Occultation Newsletter

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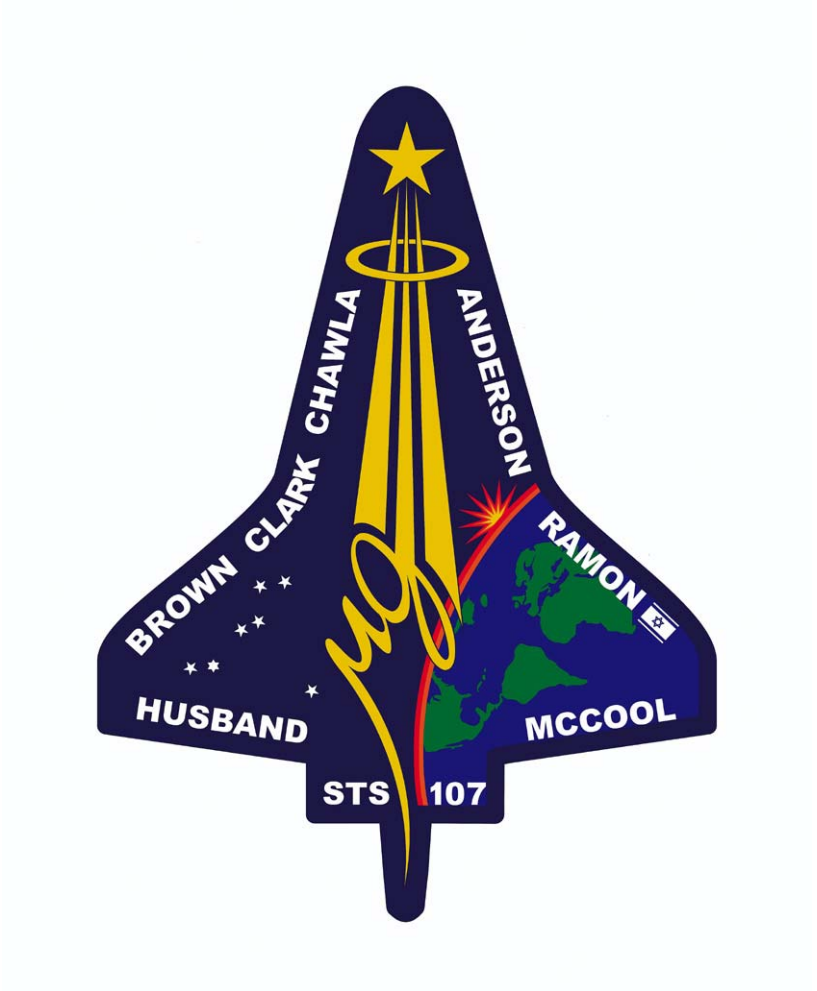

In Memory of the STS-107 Astronauts

In this Issue

ON THE COVER:

STS-107 patch in memory of the crew of Columbia.

Publication Date for this issue:
May 2003

Please note: The date shown on the cover is for subscription purposes only and does not reflect the actual publication date.

What to Send to Whom

Send new and renewal memberships and subscriptions, back issue requests, address changes, email address changes, graze prediction requests, reimbursement requests, special requests, and other IOTA business, but **not observation reports**, to:

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Send Lunar Grazing Occultation reports to:

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Tokyo 181-8588, Japan
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Send interesting stories of lunar grazing occultations to:

Richard P. Wilds
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Email: **Wilds@networksplus.net**

Send Total Occultation and copies of Lunar Grazing Occultation reports to:

International Lunar Occultation Centre (ILOC)
Geodesy and Geophysics Division
Hydrographic Department
Tsukiji-5, Chuo-ku
Tokyo, 104-0045 Japan
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Send Asteroidal Appulse and Asteroidal Occultation reports to:

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Send observations of occultations that indicate stellar duplicity to:

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Membership and Subscription Information

All payments made to IOTA must be in United States funds and drawn on a US bank, or by credit card charge to VISA or MasterCard. If you use VISA or MasterCard, include your account number, expiration date, and signature. (Do not send credit card information through e-mail. It is neither secure nor safe to do so.) Make all payments to **IOTA** and send them to the Secretary & Treasurer at the address on the left. Memberships and subscriptions may be made for one or two years, only.

Occultation Newsletter subscriptions (1 year = 4 issues) are US$20.00 per year for USA, Canada, and Mexico; and US$25.00 per year for all others. Single issues, including back issues, are 1/4 of the subscription price.

Memberships include the *Occultation Newsletter* and annual predictions and supplements. Memberships are US$30.00 per year for USA, Canada, and Mexico; and US$35.00 per year for all others. Observers from Europe and the British Isles should join the European Service (IOTA/ES). See the inside back cover for more information.

IOTA Publications

Although the following are included in membership, nonmembers will be charged for:

Local Circumstances for Appulses of Solar System Objects with Stars predictions US$1.00
Graze Limit and Profile predictions US$1.50 per graze.
Papers explaining the use of the above predictions US$2.50
IOTA Observer's Manual US$5.00

Asteroidal Occultation Supplements will be available for US$2.50 from the following regional coordinators:
South America--Orlando A. Naranjo; Universidad de los Andes; Dept. de Fisica; Mérida, Venezuela
Europe--Roland Boninsegna; Rue de Mariembourg, 33; B-6381 DOURBES; Belgium or IOTA/ES (see back cover)
Southern Africa--Brain Fraser - fraserb@intekom.co.za
Australia and New Zealand--Graham Blow; P.O. Box 2241; Wellington, New Zealand
Japan--Toshiro Hirose; 1-13 Shimomaruko 1-chome; Ota-ku, Tokyo 146, Japan
All other areas-Jan Manek; (see address at left)

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In Memory of Michiel Daniel Overbeek

Editor's note: M.D. Overbeek passed away in July of 2001. I was remiss not mentioning this much earlier.

In Danie Overbeek, the Johannesburg Centre of ASSA had one of the world's top amateur astronomers as one of its longstanding members. His achievements were recognised locally by the Society (in 1984 Danie received the Gill Medal of the ASSA), and abroad (in 1986 the Merit Award by AAVSO, in 1994 the AAVSO Director's Award and prolific observer's merit award, in 1996 the Astronomical Society of the Pacific 1996 Amateur Achievement Award, and in 1997 the AAVSO prolific observer's merit award). In 1998 Danie was elected the President designate of the ASSA for the second time, a rare occurrence in the history of the Society.

In 1950, during a four month stay in New Jersey, New York and California, whilst visiting the Haydn Planetarium in New York, Danie met Richard Luce, a great amateur telescope maker, and associate of Alleyn Thompson of "Making your own Telescope". Luce helped with surplus optics and encouragement. Shortly after this, Danie constructed a 6" Newtonian and started his occultation and variable star observing. Two years later, Danie built his 12" Dall-Kirkham Cassegrain.

Danie's career from 1946 to 1980 was in maintenance, training, civil engineering research and administration at the South African Airways and South African Railways.

Danie was elected Chairman of the Transvaal Centre, ASSA in 1956 and President of ASSA for the first time in 1961. After re-reading Leslie Peltier's "Starlight Nights" became inspired to return to Variable Star Observing. Danie's first AAVSO meeting, at Blantyre Castle, in 1973, gave him the opportunity to meet all the luminaries, an experience he said would never forget!

1977 to 1980 saw Danie back in New York, where he had the opportunity of attending meetings of the AA of NY, Fairfield County & Union College groups and the AS of Long Island, fairly regularly. Danie went to occultation events as far north as Montreal and as far south as Ciudad Bolivar, Venezuela. Between these years, Danie was made Council Member of the AAVSO, Honorary Member of the Transvaal Centre, ASSA, and Honorary Member of the ASSA. In 1981, Danie started solar flare STD/SES recording for Cap Hossfield and built a magnetometer for fun which he used to regularly monitor the earth's magnetic field. In addition to the magnetometer, in 1990, Danie built a seismograph, and monitored Gaia's shivering on a daily basis.

Danie was the author and co-author of numerous articles for MNASSA, Astrophysics and Space Science, and other publications.

The above notes are extracted from an article in the October 1998 "Canopus" journal of the Johanesburg Centre of the Astronomical Society of South Africa. The full article can be found on the internet at:

http//www.aqua.co.za/assa_jhb/Canopus/c98appDO.htm

A Remembrance of Danie Overbeek

Henk Bulder

I just learned from Margaret, one of his daughters, that Danie Overbeek died July 19th 2001 from a heart attack. He had suffered a stroke in February from which he was recovering fairly well.

Each year I did send him seasonal greetings since he spent several days at our home in Zoetermeer in 1990 and I very much enjoyed receiving his South African letters (which very much resembles Dutch). Danie was a very kind and modest man with whom I shared the same passion for astronomy.

He was one of the most active variable star observers and besides that he organized quite a number of successful graze
expeditions and was a very active observer of occultations by asteroids for more than 20 years with several successes on his name. Asteroid 5038 Overbeek is named after him by the 1948 discoverer EL Johnson.

He was one of the leading spirits in South Africa as far as occultations are concerned. Too many key figures have passed away the last years.

ERRATUM to O. N. Volume 9 No.3 (published December 2002)

Dr. Eberhard H. R. Bredner

ESOP
IOTA/ES secretary made a mistake, numbering the ESOP's. Here you find the correct listing:

2002 ESOP XXI was Naples Italy)
2003 XXII will be Trebur Germany
2004 XXIII Paris (must be still confirmed)
2005 XXIV ?? (up to now no invitation)
2006 XXV will be organized by DOA (Dutch Occultation Association) or NVWS (Nederlands Vereniging van Waarnemers van Sterbedekkingen). ■

Invitation to ESOP XXII 2003

ESOP XXII 2003
European Symposium on Occultation Projects
Trebur, August 29 – 31, 2003

The boards of IOTA/ES and Michael Adrian Observatory invite all members and friends to participate in the European Symposium on Occultation Projects to be held in Trebur in Germany at the end of August 2003. The symposium will be located at the Michael Adrian Observatory with its public observatory, which is situated in the heart of Trebur. The dome of the observatory houses one of the largest privat telescopes of Europe - the Trebur-1.21 meter-telescope T1T - and is visible from quite a distance from the outlying fields surrounding the village.

With this announcement we want to give you the first information about the symposium. You will get more detailed information via internet at
http://www.t1t-trebur.de/esop-2003/index.html
and at our mirror site
http://www.fh-friedberg.de/users/jomo/esop.htm

Program Details

Welcome Evening
Friday, Aug. 29 2003 16:00 - 22:00h
The Welcome Pre-Registration and Reception on Friday afternoon will take place at Vortragsraum, Fichtenstrasse 7 (ground floor), 65468 Trebur. Here you get your conference information folder. Have a cool beer and some good tasting snacks, and say "Hello" to everybody!

Scientific Program
The symposium is open to all scientific contributions in the field of eclipses, occultations, instrumentation, organization of events etc. .Based on abstracts sent in, the scientific committee will decide about the presentations on the conference.

Saturday and Sunday Aug. 30 - 31, 2003
The symposium will take place at the Council Chamber of Trebur, Herrngasse 3, 65468 Trebur

Social Program

Conference Lunches
The Conference Lunches take place on Saturday and Sunday. There is no extra payment for these lunches, they are included in the conference fee.

General Excursion: Wine-Tasting and visit of the Starkenburg Sternwarte. In Heppenheim on Sunday afternoon with Otto Guthier, Chairman of VdS, the "Vereinigung der Sternfreunde", the general association for amateur astronomers in Germany.

Special organized Excursions
Monday till Wednesday, Sept 1 - 3, 2003

Conference location

Michael Adrian Observatorium
Fichtenstrasse 7 (3rd floor), 65468 Trebur, Germany

and alternatively

Council Chamber of Trebur
Herrngasse 3, 65468 Trebur, Germany

The conference fee for members of IOTA and their accompanying persons amounts to 48,- EURO, for non-members to 68,- EURO. The registration fee includes:

- admission to all lectures on Saturday and Sunday
- welcome reception on Friday evening
- refreshment and coffee breaks during the symposium
- dinner on Friday
- lunch on Saturday and Sunday
- buffet on Saturday evening
- mayor's reception
- abstract booklet
- symposium information folder
- shuttle-service to and from all listed hotels

Deadlines

Abstracts:	Aug. 1st
Abstracts for posters:	Aug. 1st
Registration for symposium:	July 13th
Registration for social program:	July 13th ■

Minutes of the 2002 IOTA Annual Meeting

Richard Nugent, Executive Secretary
JackiesDad@Weblore.com

The 20th annual meeting of the International Occultation Timing Association was held Saturday, October 19, 2002 at the Rice University Campus, Space Science Building, in Houston, Texas. This location was chosen since IOTA President David Dunham was already attending the World Space Conference in Houston this same week and it was convenient for some of the other IOTA officers as well.

Ten members and attendees were present at the meeting:

President David W. Dunham from Maryland,
Vice President Paul D. Maley from Texas,
Executive Secretary Richard L. Nugent from Texas,
Secretary Treasurer Art Lucas from Oklahoma,
Dr. Harry Bates from Maryland,
Richard Wilds, Dr. Gilbert Parks from Kansas,
Rocky Harper, Don Stockbauer, Brian Cudnick and Matt Delavoryas from Texas.

At 9:30 AM, **President David Dunham** opened the meeting and asked the attendees to introduce themselves. Following the introductions, Executive Secretary **Richard Nugent** asked the attendees to sign in to the Executive Secretary's record book which has photos and Minutes of the past meetings going back to 1998. This history file will be maintained by Nugent for IOTA history purposes.

President David Dunham briefly mentioned about the before and after astrometric tests for asteroid occultation predictions program being carried out by Rui Goncalves and others in Spain and France. In this technique, Goncalves is imaging the asteroid and target star just before and just after the predicted occultation. For 25 Phocaea recently, he reported a standard error of just 0.012" in the asteroid's position, which corresponds to $1/10^{th}$ the diameter of the asteroid. Using the UCAC-1 catalog, the standard errors rose to 0.05 - 0.07", still very impressive for a CCD camera and small telescope. He also says the USNO A2.0 catalog gives errors 2-3 times worse. Goncalves reported that a more sophisticated astrometric reduction model was the key to improving the results.

Vice President **Paul Maley**, reported on IOTA's continued tax-exempt status. Everything is fine with IOTA's records with the State of Texas and a quick check on the internet by Nugent confirmed this, as IOTA is a non profit corporation in good standing with the Secretary of State in Texas. Copies of these good standing letters are kept in the Executive Secretary's file.

Treasurer **Art Lucas** gave a report of IOTA's financial status. Summary of balances are:

Starting Balance: July 2001	$6,701.76
Ending Balance: October 2002	7,335.59
Total Checks written	2,631.06

Lucas reminded everyone to check their mailing labels for their own dues expiration date. Some members are way ahead on their dues, and the credits will not be refunded. Currently when a dues check arrives, it is entered into six different databases. Art Lucas will investigate converting the current bookkeeping system to Microsoft Access, a much simpler system that would streamline the accounts and finances.

Lucas also mentioned that ***Occultation Newsletter*** (***ON)*** editor John Graves has a lack of material for publishing and encouraged IOTA members to submit their articles/observations, since this is the medium that IOTA maintains a permanent record of its continuing activities.

EDUCATIONAL OUTREACH

A long discussion followed on the methods and strategies IOTA can and should use to try to encourage and recruit new observers for occultation activities. President **Dunham** discussed his reaching out to colleges/universities to excite young people and students with occultation events. Occultation events happen all the time and they are usually spectacular to first time observers. This can provide great educational opportunities for students and amateur astronomers alike, plus the added benefit of knowing they are making a useful scientific contribution. One idea was a science project for a student. This could be a grazing occultation expedition or an asteroid occultation plus data reduction. Dunham also spent the previous week here in Houston attending the World Space Congress, which did offer sessions on education. Dunham brought up the idea of using occultations at one of these sessions where one of the presentations mentioned using total solar eclipses as a focus for space education.

Long time IOTA member **Richard Wilds** explained how a Kansas company, A Tech, is trying to recruit and bring younger people into astronomy by exciting them with active solar system research opportunities. A Tech is in the process of setting up a National Research & Educational Outreach Program. He and his colleague, **Dr. Gilbert Parks** (A Tech President and CEO) are negotiating with NASA & NSF to start such a program nationwide. The prototype system they would like to install in colleges/universities is similar to that of the current HART (Heartland Astronomical Research *Team*) program. This advanced telescope system features a 20" reflecting telescope, image intensifier, GPS and time insertion capability plus a high resolution monitor and DVD Recorder for real time views and direct video recording that

can obtain deep images to a limit of 18th to 20th magnitude in digital form to 0.02 second accuracy. Wilds showed videos of telescope field of views using the image intensifier. Several objects were shown demonstrating detail in Messier and NGC objects, spiral arms in M51, and structure in M8, M20 and several star clusters with telescopic meteors and satellites moving through. This video easily matched or exceeded the visual capability of an observer in a dark sky with the same telescope. The capability of bringing a dark sky view to young people is important in an urban light polluted sky to impress upon them the wonders of observational astronomy. Wilds also presented one his many TV interviews depicting an important upcoming occultation event. Richard Wilds claims that if he can get on television for an interview related to an occultation event, that anyone can. The central plan is to remind NASA that their current asteroid radar observations are limited to NEOs and the inner region of the Main Asteroid Belt. The A Tech program would deliver detailed information about asteroid size and shape from the NEOs through the Main Asteroid Belt, and out to the Trojans, Centaurs and Kuiper Belt. This would be a significant improvement over the current options and the publicity generated for NASA would also be helpful to all involved.

Obviously, negotiating with NASA involves politics. Wilds and Parks demonstrated how building a nationwide system similar to HART could "create jobs." There would be acquisition costs (land, equipment), training and even security in setting up and maintaining such a network. A pilot project has already been funded at South Carolina State University using a completely mobile asteroid hunting Image Intensified GPS Time Inserted Video System. The estimated cost per unit is approximately $50,000, and this not only includes equipment, but travel and training costs. IOTA appears to be well placed to play an exciting role in the project. Dr. Parks is meeting at NASA Headquarters in a week with senior NASA administrators. A larger meeting is tentatively planned for December 2002 [but had not taken place as of the end of February 2003]. Dr. Dunham and Wilds are scheduled to be in attendance at this meeting. A nationwide A Tech Program with key IOTA support could soon make asteroid research a major part of NASA's solar system research and educational outreach opportunities.

Dr. Harry Bates made a presentation on, "Observing Lunar Occultations as Student Astronomy Projects". He showed ways that Physics and Astronomy Departments could be combined to include occultation projects as part of their curriculum. The basic idea was more students = more data = more chords, plus the spin off result = more interest!! Dr. Bates' power point presentation was well done and could be used effectively by other interested teachers/educators. Dr. Bates even suggested schools could eventually have student chapters of IOTA. This concept of recruiting new IOTA members is extremely important, as new blood is desperately needed to continue occultation studies.
On the issue of security, Richard Wilds mentioned that he usually places able-bodied males at the ends of a grazing occultation line. In his occultation expeditions, observers have hand held CB/2-way radios for communication, and usually notify the local authorities (Sheriff, Police, etc.) so as to avoid any confrontations during critical observation windows. Case in point: if the local authorities are notified, then phone calls from unsuspecting residents can avoid patrol cars from driving to the occultation site and causing a light pollution/conflicts scene. Several attendees told stories of experiences with police cars driving up, local “curious” residents and the like. Maley mentioned that many schools do not allow or are very cautious in allowing telescope set ups on their property or for school functions/star parties because of the liability issue. The basic thought agreed upon is to maintain a level of awareness and security during occultation expeditions so as to keep the area/unsuspecting residents safe and friendly.

Brian Cudnick, discussed the ongoing lunar meteor impact observation program. During observation of the recent Perseids in August 12, 2002, 55 candidate impact events were observed/videotaped. Cudnick would like to see a program started that would continuously monitor the dark side of he Moon monthly from age 2 days to 6 or 7 days for possible meteor impacts events. He also has submitted to NASA a proposal to have 10 people monitor the Moon these days out of every month. Toward this purpose, he created definitions in order to maintain a high level of certainty from real events vs. spurious “cosmic ray” or other false events.

The definitions are:

CONFIRMED EVENT:

The observation is 99% confident,
Observed by 2 or more observers,
Separated by at least 30 miles,
Time of event ±1 second,
Position of event ±3 degrees on lunar surface.

TENTAVELY CONFIRMED EVENT:

The observation is 95% confident,
Observed by 2 or more observers,
Separated by less than 30 miles,
Time of event ±3 seconds,
Position of event ±5 degrees on lunar surface.

PROBABLE EVENT
:
Highly probable but not confirmed,
Observed by a single observer,
Appears in two or more video frames,
Has stellar profile, ≈ 80% confident.

CANDIDATE EVENT:

50% confidence level,
Observed by a single observer.

Art Lucas showed his PowerPoint IOTA presentation made earlier this year for the Astronomical League's annual Convention in Salt Lake City, Utah. The theme of the presentation was to describe what equipment is needed for a video occultation observation along with the reduction techniques used to pin down the event times to 0.03 seconds. Toward calibrating the WWV tones, Lucas demonstrated oscilloscope patterns of the signal and the various delays in receiving the signal from Ft. Collins, CO to various locations within the US. For example, from Ft. Collins to Stillwater, OK, the delay was 20-25 milliseconds, from the Hawaii transmitting station at 20 Mhz, the delay was over 100 milliseconds.

At 12:30PM, the attendees headed out for lunch. Following the lunch break, David Dunham showed the results of the highly successful asteroid occultation of the star FK6 1115 (43, Tauri, *m* = 5.3) by the asteroid 345 Tercidina in Europe on September 17, 2002. Over 70 observers traveled to several countries thus making this an international effort. The preliminary size of Tercidina from the initial analysis of the over 70 chords is 99 x 93 km.

Just 3 days prior to the IOTA meeting, the small asteroid 3171 Wangshouguan was scheduled to occult the *m* = 4.9 star FK6 1089 ζ Arietis. Reports from observers indicated that the actual path shifted by a full path width south. At the time of the meeting, just 5 positive observations have come in from the Seattle, Washington area.

Dunham announced some major approaching bright star asteroid events:

3 November 2002 - 431 Nephele, HIP 18735, *m* = 5.9, European side: Finland, Atlantic side: New England to Texas. Path uncertainty is one path width. [that path shifted almost a path-width north; about 9 observers from West Virginia to Massachusetts, and one in Finland, timed the occultation].

10 November 2002 - 828 Lindemannia, π Aries (HIP 13165), *m* = 5.2, South Carolina to south central Texas. Paul Maley and Richard Nugent sought and recruited observers in the Houston area (just north of which the occultation path was expected) and Rick Frankenburger recruited observers in San Antonio, expected to be within the path. Maley showed a plot of current observer's stations (usually their residences) on a large scale map of the Houston area. Coverage was good around Houston, but with only a few observers in the actual path and north of the path. At the IOTA meeting time, the uncertainty was one path width (53 km), however Maley noted at least one more astrometric update was expected before the occultation. [See R. Nugent's separate article about observations of this occultation].

David Dunham made a presentation from July 17 earlier this year, "Increasing Coverage of Occultations with remote Video Stations". He showed how use of remote video stations increases the coverage for occultations. On December 21, 2002, for the graze of τ Aqr, *m* = 4.0 in Kitty Hawk, North Carolina, 4 observers produced a total of 8 stations, which included 4 remote video stations. Since it was in December, during the off season, the town was empty, so the remote unattended video stations were fairly safe. In addition to these stations, several stations in Georgia observed the event.

On July 15, 2002, ν Virginis, *m* = 4.0, was observed with 5 unattended video stations near Champaign, Illinois by the 26% Moon. The video stations showed several dimming/partial events on this Spectral type M0III red giant star.

The first ever remote video station used on an asteroid occultation was made by David Dunham for 9 Metis on September 7, 2001 near Orland, California. The star was SAO 78349, *m* = 6.0 spectral type A2V. Dunham set up a camcorder with 50mm lens and image intensifier on a tripod and pointed it to the area of sky the target star would drift into during the occultation. He then drove some 23 miles south on Interstate 5 and video taped the event with a telescope. After returning to the remote station, he saw the battery had died, *just after the occultation !!* Steve Preston video taped this event from Redding, CA and had step events caused by the star's duplicity. Each video station produced chords, and the analysis showed Metis to be elongated in shape 240 x 122 km. The target star was in fact a double star and analysis of the tapes by Frank Anet found the star components to be separated by 0.040″ in position angle 343°. Further details appear in ***Sky and Telescope***, March 2002 page 97.

An important procedure when setting up remote video stations is to point the telescope at the altitude and azimuth that the target star will have at the time of the occultation an hour or two before the occultation. This can be done by finding a star field at the same declination with an R.A. 1 to 2 hours less than that of the target star, set on that field at the right time, and then let the star drift into the field during the occultation rather than use a motor driven mount. Quick polar alignments for one-time occultation events usually result in tracking errors, and these accumulate over time causing the star to drift out of the field.

Dunham showed a video with multiple lunar and asteroid occultation events, including the first ever confirmed video of a meteor striking the Moon during the Leonid meteor storm of November 18, 1999 and the spectacular occultation of Saturn by the Moon on December 28, 2001.

Dunham noted that Sandy Bumgamer (who could not make the meeting) has developed a technique to modify the Supercircuits PC-164C camera to add manual gain control. He will make the modification for you if you send your PC164C camera to him. For additional details, contact Sandy directly at sandy@vbbn.com .

Art Lucas read a letter from Majorie Walker and Alfred Kruijshoop from Mount Waverly, Victoria, Australia. They wanted to the meeting attendees to know how much they appreciate the assistance of Art Lucas and David Dunham in their occultation activities.

Paul Maley briefly discussed some upcoming eclipses in the continuous effort of IOTA to monitor possible solar radius variations. For the December 4, 2002 total eclipse over southern Africa, Paul is planning on recording the Baily's Beads at the southern limit, while Richard Nugent is planning to go to the northern limit in Mozambique [That effort was not successful, but video observations at both limits were obtained in Australia, as reported in a separate article by Dunham]. In May 2003, an annular eclipse will occur over Iceland, and Maley is planning an expedition there also.

David Dunham next showed a few of the major asteroid events for 2003 visible from North America. One such favorable event is 44 Nysa on January 3, 2003 with an m = 8.0 star. The brightest event for the year is January 11, 2003, when m = 7.7 SAO 117679 is occulted by 441 Bathilde. [However, since the IOTA meeting, some brighter events were found and incorporated into the distributed 2003 predictions.] Other events will be available on IOTA's website with updates made by Steve Preston.

Harry Bates then made a presentation "Using PC's to Reduce Occultation Data". Dr. Bates has been working with Ron Santana at the video center at his University to reduce videos of occultations. Santana has a video setup using software for a Mac computer. Bates showed an example reduction of an occultation done in a frame-by-frame mode. The software allowed extraction of intensity levels of stars, which then could be used in the software package MathCad to plot intensity profiles, thus simplifying the reduction of an occultation event.

Following this **Richard Nugent** showed a video of the asteroid occultation of the m = 9.2 star SAO 76241 by 161 Athor earlier in the week. This 5.7 second occultation was converted from 8mm video to an AVI file by a low cost software program available at Best Buy (Dazzle Video Digital Creator 80). Nugent positioned himself 15 miles inside the southern occultation limit while Dunham stayed about 2 miles inside this limit. Dunham had a miss. Ed Vinson and Mitch Brumbelow observed this event near the Midland, Texas area and had a positive observation, but had not reduced their tapes in time for the meeting.

Following this the formal meeting adjourned at 4:35 PM, while some of the attendees continued discussions afterwards. ■

Occultation of π Arietis by Asteroid (828) Lindemannia On November 10, 2002

Pedro V. Sada (psada@ix.netcom.com, Universidad de Monterrey, México)
Richard Nugent (JackiesDad@weblore.com)
Paul Maley (pdmaley@yahoo.com)
Rick Frankenberger (rickf@stic.net)
Steve Preston (stevepr@acm.org)
David Dunham (dunham@erols.com)
W. Dean Pesnell (pesnell@nomadresearch.com)

The occultation of the bright star π Arietis (HIP 13165) by the asteroid (828) Lindemannia was recorded by 10 observers in Texas on November 10, 2002. Clouds hampered many more potential observers. Nine disappearances, ten reappearances, and 2 near misses are reported. A least-squares fit to the data results in a 52.6 km. X 50.8 km. ellipse with the major axis oriented at a PA of 90.0o. However, deviations from a perfect ellipse were observed.

The occultation of the star π Arietis (HIP 13165, mag. 5.3) on November 10, 2002 by the asteroid (828) Lindemannia over North America was eagerly anticipated by members of the International Occultation Timing Association. This event included one of the brightest stars predicted to be occulted that year and the occultation occurred on a weekend night, when more observers could be mobilized. Initial predictions by Edwin Goffin showed that the path of the shadow would cross central Florida and México from east to west. Updates closer to the date of the event by Steve Preston, using the latest available asteroid astrometry from FASTT and TMO, indicated that the path had shifted north and now crossed the southern portions of South Carolina, Georgia, Alabama, Mississippi, Louisiana, east and central Texas, and northwestern México. In particular the shadow was predicted to pass north of Houston and between San Antonio and Austin in Texas. The formal uncertainty of the prediction was about ±50 km. perpendicular to the path direction, which was about the estimated size for the asteroid itself.

In Texas a large campaign was thus initiated to recruit as many volunteer observers as possible and to place them so that as wide a track as possible could be covered, centered on the predicted path and minimizing duplication. Paul Maley and Steve Preston developed and implemented a unique mapping scheme in which observing tracks, spaced by 1 km. perpendicular to the path of the shadow, were overlaid on an urban map in order to coordinate the placement of a large contingent of observers with different skills and observing needs. In addition, Steve Preston prepared detailed geographical maps of the region with observing chords and observing sites drawn in, while Paul

Maley used email to contact the potential observers and set up an information web page where they could easily visualize their intended observing locations. Richard Nugent helped organize observers in the Houston Area while Rick Frankenberger did the same in the San Antonio area. Over 100 enthusiastic observers signed up for the event since it was a relatively easy observation of a naked-eye star, located near the central meridian, decreasing in brightness by over 9 magnitudes, a little past midnight, and on a weekend night. David Dunham helped organize observers in other locations.

Wather conditions were predicted to be fine for the night of the occultation. However, winds from the southeast brought high humidity from the Gulf of Mexico to the region and clouds formed over most of the Houston area, preventing most observers there from observing the event. Further east, near San Antonio and Austin, observers had better luck though they had to fight dew formation on their telescopes. Overall, 10 observers reported successful timings of the occultation that were useful for estimating the outline of (828) Lindemannia. Three of them recorded the event on video while the others performed visual observations. Observers in the other southern states where the shadow crossed over were clouded out. No reports from México were obtained. The Table summarizes the Texas observations in order of decreasing observer latitude. According to the location of the successful observers, the actual path of the occultation shifted northward of the final prediction by about half of the expected path width of the shadow, or about 25 km.

Each timed event (D and R) was projected on the fundamental plane of the sky according to the method described by Mills and Elliot (*Direct Determination of Asteroid Diameters from Occultation Observations*. **Asteroids**. T. Gehrels, ed. University of Arizona Press, Tucson, 1979, 98-118). The star position used (R.A. = 02h 49m 17.5606s, DEC. = +17° 27' 51.471") was obtained from the Hipparcos star catalog (ESA, *The Hipparcos and Tycho Catalogues*, 1997, ESA SP-1200) and was corrected by its proper motion to the epoch of the occultation. Ephemeris for the asteroid were generated using JPL's HORIZON web-based service (Giorgini, J.D., et al., *JPL's On-Line Solar System Data Service*, Bulletin of the American Astronomical Society, 1996, 28(3), 1158. http://ssd.jpl.nasa.gov/horizons.html).

W. Dean Pesnell used a custom-made least-squares routine to find the ellipse that best fits the data points. The Figure shows the location in the fundamental plane of all the reported Ds (crosses) and Rs (stars) connected by a line for each observer, two near misses (diamonds), and the best-fit ellipse: which has dimensions of 52.6 km. X 50.8 km. with the major axis oriented at a PA of 90.0°. This very nearly resembles a circle.

No other stellar occultation has been observed for this asteroid (Dunham, D., *Observed Minor Planet Occultation Events*, Version for January 18, 2002). The observed mean size of the asteroid during this occultation matches its estimated diameter of about 53.4 km. obtained by other methods (*IRAS Diameters and Albedos from the IRAS Minor Planet Survey, Version 4*, 1983. http://pdssbn.astro.umd.edu/SBNast/holdings/IRAS-A-FPA-3-RDR-IMPS-V4.0.html). From the eccentricity of the ellipse, and assuming that the rotation axis is on the plane of the sky and aligned with the minor axis of the asteroid and that the third axis is similar to the minor axis, we can estimate an amplitude for its rotation curve of less than 0.1 magnitudes. Unfortunately this cannot be confirmed as its rotation period has not yet been photometrically measured (See: Harris, A.W., *Minor Planet Lightcurve Parameters*, update for March 1, 2001. http://cfa-www.harvard.edu/iau/lists/LightcurveDat.html or Warner, B., *Collaborative Asteroid Lightcurve Link (CALL)*. http://ssd.jpl.nasa.gov/horizons.html and links therein).

It is clear from the Figure that the shape of the asteroid deviates from the modeled ellipse. The following end of the asteroid (observed Rs) in particular seems to have irregular topography. Also note that observer BR probably had a very close miss as the nearby short chord recorded by observer BH places a stringent southeastern edge on the outline of the asteroid. One difficulty with timing this particular occultation was the short duration of the event. The longest occultation lasted only 3.9 seconds. Each second of time corresponds roughly to 14 km. in the plane of the sky (see Figure). This makes an accurate estimation of the reaction time for the visual observations very important since uncertainties of ±0.2 seconds become significant in the final estimation of the asteroid size and shape.

Overall the observing campaign organized for this particular asteroid occultation was a success. The scheme for coordinating and placing a large number of observers using detailed urban maps and the internet was implemented for the first time and could be used in future asteroid occultations. Most of the outline of the asteroid was recorded with little overlap. The only exception being the northern edge, but that is understandable in light of the northern shift of the actual occultation path, where fewer observers were located following the final prediction. It is indeed unfortunate that clouds interfered and prevented more observers from recording the event and providing a finer grid of chords to better constrain the outline of asteroid (828) Lindemannia.

NAME **(v = video)**	**Latitude** (N) **Longitude** (W)	**Elevation** (m)	**D** (UTC)	**R** (UTC)
Fred Henderson	+30° 25' 05.4" 96° 38' 55.1"	200	----------	06:34:55.8
Kent Francis **v**	+30° 16' 58.1" 97° 50' 36.5"	200	06:35:00.8	06:35:03.7
Richard Nugent **v**	+30° 16' 32.2" 96° 56' 42.5"	295	06:34:54.0	06:34:57.4
Walter Aulenbacher	+30° 03' 30.9" 97° 43' 02.3"	100	06:34:59.8	06:35:03.3
Paul Sventek	+30° 01' 48.2" 97 ° 41' 17.7"	100	06:34:59.7	06:35:02.9
Rick Frankenberger **v**	+29° 57' 09.1" 98° 23' 50.8"	396	06:35:04.19	06:35:07.46
Scott Magee	+29° 50' 02.1" 99° 14' 48.3"	500	06:35:10.1	06:35:14.0
Dwight Jurena	+29° 49' 14.4" 98° 31' 32.0"	430	06:35:06.2	06:35:08.8
Barry Hidemma	+29° 48' 11.7" 98° 21' 24.7"	384	06:35:06.5	06:35:07.7
Heather Sherbourne	+29° 47' 45.0" 98° 44' 00.0"	432	06:25:07.4	06:35:10.4
Becky Ramotowski	+29° 45' 36.3" 98° 27' 36.0"	360	miss	miss
Pedro Valdés Sada	+29° 33' 54.7" 98° 27' 41.8"	253	miss	miss

Table: Successful reported observations from Texas of the occultation of the star π Arietis by the asteroid (828) Lindemannia on November 10, 2002. **D** stands for the time of disappearance of the star behind the asteroid and **R** is the reappearance.

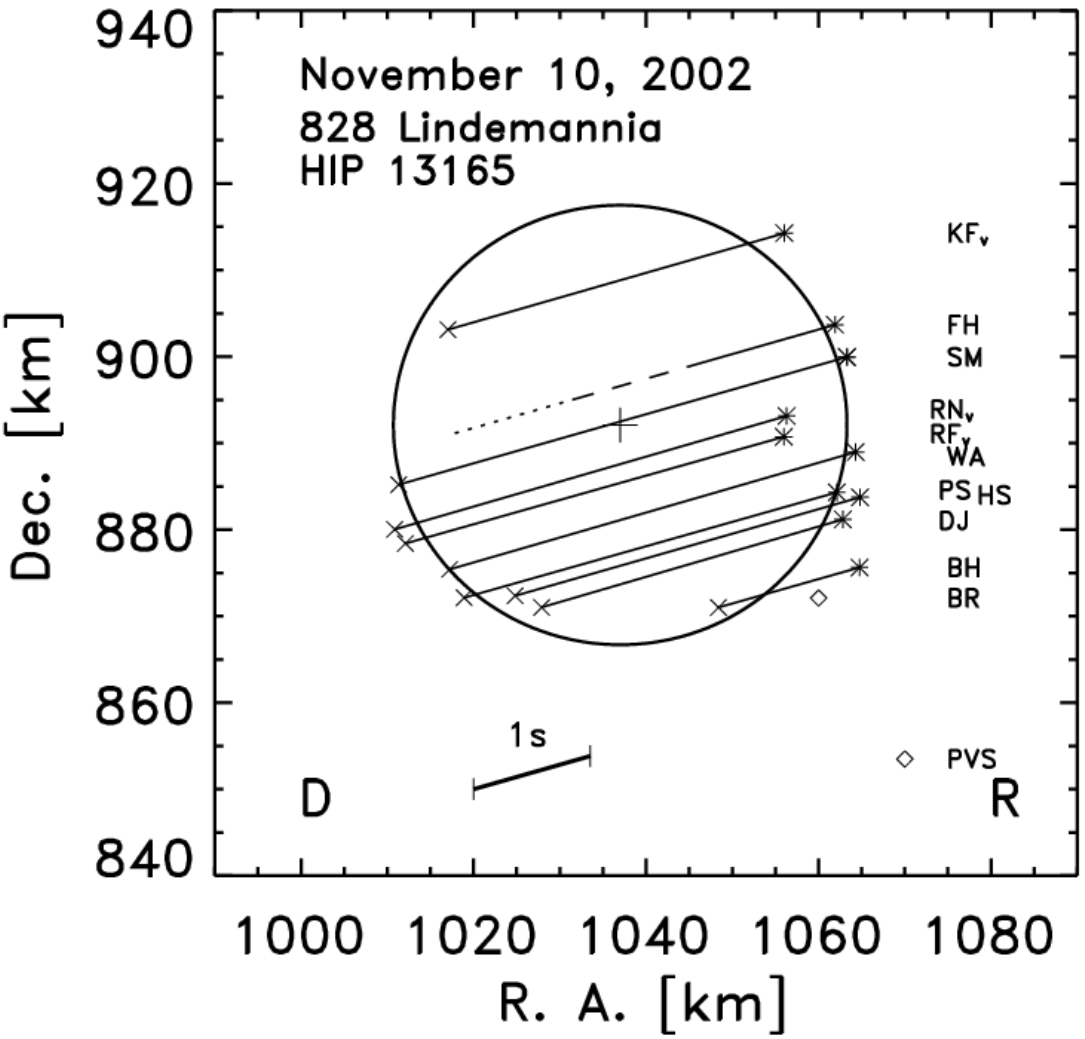

Figure: Observed disappearances (crosses) and reappearances (stars) of the star in the fundamental plane of the sky during the occultation of the star π Arietis by the asteroid (828) Lindemannia on November 10, 2002. Diamonds represent misses. Each chord is labeled on the right side of the figure with the initials of the observer (see Table). The subindex "v" indicates a video recorded observation. The best-fit ellipse is outlined.

IOTA's Mission

The International Occultation Timing Association, Inc. 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.

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IOTA on the World Wide Web

(IOTA maintains the following web sites for your information and rapid notification of events.)

IOTA Member Site
http://www.occultations.org

This site contains information about the organization known as IOTA and provides information about joining IOTA and IOTA/ES, topics related to the *Occultation Newsletter*, and information about the membership--including the membership directory.

IOTA Lunar Occultations, Eclipses, and Asteroidal and Planetary Occultations Site
http://www.lunar-occultations.com

This site contains information on lunar occultations, eclipses, and asteroidal and planetary occultations and the latest information on upcoming events. It also includes information explaining what occultations are and how to report them.

IOTA's Telephone Network

The Occultation Information Line at 301-474-4945 is maintained by David and Joan Dunham. Messages may also be left at that number. When updates become available for asteroidal occultations in the central USA, the information can also be obtained from 708-259-2376 (Chicago, IL).