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VERY COMPACT ASTEROID OCCULTATION IMAGING SYSTEM

In this Issue

ON THE COVER:

Scott Degenhardt's new compact imaging system. Article on page 5.

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Chad K. Ellington
Secretary & Treasurer
PO Box 6356
Kent, WA 98064-6356 USA
Email: **business@occultations.org**

Send *ON* articles and editorial matters (in electronic form) to:

John A. Graves, Editor for *Occultation Newsletter,*
PO Box 280984
Nashville, TN 37228-0984 USA
Email: **editor@occultations.org**

Send Lunar Grazing Occultation reports to:

Dr. Mitsuru Sôma
V.P. for Grazing Occultation Services
National Astronomical Observatory
Osawa-2, Mitaka-shi
Tokyo 181-8588, Japan
Email: **Mitsuru.Soma@gmail.com**

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3853 Hill Song Circle
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Email: **iloc@jodc.go.jp**

Send Asteroidal Appulse and Asteroidal Occultation reports to:

Jan Manek
IOTA V.P. for Planetary Occultation Services
Stefanik Observatory
Petrin 205
118 46 Praha 1
Czech Republic
Email: **jan.manek@worldonline.cz**

Send observations of occultations that indicate stellar duplicity to:

Henk Bulder
Noorderstraat 10E
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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

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: A Book Review

Art Lucas

Today I received my copy of Walker Vaning's 8th edition of his work entitled "Pluto:Propaedeutic Pardigms". It's a rather rambling collection of his work on the once planet. The book proceeds a bit as an artist's sketchpad as Mr. Vaning ponders the data which is, was and should be in studying the planet. In these nearly 300 pages he treats rings, atmospheres, available data, conjectures on it, satellites, and, oh yes, occultations.

The book is a natural for we amateurs for we often travel an irregular path hopping from one area of interest to another. It is written as a collection of notes, which were accumulated over several years. It can, therefore, be read by opening it to any page; there to find an item of coherent, intense interest.

You have to see the book to know the man. Some of you who are older remember penning notes into the margins, which needed some new computer yet to be invented. No problem! Einstein wrote in the margins, why not we. Was Mr. Vaning grading his own papers? No, he was just hustling ahead to tell the story without being hung up on the publication details.

Finally, he has published the book himself. It arrived in a nicely bound format, printed on both sides of the paper and a good 16 mm thickness. He offers it to anyone for $30 by calling him at (415)482-0613 or writing to 1309-5th Ave, San RAfael, CA, 94901. Postage included in the USA--a bit more overseas. No credit cards are accepted. I commend the book to my IOTA friends. He thinks as we do. ■

GALILEO'S LEGACY

A celebration of small telescopes and astronomical research four centuries later

Russell M. Genet, PhD

It is my pleasure to invite IOTA members to attend and speak in the special focus sub-session on spectroscopy at Galileo's Legacy, December 31, 2008 - January 5, 2009, at the Makaha Resort, Waianae, Hawaii. If you would prefer, you could provide a poster instead of a talk, or just attend. The talks will be followed by a panel discussion, and you would be most welcome as a panel member. There will also be an informal occultation luncheon and afternoon discussion session. Please see www.GalileosLegacy.org for conference details.

This conference will not only explore the development of smaller telescopes and their instruments, but the many areas of scientific research by both amateur and professional astronomers where small telescopes excel, such as occultations. This conference will also consider how astronomical research by undergraduate students—even high school students—provides, simultaneously, a unique scientific education, a career boost, and modest contributions to the advancement of science, making these conferences of particular interest to students and educators alike. Conference proceedings, included in the registration, will be published by the Collins Foundation Press as an affordable book available by way of advanced orders at reduced prices for those unable to attend the conference.

All participants, including speakers, pay their own registration and other costs, although funds are being raised for several high school student scholarships. The leeward side of Oahu features pleasant weather in January, so I encourage you to bring your family or friends for a vacation by the beach. The conference schedule is relaxed, with plenty of time off to spend with your family (or talk telescopes or astronomy with your colleagues). Guests are welcome at all the conference social events and evening talks. The Hawaii conference features a mid-conference day off with an evening luau and speaker (Richard Berry) and a post conference tour of the Big Island and the telescopes on Mauna Kea. ■

VERY COMPACT ASTEROID OCCULTATION IMAGING SYSTEM

Scott Degenhardt

Since there is always need for more chords of data on an asteroidal occultation event, many of us are driven to find ways to both shrink and lighten a complete observing system for mobile use while simultaneously trying to push the useful limiting magnitude of this system. There have been many improvements in camera sensitivity and resolution over time and there have been a variety of ways to image with these cameras. In my early days of exploring uses of video cameras, I got an idea of replacing the eyepiece of my telescope's finder scope as a method to both guide the scope during astrophotography as well as improve my star hopping speed. So this setup has worked well for these applications for over a decade, but given the advent of the PC164C and now the EX2 version of that camera, my video finder scope is now performing on par with many smaller telescope setups.

When I bought my 10" Orion SkyQuest Dobsonian telescope, it came with a 9x50 finder scope that had a right angle lens corrector built in it designed to help eliminate both neck strain AND brain strain from trying to invert in your mind the star field you are looking at. Having acquired a PC164C-EX2 as well as some Mogg focal reducers, I felt it was time to visit the local hardware store's plumbing section and modify this 9x50 finder scope to accept my video camera. This conversion costs less than $10 for the hardware and about $90 for the Mogg focal reducer and UWAC-F camera adapter. I will detail the steps I took to perform this conversion later in this article. Always remember, this is the way I did it, but you may find another way that works better for you.

After the successful conversion, I designed an experiment to test the performance of the Orion 9x50 video finder system that would test both prime focusing on the EX2 camera as well as various spacing of a Mogg focal reducer to increase the field of view. Pictures of the following modification procedures and the full spreadsheet results of these tests can be found on our IOTA files section at:

http://tech.groups.yahoo.com/group/IOTAoccultations/files/Scotty%27s%20stuff/9X50%20video%20finder/

The result highlights are:

- Prime focus FOV & limiting magnitude: 1.1 x 1.5 degrees and faintest star = 10.7 magnitude
- 29mm FR spacing FOV and magnitude: 2.0 x 2.6 degrees and faintest star = 10.2 magnitude

Conclusion from imaging tests:

- I would aim for a Mogg FR spacing of 25mm giving me a 1.8 x 2.4 degree FOV and a limiting magnitude of around 10.5 (remember, this is both spectrum of the star, altitude off of the horizon, and seeing dependant).
- This system should reliably image any asteroidal occultation 9th magnitude or brighter, with the possibility of up to 10th magnitude events with frame stacking and/or ideal sky conditions.
- This finder scope can easily be fitted to mount on a standard camera tripod making it versatile as both a video finder scope as well as an asteroid occultation mobile system, making it easier to produce multiple chords by a single observer. I have already proven the usefulness of this with the Dec 2007 Thusnalda and the March 2008 Petit expeditions in which I used three lens type setups with a 90 percent success rate in getting data.

Now I will describe how to modify an Orion 9x50 right angle corrected finder scope.

PARTS LIST:

The Orion 9x 50 right angle corrected finder scope can be found at:
http://www.telescope.com/control/product/~category_id=finder_scopes/~product_id=07212
Also, don't forget to order a dovetail base for additional ease of use and mounting:
http://www.telescope.com/control/product/~category_id=finder_scopes/~product_id=07214

The PC164C-EX2 can be purchased at:
http://www.supercircuits.com/index.asp?PageAction=VIEWPROD&ProdID=4167

The Mogg focal reducer and the UWAC-F adapter can be found at:
http://webcaddy.com.au/astro/ProductList.asp?cat=reducer. The part number for the focal reducer is ***F-0.6FR*** and the part number for the 25mm spacing C to filter thread adapter is ***UWAC-F***.

Making a PVC Focuser:

Attaching the camera to the finder is fairly painless, but does require some more arts and crafts. First, if you are buying an Orion 9x50 finder please make sure that you get the Right Angle Correct Image Finder (http://www.telescope.com/control/product/~category_id=finder_scopes/~product_id=07212). The reason for this is that the optical tube is shorter than their standard finder, and that shorter optical spacing is needed to get the camera close enough to focus; the right angle hardware and eyepiece all unscrew from the optical tube. To make a focuser, one can buy a PVC 1 1/2" trap adapter for about 90 cents at Lowes. This is an adapter that converts 1 1/2" PVC trap to 1 1/2" drain pipe.

I also found what is called a 1 1/5" straight adapter that has a 1 1/2" male side and a female compression thread on the other side. I take that PVC adapter and spray paint it flat black. Then I take a sheet of 65# black card stock and cut two strips 3/4 inch wide and a total of 20.25 inches long (one 11" and one 9.25" strip) and I tightly wrap and scotch tape these to shim the male side of the PVC to fit snugly into the optical tube.

Shimming the EX2 Camera Body to Fit in the Focuser:

Next, I have to shim the body of the PC164C-EX2 to fit inside the 1 1/2 inch drainpipe end of the PVC adapter (the end with threads).

Before I shim the camera body with black cardstock, I need to unscrew the 1/4-20 screw hole that is in the body of the camera, as it sticks out too far and will interfere with my shimming. This simply unscrews using a standard flat head screwdriver, but don't forget to put it in a safe place so you can use the camera on a tripod again! After removing the screw hole from the camera body, I cut three strips of the same black cardstock 1 1/2 inch wide by 11 inches long and one strip 8 1/2 inches long and tightly wrap these strips, scotch taping them after every wrap around the front half of the body of the camera.

This then allows me to insert the PC164C-EX2 (with the UWAC-F, and Mogg FR attached) snuggly into the optical tube of the finder scope. You will need to adjust the depth of the camera into the PVC focuser based on the focusing a star image. You can get it close by pushing the camera into the body, and then fine tune focusing is actually done by loosening the lock ring on the objective lens and screwing the objective lens in and out. Don't forget to snug the lock ring back on the objective once final focus is reached. Once you have focused the system, you may want to tape the camera in place in the focuser and also run a piece of tape around the PVC and the optical tube to keep these from falling out during travel or use.

Adapting the 9X50 Video Finder to a Camera Tripod:

Now I will attempt to explain how I adapted the 9x50 to attach to a standard camera tripod. It costs all of roughly $2 to do this! First, go to any hardware section and buy a 4" long by 5/8 inch wide "mending brace". This is, basically, a straight bar with holes already drilled. Since the camera tripod bolt is a 1/4-20, I just attached that bar to the tripod using a 1/4-20 wing nut. (Then I can use the tripod for regular cameras again in an instant by quickly unscrewing this bar from the tripod head). I use a small 8-32 x 1/2 inch screw and nut to attach the dovetail base to this brace. Then the finder can be attached and removed via the dovetail screw for setup and breakdown when traveling.

Here are some of the pros and cons of using a video finder scope for asteroidal occultations. More of these need to be brought out after some more users of this type of system can discuss their experiences, but here are a few:

Pros:

- You simply cannot beat the portability of a one-pound optical system! This makes remote pre-point observing stations much more manageable.

- The nearly 3 degree FOV coupled with a 10th limiting magnitude makes star hopping a breeze instead of a chore. Most target areas can be found in well under 5 minutes, with the easiest ones taking under a minute to point and move on.

Cons:

- Occultations with an event duration expected to be shorter than a second should be limited to 9th or brighter (but the are a LOT of events in this range!). Frame averaging will bring you to 10th to 10.5 magnitude, but at the cost of time resolution.

- Due to the extreme sensitivity of the EX2 and the wide FOV, bright twilight or moonlight will limit your magnitude to below 9th. A study of this limit needs to be performed, but you could lose several magnitudes to bright background effects. So either a prime focus without the Mogg, or more magnification from a telescope may be needed to dim the background sky under bright sky conditions.

Other Applications of the Video Finder Scope:

- Monitoring of the entire moon for meteor strikes is possible with a manual gain camera and a prime focus FOV.
- Wider FOV can be obtained with a 1/2 inch CCD camera.
- While writing this article, I found that earth atmospheric meteors can me measured down to 9th magnitude and 1/60th second time resolution!
- Of course, using it as an actual finder scope is ideal.

I would encourage anyone to try this type of setup and report back to the IOTA group about their experiences. If anyone needs help in the PVC adaptor, I would gladly provide that, and even build one for you, as these are less than $1 to make. And remember, pictures of this procedure can be found at:

http://tech.groups.yahoo.com/group/IOTAoccultations/files/Scotty%27s%20stuff/9X50%20video%20finder/

Scott Degenhardt
Scottyd@charter.net

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:

Eberhard H. R. Bredner
IOTA/ES Secretary
Ginsterweg 14
D-59229 Ahlen 4 (Dolberg)
Germany

Phone: 49-2388-3658 (in Germany 0-2388-3658)

Hans-Joachim Bode
IOTA/ES President
Bartold-Knaust-Str. 8
D-30459 Hannover 91
Germany

Phone: 49-511-424696 (in Germany 0-511-424696)
Fax: 49-511-233112 (in Germany 0-511-233112)

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.