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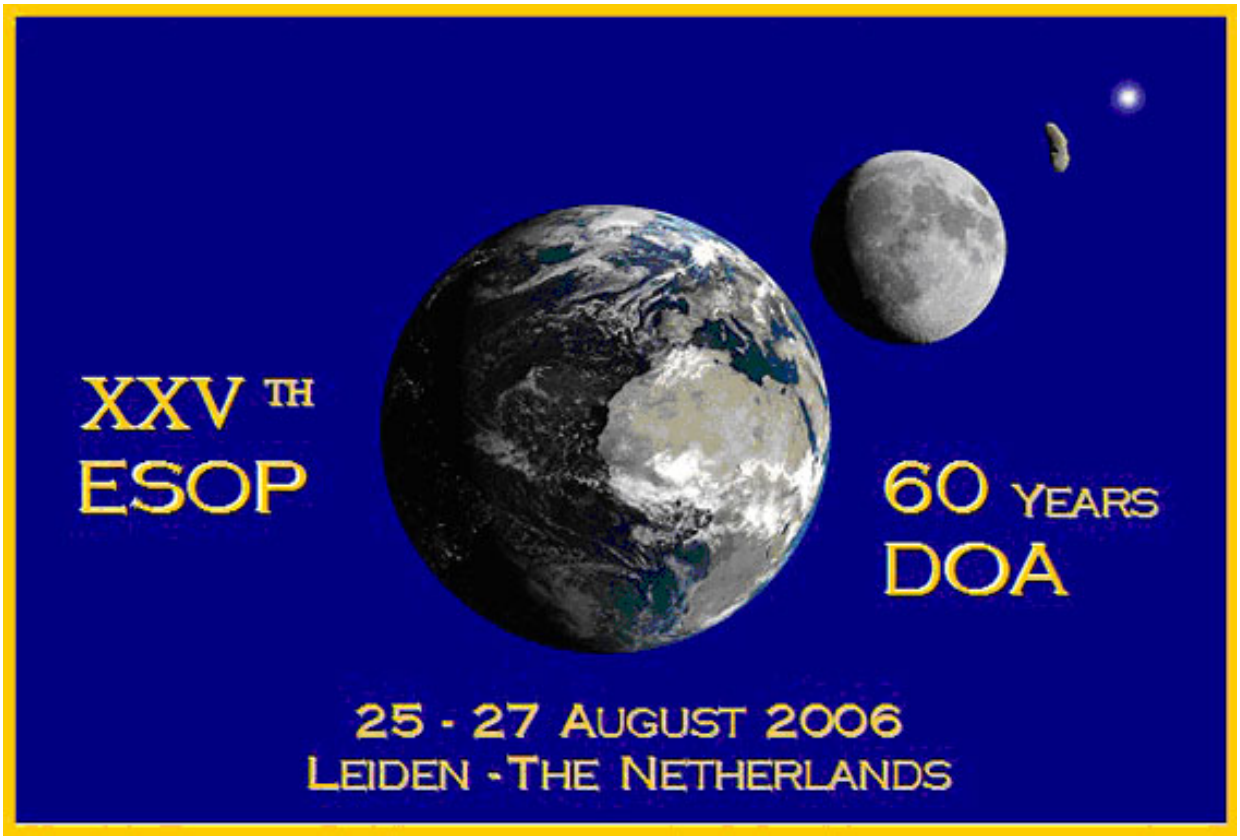

2006 European Symposium on Occultation Projects
ESOP XXV - Leiden Observatory, Leiden NL
25-27 August 2006

In this Issue

ON THE COVER:

ESOP XXV – The 2006 European Symposium on Occultation Projects will be held 25-27 August 2006 at the Leiden Observatory, Leiden NL. For more information, see the article on page 5 of this issue or visit www.esop2006.nl.

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

The next issue, Volume 13, Number 1 will be published in late May.

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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 inside back cover)
Southern Africa--Brian 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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Pluto & Charon Occultations During The Next Decade

Walker Vaning, San Rafael, CA

My recent research into Pluto's 1988 occultation suggests Pluto is a sphere 1177+/-9 Km in diameter. Its atmosphere is fairly clear but its isobars were 150 km higher over its equator. There were two thin detached haze layers (or thermal gradients, shockwaves, etc.) over the South pole. There may exist a 20 km high mountain or mountain range opposite to Charon.

Other data suggest Pluto has dark splotchy Rings, which are actively accreting material (mostly from the Neptune-Sun L5 Lagrange point) onto Pluto & Charon at a rapid rate. Some of Pluto's brightness may be due to these incandescent meteors.

Pluto will be crossing the dense star fields of the central Milky Way for the next decade. IOTA's members can contribute valuable data about Pluto & Charon and the accretion disc by observing some of the Pluto & Charon occultations. By recording close (under 20 arcsecond) conjunctions of bright stars for about 20-30 minutes, centered on closest approach to about 0.01 magnitudes, you might prove the existence of the rings.

A double occultation where one site sees a Pluto occultation, and the same site or another site sees a Charon occultation can increase the accuracy of Charon's orbit (and other fundamental parameters) by a hundredfold. This should occur in about 40% of the occultations. The September 27, 2007 event predicted by Dr. David Herald of Australia and a very red magnitude 8.7 star is good. Unfortunately Pluto is partly off planet & telescopes need to be in or near Antarctica. Charon's occultation should be visible near the longitude of India. Light intensifying equipment may prove useful for this.

About 10% of events will include spectroscopic binary stars. In these cases you can get 2 chords per telescope! ■

An Unusual Pretoria Experience

Bob Sandy

For the asteroid Pretoria occultation of 10.7-magnitude star TYC 0216-01594-1 on Saturday morning 10/29/05, David Dunham assigned me to be located within a few kilometers of the small town of Big Cabin, Oklahoma near Interstate 44. I arrived there at around 7:00 p.m. CST, and checked into the only motel there, and then started asking questions of the natives as to how to drive to get to the EAST side of I-44, since the target star would be high in the southeastern sky at event time. It just so happened that running east-west directly in front of the motel, was a gravel road passing over I-44. So I proceeded to check out possible observing sites on the sides of east-west, and north-south roads within a few kilometers southeast of the town, after darkness.

While slowly driving west on a gravel road, I saw a Minivan slowly driving toward me heading east. When we got side-by-side, I rolled down my window, and proceeded to explain to the male driver who I was, what I was doing driving down rural roads after dark, and what I was hoping to do with the two 8" telescopes I had in the back the next morning. He then said (quote)---"I own an 8" Dobsonian, and follow me/ We will take you to our farm, and you are welcome to set up on our property"! How good could it get?

So we went there, and he brought out a long extension cord and connected a spotlight to it, so I could set up my equipment under illumination. He then mentioned that when they saw me on the road, that they were wondering what I was doing, since his elder parents, who lived a mile, or two away, had called them saying something might be a little "fishy" going on.

These people were so confident that I was "legitimate", that they explained that when they spotted me on the road, that they were on there way to a party/meeting/engagement (?), and I was welcome to finish setting up my scopes, and they drove away to their rendezvous! So I did just that, and then went back to the motel for a few hours of shuteye.

This occultation occured shortly after 5:58 a.m. CDT, or just about the beginning of twilight. The evening before, I had talked to Mr. Carr about the fact that I would be recording WWV time signals, and that I would appreciate it if he could leave their dog indoors, since the odd frequency tone of the signals would probably make the dog bark, so he said he would. But he forgot that he also had Roosters on his farm, so sure enough, there are several "Cockadoodaldoos" on my VCR tape, but NOT during the critical occultation duration of approximately 6.60 seconds!

After the event ended, Mr. Carr came out of his house, and I replayed my video tape of the occultation for him, and let him look at the crescent moon in the eastern sky through my Celestron 8" GPS SCT and he seemed quite impressed. ■

Invitation to ESOP XXV
25-27 August 2006

The board of DOA en IOTA-ES invites all members, friends, and others, who are interested in occultation phenomena, to join the ESOP XXV. The ESOP (European Symposium on Occultation Projects) is a yearly conference to bring together professional and amateur astronomers who are interested in occultation phenomena of stars by bodies within our solar system, such as:

Moon
Planets
Satellites of planets
Rings of planets
Asteroids
Eclipses
etc.

Papers are presented on the results of studies and observation. Also proposals will be presented for work, ephemeris, instrument and software techniques, image processing, organization of new expeditions, new methods, etc.

The ESOP XXV will be held in Leiden. Leiden, with a famous university, where great names like Oort have worked, is located between Amsterdam and The Hague. ESOP XXV is being organized by DOA, the Dutch Occultation Association. This association is an associate of the Royal Dutch Society for Meteorology and Astronomy (KNVWS) which numbers about 4000 members, about 70 are members of DOA.

This ESOP XXV is not only a milestone in ESOP, this year DOA reaches a milestone too. The Association celebrates its 60th anniversary. DOA is one of the first associations in the world dedicated to occultation projects.

Symposium Program
August 25th-27th

Friday 25th: Opening Buffet
Saturday 26th: Lectures
Saturday 26th: Social Dinner
Sunday 27th: Lectures

Excursion Program
August 28th-30th

Monday 28th: ESA-ESTEC
Monday 28th: Canal Tour
Tuesday 29th : Boerhaave & Sonneborgh Observatory
Wednesday 30th: Delta works

Fees:

Symposium includes Buffet & Lunches: The cost is € 75 for Members of DOA-IOTA-ES and € 115 for non-members.

Social Dinner: € 30 | ESA-ESTEC; € 25 | Canal Tour: € 35 | Boerhave & Sonneborgh: € 45

Delta Works: € 55 | All Excursions include a Lunch or Dinner and Bus Transfers (no bus for the Canal Tour).

Non-members should add € 10 for every Excursion Program.

Registration is possible until August 1st 2006. For more information, please visit:

http:// www.esop2006.nl ■

LinOccult – An Application for Predicting Occultations of Stars by Minor Planets

Andrei Plekhanov

Observations of stellar occultation by asteroids can make significant impact in several areas of astronomy. Observations of these events by professional and amateur astronomers are extremely important since they can provide unique information about the size of asteroids and improve the accuracy of their orbit elements dramatically.

In spite of the fact that the quantity of occultation events is large, the actual observation of such events is not always easy because the size of the majority of minor planets seldom exceeds one hundred kilometers, and their orbits are not always determined to sufficient precision. Until recently, calculation of such phenomena has also been hampered by absence of the star catalogues containing exact coordinates of many stars. These factors led to shadow path coordinates that contained large errors and, as a result, the probability of observing such events was often close to zero. Fortunately in the last few years the situation has changed for the better. New star catalogues and updated asteroid orbits have allowed much more accurate predictions of the coordinates of an occultation's shadow path.

For observation of a stellar occultation by a minor planet, it is necessary to know the exact geographical coordinates of the occultation path and the time when the shadow will pass an observation point. It is necessary to note that the shadow path can have a complex appearance as its coordinates depend on movement of an minor planet around the Sun and also from movement of the Earth in its orbit and its rotation about its own axis. To do such calculations LinOccult was created to calculate time and geographical location of star occultations by minor planets.

I created LinOccult in my spare time after my basic work and house duties. Development of this project began at the end of 2003 when I became interested in algorithms used in celestial mechanics. Similar programs already existed, in particular WinOccult, however, to my surprise, I found that source code for these programs is not available for studying and updating.

Because I believe that scientific programs should be distributed with their source code, I have chosen the GNU General Public License for LinOccult, so that all interested in celestial mechanics algorithms have the opportunity to study them by playing with a working program.

As the most suitable environment for scientific programs development is UNIX, I have decided to create initial LinOccult version for this operating system. In my work I used the exccellent book "Astronomy on a Personal Computer" despite the very large quantity of typing errors in the Russian edition. I also used GNU Open Source code for reading the major planets ephemeris, taken from www.projectpluto.com, and code for working with kdtree, taken from www2.imm.dtu.dk/~jab. LinOccult uses some other open source applications to process, display and store occultation events.

By the middle of 2004 all the necessary features to calculate occultation events in LinOccult had been implemented, and it was time to present LinOccult to the world community. This was done at the ESOP XXIII conference at the Paris observatory[1].

LinOccult was able to calculate shadow paths of minor planets and to use the specified values of updated asteroidal orbital elements from Steve Preston's and Jan Manek's WWW sites. For asteroid orbit calculations the major planets' positions were read from JPL's DE405 ephemeris. The results of calculations were output both in text format and in the format of the PovRay program for the subsequent creation of a 3D picture with a map of shadow's path. As the program allowed asteroids with eccentricity close to 1, I found some interesting predictions of occultations by TNOs and some other objects.

As the project continued to develop as Open Source, I have made a decision to place the source code on my site www.newtech.ru/~andyp and on a site http://linoccult.sourceforge.net.

During the next year, a number of new features were implemented. In particular the kdtree algorithm for the fast search of stars in the asteroid's area in the sky has been included. This algorithm has considerably improved the program's performance and has eliminated the need for indexing of the star catalogue. I also implemented storage of a calculated asteroid orbit in the form of a Chebyshev polynomials approximation. This has enabled an even faster search of occultation events during long time intervals. I implemented storage of calculation results in an internal database and in an external MySQL database. By using internal and MySQL databases, I added new options to calculate occultation circumstances for a particular observation point and make interesting occultation analyses across the world.

At the end of 2004 I added support for an observation points file to process occultation circumstances at many points with individual parameters at each point. The output occultations list include text, html and LaTeX formats. At this point, LinOccult began to support a special file with the list of updated orbit elements that has essentially raised accuracy of predictions. It has allowed me to create my email list to send occultation predictions monthly to many observers in the world. I have given a report on all of the above achievements at ESOP XXIV conference in Helsinki[2].

At the beginning of 2006, LinOccult for Windows was released.

For Windows users not familiar with UNIX philosophy LinOccult's functioning may seem a little bit unusual at first sight. As LinOccult is a console application, it works without the typical graphic user interface (GUI). In a UNIX environment, however, this is the usual practice and, in so doing, it offers a number of advantages. For example, if it is necessary to start LinOccult several times with different parameters, it is possible to make one batch file to start it processing for the night, thus there is no necessity to wake up at night to press buttons in the menu for switching modes. All control information is contained in configuration files (these are usual text files) and there is no necessity to search for the necessary parameter in depths of dropdown menus.

Configuration files play an important role in the function of LinOccult. These text files contain the list of parameters, each of which can be one of three types - an integer, number with a floating point, or a string. The value of parameter is set in three places. One in the program itself(value by default), in a file named linoccult.config and in a project file which holds values for a particular LinOccult run. It is possible to have as many project files as you want but LinOccult uses only one for each run.

Values of each parameter which will be used by LinOccult works out under the following scheme:

First the default values in LinOccult are taken. Next the linoccult.config file is searched for parameter values. If any are present, the values of the default parameters referenced are replaced with their respective values from the linoccult.config file. After this, the project file referenced in the command line is then searched for parameters. If any are present, those values will be used.

LinOccult has many parameters. The majority of parameters are set in the program by default and normally the user does not override their values. The parameters common for all projects are usually setup in the linoccult.config file. An example of this would be the path to the astorb.dat file.

At the beginning of a run, LinOccult outputs information about the current version and its copyright. Then the information about parameters that will be used in current run and source file where these parameters have been found.

Each event found by LinOccult will output the information on the occulted star, the catalogue and its number, the star's visual magnitude, the star's coordinates, the asteroid's diameter, its brightness, the magnitude drop during occultation, and a one root-mean-square uncertainty expressed in angular seconds and kilometers. Then LinOccult outputs data about the circumstances of the event; the distance of star to the Sun and the Moon in degrees, and also the phase of the Moon as a percentage.

For each point, LinOccult outputs date and time in UTC, the longitude and latitude of the given point, height of the star above the horizon, the height of the Sun and the duration of event in seconds.

LinOccult has several base run modes. First is a precise calculation of a shadow path. In this mode it is possible to use the updated orbit elements from Steve Preston's (http://www.asteroidoccultation.com) and Jan Manek's (http://mpocc.astro.cz/updates) web sites. Typically this mode is used if asteroid number and occultation date are known. This mode is the most precise, but requires more computing resources.

The second LinOccult mode is an occultation events search. For this mode you may set start and end asteroid number as well as asteroid diameter or orbit restrictions to select asteroids for processing. In this mode it is also possible to use a file with asteroid orbit element updates.

The third LinOccult mode outputs information about occultation events in observation points. The LinOccult program starts by parsing the configuration file and the project configuration file from the command line and sets parameters, in particular a path to astorb.dat, the path to the star catalogue, and the path to planets ephemeris. Then, depending on other parameters, LinOccult creates the list of asteroids for processing and a time interval. LinOccult creates a kdtree index for fast search of stars in the area. The calculation is made by numerical integration of asteroid coordinates with planetary perturbations being considered. Planet's positions are read from file DE405. In a search mode LinOccult approximates asteroid orbits by Chebyshev polynomials. After that all nearby stars are searched and for each of them is searched for an occultation event. If an occultation is found, it is output to the console and, if needed, saved in internal and MySQL databases.

LinOccult is written on C++ and include libraries that can be reused in other projects:

1. APSLib – a general purpose library for application developing.
   Contains classes for working with parameters, files and also a number of useful procedures.

2. APSMathLib – a general purpose library with vector and matrix arithmetic, code for working with Chebyshev polynomials and other mathematical procedures.

3. AstroIO – a library containing procedures for input/output into various formats of astronomical databases; for example an astorb.dat file.

Though all the basic options for occultation calculations and search currently exist, I am going to continue to develop and support LinOccult. In particular I will significantly change some of the program's structure, alter several modules and fix some insignificant bugs.

LinOccult works in a very stable fashion and allows one to make long calculations for the large number of asteroids and long time intervals. In addition, LinOccult has several unique features that are not implemented in other similar programs. In particular LinOccult can store occultations in MySQL database for further analysis, and can use updated orbital elements in search mode instead of the orbital elements from the astorb.dat file. You can find LinOccult and more detailed information about it on my www site at: www.newtech.ru/~andyp site.■

Bibliography:

[1] LINOCCULT - APPLICATION FOR CALCULATING STAR OCCULTATIONS BY MINOR PLANETS ESOP 2004 SCIENTIFIC PROGRAM.
Observatoire de Paris, Paris 27-29 August, 2004 http://calys.obspm.fr/~ESOP2004/sessions.html

[2] LinOccult - Overview of New Features 24th European Symposium on Occultation Projects,
Helsinki 26-31 August, 2005 http://www.ursa.fi/ursa/jaostot/pikkuplan/tapahtumat/ESOP2005/lecture_11.html

New double star discoveries

Henk Bulder

This is the follow-up of the article in Occultation Newsletter, Volume 12, Number 3. It concerns a date correction of an earlier discovery by D S Evans in 1969. One earlier discovery by R Melley in 1974 (OCC 301) turns out to be a single star after all. New double star discoveries are made by Andrea Richichi et al. at Calar Alto observatory from 2000 until February 17th 2005 as published in the following papers:

Richichi A., Ragland, S., Calamai, G., Richter, S., Stecklum, B. 2000, New binary stars discovered by lunar occultations. V, Astronomy and Astrophysics, 361, 594

Richichi A, Calamai G, Stecklum B. 2002, New binary stars discovered by lunar occultations. VI, Astronomy and Astrophysics, 382, 178

O. Fors, A. Richichi, J. Núñez, A. Prades 2004, Infrared and visual lunar occultations measurements of stellar diameters and new binary stars detections at the Calar Alto 1.5m telescope, Astronomy and Astrophysics, 419, 285

A. Richichi, O. Fors, M. Merino et al. 2006, The Calar Alto lunar occultation program: update and new results, Astronomy and Astrophysics, in press.

OCC	X	SAO/ZC	MAG1	MAG2	SEP	PA	DATE	DISCOVERER	REMARKS
235	4831	539	4.6	6.1	.1	0	19690806	D S Evans	Date Correction
1105	8595	78119	8.1	11.9	.0131	127	20020222	A Richichi et al	
1106	8849	78258	8.2	10.5	.0473	45	20020223	A Richichi et al	
1107	10826	79251	8.7	11.8	.0269	85	20020223	A Richichi et al	
1108	14132	80764	7.8	10.7	.0425	73	20040401	A Richichi et al	
1109	23864	185661	9.9	13.1	.0379	155	20040728	A Richichi et al	
1110	23904	185691	8.8	11.1	.015	136	20040728	A Richichi et al	
1111	29945	164567	7.4	9.5	.002	85	20011025	A Richichi et al	
1112	30777	165154	9.0	10.7	.043	117	20041119	A Richichi et al	
1113	33909		10.3	12.0	.0288	75	20020223	A Richichi et al	
1114	69800		9.6	11.6	.0195	121	20050216	A Richichi et al	
1115	70786		10.9	11.3	.0156	77	20050121	A Richichi et al	
1116	80244		9.2	10.2	.005	278	20000313	A Richichi et al	
	GSC 1270	897	12.3	12.6	.1312		20000727	A Richichi et al	Not in XZ
	GSC 1820	1264	11.4	12.4	.0895	86	20050217	A Richichi et al	Not in XZ
	GSC 1834	239	12.7	16.4	.0065	135	20050121	A Richichi et al	Not in XZ
	GSC 1869	565	11.5	13.7	.0248	108	20050122	A Richichi et al	Not in XZ
	2MASS J17454891-2809333				.0393	117	20040728	A Richichi et al	Not in XZ/GSC

TABLE 1 New double star discoveries till 17 February 2005

OCC1110 is a triple. The GSC numbered stars are too faint to be in XZ80Q and consequently do not get an OCC number. They are simply mentioned for completeness and will get an OCC number as soon as they are incorporated in XZ catalog in the future.

The magnitude of the component (MAG2) for the Richichi observations is just an indication. This magnitude was calculated using the brightness ratio between the components as measured with a K filter, which is not necessarily the same as in V.

Table 2 contains confirmations of discoveries made by occultations work (non zero OCC number) or confirmations of earlier discoveries by unknown discoverers (0000 numbers).

OCC	X	SAO/ZC	DATE	CONFIRMER
0000	2879	110325	20011128	A Richichi et al
235	4831	539	19690806	R Sandy & H Povenmire

TABLE 2 Confirmations of double star discoveries till 1January 2005

The correction of OCC 235 concerns an old observation of Taygeta. It was first mentioned to be double by Bob Sandy and Hal Povenmire who observed it to be double during a graze organized by Bob. This observation was rejected as most likely to be refraction fringes in 1969. Bob and Hal never agreed about that conclusion. A few minutes before their observation David S Evans observed a regular occultation which seemed to be double. Only in 1988 and 1989 Andrea Richichi et al. confirmed the star to be double. In astronomy sometimes observers get credit after a century or more. Even in times where information is spread via internet within seconds it can take some time. I hope the record has been set straight here.

Updated XZDoubles.DAT, XZDoubles Discoveries.DAT and XZConfirmations.DAT can be downloaded from IOTA website (url). When you use these new files in Winoccult don't forget to use option 6 (Update XZ catalogue...) in star catalogues menu.

Mitsuru Soma et al. pointed out that the double star information about X5948 is incorrect. If you are planning to observe a graze of this star please contact him to get the correct data.

Observers that have observed gradual or step events during 2005 are urged to report their data using ILOC report form to Henk Bulder before July 1st of 2006. The next update will be in September 2006. ■

Abstract from ESOP XXIV

Visual Minor Planet Observations

Hans-Joachim Bode, IOTA/ES President

Discussions between participants of the planoccult-list leaded to the necessity of giving a talk concerning the problem: "What to do with "suspicious" visual observations?"

As a result of the discussion between the participants of ESOP XXIV in Helsinki the following conclusions have been drawn:

- It is necessary that every successful (suspicious) observation has to be reported. Otherwise these events would never be known, even if two or more independent observers have observed them.

- It is very useful that visual observers always form a double observing station – if possible.

- Suspicious observation should be stored in an extra list, to refine them some day – if possible. ■

Occultation Observer's Handbook

A new book is now available for the occultation observer. Walt Robinson and Hal Povenmire have written a book entitled "*Occultation Observer's Handbook*".

"This comprehensive book covers all of our knowledge of Lunar and Asteroidal Occultation work. Occultations are special eclipses. These are usually of the Moon covering a star or planet as seen from Earth. Observing occultations is a valuable field of astronomy. This up to date, well-illustrated book tells how the amateur astronomer can make a valuable contribution to this exciting field."

You may order a copy by sending $23.00 ($20.00 for the book and $3.00 for postage and handling) to:

Hal Povenmire
215 Osage Drive
Indian Harbour Beach, FL 32937 ■

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.

The Offices and Officers of IOTA

IOTA European Section (IOTA·ES)

Observers from Europe and the British Isles should join IOTA/ES, sending a Eurocheck for EURO 25,00 (bank-transfer-costs included) 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. Sending EURO 20 EU-members must use the IBAN- and BIC-code as additional bank-address (IBAN: DE97 2501 0030 0555 8293 03, BIC: PBNKDEFF). German members should give IOTA/ES an "authorization for collection" or "Einzugs-Ermaechtigung" to their bank account. Please contact the Secretary for a blank form. Full membership in IOTA/ES includes one supplement for European observers (total and grazing occultations) and minor planet occultation data, including last-minute predictions; when available. The addresses for IOTA/ES are:

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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.