Occultation Newsletter

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Joan Bixby Dunham, Editor

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Occultation Newsletter is published by the International Occultation Timing Association. Editor: Joan Bixby Dunham; 7006 Megan Lane; Greenbelt, MD 20770-3012; U.S.A.; e-mail joan@ulabsgi.gsfc.nasa.gov. Please send editorial matters to the above. Send new and renewal memberships and subscriptions, back issue requests, address changes, graze prediction requests, reimbursement requests, special requests, and other IOTA business, but not observation reports, to: Craig and Terri McManus; 2760 SW Jewell Ave.; Topeka, KS 66611-1614; U.S.A.

FROM THE PUBLISHER

For subscription purposes, this is the third issue of 1994. It is the fifth issue of Volume 6. IOTA annual membership dues, including ON and supplements for U.S.A., Canada, and Mexico $30.00
for all others 35.00

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for U.S.A., Canada, and Mexico 20.00
for all others 25.00

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

Local circumstance (asteroidal appulse) predictions 1.00
Graze limit and profile predictions (per graze) 1.50
Papers explaining the use of the predictions 2.50

Asteroidal occultation supplements will be available at extra cost: for South America via Orlando A. Naranjo (Universidad de los Andes; Dept. de Fisica; Merida, Venezuela), for Europe via Roland Boninsegna (Rue de M ariembourg, 33; B-6381 DOURBES; Belgium) or IOTA/ES (see below), for southern Africa via M. D. Overbeek (Box 212; Edenvale 1610; Republic of South Africa), for Australia and New Zealand via Graham Blow (P.O. Box 2241; Wellington, New Zealand), and for Japan via Toshio Hirose (1-13 Shimomaruko 1-chome; Ota-ku, Tokyo 146, Japan). Supplements for all other areas will be available from Jim Stamm (11781 N. Joi Drive; Tucson, AZ 85737; U.S.A.) for $2.50.

Observers from Europe and the British isles should join IOTA/ES, sending DM 40.- to the account IOTA/ES; Bartold-Knaust Strasse 8; D-30459 Hannover, Germany; Postgiro Hannover 555 829 - 303; bank-code-number (Bankleitzahl) 250 100 30.

IOTA NEWS

David W. Dunham

IOTA Manual and Dues Increase: Sometime during 1995, the **IOTA Observer's Manual** will be distributed to all IOTA members. As many of the planned updates (including the new graze prediction format, expanded eclipse observing chapter, and other improvements) as possible will be included so that it can be distributed before November 1995. The cost of this, and a planned postal rate increase during 1995, make it necessary to increase our dues for IOTA members, as shown in "FROM THE PUBLISHER" on this page. The rates for **ON** subscriptions alone have not been changed. The new IOTA rate is given in my 1995 lunar occultation highlights article in the January 1995 issue of **Sky and Telescope**, which many of you will have received before this issue of **ON**. The old rate is given in the **RASC Observer's Handbook** for 1995. The new rates are in effect now, with the distribution of this issue of **ON**. It is difficult to forecast the extra cost of the IOTA manual, and the exact postal rate increases have also not been announced. The new rate might not be sufficient to cover IOTA's costs, but if so, an additional increase in dues or **ON** subscription will be delayed as long as possible using our current reserves.

Observations: The main purpose of this issue is to publish observational reports that could not be included in previous issues. Also in this issue is Edwin Goffin's report of the ESOP-XIII meeting. Edwin Goffin's 1995 Planetary Occultation Supplement for North American Observers, with events selected mainly by Jim Stamm and annotated by David Werner, is being distributed with this issue.

χ Virginis Graze Dec. 26: The southern limit of a good graze of this star by the last-quarter Moon is shown crossing the Great Lakes region and southern New England, passing near Toronto, Rochester, and New Haven, on my map on p. 80 of last January's issue of

Sky and Telescope. Robert Sandy hopes that additional observations can be made of the 9th-mag. companion that he and others saw during a previous graze of the star. Those planning expeditions for this graze are encouraged to send me their plans, preferably by e-mail to: David_Dunham@jhuapl.edu or by phone to 301-474-4722, so that this information can be included on the IOTA occultation line at 301-474-4945. Phil Dombrowski, Glastonbury, CT, is planning an expedition near Hamden; if you are interested in joining it, contact him by e-mail at 73170.1503@compuserve.com or by phone at 203-659-1783.

Next Issue: The main purpose of the next issue will be to publish several other articles for which there was not space in this issue, including important articles about using the Global Positioning System (GPS) and five years of total lunar occultation tallies by Joseph Carroll. It will be published later this month, but you will probably not receive it until early January.

PREDICTIONS FOR 1995

David W. Dunham, Eberhard Riedel,
Eric Limburg, Eran Ofek and Edwin Goffin

After completing this issue, we will send the necessary data to the national and regional coordinators, and graze computors, to compute and distribute the asteroidal, and lunar total and grazing, occultation predictions for IOTA members.

Evans Total Occultation Predictions: Total lunar occultation predictions may have already been distributed by European coordinators, since they got the 1995 Besselian elements file (befile) at ESOP-XIII in August; see p. 68 of the last issue. However, Wolfgang Zimmermann in Hannover has created a new zodiacal catalog, based mainly on the PPM catalog, which contains several thousand more stars than the XZ catalog used to create the 1995 befile. Zimmermann hopes to use his new catalog to create a new befile for 1995 to produce more comprehensive total occultation predictions for observers with large telescopes.

The total occultation predictions produced by the Evans program will be distributed to IOTA members in the current address list. Non-members will either need to buy the predictions with prices to be announced, arrange to receive them as attached (uuencoded) files by e-mail, or will need to get similar predictions (but without many of the special Evans-program features) from ILOC. Or they could generate their own predictions (except for some events near 0h U.T.) using the OCCULT 2.0 program; see **ON 6** (3), pp. 56-57. IOTA members are encouraged to receive their predictions by e-mail, or at least on diskette rather than paper, to save time and mailing costs. Having the predictions in soft form also allows generation of neighboring-station predictions using Henk Bulder's OCCLIST program; see **ON 6** (3), p. 56.

Lunar Occultation Workbench: Eric Limberg described the goals of this total occultation software at the ESOP-XIII meeting, where a partially-operational version was demonstrated. More information about it, in Dutch, has been published in **Occultus** No. 38 (Sept. 1994), publication of the Dutch Occultation Association. The software, now ready for distribution, is a user-friendly menu-driven program for IBM-compatible PC's. The menus are in English. The program is a general-purpose lunar occultation tool, allowing one to generate predictions (using A. Gerritsen's software, which is similar to OCCULT 2.0 and Evans in capabilities for XZ-catalog stars), observation report files in ILOC's format, reductions, and graphical animations. The software uses 3 megabytes, plus 5 more if a version of Watts' data are also included (it would be needed to achieve accuracies of 1-2 seconds in most predictions). A form in the **Occultus** article asks if the PC is 386, 486, Pentium, or other; if it is 386 or 486 SX, if it has a math co-processor or not; and if the Watts data are wanted or not. The cost for Dutch observers is 3.6 guilders (about $2) without the Watts data and twice that with it. Eric's address is Wilhelminastraat 37; 1054 VV Amsterdam; The Netherlands; telephone 20-6184772; fax 20-6910781. We will be interested in publishing an English version of the **Occultus** article in a future version of **ON**, along with prices for foreign orders.

Grazing Occultations: Riedel has changed his graze predictions to include coverage to 0.5 magnitude fainter than before during the gibbous phases (this increases the volume of predictions by about 25%), warning messages for grazes in the Cassini regions, and data interpolated to longitude intervals of either 2.5, 5', 7.5, or 10'. The latter will obviate the need for the Grazeint program that was used for the 1994 North American graze predictions. Software including these changes (GRAZEREG 3.4) and the 1995 graze datasets have been distributed to the graze computors.

Asteroidal and Planetary Occultations: Goffin has supplied his prediction data (stellar information, asteroid ephemeris, and some other information) to Dunham in computer files. This will ease creation of the 1995 dataset needed for use by the LOCM program used to generate local circumstance appulse predictions. Some simple changes are needed to the LOCM program, after which it and the 1995 data will be distributed to the regional coordinators, probably before the end of December.

Saturnian Satellite Mutual Events: J. E. Arlot and W.

Thuillot published a list of eclipses and mutual events of the first 8 Saturnian satellites during the current series that lasts into 1996. Timing of these phenomena can provide accurate astrometric measurements of the satellites that will be valuable for the Cassini Saturn orbiting mission, among other purposes. From photometric observations, we can learn about the atmospheric structure of Saturn and the surface characteristics of the satellites. The events are hard to observe due to the faintness of the satellites. More details and predictions can be obtained upon request to Jean-Eudes Arlot or William Thuillot, Bureau des Longitudes, Unite de Recherche Associee 707 du CNRS, F-75014 Paris, France, or by e-mail: Arlot@iap.fr or Thuillot@iap.fr.

ERRATA

There is an error in the table of observed eclipses given on p. 97 of the last issue. For the 1970 March 7 eclipse, the remark should read "No useful timings at N. limit". Also, Jim Hart of Pickering Anomalies has checked the events for 1995 listed by Goffin on p. 73 of the last issue; he writes: "The first noted event for 15 Eunomia has the date misprinted, being June not January. Also, the third event for 94 Aurora seems to be in error in that Aurora does not get near the noted R.A. and Dec. until 1997. No relatively bright asteroid is in that region of the sky on March 12, 1995. The other 1995 predictions agree with my results." Edwin Goffin confirms these errors, a confusion between "Jan"and "Jun"in the first case and a mistake in the orbital elements that he used for Aurora in the second case.

ECLIPSE NEWS; MORE LESSONS LEARNED

David W. Dunham

1994 May 10, annular: I have all known videotapes of this eclipse that show Bailey's beads. After the 1995 predictions get underway, I will put these together to make an overall composite tape (Paul Maley has already done most of this work) that will be copied for distribution to each contributor. Copies will also be available to buy or rent; details will be announced in a future issue. Also, more information will be distributed for analyzing the tapes for those who received time-inserted copies of their tapes from Tom Campbell.

1994 November 3, total: Joan and I set up one station, and members of IOTA/ES from Germany established 3 more just inside the northern limit near the town of Culluri, on the Altiplano of Bolivia about 60 km southwest of Oruro (3720 m elevation). We had broken cirrus, but fortunately it thinned a lot around totality and we got good video (and audio this time, though WWVH was faint) at our site, with about 33 seconds of totality. We lost several seconds of data changing filters, but got the most critical parts. One of the German stations got low-resolution video of the beads up through 2nd contact, but failed after that, and the other two stations had total equipment failures. It's a good thing we had a GPS receiver, because we had laid out our sites with a detailed 50,000-scale map of the area that we got from the Bolivian Instituto Geografico Militar. When we got on site, we found that the Culluri town square was over a km north of where the map said it was! We probably would have had a miss at our site if we'd located using the map.

After the eclipse, we travelled to Tarija, Bolivia, where I attended the 7th meeting of the Liga Iberoamericana de Astronomia (LIADA). I showed our eclipse videotape for the first time (as well as some footage of the May 10th annular eclipse), gave a well-received presentation on the work of IOTA, and made contacts with many Latin American amateur astronomers.

For the eclipse, three more stations were set up by the Germans at the southern limit near Uyuni, Bolivia, led by Hans Bode. Scheduling problems with a group of surveyors hired by them to obtain accurate differential GPS measurements delayed arrival at their sites, and equipment difficulties permitted only one of the stations to obtain data before and after totality.

The Eclipse Edge expedition, organized by Tom Van Flandern near the southern limit near Codpa, Chile, had about 45 seconds of totality through broken cirrus, apparently like what we had. Wayne Warren's setup didn't work; his filter was too strong, and he discovered after the eclipse that his video was blank, strange since he could see a few beads in the viewfinder, and he's recorded a couple of lunar occultations successfully with the same system since he returned. Another Eclipse Edge expedition member apparently got some useable video, and Wayne is trying to get a copy.

A few people in Paul Maley's expedition stayed at GPS-positioned sites near the northern limit in Arequipa, Peru. Clouds prevented most of them from getting data. However, Chuck Herold managed to remove his filter at the proper time and got about 30 seconds of north edge bead data! Isao Sato from Tokyo, Japan, working at a nearby site, also video recorded the eclipse and has started to reduce his data.

Paul Maley sent the following message regarding Chuck's observation, and a similar experience he had at a previous eclipse: "During the one-second annular-total eclipse in March 1987, I experienced clouds which made

it impossible to locate the Sun using a telescope and video camera. Chuck Harold experienced the same situation, as did others, at Arequipa. In 1987, I removed my ND5 filter prior to maximum eclipse, and the Sun was so bright that an image could not be obtained until just after totality. I placed my hand over the aperture, causing the Baily's Beads to immediately come into focus. On Nov. 3rd, Chuck Harold removed his ND5 filter during totality and a crisp bead image appeared. The lessons to be learned is that in the event of clouds, one should remove the ND5 filter as the bead activity approaches. Use a piece of cardboard or other material to move over part of the telescope aperture until a crisp image appears. In my case about 80% of the aperture was covered. In Harold's case 0% was covered. Variability in cloud cover will demand some innovation."

We have heard that skies were clear along the eclipse path also in Paraguay and probably also southern Brazil. I have not heard of any expedition, let alone one involving IOTA members, that planned observations from Paraguay, and I have not yet received any messages about what happened in Brazil.

1995 April 29, annular: Paul Maley's southern-limit expedition to Iquitos, Peru, was mentioned in **ON 6** (2), pp. 41-42. Hans Bode is leading an IOTA/ES expedition to observe this eclipse near the northern limit in Ecuador, so the two expeditions will complement each other to obtain the observations needed to measure the solar diameter. Those interested in joining these efforts should contact Maley either by e-mail at: maley%jscdo6@jesnic.jsc.nasa.gov or by phone at 713-488-6871 or at the address in **ON 6** (2), p. 36, or contact Hans Bode; see the back page of this issue.

ASTEROIDAL SATELLITES

David W. Dunham

Articles about 243 Ida and the asteroid's satellite, now named Dactyl, have been published in the 1995 January issues of both **Sky and Telescope** and **Astronomy**. The article in **S&T**, by Kelly Beatty, is "Ida & Company" on pages 20-23. It includes a box, "The Binary Brouhaha", which discusses the occultation evidence for asteroidal satellites, and its acceptance, or lack thereof, by various astronomers. The box did not have room to adequately discuss the main pros and cons of the argument, some of which are discussed in "Asteroidal Satellites Revisited" in **ON 6** (3), pp. 53-55. For instance, the work done at Lowell determined that the secondary event could not have been caused by a guiding error or a tree blocking the view was not mentioned, nor was the somewhat unusual slope of the secondary event disappearance and reappearance, or the five other secondary events, all of shorter duration, that McMahon reported. The strongest argument in my mind remains the time coincidence, the fact that both McMahon's longest secondary event and the Lowell secondary event occurred 90 seconds before the primary event, with agreement in the D and R times to within a second, and the fact that the shadow of both Herculina and its possible satellite both took six seconds to travel from Boron, CA, to Lowell, as predicted by the motion of Herculina. Some are uncomfortable with the low altitude of the event at Lowell (only 3°), but Ted Bowell confirmed that sky conditions were excellent and a 42-inch telescope was used; there is no doubt about the primary event shown in the box, and the secondary event occurred before it when the altitude was higher (about 20 seconds after the primary reappearance, the observation had to be stopped because the telescope had reached its altitude limit). At Boron, the altitude of the 6th-mag. star was 9°, quite easy to see with the 4-inch telescope that McMahon was using.

Paul Maley comments further: "I read the **S&T** article and thought it did not offer a great deal of hope for amateurs playing a role in the asteroid satellite discovery process. In fact, I thought it was not exactly upbeat and never really credited IOTA for stimulating and propagating the whole argument, much less attempting to resolve it through an organized program of ground measurements at members' expense. It alluded to HST surveys which were incomplete and conducted under less than auspicious circumstances. It should have outlined which asteroids had been viewed with HST, what the limitations were, and why such small objects would likely not be found, but might be found with a more thorough search program."

On p. 30 of the January issue of **Astronomy**, there is a large article, "Do Double Asteroids Roam the Solar System". The article has some good illustrations, facts about double and multiple craters, and theoretical information, but it fails to say anything about the role of occultations.

THE XIIIth EUROPEAN SYMPOSIUM ON OCCULTATION PROJECTS

Edwin Goffin and David W. Dunham

The 13th European Symposium on Occultation Projects was held on 12-17 August 1994 in Cracow, Poland. It was organized by IOTA/ES in collaboration with the Polish Amateur Astronomers Society (PTMA), together with the Planetarium and Astronomical Observa-

tory of Lodz. The location was the Polonia Institute of the Jagiellonian University, located a few kilometres from the centre of Cracow on a hill with a scenic view over the surrounding landscape and the Vistula river.

The symposium was attended by 50 participants coming from 12 different countries : Belgium (3), Czech Republic (2), England (1), Finland (1), France (2), Germany (6), Italy (1), Netherlands (6), Poland (21), Portugal (2), Russia (5), USA (1). It was a pleasant surprise to note that several of them were professional astronomers active in occultation work.

As ESOP tradition wants it, the first 1.5 days were devoted to lectures and presentations. After the opening lecture by prof. M. Urbanik on magnetic fields of spiral galaxies, a total of 25 presentations were given, divided over 5 sessions. Here, I can only give an overview of the lectures. The full texts of most of them were printed in advance and were available at the beginning of the symposium, something that was highly appreciated by all participants. The Internet as well as postal addresses are given for most authors. A few copies of these ESOP 13 Proceedings remain; if you are interested in getting one, contact Błażej Feret, e-mail blzferet@mitr.p.lodz.pl.

Session I: Total Occultations

H. Brancewicz: Role of amateur astronomers in the field of occultation observations.

S.V. Korobkin, A.Yu. Solov'ev, N.V. Kulakova, O.I. Mitin: Occultation observations in Moscow during 1992-1994.

Y-D. Rabbia, C. Meyer, M. Froeschlé: Lunar Occultations at the Observatoire de la Côte d'Azur. Some examples of records showing stellar angular diameters and duplicity are shown, and references given that provide details of the observations, some made in the infrared.

O.I. Mitin, E.M. Trunkovski: Revelation of SAO 78380 duplicity from processing photoelectric lunar occultation curve by Tikhonov's regularization method.

E.M. Trunkovski: Some results of the determination of stellar angular sizes from analysis of the lunar occultation diffraction curves. The article describes visual-band and infrared photoelectric observations of μ Ceti, Y Tauri, Z.C. 881, δ^1 and δ^3 Tauri, and other stars.

T.R. Irsmambetova, O.I. Mitin, E.M. Trunkovski: Angular sizes of the stars σ Aqr, SAO 138638, 23 τ Sco and 91 ν Leo obtained from the lunar occultation data. Observations in W, B, V, and R bands are described.

A. Richichi: The role of lunar occultations in modern high angular resolution astronomy. Infrared array detectors were used to record occultations and the SL-9 fragment impacts. Simple PC programs for occultation prediction, data acquisition, and analysis are available; contact richichi@mpia-hd.mpg.de if interested.

Session II: Observational Instruments

I.V. Egorov, O.I. Mitin: Amateur observational equipment for timings.

J. Wiland: The microprocessor registrator of time and its use in observational work.

J. Garcia: Improvement of Newtonian telescope design for occultation work. A smaller secondary mirror than usual is better for occultation work, to increase contrast between a star at the center of the field and background glare from the Moon or twilight.

H.-H. Cuno (read by H.-J. Bode): The DCF-77 time inserter for the Philips camera.

W. Beisker: Detection limit of CCD cameras in occultation work. First occultation observations with the IOTA/ES computerised camera system. Plans were made at this meeting to manufacture in the Czech Republic these relatively inexpensive CCD cameras, controlled with a PC and software supplied. Those interested may want to contact Wolfgang at beisker@gsf.de.

Session III: History of Occultations

P. Sobotko, M. Zawilski: Methods of occultation observations in the past.

M. Zawilski: The catalog of historical observations of occultations for Europe and the Near East.

Session IV: Mathematics of Occultations & Computer Software:

D.W. Dunham: Occultation prediction and reduction status.

M. Suhonen: A review of computer programs that either calculate predictions for total occultations or assist to fill report forms.

E. Limburg: The Occultation Workbench. See p. 106 above.

R. Fangor, B. Feret, J. Wiland: A review of computer occultation programs used in Poland.

L. Benedyktowicz, M. Zawilski: Quality and systems of reductions of lunar occultations from the observers' viewpoint. They conclude that today's system of reduction calculations is far from ideal. Use of new star catalogs like the PPM and determining corrections to Watts' data should improve the situation. The latter is addressed in "Examination into error of Watts' datum and recomputation of Moon's position" by Yoshio Kubo in **Report of Hydrographic Researches** No. 30 (Tokyo, March 1994), a preprint of which Dunham obtained at the I.A.U. General Assembly in the Hague, the Netherlands, a week after the ESOP meeting.

B. Feret: Computer networks in amateur astronomy

Session V: Solar eclipses & Varia

P. Maley, Ch. Gilbert, A. Fluter (read by D. Dunham): Use of GPS receiving devices to support solar eclipse expeditions. This is published later in this issue.

P. Maley, D.W. Dunham: Methodology of the observation of Baily's beads at solar eclipses. This was published on pp. 94-103 of the last issue of **ON**.

E.M. Trunkovski, E.I. Moskalenko: A scope for observations of the occultations of stars by solar sails.

W. Beisker: Preliminary results of the SL9-Jupiter event as has been observed by IOTA/ES.

On the evening of the first day, a visit was organized to the nearby Astronomical Observatory of the Jagiellonian University. Most participants also joined the optional part of the programme on the following days: a full day's excursion to the Suhora Astronomical Observatory in the Gorce Mountains, a visit to the old salt mine in Wieliczka and of course a sightseeing tour in the beautiful old city of Cracow, including a visit to the Collegium Maius of the Jagiellonian University. Equally important as the lectures were the informal contacts and exchange of ideas (whether verbally or on diskettes) between the participants during coffee breaks and in the evenings.

On behalf of all participants, we want to express our gratitude to all our Polish friends that helped to organize this fine symposium. Next August, ESOP XIV will be organized in Plzeň (or Pilsen), Czech Republic. It will be the 700th anniversary of the city and the 50th anniversary of its liberation by Americans in World War II. Plans are being made to hold ESOP XV in England, perhaps in Cambridge, in August 1996.

GRAZING OCCULTATION OBSERVATIONS

Richard P. Wilds

We need to begin this quarter's report with a few housekeeping chores. Please review this article in the **ON 5**, #12 (May, 1993) for the requirements for reporting a graze. Most have done a very good job of including the necessary information, but some have not been providing critical data. Japanese astronomers, in particular, have done many grazes, but report them on total occultation forms. Thus, much of the needed data, primarily the prediction and shift, are nowhere to be found. Remember that this information is needed, if your observations are to be of value to other graze leaders around the world.

The second issue is a reminder of our new column heading "PP" for Prediction Program. There are up to six different programs (with their "PP" abbreviations following their names) - ie. Evans (E) (using "graze nearby" messages; this is discouraged, since the other predictions include profiles and are more accurate), Occult 1.0 (o), Occult 2.0 (O) (more accurate than 1.0 since it includes the major geodetic datums), Riedel (R) (Grazereg or the equivalent Grazeint), ACLPPP (a) (version 85A or higher, using OCCRED) and ACLPPP (A) (version 80N, using OCC, has been IOTA's standard for many years and is still preferred during 1994 while we are trying to transition to the Grazereg system). The new standard program will likely be Grazereg 4.0 with a built in ACLPPP.

We begin this quarter's report with five grazes from 1993. Benny Roberts reports a fine Cassini graze over the crater Zeeman. His is also the only other graze report received so far on last years lunar eclipse. His reports will help you fill in some of the missing data of the last article. The Garcia/Goncalves team used the Occult 1.0 program for a graze in front of Beta Leibnitz. He reports that he was ill the entire week before the graze and had to leave his sick bed in order to time it at his observatory. He also reports that the timings were recorded on their observatory chronograph. John Centala led his team to a graze behind Beta Leibnitz and over the proposed crater Faustini.

1994 began with three grazes from Florida. Hal Povenmire observed a Riedel predicted graze over Beta Leibnitz and the crater Scott. This was followed by two grazes by Chris Stephan and Tom Campbell that were deep in the Cassini Region. The star went through the mountains M4, M5 and M6 and the crater Wiechert. Tom reports that the graze had the typical beauty of a Cassini with only one partially lit peak. He also reported an extra advantage of using video to record grazes. As noted by other video users, he points out that the video could handle the star much better than visual observers when it was up against the sunlit peak's irradiation.

HART returns with a double graze expedition with one star on the north and one on the south limb of the moon. These predictions, from Riedel and Occult 1.0, did not prove to be reliable. This was also true for the Garcia/Goncalves team as they obtained video images of two grazes behind the craters Lovelace and Froalich. These were followed by five grazes observed between a triangle defined by the craters Froalich, Merril and Brianchon.

July 4 is normally a time of celebration and fireworks in the USA, but Hal Povenmire had another reason for both. He had a graze with 18 timings - a good reason to celebrate. However, this graze also happened to be his 300th successful graze since starting to observe them in 1963. [ed.: An article by Povenmire commemorating this event will appear in the next issue.] HART continued

observations with the best observed graze of the period over the crater Drygalski. This was followed by the period's most prolific observers - Garcia/Goncalves - who observed two more grazes. The first was over the craters Peary and Plaskett in the north. The second was in the south through the craters Cabeus and Malapert and the mountains M1 and Leibnitz A. The last graze of the period was the author's first daylight graze. Observed just 5 miles from my home, this was very easy and quite beautiful to see on the bright side and in broad daylight. The graze occurred over the crater Byrd with the crater Gioja clearly visible in the foreground. E-mail messages indicate that others observed this same graze further toward the east coast of the USA. We look forward to hearing of their results.

HISTORICAL FLASHBACK. "Grazes As Sporting Events", by Richard Nolthenius **ON 1** (5) for August 1975. This is an interesting article worth reading. Richard was an active graze leader back in the 70's. He wrote the article to share how they looked at grazes beyond just their scientific potential. They also viewed them as fun social events of the sporting type.

Most interesting was his discussion of their new graze terminology. "Thus, January 1st thru December 31st wasn't just a year; it was a "season", during which observers were on the "graze circuit", the circuit being divided into "home grazes" (usually sub-marginals which wouldn't normally warrant an expedition, but happen to pass thru your home town) and "away grazes". Major grazes were always the most fun: we'd assemble our regular "team", headed by "team co-captains" Bob Fischer and me, then maybe hold a "free agent draft" of the local surrounding suburbs' talent. At the graze site, some light-duty road would become our "field". If there were two different areas of the profile needing coverage, we'd go into our "double-wing offense". If equipment was short, we might have two observers at one position "double-teaming the limb". A look at the final "score" would show the team "shooting percentage from the field" (number of timings made divided by total timings estimated possible - usually about 85% for us). After the season was over, you could look back at the team and individual won-lost records, winning and losing streaks, shut-outs, 10-graze winners, 20-graze winners - maybe even a 30-graze winner - and make a comparison with previous seasons."

Of course, this can be taken too far. However, if kept within the reasonable limits of friendly competition, this idea can lend some fun beyond the normal excitement of scientific work. By the way, the Garcia/Goncalves team leads all others in this report with 6 grazes. Sorry, I could not help myself.

REMEMBER to apply the following shifts, which past experience has shown to be useful when using the ACLPPP (version 80N) profiles:

1.Northern limit, waxing-phase, dark-limb grazes tend to have a 0.″3 south shift from your predicted graze path. One should spread out, however, since star errors could increase this shift or reduce it to a 0 shift.

2. Southern limit, waxing-phase, dark-limb Cassini region grazes tend to have a 0.″4-0.″5 south shift from your predicted graze path. Cassini region grazes have profile points from 3 to 7. Southern-limit Cassini grazes will also have negative latitude librations. This correc-

Graze List

UTDate YYMMDD	VP PP	Star #	Mag	% Snl	CA	Location	# Sta	# Tm	S S	Ap Cm	Organizer	N Sh	S	WA	B
1993															
931123	A	128186	4.9	69+	12.1S	Sanford, Mississippi	1	8	1	33	Benny Roberts	0.3S		171	-6.2
931129	A	76548	5.4	30E	66.9U	Enid, Mississippi	2	20	1	20	Benny Roberts	0.2N		4	0.6
931129	A	76565	7.1	10E	47.6U	Pope, Mississippi	1	3	1	20	Benny Roberts	0.4S		8	0.7
931207	Co	138155	8.9	44-	3.5S	Caxias, Portugal	2	4	2	20	Garcia/Goncalves	0.1S		183	6.8
931211	A	183533	6.1	4-	6.0S	Central City, Iowa	5	18	2	13	John Centala	0.5S		182	1.5
1994															
940106	R	158363	7.1	34-	7.6S	Dupont, Florida	1	5	1	15	Hal Povenmire	0.0		185	3.5
940117	A	128281	5.6	24+	1.0S	Alturas, Florida	2	10	1	20	Chris Stephan	0.0		177	-6.0
940117	VA	128281	5.6	24+	1.0S	Wimauma, Florida	4	4	1	10	Tom Campbell	0.0		177	-6.0
940305	VR	185526	6.6	43-	1.5S	Falls City, Nebraska	3	5	1	18	H.A.R.T. R. Wilds	0.5N		184	-2.2
940305	o	185555	9.1	41-	0.6N	Falls City, Nebraska	1	1	1	33	H.A.R.T. R. Wilds	0.0		358	-2.2
940320	VR	95544	7.9	54+	12.9N	BGEM, Magos,Portugal	2	4	1	20	Garcia/Goncalves	0.1S		13	4.7
940323	VR	98267	4.3	82+	10.4N	Infantado, Portugal	4	13	1	10	Garcia/Goncalves	0.3N		6	6.9
940419	R	97399	6.0	49+	13.4N	Elkton, Florida	3	16	1	15	Hal Povenmire	0.1S		15	6.5
940420	A	98146	8.0	59+	11.6N	Trumbull, Ohio	1	4	1	20	Robert J. Modic	0.4S		11	7.1
940420	A	98146	8.0	59+	11.7N	Jackson Center, PA.	2	15	1	25	John Holtz	0.5S		11	7.1
940517	R	97913	6.4	34+	9.9N	Statesboro, Georgia	2	23	1	15	Hal Povenmire	0.9S		12	7.1
940612	R	97628	6.1	11+	1.8N	Odrinhas, Portugal	4	12	2	10	Garcia/Goncalves	0.2N		10	7.0
940704	A	93376	7.5	18-	4.6N	Ormond Beach,Florida	1	18	1	15	Hal Povenmire	0.1S		357	0.4
940816	A	185024	6.3	70+	7.5S	Sycamore, Kansas	3	36	1	18	H.A.R.T. R. Wilds	0.4S		172	-2.3
940829	R	93763	7.6	51-	2.6N	Torrao, Portugal	2	5	1	20	Garcia/Concalves	0.3N		359	2.4
940902	R	97211	8.1	14-	3.7S	Pancas, Portugal	2	9	2	20	Garcia/Concalves	0.3S		179	6.5
941012	A	163481	3.2	62+	-3.4N	Auburn, Kansas	1	6	1	18	H.A.R.T. R. Wilds	0.0		358	-5.8

tion should continue into the waning-phase grazes to Watts angle 187°.

Please report all grazes to:
Richard P. Wilds
3630 S.W. Belle Ave
Topeka, KS 66614-4542
USA

and the

International Lunar Occultation Centre (ILOC)
Geodesy and Geophysics Division
Hydrographic Department
Tsukiji-5, Chou-ku
Tokyo, 104 Japan

Stellar Cross Reference

SAO#	ZC#	Other
128186	3453	κ Piscium
76548	633	53 Tauri
76565		X 5624
138155		PPM 178464
183533	2212	147 B. Librae
158363		X 20012
128281	3482	16 Piscium
185526	2529	52 Ophiuchi
185555		PPM 552154
95544		X 8819
98267	1341	Acubens = α Cancri
97399	1197	1 Cancri
98146		X 13406
97913	1281	84 B. Cancri
97628	1234	30 B. Cancri
93376		X 4298
185024	2457	116 B. Ophiuchi
93763	605	
97211		X 11636
163481	2969	β^2 Capricorni

LAST MINUTE ASTROMETRY FOR THE NOVEMBER 26th ARMIDA OCCULTATION

David W. Dunham

For over twenty years now, photographic plates have been taken during the week before various asteroidal occultations to update the predictions, and many of these efforts have been quite successful. The phrase "Last-minute astrometry" was coined to describe this process, when the target star and asteroid could be photographed together on the same photographic plate, usually 7 to 2 days before the occultation. Only in this way could the sizable local errors that occur in all currently-available star catalogs be cancelled through the plate reduction process to enable an accurate prediction.

Now, astrometry with CCD's, as described on pages 87 and 91 of the last issue, offers the possibility of more accurate predictions shortly before the event, in a process that I think Edwin Goffin a few years ago first called "last-second astrometry". The small field of CCD's limits these efforts to about a day before the event, but the ability to quickly reduce the data with small computers enable the effort to be completed quickly. E-mail further allows the rapid distribution of data needed for the reductions and predictions.

The occultation of 9.7-mag. PPM 117739 by (514) Armida on November 26th was not the most promising event for such an effort. It was neither publicized in **Sky and Telescope** nor included in the main 1994 North American Asteroidal Occultation Supplement to **ON** distributed a year ago; with an angular diameter of 0.″075, it was just under IOTA's usual limits. But otherwise the event was quite favorable, with an expected 14-second central duration and Δm of 4. So it was favorable for visual observation and the path was expected to cross western Europe and North America somewhere.

The occultation probably wasn't observed. But with CCD observations by Dennis DiCicco at Sudbury, Massachusetts, from 0:28 to 1:12 UT Nov. 26 (2.6 to 1.9 hours before the occultation), I think that we know where the path went to within a path-width, which was expected to project to 120 km on the Earth's surface. It passed over southern Sweden and southern Norway at about latitude +59° (a European satellite photo on the Weather Channel showed quite a bit of cloudiness in that area) at 3:06 UT; over the northern Shetland Islands at 3:07; over astronomically unpopulated parts of eastern Canada; a short distance west of Sault St. Marie, Michigan, 3:14; about halfway between Wausau and Madison, Wisconsin, 3:15; over Ames, Iowa, 3:16; over the area where Iowa, Missouri, Kansas, and Nebraska meet; over north-central Kansas, 3:17; the western Oklahoma panhandle, 3:18; near San Antonio, New Mexico, 3:19; just southeast of Sierra Vista, Arizona, and just north of Cananea, Sonora, Mexico, 3:20; then far south of San Pedro Martir, Baja California. A telephone call to Mark Trueblood found that it was overcast in southeastern Arizona, and the weather satellite photo showed heavy clouds also over New Mexico and Oklahoma. There may have been a small clear area over north-central Kansas, with more

clouds just northeast of there. There may have been some clear sky in the upper Midwest, but the Weather Channel was concentrating on a large storm in the West and did not show the satellite image of the Midwest.

Brian Marsden sent me two messages with Dennis' positions at 1:31 and 1:48 UT; the last one, sent only 0.6 hour after the last observation, gave the averaged position of the star. So that was done quickly, but I was eating dinner at the time, and logged on to my e-mail account half an hour later. Then, in doing my calculations (which take about half an hour), I made a mistake in the longitude of Sudbury. At first, I was puzzled by the resultant discordant result, but discovered the problem quickly during a phone call to Brian. The correct calculations, and examination of the path on a map, took almost another half hour, so I updated the answering machine with this last prediction about the time of the event. I thought I had another hour, having converted UT to local time incorrectly. Anyway, now I have the correct coordinates of Sudbury in my computer file, and if someone sending me a message with "last-second" astrometry within a few hours of the event also telephones me at 1-301-474-4722 (home) or 1-301-953-5609 (office) to let me know that an urgent message is on the way, then next time things can be done at least an hour faster. But I think even more time could be obtained by taking CCD images of the star and the approaching asteroid the night before the night of the event, if the motion is slow enough that some of the same reference stars are on both images, and they are reduced with plate-overlap methods. Astrometry a few hours before the event would also help to get a more accurate final update. Anyway, we should have more successes in the future with more observers providing CCD updates for these events. Before Armida, only Petr Pravec and colleagues at Ondrejov, Czech Republic, were doing this; with help also from Fiona Vincent at St. Andrews, Scotland, and Dennis, we are bound to do better in the future.

Below is a history of the predictions for the Armida occultation; path and time differences are relative to my nominal prediction, and the path is given in arc seconds perpendicular to the motion at the time of the occultation, with negative values indicating a shift towards the south:

Path Shift	Time Corr.	Astrometry from
-0.30	-2.4	Pravec, Oct. 31, GSC for Armida and star
+1.49	-1.7	Vincent, Nov. 23, GSC for Armida, PPM for the star
+1.36	-1.7	Vincent, Nov. 23 & 24, GSC for Armida, PPM for the star
+1.25	-1.9	Vincent, as above, with GSC (Pravec, Oct.31) for the star
+1.35	-2.0	Vincent, Nov. 23 & 24, Thierry data reduced by Vincent, Thierry data for star
+1.06	-1.5	Vincent, Nov. 23 & 24, Thierry data reduced by Marsden, Thierry data for star
+0.70	-2.0	Vincent, Nov. 23 & 24, Thierry data reduced by Vincent, PPM for star
+0.41	-1.5	Vincent, Nov. 23 & 24, Thierry data reduced by Marsden, PPM for star
+0.68	-1.5	DiCicco, Nov. 26, GSC

Thierry Pauwels provided measurements of faint secondary stars measured from 5 Uccle Observatory plates and reduced with PPM data; these were used to make better reductions of Vincent's measurements than are possible with GSC (Guide Star Catalog) data. This was necessary because Vincent's CCD observations were made 2.5 an 1.3 days before the occultation, and they did not include the target star. Thierry's positions of the star were used for the values on the 5th and 6th lines of the table. For these, I calculated proper motion corrections from his 1948 and 1988 plates. I got the positions reduced with Thierry's data at 23h UT Nov. 25. After the occultation, I thought that it might be better to use the PPM position for the star rather than the one with Thierry's corrections for it (in a later message Thierry said that this would be better, due to the relatively large errors of his individual measurements). The results are given on the 7th and 8th lines, which are closer to DiCicco's result given on the last line. If Thierry had determined the positions of secondary reference stars around PPM 117739 (along with his measurements to reduce Vincent's measurements of Armida, so they would be in the same local system), they could have been used to reduce Pravec's Oct. 31st measurements of PPM 117739, and that might have resulted in a prediction closer to DiCicco's.

Dennis DiCicco provides the following account: "Glad I could contribute the other night. To be honest, part of the inspiration was the last-minute aspect of getting the positions. To expand a bit more on what you already know, as it happened I was sitting at the telescope just moving from the field of one asteroid to another when Brian Marsden called to suggest the project [just after he had discussed the reduction of Pauwels' and

Vincent's data with Dunham]. The timing couldn't have been better, and I dialed in the position of the star on the digital setting circles as he gave me the information over the phone. It took less than a minute to confirm that a star of the proper brightness was in the field and that something was to the northeast, but it took a few minutes after hanging up the phone to double check the field based on a chart I generated from GSC data. Since the objects were so bright I only needed exposures of a few seconds. I'm using Astrometrica Version 2.1 by Herbert Raab (in Austria) to measure positions. The program is specifically designed to work with images from an SBIG ST-6 CCD camera (which I have) as well as others. It does require a CD-ROM drive and the actual GSC (not a copy of the data as contained in one of several popular software products that have appeared on the market recently). In less than 5 minutes from completing an exposure I can be set up to measure a position -- a process that itself takes only moments. In fact, it was less than a half hour from the time Brian called to the time I e-mailed him 4 positions for the star and asteroid (and this included the time it took to run up to the house and kiss my daughter good night!). I called Brian to tell him the positions were sent and he was already puzzling over the results, so while on the phone I make another 4 exposures (the scope was still tracking the field), and it took another 15 minutes to measure the new positions and drop them in the e-mail to Brian.

Obviously, given clear skies and advance planning, this could be a routine part of these events, and I'd be happy to contribute whenever possible -- sort of a rekindling of my latent interest in occultations that goes back to the 1960s. At this point that I should add that I'm an observer, not an astrometry expert, but I have no reason to doubt the accuracy of Raab's program. Its biggest limitation is almost certainly the GSC data. I use an 11-inch Celestron working at a focal length of only 70 inches (f/6.3)! My field of view is about 1/4 degree and I contend that if I can do it, so can others."

This is the first time I've had true "last-second" astrometry before the occultation, although in this case, it was not enough time before. Petr Pravec obtained such observations, 10 hours beforehand, for the occultation of PPM 154599 by (181) Eucharis on 1994 January 18. He sent them to me by e-mail to my nssdca account at Goddard Space Flight Center, which I can access from home. I was expecting this from an earlier message, but when I tried to log on, I got no response; the nssdca computer at Goddard was down, and no operator was on duty to restart it due to the Martin Luther King holiday. Petr sent a copy of the message to my office e-mail account, which can not be accessed remotely. Normally, I would have driven the 25 km to my office to get the message, but an ice storm in progress at the time prevented that. Late the next morning after the roads were cleared, I got to my office and got the message, then several hours after the event; Goddard remained closed due to the icy conditions. The best before that was for an occultation of SAO 77562 by (30) Urania on 1993 Dec. 17, when Petr obtained separate CCD images of the star and Urania 1.2 days before the occultation, when the objects were only 14′ apart and the GSC errors probably not too different for each. I distributed that prediction widely by e-mail; the expected path crossed Florida near Daytona Beach, Orlando, and south of Gainesville, and some observatories in southern France, including Haute Provence. The west coast of Florida had clouds, word did not get to anyone in Orlando or Daytona Beach, and an observer in Melbourne, Florida, south of the path, had no occultation, as expected. I never heard from France, so I guess it was cloudy there.

Last-second astrometry would work best if done by observers several hours of longitude east of the area of the occultation, where the objects can be imaged close enough together and enough time exists to notify observers. For North America, this means observations from Europe, which in turn could benefit from observations in Japan or Australia, and those areas would be best served by North America. But even eastern North American observations could help west-coast events, and if the occultation occurs near opposition and in the morning local time, there would also be enough time for observations made in the evening in the area of the event. For observations made about a day before the occultation, plate overlap techniques might work if some stars are in common on the separate CCD images of the star and asteroid, and the GSC reference frame is reasonable (that is, the GSC reference stars are all taken from relatively far from the edges of the same GSC plate). Finding suitably-equipped CCD observers, preferably in areas with relatively good weather prospects, in the three major regions mentioned above would help make "last-second" updates of asteroidal occultations routine. Some of the stars involved in occultations are quite far south, so observations either from the Southern Hemisphere or from the southern U.S.A. are needed for those events.

Anyway, we must be thankful for everyone who contributed to the Armida occultation astrometric update effort. The next possibility for North America is an occultation involving (70) Panopaea in the western USA or Canada the morning of Dec. 29; I will remain in town until a few hours before that event.

REPORTS OF ASTEROIDAL APPULSES AND OCCULTATIONS, EARLY 1992

Jim Stamm

If you do not have a regional coordinator who forwards your reports, they should be sent to me at: 11781 N. Joi Dr. Tucson, AZ 85737 USA. Names and addresses of regional coordinators are given in "From the Publisher" on *Occultation Newsletter's* front page. All times in this report are UTC.

I have summarized all of the reports that I have received for the first half of 1992 in the following two tables and section of notes. Table 1 lists the 1992 date, minor planet, occulted star, IDs of successful observers, and references to any notes. Table 2 lists the observer's ID, name, nearest town to location of observation, country (includes state or province for North America and Australia), and the total number of observations made in the period. The notes section details those events that included positive observations, or other significant information that could not be reported in the tables. I am not including notes on those observations that may have been spurious unless there is some sort of confirmation, or the fact that something may have happened is relevant to another observation. Instead, I will place an asterisk (*) in the Notes column to indicate that I have received a report with more than a "no event....." in it.

Table 1. Asteroidal appulses and occultations: Jan-Jun 1992.

1992	Minor Planet		Cat	Star	Observers	Notes
Jan 03	1841	Masaryk	PPM	95150	CalDlrDssEblErnFen	
					GcvGrcHoqHokKaoKbk	
					KhlKocKsiMaaMihMrx	
					PirPohSauSgl	
Jan 07	91	Aurora	PPM	92040	DflDnzDssKocMos	
					SzaSmi	
Jan 08	13	Egeria	AGK3R	4228	HahKazGrh	1
Jan 10	442	Eichsfeldia	PPM	121781	StqDik	
Jan 10	137	Meliboea	PPM	143461	BulDflDnzDssKrt	
					MltMosRvsSpr	
Jan 12	492	Gismonda	PPM	96700	MolBlkLap	
Jan 17	15	Eunomia	PPM	548704	HuzWeoSta	
Jan 23	2060	Chiron	FAC	361318	DnzDssHckHzl	
					KrtOveSmi	
Jan 24	856	Backlunda	PPM	159160	BulDnzFarHckHzl	
Jan 24	704	Interamnia	FAC	193057	SmcAndNesLap	
Feb 01	5	Astraea	PPM	526756	WadLoa	
Feb 03	40	Harmonia	AGK3R	7316	Hon	
Feb 04	713	Luscinia	AGK3R	9878	SmcBlk	
Feb 13	411	Xanthe	PPM	99754	BulDssGocTrl	
Feb 18	145	Adeona	PPM	75181	Blk	
Feb 19	849	Ara	PPM	550456	Sta	
Feb 19	135	Hertha	PPM	550238	SmcStqBlk	
Feb 21	743	Eugenisis	PPM	124177	Kan	
Feb 23	51	Nemausa	FAC	119281	KanUdaOkm	
Feb 27	1467	Mashona	PPM	178266	BdwDssKaoNelSykSza	
Feb 29	654	Zelinda	PPM	596071	Ove	
Feb 29	624	Hektor	PPM	575350	Lou	
Mar 05	924	Toni	AGK3R	9385	BdwBqsBlmBrnBulCas	
					DedFchGlzGznHalHer	
					HokKaoKhlKldKrtLac	
					LskMcsOtdPlzPnnRdr	
					SnzSplSprSuhTbzTll	
					VaaVdlVdm	2
Mar 05	227	Philosophia	PPM	126912	AntBdwByoCsiErnGlo	
					GrbHckHokHzlJelKao	
					KikKisNeuPnnRaySwi	
					SykSzaSzcTbzWaaZwk	
Mar 09	479	Caprera	AC	21734	AntBdwBlmBulCpsDhy	
					DlrElfEnsErnFarFau	
					HalHckHokHzlJbsKhl	
					KrtLozMezMrxNeuPlz	
					PohPolRaySplSprSyk	
					SzaTlpWar	
Mar 13	47	Aglaja	PPM	157377	PriWadMolBlkLap	
Mar 17	20	Massalia	LickV	2848	AndSmcDik	
Mar 19	779	Nina	LickV	1492	AzaBdwDssEnqFlo	
					HckHzlKaoKlmNeu	
					PrtRaySykTlp	
Mar 20	175	Andromache	PPM	552357	Dss	
Mar 20	48	Doris	PPM	157977	SmcHut	3
Mar 21	229	Adelinda	PPM	97232	NesTreSkiBlkHasYon	
					TodOhsAkaOhkKolMay	
Mar 22	251	Sophia	PPM	508948	WadDik	
Mar 25	80	Sappho	PPM	507006	WadDikHutSmc	
					AndBryBlk	
Mar 26	409	Aspasia	PPM	506657	GemDalMolHutSmcAnd	
Mar 31	230	Athamantis	SAO	162593	HutSmcAndBlkLap	
Apr 01	29	Amphitrite	PPM	96641	CopOveSmi	
Apr 03	117	Lomia	AGK3R	5344	CflCfvChlDssFeq	
					GrcGzdKrkSprTho	
Apr 12	154	Bertha	PPM	550736	DikSmc	
Apr 13	184	Dejopeja	PPM	507957	Hon	
Apr 14	276	Adelheid	PPM	522881	MunLoaStqVikSmc	
Apr 18	44	Nysa	PPM	98409	Rob	
Apr 18	952	Caia	PPM	549737	MunStqSmc	
May 02	308	Polyxo	AC	24647	Cop	
May 03	97	Klotho	PPM	511997	CopOve	
May 04	596	Scheila	AC	7984	DikWadSmcBlkHutAnd	4
May 05	804	Hispania	PPM	547895	VikByrBenWadGemStq	
					DikSmcHutOhkAnd	5
May 06	429	Lotis	FK4	1335	Lou	
May 07	165	Loreley	PPM	555279	GemStqWadAnd	
May 08	258	Tyche	PPM	526403	DssGrcKhlLac	
					MipNelPrc	
May 09	309	Fraternitas	DM	-21° 5940	BlkAnd	
May 12	596	Scheila	AC	551961	PriGemDalBlw	
					StqDikWadBlw	
May 13	223	Rosa	LickV	5575	CopOveSmi	
May 15	914	Palisana	PPM	553740	Tay	
May 18	468	Lina	PPM	525765	PriBlwStqDal	
					GemLoaAndBlw	
May 28	307	Nike	PPM	554208	SmcBlk	
May 30	175	Andromache	PPM	552490	LouCopOveSmi	
May 31	47	Aglaja	PPM	157163	SmcIkaAnd	
Jun 01	651	Philippina	AGK	+05°3059	SmcIkaOhkMat	
Jun 04	27	Euterpe	PPM	551949	CopOveDeb	
Jun 10	510	Mabella	AGK3	+01° 2696	CopSmi	
Jun 15	469	Argentina	FK4S	3295	AllHulPatLoaSmc	
					MuaStqDikAnd	
Jun 18	564	Dudu	SAO	212937	SmcDikAnd	
Jun 19	110	Lydia	AGK3R	10688	LoaSmcBuqHutAnd	

Table 2. Observers and locations of events Jan-Jun 1992.

ID	Observer	Town	Country	No.
Aka	Akazawa, Hidehiko	Asaguchi	Japan	1
All	Allen, William	Blenheim	New Zealand	1
And	Anderson, Peter	The Gap	Queensland - AUS	14
Ant	Antos, M.	Jablonec	Czechoslovakia	2
Aza	Azema, J.-M.	Lamalou	France	1
Brn	Barrena, R.	La Orotava	Spain	1
Bem	Bembrick, Colin	Bathurst	N.S.W. - AUS	1
Bdw	Benedyktowicz, L.	Kracow	Poland	5
Byo	Benyo, I	Rimavska Sobota	Czechoslovakia	1
Blk	Blanksby, Jim	Wandin	Victoria - AUS	11
Ebl	Blattler, E.	Wald	Switzerland	1
Blm	Blommers, L.	Leiden	Netherlands	2
Blw	Blow, Graham	Wellington	New Zealand	4

Table 2 (Cont.). Observers/locations of events: Jan-Jun 1992.

Bgs	Bourgeois, Jean	Ciney	Belgium	1
Bry	Bryant, Ken	Langwarrin	Victoria - AUS	2
Bul	Bulder, Henk	Zoetermeer	Netherlands	5
Bug	Burns, Greg	Lenah Valley	Tasmania	1
Cal	Caldeira, S.	Beja	Portugal	1
Cps	Campos Cucarella	Barcelona	Spain	1
Cas	Casas, Ricard	La Orotava	Spain	1
Chl	Chlachula, J.	Zlin	Czechoslovakia	1
Ens	Club Ast. De L'Ensae	Toulouse	France	1
Cop	Cooper, Tim	Benoni	South Africa	7
Cfl	Coufal, Z.	Zlin	Czechoslovakia	1
Cfv	Coufalova, D.	Zlin	Czechoslovakia	1
Csi	Csipes, J.	Komarno	Czechoslovakia	1
Dal	Daalder, Peter	Launceton	Tasmania	3
Dfl	Daiffallah, Khalil	Alger	Algeria	2
Deb	de Beer, G.	Ladysmith	South Africa	1
Ded	Dedoch, A.	Praha	Czechoslovakia	1
Otd	Del Teide Observ.	La Orotava	Spain	1
Dhy	Delahaye, F.	Bordeaux	France	1
Dnz	Denzau, Helmut	Essen	Germany	4
Dlr	Di Luca, Roberto	Bologna	Italy	2
Dik	Dickie, Ross	Gore	New Zealand	10
Dss	Dusser, Raymond	Kalaa Sghira	Tunisia	9
Elf	Eklof, A.	Stockholm	Sweden	1
Eng	Engra Hinarejos	Valencia	Spain	1
Ern	Ernst, Christoph	Graz	Austria	3
Far	Farago, O.	Stuttgart	Germany	2
Fau	Faure, G.	Varces	France	1
Feg	Feger, F.	Siegen	Germany	1
Fen	Fernandes, J.	Pedrogao Pequeno	Portugal	1
Fch	Fischer, D.	Koenigswinter	Germany	1
Flo	Flores Martinez	Valencia	Spain	1
Glo	Gallo, Vicenzo	Salerno	Italy	1
Grc	Garcia, Joaquim	Lisboa	Portugal	3
Gem	George, Martin	Launceton	Tasmania	5
Grb	Gerbos, J.	Rimavska Sobota	Czechoslovakia	1
Goc	Gomez Castano, J.	La Coruna	Spain	1
Gcv	Goncalves, Rui	Lisboa	Portugal	1
Gzd	Gonzalez, Domenech	Zaragoza	Spain	1
Gzn	Gonzalez, N.	La Orotava	Spain	1
Glz	Gonzalez, Victor	La Orotava	Spain	1
Grh	Graham, Frances	E. Pittsburg	Pennsylvania - USA	1
Hah	Hahn, Richard	Keaau	Hawaii - USA	1
Hal	Halir, K	Rokycany	Czechoslovakia	2
Hzl	Hanzl, D	Brno	Czechoslovakia	5
Has	Hasegawa, Takashi	Hujioka	Japan	1
Her	Hernandez, Jose F.	La Orotava	Spain	1
Hog	Holler, Gert	Graz	Austria	1
Hok	Holler, Klaus	Graz	Austria	4
Hon	Honkus, Edward	Carnegie	Pennsylvania - USA	2
Hck	Hudecek, T.	Brno	Czechoslovakia	5
Hul	Hull, O.R.	Auckland	New Zealand	1
Hut	Hutcheon, Steve	Sheldon	Queensland - AUS	7
Huz	Huziak, Richard	Saskatoon	Saskatchewan - CAN	1
Ika	Ikari, Yasukazu	Ohutu	Japan	2
Jel	Jelinek, V.	Valasske Mez.	Czechoslovakia	1
Jbs	Jobstl, E.	Graz	Austria	1
Kaz	Kaczmarski, M.	Ewa Beach	Hawaii - USA	1
Kan	Kaneko, Sakae	Sakura	Japan	2
Kid	Kidger, M.	La Orotava	Spain	1
Klk	Kieltyka, G.	Krosno	Poland	1
Kis	Kiss, L.	Szeged	Hungary	1
Klm	Klemencie, R.	Gorenja Vas	Slovenia	1
Koc	Kocsis, Antal	Balatonkenese	Hungary	2
Khl	Kohl, Mike	Wald	Switzerland	4
Koi	Koizumi, Yoshii	Okayama	Japan	1
Krk	Kolarik, M.	Zlin	Czechoslovakia	1
Ksi	Kraisics, S.	Graz	Austria	1
Kao	Krakow Obs.	Krakow	Poland	5
Krt	Kretlow, Mike	Siegen	Germany	4
Kbk	Kubik, M.	Graz	Austria	1
Lac	Lacour, B.	Euffigneix	France	2
Lap	Larkin, Patricia	The Basin	Victoria - AUS	4
Lsk	Lesnak, M.	Praha	Czechoslovakia	1
Loa	Loader, Brian	Christchurch	New Zealand	5
Loz	Lomoz, F.	Sedlicany	Czechoslovakia	1
Lou	Lourencon, R.	Jundai	Brazil	3

Table 2 (Cont.). Observers/locations of events: Jan-Jun 1992.

Mcs	Macias, D.	La Orotava	Spain	1
Maa	Manna, A.	Locarno	Switzerland	1
Mlt	Mariot, C.	Guines	France	1
Mez	Martinez, P.	Toulouse	France	1
Mrx	Marx, Harald	Stuttgart	Germany	2
Mat	Matsuda, Hideki	Tenri	Japan	1
May	Matuyama (Club)	Muroto	Japan	1
Mlh	Michon, Jean-Pol	Herment	France	1
Mlp	Milanese, P.	Alessandria	Italy	1
Mol	Moller, Harry	Kingsley	W. Australia - AUS	3
Mos	Mostefaoui, Toufik	Alger	Algeria	2
Mun	Munford, Noel	Palmerton N.	New Zealand	2
Mua	Murray, Alasdair	Herberton, N.	Queensland - AUS	1
Nel	Neel, Regis	Lyon	France	2
Nes	Nelson, Peter	Ellinbank	Victoria - AUS	2
Neu	Neureiterova, E.	Brno	Czechoslovakia	3
Ohs	Ohshima, Osamu	Kurasiki	Japan	1
Okm	Okamoto, Tomohiro	Taga	Japan	1
Ohk	Okura, Nobuo	Okayama	Japan	3
Ove	Overbeek, Danie	Edenvale	South Africa	7
Plz	Palzer, Wolfgang	Wiesbaden	Germany	2
Pnn	Pannier, Lutz	Gorlitz	Germany	2
Pat	Patterson, George	Christchurch	New Zealand	1
Prt	Pierantoni, E.	Bologna	Italy	1
Pir	Piriti, J.	Nagykanizsa	Hungary	1
Pol	Polacek, M.	Valasske Mez.	Czechoslovakia	1
Prc	Porcini, Roberto	Salerno	Italy	1
Poh	Posch, Thomas	Graz	Austria	2
Pri	Priestley, John	Pukerua Bay	New Zealand	3
Ray	Rapavy, P.	Rimavska Sobota	Czechoslovakia	3
Rvs	Rivas, L.	Tabarnes Bl.	Spain	1
Rob	Roberts, Benny	Jackson	Mississippi - USA	1
Rdr	Rodriguez, P.	La Orotava	Spain	1
Snz	Sanchez, Javier	La Orotava	Spain	1
Sau	Sauter, Christof	St. Margarethen	Switzerland	1
Ski	Skilton, Peter	Frankston	Victoria - AUS	1
Syk	Slusarczyk, Janusz	Niepolomice	Poland	4
Smi	Smit, J.	Pretoria	South Africa	6
Smc	Smith, Charlie	Woodridge	Queensland - AUS	19
Spl	Speil, Jerzy	Walbrzych	Poland	2
Spr	Springob, C	Siegen	Germany	4
Stg	St. George, Lou	Auckland	New Zealand	9
Sta	Stamm, Jim	Tucson	Arizona - USA	2
Sgl	Stangl, M.	Graz	Austria	1
Suh	Suchan, P.	Praha	Czechoslovakia	1
Swi	Swietnicki, K.	Zrecin	Poland	1
Sza	Szabo, Sandor	Boly	Hungary	4
Szc	Szolcsanyi, Gyorgy	Pillisszen	Hungary	1
Tll	Tailleu, B.	Ledegem	Belgium	1
Tay	Taylor, Charles	McMinnville	Oregon - USA	1
Tho	Thooris, Bertrand	Wervik	Belgium	1
Tso	Tissot, M.	St Jean De Br.	France	1
Tod	Toda, Hiroyuki	Kamogata	Japan	1
Trl	Torrell, Sebastia	Barcelona	Spain	1
Tbz	Trebacz, A.	Niepolomice	Poland	2
Tre	Tregaskis, Bruce	Mt. Eliza	Victoria - AUS	1
Tlp	Tulipani, F.	Bologna	Italy	2
Uda	Uda, Kiyo	Shigaraki	Japan	1
Vdl	Vandaele, C.	Dranouter	Belgium	1
Vdm	Vandemaele, L.	Dranouter	Belgium	1
Vaa	Vasta, L.	Praha	Czechoslovakia	1
Vik	Vincent, Keith	Havelock N.	New Zealand	2
Waa	Wagenaar, R.	Wateringen	Netherlands	1
War	Warell, J.	Angelholm	Sweden	1
Wad	Watson, Diana	Whakatane	New Zealand	7

NOTES:

1 (13) Egeria and SAO 39748, Jan 08. Richard Hahn timed a 30 sec. (± 2 sec.) event from Keaau, Hawaii, beginning at 08:46:14. 1.7 minutes later Michael Kaczmarski timed a 12.9 sec. occultation beginning at 08:47:56.8, from Ewa Beach, Hawaii.

2 (924) Toni and AGK3R 9385, Mar 05. Her reported a 2 second occultation beginning at 03:24:38.4, but none of the other 32 observers confirmed it.

3 (48) Doris and PPM 157977, Mar 20. Much experienced observer Charlie Smith at Woodridge, Queensland, timed a 1 sec. disappearance beginning at 18:03:38.9. Although he is not without doubt, his field was fully visible except for the target.

4 (596) Sheila and Ac 7984, May 04. Ross Dickie timed a 10.3 sec. disappearance beginning at 14:37:58.9 from Gore, New Zealand.

5 (804) Hispania and PPM 547895, May 05. [O.N. 5(10), p.268]. Three Australasian observers timed events: K. Vincent (Blenheim, New Zealand), 11.4 sec. beginning at 11:20:06; J. Byron (Sydney, NSW), 7.5 sec. beginning at 11:23:24.3; and C. Bembrick (Bathurst, NSW), between 2 and 5.5 sec. Bembrick's difficulties arose from problems with lights and a towel to cover them. When the towel began to slip, he glanced away from the eyepiece, and when he returned could not see the target star. When it popped back, he thought, "Oh no, was that really an occultation?" He dismissed it because of the towel problem, and still took no timings. After talking with Byron, he realized that it must have been the real thing, and went back to the telescope to reproduce his observing session, thus coming up with the time span. The diagram on page 268 is reproduced from Graham Blow's analysis, and shows that results from only two observations can give useful scientific information, as his obtained diameter of Hispania is about 141 km, considerably smaller than the 161 km from ASTEROIDS II! He also notes that Bembrick's proximity to Byron means that even a precise timing by Bembrick would not have contributed much to the overall result. This again illustrates the importance of separation of observers in determining asteroid diameters by this technique.

REPORTS OF ASTEROIDAL APPULSES AND OCCULTATIONS, LATE 1992

Jim Stamm

If you do not have a regional coordinator wh forwards your reports, they should be sent to me a 11781 N. Joi Dr. Tucson, AZ 85737 USA. Name and addresses of regional coordinators are given i "From the Publisher" on *Occultation Newsletter's* fron page. All times in this report are UTC.

I have summarized all of the reports that I hav received for the last half of 1992 in the following tw tables and section of notes. Table 1 lists the 1992 dat minor planet, occulted star, IDs of successfu observers, and references to any notes. Table 2 list the observer's ID, name, nearest town to location c observation, country (includes state or province fo North America and Australia), and the total number c observations made in the period. The notes sectior details those events that included positive observations or other significant information that could not b reported in the tables. I am not including notes or those observations that may have been spurious unless there is some sort of confirmation, or the fact tha something may have happened is relevant to anothe observation. Instead, I will place an asterisk (*) in the Notes column to indicate that I have received a repor with more than a "no event....." in it.

Table 1. Asteroidal appulses and occultations: Jul-Dec 1992.

1992	Minor Planet		Cat	Star	Observers	Notes
Jul 04	68	Leto	PPM	532316	CopOveSmi	
Jul 07	261	Prymno	PPM	555448	AndSmc	
Jul 09	546	Herodias	AGK3R	1387	Smc	
Jul 14	49	Pales	LickV	1282	McpBlkDikSmcAnd	
Jul 18	52	Europa	FAC	52331	Smi	
Jul 18	3148	Grechko	FK4	396	McpBlkSekSkiDik	
Jul 18	24	Themis	PPM	507721	Ski	
Jul 19	49	Pales	C	2413621	Smc	
Jul 20	165	Loreley	PPM	554575	Smc	
Jul 25	2	Pallas	FAC	552190	And	
Jul 31	101	Helena	PPM	575578	AndSmcLoa	
Aug 07	30	Urania	LickV	881	CopKniOveVijBlkNes	
Aug 09	490	Veritas	SAO	143850	SulWeoHuz	
Aug 10	279	Thule	AC	11126	Ove	
Aug 14	212	Medea	PPM	554774	SmcAndHut	
Aug 20	309	Fraternitas	PPM	556458	SmcAnd	
Aug 20	584	Semiramis	PPM	511908	EvsSmcHut	
Aug 21	115	Thyra	PPM	554644	Smc	
Aug 24	18	Melpomene	FAC	170657	Tso	
Aug 29	213	Lilaea	PPM	120304		1
Sep 02	510	Mabella	PPM	172436	StgWadLoa	
Sep 11	547	Praxedis	PPM	120908	And	
Sep 12	344	Desiderata	PPM	514706	SamWamSud	
Sep 13	380	Fiducia	PPM	551121	Smi	
Sep 24	1712	Angola	PPM	167764	Hon	
Sep 24	589	Croatia	PPM	145526	Hon	
Sep 25	6	Hebe	SAO	98280	Mod	
Sep 27	21	Lutetia	PPM	554146	BlkBryAndSmcHut	
Sep 30	1194	Aletta	PPM	173115	KanSmcAnd	
Oct 05	30	Urania	AC	11075	Smc	
Oct 05	805	Hormuthia	PPM	175128	Smc	
Oct 23	1317	Silvretta	PPM	47163	And	
Oct 30	1	Ceres	PPM	555835	Blr	2
Oct 30	3	Juno	FAC	246779	OhkBlw	

Table 1 (Cont.). Asteroidal appulses/occultations: Jul-Dec 1992.

1992	Minor Planet		Cat	Star	Observers	Notes
Nov 02	116	Sirona	AGK3R	7408	AndSmc	
Nov 04	115	Thyra	LickV	2454	SkiSmc	
Nov 12	524	Fidelio	PPM	67474	Say	
Nov 13	49	Pales	PPM	553977	StgWadSmcAndHut	
Nov 18	103	Hera	SAO	164286		3
Nov 27	84	Klio	PPM	512731	MatUdaIdaKan	
Nov 30	192	Nausikaa	FK4S	3600	BlkSkiHut	
Dec 02	152	Atala	AGK3R	2936	Sta	
Dec 02	43	Ariadne	PPM	118029	Sta	
Dec 08	4179	Toutatis		9.3 mag.	AkaOhkIkaUda	
Dec 15	395	Delia	AC	3834	Hon	
Dec 17	36	Atalante	SAO	24597	Emm	
Dec 18	382	Dodona	AGK3	+26° 0862	OhkUdaKan	
Dec 18	4179	Toutatis	SAO	97803	OhkUda	
Dec 23	4179	Toutatis		10 mag.	Sta	
Dec 25	4179	Toutatis	SAO	98007	Hon	
Dec 26	4179	Toutatis	SAO	97923	CopSmi	
Dec 29	4179	Toutatis		Anon.	SmcAndKthHsh	

Table 2. Observers and locations of events Jul-Dec 1992.

ID	Observer	Town	Country	No.
Aer	Aerts, L.	Carpentras	France	1
Aiz	Aizawa, Sumio	Okayama	Japan	1
Akh	Aka, Hidehiko	Funaho	Japan	1
Aka	Akazawa, Hidehiko	Funaho	Japan	2
And	Anderson, Peter	The Gap	Queensland - AUS	13
Ann	Annzai, Yoshinao	Hukush	Japan	1
Bae	Baetens, C.	Boechout	Belgium	1
Bni	Baroni, Sandro	Milano	Italy	1
Bdw	Benedyktowicz, L.	Kracow	Poland	2
Bgl	Bertoglio, A	Torino	Italy	1
Brt	Bertoli, Oreste	Alpignano	Italy	1
Bir	Birch, Peter	Bickley	W. Australia - AUS	1
Blk	Blanksby, Jim	Wandin	Victoria - AUS	5
Blw	Blow, Graham	Wellington	New Zealand	1
Bry	Bryant, Ken	Langwarrin	Victoria - AUS	1
Cps	Campos Cucarella, F.	Vallirana	Spain	4
Cop	Cooper, Tim	Benoni	South Africa	3
Dnz	Denzau, Helmut	Essen	Germany	4
Dik	Dickie, Ross	Gore	New Zealand	2
Dss	Dusser, Raymond	Kalaa Sghira	Tunisia	5
Egw	Egawa, Humiharu	Kumatori	Japan	1
Emm	Emmons, Richard	North Canton	Ohio - USA	1
Eng	Engra Hinarejos, A.	Mislata	Spain	2
Evs	Everington, Sean	Vermont	Victoria - AUS	1
Fnz	Fernandez Barba, D.	Barcelona	Spain	1
Flo	Flores Martinez, A.	Mislata	Spain	2
Fgl	Foglia, Sergio	Milano	Italy	1
Gjz	Garcia, Jimenez J.M.	Dos Hermanas	Spain	1
Gey	Geyer, E.H.	Daun	Germany	1
Goc	Gomez Castano, J.	Fuenlabrada	Spain	2
Gzd	Gonzalez, D. M.	Zaragoza	Spain	1
Hzl	Hanzl, D	Brno	Czech Republic	1
Hsh	Hashimoto, Akie	Chichibu	Japan	2
Hon	Honkus, Edward	Carnegie/Nineveh	Pennsylvania - USA	4
Hdk	Hudecek, T.	Brno	Czech Republic	1
Hut	Hutcheon, Steve	Sheldon	Queensland - AUS	5
Huz	Huziak, Richard	Saskatoon	Saskatchewan - CAN	1
Ida	Ida, Miyoshi	Youkaichi	Japan	3
Iel	Ielo, Antonio	Castiglione	Italy	1
Ika	Ikari, Yasukazu	Ohtsu	Japan	3
Iwa	Iwai, Tetsuya	Ohita	Japan	1
Kan	Kaneko, Sakae	Sakura	Japan	3
Kth	Katoh, Taichi	Ohuda	Japan	1
Kaw	Kawahara, Tetsu	Okayama	Japan	1
Kwa	Kawasaki, Koichi	Muroto	Japan	1
Kni	Knight, J.	Bernoni	South Africa	1
Khl	Kohl, Mike	Laupen	Switzerland	2
Koz	Koizumi, Sachiko	Okayama	Japan	1
Krt	Kretlow, Mike	Siegen	Germany	2

Table 2 (Cont.). Observers/locations of events: Jul-Dec 1992.

ID	Observer	Town	Country	No.
Kur	Kuroda, Rumi	Kamogawa	Japan	1
Lhd	Lindhard, L.	Esbjerg N	Danemark	1
Loa	Loader, Brian	Christchurch	New Zealand	2
Mti	Marti Ribas, Josep	Mataro	Spain	1
Mat	Matsuda, Hideki	Tenri	Japan	3
Mau	Matsuyama, Sadamichi	Okayama	Japan	1
Mcp	McCronan, Philpip	Bendigo	Victoria - AUS	1
Miy	Miyake, Motoharu	Kamogawa	Japan	1
Mod	Modic, Robert	Richmond Hts.	Ohio - USA	2
Mor	Morita, Naoko	Muroto	Japan	1
Mur	Murata, Kazuhiko	Kuritou/Kiyosa	Japan	2
Nar	Narusawa, Shinya	Sayou/Hukush	Japan	2
Nes	Nelson, Peter	Ellinbank	Victoria - AUS	1
Jun	Obs, du Jungfraujoch	Jungfraujoch	Switzerland	1
Meu	Obs. De Meudon	Meudon	France	1
Ohk	Ohkura, Nobuo	Okayama	Japan	5
Oka	Okada, Ichiro	Omihachman	Japan	1
Oku	Okudo, Masami	Sayou	Japan	1
Ove	Overbeek, Danie	Edenvale	South Africa	3
Prt	Pierantoni, E.	Bologna	Italy	1
Prc	Porcini, Roberto	Salerno	Italy	1
Rsp	Raspadori, G.	Bologna	Italy	1
Rge	Regheere, G.	Valenciennes	France	1
Sam	Samolyk, G.	Milwaukee	Wisconsin - USA	1
Say	Sarty, Gordon	Saskatoon	Saskatchewan - CAN	1
Soh	Sato, Motomaro	Okayama	Japan	1
Sht	Scholten, Alex	Eerbeek	Netherlands	1
Sek	Self, Ken	Rosanna	Victoria - AUS	1
Ski	Skilton, Peter	Frankston	Victoria - AUS	4
Syk	Slusarczyk, Janusz	Krakow	Poland	1
Smi	Smit, J.	Pretoria	South Africa	4
Smc	Smith, Charlie	Woodridge	Queensland - AUS	19
Spr	Springob, C	Siegen	Germany	2
Stg	St. George, Lou	Auckland	New Zealand	2
Sta	Stamm, Jim	Tucson	Arizona - USA	3
Sud	Sudol, Jeff	New Britain	Connecticut - USA	1
Sue	Sueyosni, Michio	Tsuyama	Japan	1
Sul	Sullivan, Philip	Occidental	California - USA	1
Tao	Takao, Akihiro	Matsue	Japan	1
Tkd	Takeda, Yasushi	Hukusn	Japan	1
Tod	Toda, Hiroyuki	Kamogata	Japan	1
Tok	Tokimasa, Noritaka	Sayou	Japan	1
Yub	Tuboi, Tamio	Kamogawa	Japan	1
Tlp	Tulipani, F.	Bologna	Italy	2
Uda	Uda, Kiyo	Shigaraki	Japan	6
Ued	Ueda, Masayoshi	Habikino	Japan	1
Ume	Umezu, Atsushi	Hukush	Japan	1
Fvl	Van Loo, Francois	Carpentras	France/Belgium	1
Vij	Vincent, J.	Harare	South Africa	1
Wat	Watanabe, Shinobu	Shizuok	Japan	1
Wad	Watson, Diana	Whakatane	New Zealand	1
Wam	Watson, Mark	Stafford	Ohio - USA	1

NOTES:

1 Aug 29. Observers were IwaTodAkaTubOhkSue MorKwaNarUedMatIkaMurOkaIdaWatMiyKur KawAizKozMauSohOkuTok.

2 Oct 30. After much astrometry, with the final prediction of an off-Earth path, Peter Birch in Perth, Australia confirmed such with a 2"-3" miss, while others in Australasia had cloud.

3 Nov 13. Observers were TaoAkaEgaMatIkaUda IdaMurHshNarUmeAnnTkdSmc.

These three articles appeared in the Astronomical Society of Kansas City publication the "Cosmic Messenger"

WHAT TIME IS IT?

Bob Sandy

Have you ever heard of the time reference Astronomers use called "Universal Time" or UT? Well, there's a rumor that it is going to be replaced by one called W.R.T. or "Walter Robinson Time"!

How did this come about? Bob Sandy (Blue Springs, Mo.) and Walter Robinson (Bonner Springs, Kansas) are actively timing star occultations by the Moon. On the evening of November 18, 1988, Bob phoned Walter to remind him of an occultation that was to occur the next morning at 2:20 a.m. As on prior occasions, Bob asked Walter to phone him 5 minutes **AFTER** making his timing so that the two of them could compare timings. Then Bob set his alarm and went to bed.

Some time later, Bob's phone jarred him awake. Answering it, he heard Walter say, "Well, did you time the occultation?" Startled, Bob checked his wristwatch which read 1:25 a.m.!! "What?!" Bob exclaimed to Walter. "I've still got an **HOUR** to go before my alarm goes off!"

Well, you might think that Bob's watch was malfunctioning or maybe that Bob was confusing C.D.T and E.D.T., right? Wrong! Here's what happened: when Walter checked on his occultation predictions from the Naval Observatory, he noticed that there was a star occultation occurring almost exactly one hour **BEFORE** the one Bob intended to time. Assuming the earlier occultation was the one in discussion, Walter timed IT!

Walter says it will be a long time before he lives this one down! If in the future you should hear people referring to W.R.T., you'll know what they are talking about!!

- NEWS BREAK -
Astronomer Goes Belly Down!!

Yes, you read the heading correctly. On Saturday Evening January 30th, 1993, Nick Ruess, using his 3.5-inch Questar, optioned to place his *belly* down on the ground to observe the star graze of Z.C. 397! The Fahrenheit temperature was 32 degrees with a strong wind. But Nick says by observing close to the ground, he was very comfortable (covered with blankets of course) and had no tearing of the eyes during the critical moments of the graze. He also indicated this was the *second* time he's observed *belly down* to *look up*, and will use this method again if the need arises.

The next thing we'll probably see is a bumper sticker on Nick's car saying, "I DO IT BELLY DOWN!".

Other observers on the graze team were ASKC club members Rick Singmaster, Vic Winter, David Neuenschwander, and graze expedition leader, Bob Sandy.

- NEWS BREAK -
Astronomer Goes Belly Down Again!!

Yes, 3 days after the biggest snow storm in our area in quite a number of years, Marilyn Unruh, Mike Larkin, Bob Sandy, and Nick Reuss drove in a 2-car graze expedition Sunday, February 28th, to Milan, Missouri, successfully observing the moon's northern limb graze the star 39 TAURI, and for the 3rd time, Nick optioned to observe *belly down*! BUT this time lying on the large accumulation of "white stuff" on the edge of a farm road!! I guess Nick still hadn't cooled down from his timing 11 events during the graze in January!! But can you believe it? - on *this* graze *he* observed 9 disappearances and 9 reappearances of the star over a 2-minute time period using his small 3.5-inch Questar! These 18 timings set a record for "per one observer" during any past observing expeditions that the A.S.K.C. has been involved in dating clear back to 1964 (per Bob Sandy).

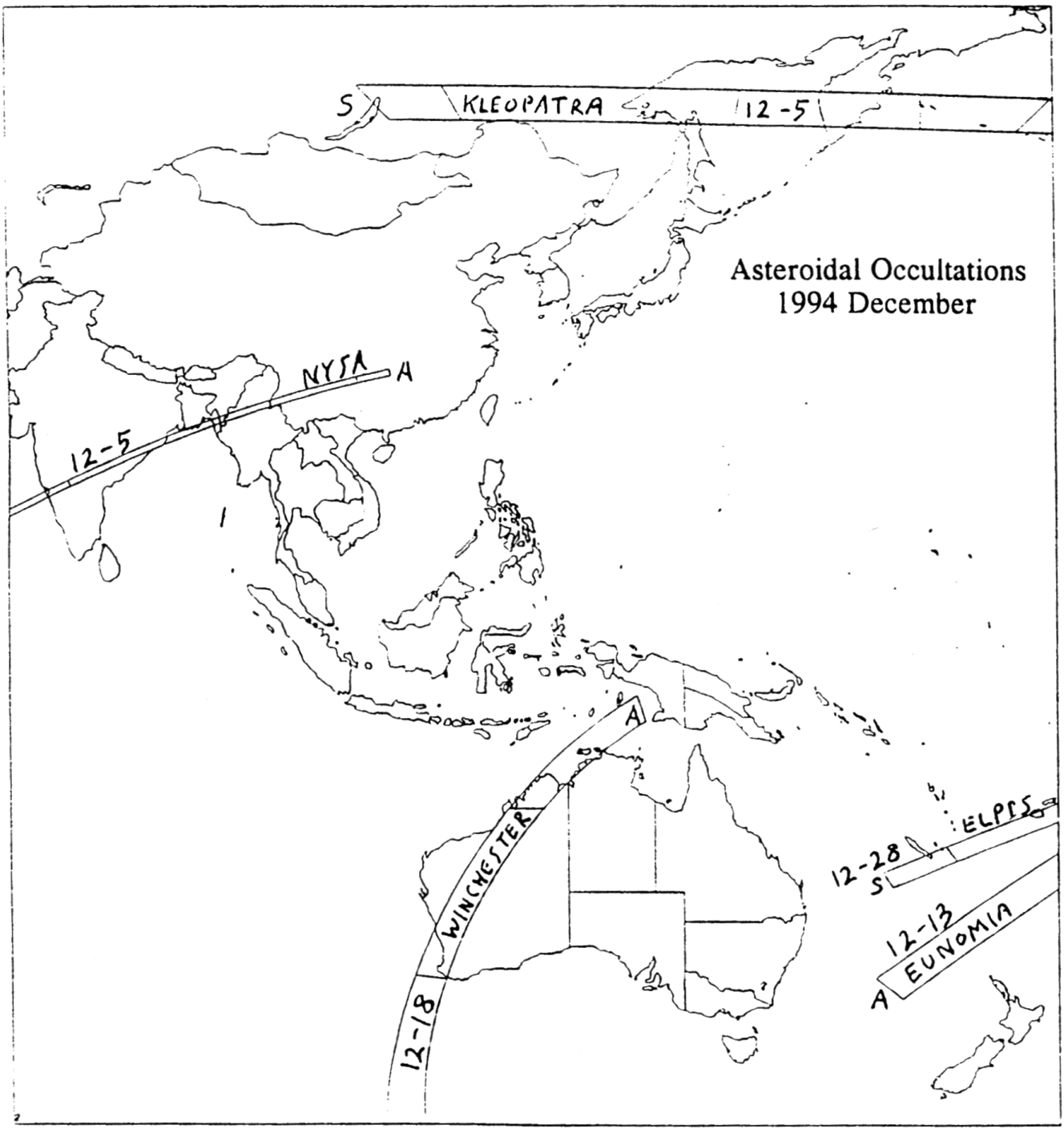
The old record was 14 events each seen by the late Russ Maag on September 26, 1978 and Larry McGill on September 12, 1979.

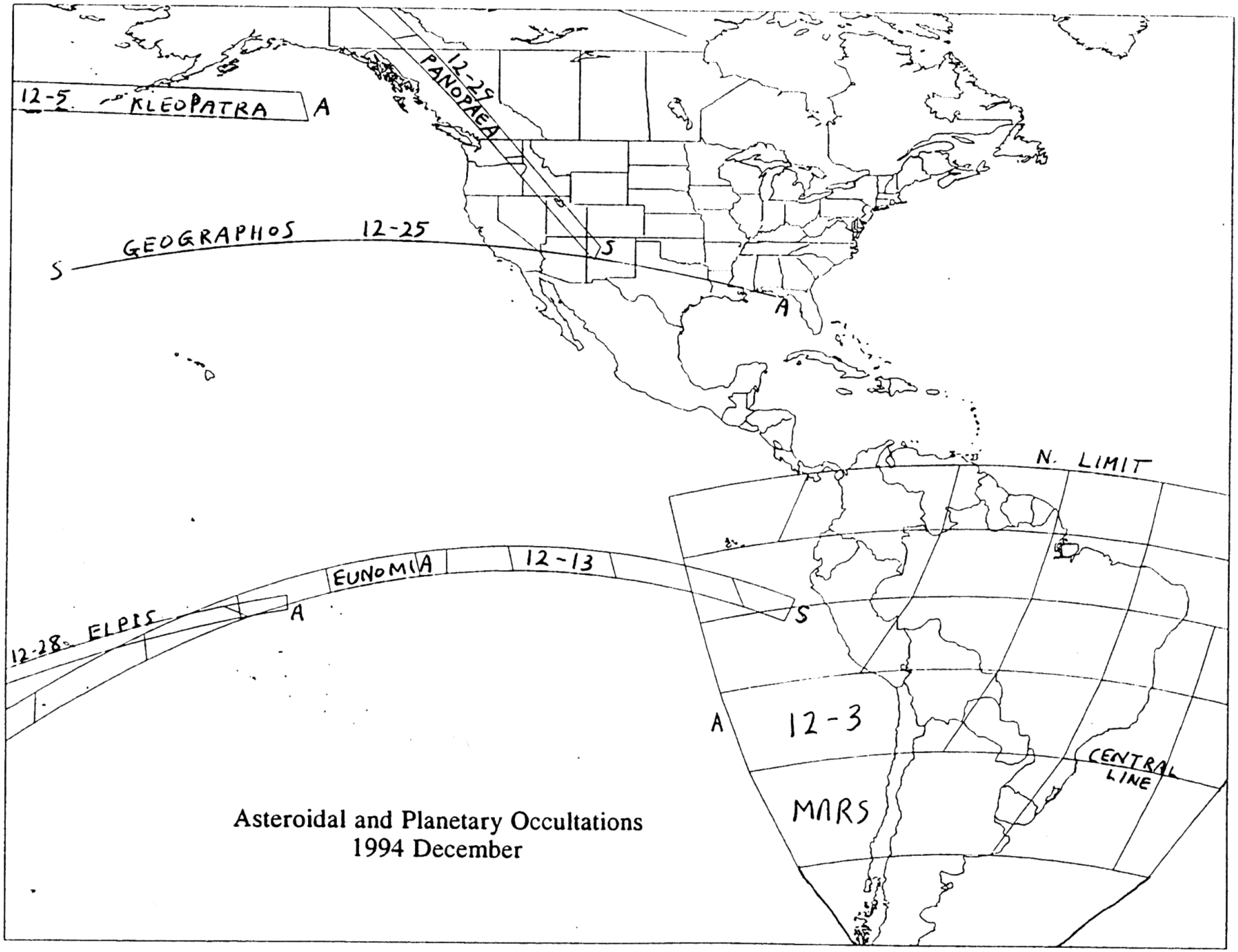
SOLAR SYSTEM OCCULTATIONS DURING LATE 1994

David W. Dunham

This continues and concludes the article with this title begun on p. 75 of the last issue. This only includes regional maps showing the paths of events during December, and some world view maps by Mitsuru Sôma. The map for Europe, Africa, and the Middle East is not included since only three events appear on it, in areas where there are no **ON** subscribers: An occultation by Mars on Dec. 3 in the Atlantic Ocean southwest of northwester Africa; one by 44 Nysa on Dec. 5 crossing northeastern Tanzania; Mombasa, Kenya; and the Arabian Sea; and one by 70 Panopaea on Dec. 29 passing over the northern Ural Mountains. In Table 1, Part 2 on p. 82 of the last issue, incorrect data about an occultation by Mercury on Dec. 28th are given under "Possible Path"; a description of the region of visibility should have

been given there, reading "n.e. tip of Brazil and nearby parts of the Atlantic Ocean". But the occultation of the 6.2-mag. star will be very difficult to see due to the 9° elongation from the Sun, and consequent low altitude in bright twilight.





Asteroidal and Planetary Occultations
1994 December

The International Occultation Timing Association was established to encourage and facilitate the observation of occultations and eclipses. It provides predictions for grazing occultations of stars by the Moon and predictions for occultations of stars by asteroids and planets, information on observing equipment and techniques, and reports to the members of observations made. IOTA is a tax-exempt organization under section 509(a)(2) of the (USA) Internal Revenue Code, and is incorporated in the state of Texas.

The ON is the IOTA newsletter and is published approximately four times a year. It is also available separately to non-members.

The officers of IOTA are:

President	David W. Dunham
Executive Vice President	Paul Maley
Executive Secretary	Rocky Harper
Secretary-Treasurer	Craig and Terri McManus
VP for Grazing Occultation Services	Joe Senne
VP for Planetary Occ'n Services	Joseph Carroll
VP for Lunar Occultation Services	Walter Morgan
ON Editor	Joan Bixby Dunham
IOTA/European Section President	Hans-Joachim Bode
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The Dunhams maintain the occultation information line at 301-474-4945. Messages may also be left at that number. When updates become available for asteroidal occultations in the central U.S.A., the information can also be obtained from either 708-259-2376 (Chicago) or 713-488-6871 (Houston).

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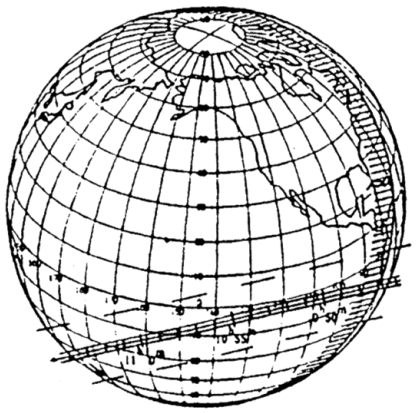
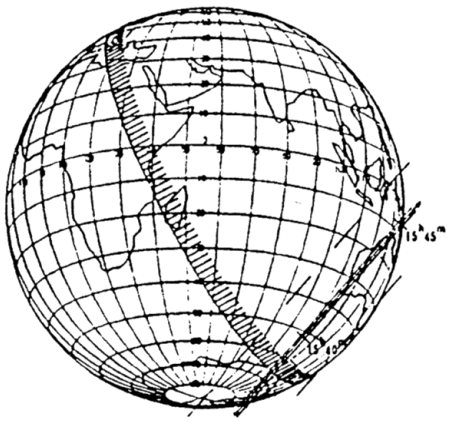


+30° 1329 by Eunomia 94 Dec 13



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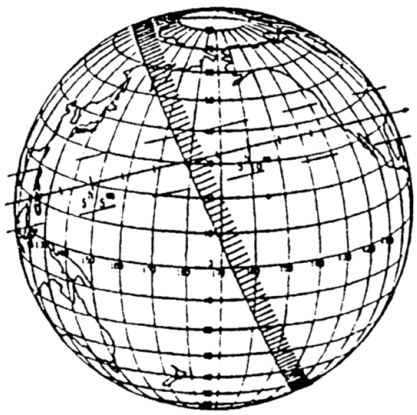

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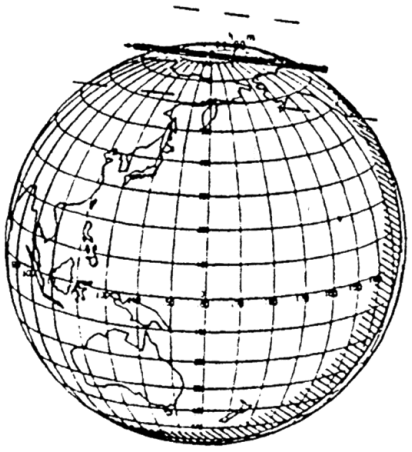

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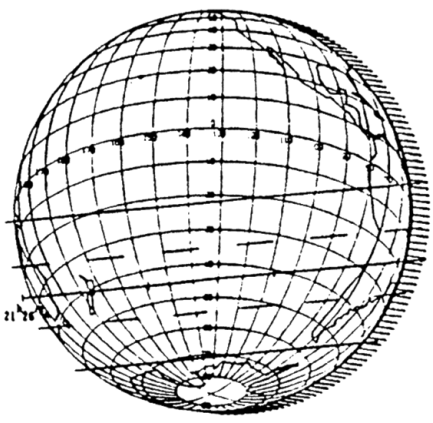

ZC 2790 by Mercury 94 Dec 28

SAO 96651 by Polyxo 94 Dec 31