

# *Occultation* *Newsletter*

**Volume VI, Number 10    June, 1996    ISSN 0737-6766**

Published quarterly by the International Occultation  
Timing Association  
Joan Bixby Dunham, Editor

# Occultation Newsletter

Volume VI, Number 10

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ISSN 0737-6766

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 [dunham@erols.com](mailto:dunham@erols.com). 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 fourth and last issue of 1995. It is the tenth issue of Volume 6. IOTA annual membership dues, including ON and supplements for U.S.A., Canada, and Mexico \$30.00  
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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 Física; Mérida, Venezuela), for Europe via Roland Boninsegna (Rue de Mariembourg, 33; B-6381 DOORBES; 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 a Eurocheck in the amount 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. German members should give IOTA/ES an "authorization for collection", or "Einzugs-Ermächtigung" in German, to their bank account. Please contact the secretary for a blank form.

## IOTA NEWS

David W. Dunham

**IOTA Meeting:** The 1996 meeting of the International Occultation Timing Association will be held in Houston, Texas, probably at the Lunar and Planetary Science Institute, in October or November. A tentative date for the meeting is Oct. 26. Final information will be announced when it becomes available, and will also be given on IOTA's Web sites; see the end of this issue.

**Graze Reports by e-mail:** Reports of lunar grazing occultations reported to IOTA should now be sent directly to Richard Wilds at his new Internet address: [darkmatter-at-hart@worldnet.att.net](mailto:darkmatter-at-hart@worldnet.att.net). As noted on p. 192 of the last issue, reports to the International Lunar Occultation Centre should be sent to: [iloc@ws11.cue.jhd.go.jp](mailto:iloc@ws11.cue.jhd.go.jp).

**Asteroidal Occultation Chart Help Needed:** David Werner needs help annotating E. Goffin's charts for 1997 North American events; let me know if you can help.

**Next Issue:** This is the last issue with Joan as the editor. The next issue will be produced by Rex Easton (see the article on page 206). Material that Joan has received, but not yet published, is being sent to Rex. This includes articles from David Herald on asteroidal occultation statistics, from Tony Murray on double stars, from Isao Sato on a Hyakutake occultation, and more graze reduction plots by Bob Sandy.

## OCCULT VERSION 3.14

David Herald, David Dunham, and Kent Okasaki

Several enhancements to the OCCULT program, version 3.11a, including a high-level menu of its options, was given in ON 6 (8), p. 169. Since then, many important corrections and additions have been made to

the program, leading to version 3.13, upgrades to which were widely distributed starting in March. Version 3.13 added an option for lunar occultation predictions to give "photoelectric" output similar to that previously available only with the Evans and PC-Evans program, and also observed graze data in the Cassini regions for producing the graze profiles, using an updated version of the files that have been used by the ACLPPP profile printing program that has been the basis for IOTA predictions since 1975. The regional maps and predictions for the May 8th lunar occultation of Comet Hale-Bopp published on pages 193-197 of the last ON were produced by vers. 3.13. Upgrades from OCCULT version 2 to 3.13 were distributed by e-mail a few days before the April 3-4th total lunar eclipse to IOTA lunar occultation prediction coordinators in the regions of visibility of that event so that they could compute predictions of occultations of faint stars during that event; the upgrade included the GSC files for both 1996 total lunar eclipse star fields.

Version 3.14, available for distribution at the end of May, includes the addition of extra geodetic datums, provision for producing lunar observation reports in the e-mail76 format described in ON 6 (8), pp. 173-177, several revisions to the eclipse module, correction of an error in the asteroidal occultation calculations so that they now closely duplicate the IOTA predictions based on Edwin Goffin's computations, addition of a capability to update asteroidal occultation predictions using astrometric observations, and many other features. Thanks to work by Jim Hart at Pickering Anomalies, the full OCCULT program, as well as upgrade files from earlier versions of the program, are now available by ftp at [ftp.anomalies.com](ftp://ftp.anomalies.com). If you are interested in this, read the documentation files that you will find at that site. Most of the program can be downloaded by ftp, but a small key file is left out. Although no cost is involved for downloading by ftp, we want to register users of OCCULT so that they can be notified of updates to the program, since corrections and new capabilities are likely to be added in the future. The registration, and the key file, can be obtained by contacting Kent Okasaki at [kento@hpctgjm.hpl.hp.com](mailto:kento@hpctgjm.hpl.hp.com). If you do not have ftp capability, but if you can receive large attached (uuencoded or mime-encoded) files by e-mail, Kent can also send the OCCULT files that way. Otherwise, it can be provided at cost on diskette; Kent's postal address is 5255 Stevens Creek Blvd., #236, Santa Clara, Calif. 95051. The full OCCULT lunar occultation software and files are compressed on 3 IBM-PC diskettes available for \$12 (or \$6 for IOTA members); make checks payable to Kent Okasaki in US funds. If you want the asteroidal occultation prediction capability, you need OCCULT's condensed version of the PPM star catalog, available on 4

more diskettes for an additional \$6. Purchasers outside of the U.S.A., Canada, and Mexico need to add \$3 to the price to cover the higher postal expense for sending airmail small packettes.

Dunham just recently upgraded his OCCULT to version 3.14 and tested some of the features. The asteroidal occultation paths are now much more accurate than they were with version 3.11a. In the F7 summary display, the "mag." given before the star's PPM number is the occultation magnitude change, not the star's magnitude. The correct star and occultation change magnitudes are given in the more detailed event displays.

Dunham started to write a program to convert the PC-Evans station and prediction files into the OCCULT station file (sites.dat) format, but the logic became more complex than expected; he hopes to complete the job in time for the 1997 predictions. He wrote other programs that convert the IOTA graze station card format, like those read by E. Riedel's grazereg program, and Jim Hart's comprehensive file of occultation stations and observatories that can be obtained from the Web URL <http://www.anomalies.com/iota/splash.htm>, into OCCULT's sites.dat format. Dunham also has an occultable program that produced the tables for individual events for several locations like those on pages 195-197 of the last ON, but that program has not been documented yet.

A chronology of updates to OCCULT from version 3.11a is given below; the numbers are a chronological sequence of updates from version 2.0:

**Version 3.11b** (Late 1995; a variant of this, version 3.12, was not distributed)

56. Reduction module changed to allow entry of PPM catalogue stars. Also, if the PPM catalogue is present (for asteroidal predictions), reduction of PPM stars numbered < 300000 is performed.

57. Bug removed from graze predictions - If graze path missed the earth, a file was erroneously left open. Error occurred while plotting the profile.

58. Bug removed from editor for asteroid elements, to permit negative slope parameter to be specified.

59. Dec 28. Bug removed from asteroid predictions (bug caused stars near boundary between PPM zones to sometimes be skipped.)

60. Dec 29. Asteroidal occultations - when scanning to find events, the events found are shown on the screen. Bug removed to allow continuous sending of plot screen to the printer. Output to screen of summary of events found pauses if screen filled.

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61. Jan 11. Routine for integrating elements for lunar occultations would not stop if integration for a particular

short period - fixed.

62. Jan 18. Duplicated output routines eliminated. Output to printer or disk is now identical to the screen output. PREDICT.EXE file size reduced.

63. Jan 21. Routine added to Predictions to display world map showing region of visibility of asteroidal occultations.

64. Jan 27. Cassini region data incorporated for graze predictions - data files NCASSINI.DAT and SCASSINI.DAT added, and Predictions program changed to show Cassini profile as a double, dashed line.

### Version 3.13

65. Feb 9. For grazes of planets, the planet's semi-diameter and the width of the graze zone is displayed. Photoelectric option for ordinary occultations added - gives contact angle, and radial velocity (in milliarc secs).

66. Feb 14. For grazes and occultation maps where the object is a planet - the name of the planet is no longer split if it is greater than 6 characters long. Also, calculated magnitude displayed to 0.1 mag.

67. Feb 16. In CONFIGURATION, edit sites, corrected input bug so that site numbers greater than 9 could be specified.

### Version 3.14

68. Feb 29. Extra geodetic datums added.

69. Mar 1. Added geodetic datum corrections to Reductions module.

70. Apr 1. In asteroid plot, made 10min. markers larger than 5min. markers. Identifiers better positioned.

71. Apr 5. Asteroidal Occns - moon elongation and %illum added. Chart no. in the Herald-Bobroff *AstroAtlas* containing the field of the finder chart added. *AstroAtlas* can be purchased by credit card and is available from the address below. It is distributed in USA by CRAZY ED OPTICAL; PO Box 110566; Campbell, CA 95011-0566; phone (408) 364 0944 - for further information, see also the Web at URL <http://www.rahul.net/resource/regular/products/ceo>

72. Apr 5. Predictions - for output to disk file, an 'e-mail' option added. With this option, the maximum line length of the output file is 76 characters. The shorter line length is achieved by removing spaces between several columns.

73. Apr 6. Reductions module changed to:

- include E-Mail address in report form;
- provide a routine to 'report' observations by copying the file to a floppy disk or other specified location;
- the reporting routine including an option to convert the file into the EMAIL standard format for occultation reports (i.e. 76 column max); see ON 6 (8), pp. 173-177.
- the reporting routine writes a log of files reported -

`\occult\observns\report.log`

- Configuration module changed to allow specification of the default e-mail address to appear on report forms.

- Batch file for installing OCCULT amended to create the directory `\occult\observns\email` as a default directory for holding files converted to the email format.

74. Apr 7. Defaults.dat file amended to include default values for asteroidal occultation predictions. Configuration module now allows editing these values.

75. Apr 13. Asteroidal occultations routines added to:

- enter last-minute astrometry. Routine will accept manual entry, or will read the data from a file with positions specified in the IAU format. Limited editing of the input file data, especially to remove extraneous material in the file, is provided.

- compute path correction from entered astrometry; this was tested with astrometric updates computed by Dunham and Goffin for the March 28th 517 Edith event.

- plot the corrected path location from the computed corrections (or from user specified offsets);

- plot map of world at a larger scale, centred on the nominal site position, to better show the corrected path;

- for astrometric analysis, a file containing site parameters for IAU-recognised observatories, and short routine to edit that file.

76. Apr 15. Input routine modified to recognise the ESCAPE key, and treat it the same as the CURSOR UP key. For inexperienced users, this is more likely to be pressed to escape from a menu.

77. Apr 15. In REDUCTIONS, data entry routine modified to permit more characters to be entered in the COMMENTS field of the occultation report.

78. Apr 15. Predictions - header information - reformatted to include the value of the correction to the limiting magnitude.

79. Apr 15. Location of cities in cities.big indicated on the large-scale map in asteroidal occultations.

80. In eclipse module, if site was close to an eclipse limit, the program exited the computation too early with a message that there was no eclipse. This was fixed.

81. For asteroidal occultations, the 95% probability range computed, using the 't-student' distribution. Corresponding error bars shown on plot, and data fields for the errors shown on main screen (with manual input if required.)

82. For asteroidal occultations, the site used for selecting the event is marked with a small cross, and the latitude/longitude printed above the chart. The map of the world is plotted for the time when the path is closest to the selected site (not the time of mid-event shown at the top of the chart.)

83. The diam. of the asteroid in arc secs is displayed.

84. The table of DeltaT was updated to latest values.

85. Eclipse module modified to provide a world map showing the eclipse path with sunrise/set curves. Routine to display coordinates of rise/set curves removed.

86. Apr 25. In asteroidal updates, small bug identified in computing parallax correction for astrometric observations - & removed.

87. Apr 27. Plot routines amended so that borders between east & west Germany, and north & south Vietnam, are not plotted.

88. Apr 27. For graze output during a lunar eclipse the % illumination of the eclipsed moon is given in an extra (unlabelled) column. Bug - where %illum not given if umbral distance > 1.03 - removed.

89. Rotating indicator changed so that the vertical line is a complete, rather than a broken, line.

90. Eclipse module substantially revised:

- option to scan a range of years for eclipses removed;
- scan module rewritten to be the initial input; to compute an eclipse, specify the year of the eclipse; all eclipses that year are identified; select the relevant eclipse (by number);

- error in scan module removed (error resulted in incorrect time for mid eclipse, and could lead to difficulties in computing certain eclipses.)

- Mapping routines added for solar eclipses - to map whole world or part of the world (Mercator projection), or selected region (conic projection).

- routine to display coordinates for sunrise/set curves removed (data used in mapping routine.)

- curve of max eclipse at sunrise/set shown on maps.
- indicator for solar eclipse being annular or total;
- position of moon corrected for difference between center of mass and center of figure (in latitude only).

91. May 5. Error in asteroidal occultations located - latitude of the Earth used with wrong sign. Corrected.

On 1996 May 5, OCCULT Version 3.14 was thus created. Revision from version 3.13 involves new .exe files for all modules, and \occult\asteroid\observty.IAU. It also requires new directory \occult\EMAIL.

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## LOWER CASE LETTERS NOW ALLOWED IN OCCULTATION REPORTS SENT TO ILOC

The software used by ILOC no longer confuses lower-case letters with Japanese characters. So they can now be used for addresses, names, and comments, but capitals are needed for station and observer codes and key letters.

## VIDEO OF DELTA 1 TAURI GRAZE

Thomas H. Campbell, Jr.

This video taped graze was absolutely spectacular! 14 contacts were recorded, although I did not know that until I played the tape after I returned home. I was distracted at the critical time by a local, but the VCR recorded it all. A great advantage of using video tape vs. a visual observation. Harold (Hal) Povenmire told me that the stations above me and below me timed 8 to 10 events. I did see one definite step event for a few seconds; it was not a gradual contact as I have seen many times before.

I did not have the Rock Harbor quadrangle map, but I did have my Florida Atlas & gazetteer and plotted it on its scale of 1:150,000. I then compared the Xeroxed copy of the site that Hal had mailed to me to my plot and there was no difference detectable. I plotted the .82 mile line to the limit before I left on the trip, the distance from the Grazereg northern limit suggested by D. Dunham after receiving Mitsuru Sôma's reduction profile of the observations of a graze of the star observed by expeditions in the Netherlands, Germany, and the Czech Republic on January 29th.  $\delta^1$  Tauri is Z.C. 648; Sôma's profile is shown on p. 225. Since our central graze was near Watts angle 11:8, our observations will add useful detail to the observed profile for Watts angles greater than 10:4 where there was little coverage from the European observations. I was at station 4 which looked to be very close to the .82 mile line by eye balling distances to landmarks. [ed.: We are thankful for Marcel Wilmet, Reinhold Büchner, and the other expedition leaders for rapidly supplying the observations by e-mail so that the analysis could be completed in time to best position the observers in Florida. We have had similar success for recent grazes of  $\rho^1$  Sagittarii and  $\alpha$  Cancri in the U.S.A. and Japan; those profiles will appear in a later issue. If you plan an expedition for a graze of a bright star, you might contact David at [dunham@erols.com](mailto:dunham@erols.com) to see if analysis of past data can help position your observers.]

Trips to a graze can be an interesting adventure as well as the graze itself. Below, I will describe how my trip "adventure" went.

I had planned to give myself a 3-hour time margin before central graze time. That would have given me enough time to check into a motel, eat supper and top off the charge on my camcorder battery. Well things sometimes don't go exactly as planned.

I had planned to depart home at 10:30 am for Key Largo. It is a good thing I did a last minute voltmeter check of my 12V gel cell. The night before it was good, but I only used it for a few seconds. Overnight the voltage had dropped to 9.3 volts! Under load the voltage

read 3 volts. I depend on it to give me noise free power to my Phillips CCD and my VTACT. The 11 year old "Portapower" finally bit the dust. Batteries with a built in cigarette lighter socket do not exist here in the local stores. So after using up an hour, I bought a small 12V (sealed) lawn mower battery. Then I went to Radio Shack to pick up an adapter cord with battery clips on one end and a cigarette lighter socket on the other. The closest store was out of stock. Time running short, I bought the stuff to make up the adapter cord myself using my soldering iron at home.

At 12:30pm I discovered that the A/C in my station wagon does not work. I had charged the system with a couple of cans of freon but it leaked out overnight! A/C not necessary for car to operate so I departed at 1-2:30pm using my 2/70 air conditioning (2 open windows and 70 miles per hour). The air was warm and humid so I carried a 1 liter bottle of water and a bottle of apple juice to replace fluids. I took a towel to dry my face and forehead once in awhile.

Three-quarters of the way across Alligator Alley I begin to feel a serious vibration from the rear of my car. I slowed a little and drove a few more miles. It got progressively worse so I pulled over. Just as I suspected, there was a knot on my tire where the thread was becoming delaminated. So I had to get the tire tools and mount my spare on the roadside. All of my telescope and video equipment was directly on top of my spare wheel well! So I had to unload all of that onto the roadside before I could get the car jacked up. It was warm and steamy with that bright sun and saw grass from horizon to horizon. That was another 30 minute delay.

A few minutes later I was on WHY 997 (Krone Ave.), 20 miles north of Florida City. I stopped at a convenience store to buy a liter of bottled drinking water. I came back out of the store, cranked up my car and I noticed that the temperature idiot light is on. My first thought was "afterboil" or the tendency for an engine to get warmer immediately after shutting it down. Thinking the light would go out with ram air cooling the radiator I drove on. 1/2 mile down the road the dammed light was still on! So I pulled over next to a large open vegetable farm and shut the engine down. I opened the hood and knew I had to wait until it cooled down before loosening the radiator cap. After a 25 minute wait, I loosened the cap a little and allowed steam to flow into the overflow tank. The latter was full of coolant? Releasing steam slowly helped to cool the engine faster. Finally I am able to take the radiator cap off completely and the radiator was only half full! I emptied about a pint and a half of my drinking water into the radiator but it wasn't enough to fill it! I thought, "looks like I may not get to the graze site in time"! Just as I thought that, I spotted what looked

like a well, pump and small water storage tank 1/4 mile away in the field. Sure enough it was water, there was a spigot and the pump worked! I made two trips to fill my 1 liter water bottle and got the radiator filled up. I was on my way again.

I was now really worried about the time so I drove through Florida City and directly toward the graze site. I could always check into a motel after the graze. The site was a lot further down Key Largo than I had previously thought but I found a string of telescopes on the roadside and found Hal with 65 minutes to go before central graze. After talking with Hal, I found my assigned station and began to setup. That part went very smoothly and I had 15 minutes to spare before the beginning of the observation period.

It took me 7 hours on the road, with no air conditioning to get to the graze site. I was exhausted and hungry. But it was worth it all because I made a good video recording. The total expenses were some \$89.00. So at a cost of roughly \$10 per event, it wasn't a bad deal.

The return trip today was smooth and uneventful, taking 5 hours and 15 minutes. Made the trip from Florida City to home in exactly 5 hours and 15 minutes.

[Later, Tom sent the message below:]

I re-played my video tape of the Key Largo graze for the first time this evening. I played it twice and both times I counted 14 events. All occurred within -1 minute to +1 minute from central graze (CG).

There were 7 events prior to CG, a few tens of seconds pause around central graze and 7 events after CG. This was the most events I have ever video tapped and the "rapid fire effect" looked spectacular! Earthshine was not visible on the video because of the camera sensitivity and use of prime focus (f/10). Had I had a little more time, I could have used my telecompressor for f/5 which may have brightened the Earthshine enough to record. All events were clearly recorded and WWV time signals were a little noisy but clear enough to hear the seconds ticks and the louder minute tones.

I have not reduced any of my timings yet. I just made a couple of passes to count the total number of events. Upon review of the re-play, I saw a quick partial occultation or dimming and it was hard to tell if it was stepped or gradual. I had reported earlier that I thought it was stepped, but that was from my live visual observation on my 9" black and white monitor. I will have to do a one frame at a time playback to make a determination of whether this one event was stepped or a gradual event.

I will reduce the timings, visually by watching the re-play monitor, when I get the opportunity. That will be sometime for sure during the next few days.

The price per event dropped from my earlier estimate of \$10 to \$6.36 per event.

## NEW EDITOR FOR ON

Joan Bixby Dunham

When I became the editor of ON in 1990, Homer DaBoll had been the editor and compositor of the newsletter since its inception in 1974. He had designed the format, and his father designed the ON logo. The tools that Homer used for editing ON were an IBM Selectric typewriter, scissors, tape, and careful attention to detail. The layout and the column width were defined in terms of the Letter Gothic 12 pitch font. I never trusted my typing (or spelling) enough to produce an issue without the aid of wordprocessors and printers.

The newsletter has not changed much since Homer designed it. We used the same font for awhile, and then switched to a proportional font. We kept the two columns, and we still use scissors and tape (actually, now I use Uhu stick glue) to incorporate the graphics. The logo is also still taped on. Tony Murray convinced us the newsletter would look much better with a cover, and he has been printing it that way for us since 1993. We used to have the newsletter offset printed, but we found that the quality of a Xerox copy was quite acceptable, and considerably cheaper.

While I have enjoyed working with the newsletter, it has become increasingly obvious that the Dunhams have more to do than they can reasonably accomplish. I hope to have more time for data reduction and writing in the future. Rex Easton will be the new editor of the ON beginning with the next issue. I will continue to help as he needs it. I also plan to write an occasional article as well. If you have communications for the ON, you should send them to Rex Easton; 2007 S.W. Mission Ave., Apt 1; Topeka, KS 66604-3341 or to his email at skygrazer@smartnet.net.

## ANALYSIS OF LARGE O-C's, 1986-1994

Robert H. Hayes, Jr

I read with interest the article by Peter Anderson in ON 5(12), pp 310-311. I have also had some O-C problems in the past, so I checked my reductions from 1986 onward. I also tabulated the number of events reduced by ILOC, and the number of residuals with absolute value greater than 2".00. There were occasions (especially in 1990!) When subsequent runs would improve large residuals for one reason or other. This analysis includes only those events which always had a residual greater than 2".00.

I am also an experienced observer with many occultation observations since the early 1970s. Nearly all have been made with a 15cm reflector; occasionally a 13cm Celestron was used. A stopwatch/eye and ear combination timing method was used. I also used a tape recorder when away from home, or when events were closely spaced. When an event is at least fairly easy, I can hit the switch or button without thinking. The weather is often bad, but much can be done if conditions cooperate at the right time.

I found that most of my large O-Cs do involve southern stars. Due to parallax from my latitude of +42°, the Moon can go quite a bit farther south than from Australia. One of my occulted stars was only 8' north of declination -30°. The large southern O-Cs tended to bunch. (Are these the result of old G. C. Positions?) Most of these residuals were not surprising. The southern declination problem lessened after 1988.

Occasionally events involving secondary stars would be reduced using the primary's position. This must have been the case for the companion of Antares, and Zeta Cancri C.

Mr. Anderson's article did not mention an irksome problem that I have had, and that is large, uncertain limb corrections near the lunar south pole. I have listed three events whose O-Cs must have been inflated by these corrections. These were all nearly grazing reappearances around Watts angles 184° to 187°, with the Moon well north of the ecliptic. This may be part of Luna Incognita, the area that was poorly observed by the Lunar Orbiters. [Ed. Note: It is, and is deep in the Cassini region that has been mapped better with graze data.] Due to grazing geometry, there cannot be many observations in this area. Perhaps by dumb luck, though, two of these events were reappearances of bright Pleiads during the last series of passages. The limb corrections hint at very low terrain, but even so, foreground and background features would tend to fill in gaps, much as in terrestrial landscapes. I have noticed similar, but less extreme, examples of this situation while browsing through the ILOC reports. Perhaps now that Clementine has photographed this area better than the previous two probes, the corrections may be improved.

I am surprised and pleased at the lack of large O-Cs among my observations since 1991. I do not know if this is due to a lack of strange events or good reducing, but I hope it continues!

Table 1: This summary of event totals excludes away from home grazes, but does include away from home total occultations. Events involving unidentified stars, those with obscure designations, or planets are not reduced.

Table 2: Notes

A: The limb correction (HW) was given as  $-4''.17^*$ . This uncertain value was probably the reason for the large O-C. The event was a near-graze reappearance near the lunar south pole at Watts angle  $185^\circ$ .

C: The components of this double star were seen and timed separately.

L: Nearby star X25230 had an O-C of  $+0''.99$ .

R: Large, positive O-C was a surprise for a late disappearance. A large, negative O-C would have been expected. [Ed note: Remember the O-C's are given as height above the predicted limb.]

U: The star is Merope in the Pleiades. This was a near-graze reappearance on the southern limb at Watts angle  $180^\circ$ . HW was given as  $-4''.*$ . Surely this was the reason for the large O-C (See also notes A and Z).

V: Predicted time is from special Pleiades predictions. Star rather faint.

X: Star rather faint.

Y: This is the primary component of a double star. Secondary was too faint to be timed.

Z: This is Atlas in the Pleiades. This event was observed while away from home. I had hoped to observe this Pleiades passage from the Maia graze line. The graze was lost in passing clouds, but the second half of the passage was observed fairly well from a nearby campground. This event was a southern-limb, near-graze like the Merope event in note U. The HW was given as  $-3''.67^*$ , and the Watts angle was about  $184^\circ$  (estimated cusp angle was  $4S$ ).

AA: This is the secondary of Antares. The O-C must have been computed using the primary's position. The O-C of the primary was  $-0''.14$ .

CC: This is the companion to ZC 2220. These stars are about  $9''$  apart. The O-C for ZC 2220 was  $+0''.01$ .

EE: This is the C-component of the triple star Zeta Cancri. ILOC must have used the close AB pair to reduce all three stars. My AB O-Cs were  $-0''.09$  and  $+0''.08$ , respectively. The C-component has the same BD designation as the AB pair, but it has a separate SAO number.

Table 1. Reduction of Events 1986-1994

Year	Reported Events	Reduced Events	Original O-C > $2''.0$	Later O-C > $2''.0$	Comments
1986	194	193	11	10	Two grazes at home
1987	244	243	12	11	Imm. Of Venus reported
1988	205	200	5	1	Five faint star events at Aug. eclipse not reduced
1990	220	219	21	2	Second run of residuals much more realistic than first
1991	190	190	6	6	
1992	129	128	1	0	
1993	184	182	0	0	
1994 (to June 4)	80	77	0	0	Three faint M67 stars not reduced. 167 events for the year

Event totals exclude away-from-home grazes, but do include away-from-home total occultations. Events involving unidentified stars, those with obscure designations, or planets are not reduced.



Table 2. Analysis of Large O-Cs 1986-94

UT Date	Star	Event	UT Obs Time	Obs Acc	Predicted Time	Pred Acc	O-C (")	Dec.	Notes
1986									
08/30/86	X 9817	R	09:14:01.5	0.2	09:14:00	17	2.55		A
09/13/86	X26277	D	02:15:22.7	0.1	02:14:32	6	4.05	-28 40	
09/13/86	X26286	D	02:24:47.9	0.1	02:24:58	5	4.53	-28 40	C
09/13/86	X26286	D	02:24:53.5	0.2		0	2.35	-28 40	C
10/10/86	X25751	D	00:49:54.1	0.1	00:50:02	3	3.71	-29 06	
10/10/86	X25778	D	01:22:35.9	0.1	01:22:43	5	3.13	-28 57	
10/10/86	X22820	D	01:59:57.6	0.1	02:00:05	4	3.65	-28 59	
10/10/86	X25811	D	02:15:10.1	0.1	02:15:19	9	2.50	-28 48	
10/11/86	X27615	D	02:46:57.8	0.1	02:47:07	10	2.24	-27 23	
11/22/86	X12718	R	05:27:10.7	0.1	05:27:09	3	2.07		
1987									
04/19/87	X25584	R	8:30:32.2	0.1	8:30:37	5	-2.18	-29 29	
08/06/87	X23949	D	3:42:46.5	0.1	3:42:51	4	2.60	-29 27	
09/02/87	X23380	D	2:10:24.9	0.1	2:10:29	4	2.25	-29 31	
09/03/87	X25229	D	1:15:31.0	0.3	1:15:36	4	2.58	-29 33	L
09/03/87	X25296	D	2:40:35.3	0.2	2:40:40	4	2.21	-29 41	
09/03/87	X25353	D	3:45:08.0	0.1	3:45:14	4	3.07	-29 22	
09/03/87	X25363	D	3:55:04.5	0.1	3:55:11	4	3.40	-29 52	
09/30/87	X24482	D	00:14:30.3	0.1	00:14:40	14	2.34	-29 52	
10/01/87	X26477	D	00:41:11.2	0.2	00:41:20	6	3.97	-28 34	
10/01/87	R 2800	D	1:37:33.2	0.1	1:37:25	7	2.01	-28 34	R
12/17/87	X20402	R	11:35:09.8	0.1	11:35:13	3	-2.65	-19 10	
1988									
02/12/88	X22467	R	11:03:54.8	0.1	11:03:59	4	-2.21	-28 11	
10/27/88	R 545	R	1:12:58.0	0.1	1:12:59	13	2.82		U
10/27/88	X 4963	R	2:53:18.1	0.3	2:53:21	3	-2.28		V
11/13/88	X26390	D	23:47:19.1	0.1	23:47:28	4	4.22	-27 33	
1989									
08/15/89	X27830	D	5:12:51.2	0.3	5:12:56	4	2.46	-23 59	X
1990									
08/09/90	X31425	R	7:00:29.0	0.2	7:00:42	2	-6.48		Y
08/14/90	R 560	R	7:07:31.7	0.1		0	2.32		Z
1991									
02/08/91	R 2366b	R	10:12:35.7	0.1	10:12:41	2	-2.67		AA
03/07/91	X22134	R	10:59:55.7	0.1	10:59:54	3	2.23	-25 52	
07/31/91	X22134	D	3:48:49.9	0.1	3:48:57	5	2.65	-21 09	
10/18/91	X29699	D	2:46:34.1	0.2	2:46:30	2	-2.12		
11/26/91	X12393	R	3:41:24.9	0.1	3:41:26	1	5.42		EE

1992 through 1994, June 4: None

## TOTAL OCCULTATION TALLYS

Joseph E. Carroll

After many years, here at last is a report on the number and distribution of total occultations observed 1982 through 1985. After that, who knows?

For those of you who might ask, I am, to the best of my memory, retaining the county designations as they existed during the years of observation.

The number of observations for each year are presented in two tables, one listing the observations by individual and one by country. As since 1975, the values (and therefore the ranking) are computed from the formula:  $\text{Value} = \text{Disappearances} + C * \text{Reappearances}$ , where  $C$  is the ratio of total disappearances to total reappearances for the entire year

## 1981

During 1981 a total of 153 observers from 20 countries reported 4176 total lunar occultations. In the 1981 individual list Brian Loader of New Zealand is the leader followed by B.F. Sincheskul of the USSR and Robert Hays of the USA third. In the 1981 country list, the USA leads by virtue of its large number of observers with New Zealand and the USSR second and third. However, from an observer productivity basis (value per observer), the USSR is tops followed by South Africa and then Denmark. In 1981, 4176 occultations were reported of which 1334 were reappearances and 2842 disappearances. That makes  $C = 2.13043478$ , which is the factor by which reappearances are weighted over disappearances.

## 1982

During 1982 a total of 177 observers from 16 countries reported 6990 total lunar occultations. In the 1982 individual list Tom Langhans of the US is the leader followed by B.F. Sincheskul of the USSR and Brian Loader of New Zealand third. In the 1982 country list, the USA leads by virtue of its large number of observers with New Zealand and the German Democratic Republic second and third. However, from an observer productivity basis (value per observer), the USSR is tops followed by the USA and then Belgium. In 1982, 6990 occultations were reported of which 2036 were reappearances and 4954 disappearances. That makes  $C = 2.43320236$ , which is the factor by which reappearances are weighted over disappearances.

## 1983

During 1983 a total of 144 observers from 15 countries reported 5242 total lunar occultations. In the 1983 individual list Tom Langhans of the US is the leader

followed by Brian Loader of New Zealand and N.P. Weith-Knudsen of Denmark third. In the 1983 country list, the USA leads by virtue of its large number of observers with New Zealand and Australia second and third. However, from an observer productivity basis (value per observer), Denmark is tops followed by England and then Australia. In 1983, 5242 occultations were reported of which 1422 were reappearances and 3820 disappearances. That makes  $C = 2.68635724$ , which is the factor by which reappearances are weighted over disappearances.

## 1984

During 1984 a total of 132 observers from 17 countries reported 4432 total lunar occultations. In the 1984 individual list Brian Loader of New Zealand is the leader followed by N.P. Weith-Knudsen of Denmark and Tom Langhans of the US third. In the 1984 country list, New Zealand leads for the first time with the USA and Australia second and third. However, from an observer productivity basis (value per observer), the Netherlands is tops followed by Denmark and then South Africa. In 1984, 4432 occultations were reported of which 1269 were reappearances and 3163 disappearances. That makes  $C = 2.49251379$ , which is the factor by which reappearances are weighted over disappearances.

## 1985

During 1985 a total of 119 observers from 16 countries reported 4003 total lunar occultations. In the 1985 individual list Tom Langhans of the US is the leader followed by Peter Anderson of Australia and Brian Loader of New Zealand third. In the 1985 country list, the USA leads with New Zealand and Australia second and third. However, from an observer productivity basis (value per observer), Denmark is tops followed by England and then South Africa. In 1985, 4003 occultations were reported of which 1201 were reappearances and 2802 disappearances. That makes  $C = 2.33305579$ , which is the factor by which reappearances are weighted over disappearances.

The following pages have the total occultation tallies for 1982 to 1985.

## 1981 Total Occultation Country List

Country	Total	Reap	Value	# Obs	Val/Obs
USA	1110	400	1562.2	28	55.8
New Zealan	828	335	1206.7	19	63.5
USSR	289	114	417.9	3	139.3
Denmark	233	142	393.5	4	98.4
Australia	334	15	351	4	87.7
GDR	252	39	296.1	35	8.5
Belgium	235	49	290.4	6	48.4
Poland	187	91	289.9	23	12.6
South Africa	193	37	234.8	2	117.4
Italy	127	20	149.6	3	49.9
Netherlands	76	20	98.6	2	49.3
England	52	31	87	2	43.5
Brazil	77	3	80.4	8	10
Philippines	66	11	78.4	2	39.2
Finland	41	11	53.4	3	17.8
FRG	41	5	46.7	5	9.3
Mexico	11	8	20	1	20
Portugal	11	0	11	1	11
Norway	5	3	8.4	1	8.4
Spain	8	0	8	1	8
1981 Totals	4176	1334		153	

## 1982 Total Occultation Country List

Country	Total	Reap	Value	# Obs	Val/Obs
USA	1864	834	3059.3	30	102
New Zealan	1355	306	1793.6	33	54.4
GDR	759	164	994	39	25.5
Denmark	684	156	907.6	14	64.8
Poland	436	179	692.5	16	43.3
USSR	386	142	589.5	2	294.8
Australia	457	33	504.3	9	56
Belgium	282	55	360.8	4	90.2
South Africa	213	42	273.2	6	45.5
England	144	32	189.9	3	63.3
Italy	143	25	178.8	7	25.5
Netherlands	106	37	159	2	79.5
Brazil	79	13	97.6	6	16.3
FRG	70	17	94.4	4	23.6
Spain	8	0	8	1	8
Norway	4	1	5.4	1	5.4
1982 Totals	6990	2036		177	

## Occultation Tally for 1981

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Value	Name	Country	Province, City, State	Total	Reap
478.9	BRIAN LOADER	NEW ZEALAND	BLENHEIM	324	137
398.0	B.F. SINCHESKUL	USSR	POLTAVA	277	107
366.4	ROBERT H. HAYS JR.	USA	WORTH, IL	250	103
341.8	N.P. WEITH-KNUDSEN	DENMARK	TISVILDELEJE, SEALAND	196	129
291.0	THOMAS W. LANGHANS	USA	SAN BRUNO, CA	152	123
283.7	34 OBSERVERS	GDR	EILENBURG	243	36
239.3	PETER E. ANDERSON	AUSTRALIA	BRISBANE	237	2
228.8	M. DANIEL OVERBEEK	SOUTH AFRICA	EDENVALE, TVL	187	37
213.4	NOEL T. MUNFORD	NEW ZEALAND	PALMERSTON NORTH	132	72
158.8	M. MATTHEWS	NEW ZEALAND	AUCKLAND	91	60
132.4	MIECZYSTAW SZULC	POLAND	TUCHOLA	77	49
121.6	ADRIANO FILIPPONI	ITALY	ROME	99	20
121.6	PAUL V. MCBRIDE	USA	GREEN FOREST, AK	99	20
114.4	JEAN BOURGEOIS	BELGIUM	FUROOZ	76	34
113.1	RICHARD W. LASHER	USA	CHINA LAKE, CA	60	47
104.0	RICHARD WAYNE BALDRIDGE	USA	MOUNTAIN VIEW, CA	95	8
86.0	HENK J.J. BULDER	NETHERLANDS	ZOETERMEER	69	15
76.0	ANDREW J. ELLIOTT	ENGLAND	LEEDS, W. YORKSHIRE	41	31
71.1	JAMES H. VAN NULAND	USA	SAN JOSE, CA	70	1
69.3	NEAL D. BLACKBURN	USA	KANSAS CITY, MO	49	18
67.2	LIONEL E. HUSSEY	NEW ZEALAND	CHRISTCHURCH	48	17
62.8	ROBERT L. SANDY	USA	KANSAS CITY, MO	47	14
61.4	JEAN DOMMANGET	BELGIUM	BRUSSELS	58	3
55.2	STEVE J. ZVARA	USA	WHITTIER, CA	45	9
54.1	JUAN D. SILVESTRE	PHILIPPINES	QUEZON CITY	53	1
46.8	DAVID STEICKE	AUSTRALIA	MURRAY BRIDGE	40	6
46.4	PATRICK POITEVIN	BELGIUM	LIMBURG, HERK-DE-STAD	43	3
46.0	ROGER LAUREYS	BELGIUM	VLIERMAALROOT	46	0
42.7	CARL SCHWEERS	USA	ARDMORE, OK	37	5
41.1	PAUL R. KILBEY	NEW ZEALAND	AUCKLAND	23	16
40.6	RICHARD NOLTHENIUS	USA	MOUNTAIN VIEW, CA	27	12
40.3	JUHANI SALMI	FINLAND	LAHTI	29	10
39.7	PAUL J. NEWMAN	USA	GARLAND, TX	25	13
39.5	HARRY O. WILLIAMS	NEW ZEALAND	AUCKLAND	35	4
39.0	ROGER H. GILLER	AUSTRALIA	ENGADINE, NSW	39	0
36.5	MAURICE F. STOKER	NEW ZEALAND	AUCKLAND	32	4
33.4	CARL GRUNNET	DENMARK	VIRUM	21	11
33.3	ROMAN FANGOR	POLAND	WARSAW	22	10
32.3	HARALD MARX	FRG	KORN TAL-MUNCHINGEN	30	2
31.2	RYSZARD DRAZKOWSKI	POLAND	WLOCLAWEK	21	9
28.8	G. HERDMAN	NEW ZEALAND	AUCKLAND	22	6
28.1	ALFRED C. WEBBER	USA	CHADDS FORD, PA	27	1
27.9	ROBERT LASCH	USA	GREEN VALLEY, AZ	20	7
27.3	G.G. COULING	NEW ZEALAND	TAWA	25	2
26.1	GERRY D. ALLCOTT	NEW ZEALAND	AUCKLAND	25	1
25.9	PAUL MAEGRAITH	AUSTRALIA	ADELAIDE, S. AUSTR.	18	7
24.3	CESARIO E. TAGANAS	PHILIPPINES	QUEZON CITY	13	10
21.3	A. WOODGER	NEW ZEALAND	SN120	19	2
21.2	JEAN SCHWRENNEN	BELGIUM	MARCINELLE	11	9
21.0	GRAHAM L. BLOW	NEW ZEALAND	BLACK BIRCH	12	8
20.1	BARRY MENZIES	NEW ZEALAND	AUCKLAND	19	1
20.0	FRANCISCO DIEGO	MEXICO	MEXICO CITY	11	8
18.0	LUIS GUSTAVO	BRAZIL	RECIFE, PERNAMBUCO	18	0
17.3	PETER MORTENSEN	DENMARK	HADSTEN	15	2
17.0	JORGE POLMAN	BRAZIL	RECIFE, PERNAMBUCO	17	0
16.9	V.N. SINCHESKUL	USSR	POLTAVA	9	7
16.0	BRAD TIMERSON	USA	NEWARK, NY	16	0
15.8	ARKADIUSZ KRAJEWSKI	POLAND	WARSAW	9	6
15.3	PAULO SERGIO BRETONES	BRAZIL	CAMPINAS, SAN PAULO	13	2
15.0	MARCO CAVAGNA	ITALY	MILAN	15	0
14.5	RICHARD P. BINZEL	USA	AUSTIN, TX	10	4
14.4	CRAIG R. PATTERSON	USA	LANCASTER, PA	11	3
13.5	CLIFFORD J. BADER	USA	WEST CHESTER, PA.	9	4
13.3	VICTOR J. SLABINSKI	USA	ARLINGTON, VA	11	2
13.0	SANDRO BARONI	ITALY	MILAN	13	0
12.7	DIETER SCHMIDT	NETHERLANDS	HUIZEN	7	5

## Occultation Tally for 1981

Value	Name	Country	Province, City, State	Total	Reap
12.4	DIETMAR BUTTNER	GDR	KARL-MARX-STADT	9	3
12.1	LUIZ AUGUSTO DA SILVA	BRAZIL	PORTO ALEGRE, RS	11	1
12.1	JARI HOFFREN	FINLAND	KUOPIO	11	1
12.0	ROBERT KURIANOWICZ	POLAND	WARSAW	12	0
11.4	L.E. ST. GEORGE	NEW ZEALAND	AUCKLAND	8	3
11.0	DOUGLAS HALL	ENGLAND	LEICESTER	11	0
11.0	JOSE OSORIO	PORTUGAL	VILA NOVA DE GAIA	11	0
10.1	JANUSZ BANKOWSKI	POLAND	BEKCHATOW	9	1
10.0	DON M. STOCKBAUER	USA	HOUSTON, TX	10	0
9.5	RYSZARD SZUJECKI	POLAND	WARSAW	5	4
9.4	STAWOMIR CHOREK	POLAND	BELCHATOW	6	3
9.0	FELIPE SAMPAIO	BRAZIL	RECIFE, PERNAMBUCO	9	0
8.4	ROAR HANSEN	NORWAY	BERGEN	5	3
8.3	H.F. DABOLL	USA	ST. CHARLES, IL	6	2
8.3	A.W. DODSON	NEW ZEALAND	OTAKI	6	2
8.3	MICHELLE L. KLEINRICHERT	USA	AUSTIN, TX	6	2
8.0	JOSE RIPERO OSORIO	SPAIN	MADRID	8	0
7.3	EBERHARD BREDNER	FRG	MARDERWEG	5	2
7.1	WAYNE OSBORN	USA	MT PLEASANT, MI	6	1
6.3	MAREK ZAWILSKI	POLAND	LODZ	4	2
6.1	DENNIS L. HALL	USA	DEXTER, ME	5	1
6.0	JOHN A. CHURCH	USA	PRINCETON JCT., NJ	6	0
6.0	MARK GINGRICH	USA	OAKLAND, CA	6	0
6.0	JAN HERS	SOUTH AFRICA	SEDFIELD, CAPE PROV.	6	0
6.0	JOAO RODRIGUES	BRAZIL	RECIFE, PERNAMBUCO	6	0
5.3	DANIEL FILIPOWICZ	POLAND	OTWOCK	3	2
5.3	KRZYSZTOF ROCHOWICZ	POLAND	OLSZTYN	3	2
4.1	JERZY LUKASZEWICZ	POLAND	WARSAW	3	1
3.1	HEINZ KUCK	FRG	KENTROPERWEG	2	1
3.0	DAVID ARGANBRIGHT	USA	MT PLEASANT, MICHIGAN	3	0
3.0	MARTIN GUTEKUNST	FRG	STUTTGART	3	0
3.0	V.N. MAZHOROVSKI	USSR	POLTAVA	3	0
3.0	D. MCDONALD	NEW ZEALAND	BLACK BIRCH	3	0
2.1	KRZYSZTOF MASLOWSKI	POLAND	WARSAW	1	1
2.1	DARIUSZ MILLER	POLAND	WARSAW	1	1
2.0	STEFAN CZECH	POLAND	OPOLE	2	0
2.0	THOMAS JOHNSON	USA	MT PLEASANT, MICHIGAN	2	0
2.0	MIROSTAW KUBIAK	POLAND	GRUDZIADZ	2	0
2.0	EDUARDO C. LINS	BRAZIL	RECIFE, PERNAMBUCO	2	0
2.0	G. PATTERSON	NEW ZEALAND	CHRISTCHURCH	2	0
1.0	ZBIGNIECS BINIENDA	POLAND	BYDGOSZCZ	1	0
1.0	BLAZEJ FERET	POLAND	LODZ	1	0
1.0	MICHAEL GALLAGHER	NEW ZEALAND	TAWA	1	0
1.0	MICHAEL HANDSCHUH	FRG	STUTTGART	1	0
1.0	PER KRAMER	DENMARK	HADSTEN	1	0
1.0	DARIUSZ KROLAK	POLAND	WLOCLAWEK	1	0
1.0	TOMASZ KWIATKOWSKI	POLAND	BYDGOSZCZ	1	0
1.0	RALPH LOADER	NEW ZEALAND	BLENNHEIM	1	0
1.0	JEAN MEEUS	BELGIUM	ERPS-KWERPS	1	0
1.0	ZBIGNIEW RZEPKA	POLAND	POZNAN	1	0
1.0	MATTI SUHONEN	FINLAND	HELSINKI	1	0
1.0	SEVERAL OBSERVERS UBA	BRAZIL	PORTO ALEGRE, RS	1	0
1.0	STAWOMIR WOJCZUK	POLAND	LODZ	1	0
1.0	HANNA WOJTAS	POLAND	KIELCE	1	0

## Occultation Tally for 1982

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Value	Name	Country	Province, City, State	Tota	Rea
1423.5	THOMAS W. LANGHANS	USA	SAN BRUNO, CA	694	509
939.9	37 OBSERVERS	GDR	EILENBURG	712	159
580.5	B.F. SINCHESKUL	USSR	POLTAVA	377	142
553.6	BRIAN LOADER	NEW ZEALAND	BLenheim	373	126
412	N.P. WEITH-KNUDSEN	DENMARK	TISVILDELEJE, SEALAND	250	113
405.6	P. DARNELL, 11 OBS.	DENMARK	COPENHAGEN	354	36
405.2	ROBERT H. HAYS JR.	USA	WORTH, IL	259	102
336.5	MIECZYSTAW SZULC	POLAND	TUCHOLA	186	105
307.9	PETER E. ANDERSON	AUSTRALIA	BRISBANE	305	2
243	JEAN BOURGEOIS	BELGIUM	FUROOZ	190	37
221.6	M. DANIEL OVERBEEK	SOUTH AFRICA	EDENVALE, TVL	170	36
173.9	GRAHAM L. BLOW	NEW ZEALAND	BLACK BIRCH	128	32
144	HENK J.J. BULDER	NETHERLANDS	ZOETERMEER	91	37
135.5	RICHARD NOLTHENIUS	USA	MOUNTAIN VIEW, CA	114	15
131.7	ROMAN FANGOR	POLAND	WARSAW	93	27
129.9	G. HERDMAN	NEW ZEALAND	AUCKLAND	84	32
129.3	PAUL V. MCBRIDE	USA	GREEN FOREST, AK	92	26
126.7	ANDREW J. ELLIOTT	ENGLAND	LEEDS, W. YORKSHIRE	88	27
125.6	BENNY J. ROBERTS	USA	JACKSON, MS	74	36
119.9	MAURICE F. STOKER	NEW ZEALAND	AUCKLAND	97	16
115.3	JAMES H. VAN NULAND	USA	SAN JOSE, CA	101	10
107.1	LIONEL E. HUSSEY	NEW ZEALAND	CHRISTCHURCH	77	21
95.1	RICHARD WAYNE BALDRIDGE	USA	MOUNTAIN VIEW, CA	55	28
91.8	JEAN DOMMANGET	BELGIUM	BRUSSELS	66	18
89.9	ADRIANO FILIPPONI	ITALY	ROME	67	16
86.8	NOEL T. MUNFORD	NEW ZEALAND	PALMERSTON NORTH	61	18
82.3	PAUL J. NEWMAN	USA	GARLAND, TX	45	26
79.7	G.G. COULING	NEW ZEALAND	TAWA	74	4
73.1	PAUL R. KILBEY	NEW ZEALAND	AUCKLAND	43	21
72.3	A.W. DODSON	NEW ZEALAND	OTAKI	68	3
61.6	CARL GRUNNET	DENMARK	VIRUM	53	6
61.6	DON M. STOCKBAUER	USA	HOUSTON, TX	53	6
60.5	BARRY MENZIES	NEW ZEALAND	AUCKLAND	49	8
60.2	A. WOODGER	NEW ZEALAND	SN120	53	5
56.3	GERRY D. ALLCOTT	NEW ZEALAND	AUCKLAND	52	3
54.7	G. HUDSON	NEW ZEALAND	PALMERSTON NORTH	49	4
51.5	G.B. EVANS	NEW ZEALAND	SN213	40	8
50.8	NEAL D. BLACKBURN	USA	KANSAS CITY, MO	35	11
50.2	DIETMAR BUTTNER	GDR	KARL-MARX-STADT	43	5
48.9	PHILIP L. DOMBROWSKI	USA	GLASTONBURY, CT	36	9
46.2	CRAIG R. PATTERSON	USA	LANCASTER, PA	29	12
44.3	ROGER H. GILLER	AUSTRALIA	ENGADINE, NSW	40	3
42.2	DENNIS LOWE	AUSTRALIA	BUNDABERG, QUEENSLAND	35	5
41.9	DAVID STEICKE	AUSTRALIA	MURRAY BRIDGE	19	16
41.2	DANIEL FILIPOWICZ	POLAND	OTWOCK	24	12
40.5	RICHARD TAIBI	USA	TEMPLE HILLS, MD	29	8
40.2	EBERHARD BREDNER	FRG	MARDERWEG	23	12
39.2	DOUGLAS HALL	ENGLAND	LEICESTER	32	5
38.6	ROBERT L. SANDY	USA	BLUE SPRINGS, MO	30	6
35.9	ROBERT KURIANOWICZ	POLAND	WARSAW	33	2
31.9	LOUI PAGANO	AUSTRALIA	SYDNEY, N.S.W.	29	2
30.2	P. SCHMIDTKE J. AFRICANO	USA	TUCSON, AZ	23	5
29	JANUSZ BANKOWSKI	POLAND	BEKCHATOW	19	7
28.4	J. OSTERGAARD OLESEN	DENMARK	RONNE, BORNHOLM	27	1
27.6	DENNIS L. HALL	USA	DEXTER, ME	19	6
27.2	HEINZ KUCK	FRG	KENTROPERWEG	20	5
26	JAN HERS	SOUTH AFRICA	SEDFIELD, CAPE PROV.	26	0
26	HARALD MARX	FRG	KORNTAL-MUNCHINGEN	26	0
25.4	BRAD TIMERSON	USA	NEWARK, NY	24	1
25	RYSZARD DRAZKOWSKI	POLAND	WLOCLAWEK	15	7
25	STEVE J. ZVARA	USA	WHITTIER, CA	25	0
24	ALLEN E. WELLS	ENGLAND	BIRMINGHAM	24	0
22	SANDRO BARONI	ITALY	MILAN	22	0
22	G. PATTERSON	NEW ZEALAND	CHRISTCHURCH	22	0
22	JORGE POLMAN	BRAZIL	RECIFE, PERNAMBUCO	22	0
22	JOSEPH VAN CAMP	BELGIUM	WAARLOOS, ANTWERP	22	0

## Occultation Tally for 1982

Value	Name	Country	Province, City, State	Total Rea	
22	ALFRED C. WEBBER	USA	CHADDS FORD, PA	22	0
20.6	MARK C. ALLMAN	USA	COLUMBUS, OH	12	6
20.4	SERGIO BUONAIUTO	ITALY	NAPLES	19	1
20.2	MARCO CAVAGNA	ITALY	MILAN	13	5
19.9	LUIZ AUGUSTO DA SILVA	BRAZIL	PORTO ALEGRE, RS	17	2
19	SEVERAL OBSERVERS UBA	BRAZIL	PORTO ALEGRE, RS	9	7
19	HANNA WOJTAS	POLAND	KIELCE	9	7
18.6	G.N. WALKER	SOUTH AFRICA	BLOEMFONTEIN, ORANGE	10	6
18	H.F. DABOLL	USA	ST CHARLES, IL	18	0
17.4	PAUL MAEGRAITH	AUSTRALIA	ADELAIDE, S. AUSTR.	16	1
17	ROBERT G. SHELTON	USA	CUPERTINO, CA	17	0
16.9	DAVID MCDAVID	USA	HELOTES, TX	14	2
16.9	CARL SCHWEERS	USA	ARDMORE, OK	14	2
16.7	JOSEPH E. CARROLL	USA	MINNETONKA, MN	11	4
16.7	GREG HAYWARD	AUSTRALIA	SYDNEY, NSW	11	4
16	T.J. HICKEY	NEW ZEALAND	WHANGAREI	16	0
16	JERZY LUKASZEWICZ	POLAND	WARSAW	16	0
15.9	JANUSZ WILAND	POLAND	WARSAW	13	2
15	DIETER SCHMIDT	NETHERLANDS	HUIZEN	15	0
14.6	MAREK ZAWILSKI	POLAND	LODZ	6	6
14.4	FERRUCCIO GINELLI	BRAZIL	FORTALEZA, CEARA	13	1
14	FRANCESCO CERCHIO	ITALY	RIVALBA, TORINO	14	0
12.3	PAULO SERGIO BRETONES	BRAZIL	CAMPINAS, SAN PAULO	8	3
11.9	VICTOR J. SLABINSKI	USA	ARLINGTON, VA	9	2
11	C. HUNT	NEW ZEALAND	PN	11	0
10.9	S. RYAN	NEW ZEALAND	TO	8	2
10	JGAO R. TAVARES JR	BRAZIL	RECIFE, PERNAMBUCO	10	0
9	V.N. SINCHESKUL	USSR	POLTAVA	9	0
8.4	R. ADAM	NEW ZEALAND	WH	7	1
8.3	CARLO GUALDONI	ITALY	MILAN	4	3
8	JOSE RIPERO OSORIO	SPAIN	MADRID	8	0
8	RYSZARD SZUJECKI	POLAND	WARSAW	8	0
7.4	PAUL TEICHER	USA	FARMINGDALE, L.I., N.Y.	6	1
7	T. ROUNTHWAITE	NEW ZEALAND	AUCKLAND	7	0
7	L.E. ST. GEORGE	NEW ZEALAND	AUCKLAND	7	0
6.9	ROBERT DONINICZAK	POLAND	OSTROW	4	2
5.9	BLAZEJ FERET	POLAND	LODZ	3	2
5.9	B.A. THOMPSON	NEW ZEALAND	WK	3	2
5.4	ROAR HANSEN	NORWAY	BERGEN	4	1
5	J. O'KANE	NEW ZEALAND	IR	5	0
5	ZBIGNIEW RZEPKA	POLAND	POZNAN	5	0
4	KEN ANDERSON	NEW ZEALAND	WEST MELTON	4	0
4	DIETMAR BOHME	GDR	NESSA	4	0
4	P. BURGESS	NEW ZEALAND	NN	4	0
4	SERAFINO GARGANO	ITALY	CORSICA, MILANO	4	0
4	H. LUFT	SOUTH AFRICA	EDENVALE, TRANSVAAL	4	0
4	JEAN MEEUS	BELGIUM	ERPS-KWERPS	4	0
3	D.C.S. COPPARD	NEW ZEALAND	WH	3	0
3	DENNIS GOODMAN	NEW ZEALAND	WELLINGTON	3	0
3	TONY MURRAY	USA	GEORGETOWN, GA	3	0
2.4	TERRENCE LOSONSKY	USA	TEMPLE HILLS, MD	1	1
2	S. ALBURY	NEW ZEALAND	NN	2	0
2	C.S. LAKE	SOUTH AFRICA	PIETERMATRIZBURG	2	0
1	STAWOMIR CHOREK	POLAND	BELCHATOW	1	0
1	I. COOK	NEW ZEALAND		211	1
1	DON CURRIE	AUSTRALIA	BUNDABERG, QUEENSLAND	1	0
1	J.H. DUTHIE	NEW ZEALAND	WK	1	0
1	RALPH LOADER	NEW ZEALAND	BLenheim	1	0
1	LUCJAN NEWELSKI	POLAND	WARSAW	1	0
1	R. NEWPORT	NEW ZEALAND	NN	1	0
1	D.A. OVERBEEK	SOUTH AFRICA	EDENVALE, TVL	1	0
1	WOLFGANG QUESTER	FRG	STUTTGART	1	0
1	P. RILEY	NEW ZEALAND	TW	1	0
1	ROSS WALTERS	AUSTRALIA	BUNDABERG, QUEENSLAND	1	0

## Occultation Tally for 1983

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Value	Name	Country	Province, City, State	Total	Reap
802.1	31 OBSERVERS	GDR	EILENBURG	539	156
692.4	THOMAS W. LANGHANS	USA	SAN BRUNO, CA	291	238
576.9	BRIAN LOADER	NEW ZEALAND	BLenheim	329	147
408.7	N.P. WEITH-KNUDSEN	DENMARK	TISVILDELEJE, SEALAND	208	119
386.8	HENK J.J. BULDER	NETHERLANDS	ZOETERMEER	262	74
353.8	M. DANIEL OVERBEEK	SOUTH AFRICA	EDENVALE, TVL	256	58
349	PHILIP KEARNEY	AUSTRALIA	BUNDABERG, QUEENSLAND	209	83
347.2	ROBERT H. HAYS JR.	USA	WORTH, IL	187	95
297.2	PETER E. ANDERSON	AUSTRALIA	BRISBANE	282	9
229.5	DENNIS LOWE	AUSTRALIA	BUNDABERG, QUEENSLAND	157	43
205.1	BENNY J. ROBERTS	USA	JACKSON, MS	109	57
182.9	H.F. DABOLL	USA	ST. CHARLES, IL	80	61
169.3	JEAN BOURGEOIS	BELGIUM	FUROOZ	112	34
149.3	ANDREW J. ELLIOTT	ENGLAND	LEEDS, W. YORKSHIRE	97	31
129.4	GRAHAM L. BLOW	NEW ZEALAND	BLACK BIRCH	126	2
127.9	G.B. EVANS	NEW ZEALAND	SN213	111	10
105.3	JEAN DOMMANGET	BELGIUM	BRUSSELS	48	34
91.4	MAURICE F. STOKER	NEW ZEALAND	AUCKLAND	88	2
84.7	FERRUCCIO GINELLI	BRAZIL	FORTALEZA, CEARA	78	4
71.7	ADRIANO FILIPPONI	ITALY	ROME	65	4
68	NEAL D. BLACKBURN	USA	KANSAS CITY, MO	36	19
67.4	A.W. DODSON	NEW ZEALAND	OTAKI	64	2
65.5	CARLO GUALDONI	ITALY	MILAN	47	11
61.9	PATRICK POITEVIN	BELGIUM	LIMBURG, HERK-DE-STAD	45	10
59.2	WARMERDAM	NETHERLANDS	EMMEN	39	12
50.9	MICHAEL CRIST	USA	BURNS, TN	34	10
49	TERRY HICKEY	AUSTRALIA	ST195	49	0
49	R.T. PRICE	AUSTRALIA	SV206	49	0
48.4	MARCO CAVAGNA	ITALY	MILAN	40	5
46.5	CARL GRUNNET	DENMARK	VIRUM	33	8
43.4	PAUL V. MCBRIDE	USA	GREEN FOREST, AK	40	2
42.5	PAUL R. KILBEY	NEW ZEALAND	AUCKLAND	29	8
42.1	ALFREDINA COSTA DO CAMPO	PORTUGAL	LISBON	37	3
41.8	ALFRED C. WEBBER	USA	CHADDS FORD, PA	30	7
40.8	LIONEL E. HUSSEY	NEW ZEALAND	CHRISTCHURCH	29	7
40	MICHAEL J. FINCH	AUSTRALIA	CALOUNDRA, QUEENSLAND	40	0
40	G. HUDSON	NEW ZEALAND	PALMERSTON NORTH	40	0
39.1	SANDRO BARONI	ITALY	MILAN	34	3
35	D.J. SULLIVAN	NEW ZEALAND	SN288	35	0
34.1	D. THOMAS	NEW ZEALAND	SN127	24	6
34	J. O'KANE	NEW ZEALAND	TR	34	0
34	L.E. ST. GEORGE	NEW ZEALAND	AUCKLAND	34	0
32.7	HARALD MARX	FRG	KORNTAL-MUNCHINGEN	31	1
32	G.G. COULING	NEW ZEALAND	TAWA	32	0
32	J. PRIESTLEY	NEW ZEALAND	PB	32	0
31.4	RICHARD WAYNE BALDRIDGE	USA	MOUNTAIN VIEW, CA	23	5
28.7	D. DURHAM	NEW ZEALAND	SN129	27	1
28.4	DIETMAR BUTTNER	GDR	KARL-MARX-STADT	25	2
27.8	ROBERT CLYDE	USA	STREETSBORO, OH	16	7
27	STEVE J. ZVARA	USA	WHITTIER, CA	27	0
24.7	BOSCHLOO	NETHERLANDS	ALMEN	23	1
23.4	V. PROTITCH-BENISHEK	YUGOSLAVIA	BELGRADE	20	2
23	C. FRICK	AUSTRALIA	SX102	23	0
22	JAMES H. VAN NULAND	USA	SAN JOSE, CA	22	0
21.1	P. SCHMIDTKE & J. AFRICANO	USA	TUCSON, AZ	11	6
20	G. HERDMAN	NEW ZEALAND	AUCKLAND	20	0
20	A. PENNELL	NEW ZEALAND	SN292	20	0
18.7	J. OSTERGAARD OLESEN	DENMARK	RONNE, BORNHOLM	17	1
18.4	ROBERT L. SANDY	USA	BLUE SPRINGS, MO	15	2
18	DENNIS L. HALL	USA	DEXTER, ME	18	0
16	I. COOK	NEW ZEALAND		211	16
16	TONY MURRAY	USA	GEORGETOWN, GA	16	0
15	M. CLARK	NEW ZEALAND	SN288	15	0
14.4	VICTOR J. SLABINSKI	USA	ARLINGTON, VA	11	2
13.1	RICHARD TAIBI	USA	TEMPLE HILLS, MD	8	3
13	GERRY D. ALLCOTT	NEW ZEALAND	AUCKLAND	13	0



## Occultation Tally for 1983

Value	Name	Country	Province, City, State	Total	Reap
12.7	EZEQUIEL CABRITA	PORTUGAL	LISBON	11	1
12.4	J.H. DUTHIE	NEW ZEALAND	WK	9	2
12.1	L.J. DE LANGE	NETHERLANDS	BANTEGA	7	3
12	BRIL	NETHERLANDS	LEEWARDEN	12	0
12	JOSE RIPERO OSORIO	SPAIN	MADRID	12	0
12	JORGE POLMAN	BRAZIL	RECIFE, PERNAMBUCO	12	0
11.4	H. FEIJTH	NETHERLANDS	GOUTUM	8	2
11	JURACY AMMORIM JR.	BRAZIL	RECIFE, PERNAMBUCO	11	0
11	DOMENEC BARBANY	SPAIN	MADRID	11	0
11	BARRY MENZIES	NEW ZEALAND	AUCKLAND	11	0
11	DIETER SCHMIDT	NETHERLANDS	HUIZEN	11	0
11	K. SELIE	NETHERLANDS	DEN HELDER	11	0
10	CRISTIANO J. DA SILVA	BRAZIL	RECIFE, PERNAMBUCO	10	0
10	NOEL T. MUNFORD	NEW ZEALAND	PALMERSTON NORTH	10	0
9.4	GRAHAM WALTERS	AUSTRALIA	BUNDABERG, QUEENSLAND	6	2
9	A. VAN DER DRIFT	NETHERLANDS	SOESTDIJK	9	0
9	W.T. ZANSTRA	NETHERLANDS	APPINGEDAM	9	0
8	DIETMAR BOHME	GDR	NESSA	8	0
8	LUIZ AUGUSTO DA SILVA	BRAZIL	PORTO ALEGRE, RS	8	0
8	D. SCHILLER	SOUTH AFRICA	EDENVALE, TRANSVAAL	8	0
7.7	SCHOENMAKER	NETHERLANDS	RODEN	6	1
7	A. WOODGER	NEW ZEALAND	SN120	7	0
6.4	T.P. HOMES	NEW ZEALAND	WN	3	2
6	PHILIP L. DOMBROWSKI	USA	GLASTONBURY, CT	6	0
6	DENNIS GOODMAN	NEW ZEALAND	WELLINGTON	6	0
6	SCHOLTEN	NETHERLANDS	EERBEEK	6	0
5.7	TIEMAN	NETHERLANDS	HOOGVIET	4	1
5	B. FRASER	SOUTH AFRICA	EDENVALE, TRANSVAAL	5	0
5	GOVAARTS	NETHERLANDS	EMMEN	5	0
5	WAYNE OSBORN	USA	MT PLEASANT, MI	5	0
5	JOSE OSORIO	PORTUGAL	VILA NOVA DE GAIA	5	0
5	VALKANBURG	NETHERLANDS	EMPE	5	0
4	JOAO R. TAVARES JR.	BRAZIL	RECIFE, PERNAMBUCO	4	0
3.7	V. BALLEGOY	NETHERLANDS	DRUTEN	2	1
3	RICARDO J. AMORIM	BRAZIL	RECIFE, PERNAMBUCO	3	0
3	A. BAYNE	NEW ZEALAND	CH	3	0
3	B.A. IVES	NEW ZEALAND	SN103	3	0
2	PAULO SERGIO BRETONES	BRAZIL	CAMPINAS, SAN PAULO	2	0
2	S. KEARNEY	AUSTRALIA	ST121	2	0
2	J.K. PARKER	NEW ZEALAND	WELLINGTON	2	0
1	I. COUTO	PORTUGAL	VILA NOVA DE GAIA	1	0
1	EM. F. LOPES DA SILVA	BRAZIL	RECIFE, PERNAMBUCO	1	0
1	MERCIO A.O. DE AUDRADE	BRAZIL	RECIFE, PERNAMBUCO	1	0
1	GERALDO FALCAO	BRAZIL	RECIFE, PERNAMBUCO	1	0
1	JOST JAHN	FRG	MOLLN	1	0
1	M. SENAY	SOUTH AFRICA	EDENVALE, TRANSVAAL	1	0
1	VERHOEF	NETHERLANDS	DEN HELDER	1	0

## 1983 Total Occultation Country List

Country	Total	Reap	Value	# Obs	Val/Obs
USA	985	514	1851.8	21	88.2
New Zealand	1172	189	1490.7	29	51.4
Australia	817	137	1048	9	116.4
GDR	572	158	838.4	33	25.4
Netherlands	420	95	580.2	17	34.1
Denmark	258	128	473.9	3	158
South Africa	270	58	367.8	4	92
Belgium	205	78	336.5	3	112.2
Italy	186	23	224.8	4	56.2
Brazil	131	4	137.7	11	12.5
England	97	31	149.3	1	149.3
Portugal	54	4	60.7	4	15.2
FRG	32	1	33.7	2	16.8
Spain	23	0	23	2	11.5
Yugoslavia	20	2	23.4	1	23.4
1983 Totals	5242	1422		144	

## Occultation Tally for 1984

Value	Name	Country	Province, City, State	Total	Reap
604.4	31 OBSERVERS	GDR		385	147
578	BRIAN LOADER	NEW ZEALAND	BLLENHEIM	369	140
565.1	N.P. WEITH-KNUDSEN	DENMARK	TISVILDELEJE, SEALAND	286	187
555	THOMAS W. LANGHANS	USA	SAN BRUNO, CA	246	207
281.4	PETER E. ANDERSON	AUSTRALIA	BRISBANE	271	7
238.5	D. THOMAS	NEW ZEALAND	SN127	131	72
211.6	ROBERT H. HAYS JR.	USA	WORTH, IL	131	54
201.2	HENK J.J. BULDER	NETHERLANDS	ZOETERMEER	140	41
200.7	D. DURHAM	NEW ZEALAND	SN129	132	46
178.8	BENNY J. ROBERTS	USA	JACKSON, MS	134	30
167.9	CHARLES SMITH	AUSTRALIA	QUEENSLAND, WOODRIDGE	153	10
160.2	M. DANIEL OVERBEEK	SOUTH AFRICA	EDENVALE, TVL	108	35
158.7	ANDREW J. ELLIOTT	ENGLAND	LEEDS, W. YORKSHIRE	102	38
152.7	DONALD L. OLIVER	USA	HOUSTON, TX	93	40
141.3	PHILIP KEARNEY	AUSTRALIA	BUNDABERG, QUEENSLAND	104	25
133.9	J. PRIESTLEY	NEW ZEALAND	PB	113	14
117.9	FERRUCCIO GINELLI	BRAZIL	FORTALEZA, CEARA	106	8
96.4	J. O'KANE	NEW ZEALAND	TR	68	19
81.9	JEAN DOMMANGET	BELGIUM	BRUSSELS	55	18
78.4	DENNIS LOWE	AUSTRALIA	BUNDABERG, QUEENSLAND	68	7
77	R.T. PRICE	AUSTRALIA	SV206	77	0
67	MAURICE F. STOKER	NEW ZEALAND	AUCKLAND	64	2
66.5	A.W. DODSON	NEW ZEALAND	OTAKI	59	5
62.9	HARALD MARX	FRG	KORNTAL-MUNCHINGEN	48	10
61	G.G. COULING	NEW ZEALAND	TAWA	55	4
60.5	L.E. ST. GEORGE	NEW ZEALAND	AUCKLAND	53	5
57	G. HUDSON	NEW ZEALAND	PALMERSTON NORTH	57	0
54	MICHAEL J. FINCH	AUSTRALIA	CALOUNDRA, QUEENSLAND	54	0
51.9	NOEL T. MUNFORD	NEW ZEALAND	PALMERSTON NORTH	34	12
48	TONY MURRAY	USA	GEORGETOWN, GA	48	0
42.4	JIM PALFREYMAN	AUSTRALIA	HOBART, TASMANIA	29	9
39.9	P. SCHMIDTKE & J. AFRICANO	USA	TUCSON, AZ	22	12
35.5	BRAD TIMERSON	USA	NEWARK, NY	28	5
35	C. FRICK	AUSTRALIA	SX102	32	2
33	NEAL D. BLACKBURN	USA	KANSAS CITY, MO	24	6
31.9	JAMES H. FOX	USA	AFTON, MN	17	10
31	TERRY HICKEY	AUSTRALIA	ST195	31	0
28	G.B. EVANS	NEW ZEALAND	SN213	28	0
26	RICARD CASAS	SPAIN	SABADELL, CATALONIA	23	2
25.9	B.A. IVES	NEW ZEALAND	SN103	14	8
24.5	ROJER PELLO ET AL	SPAIN	BARCELONA, CATALONIA	23	1
23.5	LUIZ AUGUSTO DA SILVA	BRAZIL	PORTO ALEGRE, RS	16	5
22	RICHARD WAYNE BALDRIDGE	USA	MOUNTAIN VIEW, CA	19	2
21	BARRY MENZIES	NEW ZEALAND	AUCKLAND	21	0
20	STEVE J. ZVARA	USA	WHITTIER, CA	20	0
20	JAMES H. VAN NULAND	USA	SAN JOSE, CA	17	2
18	MARCO CAVAGNA	ITALY	MILAN	18	0
17.5	T. ROUNTHWAITE	NEW ZEALAND	AUCKLAND	16	1
16.5	I. COOK	NEW ZEALAND	211	15	1
16	JOAQUIM GARCIA	PORTUGAL	LISBOA	16	0
16	MATTHIAS KOPP	FRG	NORDRHEIN-WESTF.	13	2
14	CARLO GUALDONI	ITALY	MILAN	14	0
13.5	DIETMAR BUTTNER	GDR	KARL-MARX-STADT	12	1
13	CARL GRUNNET	DENMARK	VIRUM	7	4
12.5	H.F. DABOLL	USA	ST. CHARLES, IL	11	1
12.5	DOMINGO SANCHEZ	VENEZUELA	GURI	11	1
12.5	VICTOR J. SLABINSKI	USA	ARLINGTON, VA	11	1
12.5	K. VINCENT	NEW ZEALAND	SV	11	1
11.5	JEAN BOURGEOIS	BELGIUM	FUROOZ	10	1
11	MARTIN GEORGE	AUSTRALIA	LAUNLESTON, TASMANIA	11	0
10.5	JOSE OSORIO	PORTUGAL	VILA NOVA DE GAIA	9	1
10	WAYNE & CHARLES OSBORN & NORISEZ	USA	MT PLEASANT, MI	10	0
9	JOSE RIPERO OSORIO	SPAIN	MADRID	9	0
8.5	S. KERR	AUSTRALIA	KOGAN	7	1
8	DOMENEC BARBANY	SPAIN	GRANOLLERS, CATALONIA	8	0
8	A. PENNELL	NEW ZEALAND	SN292	8	0

## Occultation Tally for 1984

Value	Name	Country	Province, City, State	Total	Reap
8	P. RILEY	NEW ZEALAND	TW	8	0
7	J. OSTERGAARD OLESEN	DENMARK	RONNE, BORNHOLM	7	0
6	PETER L. MANLY	USA	TEMPE, AZ	6	0
6	LEROY PALLER	USA	TEMPE, AZ	6	0
5.5	I. COUTO	PORTUGAL	VILA NOVA DE GAIA	4	1
5	ERNESTO ARREDONDO	SPAIN	BARCELONA, CATALONIA	5	0
5	TERRENCE ROSS	USA	MILWAUKEE, WI	5	0
4.5	R.W. EVANS	NEW ZEALAND	INV	3	1
4	RAMON GUILLEMAS	SPAIN	STA MARGARIDA,, CATALONIA	4	0
4	R.D. LEE	NEW ZEALAND	WGI	4	0
4	GERRY SAMOLYK	USA	MILWAUKEE, WI	4	0
4	TOFOL TOBAL	SPAIN	VILANOVA, CATALONIA	4	0
3.5	TOMAS LUIS GOMEZ QUIROGA	SPAIN	MADRID	2	1
3.5	COL J.E.S. SINGH	INDIA	DELHI	2	1
3.5	WAI-CHUN YUE	HONG KONG	HONG KONG	2	1
3	GERRY D. ALLCOTT	NEW ZEALAND	AUCKLAND	3	0
3	JORDI ALOY	SPAIN	BARCELONA, CATALONIA	3	0
3	GRAHAM L. BLOW	NEW ZEALAND	BLACK BIRCH	3	0
3	BRIAN CIESLAK	USA	MILWAUKEE, WI	3	0
3	ROBERT L. SANDY	USA	INDEPENDENCE, MO	3	0
3	JEBASTIA TORRELL	SPAIN	BARCELONA, CATALONIA	3	0
2.5	W.S. THRUSH	NEW ZEALAND	WGI	1	1
2	M. CLARK	AUSTRALIA	TBP	2	0
2	CARME GALLART	SPAIN	MEDIONA, CATALONIA	2	0
2	JEAN MEEUS	BELGIUM	ERPS-KWERPS	2	0
1	KARGNNE BARNES	AUSTRALIA	HOBART, TASMANIA	1	0
1	R. CROWSEN	NEW ZEALAND	WHG	1	0
1	T.P. HOMES	NEW ZEALAND	WN	1	0
1	JOSEP MARTI	SPAIN	MATARO, CATALONIA	1	0
1	J.K. PARKER	NEW ZEALAND	WELLINGTON	1	0
1	ISIDRO PUIG	SPAIN	BARCELONA, CATALONIA	1	0

## 1984 Total Occultation Country List

Country	Total	Reap	Value	# Obs	Val/Obs
New Zealand	1273	332	1768.5	27	65.5
USA	858	370	1410.2	23	61.3
Australia	840	61	931	13	71.6
GDR	397	148	617.9	32	19.3
Denmark	300	191	585.1	3	195
Netherlands	140	41	201.2	1	201.2
South Africa	108	35	160.2	1	160.2
England	102	38	158.7	1	158.7
Brazil	122	13	141.4	2	70.7
Spain	88	4	94	16	5.9
Belgium	67	19	95.4	3	31.8
FRG	61	12	78.9	2	39.5
Italy	32	0	32	2	16
Portugal	29	2	32	3	10.7
Venezuela	11	1	12.5	1	12.5
Hong Kong	2	1	3.5	1	3.5
India	2	1	3.5	1	3.5
1984 Totals	4432	1269		132	

## Occultation Tally for 1985

Value	Name	Country	Province, City, State	Total	Reap
499.3	THOMAS W. LANGHANS	USA	SAN BRUNO, CA	218	211
496	PETER E. ANDERSON	AUSTRALIA	BRISBANE	476	15
418.6	23 OBSERVERS	GDR	EILENBURG	236	137
315.3	BRIAN LOADER	NEW ZEALAND	BLLENHEIM	206	82
283	N.P. WEITH-KNUDSEN	DENMARK	TISVILDELEJE, SEALAND	147	102
245.7	DONALD L. OLIVER	USA	HOUSTON, TX	187	44
245.6	J. PRIESTLEY	NEW ZEALAND	PB	143	77
240	ROBERT H. HAYS JR.	USA	WORTH, IL	160	60
195.3	HENK J.J. BULDER	NETHERLANDS	ZOETERMEER	134	46
190.7	M. DANIEL OVERBEEK	SOUTH AFRICA	EDENVALE, TVL	144	35
167	JOAQUIM GARCIA	PORTUGAL	LISBOA	123	33
137	MICHAEL J. MORROW	USA	EWA BEACH, HI	137	0
131.7	ANDREW J. ELLIOTT	ENGLAND	LEEDS, W. YORKSHIRE	85	35
130.7	CHARLES SMITH	AUSTRALIA	QUEENSLAND, WOODRIDGE	124	5
81.7	L.E. ST. GEORGE	NEW ZEALAND	AUCKLAND	59	17
79.7	EZEQUIEL CABRITA	PORTUGAL	LISBON	73	5
79.7	BENNY J. ROBERTS	USA	JACKSON, MS	41	29
74.3	A.W. DODSON	NEW ZEALAND	OTAKI	69	4
71.7	J. O'KANE	NEW ZEALAND	TR	53	14
66	PHILIP KEARNEY	AUSTRALIA	BUNDABERG, QUEENSLAND	42	18
64.7	G.G. COULING	NEW ZEALAND	TAWA	62	2
61	TONY MURRAY	USA	GEORGETOWN, GA	61	0
54.3	JAMES H. VAN NULAND	USA	SAN JOSE, CA	53	1
54	MICHAEL J. FINCH	AUSTRALIA	CALOUNDRA, QUEENSLAND	54	0
51.3	ALFREDINA C. DO CAMPO	PORTUGAL	LISBON	22	22
51	P. ANDERSON	NEW ZEALAND		51	0
46.7	G.B. EVANS	NEW ZEALAND	SN213	36	8
45.3	K. VINCENT	NEW ZEALAND	SV	28	13
45.3	D. THOMAS	NEW ZEALAND	SN127	20	19
42.7	P. RILEY	NEW ZEALAND	TW	20	17
39	RUI GONZALVES	PORTUGAL	LISBOA	35	3
37	DENNIS LOWE	AUSTRALIA	BUNDABERG, QUEENSLAND	33	3
36.7	RICHARD WAYNE BALDRIDGE	USA	MOUNTAIN VIEW, CA	26	8
35.3	D. DURHAM	NEW ZEALAND	SN129	22	10
33	P. SCHMIDTKE & J. AFRICANO	USA	TUCSON, AZ	29	3
32.3	DENNIS GOODMAN	NEW ZEALAND	WELLINGTON	15	13
32	JAN HERS	SOUTH AFRICA	SEDFIELD, CAPE PROV.	24	6
31.3	HARALD MARX	FRG	KORNTAL-MUNCHINGEN	30	1
30	JEAN DOMMANGET	BELGIUM	BRUSSELS	22	6
29.7	PETER L. MANLY	USA	TEMPE, AZ	19	8
28	MARCO CAVAGNA	ITALY	MILAN	24	3
27.3	STEVE J. ZVARA	USA	WHITTIER, CA	14	10
26.7	THOMAS H. CAMPBELL	USA	TEMPLE TERRACE, FL	16	8
26.3	MATTHIAS KOPP	FRG	NORDRHEIN-WESTF.	25	1
26.3	NEAL D. BLACKBURN	USA	KANSAS CITY, MO	21	4
26.3	C. FRICK	AUSTRALIA	SX102	21	4
22.3	DIETMAR BUTTNER	GDR	KARL-MARX-STADT	13	7
22	MAURICE F. STOKER	NEW ZEALAND	AUCKLAND	22	0
21.7	JEAN BOURGEOIS	BELGIUM	FUROOZ	19	2
21	B.A. IVES	NEW ZEALAND	SN103	9	9
19	TERRY BENNER	USA	PERKASIE, PA	19	0
19	G. HERDMAN	NEW ZEALAND	AUCKLAND	19	0
18	WAYNE OSBORN	USA	MT PLEASANT, MI	18	0
16	JAMES H. FOX	USA	AFTON, MN	12	3
14.7	WAI-CHUN YUE	HONG KONG	HONG KONG	8	5
14.3	H.F. DABOLL	USA	ST. CHARLES, IL	9	4
14	CARL GRUNNET	DENMARK	VIRUM	10	3
13.7	G. HUDSON	NEW ZEALAND	PALMERSTON NORTH	11	2
13	JOSE RIPERO OSORIO	SPAIN	MADRID	13	0
12	DIETMAR BOHME	GDR	NESSA	12	0
12	C. FRICK	NEW ZEALAND		12	0
11.7	R. CROWSEN	NEW ZEALAND	WHG	9	2
10.3	M. ALIETE	PORTUGAL	LISBOA	9	1
10.3	LUIZ AUGUSTO DA SILVA	BRAZIL	PORTO ALEGRE, RS	9	1
10	GRAHAM L. BLOW	NEW ZEALAND	BLACK BIRCH	10	0
10	THOMAS SHADER	USA	HARISBURG, PA	6	3

## Occultation Tally for 1985

Value	Name	Country	Province, City, State	Total	Reap
10	COL J.E.S. SINGH	INDIA	DELHI	6	3
10	DAVID STEICKE	AUSTRALIA	MURRAY BRIDGE	6	3
9.3	C. SMITH	NEW ZEALAND		8	1
9	SANDRO BARONI	ITALY	MILAN	9	0
7.7	T. ROUNTHWAITE	NEW ZEALAND	AUCKLAND	5	2
7.3	CARL SCHWEERS	USA	ARDMORE, OK	6	1
7	DOMENEC BARBANY	SPAIN	MADRID	7	0
7	A. PENNELL	NEW ZEALAND	SN292	7	0
6.3	JIM PALFREYMAN	AUSTRALIA	HOBART, TASMANIA	5	1
6	MARTIN GEORGE	AUSTRALIA	LAUNLESTON, TASMANIA	6	0
5.3	BRIAN CIESLAK	USA	MILWAUKEE, WI	4	1
5.3	DIETER SCHMIDT	NETHERLANDS	HUIZEN	4	1
5	D. LOWE	NEW ZEALAND		5	0
5	GERRY SAMOLYK	USA	MILWAUKEE, WI	5	0
5	VIRGIL J. TANGNEY	USA	MILWAUKEE, WI	5	0
3.3	MICHAEL BROCK	AUSTRALIA	MURRAY BRIDGE	2	1
3.3	F. GRAHAM & J. D. POTEMRA	USA	EAST LIVERPOOL, OH	2	1
3.3	DAVID SYMONDS	AUSTRALIA	MURRAY BRIDGE	2	1
3	GREG HAYWARD	AUSTRALIA	SYDNEY, NSW	3	0
3	MANUEL MARQUES	PORTUGAL	LISBON	3	0
3	ROBERT L. SANDY	USA	BLUE SPRINGS, MO	3	0
2.3	GILBERT K. RENNAN	BRAZIL	PORTO ALEGRE, RS	1	1
2	OTTO FARAGO	FRG	STUTTGART	2	0
2	TOMAS L. G. QUIROGA	SPAIN	MADRID	2	0
1	W.H. ALLEN	NEW ZEALAND	DUNEDIN	1	0
1	JOHN BETZ	USA	HARRISBURG	1	0
1	I.P. DEBONO	AUSTRALIA	RAG	1	0
1	WOLFGANG QUESTER	FRG	STUTTGART	1	0
1	VICTOR J. SLABINSKI	USA	ARLINGTON, VA	1	0
1	C. WALLINGTON-BEDOE	AUSTRALIA	RAG	1	0

## 1985 Total Occultation Country List

Country	Total	Reap	Value	# Obs	Val/Obs
USA	1073	399	1604.9	27	59.4
New Zealand	902	292	1291.3	25	51.7
Australia	776	51	844	14	60.3
GDR	261	144	453	25	18.1
Portugal	265	64	350.3	6	58.4
Denmark	157	105	297	2	148.5
South Africa	168	41	222.7	2	111.3
Netherlands	138	47	200.7	2	100.3
England	85	35	131.7	1	131.7
FRG	58	2	60.7	4	15.2
Belgium	41	8	51.7	2	25.8
Italy	33	3	37	2	18.5
Spain	22	0	22	3	7.3
Hong Kong	8	5	14.7	1	14.7
Brazil	10	2	12.7	2	6.3
India	6	3	10	1	10
1985 Totals	4003	1201		119	

# REPORTS OF ASTEROIDAL APPULSES AND OCCULTATIONS, EARLY 1993

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 1993 in the following two tables and section of notes. Table 1 lists the 1993 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 1993.

1993	Minor Planet	Cat	Star	Observers	Notes
Jan 01	983 Gunila	PPM	154323	DnzDss	
Jan 10	10 Hygiea	FAC	330378	Dnr	
Jan 11	1356 Myrza	PPM	99422	Dss	
Jan 11	2617 Jiangxi	PPM	72412	Dss	
Jan 12	1330 Spiridon	PPM	155844	CpsDbnDlrDssGrs TelKlissZaVrn	
Jan 14	1177 Gonnessia	PPM	152570	AzaKpsDssPdrFvJGry HtHoyKtLPlzPdrVtr	
Jan 19	198 Ampella	Lick4	1895	WanSmeAndSkBik	
Jan 24	51 Nemausa	PPM	525633	DssPnzNelTri	
Jan 25	87 Sylvia	DM	+16°0425	KruSenDnlBik	
Jan 26	545 Massalia	PPM	524802	RaeDssFlu	
Jan 26	957 Camelia	PPM	505328	BfBrtDssFluScvdr KisMrqBaaPdrJrdFlp Onk	
Jan 28	1042 Amazone	PPM	51562	AntBgsBtaDssGrsBt	
Jan 31	324 Bamberga	PPM	156858	BrdHlZNoNssFlaTr hon	
Feb 03	156 Xanthippe	PPM	117683	OnkSgeIkaTtrUda	4
Feb 05	386 Slegena	Lick2	2123	AntPaaPlz	
Feb 09	712 Holliviana	DM	+04°0554	SmeAnd	
Feb 15	980 Anacostia	PPM	575553	Rik	
Feb 16	2060 Chiron	FAC	185452	TadAkaOhkEgaTkaMatMur BskKanknBocBulLay PatSmeKruGerAnde	4
Feb 17	357 Ninina	PPM	123418	AndSaeGrsJkLun LidNelPdrVtr	
Feb 23	1628 Strobe	PPM	149496	AndBnlBskBrtUpsBrtG. EnzFndGzLelKrtJndLse MchMrxNelPlzPdrSprVtrFeb	
Feb 26	3 Juno	FAC	198827	Tay	
Feb 26	105 Cava	Lick2	4550	KenTay	
Mar 02	8 Id	PPM	506828	PerMatSmeAndGrsHutBik	

Table 1 (Cont.). Asteroidal appulses/occultations: Jan-Jun 1993.

Mar 08	539 Pamina	PPM	507343	Sme	
Mar 09	850 Altona	PPM	96509	BaeBnnDnzFrrFvJGkh KrtPlzSarSprVtr	4
Mar 09	395 Delia	PPM	95198		
Mar 12	18 Melpomene	FAC	274826	BaeBnnBulDnzDss MrxSpr	
Mar 14	287 Nephthys	PPM	509114	DnzDssHolNel	
Mar 14	534 Peraga	SAO	098690	Krt	
Mar 14	176 Iduna	PPM	523090	EgaMatOkd	
Mar 19	283 Nora	PPM	160351	BulDssFauHollieKkn KlPlzSleSzaWar	
Mar 20	362 Bavnia	PPM	551031	GrcVer	
Mar 20	514 Armida	Lick5	2216	Sk1	
Mar 26	547 Praxedis	PPM	149603	WadBrySkIBik	
Mar 26	114 Cassandra	Lick3	3998	Sk1	
Mar 27	P/Sch-Wach	Anon.		Ita	
Apr 01	704 Interamnia	PPM	527660	KzuAkaOhkEgaTkaMatMur IkaUdaIdaWatSotKam	5
Apr 05	959 Arne	PPM	508165	GcvJunMrqSmtBim	
Apr 08	429 Lotis	DM	-14°5452	Hon	
Apr 08	1049 Getho	PPM	126897	ObkKan	
Apr 16	744 Argentina	PPM	508841	GssDssGcvGrcMrq	
Apr 20	280 Armenia	PPM	163496	Ega	
Apr 26	80 Sappho	PPM	528938	HutSme	
May 01	6 Hebe	FAC	394995	Coa	
May 02	P/Swift-Tut	SAO	248548	Hut	
May 08	445 Edna	PPM	522948	TodOnk	
May 08	61 Danae	PPM	595498	WadPen	6
May 11	680 Geneveva	PPM	294821	Sno	
May 12	2 Pallas	PPM	140989	GoL	1
May 18	456 Abnoba	PPM	526891	TodOnk	
May 22	772 Tanete	PPM	129929	Lyz	
May 25	1331 Smutis	PPM	529298	Sme	
May 27	1297 Quadea	PPM	548977	Sme	
Jun 10	1109 Tata	PPM	552056	DmpWkaSme	
Jun 13	24 Themis	DM	-25°4194	HutSme	
Jun 14	3259 Brownlee	DM	-17°4102	HutSme	
Jun 15	20 Massalia	PPM	551357	Sme	
Jun 29	429 Lotis	PPM	511248	SmeDik	

Table 2. Observers and locations of events Jan-Jun 1993.

ID	Observer	Town	Country	No.
Aka	Akazawa, Hidehiko	Funaho	Japan	2
And	Anderson, Peter	The Gap	Queensland - AUS	4
Ant	Antos, M.	Caltoned	Czech Republic	2
Avd	Audevan, M.	Chilhon	France	2
Azu	Azuma, G.-M.	Iamalou	France	2
Bae	Bartens, C.	Boechout	Belgium	5
Ban	Ban, Yoshiniko	Mastumoto	Japan	1
Bnl	Baroni, Sandro	Milano	Italy	1
Bf	Buffardi, Pietro	Massa	Italy	1
Brt	Bertoli, Creste	Alpignano	Italy	2
Bik	Blankensy, Jim	Wandl	Victoria - AUS	1
Bim	Blommers, L.	Leiden	Netherlands	1
Bkw	Blow, Graham	Wellington	New Zealand	5
Boc	Boccadoro, R.	Milano	Italy	1
Brd	Boninaegna, Roland	Abries	Belgium	2
Bgs	Bourgeois, Jean	Ciney	Belgium	2
Bra	Brichta, Z.	Druztova	Czech Republic	2
Bry	Bryant, Ken	Langwarrin	Victoria - AUS	1
Bul	Bulder, Henk	Zeetermeer	Netherlands	3
Bva	B.V.A.A.	Portimao	Portugal	1
Cps	Campos Cucarella	Valldiana	Spain	3
Dal	Dalder, Peter	Launceston	Tasmania	1
Dbr	De Benedetti, G.	Reg Calabria	Italy	2
Dnz	Denza, Helmut	Essen	Germany	4
Drr	Di Luna, Roberto	Bologna	Italy	2
Dik	Dickie, Ross	Gore	New Zealand	1
Drl	Drummond, John	Gisborne	New Zealand	1
Dss	Dusser, Raymond	Sousse	Tunisia	13
Ega	Egawa, Humiharu	Kumatori	Japan	3

Table 2 (Cont.). Observers/locations of events: Jan-Jun 1993.

Bl	Blillott, A.T.	Reading	United Kingdom	1
Br	Barton, G.	St.-Avertin	France	1
Bu	Baure, G.	Grenoble	France	1
Br	Brederspiel, Martin	Heidelberg	Germany	1
Bz	Bertrando Barba, D	Barcelona	Spain	2
Bz	Bertrando Barba, A	Valencia	Spain	2
Bz	Bertrando, Andujar J.M.	Sevilla	Spain	1
Bz	Bertrando, Sergio	Milano	Italy	2
Bz	Bertrando, Jimenez JM	Dos Hermanas	Spain	1
Bz	Bertrando, Joaquim	Lisboa	Portugal	5
Bz	Bertrando, Martin	Launceston	Tasmania	3
Bz	Bertrando, E.H.	Darm	Germany	1
Bz	Bertrando, William	Tarnagulla	Victoria - AUS	1
Bz	Bertrando, J.	Enladrada	Spain	1
Bz	Bertrando, Rui	Lisboa	Portugal	3
Bz	Bertrando, Domenech	Zaragoza	Spain	1
Bz	Bertrando, C.	Vilum	Danemark	1
Bz	Bertrando, K.	Rokycany	Czech Republic	2
Bz	Bertrando, D.	Brno	Czech Republic	2
Bz	Bertrando, D.	Wiesbaden	Germany	1
Bz	Bertrando, Akie	Chichibu	Japan	1
Bz	Bertrando, Martin	Weidenbach	Germany	1
Bz	Bertrando, Gert	Graz	Austria	3
Bz	Bertrando, Edward	Carnegie	Pennsylvania - USA	2
Bz	Bertrando, G.	Newaport	France	1
Bz	Bertrando, E.	Brno	Czech Republic	2
Bz	Bertrando, Linda	Christchurch	New Zealand	1
Bz	Bertrando, Steve	Sheldon	Queensland - AUS	4
Bz	Bertrando, Miyoshi	Yokohama	Japan	1
Bz	Bertrando, Antonio	Castiglione	Italy	4
Bz	Bertrando, Yasukazu	Ohtsu	Japan	2
Bz	Bertrando, K.	Oostende	Belgium	3
Bz	Bertrando, Mika	Baitou	Japan	1
Bz	Bertrando, Kazuyoshi	Baitou	Japan	1
Bz	Bertrando, Sakae	Sakura	Japan	2
Bz	Bertrando, Tasha	McMinnville	Oregon - USA	1
Bz	Bertrando, A.	Szege	Hungary	3
Bz	Bertrando, M.	Szaz	Austria	1
Bz	Bertrando, Mike	Laufen	Switzerland	3
Bz	Bertrando, Anila	Saeneta	Romania	2
Bz	Bertrando, Mike	Stegen	Germany	1
Bz	Bertrando, Alfred	Mt. Waverly	Victoria - AUS	2
Bz	Bertrando, B.	Baffignole	France	1
Bz	Bertrando, F.	Nassau	Danemark	1
Bz	Bertrando, Vincent	Brest	France	1
Bz	Bertrando, L.	Esbjerg N	Danemark	1
Bz	Bertrando, Brian	Christchurch	New Zealand	1
Bz	Bertrando, Greg	Table Mt.	California - USA	1
Bz	Bertrando, R.	Parade	Portugal	3
Bz	Bertrando, Harald	Stuttgart	Germany	3
Bz	Bertrando, Hideki	Tenri	Japan	3
Bz	Bertrando, Mechling	Sexey-les-Bois	France	1
Bz	Bertrando, Harry	Kingsley	W. Australia - AUS	1
Bz	Bertrando, Kazuhiko	Kusatsu	Japan	1
Bz	Bertrando, Regis	Versailles	France	5
Bz	Bertrando, E.	Brno	Czech Republic	1
Bz	Bertrando, Nobuo	Okayama	Japan	8
Bz	Bertrando, Kouji	Shigaraki	Japan	1
Bz	Bertrando, Wolfgang	Wiesbaden	Germany	5
Bz	Bertrando, M.G.	Bologna	Italy	1
Bz	Bertrando, Lutz	Corlitz	Germany	1
Bz	Bertrando, A.	Pecs	Hungary	3
Bz	Bertrando, George	Christchurch	New Zealand	1
Bz	Bertrando, Ashley	Dunedin	New Zealand	2
Bz	Bertrando, Bruno V.	Albuquerque	Spain	1
Bz	Bertrando, E.	Mazieres	France	2
Bz	Bertrando, Roberto	Salerno	Italy	2
Bz	Bertrando, G.	Valenciennes	France	1
Bz	Bertrando, H.	Berchem	Belgium	1
Bz	Bertrando, Clive	Christchurch	New Zealand	1
Bz	Bertrando, M.	Gennevilliers	France	1
Bz	Bertrando, Yasushi	Baitou	Japan	1
Bz	Bertrando, Shinya	Sakura	Japan	1
Bz	Bertrando, Peter	Frankston	Victoria - AUS	4
Bz	Bertrando, Charlie	Woodridge	Queensland - AUS	13
Bz	Bertrando, A.	Portimao	Portugal	1
Bz	Bertrando, U.	Stegen	Germany	4

Table 2 (Cont.). Observers/locations of events: Jan-Jun 1993.

Str	Stracman, D.Ed.J.	Petwoth	United Kingdom	1
Sze	Sugie, Atsushi	Taga	Japan	1
Sza	Szabo, Sandor	Sumegsehl	Hungary	3
Tka	Takenaka, Yasuti	Uji	Japan	2
Tay	Taylor, Charles	McMinnville	Oregon - USA	2
Tmp	Thompson, Bruce	Whakatane	New Zealand	1
Tho	Thooris, Bertrand	Wervik	Belgium	1
Tod	Toda, Hiroyuki	Kamogata	Japan	3
Tmm	Tomomura, Hajime	Taga	Japan	1
Trl	Torrell, Sebastia	Barcelona	Spain	1
Tlp	Tulipani, F.	Bologna	Italy	1
Uda	Uda, Kiyu	Shigaraki	Japan	1
Vcb	Van Cauwenbergh, K.	Hurebeke	Belgium	3
Fvl	Van Ioo, Francois	Carpentras	France/Belgium	2
Vnm	Vanmunster, T.	Landen	Belgium	2
Vmm	Vantomme, J.	Lokeren	Belgium	1
Ver	Verseau, R.	Aqadir	Morocco	1
Vig	Vingerhoets, P.	Berchem	Belgium	1
War	Wareil, J.	Upsalla	Sweden	1
Wat	Watanabe, Shinobu	Fujieda	Japan	1
Wad	Watson, Diana	Whakatane	New Zealand	3

## NOTES:

- 1 Jan 12 Spiridon. Laszlo Kiss (Kis) and Tonny Vanmunster (Vnm) reported 5.4 and 4.3 second occultations beginning at 22:26:37 and 22:27:53 respectively. Kis was not sure of the accuracy of the disappearance and noticed a gradual reappearance, lasting about .75 sec. Coordinator Roland Boninsegna could not correlate these two events, in large part because two other observers did not monitor the star through the whole critical period. He believes that Sza probably missed a positive event.
- 2 Feb 05 Siegena. This was one of the erroneous predictions due to bad "Lick2" data mentioned in ON 5, 8 p.218. Some of the Japanese observers were aware of this, and several observers are not included in Table 1.
- 3 Feb 17 Ninina. Clive Rowe (Roc) and O.R. Hull (Hul) obtained a 6 sec. photoelectric decline of light level with some cloud possibility. Two other observers (Loa and Pat), both near Roc's photoelectric track, were able to monitor through Roc's times with no dimming noted.
- 4 Mar 09. Observers were AzaBacBtaBulCpsElHfGl GocGrHalHolHrhHzlJkhKhlKisKknKrtMrx PaaRgeRieSprStrSzaThoVcbVigVmm.
- 5 Apr 01 Interamnia. Uncertain event for Uda.
- 6 May 07 Danae. Diana Watson (Wad) obtained a 6.2 sec. occultation beginning at 10:08:42.2 (No PE applied).
- 7 May 12 Pallas. William Goltz (Gol) reported a positive observation beginning at 19:27:33.8, and lasting 24.7 sec.

# REPORTS OF ASTEROIDAL APPULSES AND OCCULTATIONS, LATE 1993

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. My new e-mail address is jimstamm@aztec.asu.edu. 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.

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Table 1. Asteroidal appulses and occultations: Jul-Dec 1993.

1993	Minor Planet	Cat	Star	Observers	Notes
Jul 03	21 Themis	EX	-25°3814	McAlb	
Jul 06	638 Meira	PPM	526321	CoaDssGrc	
Jul 07	227 Philosphia	PPM	577643	Dik	
Jul 25	1303 Luthera	PPM	581784	Haw	
Jul 28	197 Arete	PPM	557800	AzaBifBimCasCps EngFloGdtGingJz GocIelPrcTrlVsc BnnCoaDssGrcRspVid	
Aug 08	354 Eleonora	Lick5	3323	DssFauNel	
Aug 12	1819 Laputa	PPM	532900	DenKubOtaRch	
Aug 13	354 Eleonora	SAO	163419	Den	
Aug 17	304 Olga	PPM	174668	Den	
Aug 18	79 Fortuna	PPM	529824	PhpGrsShh	
Aug 28	1113 Katja	PPM	577004	UdaSugTakTkeKan	
Aug 30	156 Xanthippe	PPM	95674	AudCoaDssFauHal IelKhlMezNel	
Sep 11	709 Pringilla	PPM	513143	Hon	
Sep 16	45 Eugenia	FAC	66711	Prc	
Sep 23	17 Themis	PPM	500405	Sta	
Sep 23	592 Bathseba	PPM	145700	Sta	
Sep 28	89 Julia	PPM	47424	ModMelAtwDwdDii	
Oct 01	183 Istria	PPM	582326	Ohk	
Oct 06	631 Philippina	PPM	91672	Hon	
Oct 09	21 Lutetia	PPM	96183	AzaCasDss	
Oct 09	27 Euterpe	PPM	174714	LyzComVenNyeVre WsnMrtBerCooHanRot SciSpaTonTsdWreSta	1
Oct 09	40 Harmonia	PPM	552408	AkaOhkShb	
Oct 10	206 Hersilia	PPM	121101	SotAkaOhkShi	
Oct 14	582 Olympia	PPM	534180	Hon	
Oct 14	498 Tokio	Lick1	2090	AkaOhkEgaMat	
Oct 15	40 Urania	PPM	95472	CasDssSraTom	
Oct 17	735 Marghanna	PPM	118619	KubWkl	

Table 1 (Cont.). Asteroidal appulses/occultations: Jul-Dec 1993.

Oct 17	444 Gyptis	PPM	118783	KrsNzeWkl
Nov 01	171 Ophelia	PPM	126851	Den
Nov 04	449 Hamburga	PPM	118219	OhkEgaIka
Nov 09	56 Melete	PPM	156956	KzuSotTagSohAkaOhk IkaUdaIdaYtoOht
Nov 13	358 Apollonia	PPM	531691	Mod
Nov 23	19 Fortuna	PPM	530721	DwdWrr
Dec 08	57 Mnemosyne	PPM	512872	DssPaa
Dec 08	718 Erida	PPM	98603	TodAkaOhk
Dec 13	419 Aurelia	PPM	120118	Hon
Dec 17	30 Urania	PPM	94878	StaCpsDnvFglFpz GdzGocIlvMtIopc OtdPdmSobTrlVscVid
Dec 17	891 Gunhild	Lick4	2854	TodIka
Dec 26	203 Pompeja	PPM	97297	Kan
Dec 30	27 Euterpe	PPM	143623	Mcb
Dec 31	144 Vibilia	PPM	96118	McbFviMtIopcPrcPkz4

Table 2. Observers and locations of events Jul-Dec 1993.

ID	Observer	Town	Country	No.
Aka	Akazawa, Hidehiko	Asaguchi	Japan	5
Alb	Albers, Steve	Longmont	Colorado - USA	1
Atw	Atwood, Terry	Shreveport	Louisiana - USA	1
Aud	Aude Jean, M.	Chinon	France	1
Aza	Azema, J.-M.	Lamallou	France	2
Bff	Baruffetti, Pietro	Massa	Italy	1
Ber	Bergeron, Joe	Tucson	Arizona - USA	1
Bim	Bigli, M.	Massa	Italy	1
Bnn	Boninsegna, Roland	Dourbes	Belgium	1
Coa	C.O.A.A.	Portimao	Portugal	5
Cps	CamposCucarella, F.	Vallirana	Spain	1
Cas	Casas, Ricard	La Orotava	Spain	3
Com	Comba, Paul	Prescott	Arizona - USA	1
Coa	Cooper, Michael	Socorro	New Mexico - USA	1
Otd	Del Teide Observ.	La Laguna	Spain	1
Drv	Denchev, P.	Gabrovo	Bulgaria	1
Den	Dentel, Martin	Bernau	Germany	3
Dik	Dickle, Ross	Gore	New Zealand	1
Dii	Diluli, Ron	Fort Worth	Texas - USA	1
Dwd	Dunham, David W.	Greenbelt	Maryland - USA	2
Dss	Dusser, Raymond	Apt	France	8
Ega	Egawa, Fumiharu	Kumatori	Japan	2
Eng	Engra Hinarejos, A.	Yatova	Spain	1
Ewl	Ewald, D.	Melchow	Germany	2
Fau	Faure, G.	Grenoble	France	2
Fnz	Fernandez Barba, D.	Barcelona	Spain	1
Flo	Flores Martinez	Valencia	Spain	2
Fgl	Foglia, Sergio	Milano	Italy	1
Gjz	Garcia, J. J.M.	Dos Hermanas	Spain	1
Grc	Garcia, Joaquim	Lisboa	Portugal	3
Goc	Gomez Castano, J.	Fuenlabrada	Spain	3
Gdt	Gomez, Donet J.J.	Gandia	Spain	1
Gcv	Goncalves, Rui	Lisbon	Portugal	1
Gdz	Gracia, Diaz, V.	Esplugues	Spain	1
Grs	Grieser, Dan	Columbus	Ohio - USA	1
Gln	Guerin, P.	Bressuire	France	1
Hal	Halir, K	Rokycany	Czech Republic	1
Han	Hankins, Tim	Socorro	New Mexico - USA	1
Haw	Hayward, Steve	Madang	Papua New Guinea	1
Hon	Honkus, Edward	Carnegie	Pennsylvania - USA	4
Ida	Ida, Miyoshi	Yokaiichi	Japan	1
Iel	Ielo, Antonio	Castiglione	Italy	2
Ika	Ikari, Yasukazu	Ohtu	Japan	3
Ilv	Iliev, I.	Gabrovo	Bulgaria	1
Kzu	Kanatzu, Kazuyoshi	Daitou	Japan	1
Kan	Kaneko, Sakae	Sakura	Japan	2
Khl	Kohl, Mike	Laupen	Switzerland	1
Krs	Kruse, H.	Bremen	Germany	1
Kub	Kubicek, P.	Teplice	Czech Republic	2
Lyz	Lyzenga, Greg	Table Mt.	California - USA	1
Mod	MacDougal, Craig	Tampa	Florida - USA	2
Mcb	MacRobert, Alan	Bedford	Massachusetts - USA	2
Mah	Mahoney, T.	La Orotava	Spain	1



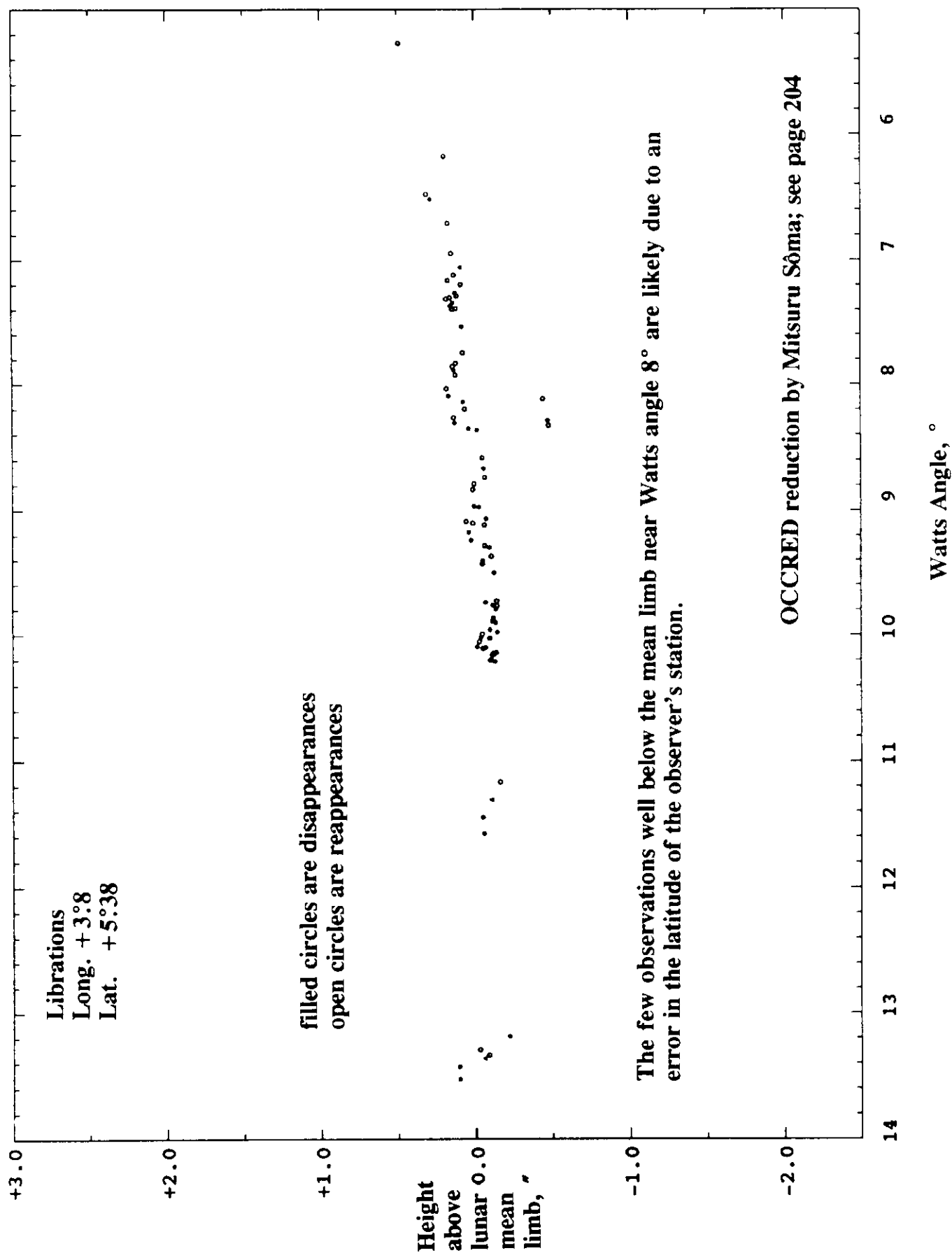
Table 2 (Cont.) Observers/locations of events: Jul-Dec 1993.

Mit	Mariot, C.	Guines	France	1
Mu	Marta Ribas, Josep	Mataro	Spain	2
Mez	Martinez, P.	Toulouse	France	1
Mot	Matsuda, Hideki	Tenri	Japan	1
Moc	McCurdy, Bruce	Edmonton	Alberta - CAN	1
Mel	Meiella, Frank	Holtsville	New York - USA	1
Mrt	Morton, Allen	Coolidge	Arizona - USA	1
Ne	Neel, Regis	Venissieux	France	2
Nze	Nezel	Bremen	Germany	1
Nye	Nye, Derald	Tucson	Arizona - USA	1
Onk	Onkura, Nobuo	Okayama	Japan	7
Ont	Onuki, Isao	Mazumori	Japan	1
Ora	Otta, S.	Teplice	Czech Republic	1
Opc	Parc CatalunyaObs.	Sabadell	Spain	2
Paa	Patak, A.	Pecs	Hungary	1
Pab	Peris, Bueno V.	Albuxech	Spain	1
Pnc	Phillips, Earl	Columbus	Ohio - USA	1
Pdm	Pic-du-Midi Obs.	Bagnere	France	1
Pkr	Piskorz, Witold	Kracow	Poland	1
Prc	Pardini, Roberto	Salerno	Italy	4
Rsp	Raspadori, G.	Bologna	Italy	1
Rdt	Richter, Steffen	Eberswalde	Germany	1
Rcl	Retering, Paul	Socorro	New Mexico - USA	1
Sch	Sato, Motomaro	Okayama	Japan	1
Sot	Sato, Yasushi	Daitou	Japan	2
Sib	Sornaboi, Charles	Barcelona	Spain	1
Sra	Serra, M.	la Laguna	Spain	1
Sst	Shitaya, Hiroto	Matsubarako	Japan	1
Shi	Shitaya, Yuto	Matsubarako	Japan	1
Sly	Smith, Alyn	Melbourne	Florida - USA	1
Slr	Smith, Clay	Socorro	New Mexico - USA	1
Spa	Spargo, John	Socorro	New Mexico - USA	1
Sta	Stamm, Jim	Tucson	Arizona - USA	4
Sag	Sugie, Jim	Taga	Japan	1
Taq	Takahira, S.	Okayama	Japan	1
Tak	Takamachi, Susumu	Taga	Japan	1
Tke	Takelichi, Kazushi	Taga	Japan	1
Tya	Toda, Hiroyuki	Kanagata	Japan	2
Tus	Tomas, L.	Sabadell	Spain	1
Tor	Torgue, Tom	Socorro	New Mexico - USA	1
Tre	Turrell, Sebastia	Barcelona	Spain	2
Tro	Truesdell, Len	Socorro	New Mexico - USA	1
Uda	Uda, Kiyo	Shigaraki	Japan	2
Ude	Van Ude, F.	Gesk	Belgium	1
Ure	Urebaso, E. M.	Vallirana	Spain	1
Ver	Venancio, Roger	Avigasta	Georgia - USA	1
Via	Vidal, Salva J.	Zaragoza	Spain	2
Vre	Veelant, A.	Tucson	Arizona - USA	1
Wen	Warren, Wayne	Greenbelt	Maryland - USA	1
Wkl	Winkel, J.-M.	Zeddam	Netherlands	2
Yto	Yamamoto, Masayuki	Kawasaki	Japan	1

## NOTES:

- 1 Oct 09. A separate article about this well-observed event will be published in a future issue.
- 2 Nov 23. David Dunham and Wayne Warren video recorded a 9-second occultation about half a minute after the predicted time of closest approach at a site near Inwood, WV. The occultation of the 9th-mag. star was recorded well in spite of the 7° altitude and the star was followed for several more minutes as the altitude decreased (it was a very clear night). The length of the event, a little longer than predicted, showed that they must have been near the central line, while Alan Gilmore's astrometry indicated that Inwood was near the southern limit. 20 minutes after the event, Dunham video recorded a lunar occultation of  $\kappa$  Piscium, a graze of which was seen by observers near Norfolk, VA, that evening.
- 3 Dec 17. Pic-du-Midi Observatory reported an occultation, but no details have been received yet.
- 4 Dec 31. Alan MacRobert in Massachusetts timed a 13.7-sec. occultation beginning at 23:16:20.3, "both events being very obvious." Witold Piskorz in Poland reported a 9.6-second occultation starting at 23:08:26.7. Both observations are in agreement with a CCD determination by Ricard Casas at Parc Catalunya Observatory in Spain. D. Dunham computed the diameter from these chords to be  $178 \pm 11$  km. The solution would have been stronger if the two chords, separated by only 27 km in the plane of the sky, had been farther apart. This was unlucky considering the over 5000 km distance between the two sites.

Grazing Occultation of  $\delta^1$  Tauri = Z.C. 648  
1996 January 29, European Observations



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 sections 501(c)(3) and 509(a)(2) of the (USA) Internal Revenue Code, and is incorporated in the state of Texas.

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

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The Dunhams maintain the occultation information line at 301-474-4945. Messages may also be left at that number.

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