with a small telescope, or even with a telescope finder (so the main telescope can be used for guiding; care must be taken to keep the star's light centered on the sensitive part of the photodiode, which is only about one square millimeter) or half of a firmly mounted pair of binoculars (the other half used for visual guiding). Field-testing the equipment on Kappa Geminorum before the night of the event will be a virtual necessity for success. Unfortunately, time is very short; anyone interested in building the equipment should request plans and parts by telephone. The United Technology photodiode might also be available from distributors in Toronto, Montreal, Boston, or New York City. The equipment could also be used to obtain photoelectric records of lunar occultations, especially with larger (to get fainter stars) amateur telescopes.

With a horizontal parallax of about one minute of arc, it would be remarkable if Kappa Geminorum were to be the only star to be occulted as seen from the earth's surface as Eros careens across the January sky. Judging from the chart on p. 9 of the January issue of Sky and Telescope, it appears that several close approaches to fainter stars might produce occultations somewhere. These will occur at the following Universal Time dates and hours: Jan. 1, 21^h; Jan. 7, 16^h; 8, 8^h; 10, 13^h; 12, 11^h; 13, 16.5^h and 17.5^h; 16, 5^h; 18, 19^h; 22, 3^h; 22, 6^h and 18^h; 25, 8^h and 14^h; 28, 22^h; 29, 2^h; 31, 4^h and 10^h; and Feb.1, 3^h. The stars involved will be obvious from consulting the Sky and Telescope map. In many of these cases, no occultations will be visible from the earth's surface, and for some others, Eros will be brighter (depending on its phase) than the star, making reliable visual observations impossible. Without predictions, the chances for any one observer to see an occultation are extremely small, but if enough try, perhaps one will. If more than one observer in an area tries to see these, they might try to separate at intervals of about 10 miles in an east-west direction to increase chances.

Hopefully, the kappa Geminorum event will be more successfully observed than the occultation of a 7th-magnitude star by (129) Antigone predicted for the southeastern United States last October 12th. Generally clear skies prevailed, but low altitude in Texas, a difficult-to-use finding chart, and little advance notice caused problems. Probably over 100 tried to observe the event. Only Harold Povenmire, observing south of Miami, claimed to have seen a possible one-second occultation. Unfortunately, there was nobody observing south of him to confirm the observation or get an estimate of the diameter of the asteroid.

PLANETARY OCCULTATIONS

Conducted by Mike Reynolds

Recent Observations

17 July 1974 - Occultation of Venus by a 6% sunlit moon. Another report has been received concerning the total occultation of Venus (See Vol I, No. 2 for earlier reports). L. Nadeau, Boston, MA, reports that he easily observed Venus disappear and reappear with the naked eye, from Washington, DC.

12 October 1974 - Occultation of magnitude 6.40 star 84 B. Cancri (Z.C. 1281) by the 12th magnitude minor planet (129) Antigone. In view of David Dunham's note, in this issue, to the effect that probably over 100 observers were involved, it would seem gratuitous to mention the few names that have come to my attention.

16 October 1974 - Occultation of Mercury by a 2% sunlit moon. The difficult observation of this daylight occultation of Mercury was attempted by several observers. R. Nolthenius and S. Hale, Tucson, AZ, observed the total occultation from Tucson. Nolthenius reports: "The sight was rather impressive; the moon was a razor-thin, very pale arc extending about 150°, while Mercury could be seen as a small, bright 20% crescent, 9" in diameter, near the north cusp of the moon." They recorded timings of 1st and 2nd contacts. D. Dunham, Austin, TX, reported on Texas observers attempting the event. G. Haysler attempted to observe a shallow partial occultation from the University of Texas, but heat from surrounding buildings prevented observations. W. Eichhorn and others attempted the graze near San Angelo, TX, but failed to see anything. J. Vander Stucken observed the event in Sonora, TX. Dunham reports that his group, which consisted of J. Dunham, C. Smith, D. Stockbauer, and T. Webber, attempted the event near Austin, TX. Dunham noted: Tantalizing views of the moon and Mercury were glimpsed by three observers, but no useful timings were obtained." A detailed account of their expedition will be given in the next issue of Occultation Newsletter for the benefit of those attempting the similar occultation of Mercury in July 1975.

Upcoming Planetary Occultations

21 June 1975 - Occultation of Neptune by a 97% sunlit moon. This occultation will occur for Antarctica and the southern tip of South America, at approximately 23 hours ET.

There are several other marginal occultations in the first half of 1975:

Mercury:

February 10
begin ϕ +39.25, λ -151.85, $16^h\ 39^m$ ET
end ϕ +72.77. λ - 60.36, $18^h\ 48^m$ ET

June 9
begin ϕ +63.90, λ + 89.46, $20^h\ 54^m$ ET
end ϕ +64.54, λ - 9.10, $22^h\ 04^m$ ET

Neptune:

March 4
begin ϕ -45.24, λ +102.02, $15^h\ 37^m$ ET
end ϕ -49.84, λ - 70.52, $18^h\ 23^m$ ET

March 31 - April 1
begin ϕ -31.62, λ - 34.14, $23^h\ 30^m$ ET
end ϕ -36.44, λ +122.33, $03^h\ 02^m$ ET

April 28
begin ϕ -27.64, λ +166.56, $08^h\ 26^m$ ET
end ϕ -32.63, λ - 43.33, $12^h\ 05^m$ ET

May 25
begin ϕ -30.26, λ + 10.73, $16^h\ 53^m$ ET
end ϕ -35.61, λ +165.80, $20^h\ 25^m$ ET

Further information may be obtained from Dr. David Dunham, University of Texas at Austin, Austin, TX 78712 USA.

Erratum: In Vol I, No. 2, page 13, column 2, the data given for β Ceti are actually for the star 2 Ceti. My apologies for this; I hope that not too many observers were thrown off. I don't know how I slipped in the data for 2 Ceti instead of β Ceti.

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FROM THE PUBLISHER

Until now, we have provided copies of Vol. I, No. 1 to all requesters, at no charge. Thus, all subscriptions, to date, start with No. 2 or No. 3. Effective with publication of No. 3, back issues will be priced at one fourth the current price of a one-year subscription. In the interest of keeping subscriptions current, we eventually will raise the price of back issues more than one year old somewhat above that level.

The current subscription price is \$2.00 (U.S.) per year, sent by first class surface mail, or by air mail, adding the difference in cost. Checks should be made payable to: Occultation Newsletter. Address: Occultation Newsletter; 6 N 106 White Oak Lane; St. Charles, IL 60174 U. S. A.

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 previous issues. All components indicated were discovered during occultations. Under column N (new double star code), "I" designates a triple star, where orbital elements are available for the two main stars while the third star is near the secondary. The third star's separation and p.a. are referred to the secondary. A probable faint star in the Z.C. 3015 system (A.D.S. 14099) is evident in the blue channel photoelectric record obtained at McDonald Observatory in August.

Although the third star in the δ Scorpii (Z.C. 2290) system was discovered during occultations, details about the star have been obtained by sophisticated modern techniques. The separation and position angle were determined by speckle interferometry by Stachnik et al. and reported at the meeting of the American Astronomical Society in Gainesville, Florida, in December, 1974. The magnitude difference was determined to be 1.9 using the Australian intensity interferometer (see p. 10 of the first issue), in agreement with the speckle interferometer result of 2. Analysis of the photoelectric records of the September occultation at Lowell and Table Mountain Observatories should contribute more information.

SAO 76814, listed as a possible double last time, is actually a possible triple. Harold Povenmire notes that the star has a 10.6-magnitude companion 4".7 away in p.a. 62°, according to Aitken; the possible companion noted by D. Sharp was probably much closer and brighter.

We recently received a copy of "Abnormal Occultations of stars by the Moon", Union Observatory Circular No. 95, p. 192-197 (1935). This lists 286 stars whose occultations appeared abnormal to South African observers early this century. Several mention step events, while most involve gradual fades indicating possible doubles. Publication of this many stars would overwhelm an issue of Occultation Newsletter, so they will be included in an updated full list to be distributed separately later. We are also waiting for some information on visual doubles from Paul Coteau, but the recent French postal strike has delayed this. A considerable effort will be involved to integrate all of this data into the University of Texas list. Whether this can be done or not during the next few months will depend in part on our funding situation.

NEW UNIVERSITY OF TEXAS SPECIAL DOUBLE STARS, DATE 1974 DECEMBER 20

SAO	ZC	M	N	MG1	MAG2	SEP	PA	MAG3	SEP3	PA3	DATE, DISCOVERER, NOTES
78666		T	K	9.8	9.8	0.3	90				1974 Oct. 8, D. Dunham, Austin, TX
97148		T	X	9.0	9.4	0.03	341				1974 Oct. 9, T. Campbell, Temple Terrace, FL
97168		T	K	8.8	8.8	0.1	100				1974 Oct. 9, D. Dunham, Liberty Hill, TX
97429	1198	T	K	7.0	7.0	0.2	130				1974 Dec. 3, W. Eichhorn, San Angelo, TX
146239	3326	P	V	6.7	7.8	0.065	254				1974 Sep. 29, D. Evans, McDonald Observatory, TX
163645	2995	G	V	6.6	7.4	0.1	150				1974 Nov. 20, T. Campbell, Verna, FL
163688		T	V	9.5	10.2	0.3	236				1974 Nov. 20, R. Nolthenius, Tucson, AZ
163771	3015	P	I	5.8	6.3	0.257		9.3	.052	264	3rd*, 1974 Aug 30, J. Africano, McDonald Observatory, TX
184014	2290	V	L	3.0	5.0	0.00001		4.9	0.18	170	3rd*, 1974, Stachnik, Gezari, et al.

HIGH ALTITUDE AIRCRAFT PHOTOS FOR RECONNAISSANCE USE

Karl Simmons

Besides the space photos available from the EROS data center (see p. 18 of the last issue), the following agencies supply aerial photos that may be useful when only old edition topographic maps are available:

1. U. S. Dept. of Agriculture
   Soil Conservation Service
   Hyattsville, MD 20782

2. (West coast) ASCS-USDA
   2505 Parley's Way
   Salt Lake City, UT 84109

   (East coast) ASCS-USDA
   45 S. French Broad Ave.
   Asheville, NC 28801

3. Cartographic Archives Div.
   General Services Div.
   National Archives and Records Serv.
   Washington, DC 20408

4. Cartographic Division
   USGS
   Washington, DC 20242

When writing, specify what areas you would like photos for. Coverage charts for each state are available. We have found that the index photos available for $3.00 a sheet are the most useful, at the lowest price. These photos are about one yard square, and cover from 4 to 10 7 1/2-minute quadrangles. Agencies 1 to 3 supply index photos. Agency 3 only supplies photos taken before 1943.

MORE ON OBSERVING REAPPEARANCES

In response to our request in the last issue, we have received the following comments from Bruce Blundell, Manhasset, NY:

"I have found that, for reappearances on the dark limb with the dark limb invisible, I have a tendency to watch for the star too far out; it reappears a little closer to the lighted portion than I had expected. Also, when estimating the C.A. of reappearance, I have a tendency to watch for the star at too high a cusp angle; it reappears a little closer to the cusp than I had expected. In the critical moments before reappearance, an observer should make sure that he does not fall victim to either of these tendencies.

"While waiting for a dark limb reappearance with a crescent moon, with the crescent at the edge of the field, one should not focus on the moon. This is especially true if the eyepiece does not have a very flat field, such as a wide-angle Kellner. While the moon at the edge of the field may be in focus, a star reappearing in the center will not. Thus the star might reappear invisible, or at best, might not be noticed until too late. It is best to focus on the moon (or better yet, a star) while in the center of the field, and ignore the out-of-focus crescent at the edge of the field while waiting for reappearance."

SOME COMMENTS ON OBSERVING

Amateur telescope makers ponder whether to build compact, close-to-the-ground instruments which children can use without ladders, or add a few inches, to gain better seeing. Observatory designers debate putting the telescope at second floor or higher level. All of us would like mountaintop seeing conditions, with back yard convenience. Edward C. Wetherbee, Hamden, CT, gives emphasis to this theme:

"The article entitled 'The Remote Ocular Technique' especially interested me because I use it most of the time, especially on the fainter stars. I have an 8" f/6 reflector, and for most occultations, I use a 16.3 mm eyepiece (75X). I find that I can follow a star much more comfortably by using this technique. It is useful because the eye is not subjected to the full light of the moon until it is necessary, during the actual graze.

"At my home location, I am less than 2 miles from Long Island Sound, and at 70 feet elevation. Even with the best seeing conditions, I find that I cannot see 8th magnitude stars due to the glare surrounding the moon. I believe that this glare is caused by high humidity at my location. I have observed a grazing occultation of an 8.3 magnitude star at a location 15 miles inland and at 300 feet elevation with no glare problem at all."

1973 TOTAL OCCULTATION TALLY

David W. Dunham

The following tally of total occultations for 1973 has been compiled from data reported in the returned observer information forms distributed last July and from copies of reports sent to the University of Texas. The completeness of the list can be judged by the fact that the overall total is 3448, in comparison with about 6200 timings made during 1973 reported to H.M.N.A.O. at the Royal Greenwich Observatory. About 300 of the timings reported here are known to have not yet been reported to H.M.N.A.O., while H.M.N.A.O. includes approximately 1200 timings made during grazing occultations excluded here. Hence, the list is about 3/4 complete. Unfortunately, some observers, including a couple with rather large totals, could not be included because they hadn't kept accurate records of what they had reported to H.M.N.A.O.

Don Stockbauer wrote the computer program which produced the list, and keypunched most of the data; Scott Kelbell did some of the keypunching. The program computes a "value" which is 3.20 times the number of reappearances plus the number of disappearances; observers are ranked according to their "value". 3.20 is the ratio of the total number of disappearances to the total number of reappearances, applied to reflect the increased value of reappearances in analyses of occultation observations due to the uneven distribution of observations. It has been suggested that this be carried further by summing the U.S.N.O. value codes for each observed event, but this was not done, due in part to the fact that a few of the listed observers do not have U.S.N.O. predictions, but mainly because it would be a much bigger job.

Following the observer's name is the city, then state (using the 2-letter abbreviations), province, or country, where most of the observations were made. An asterisk (*) indicates that more than one observer is included in the totals, while a space sign (#) indicates that at least some (usually all) of the observations were made photoelectrically. After the "value" and the total number of reported events is given the number of reappearances and the number of the total which are not Z.C. stars (the U.S.N.O. reference number of Z.C. stars has no "Z" prefixed in the U.S.N.O. predictions).

It is interesting to note that the top three observers live in areas which are not known for clear skies. It shows what can be done with the detailed U.S.N.O. predictions, experience, and persistence in taking advantage of the clear nights which do occur. Roberts Hays uses a 20-cm Celestron, while Joel Dubin uses a 15-cm reflector. Nobody has come close, however, to the record 462 timings made by Robert Chew with a 32-cm reflector in California in 1966 (before U.S.N.O. predictions).

A coupon is enclosed to report the

Rank	Observer	Value	Total	R's	Non ZC
1	N. Wieth-Knudsen, Tisvildelunde, Denmark	426.08	210	98	139
2	Robert Hays, Chicago, IL	365.68	240	57	163
3	Joel Dubin, Skokie, IL	315.37	150	75	113
4	Harry Cochran, Brownwood, TX	263.81	169	43	120
5	David Dunham, Austin, TX	229.14	77	69	48
6	M. D. Overbeek, Johannesburg, South Africa#	170.30	124	21	78
7	John Phelps, Calumet Park, IL	165.51	117	22	82
8	John Korintus, Palm Bay, FL	152.15	86	30	0
9	A. Morrisby, Causeway, Rhodesia	148.97	74	34	52
10	Ernesto Calpo, Quezon City, Philippines*	139.33	82	26	24
11	Clay Sherrod, North Little Rock, AR	114.46	88	12	29
12	Richard Nolthenius, Tucson, AZ	109.30	63	21	37
13	Nicholas Esposito, New Hyde Park, NY	103.30	57	21	0
14	Steven Griffith, San Antonio, TX	99.48	62	17	38
15	H. F. DaBoll, St. Charles, IL	92.89	51	19	23
16	Bill Fisher, Colfax, CA	90.48	53	17	17
17	Robert Bailey, Houston, TX	90.10	46	20	29
18	Robert Sandy, Kansas City, MO	89.48	52	17	15
19	J. Pogoda, Olomouc, Czechoslovakia	69.23	56	6	45
20	James Fox, Cottage Grove, MN	57.64	40	8	27
21	Charles Cobb, McDonald Observatory, TX#	56.00	56	0	48
22	Clifford Bader, West Chester, PA	51.23	38	6	5
23	Richard Van Etten, Brandon, FL	50.66	22	13	0
24	José Osório, Vila Nova De Gaia, Portugal	50.61	44	3	26
25	Luciano Pazzi, Noycedale, South Africa	48.84	29	9	7
26	Mike Reynolds, Jacksonville Beach, FL	48.43	33	7	19
27	Robert Germann, Wald, Switzerland	45.82	37	4	1
28	Per Darnell, Rodovre, Denmark	42.82	34	4	18
29	David Evans, McDonald Observatory, TX#	42.00	42	0	36
30	Mike Lawson, Austin, TX	40.84	21	9	4
31	Klaus Klebert, Stuttgart, West Germany	40.00	40	0	25
32	William Sandmann, McDonald Observatory, TX#	40.00	40	0	34
33	Douglas Hall, Leicester, England	39.61	33	3	10
34	Geoffrey Kirby, Weymouth, Dorset, England	39.02	28	5	11
35	John West, Bryan, TX	37.64	20	8	14
36	John McGraw, Tonantzintla, Mexico#	37.00	37	0	24
37	Francisco Diego, Mexico City, Mexico	35.43	20	7	9
38	James McMahon, China Lake, CA	35.41	31	2	18
39	Rick Binzel, Washington C. H., OH	33.43	18	7	2
40	Donald Scott, Panama City, FL	32.05	10	10	3
41	Paul Goodwin, Shreveport, LA	31.20	29	1	15
42	Harold Povenmire, Indian Harbour Beach, FL	31.02	20	5	7
43	Haruki Abe, Yamakoshigun, Japan	30.82	22	4	7
44	Vic Matchett, Indooroopily, Queensland, Australia	30.00	30	0	21
45	Mickey Schmidt, Ira, TX	29.41	25	2	1
46	Mervyn Jones, Maryborough, Queensland, Australia	28.00	28	0	10
47	Steve Vogt, McDonald Observatory, TX#	28.00	28	0	24
48	Keith Horne, Claremont, CA	27.61	21	3	17
48	Simon McMillan, Holland Park, Queensland, Australia	27.00	27	0	13
50	William Westbrooke, San Francisco, CA	26.82	18	4	4
51	Warner and Swasey Observatory, East Cleveland, OH	26.61	20	3	0
52	Harald Marx, Münchingen, West Germany	26.20	24	1	18
53	P. Hazucha, Hlohovec, Czechoslovakia	24.00	24	0	7
54	Roger Tuthill, Mountainside, NJ	23.82	15	4	0
55	Bradley Timerson, Newark, NJ	23.82	15	4	8
56	Thomas Campbell, Temple Terrace, FL	23.61	17	3	9
57	John Church, Princeton Junction, NJ	23.61	17	3	5
58	Jan Hers, Randburg, South Africa	23.20	21	1	7
59	Lee Mills, Austin, TX	23.00	23	0	7
60	S. Kochan, Ziar N. Hronom, Czechoslovakia	22.20	20	1	2
61	George Haysler, Austin, TX	21.61	15	3	9
62	Clyde Reid, Selkirk, Manitoba, Canada	20.00	20	0	0
63	Mary King, Armdale, Nova Scotia, Canada	19.82	11	4	0
64	Herbert Luft, Oakland Gardens, NY	19.41	15	2	2
65	P. Vozar, Banska Bystrica, Czechoslovakia	19.20	17	1	3
66	Michael Wilson, Milwaukee, WI	17.41	13	2	0
67	H. J. Widdop, Pierrefonds, Quebec, Canada	17.20	15	1	0
68	Alfred Webber, Chadds Ford, PA	17.00	17	0	1
69	Roy Bishop, Avonport, Nova Scotia, Canada	16.82	8	4	0
70	Jeri Jones, Salisbury, NC	16.61	10	3	0
71	George Fortier, Baie d'Urfe, Quebec, Canada	15.00	15	0	5
72	Daniel Green, Boone, NC	14.61	8	3	4
73	Ronald Parmentier, Green Bay, WI	14.20	12	1	2
74	Vojtisek, Prague, Czechoslovakia	14.00	14	0	6
75	Wayne Clark, St. Louis, MO	13.41	9	2	4
76	T. Pertile, Ostrava, Czechoslovakia	13.00	13	0	0
77	Carroll Evans, China Lake, CA	12.00	12	0	8
78	Cliff Turk, Pinelands, South Africa	11.20	9	1	0
79	Timothy Chambers, Redding, CA	10.61	4	3	0
80	Alvin R. Flesher, Baltimore, MD	10.20	8	1	6
81	James Dominy, Austin, TX	10.20	8	1	2
82	J. Solheim, Tromsoe, Norway	10.00	10	0	0

number of occultation timings made during 1974. A list of 1974 totals, based upon returned coupons, and any copies of occultation timing reports received, will be published, probably in the July, 1975 issue. We could use H.M.N.A.O.'s observation files (U.S.N.O. receives copies on magnetic tape) for this purpose, but these do not contain unique observer identification, although this is included on their report forms (they may add this information later). Since most observers make timings from one place, where others do not observe, someone could cross-reference H.M.N.A.O.'s file for a year with U.S.N.O.'s records, to make a fairly comprehensive list, but this would involve quite a bit of work which could probably only be done by an amateur in the Washington, D.C. area. For 1974, it will be most efficient to use the enclosed coupon.

Rank	Observer	Value	Total	R's	Non ZC
83	J. Ocenas, Bratislava Krasnany, Czechoslovakia	9.41	5	2	0
84	Alain Porter, Narragansett, RI	9.20	7	1	3
85	P. Najser, Prague, Czechoslovakia	9.00	9	0	7
86	Ed Dutchover, McDonald Observatory, TX#	9.00	9	0	7
87	Charles Kapal, Parlin, NJ	8.41	4	2	0
88	J. Klimesova, Brno, Czechoslovakia	8.20	6	1	1
89	N. McKinnon, Panama City, FL	8.00	8	0	2
90	M. Sedlacek, Uhersky Brod, Czechoslovakia	7.41	3	2	0
91	William Dickinson, Norfolk, VA	7.41	3	2	0
92	Jean Meeus, Erps-Kwerps, Belgium	7.20	5	1	0
93	Richard Sweetsir, Jacksonville, FL	7.20	5	1	1
94	Willy Verhaegen, Wetteren, Belgium	7.00	7	0	1
95	Robert Pike, Mississauga, Ontario, Canada	6.20	4	1	2
96	J. Lacny, Ziar N. Hronom, Czechoslovakia	6.00	6	0	0
97	Ronald Cross, Christchurch, New Zealand	6.00	6	0	2
98	Edward Wetherbee, Hamden, CT	6.00	6	0	2
99	Victor Slabinski, Arlington, VA	6.00	6	0	3
100	M. Hartansky, Banska Bystrica, Czechoslovakia	5.20	3	1	1
101	B. Shinn, Winnipeg, Manitoba, Canada	5.00	5	0	0
102	J. Smudla, Gottwaldov, Czechoslovakia	5.00	5	0	0
103	Standovsky, Prague, Czechoslovakia	5.00	5	0	2
104	Luigi Baldinelli, Bologna, Italy	5.00	5	0	0
105	Kevin Kane, Columbus, OH	5.00	5	0	0
106	Karl Simmons, Jacksonville, FL	4.20	2	1	1
107	K. Jehlicka, Brno, Czechoslovakia	4.00	4	0	0
108	Chromek, Banska Bystrica, Czechoslovakia	4.00	4	0	4
109	Fabricus, Banska Bystrica, Czechoslovakia	4.00	4	0	3
110	Sirova, Prague, Czechoslovakia	4.00	4	0	1
111	Roy Caputo, Howard Beach, NY	4.00	4	0	0
112	Richard Wade, Salt Lake City, Utah	4.00	4	0	2
113	Bohumil Malacek, Valasske Mezirici, Czechoslovakia	3.20	1	1	0
114	F. Pavlas, Holesov, Czechoslovakia	3.20	1	1	1
115	V. Skodova, Valasske Mezirici, Czechoslovakia	3.20	1	1	0
116	Byron Labadie, Tulsa, OK	3.20	1	1	1
117	Hank Geerlof, Calgary, Alberta, Canada	3.00	3	0	0
118	K. Vanek, Olomouc, Czechoslovakia	3.00	3	0	2
119	J. Teply, Broumov, Czechoslovakia	3.00	3	0	0
120	O. Kolar, Gottwaldov, Czechoslovakia	3.00	3	0	0
121	Sedlacek, Hlohovec, Czechoslovakia	3.00	3	0	0
122	J. Robert Andress, Hiram, OH	3.00	3	0	0
123	Robert Clyde, Streetsboro, OH	3.00	3	0	0
124	Robert Yajko, West Leechburg, PA	3.00	3	0	0
125	M. Vlcek, Ostrava, Czechoslovakia	2.00	2	0	2
126	Palka, Prague, Czechoslovakia	2.00	2	0	1
127	Krejci, Prague, Czechoslovakia	2.00	2	0	1
128	M. Tonomura, Shizuoka-Ken, Japan	2.00	2	0	0
129	Michael Kazmierczak, Atlantic Beach, FL	2.00	2	0	1
130	Bruce Blundell, Manhasset, NY	2.00	2	0	0
131	Michael Blair, Washington C. H., OH	2.00	2	0	0
132	M. Vonasek, Rokycany, Czechoslovakia	1.00	1	0	0
133	M. Neubauer, Valasske Mezirici, Czechoslovakia	1.00	1	0	0
134	S. Pinter, Hurbanovo, Czechoslovakia	1.00	1	0	0
135	P. Kastovsky, Valasske Mezirici, Czechoslovakia	1.00	1	0	0
136	T. Metelka, Uhersky Brod, Czechoslovakia	1.00	1	0	0
137	B. Lukac, Hurbanovo, Czechoslovakia	1.00	1	0	0
138	P. Saroch, Slany, Czechoslovakia	1.00	1	0	0
139	Mudra, Prague, Czechoslovakia	1.00	1	0	1
140	Csolle, Hurbanovo, Czechoslovakia	1.00	1	0	0
141	Pajtl, Rokyany, Czechoslovakia	1.00	1	0	0
142	Jezik, Hlohovec, Czechoslovakia	1.00	1	0	0
143	M. Jirku, Jindrichuv Hradec, Czechoslovakia	1.00	1	0	0
144	Douglas Sharpe, Satellite Beach, FL	1.00	1	0	0
145	Claude Baines, West Monroe, LA	1.00	1	0	0
146	James Bryan, Austin, TX	1.00	1	0	0
147	Stan Harley, Austin, TX	1.00	1	0	1
	R/D value ratio = 3.20	5256.00	3448	820	1683

SOME MISCELLANEOUS ITEMS

David W. Dunham

A few observers who used to send copies of graze reports to H.M.N.A.O. have stopped doing so due to the announced intention of keypunching the data at the University of Texas and sending H.M.N.A.O. data converted to their format. Unfortunately, this project has been delayed, but hopefully, will be started during the next few months. Even when it is begun, H.M.N.A.O. should still have a copy of the report, even though on a University of Texas form, in order to check for possible keypunch errors and observer comments.

WWV is available by telephone at Bergstrom A.F.B., Austin, Texas. Call 512, 385-4100 and ask for extension 3303. As mentioned on p. 7 of O.G.O.-VIII, accurate time is also available by telephone in New York City; Chicago; Fairbanks, Alaska; Boulder, Colorado; Kehaha, Hawaii; the United Kingdom; and some European countries. WWV might also be available by telephone at a United States military installation near you; if so, let me know, and I'll spread the word.

According to the National Bureau of Standards Time and Frequency Service Bulletin No. 204 (Nov. 1974), p. 7, the radiated power of WWVH will remain unchanged for the present, due to a large number of responses objecting to the proposed reduction (see last issue, p. 17).

My funding situation, as described in the last issue, p. 17, remains unchanged. The grants which will determine my future (if any) at the University of Texas will not be decided until January; at least, they have not been rejected yet (mid-December). Two new computors have become operational, and more will likely follow. The January - March, 1975 graze predictions, except for a few special requests, all have been computed by others, at distant institutions, for the first time. It is likely that, during the next few months, we can compute all of the 1975 predictions, and develop a year's lead time.

Richard Nolthenius has recommended an extension of the extended H.M.N.A.O. timing method code described in O.G.O.-VIII, p. 3. Add method number 16 - Estimated time with respect to an accurately timed event. This might be needed, for example, when two or more events occur so quickly during a graze that the observer can't record them separately, but did call out the first event and can recall essentially what happened after that. I propose another method, number 17 - Relative timings made absolute to the given accuracy by forced agreement with timings made at neighboring stations. For example, if an observer at station 2 recorded his events, but the short wave time signals (even the minute marks, calls of other observers, or passing automobiles) were too weak to record, and the observer at station 1 timed the first disappearance 2.0 seconds later than the observer at station 3, the time of first disappearance at station 2 is known to ± 1.0 second, if the observers were set up along a straight road.

GRAZES OBSERVED IN 1974 REPORTED TO THE UNIVERSITY OF TEXAS

David W. Dunham

Reports of 1974 expeditions not listed in previous issues are listed here in the same format. The last few months have been very productive, with four expeditions obtaining more timings than any of the expeditions for grazes of distant stars listed in the previous two issues. September had the most expeditions, 23, not including two successful expeditions for the Delta Scorpii graze (unfortunately, clouds interfered considerably for the group at Gila Bend, Arizona, and also partly for the Baja California effort; five other major attempts were completely clouded out).

The November 20th graze of 27 G. Capricorni (Z.C. 2995) observed in Florida is now the sixth most successfully observed graze, with a total of 136 timings. A good profile and the star's unexpected duplicity helped. Since the graze occurred a couple of minutes earlier at Verna than at Cocoa, Campbell was the first to see the companion. However, Povenmire's results were needed in order to estimate the separation.

Another "top dozen" graze which should have been included on last issue's list was one which tied for 7th (now 8th) place with 134 timings. It occurred on 1971 September 24 involving 153 B. Librae at Arthur's View, South Africa; the expedition was organized by Jan Hers. Multiple events involving all three components helped make it the most successful expedition outside the United States. The November 18th expedition for 36 Sagittarii (Z.C. 2757) is now the 14th most successful. The largest number of successful stations for a graze this year, at Port Washington on September 23rd, used the Milwaukee Astronomical Society's timing cable and many of their special 10-inch graze telescopes.

The September 29th graze of Situla (Kappa Aquarii, Z.C. 3320) helped define the unusually low area of the moon at negative librations in the range 165° - 175° of Watts angle (this area, incidentally, is one of the few areas not photographed by lunar orbiters). Appropriate corrections were sent to all profile plotters. As a consequence, the large shifts observed in this area of the moon were rather successfully predicted. A notable example was Z.C. 2995, where a south shift of 0"9, due to a calculated star position error complicated the prediction.

Texans observed two grazes in one night twice, on September 29th and December 6th. The latter pair was most interesting, since $2^h 40^m$ and 100 miles of interstate highway separated the events. A correction to the prediction for the 2nd graze was computed enroute, based on results for the 1st one. Has anyone tried to observe three grazes (not counting components of double or multiple systems separately) in one night?

Robert Sandy points out that the latitude libration increased 3°3, rather than 2°5, as stated on line 32, col. 1, p. 15 of the last issue. Incidentally, he observed the grazes of October 9th and 23rd from his home, making three grazes which he has observed from his back yard during the past eight years (multiple events were timed during two of them).

The asterisk (*) in the entry for the October 21st graze of Xi Sagittarii (Z.C. 2759) is merely to call attention to the possibility that the prediction basis may not be comparable with that used in the United States.

1974 Mo	Dy	Star Number	Mag	% Snl	CA	Location	# Sta	# Tm	C C	Ap cm	Organizer	St	WA	b
8	1	2797	3.0	96+	7S	Key Largo, FL	1	5		15	Harold Povenmire	C		
8	10	Z02028	7.7	57-	7N	Scottsmoor, FL	2	9		15	Harold Povenmire			
8	23	Z13928	8.4	37+	N	Michelago,Austrl.	4	4	6	10	David Herald	C		
8	30	3015	5.3	94+	23S	Jupiter, FL	1	10		15	Harold Povenmire			
9	8	Z02960	7.8	66-	N	Salisbury, Rhod.	1	5	7	13	A. Morrisby			
9	10	Z05183	9.0	40-	3N	Sabino Can., AZ	1	1	6	15	R. Nolthenius	9N	358	20
9	11	Z06694	8.0	29-	4N	Winter Beach, FL	1	1		15	Harold Povenmire			
9	11	Z06883	8.3	27-	-3N	Tucson, AZ	2	2	9	15	R. Nolthenius	C20N	1	35
9	12	Z08055	8.1	18-	4S	Satellite Bch, FL	1	1		41	Harold Povenmire			
9	12	Z08070	7.7	18-	3N	Tucson, AZ	3	19	8	15	R. Nolthenius	C16N	359	48
9	21	2419	8.1	37+	S	Racepond, GA	1	7	4	20	Richard Sweetsir			
9	22	2430	7.0	38+	9S	Rose Creek, MN	2	7	7	11	James Fox	5S	167	6
9	23	Z17340	8.3	48+	13S	Rossville, KS	3	9	4	20	Richard Wilds		166	-8
9	23	Z17340	8.3	48+	13S	Port Wash., WI	16	56	8	15	Robert James	5S	166	-8
9	25	2854	7.3	67+	18S	Arcadia, FL	1	8	6	20	Thomas Campbell	1S	162	-36
9	27	Z22769	8.5	85+	18S	Sahuarita, AZ	1	11	5	15	R. Nolthenius	8N	166	-56
9	29	3320	5.3	95+	16S	Leon Springs, TX	1	3	7	15	Steven Griffith		173	-59
9	29	3320	5.3	95+	16S	Creedmore, TX	11	33	7	25	David Dunham	10N	173	-59
9	29	3340	7.5	95+	16S	Liberty Hill, TX	1	1	4	25	David Dunham	3S	172	-65
9	30	3453	4.9	98+	30S	Daytona Beach, FL	3	6	8	15	Michael Reynolds			
9	30	3455	6.4	98+	31S	Liberty Hill, TX	3	6	6	25	Don Stockbauer	6N	164	-61
10	9	Z07678	9.0	43-	3S	Kansas City, MO	1	1	7	15	Robert Sandy		183	48
10	9	Z07710	8.8	43-	3S	Liberty Hill, TX	2	5	4	25	Don Stockbauer	1S	187	46
10	10	Z08803	8.7	31-	8S	Williams Bay, WI	1	4	6	15	Homer DaBoll	1S	187	59
10	11	1410	5.3	23-	N	Maytown, FL	2	8	8	15	Richard Sweetsir			
10	11	Z09719	7.8	21-	6S	Atolia, CA	4	16		10	Robert Fischer	1S	183	65
10	12	Z10378	8.1	12-	8S	Cooper City, FL	3	16		15	Harold Povenmire			
10	20	2614	6.2	29+	S	Bloemfontein,S.Af.	2	19	5	8	Graeme Walker			
10	21	Z18492	8.0	31+	13S	Four Corners, CA	1	10	7	25	Keith Horne			
10	21	2759	3.6	36+	9S	Hayling, Hants, UK	3	10	9	5	G. J. Kirby	7S*	169	-27
10	23	Z21199	8.3	50+	13S	Kansas City, MO	3	14	8	25	Robert Sandy	9N	165	-43
10	23	3008	6.9	55+	11S	Little Bredy, UK	2	1	5	11	G. J. Kirby	-	169	-48
10	27	Z24663	8.8	85+	17S	Tucson, AZ	1	1	4	15	Richard Nolthenius		169	-63
11	3	0847	3.0	86-	10S	Rice Lake, MN	1	1	8	20	James Fox		193	22
11	4	0969	7.1	80-	5N	Picacho, AZ	1	1	6	15	R. Nolthenius	23N	353	32
11	5	1124	6.9	69-	4S	Shreveport, LA	3	10		15	Paul Goodwin			
11	8	Z10117	8.1	36-	S	Ormond Beach, FL	2	10	7	15	Karl Simmons			
11	9	Z10861	8.2	24-	9S	Hartland, IL	2	11	7	15	Homer DaBoll	8S	185	71
11	9	Z10861	8.2	24-	9S	Goshen, IN	1	2	8	15	Rick Binzel			
11	10	1743	6.8	15-	N	Cat Mountain, AZ	1	2	8	15	Richard Nolthenius			
11	18	2757	5.1	16+	12S	Olancha, CA	15	86			James McMahon			
11	20	2995	6.2	32+	14S	Verna, FL	2	25	9	20	Thomas Campbell		163	-53
11	20	2995	6.2	32+	14S	Cocoa, FL	14	111			Harold Povenmire			
11	22	Z23698	7.9	51+	11S	Garnett, KS	1	1	4	10	Richard Wilds			
11	22	Z23698	7.9	51+	11S	Freeman, MO	4	17	7	15	Robert Sandy	12N	170	-64
11	23	3340	7.5	60+	16S	Edgeville, FL	1	11	8	20	Thomas Campbell			
11	23	3453	4.9	68+	5S	Hayling, Hants, UK	2	4	9	5	G. Nash	C	176	-62
11	23	3453	4.9	68+	5S	Bournemouth, UK	3	4	5	9	D. Miles	C	176	-62
12	4	1359	5.1	72-	9S	Goss, MO	1	12	7	20	John Phelps	0	193	67
12	6	1582	6.3	50-	1S	Tubac, AZ	2	2	8	15	Richard Nolthenius			
12	6	1582	6.3	50-	4S	Turnersville, TX	3	15	8	20	David Dunham	3N	186	70
12	6	1590	6.9	49-	10S	Eddy, TX	3	19	8	20	David Dunham	4N	189	71
12	7	Z11388	8.5	38-	11S	Flagler Beach, FL	1	2		15	Harold Povenmire			
12	11	2212	6.1	4-	-N	Phelan, CA	2	4	9	13	Keith Horne			
12	17	3070	6.6	16+	9S	Hugo, MN	1	3	5	20	James Fox	2S	167	-55
12	18	Z22541	8.8	17+	9S	Austin, TX	4	11	5	31	Don Stockbauer	S	166	

SOME RECENT PUBLISHED PAPERS ABOUT OCCULTATIONS

Compiled by David W. Dunham

T. F. Bell, "Fireworks in Your Eye-piece", in *The Great Escape*, edited by M. S. Yee, p. 112 (Bantam, 1974). For novices, this is a good brief description of the basics of "grazing" which conveys the excitement involved. U.S.N.O. is incorrectly given as the address to write for graze information, but any requests will be forwarded to the proper address.

D. W. Dunham, S. W. Killen, and T. L. Boone, "The Diameter of (1) Ceres from a Lunar Occultation", Bull. Am. Astron. Soc. 6, 432. The first known observations of an occultation of a minor planet by the moon were recorded by five visual observers in Australia on 1973 Sept. 4. The diameter calculated from the observed durations of fading is 1200 ± 250 km, consistent with modern polarimetric and radiometric results and disagreeing with micrometer measurements. Uncertainties in visual thresholds and lunar slopes are the main error sources. These could have been reduced by photoelectric observations, but such attempts for this event were all defeated by clouds.

J. L. Elliot, K. Rages, and J. Veverka, "The Angular Separation of the Spectroscopic Binary β Scorpii A", Bull. Am. Astron. Soc. 6, 460. The sharp spikes in the light curves of the 1971 May 13 occultation by Jupiter are shown to be well-focussed one-dimensional images of this spectroscopic binary. Using both immersion and emersion data, the p.a. and separation (0".0007) were determined, as well as the angular diameters of the stars (0".000198 and 0".000117). Using the estimated distance to β Scorpii and the spectroscopic orbital data, the stellar radii are found to be 8.0 ± 3 and 5.0 ± 2 times that of the sun, and the mass ranges are 24 - 40 and 13 - 23 solar masses.

G. Mallén, "HP-65 Occultation Prediction Program", unpublished, Mexico City (address in 1974 July roster). This can't compete with U.S.N.O. predictions, but the procedure is instructive and might be of interest to those with access to HP-65 calculators.

J. T. McGraw, D. W. Dunham, D. S. Evans, and T. J. Moffett, "Occultations of the Pleiades; Photoelectric observations at Tonantzintla with a discussion of the duplicity of Atlas", Astron. J. 79, 1299. Twenty-three photoelectric traces, among the best ever made in visible light, were recorded using the 40-inch reflector of the National Observatory of Mexico and portable electronic equipment on 1973 February 11. Close components of SAO 76103, 76192, 76225, and Atlas were resolved. The spectroscopic orbit of Atlas is discussed in light of this and other photoelectric occultation records of the star.

C. L. Morbey, "Distortion Mechanisms for Lunar Occultation Diffraction Patterns", Astron. J. 79, 1304. Relative magnitudes of the factors causing distortion of photoelectric lunar occultation observations are compared on theoretical grounds.

G. Ricker, A. Scheepmaker, S. Ryckman, P. Downey, J. Doty, J. Ballintine, and W. Lewin, "High Energy X-Ray Observation of a Lunar Occultation of the Crab Nebula from a Balloon-Borne Telescope", Bull. Am. Astron. Soc. 6, 437. The observation was made in a range of 20 - 150 keV over Saskatchewan on 1974 August 13. The emitting region was elliptical, with a 20" long axis perpendicular to the long axis of the optical crab. NP0532 was about 9" from the center of the emitting region. The observation was planned so that both immersion and emersion took place at flat areas of the moon.

S. T. Ridgway, D. C. Wells, and D. F. Carbon, "Diameter of μ Geminorum M3 III from Lunar Occultation", Astron. J. 79, 1079. From photoelectric observations made in three colors with the 150-cm McMath solar telescope at Kitt Peak on 1974 Feb. 4, a diameter of 0".0137 ± 0".0010 was determined for a disk darkened by 90% at the limb, a reasonable assumption for such a star.

G. E. Taylor, "Planetary Occultations: A Review of the Methods of Prediction, the Results of Astrometric Analysis and the Future Prospects", N.A.O. Technical Note No. 34. Occultations of stars by planets, minor planets, and natural satellites are predicted since observations can provide valuable information about the sizes, shapes, and atmospheres (if any) of these bodies. Observations which have been made to date are summarized. He explains that the diameter of Ganymede determined by Ristenpart from observations of an occultation in 1911 are erroneous since the star was too faint relative to Ganymede for reliable visual observations.

T. C. Van Flandern, "An Investigation of Possible Systematic Error in the Observed Rate of Change of G", Bull. Am. Astron. Soc. 6, 431. Improvements resulting from the removal of problems with a numerical integration, recently measured systematic corrections to the FK4 system, removal of periodic terms in the residuals whose causes could be determined, and additional observations (mostly recent, through 1974 Oct., photoelectric data from McDonald Observatory) have resulted in a value of $\dot{G}/G = (-7.5 \pm 2.7) \times 10^{-11}$/yr. Other astrophysical and geological data, most of which tends to favor a decreasing gravitational constant, were enumerated. See p. 9 - 10 of the first issue.

N. M. White, "Angular Diameter of μ Geminorum", Astron. J. 79, 1076. Four photoelectric observations made with V or y filters with 24-, 31-, and 42-inch telescopes at Lowell Observatory during occultations on 1973 Oct. 17 and 1974 Feb. 4 result in an angular diameter of 0".0121 ± 0".0001 for a uniform disk. If a disk darkened to the limb were assumed, the diameter would be slightly larger. Infrared magnitudes were used for an improved bolometric correction which was used to calculate an effective temperature of 3880° ± 40° K at the surface of the star.

FLORIDA GRAZE OBSERVERS MEET

Thomas H. Campbell, Jr.

As Joan and David Dunham planned to be in Tampa for the Sixth Annual Meeting of the Division of Dynamical Astronomy, at U.S.F., he and I arranged a special meeting at my home in Temple Terrace, for the evening of December 8th. Several graze observers, from different cities in the central Florida area, attended; Wayne Green, Joe Huertas, Harold Povenmire, Bryan Siebuhr, Rita Fairman, Dan Bricker and Lee Ford. The group included long-time observers as well as some so new that they are not included in the latest roster of observers, new computors, expedition leaders and profile plotters. It was a very useful meeting, with Dr. Dunham giving us much insight as to how our data are handled and reduced. There was a long question and answer period.

An electronic digital reaction time tester was constructed in time for the meeting, and was successfully used. A light emitting diode was used as an artificial star. It was possible to simulate D's, R's, blinks and flashes. Favorable and marginal conditions were also simulated. Pushbutton and voice signal reactions were measured. Results of tests are now being analyzed, and I am preparing a paper, which will be available to anyone who sends me a self-addressed envelope bearing the appropriate postage for 2 ounces. Preliminary results show personal equation averages to be 0ˢ3 by pushbutton and 0ˢ4 by voice, under highly favorable conditions, and about 0ˢ4 and 0ˢ5, respectively, under marginal conditions.

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SEPARATION OF THE TERMINATOR FROM THE DARK LIMB

Table prepared using D. W. Dunham's O.G.O.-VIII formulae. For each value of Elongation (upper part of table) or Percent Sunlit (lower part), there are 2 rows of figures, omitting all but the first value above 10 seconds for each Cusp Angle, and all negative values. Upper row is separation, in seconds of arc, of the mean limb theoretical terminator from the dark mean limb. Lower row is for the "worst" terminator (2-mile-high mountains). Allow for irradiation! H. F. DaBoll

Elong. or % Snlt	CUSP ANGLE 1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	12°	14°	16°	18°	20°	25°	30°	40°	50°	60°	70°	80°	90°
179	.000	.000	.000	.001	.001	.002	.002	.003	.003	.004	.006	.008	.011	.014	.017	.025	.036	.059	.083	.107	.126	.138	.142
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
178	.000	.001	.002	.003	.004	.006	.008	.011	.014	.017	.025	.033	.043	.054	.066	.101	.142	.235	.333	.426	.502	.702	.568
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
177	.000	.002	.003	.006	.010	.014	.019	.025	.031	.039	.055	.075	.097	.122	.150	.229	.320	.529	.751	.960	1.13	1.24	1.28
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
176	.001	.003	.006	.011	.017	.025	.034	.044	.056	.069	.098	.133	.173	.218	.267	.407	.570	.942	1.34	1.71	2.01	2.21	2.28
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.003	.007
175	.001	.004	.010	.017	.027	.039	.053	.069	.087	.108	.154	.209	.271	.341	.417	.637	.892	1.47	2.09	2.68	3.15	3.46	3.57
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.042	.119	.185	.210
174	.002	.006	.014	.025	.039	.056	.076	.100	.126	.155	.222	.301	.391	.491	.602	.919	1.29	2.13	3.02	3.86	4.55	4.99	5.15
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.001	.093	.283	.489	.643	.699
173	.002	.009	.019	.034	.053	.077	.104	.136	.172	.212	.304	.411	.534	.671	.822	1.25	1.76	2.90	4.12	5.27	6.20	6.81	7.03
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.072	.354	.740	1.11	1.38	1.48
172	.003	.011	.025	.045	.070	.101	.137	.178	.225	.278	.398	.539	.699	.879	1.08	1.64	2.30	3.80	5.40	6.90	8.13	8.93	9.20
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.006	.261	.784	1.41	1.99	2.40	2.54
171	.004	.014	.032	.057	.089	.128	.174	.226	.286	.352	.505	.684	.888	1.12	1.37	2.09	2.92	4.83	6.86	8.77	10.3	11.3	11.7
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.000	.071	.570	1.38	2.31	3.13	3.70	3.91
170	.004	.018	.040	.071	.110	.158	.215	.281	.355	.437	.626	.848	1.10	1.38	1.69	2.59	3.62	5.99	8.50	10.9			
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.026	.208	1.00	2.16	3.42	4.54	5.30	5.57
168	.006	.026	.058	.102	.160	.230	.313	.408	.515	.635	.910	1.23	1.60	2.01	2.46	3.76	5.26	8.70	12.4				
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.013	.233	.702	2.23	4.24	6.34	8.15	9.38	9.81
166	.009	.035	.079	.141	.220	.317	.430	.561	.709	.874	1.25	1.70	2.20	2.77	3.39	5.17	7.24	12.0					
	-	-	-	-	-	-	-	-	-	-	-	-	.000	.038	.139	.650	1.50	3.97	7.05	10.2	12.9	14.7	15.3
164	.012	.047	.105	.186	.291	.419	.569	.742	.938	1.01	1.66	2.24	2.91	3.66	4.48	6.84	9.58						
	-	-	-	-	-	-	-	-	-	-	-	.000	.050	.186	.403	1.29	2.60	6.23	10.6				
162	.015	.060	.135	.239	.374	.538	.731	.953	1.20	1.48	2.13	2.88	3.74	4.68	5.75	8.79	12.3						
	-	-	-	-	-	-	-	-	-	-	-	.040	.189	.448	.812	2.15	4.04	9.06					
160	.019	.075	.169	.300	.469	.674	.917	1.20	1.51	1.86	2.67	3.61	4.69	5.90	7.22	11.0							
	-	-	-	-	-	-	-	-	-	-	.014	.148	.422	.831	1.37	3.26	5.82	12.5					
96	.026	.103	.232	.412	.642	.924	1.26	1.64	2.07	2.55	3.66	4.95	6.43	8.08	9.89								
	-	-	-	-	-	-	-	-	-	.002	.132	.457	.972	1.67	2.55	5.47	9.30						
95	.033	.133	.299	.532	.830	1.19	1.62	2.11	2.68	3.30	4.73	6.40	8.31	10.4	12.8								
	-	-	-	-	-	-	-	-	.003	.054	.349	.896	1.69	2.72	3.97	8.04	13.3						
94	.041	.165	.372	.661	1.03	1.48	2.02	2.63	3.32	4.09	5.87	7.95	10.3										
	-	-	-	-	-	-	-	.000	.041	.163	.646	1.44	2.54	3.93	5.60	10.9							
93	.050	.200	.449	.798	1.25	1.79	2.44	3.18	4.02	4.95	7.09	9.60											
	-	-	-	-	-	-	-	.016	.120	.322	1.01	2.08	3.51	5.30	7.42								
92	.059	.237	.533	.946	1.48	2.12	2.89	3.77	4.76	5.86	8.40	11.4											
	-	-	-	-	-	-	.000	.060	.235	.526	1.45	2.81	4.61	6.83	9.44								
91	.069	.277	.622	1.10	1.73	2.48	3.37	4.40	5.56	6.85	9.81												
	-	-	-	-	-	-	.010	.129	.384	.773	1.95	3.64	5.84	8.52	11.7								
90	.080	.319	.718	1.28	1.99	2.86	3.89	5.08	6.41	7.90	11.3												
	-	-	-	-	-	-	.037	.223	.565	1.06	2.51	4.56	7.19	10.4									
89	.091	.365	.822	1.46	2.28	3.28	4.45	5.81	7.34	9.04													
	-	-	-	-	-	-	.081	.341	.779	1.39	3.15	5.58	8.69										
88	.104	.415	.934	1.66	2.59	3.72	5.06	6.60	8.34	10.3													
	-	-	-	-	-	.003	.141	.482	1.03	1.77	3.86	6.71	10.3										
87	.117	.469	1.05	1.87	2.92	4.21	5.72	7.46	9.42														
	-	-	-	-	-	.016	.217	.649	1.31	2.20	4.64	7.96											
86	.132	.527	1.19	2.11	3.29	4.73	6.43	8.39	10.6														
	-	-	-	-	-	.038	.310	.841	1.63	2.67	5.51	9.33											
85	.148	.591	1.33	2.36	3.69	5.31	7.21	9.41															
	-	-	-	-	-	.072	.422	1.06	1.99	3.21	6.48	10.9											
84	.165	.660	1.48	2.64	4.12	5.92	8.05	10.5															
	-	-	-	-	-	.114	.550	1.31	2.39	3.79	7.53												
83	.184	.735	1.65	2.94	4.59	6.60	8.97																
	-	-	-	-	-	.168	.699	1.59	2.84	4.44	8.70												
82	.205	.818	1.84	3.27	5.10	7.34	9.98																
	-	-	-	-	.001	.233	.869	1.91	3.34	5.17	10.0												
81	.227	.909	2.04	3.63	5.67	8.15	11.1																
	-	-	-	-	.007	.311	1.06	2.26	3.90	5.98													
80	.252	1.01	2.27	4.03	6.29	9.05																	
	-	-	-	-	.018	.402	1.28	2.66	4.53	6.88													
79	.280	1.12	2.52	4.47	6.98	10.0																	
	-	-	-	-	.035	.508	1.53	3.11	5.23	7.89													
78	.311	1.24	2.79	4.96	7.75																		
	-	-	-	-	.057	.631	1.82	3.61	6.01	9.01													
77	.345	1.38	3.10	5.51	8.60																		
	-	-	-	-	.087	.772	2.14	4.18	6.89	10.3													
76	.383	1.53	3.44	6.12	9.55																		
	-	-	-	-	.123	.935	2.50	4.82	7.88														
75	.426	1.70	3.83	6.80	10.6																		
	-	-	-	-	.168	1.12	2.92	5.54	9.00														

ELG	% Snlt
180	100.00
179	99.99
178	99.97
177	99.93
176	99.88
175	99.81
174	99.73
173	99.63
172	99.51
171	99.38
170	99.24
169	99.08
168	98.91
167	98.72
166	98.52
165	98.30
164	98.06
163	97.82
162	97.55
161	97.28
160	96.98
156.93	96
154.16	95
151.64	94
149.32	93
147.14	92
145.08	91
143.13	90
141.26	89
139.46	88
137.73	87
136.05	86
134.43	85
132.84	84
131.30	83
129.79	82
128.32	81
126.87	80
125.45	79
124.06	78
122.68	77
121.33	76
120.00	75