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Journal of the Association of Lunar & Planetary Observers

Founded in 1947

The Strolling Astronomer

Volume 48, Number 4, Autumn 2006

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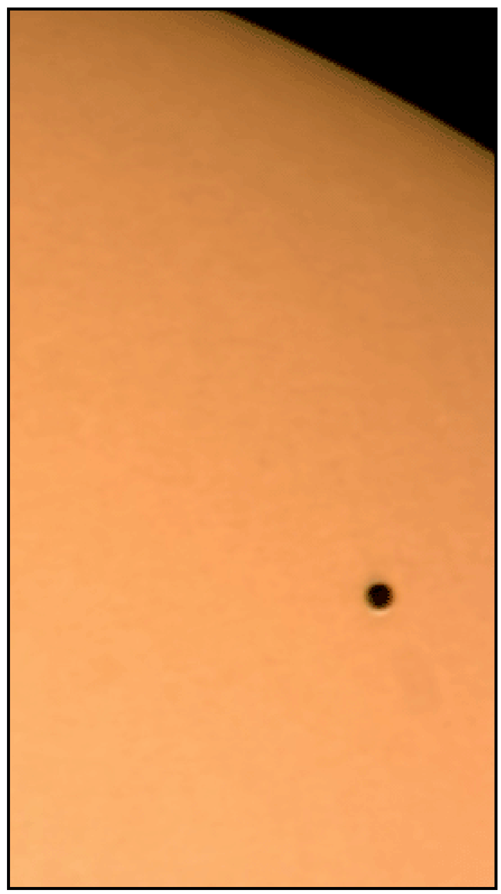
Inside. . .

- ***Mercury crosses the Sun (and lives to tell about it!)***
- ***Enigmatic lunar craters — learn all about 'em!!***
- ***Apparition reports on Venus & the Remote Planets***
- ***ALPO Conference 2006 Door Prize donors***

. . . plus reports about your ALPO section activities and much, much more



Mercury transit as seen on May 7, 2003, by Kacper Wierzchos at Lerida, Spain, using a Meade ETX90EC (90-millimeter Meade ETX Maksutov-Cassegrain) equipped with a Philps ToUcam; software processing done via K3CCD tools; image stacking by Registax. Animation of this image available at http://www.weasner.com/etx/guests/2003/mercury-transit.html

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Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

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This issue published in October 2006 for distribution in both portable document format (pdf) and also hardcopy format.

This publication is the official journal of the Association of Lunar & Planetary Observers (ALPO).

The purpose of this journal is to share observation reports, opinions, and other news from ALPO members with other members and the professional astronomical community.

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Point of View

Pluto is Now a Minor Planetary Body

By Richard Schmude, Jr., coordinator, ALPO Remote Planets Section

The International Astronomical Union (IAU) is a body of hundreds of astronomers from all areas of the world. This group of people has several responsibilities including setting nomenclature rules in astronomy. Back in August, the IAU met in Europe to discuss several matters, including the status of Pluto and other similarly-sized objects.

Several ideas were discussed and in the end, it was decided that Pluto — along with a few other objects — should be considered "minor planetary bodies".

The IAU also stated that a planet must have three characteristics, which include: it must orbit the Sun, it must have enough matter to force itself into a spherical shape, and it must have “swept out” all large objects from its orbit. Pluto does not meet the third criteria and was thus "demoted" from classification as a planet to a classification of "minor planetary body".

I feel that this decision should not have been made so soon, since we do not even know what Pluto’s surface looks like. As a result of this, planetary geologists really did not have a say in the Pluto debate. There is nothing wrong with saying that we do not have enough data to classify an object at this time. At any rate, this debate might take place again in the next decade when the New Horizons probe takes close-up images of Pluto's surface.

In the meantime, I feel that we need to follow the recommendations of the IAU, i.e., that there are officially eight planets in the solar system, along with several minor planetary bodies.

****

And finally, just for laughs, from the David Letterman show on the evening of the “big announcement”:

“Today, Pluto packed up and moved out. It said it is now going to spend more time with family. Even more sadder . . . it hung around Saturn all day trying to get a job as a moon.”

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News of General Interest

ALPO Conference Door Prize Donors Named

In appreciation for their various contributions to help make ALPO Conference 2006 the success that it was, we hereby present the list of door prizes and their donors. Just as they show their support in this manner, we ask that you show your support of them by contacting them when the time comes for your next telescope, eyepiece, filter or other astronomical goodie purchase.

Note to our online readers that the various websites listed below are linked, so that you need only to left-click your mouse on the link to visit that destination.

- **ALPO Solar Section** — Two copies of the section's totally revised handbook in pdf format on CD, *Guidelines for the Observation and Reporting of Solar Phenomena*, a 58-megabyte file which includes over 100 pages of updated techniques, pictures, and links to many solar references. This comprehensive revision was produced by Jamey Jenkins, assistant ALPO Solar Section coordinator (archivist), who also works with new observers.

- **Trey Benton**, owner of Accurate Graphics, 3128 Process Drive, Norcross, GA 30071 — Personal donation of a StarMax™ 90mm EQ Compact "Mak" telescope. Trey's company is the printer of our ALPO Journal and we appreciate his support with this donation. View this scope online at *http://www.telescope.com/shopping/product/detailmain.jsp?itemID=368&itemType=PRODUCT&iMainCat=4&iSubCat=10&iProductID=368* or phone Accurate Graphics for your own printing needs at 770-448-9408.

- **Roy Kaelin**, ALPO member & author — One copy of Mr. Kaelin's own science fiction anthology, The Star Machine and Other Tales, which traces the exploits of the O'Ryan family of Ireland over the years, including their migration to America and their founding of a band of ingenious scientists, technicians and engineers, the Travelers, who cause the greatest unrest. Advancing 21st-century industry with fabulous and fearsome machines, the Travelers launch an entrepreneurial blitz on behalf of humanity but malicious rivals frustrate their efforts at nearly every turn; published by Xlibris, subsidiary of Random House, Inc., retail value $27.84 (hard cover).

- **Jim's Mobile, Inc.**, 8550 W. 14 Ave., Lakewood, CO 80215 — Two gift certificates, each good for $50 towards the purchase of a Carrying Case from JMI. Contact JMI online at *http://www.jmitelescopes.com* or phone at 1-800-247-0304.

- **Lumicon Intl.**, 750 Easy St., Simi Valley, CA, 93065 — Two gift certificates, one for $25 and the other for $50, to be used towards the purchase price of any Lumicon product purchased directly from Lumicon or any authorized Lumicon dealer. Contact Lumicon online at http://www.lumicon.com or phone at 1-805-520-0047.

- **Orion Telescopes**, 89 Hangar Way, Watsonville, CA 95076 — One Stargazer's Filter Set (for 1.25 in. eyepieces) retail value, $79.95; one SteadyPix Camera Mount, retail value $34.95. View filter set online at *http://www.telescope.com/shopping/product/detailmain.jsp?itemID=4763&itemType=PRODUCT&iMainCat=6&iSubCat=22&iProductID=4763* View camera mount online at *http://www.telescope.com/shopping/product/detailmain.jsp?itemID=65&itemType=PRODUCT&iMainCat=6&iSubCat=29&iProductID=65*

- **Scope City,** 730 Easy St., Simi Valley, CA 93065 — Two gift certificates, each good for $45 off the purchase price of any telescope, binocular or microscope offered by Scope City. Note that Scope City also advertises in the Journal of the ALPO. Contact them online at *http://www.scopecity.com* or phone at 1-800-235-3344.

- **Software Bisque**, 912 12th St., Golden, CO 80401 — One copy of *TheSky6*™ Astronomy Software (Ver. 6.0), Student Edition, retail value $49, which is used by more observatories, controls more automated telescopes and is used in more classrooms than any other astronomy software. *TheSky6* has extensive databases that are chocked full of celestial information, all accessed at incredible speeds on a dazzling graphical display. Add to that ingenious tools like the Moon Viewer, Eclipse and Conjunction Finders, Data Wizard, Image Link, and native telescope control, and you understand why

Reminder: Address changes

Unlike regular mail, electronic mail is not forwarded when you change e-mail addresses unless you make special arrangements.

More and more, e-mail notifications to members are bounced back because we are not notified of address changes. Efforts to locate errant members via online search tools have not been successful.

So once again, if you move or change Internet Service Providers and are assigned a new e-mail address, please notify Matt Will at will008@attglobal.net as soon as possible.

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TheSky6 is astronomy's engine. Contact Software Bisque online at http://www.bisque.com or phone at 800-843-7599 (sales) or 303-278-4478 (international).

- **Tele Vue Optics, Inc.**, 32 Elkay Dr., Chester, NY 10918 — A 5 mm, Nagler Type 6 eyepiece. This is the new 7-element design update. Using different exotic materials, coating processes and design ingenuity, Al Nagler has massaged more eye-relief, contrast, and true field of view into the shorter focal length Naglers, while maintaining the absolute sharpness of the originals. Eye relief is 12mm, and, you're not limited to long focal ratio scopes, or have to squint through pinhead lenses. This is a lunar and "planetary" eyepiece with field to spare. Contact Tele Vue online at http://www.televue.com/engine/page.asp?id=11 or phone 1-845-469-4551.

And finally, we make special mention of ALPO member and conference attendee Dr. Norman Worsley who generously purchased an extremely large number of door prize tickets yet, donated doorprizes he would have received to others. The man has class.

Reminder: New ALPO Solar Observing Handbook

By Kim Hay, acting coordinator, ALPO Solar Section

Remember, the ALPO Solar Section announces the release of its totally revised handbook, *The Association of Lunar and Planetary Observers Solar Section - Guidelines for the Observation and Reporting of Solar Phenomena*, produced by Jamey Jenkins, assistant coordinator and archivist, and who works with new ALPO solar observers.

This new handbook includes up-to-date techniques, many images and links to many solar references.

The new handbook is provided as a 58-megabyte file (over 100 pages) in pdf on CD for $10 USD.

To order, send check or US money order made payable to Jamey Jenkins, 308 West First Street, Homer, Illinois 61849; e-mail to jenkinsjl@yahoo.com

ALPO Resources Updates

With new phone numbers, etc, in place, don't forget to refer to the *ALPO Resources* at the back of each Journal before you correspond with any of the ALPO staff or board members. Changes have been made.

ALPO Membership Online

The ALPO accepts membership payment by credit card via a special arrangement with the Astronomical League. However, in order to renew by this method you MUST have Internet access. See the ALPO membership application form in the ALPO Resources section later in this Journal for details.

ALPO Observing Section Reports

Eclipse Section

By Mike Reynolds, coordinator

Visit the ALPO Eclipse Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/eclipse.html

Meteors Section

By Robert Lunsford, coordinator

It is difficult to believe but the September 2006 issue marked the 50th issue of the ALPO Meteors Section Newsletter, first started shortly after I became the coordinator back in 1992.

Mr. David Levy, who was the coordinator of this section during the late 80's, also produced several newsletters during his tenure. My early productions now seem quite primitive, with endless lists of radiants, many of them now obsolete. We have come a long way since then. The radiant list is now pared down to a couple dozen showers that are easily observed by visual means.

Many of the same trusted observers who mailed in data back in 1992 are still around. Their contributions are the backbone of this section. I would particularly wish to acknowledge the efforts of Vincent Giovannone, George Gliba, Robin Gray, Robert Hays Jr., and Robert Togni. These gentlemen have been active observers and contributors to this section during a majority of my tenure as section coordinator. I sincerely appreciate their efforts!

We have seen a lot of meteor activity during the last 14 years. Back in 1992, Comet Swift-Tuttle arrived back in the inner solar system for the first time in 130 years. This arrival heralded fresh debris for the Perseid shower and strong displays throughout the '90's. In 1994, I had the privilege to witness a rare outburst of the Alpha Aurigid shower. The radiant was low at the time and all the Alpha Aurigids were beautiful "earthgrazers". In 1995, an outburst of the Alpha Monocerotids was seen by European observers. In 1998, a surprise outburst of the June Bootids caught everyone off guard. Later that year the first of a series of notable Leonid displays occurred. This was the famous Leonid fireball shower. Rates were not the strongest, but the numerous fireballs impressed everyone. The Leonids continued to impress observers for the next four years with several meteor storms.

These extraordinary displays will continue into the 21st century with a possible outburst of the Alpha Aurigids predicted for 2007. I look forward to this and other exciting events in the future. It has been a pleasure and a privilege to publicize and report these events to you. I look forward to the next 50 issues and hopefully we will be able to continue to share our experiences through our newsletter.

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Visit the ALPO Meteors Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/meteors.html*

Comets Section

By Ted Stryk, acting coordinator

The ALPO Comets Section recent observations page has been updated. Images from ALPO contributors can be seen by going to *http://pages.preferred.com/~tedstryk/*

Visit the ALPO Comets Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/comets.html*

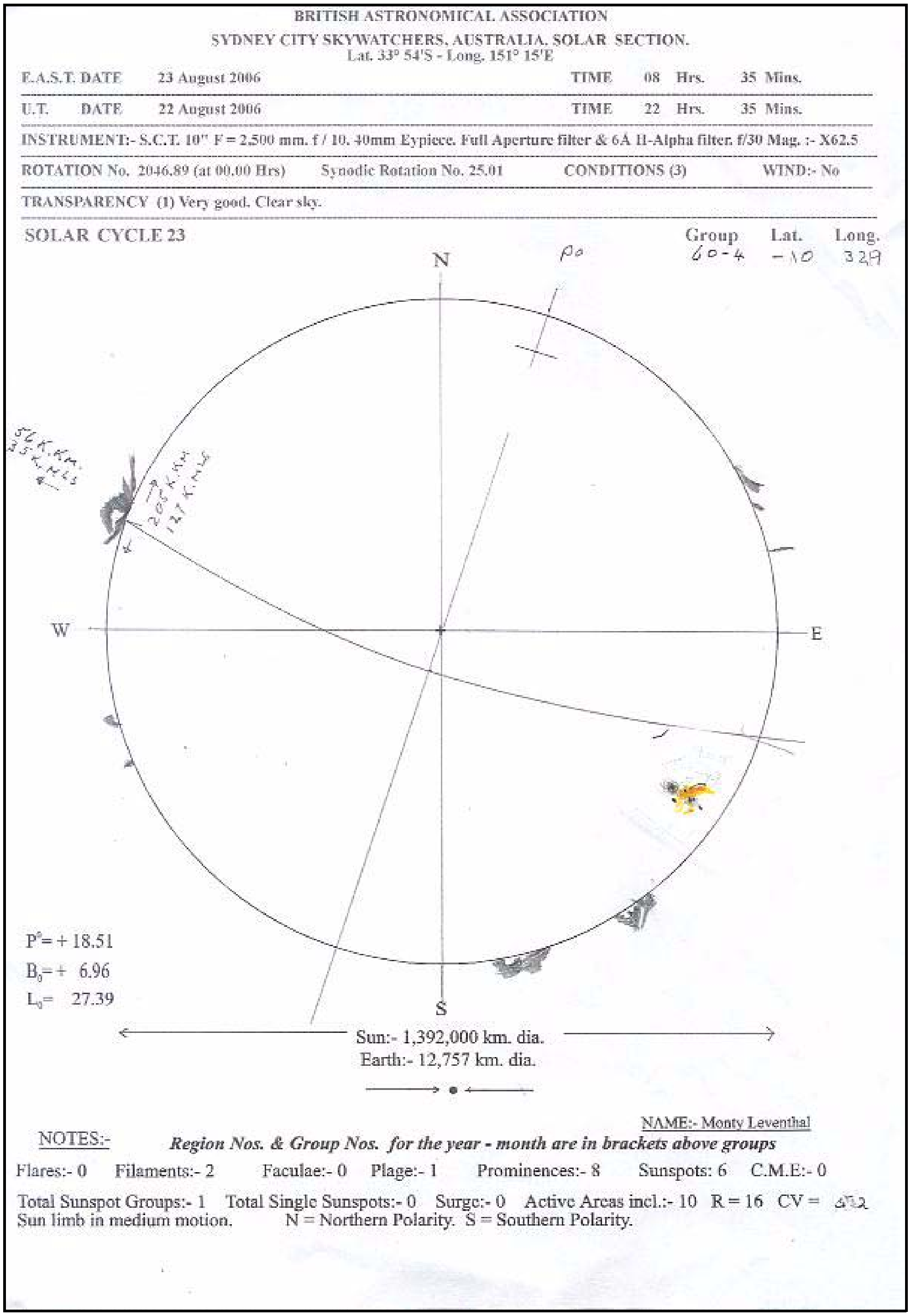
Solar Section

By Kim Hay, coordinator

The Sun has been fairly active recently. With this report, we present a sketch submitted by Monty Leventhal of the BAA, Sydney City Skywatchers (Australia) Solar Section of his observation in August (Carrington Rotation2046) of sunspot group of AR0904. (insert picture diagram. We also include a beautful image taken by Howard Eskildsen of Okala, Florida, USA, in September (CR2047) of sunspot group of AR0910.

As this report is written (in late September 2006), we are into CR2048.

The ALPO Solar group has had over 126 images/drawings submitted by 7 members contributing. You can view their work at *http://www.lpl.arizona.edu/~rhill/alpo/solar.html* Once there, scroll down and left-click on the "Recent ALPOSS Observations" link.



If you wish to contribute to the ALPO Solar Section, send your images or drawings electronically to kim@starlightcascade.ca Please be sure that your digital images are no more than 200 kilobytes and are in the jpeg graphics file format.

If you are unsure on how to go about submitting your work, drop me an e-mail, or

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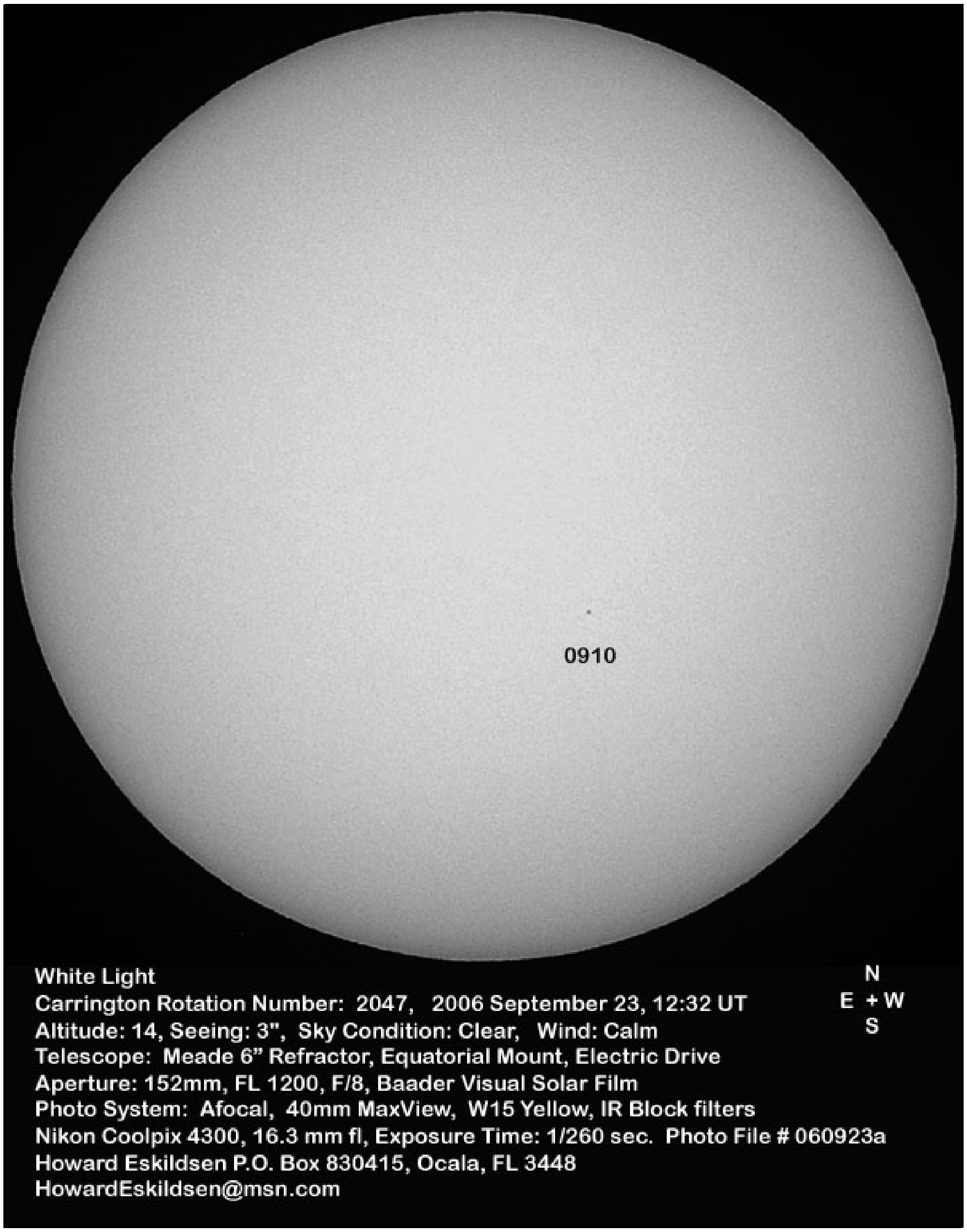

— better yet — join the Solar ALPO Yahoo group at *http://www.yahoo.com* ; go to groups and look for "Solar-ALPO" and sign in to join. I look forward to seeing your images of our Sun.

There is a more detailed report by Jamey Jenkins to be included in an uipcoming issue of this Journal.

To join the Solar Section e-mail group, and learn how to observe safely, with proper filtering, and how to take images, visit *http://www.yahoo.ca* and check out the Solar-ALPO group, subscribe to *Solar-ALPO-subscribe@yahoogroups.com*

We look forward to hearing from you and knowing what your observations are for the upcoming Carrington rotation periods.

Recently submitted observations may be viewed on the Web at *http://www.lpl.arizona.edu/~rhill/alpo/solstuff/recobs.html* Join the ALPO Solar Section e-mail list by going to *http://groups.yahoo.com/group/Solar-ALPO/*

Submit all observations to *kim@starlight-cascade.ca* . Visit the ALPO Solar Section on the World Wide Web at *http://www.http://www.lpl.arizona.edu/~rhill/alpo/solar.html*

Mercury Section

By Frank J. Melillo, coordinator

After Mercury passes in front of the Sun on November 8, it will enter in the morning sky. This will be quite favorable as seen from the northern hemisphere. Mercury will be clearly visible with the naked eye from Nov. 20 until Dec. 11.

On Nov. 25, Mercury reaches greatest elongation 20 degrees west of the Sun. Then, on Dec. 11, there will be a three-planet conjunction involving Mercury, Mars and Jupiter. Unfortunately, all three will be low in the eastern sky about 45 minutes before sunrise. But a pair of binoculars would be a big help locating faint Mars 1.0 degree to the lower right of Mercury; and Jupiter is 0.25 degree below Mercury. It should be a fine sight!

Telescopically, it will be a great opportunity to see the possible feature near the terminator. Most of the time, the 280-degree longitude will be facing us. The area contains perhaps the darkest feature anywhere on the planet. This marking is called Skinakas Basin / Solitudo Amphrodites area. Within the last five years, observers such including Tim Wilson, Mario Frassiti and Carl Roussell have successfully drew a dark marking around 280 degrees longitude just north of equator. I am hoping this will be repeated again to confirm this. The only way to find out is to get out and observe it!.

Visit the ALPO Mercury Section on the World Wide Web at *http://www.http://www.lpl.arizona.edu/~rhill/alpo/merc.html*

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Venus Section
By Julius Benton, coordinator

Circumstances of the current 2006 Western (Morning) Apparition of Venus and (for observational activity planning purposes) the forthcoming 2006-07 Eastern (Evening) Apparition are as shown in the accompanying table on this page.

As late as August 2006, Venus continues passage through its waxing phases (a gradation from crescent through gibbous phases), slowly diminishing in angular diameter from about 62 arcseconds back in January to roughly 10 arcseconds nearing Superior Conjunction in October.

Observational coverage has been good this apparition, despite the necessity for individuals to rise early before sunrise to catch Venus in the eastern sky. So far, the ALPO Venus Section has received 265 ccd and webcam images (many in UV and IR wavelengths) and drawings. Observers are always encouraged totry to view Venus as close as possible to the same time and date (simultaneous observations) to improve confidence in results and reduce subjectivity.

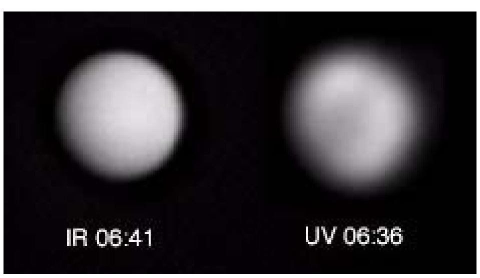
Geocentric Phenomena in Universal Time (UT)

2006 Western (Morning) Apparition

Inferior Conjunction	2006	January 14^{d} UT (angular diameter = 62”)
Greatest Brilliancy		February 18^{d} (m_v = -4.6)
Greatest Elongation West		March 25^{d} (Venus is 47º west of the Sun)
Predicted Dichotomy		March 26.21^{d} (Venus is exactly at half-phase)
Superior Conjunction		October 27^{d} (angular diameter = 9.7”)

2006-07 Eastern (Evening) Apparition

Superior Conjunction	2006	October 27^{d} UT (angular diameter = 9.7”)
Predicted Dichotomy	2007	June 8.65^{d} (Venus is predicted to be exactly at half-phase)
Greatest Elongation East		June 9^{d} (Venus will be 45º east of the Sun)
Greatest Brilliancy		July 12^{d} (m_v = – 4.6)
Inferior Conjunction		August 18^{d} (angular diameter = 60”)



Two images of Venus taken by David Arditti of Edgware, Middlesex, UK, on 2006 August 29 at 06:36UT (UV image) and 06:41 (IR image) using Celestron 28.0 cm (11.0 in) SCT at f/21 and a Philips ToUcam webcam with Baader UV 320-390nm and Baader IR Pro 807nm filters, respectively. Note the obvious dusky atmospheric features on Venus in the UV image. The planet on this date had an angular diameter of 10.3^{2} and a gibbous phase of k = 0.963 (nearly full phase). South is at the top of the image.

The Venus Express (VEX) mission began systematically monitoring Venus at UV, visible (IL) and IR wavelengths in late May 2006. As part of an organized Professional-Amateur (Pro-Am) effort, a few ALPO Venus observers have submitted high quality digital images of the planet taken in the near-UV and near-IR, as well as other wavelengths through polarizing filters. The observations should continue to be contributed in JPEG format to the ALPO Venus Section Coordinator as well as to the VEX website at: *http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=38833&fbodylongid=1856*.

Observational Highlights

- 150 CCD and webcam images of Venus have been submitted.
- 115 drawings and intensity estimates of dusky features suspected on Venus have been received.
- Numerous UV images have shown dusky banded and amorphous atmospheric features.
- No instances of dark hemisphere phenomena (e.g., Ashen Light) have been reported.
- Pro-Am collaboration in association with the Venus Express (VEX) mission is continuing.
- Incidence of simultaneous observations of Venus is increasing.

Key Observational Pursuits

- Visual observations and drawings in dark, twilight, and daylight skies to look for atmospheric phenomena including dusky shadings and features associated with the cusps of Venus
- Visual photometry and colorimetry of atmospheric features and phenomena
- Monitoring the dark hemisphere for Ashen Light
- Observation of terminator geometry (monitoring any irregularities)

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- Studies of Schröter's phase phenomenon near date of predicted dichotomy
- Routine CCD and webcam imaging of Venus at visual, UV, and IR wavelengths
- Special efforts to accomplish simultaneous observations
- Contribution of observation data and images to the Venus Express mission is encouraged

The ALPO Venus Section invites interested readers worldwide to join us in our projects and challenges ahead.

Complete details can be found about all of our observing programs in the ALPO Venus Handbook. Individuals interested in participating in the programs of the ALPO Venus Section are cordially invited to visit the ALPO Venus Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/venus.html*

Lunar Section:

Lunar Meteoritic Impact Search

By Brian Cudnik, coordinator

Information on impact-related events can be found at *http://www.i2i.pvamu.edu/physics/lunimpacts.htm*

Visit the ALPO Lunar Meteoritic Impact Search site on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/lunimpacts*

Lunar Topographical Studies / Selected Areas Program

By William M. Dembowski, FRAS section coordinator

During the first six months of 2006, the Lunar Topographical Studies Section received a total of 312 images of the lunar surface from 25 observers in 11 countries. Of these, 294 (94%) were digital images while the balance (18 = 6%) were sketches. In addition, the Section received 73 timings of stars occulted by the Moon. Although the ALPO does not presently have a formal program for the timing of lunar occultations, it is our practice to retain all lunar observations in the event they may be of some future use.

As part of an ongoing Topographical Section program, observers are assigned a specific feature or class of features to study on a bi-monthly basis. During the first half of 2006, those assignments were Eratosthenes, Pitatus, and Mare Serenitatis. Participation was excellent for all assignments and the resulting reports were published in the March, May, and July issues of the Lunar Section newsletter (The Lunar Observer).

The Lunar Topographical Studies Section has long been using the Lunar Section's monthly newsletter, *The Lunar Observer* (TLO), to display the work of its members. Now averaging 600 hits per month, the online version of TLO is read by lunar observers all over the world.

Interestingly, the author of one of its most popular features, The Feature of the Month, receives the newsletter in hard-copy form because he doesn't own a computer. Robert H. Hays of Worth, Illinois, is a traditionalist who uses a 42-year-old, 6-inch Newtonian to observe the Moon and make his occultation timings. A skilled and dedicated observer, Robert's sketches and observing notes have graced the front page of every TLO since July 1997 and play a large part in the popularity of the newsletter.

Every month for nearly 10 years, Robert has proven that a modest telescope, along with pencil & paper, are the only equipment necessary for valuable lunar observing as long as they are frequently and skillfully used.

Readers are encouraged to view Robert's work on the front page of any TLO. Current and back issues can be found at: *http://www.zone-vx.com/tlo_back.html*

Visit the following web sites on the World Wide Web for more info:

- ALPO Lunar Topographical Studies Section *http://www.zone-vx.com/alpo_topo.htm*
- ALPO Lunar Selected Areas Program *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/selarea.html*
- ALPO Lunar Topographical Studies Smart-Impact WebPage *http://www.zone-vx.com/alpo-smartimpact.html*
- *The Lunar Observer* *http://www.zone-vx.com/tlo.pdf*

Lunar Dome Survey

Marvin Huddleston, FRAS, coordinator

Visit the ALPO Lunar Dome Survey on the World Wide Web at *http://www.geocities.com/kc5lei/lunar_dome.html*

Lunar Transient Phenomena

By Dr Anthony Cook, coordinator

Since the last ALPO LTP subsection report (JALPO47-4), five new LTPs have come to light, though it should be stressed that as these are all "unconfirmed observations". However the two reports below marked with asterisks (*) are especially intriguing. Observational reports are summarized monthly in the ALPO Lunar Section newsletter *The Lunar Observer*. Observers from Australia, Belgium, Brazil, Canada, the UK and the USA have contributed to date:

- 2006 Jan 04 UT 18:32 Gutenburg C - seen by Tony Buick.
- 2006 Jan 08 UT 20:30-20:45 Aristarchus - seen by Clive Brook.
- 2006 Jan 22 UT 06:34-06:36 Tycho - seen by Fabio Carvalho (Rede de Astronomia Observacional, Brazil).*
- 2006 Feb 08 UT 20:10-20:51 Plato - seen by Clive Brook.
- 2006 Jun 05 UT ~21:30 Copernicus - seen by Geoff Burt (Soc. Pop. Astronomy).*

During the past year, this LTP coordinator has been busy at work installing robotic telescopes (a 10-in. and an 11-in.) on the roof of a library at his university. Although

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multi-purpose for use with a wide range of astronomical targets, it is hoped that some time may be scheduled for LTP searches.

The scopes are equipped with filters in a computer controlled wheel: UBVRI on one scope and two polarizing and four narrow band filters on the other scope. The polarizing filters could be used to look for LTP such as the ones imaged in Langrenus (see the 2000 Icarus paper by Dollfus). Also one of the narrow band filters should overlap with the 860nm emission lines of Radon (a gas known to leak from the interior of the Moon). Being a heavy gas, it can accumulate in the vicinity of exit fractures on the surface and it has been suggested in the past that it may be associated with LTP.

Visit the ALPO Lunar Transient Phenomena program on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/ltp.html and http://www.ltpresearch.org/*

Mars Section

By Dan Troiani, coordinator & Daniel P. Joyce, assistant coordinator

The Section is taking the time provided by the current conjunction to review the observations and data from the favorable apparition of 2005. We had 275 observers from around the world with over 4,500 observations. Most were webcam images, but CCD images and visual drawings were also well-represented. Only three film photographs were submitted during this apparition.

The final version of the 2004-2005-2006 Apparition Report is currently being written for submission to this Journal. The number of observers, volume of observations submitted and especially the quality of observations are encouraging and without precedent.

The ALPO Mars Section is also fending off rumors of a "super-close" approach of Mars to the Earth that are now so ingrained into our culture that it was even on the Disney radio channel recently!

Preparations for the "intermediate" apparition of 2007 are also underway. The 2007 pre-apparition report is already on the ALPO Mars Section website courtesy of one Jeffrey Beish. Go to either: *http://www.tnni.net/~dustymars/2007_MARS.htm* or *http://www.tnni.net/~dustymars/Article_2007.htm*

Visit the ALPO Mars Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/mars.html*

Minor Planets Section

By Frederick Pilcher, coordinator

Following the new planetary definitions adopted by the IAU in Prague in August, 2006, the ALPO Minor Planet Section staff agree that the names of the ALPO Minor Planets Section and the Minor Planet Bulletin will remain unchanged, and the scope of their activities is unaffected. Ceres continues to be asteroid No. 1, and also acquires the dual designation as an asteroid and a dwarf planet.

Brian D. Warner has published a second edition of "A Practical Guide to Lightcurve Photometry and Analysis," (available from Springer Science + Business Media, 2006, 298 pages, 110 illustrations, ISBN 0-387-29365-5, price US $39.95, *http://www.springer.com*. This is a remarkably clearly written guide which comprehensively explains all of the background material and every procedure a novice needs in order to do his own original research in the field.

Minor Planet Bulletin Vol. 33, No. 4, contains lightcurves and rotation period determinations for 91 different asteroids. Some of these are the first ever published for the asteroid; some are improvements from earlier determinations; some are at new aspects to aid in shape modeling, and a few are in support of radar observations.

Asteroids included are No. 53, 58, 71, 165, 171, 216, 268, 276, 291, 293, 314, 353, 453, 454, 486, 535, 618, 633, 683, 698, 710, 762, 774, 1016, 1043, 1064, 1115, 1186, 1304, 1319, 1320, 1326, 1384, 1396, 1484, 1490, 1523, 1546, 1592, 1653, 1854, 1889, 1950, 2104, 2047, 2195, 2221, 2288, 2501, 2725, 3318, 3642, 4077, 4091, 4490, 4580, 4608, 4985, 5080, 5222, 5430, 6159, 6170, 6185, 6296, 6384, 6393, 6859, 7360, 7563, 7760, 8213, 9483, 9992, 10909, 11271, 12271, 12290, 12317, 14257, 15350, 17509, 19204, 21022, 31383, 33116, 34442, 35369, 35690, 68950, 85840.

We remind all users and inquirers that the *Minor Planet Bulletin* is a refereed publication. It is now available on line at *http://www.minorplanetobserver.com/mpb/default.htm*

In addition, please visit the ALPO Minor Planets Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/minplan.html*

Jupiter Section

By Richard W. Schmude, Jr., coordinator

Jupiter will be low in the southeastern sky in October and will reach conjunction in November. Please be sure to send in any Jupiter observations to Richard Schmude, Jr. for the Jupiter report to be released in the next calendar year. Currently, this coordinator is writing a book about the remote planets and hopes to finish this project in about one year's time.

Visit the ALPO Jupiter Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/jup.html*

Galilean Satellite Eclipse Timing Program

By John Westfall, Jupiter Section assistant coordinator

This coordinator will be happy to supply prospective observers with an observing

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kit which includes an observation reporting form; you can contact him via e-mail at johnwestfall@comcast.net; or write to him at ALPO, P.O. Box 2447, Antioch, CA 94531-2447 USA

Saturn Section

By Julius Benton, coordinator

Circumstances of the 2005-06 and 2006-07 apparitions of Saturn are as shown in the accompanying table on this page.

Saturn entered conjunction with the Sun on 2006 August 7, thereby ending the 2005-06 apparition; a full apparition report will follow in this Journal once all observations and images have been received and a thorough analysis performed.

The 2006-07 observing season is well underway with a few images and drawings of the planet already arriving. Saturn is visible low in the eastern sky before sunrise, progressively increasing in western elongation and reaching opposition on 2007 February 10 when it will be well-placed for observing for most of the night. During this apparition, the southern hemisphere and south face of the rings are visible from Earth, but portions of the northern hemisphere of Saturn can be glimpsed now that the tilt of the rings to our line of sight has diminished to roughly -14°.

Activities of the ALPO Saturn Section this apparition include:

- Visual numerical relative intensity estimates of belts, zones, and ring components.
- Full-disc drawings of the globe and rings using standard ALPO observing forms.
- Central meridian (CM) transit timings of details in belts and zones on Saturn's globe.
- Latitude estimates or filar micrometer measurements of belts and zones on Saturn.
- Colorimetry and absolute color estimates of globe and ring features.
- Observation of "intensity minima" in the rings in plus studies of Cassini's, Encke's, and Keeler's divisions.
- Systematic color filter observations of the bicolored aspect of the rings and azimuthal brightness asymmetries around the circumference of Ring A.
- Observations of stellar occultations by Saturn's globe and rings.
- Visual observations and magnitude estimates of Saturn's satellites.
- Multi-color photometry and spectroscopy of Titan at 940nm - 1000nm.
- Regular imaging of Saturn and its satellites using webcams, digital and video cameras, and CCDs.

For 2006-07, imagers are urged to carry out simultaneous visual observations of Saturn on the same night and as close as possible to the same time images are taken. All observers should make comparisons of what can be seen visually vs. what is apparent on their images, without overlooking opportunities to make visual numerical intensity estimates using techniques as described in the author's new book, *Saturn and How to Observe It*, available from Springer, Amazon.com, etc.

Furthermore, the Saturn Pro-Am effort began back on 2004 Apr 01 when the Cassini probe started observing the planet at close range; observers are encouraged to participate in this effort as the Cassini mission continues during the 2006-07 apparition and beyond. Using classical broadband filters (Johnson UBVRI system) on telescopes with suggested apertures of 31.8 cm (12.5 in.) or more, observers should image Saturn through a 890nm narrow band methane (CH_4) filter.

Observers should image Saturn every possible clear night in search of individual features, their motions and morphology. Resulting data serve as input to the Cassini imaging system, thereby suggesting where interesting (large-scale) targets exit. Suspected changes in belt and zone reflectivity (i.e., intensity) and color will be also useful, so visual observers can play a vital role by making careful visual numerical relative intensity estimates in Inte-

Geocentric Phenomena in Universal Time (UT)		
	2005-06 Apparition	2006-07 Apparition
Conjunction	2005 Jul 23^d UT	2006 Aug 07^d UT
Opposition	2006 Jan 27^d	2007 Feb 10^d
Conjunction	2006 Aug 07^d	2007 Aug 21^d
Opposition Data:		
Equatorial Diameter Globe	20.4″	20.2″
Polar Diameter Globe	18.6″	18.0″
Major Axis of Rings	46.3″	45.8″
Minor Axis of Rings	18.2″	11.0″
Visual Magnitude (m_v)	–0.2m_v (in Cancer)	–0.0m_v (in Leo)
B =	–18.9°	–13.8°

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grated Light (no filter) and with color filters of known transmission.

The Cassini team will combine ALPO images with data from the Hubble Space Telescope and from other professional ground-based observatories. Observations should be immediately dispatched to the ALPO Saturn Section throughout the 2006, 2007, and 2008 apparitions for immediate dispatch to the Cassini team.

The ALPO Saturn Section is grateful for the work of so many dedicated observers who take the time to send us observations and images. Our efforts have prompted more and more professional astronomers to request drawings, images, andsupporting data from amateur observers and imagers worldwide.

Information on ALPO Saturn programs, including observing forms and instructions, can be found on the Saturn page on the official ALPO Website at http://www.lpl.arizona.edu/~rhill/alpo/sat.html

All are invited to also subscribe to the Saturn e-mail discussion group at Saturn-ALPO@yahoogroups.com

Remote Planets Section

By Richard W. Schmude, Jr., coordinator

Uranus and Neptune will be well-placed in the evening sky during October and November. Please be sure to read the Uranus article (authored by Frank Melillo and this coordinator) in the October 2006 issue of *Sky & Telescope* magazine.

I am especially interested in images that show some change on Uranus. Please also remember that when you take an image of Uranus that you take a second overexposed image showing the moons of Uranus.

I have already received images from over a dozen people. Several of the images including those by Don Parker, Ralf Vandebergh and Rolando Chaves show a bright south polar region. Chris Go reported seeing this bright region visually. Please get out and observe Uranus and send me any drawings that you make.

Remote planets observers are urged to submit their own brightness measurements of Uranus, Neptune and Pluto to the ALPO Remote Planets Section, c/o Richard Schmude, Jr. (e-mail to: schmude@gdn.edu).

Visit the ALPO Remote Planets Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/remplan.html

ALPO Interest Section Reports

Computing Section

By Kim Hay, coordinator

Visit the ALPO Computing Section on the World Wide Web at: http://www.lpl.arizona.edu/~rhill/alpo/computer.html

Lunar & Planetary Training Program

By Tim Robertson, coordinator

The ALPO Training Program currently has three active students at various stages of training. No one has graduated from the program in the past year.

The ALPO Training Program is a two-step program, and there is no time requirement for completing the steps. But I have seen that those students that are motivated usually complete the steps in less than 12 months. Their motivation comes from the desire to improve their observing skills and contribute to the pages of the Journal of the ALPO.

The Lunar and Planetary Training Program is open to all members of the ALPO, beginner as well as the expert observer. The goal is to help make members proficient observers. The ALPO revolves around the submission of astronomical observations of members for the purposes of scientific research. Therefore, it is the responsibility of our organization to guide prospective contributors toward a productive and meaningful scientific observation.

The course of instruction for the Training Program is two-tiered. The first tier is known as the "Basic Level" and includes reading the ALPO's Novice Observers Handbook and mastering the fundamentals of observing. These fundamentals include performing simple calculations and understanding observing techniques.

When the student has successfully demonstrated these skills, he or she can advance to the "Novice Level" for further training where one can specialize in one or more areas of study. This includes obtaining and reading handbooks for specific lunar and planetary subjects. The novice then continues to learn and refine upon observing techniques specific to his or her area of study and is assigned to a tutor to monitor the novice's progress in the Novice Level of the program.

When the novice has mastered this final phase of the program, that person can then be certified to Observer Status for that particular field.

For information on the ALPO Lunar & Planetary Training Program on the World Wide Web, go to http://www.cometman.net/alpo/ ; regular mail to Tim Robertson at 2010 Hillgate Way #L, Simi Valley CA, 93065; e-mail to cometman@cometman.net

Instruments Section

By R.B. Minton, coordinator

Visit the ALPO Instruments Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/inst.html and http://mypeoplepc.com/members/patminton/astrometric_observatory/

Feature Story:

A Convenient Transit of Mercury: November 8-9, 2006

By: John E. Westfall, coordinator, ALPO Mercury/Venus Transit Section
johnwestfall@comcast.net

Abstract

The 2006 transit will be Mercury's last until 2016, but fortunately its first portion will be visible throughout the Americas and the entire event can be seen from western North America and the eastern and central Pacific. Also, the last part of the transit will be visible from East Asia and the western Pacific.

The ALPO Transit Section invites visual, film, and electronic observations of transit optical phenomena, such as the "black drop," as well as timings of the transit contacts.

Introduction

This Fall, we will experience the last transit of a planet across the Sun until that of Venus in 2012, and the last transit of Mercury until 2016. Thus we are fortunate that the 2006 transit is timed so that observers anywhere in the Americas will be able to see at least part of the event, and those on the Pacific coast will be able to watch all of it.

Transit Parameters

Figure 1 diagrams the appearance of the upcoming transit, while Table 1 (see Appendix) gives some descriptive statistics for the event, where all times are in UT (Universal Time). Its total duration is slightly under five hours from *ingress*, the entrance of Mercury onto the Sun's disk, to *egress*, its exit from the Sun.

Some important points from the table are:

- Wherever you are in the visibility zone, the times of the transit events and the path of Mercury will be almost the same as for the hypothetical geocentric view. Nonetheless your location is still critical, as the times of local sunrise and sunset will determine whether you can see the transit at all, and if so which part of the transit you can see; ideally some observers may be able to watch the entire transit from beginning to end.
- Mercury's disk will be very small, both absolutely and in relation to the Sun – you will need to look carefully simply to identify the planet.
- Compared with its tiny disk, the planet will move very rapidly across the Sun's limb, limiting to a few seconds the length of video sequences that can be stacked without blurring the planet, the solar limb, or both.

Where Can the Transit Be Seen?

Figure 2 shows the zones worldwide where the 2006 Transit of Mercury will be visible. As the transit takes place in late northern-hemisphere Fall, the southern hemisphere is favored for this transit. (The Earth's northern hemisphere had the best views of the May 2003 transit of Mercury and the June 2004 transit of Venus.) As with any transit, there are four visibility zones, depending largely on one's longitude:

1. Localities that miss the transit completely because it starts after local sunset and ends before local sunrise. In 2006 these include central, southern and western Asia and all of Africa and Europe.
2. Areas where the Sun rises before Mercury's ingress starts, but where the Sun sets with the transit still going on. Most of the Americas falls in this category.
3. A region centered on the Pacific basin, but including New Zealand, easternmost Australia and the Pacific coast of North America where ingress occurs after sunrise and egress before sunset; thus the entire transit will be visible.
4. Finally, eastern Asia and most of Australia will see the Sun rise with the transit already in progress, but will see the transit end before the Sun sets.

Although observers in western Canada and the United States are fortunate in being able to watch the whole transit, it will end with the Sun close to their southwestern horizon. **Figure 3** is an enlarged view of western and northwestern North America, highlighting how close the Sun will be to the horizon when the transit ends.

Table 2 in the Appendix gives the time period of visibility of the upcoming transit for the major metropolitan areas that can see some or all of the event. The Appendix table takes into account the times of sunrise (SR) and sunset (SS) for each area, assuming you have no horizon obstructions.

Observing the Transit

You can't observe a transit without observing the Sun, so you must take all the precautions you would when observ-

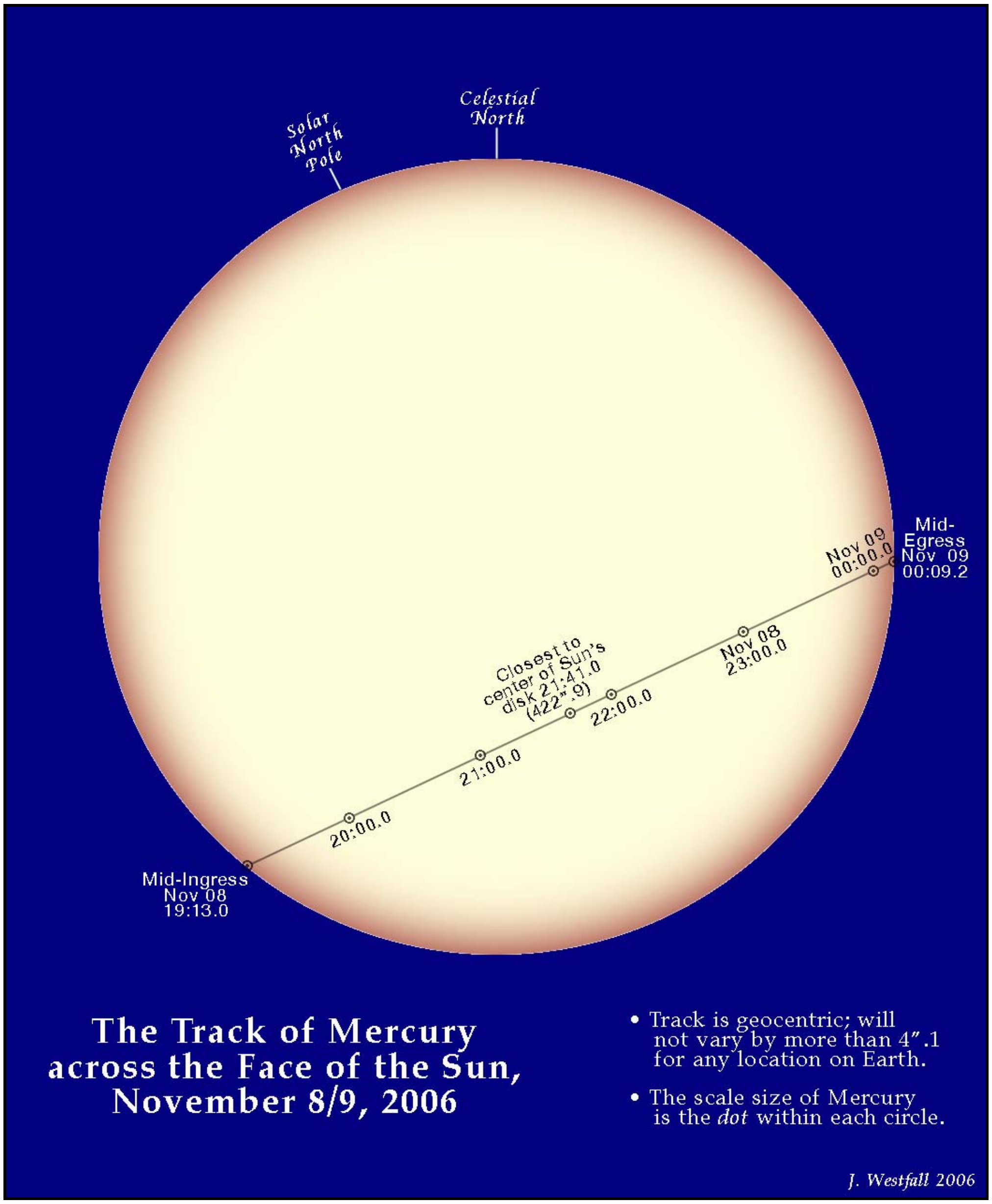

Figure 1. Apparent path of Mercury during its transit across the face of the Sun on 2006 NOV 08-09. All times are UT (Universal Time). Celestial north at top. Mercury is the small dot within each circle and is to scale with the disk of the Sun.

ing the partial or annular phases of a solar eclipse. There are only three safe ways to observe the Sun:

1. Use a small aperture with a specially-designed narrow-band solar filter, most often one that passes light within only a few tenths of an Ångstrom unit centered on the hydrogen-alpha wavelength of 6562.8 Å.

2. Use a full-aperture solar filter on the front end of your telescope. The filter should pass no more than 0.00001 (one one-hundred thousandth) of the light in the visible, ultraviolet and infrared bands and should not have scratches or pinholes. Remember to similarly filter your finder, or cover its lens entirely. If using binoculars, safely filter both lenses.

3. Project the Sun's image through the eyepiece onto a white screen. This allows several people to watch simultaneously. There are several disadvantages, however. First, contrast is low unless the screen is thoroughly shaded. Second, someone may foolishly try to look directly through the eyepiece. Third, the unfiltered sunlight inside your telescope will heat up its optics. This may actually shatter in the eyepiece, or the secondary or diagonal mirror. The same may happen with any filter placed behind the eyepiece; these so-called solar filters should be avoided entirely.

Mercury can be spotted on the Sun with low-power safely filtered binoculars, but you will probably need a telescope magnifying at least 50 times, and 60 mm aperture or larger, to see the details of ingress and egress and time the four transit contacts, as diagrammed in **Figure 4**.

Contact 1 is the most difficult to time because the planet starts to "notch" the Sun's disk without any warning. You will need to orient the telescopic field prior to this event in order to catch it. With an undriven telescope, the Sun's motion defines celestial west. With an equatorial mounting, you can move the telescope to determine celestial directions; the position angle of first contact on the solar limb will be 4/7 of the way from east to south. Also, viewing with a narrow-band hydrogen alpha filter enables you to see Mercury silhouetted on the Sun's chromosphere just before it first touches the photosphere (which defines First Contact).

The remaining contacts would seem much easier to time accurately. However, the telescopic image is always somewhat blurred by atmospheric seeing and the finite resolution of one's optical system. This creates the famous "black drop" effect – a temporary fuzzy appendage connecting the limbs of Mercury and the Sun that makes exact contact timing impossible. **Figure 5**, a high-resolution composite image of the May 2003 transit of Mercury, illustrates the black-drop phenomenon.

The ALPO Mercury/Venus Transit Section (P.O. Box 2447, Antioch, CA 94531-2447 or johnwestfall at comcast.net) would like to receive your contact times in order to study the effects of the atmosphere and telescopic characteristics on timing accuracy. Please report times to 1-second UT precision, and include your observing site's position (to 0°.01 or 1 arc-minute latitude and longitude); your telescope's

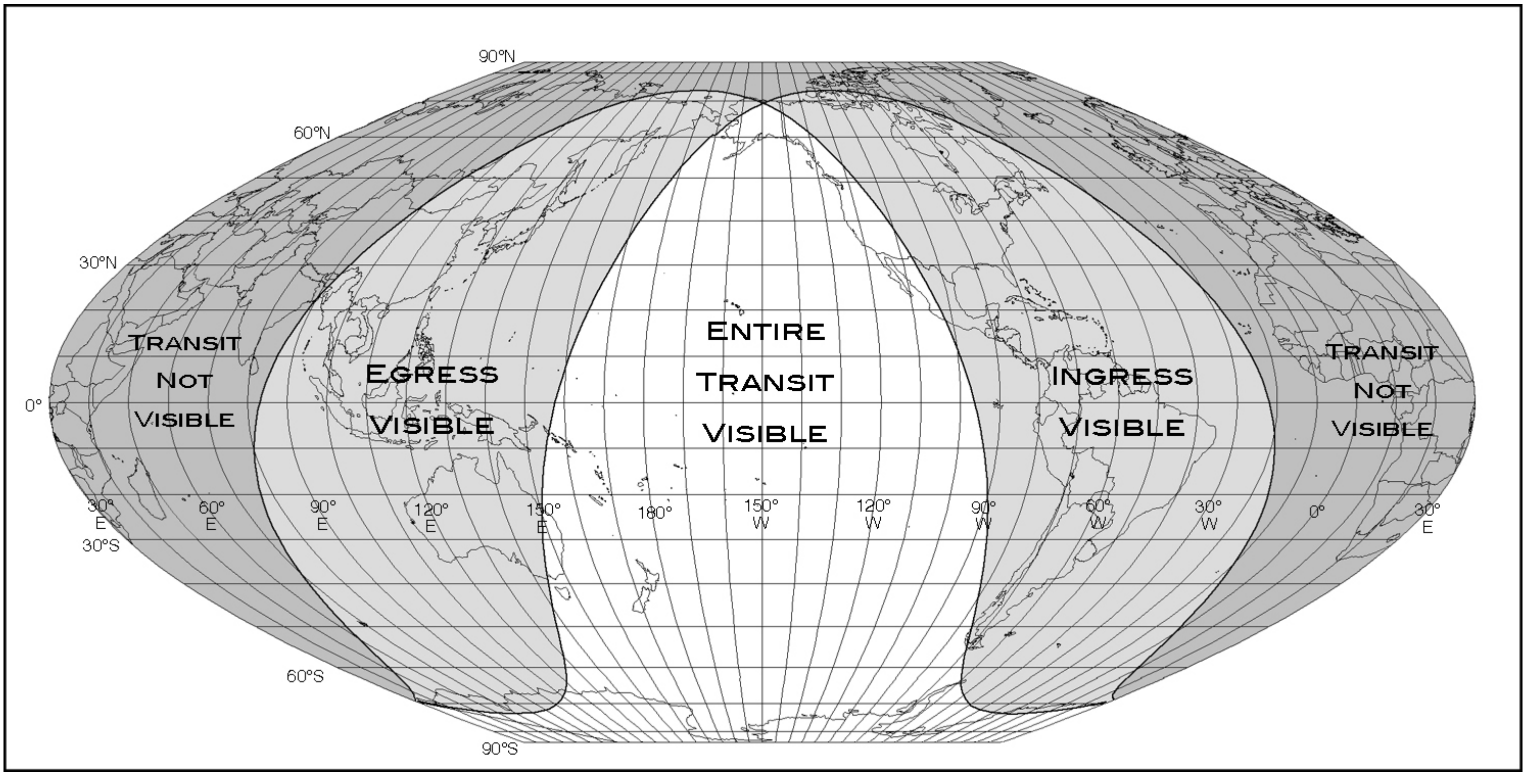

Figure 2. Worldwide visibility map of the transit of Mercury, 2006 NOV 08-09.

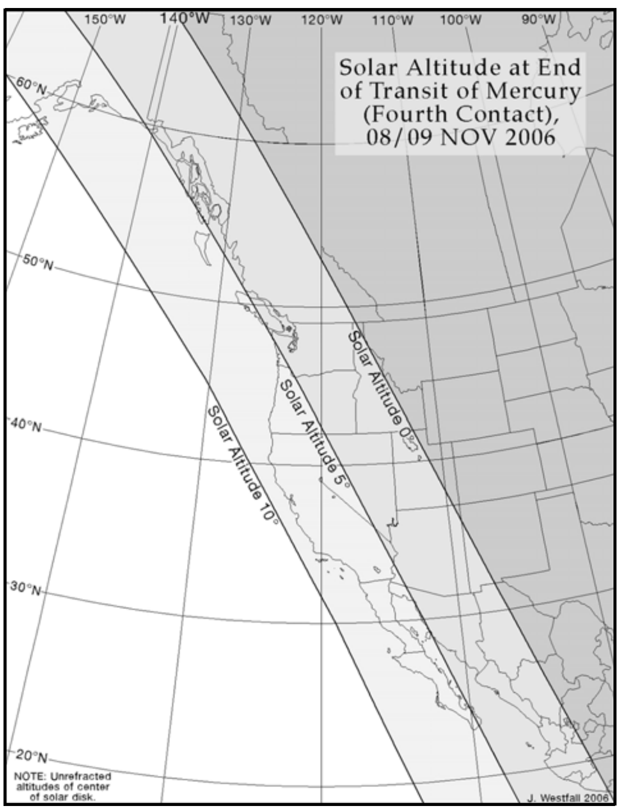

Figure 3. Western and Northwestern North America, showing the altitude of the Sun above the local horizon at the end of the 2006 NOV 08-09 transit of Mercury.

optical type, aperture, and focal length; any stops or filters used; and atmospheric seeing and transparency, preferably reported on the standard ALPO scales. Please also give your address – postal, email, or both – in case any questions arise later.

Drawings, or film or electronic images, either still or video, of the transit are a useful permanent record of the rare event, particularly if the following guidelines are followed:

- Submit your drawings, photographs or images to the ALPO Mercury/Venus Transit Section.

- Frames showing the entire disk of the Sun will be at too small a scale to show useful detail for Mercury itself. Use sufficient magnification/EFL to show only the planet and the area of the Sun immediately surrounding it.

- Do not employ any digital sharpening algorithm, which can create artifacts such as a bright halo around the planet or a light patch within its disk.

- Record the time for each image to 1 second UT. Include the same information as asked for with contact timings.

- We need to know the orientation of images or drawings; the direction of celestial north and east and whether the image is reversed. Also record the mode of imaging (afocal, prime focus, eyepiece projection, etc.) with the effective focal length or magnification, along with the image-recording method (camcorder, digital still camera, etc.).

- When stacking video frames taken during ingress or egress, avoid compositing so many frames that the planet moves significantly during the interval. A reasonable limit might be 5 seconds (50 frames at 10 f.p.s.), during which the relative motion will be a half arc-second.

- To make sure that none of the tonal range is lost, no portions of the image

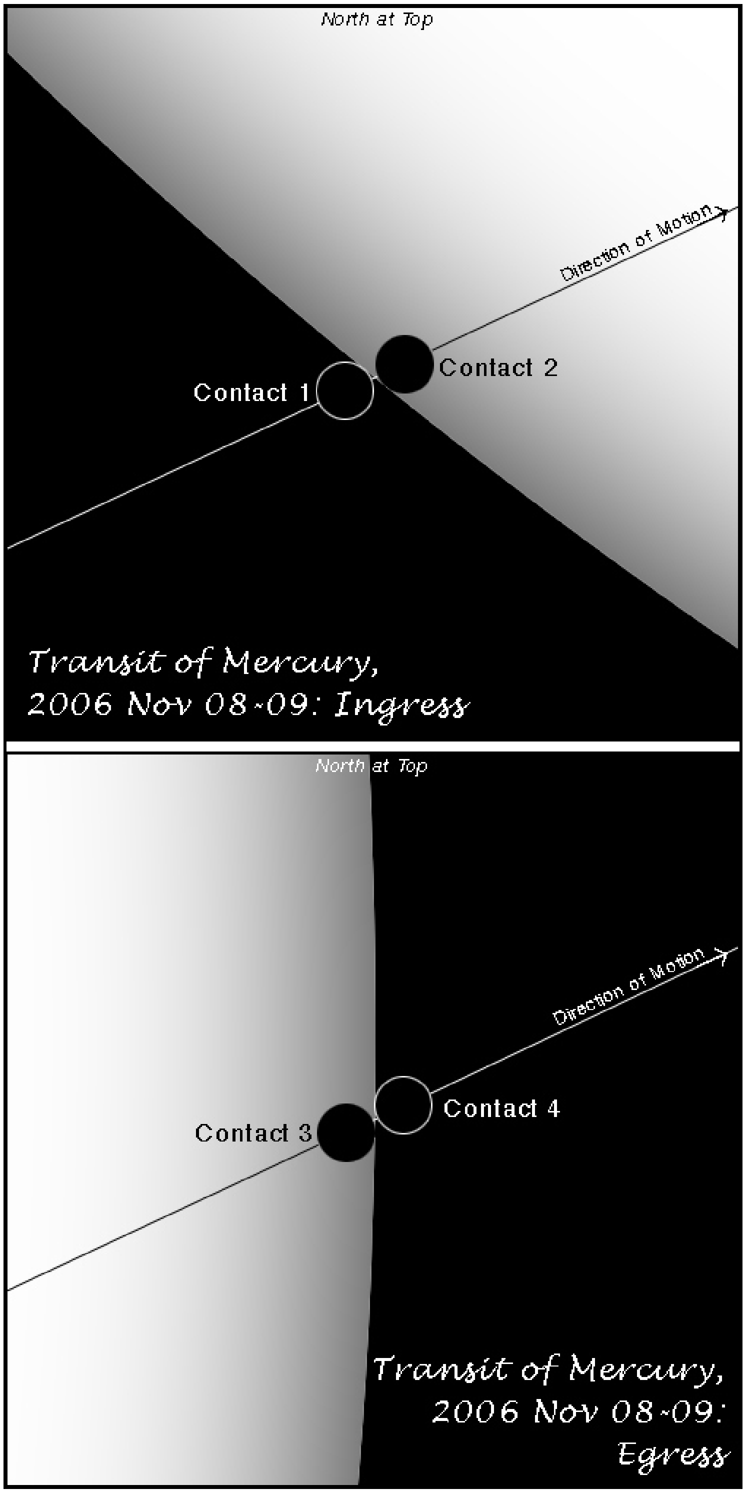

Figure 4. Diagram of the four contacts of the 2006 NOV 08-09 transit of Mercury. Mercury is drawn to scale relative to the Sun. North at top.

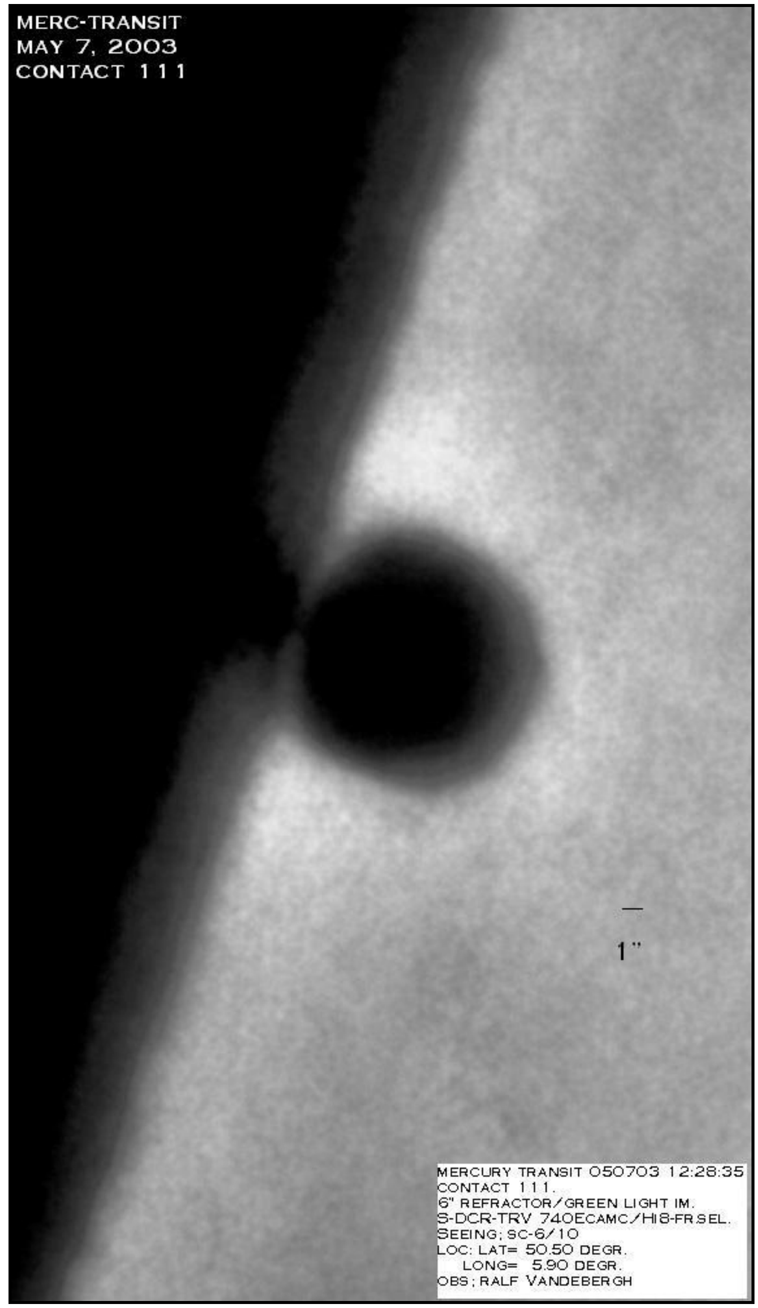

Figure 5. Sample high-resolution large-scale webcam image of a transit of Mercury. This view shows the egress phase of the 2003 MAY 07 transit, taken by Ralf Vanderbergh.

should be completely black (0% brightness) or completely white (saturated; 100% brightness).

Transits of Mercury average about thirteen per century and are thus even more rare than solar eclipses. As with solar eclipses, the most interesting phases of transits – ingress and egress – are compressed into a few minutes and present a challenge for timing contacts, making drawings, or recording images.

Appendix

Table 1: Transit of Mercury, 2006 Nov 08-09 Summary Data

Quantity	Value (all times UT)	Comments
Contact Times		
Contact 1 (begin ingress)	Nov 08 19h 12m 01.7s Position Angle 140°.9	
Contact 2 (end ingress)	Nov 08 19h 13m 54.6s Position Angle 141°.2	Anywhere on Earth, contact times will occur within 0.8 minute of the geocentric times, the transit duration will be within 1.2 minutes of the geocentric duration, while the durations of ingress and egress will be within 0.5 seconds of the geocentric durations. Also, the position angles of contacts will be within 1/4 degree of the geocentric position angles.
Least Distance between centers	Nov 08 21h 41m 01.7s Distance 422".9	
Contact 3 (begin egress)	Nov 09 00h 08m 13.6s Position Angle 269°.0	
Contact 4 (end egress)	Nov 09 00h 10m 06.5s Position Angle 269°.3	
Event Durations		
Transit	4h 58m 04.8s	
Ingress and Egress	1m 52.9s	
Apparent Diameters		Mercury's disk will appear only 1/195th as wide as that of the Sun.
Sun	1937".48 (0°.54)	
Mercury	9".96	
Apparent Velocity of Mercury relative to the Sun	5".92/minute (0".099/second)	This motion limits the total duration of a group of stacked images to a few seconds.
Differential Parallax (Mercury's minus the Sun's)	4".14	This is the maximum shift of the observed path of Mercury from its geocentric path.

Table 2: Visibility of the 2006 Nov 08-09 Transit of Mercury (from selected metropolitan areas)

Metropolitan Area	Visibility Limits	Visibility Period (Nov 08 UT)		Metropolitan Area	Visibility Limits	Visibility Period (Nov 08 UT)
GEOCENTRIC	***C1-C4****	***19:12.0-24:10.1***		**GEOCENTRIC**	***C1-C4****	***19:12.0-24:10.1***
United States				**Canada**		
Atlanta, GA	*C1*-SS	*19:12.3*-22:38		Calgary, Alta.	*C1-C4*	*19:12.6-24:09.7*
Austin, TX	*C1*-SS	*19:12.4*-23:37		Edmonton, Alta.	*C1*-SS	*19:12.6*-23:46
Baltimore, MD	*C1*-SS	*19:12.3*-21:56		Montréal, Que.	*C1*-SS	*19:12.4*-21:30
Birmingham, AL	*C1*-SS	*19:12.3*-22:48		Ottawa, Ont.	*C1*-SS	*19:12.4*-21:39
Boston, MA	*C1*-SS	*19:12.3*-21:27		Toronto, Ont.	*C1*-SS	*19:12.4*-21:58
Buffalo, NY	*C1*-SS	*19:12.4*-21:57		Vancouver, BC	*C1-C4*	*19:12.7-24:09.7*
Charlotte, NC	*C1*-SS	*19:12.3*-22:21		**Latin America**		
Chicago, IL	*C1*-SS	*19:12.4*-22:35		Belo Horizonte, Brazil	*C1*-SS	*19:11.5*-21:07
Cincinnati, OH	*C1*-SS	*19:12.4*-22:28		Bogotá, Colombia	*C1*-SS	*19:12.0*-22:36
Cleveland, OH	*C1*-SS	*19:12.4*-22:12		Brasilia, Brazil	*C1*-SS	*19:11.6*-21:17
Columbus. OH	*C1*-SS	*19:12.4*-22:20		Buenos Aires, Argentina	*C1*-SS	*19:11.5*-22:28
Dallas-Ft. Worth, TX	*C1*-SS	*19:12.4*-23:29		Cali, Colombia	*C1*-SS	*19:12.0*-22:47
Denver, CO	*C1*-SS	*19:12.5*-23:49		Caracas, Venezuela	*C1*-SS	*19:12.0*-22:01
Detroit, MI	*C1*-SS	*19:12.4*-22:16		Curitiba, Brazil	*C1*-SS	*19:11.5*-21:36
Hartford, CT	*C1*-SS	*19:12.3*-21:34		Fortaleza, Brazil	*C1*-SS	*19:11.6*-20:24
Honolulu, HA	*C1-C4*	*19:12.7-24:09.8*		Guadalajara, Mexico	*C1-C4*	*19:12.4-24:09.4*
Houston, TX	*C1*-SS	*19:12.4*-23:28		Lima, Peru	*C1*-SS	*19:11.8*-23:09
Indianapolis, IN	*C1*-SS	*19:12.4*-22:33		Medellin, Colombia	*C1*-SS	*19:12.0*-22:40
Jacksonville, FL	*C1*-SS	*19:12.3*-22:32		Mexico City, Mexico	*C1*-SS	*19:12.3*-23:58
Kansas City, MO	*C1*-SS	*19:12.4*-23:08		Monterrey, Mexico	*C1*-SS	*19:12.4*-23:54
Las Vegas, NV	*C1-C4*	*19:12.6-24:09.5*		Porto Alegre, Brazil	*C1*-SS	*19:11.5*-21:51
Los Angeles, CA	*C1-C4*	*19:12.6-24:09.5*		Recife, Brazil	*C1*-SS	*19:11.6*-20:15
Louisville, KY	*C1*-SS	*19:12.4*-22:35		Rio de Janeiro, Brazil	*C1*-SS	*19:11.5*-21:08
Memphis, TN	*C1*-SS	*19:12.4*-22:58		Salvador, Brazil	*C1*-SS	*19:11.5*-20:36
Miami, FL	*C1*-SS	*19:12.2*-22:33		Santiago, Chile	*C1*-SS	*19:11.6*-23:15
Milwaukee, WI	*C1*-SS	*19:12.4*-22:33		Santo Domingo, Dominican Rep.	*C1*-SS	*19:12.1*-22:03
Minneapolis-St. Paul, MN	*C1*-SS	*19:12.5*-22:50		São Paulo, Brazil	*C1*-SS	*19:11.5*-21:24
Nashville, TN	*C1*-SS	*19:12.4*-22:43		**Australia-New Zealand**		
New Orleans, LA	*C1*-SS	*19:12.4*-23:06		Adelaide, Australia	SR-*C4*	19:38-*24:10.5*
New York, NY	*C1*-SS	*19:12.3*-21:43		Auckland, New Zealand	*C1-C4*	*19:12.1-24:10.1*
Oklahoma City, OK	*C1*-SS	*19:12.4*-23:27		Brisbane, Australia	*C1-C4*	*19:12.2-24:10.4*
Orlando, FL	*C1*-SS	*19:12.3*-22:34		Melbourne, Australia	*C1-C4*	*19:12.1-24:10.4*
Philadelphia, PA	*C1*-SS	*19:12.3*-21:49		Perth, Australia	SR-*C4*	21:14-*24:10.7*
Phoenix, AZ	*C1-C4*	*19:12.5-24:09.5*		Sydney, Australia	*C1-C4*	*19:12.1-24:10.4*
Pittsburgh, PA	*C1*-SS	*19:12.4*-22:07		**East & Southeast Asia**		
Providence, RI	*C1*-SS	*19:12.3*-21:30		Bangkok, Thailand	SR-*C4*	23:18-*24:10.9*
Richmond, VA	*C1*-SS	*19:12.3*-22:03		Beijing, China	SR-*C4*	22:53-*24:10.6*
Riverside, CA	*C1-C4*	*19:12.6-24:09.5*		Chongqing, China	SR-*C4*	23:14-*24:10.8*
Rochester, NY	*C1*-SS	*19:12.4*-21:52		Guangzhou, China	SR-*C4*	22:37-*24:10.8*
Sacramento, CA	*C1-C4*	*19:12.6-24:09.6*		Ho Chi Minh City, Vietnam	SR-*C4*	22:47-*24:10.8*
Salt Lake City, UT	*C1-C4*	*19:12.6-24:09.6*		Hong Kong, China	SR-*C4*	22:33-*24:10.8*
San Antonio, TX	*C1*-SS	*19:12.4*-23:41		Jakarta, Indonesia	SR-*C4*	22:26-*24:10.9*
San Diego, CA	*C1-C4*	*19:12.6-24:09.6*		Manila, Philippines	SR-*C4*	21:55-*24:10.7*
San Francisco, CA	*C1-C4*	*19:12.6-24:09.6*		Osaka-Kobe, Japan	SR-*C4*	21:26-*24:10.5*
San Jose, CA	*C1-C4*	*19:12.6-24:09.6*		Seoul, South Korea	SR-*C4*	*22:06-24:10.6*
Seattle, WA	*C1-C4*	*19:12.7-24:09.6*		Shanghai, China	SR-*C4*	*22:16-24:10.7*
St. Louis, MO	*C1*-SS	*19:12.4*-23:41		Shenzhen, China	SR-*C4*	*22:33-24:10.8*
Tampa-St. Petersburg, FL	*C1*-SS	*19:12.3*-22:39		Tianjin, China	SR-*C4*	*22:48-24:10.6*
Vir. Beach-Norfolk-Portsmouth, VA	*C1*-SS	*19:12.3*-21:58		Tokyo, Japan	SR-*C4*	*21:11-24:10.5*
Washington, DC	*C1*-SS	*19:12.3*-21:58		Wuhan, China	SR-*C4*	*22:44-24:10.7*

*NOTE: C1 and C4 refer to the First and Fourth Contacts; SR indicates local sunrise and SS local sunset. All times are 2006 Nov 08 UT; 24h indicates Nov 09 00h. Italicized times to 0.1-minute precision refer to contact times; those to 1-minute are local sunrise and sunset times

Feature Story: Venus

ALPO Observations of Venus During the 2002 - 2003 Western (Morning) Apparition

By: Julius L. Benton, Jr., coordinator, ALPO Venus Section

Abstract

The report summarizes the outcome of an analysis of 200 photo-visual observations submitted to the ALPO Venus Section during the 2002-2003 Western (Morning) Apparition by observers residing in Italy, Germany, Belgium, Puerto Rico, and the United States. Types of telescopes employed when making these observations and data sources are discussed, along with comparative studies of visual and photographic data. The apparition report is based on images and drawings made in integrated light and with color filters, including a statistical analysis of the categories of markings seen or suspected at visual wavelengths in the atmosphere of Venus, plus notes on the extent and prominence of the planet's cusps, cusp-caps, and cusp-bands. Terminator irregularities and the apparent phase are also described, as well as the status of the continued monitoring of the dark hemisphere of Venus for the Ashen Light.

Introduction

A collection of 200 visual drawings, photographs, and CCD and webcam images of Venus were contributed to the ALPO Venus Section during the 2002-2003 Western (Morning) Apparition. Geocentric phenomena in Universal Time (UT) for the 2002-2003 observing season appear in *Table 1*, while *Figure 1* presents the distribution of observations by month during the apparition.

During the 2002-2003 Western (Morning) Apparition of Venus, observational monitoring of the planet was reasonably consistent. One individual, Cecil Post of Las Cruces, NM, even began observing just a few hours past Inferior Conjunction on 2002 October 31, and several others started viewing soon thereafter in early 2002 November. Most observers made drawings of Venus up to about two weeks before Superior Conjunction which occurred on 2003 August 18, and images of the planet were captured here and there during the apparition. Observational coverage of Venus from start to finish throughout every apparition is extremely important, but happily, such consistent surveillance of the planet is becoming more commonplace in recent years. The 2002-2003 viewing season ranged from 2002 October 31 to 2003 August 01, with 90.5 percent of the observations occurring between 2002 November and 2003 May. Over this time span Venus passed through greatest brilliancy (-4.7mv), dichotomy (half-phase), and maximum elongation (47.0°) from the Sun. Thirteen (13) observers submitted visual reports, drawings, and images in 2002-2003, and Table 2 shows their observing locale, number of observations contributed, and instruments used.

Figure 2 shows the breakdown of observers by national venue for the 2002-2003 Western (Morning) Apparition, while *Figure 3* shows the distribution of submitted observations by nation of origin. A little more than two-thirds (69.2%) of the individuals participating in the observing programs of the ALPO Venus Section resided in the United States, while these individuals accounted for 63.5 percent (see *Figure 3*) of the total observations received. Therefore, during the 2002-2003 observing season the international essence of our programs remained strong. The ALPO Venus Section is continually seeking to improve global cooperation of lunar

All Readers

Your comments, questions, etc., about this report are appreciated. Please send them to: *poshedly@ bellsouth.net* for publication in the next Journal.

Online Features

Left-click your mouse on:

- The author's e-mail address in blue text to contact the author of this article.
- The references in blue text to jump to source material or information about that source material (Internet connection must be ON).

Observing Scales

Standard ALPO Scale of Intensity:
- 0.0 = Completely black
- 10.0 = Very brightest features
- Intermediate values are assigned along the scale to account for observed intensity of features

ALPO Scale of Seeing Conditions:
- 0 = Worst
- 10 = Perfect

Scale of Transparency Conditions:
- Magnitude of the faintest star observable when allowing for daylight and twilight

IAU directions are used in all instances.

Terminology: Western vs Eastern

"Western" apparitions are those when an "inferior" planet (Mercury or Venus, whose orbits lie inside the Earth's orbit around the Sun) is **west of the Sun**, as seen in our morning sky before sunrise.

"Eastern" apparitions are those when that planet is **east of the Sun,** as seen in our sky after sunset.

Association of Lunar and Planetary Observers (A.L.P.O.): Venus Section

A.L.P.O. Visual Observation of Venus

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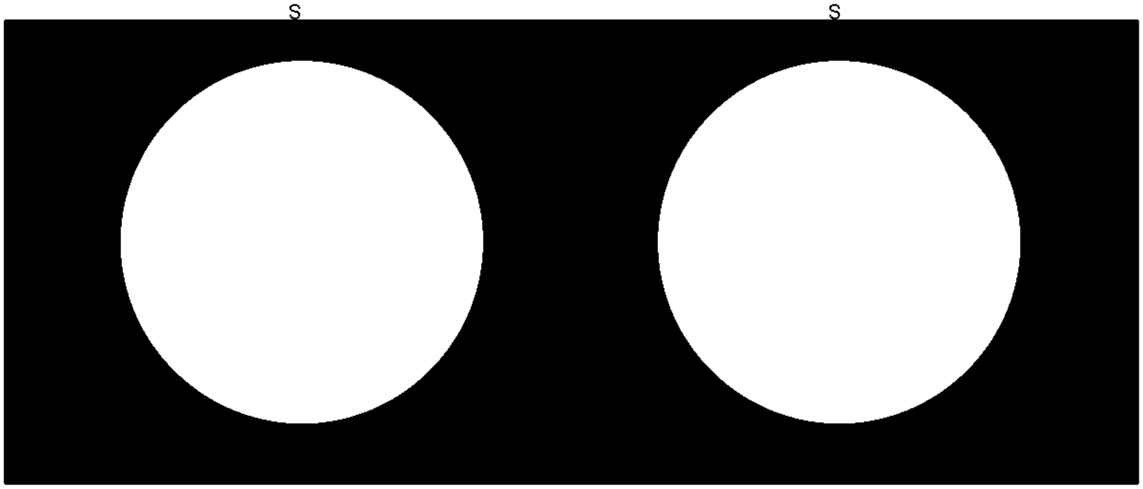

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N (*all coordinates are IAU*) N

Observer________________________________Location____

UT Date _____________ UT Start _______________ UT End _______________ D = __________″ k_m = __________ k_c = ___________

m_v = ___________ Instrument ____ Magnification(s) _____________ x_{min} _____________ x_{max}

Filter(s) IL(none) ___________ f_1 ___________ f_2 ___________ f_3 ____________ Seeing ______________ Transparency _______________

Sky Illumination (*check one*): [ ] Daylight [ ] Twilight [ ] Moonlight [ ] Dark Sky

Dark Hemisphere (*check one*):
[ ] No dark hemisphere illumination [ ] Dark hemisphere illumination suspected
[ ] Dark hemisphere illumination [ ] Dark hemisphere darker than sky

Bright Limb Band (*check one*):
[ ] Limb Band not visible
[ ] Limb Band visible (complete cusp to cusp)
[ ] Limb Band visible (incomplete cusp to cusp)

Terminator (*check one*):
[ ] Terminator geometrically regular (no deformations visible)
[ ] Terminator geometrically irregular (deformations visible)

Terminator Shading (*check one*):
[ ] Terminator shading not visible
[ ] Terminator shading visible

Atmospheric Features (*check, as applicable*):
[ ] No markings seen or suspected [ ] Radial dusky markings visible
[ ] Amorphous dusky markings visible [ ] Banded dusky markings visible
[ ] Irregular dusky markings visible [ ] Bright spots or regions visible (exclusive of cusp regions)

Cusp-Caps and Cusp-Bands (*check, as applicable*):
[ ] Neither N or S Cusp-Cap visible [ ] N and S Cusp-Caps both visible
[ ] N Cusp-Cap alone visible [ ] S Cusp-Cap alone visible
[ ] N and S Cusp-Caps equally bright [ ] N and S Cusp-Caps equal size
[ ] N Cusp-Cap brighter [ ] N Cusp-Cap larger
[ ] S Cusp-Cap brighter [ ] S Cusp-Cap larger
[ ] Neither N or S Cusp-Band visible [ ] N and S Cusp-Bands both visible
[ ] N Cusp-Band alone visible [ ] S Cusp-Band alone visible

Cusp Extensions (*check, as applicable*):
[ ] No Cusp extensions visible [ ] N Cusp extended (angle = _____°)
[ ] S Cusp extended (angle = _____°)

Conspicuousness of Atmospheric Features (*check one*):
[ ] 0.0 (nothing seen or suspected) [ ] 3.0 (indefinite, vague detail)
[ ] 5.0 (suspected detail, but indefinite) [ ] 7.0 (detail strongly suspected)
[ ] 10.0 (detail definitely visible)

IMPORTANT: Depict morphology of atmospheric detail, as well as the intensity of features, on the appropriate blanks at the tope of this form. Attach to this form all supporting descriptive information, and please <u>do not</u> write on the back of this sheet. The intensity scale is the *Standard A.L.P.O. Intensity Scale*, where 0.0 = completely black ⇔ 10.0 = very brightest features, and intermediate values are assigned along the scale to account for observed intensity of features.

and planetary observers interested in the unique observing challenges presented by the planet Venus and its elusive atmospheric features.

Telescopes employed in making observations of Venus in 2002-2003 are shown graphically in *Figure 4*, where it can be seen that the greatest majority (97.0%) of the observations were made with telescopes equal to or exceeding 15.2 cm. (6.0 in.) in aperture. Schmidt-Cassegrains were the principal instruments employed in imaging Venus during the apparition; they and their catadioptric counterparts (the Maksutovs) accounted for slightly more than a third (37.5%) of the observational work in 2002-2003, while most visual observers used refractors and Newtonians to produce 62.5 percent of the data. During 2002-2003, the majority of observations (98.6%) were made under twilight or generally light-sky conditions, with the remaining percentage (1.35%) occurring when the background sky was dark. A few observers followed Venus into the bright daylight sky after sunrise to minimize the detrimental effects of glare associated with the planet. This practice also allowed observers to watch Venus when it was higher in the sky and avoid image degradation and poor seeing near the horizon.

The writer expresses his warmest thanks to the thirteen observers mentioned in *Table 1* for their excellent drawings, comprehensive descriptive reports, and images using CCDs and webcams during the 2002-2003 Western (Morning) Apparition of Venus. Such dedicated efforts by observers, getting up before sunrise to study the planet, which is frequently an inconvenience for those who must later head off to work the same day, is deeply appreciated. Those wishing to learn more about the planet Venus and our numerous observing pursuits are heartily invited to join the ALPO and become regular contributors to the ALPO Venus Section in forthcoming apparitions.

Table 1: Geocentric Phenomena in Universal Time (UT) for the 2002 - 2003 Western (Morning) Apparition of Venus

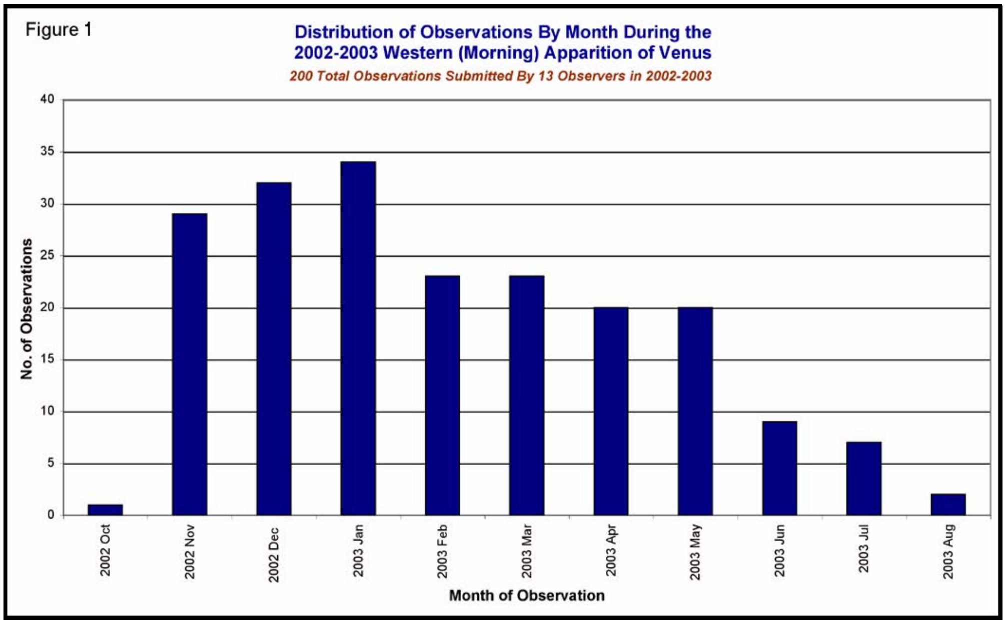
Inferior Conjunction	2002 Oct 31^d 12^hUT
Initial Observation	Oct 31 19
Greatest Brilliancy	Dec 07 01 ($m_V = -4.7$)
Greatest Elongation West	2003 Jan 11 03 (47.0°)
Dichotomy (predicted)	Jan 10 17.95
Final Observation	Aug 1 12
Superior Conjunction	Aug 18 18
Apparent Diameter (observed range):	61.6” (2002 Oct 31) 9.68” (2003 Aug 01)
Phase Coefficient, ***k*** (observed range):	0.005 (2002 Oct 31) 0.996 (2003 Aug 01)

Table 2: Participants in the ALPO Venus Observing Program During the 2002-2003 Western (Morning) Apparition

Observer and Observing Site	No. Obs.	Telescope(s) Used*
1. Benton, Julius L.; Wilmington Island, GA	52	15.2 cm (6.0 in.) REF
2. Boisclair, Norman J.; South Glens Falls, NY	6 1	9.0 cm (3.5 in.) MAK 50.8 cm (20.0 in.) NEW
3. Crandall, Ed; Winston-Salem, NC	4	25.4 cm (10.0 in.) NEW
4. Cudnik, Brian; Weimar, TX	2 5	31.8 cm (12.5 in.) NEW 25.4 cm (10.0 in.) NEW
5. DeKarske, Donald H.; Colorado Springs, CO	2	25.4 cm (10.0 in.) NEW
6. del Valle, Daniel; Aquadillo, Puerto Rico	2	20.3 cm (8.0 in.) SCT
7. Frassati, Mario; Crescentino, Italy	4	20.3 cm (8.0 in.) SCT
8. Haas, Walter H.; Las Cruces, NM	36	31.8 cm (12.5 in.) NEW
9. Melillo, Frank J.; Holtsville, NY	3	20.3 cm (8.0 in.) SCT
10. Niechoy, Detlev; Göttingen, Germany	60	20.3 cm (8.0 in.) SCT
11. Post, Cecil C.; Las Cruces, NM	10 1 4	20.3 cm (8.0 in.) NEW 31.8 cm (12.5 in.) NEW 15.2 cm (6.0 in.) NEW
12. Vandenbohede, Alexander; Ghent, Belgium	7	20.3 cm. (8.0 in.) NEW
13. Venable, Roger; Wrens, GA	1	40.6 cm. (16.0 in.) NEW
Total No. of Observers	13	
Total No. of Observations	132	

* MAK = Maksutov, NEW = Newtonian, REF = Refractor, SCT = Schmidt-Cassegrain

For the last several apparitions, there has been a continued growth in the number of submitted CCD and webcam images of Venus taken at visual and other wavelengths, and some of the results have been truly amazing, especially UV images. Indeed, the ALPO Venus Section always encourages those who possess CCD and digital cameras, as well as webcams, to image the planet routinely at different wavelengths, but as vital as these new high-tech methods are to the success of our programs, observers should not mistakenly assume that well-executed drawings of the planet are obsolete. Observers with a trained eye, carefully watching and sketching the planet in integrated light (no filter) and with color filters of precisely known transmission characteristics, can take advantage of intermittent periods of excellent seeing to record detail and subtle contrasts in the atmosphere of Venus. Comparative analysis of drawings and images has proven quite interesting, and it



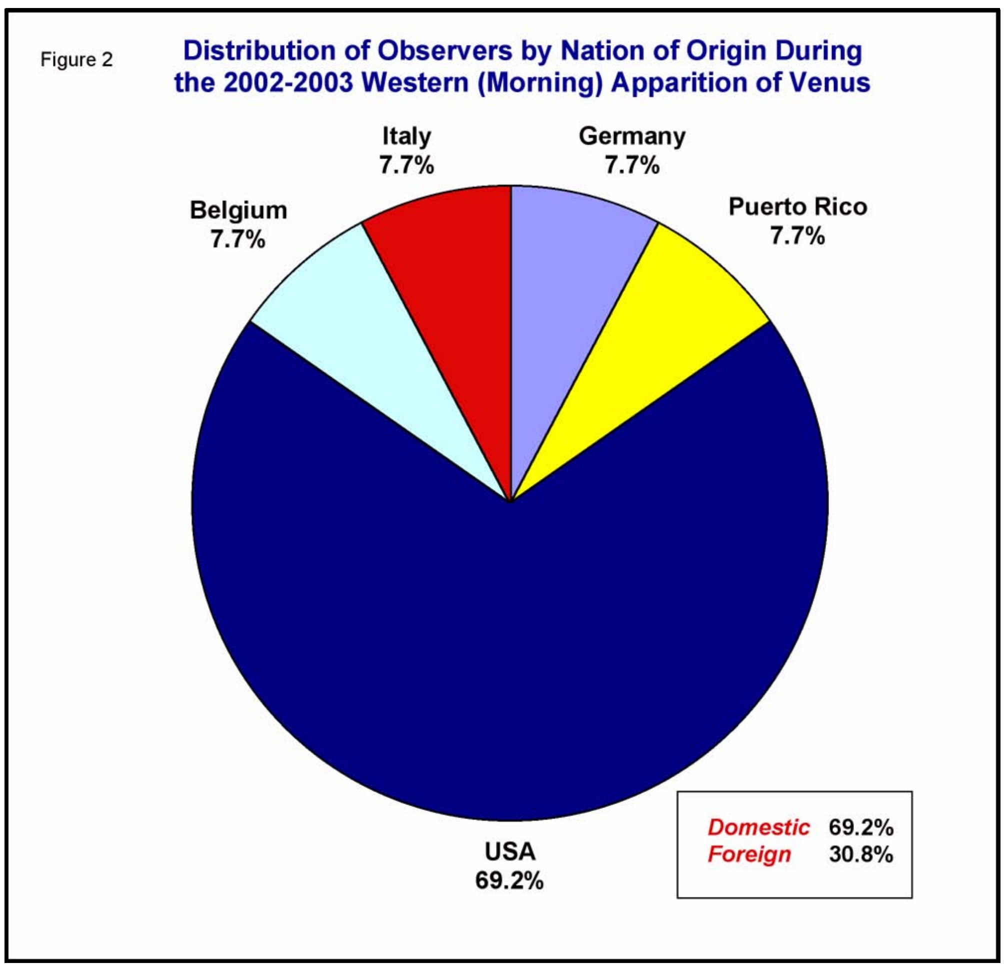
turns out that some of the features sketched by experienced observers also show up clearly on images made at the same time and on the same date. Of course, visual observations always suffer from some level of subjectivity, and that is why we stress the importance of simultaneous observations by visual observers as a means of improving opportunities for confirmation of discrete phenomena. Routine simultaneous visual observations and concurrent CCD imaging adds a valuable collaborative dimension to data acquisition, and this needs to become the rule rather than the exception as we study Venus.

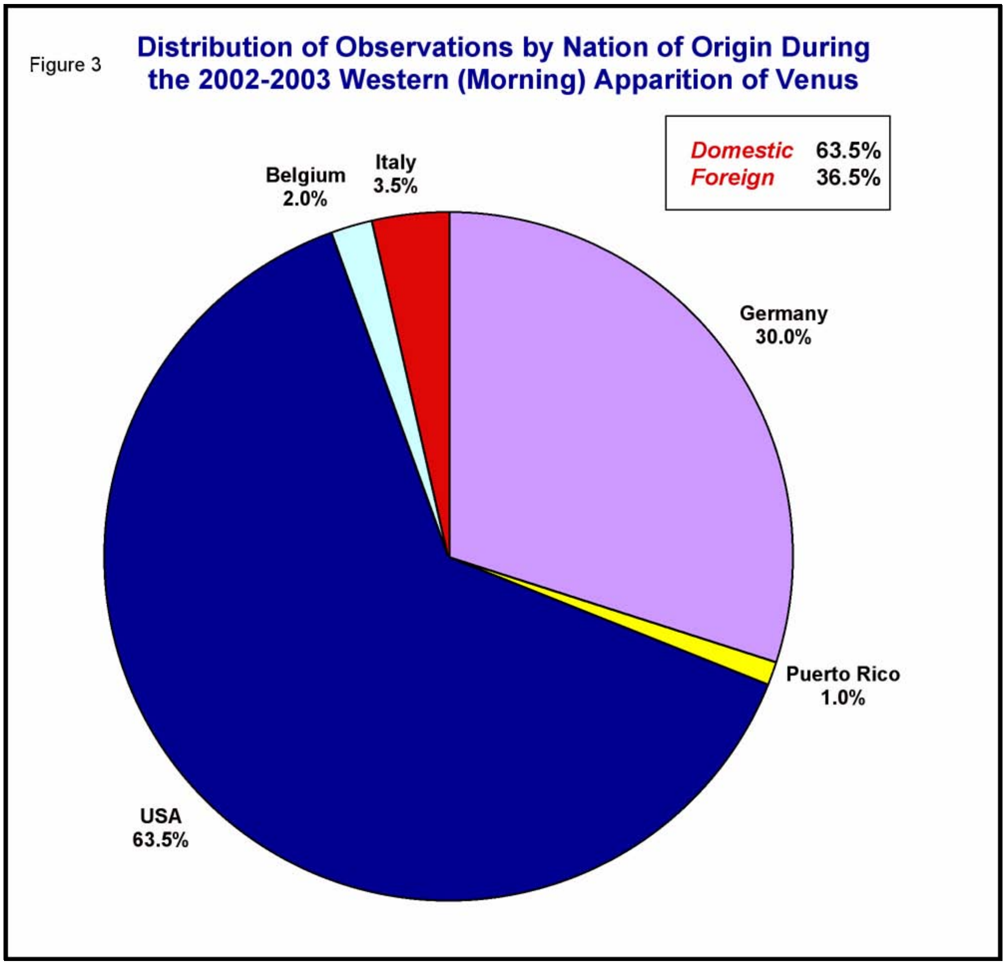
Observations of Venusian Atmospheric Details

Various methods and techniques for carrying out observations of the vague and elusive "markings" in the atmosphere of Venus are covered in detail in the newest edition of the ***The Venus Handbook***. This guidebook for observing the planet is now available either as a printed manual or as a *.pdf file for download. Also, readers who may have access to prior issues of this Journal may find it worthwhile to consult previous apparition reports for a historical perspective on ALPO studies of Venus. (See the References section at the end of this report.)

A substantial number of the Venus observations in 2002-2003 used for this analysis were made at visual wavelengths (in integrated light and with color filters), but Melillo continued to faithfully contribute his excellent CCD images of Venus in ultraviolet (UV) light. Representative drawings, as well as webcam and CCD images, accompany this report as illustrations.

After a thorough study of the photo-visual data for the 2002-2003 Western (Morning) Apparition, all of the traditional categories of dusky and bright markings in the atmosphere of Venus were seen or suspected by observers, except for radial dusky markings (see the literature referenced earlier in this report). *Figure 5* shows the frequency of the specific forms of markings that were reported by visual observers or captured on images. The majority of the observations referred to more than one category of marking or feature; so, totals exceeding 100 percent are not uncommon. Although conclusions from these data appear reasonable, readers should note that considerable subjectivity exists in visual accounts of the normally elusive atmospheric markings of Venus. It is likely that this factor affected the data presented in *Figure 5*, and hence, the need for consistent, well-planned simultaneous observing programs.





Many who attempted visual observations during the 2002-2003 observing season commented on just how troublesome the faint dusky atmospheric markings on Venus are to detect. This is a well-known characteristic of the planet that is basically independent of the experience of the observer, and it is a factor that frequently annoys and subsequently discourages many who start watching Venus with their telescopes for the first time. At visual wavelengths, employing color filters and variable-density polarizers helps improve the opportunity for seeing subtle cloud detail on Venus. The morphology of features revealed at UV wavelengths is largely different from what is seen at visual wavelengths, especially radial dusky patterns. Therefore, in addition to visual work, the ALPO Venus Section urges observers to attempt to capture UV images of the planet.

Figure 5 shows that 43.4 percent of the observations of Venus in 2002-2003 described a brilliant disc that was completely devoid of any markings whatsoever. When faint dusky features were seen or suspected, most fell in the categories of "Amorphous Dusky Markings" (73.5%), "Banded Dusky Markings" (63.7%), and "Irregular Dusky Markings" (47.8%) during the 2002-2003 Western (Morning) Apparition (there were no reports of "Radial Dusky Markings").

Terminator shading was visible during much of the 2002-2003 observing season, reported in 77.7 percent of the observations (see *Figure 5*), and it usually extended from one cusp region to the opposite one and appeared to lighten (i.e., assume a higher intensity) progressively from the region of the terminator toward the bright planetary limb. This gradation in brightness ended in the Bright Limb Band in most accounts. Most of the CCD images by Melillo at UV wavelengths during 2002-2003 depicted terminator shading as well.

The mean relative intensity for all of the dusky features on Venus in 2002-2003 ranged from 8.5 to 9.0, expressed in the Standard ALPO Scale, which ranges from 0.0 for black to 10.0 for brightest possible. The ALPO Scale of Conspicuousness (which runs sequentially from 0.0 for "definitely not seen" up to 10.0 for "certainly seen") was also used repeatedly by observers during 2002-2003. On this scale, the dusky markings in *Figure 5* had a mean conspicuousness of ~3.5 during the apparition, which suggests that these features fell within the range from very indistinct impressions to fairly good indications of their actual presence on Venus.

Figure 5 also shows that "Bright Spots or Regions," exclusive of the cusps, were seen or suspected in 6.2 percent of the submitted observations. It is a routine practice for observers to call attention to such bright areas by sketching in dotted lines around such features in drawings made at visual wavelengths.

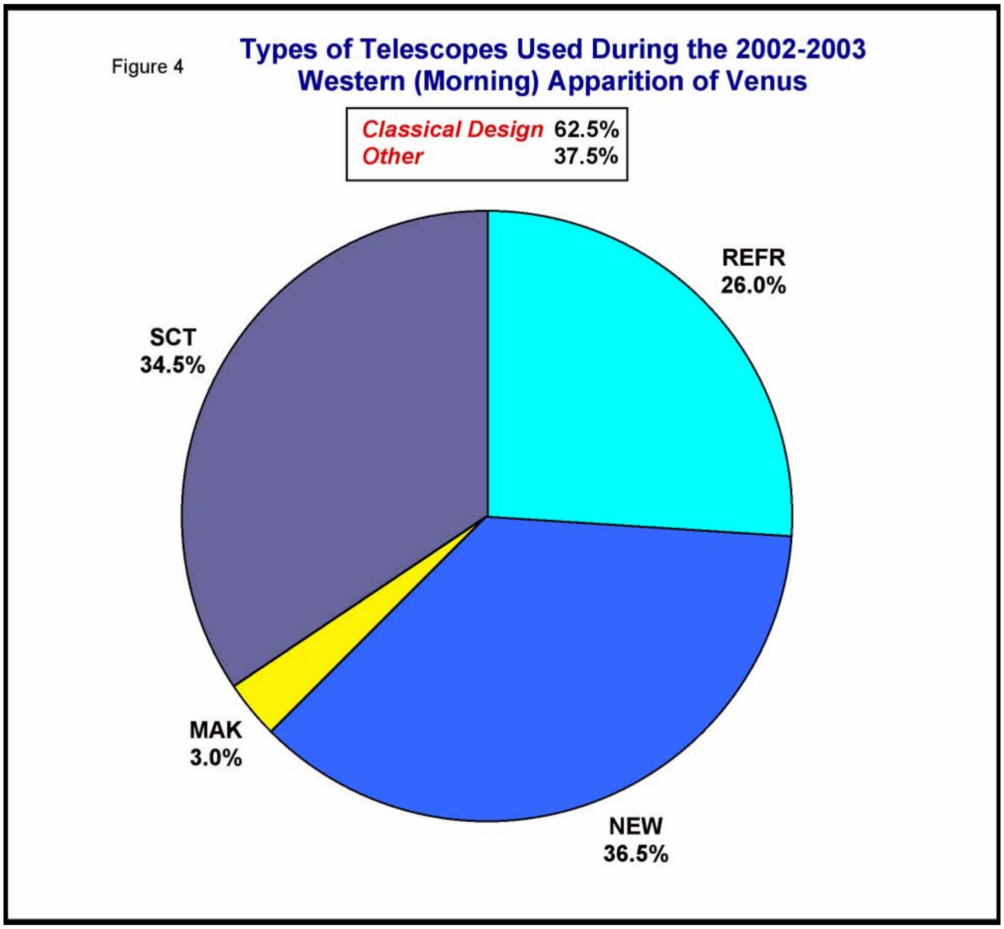
Most observers used color-filter techniques during the 2002-2003 Western (Morning) Apparition, and when results were compared with studies in integrated light (unfiltered), color filters and variable-density polarizers measurably enhanced the visibility of vague atmospheric phenomena on Venus.

The Bright Limb Band

Figure 5 shows that nearly half (49.3%) of the submitted observations in 2002-2003 referred to a "Bright Limb Band" on the illuminated hemisphere of Venus. When this feature was seen, it appeared as a continuous, brilliant arc extending from cusp to cusp 83.6 percent of the time, and interrupted or only partially visible along the limb of Venus in 16.4 percent of the positive sightings. The mean numerical intensity of the Bright Limb Band was 9.7, becoming more apparent when color filters or variable-density polarizers were utilized. Regardless of the prominence of this feature to most visual observers, it was not clearly obvious in many of the images of Venus submitted during 2002-2003.

Terminator Irregularities

The terminator is the geometric curve that divides the sunlit and dark hemispheres of Venus. Observers described an irregular or asymmetric terminator in only 8.8 percent of the observations in 2002-2003. Amorphous, banded, and irregular dusky



atmospheric markings appeared to blend with the shading along the terminator, possibly contributing to reported deformities. Filter techniques enhanced the visibility of terminator irregularities and dusky atmospheric features closely associated with it during the 2002-2003 Western (Morning) Apparition. Because of irradiation, bright features adjacent to the terminator may occasionally look like bulges, and dark features may look like dusky hollows.

Cusps, Cusp-Caps, and Cusp-Bands

In general, when the *phase coefficient*, **k**, the fraction of the disc that is illuminated, lies between 0.1 and 0.8, features on Venus with the most contrast and prominence are frequently sighted at or near the planet's cusps. These bright cusp-caps are often bordered by dusky, usually diffuse, cusp-bands. *Figure 6* shows the visibility statistics for Venusian cusp features in 2002-2003.

When the northern and southern cusp-caps of Venus were observed in 2002-2003, *Figure 6* illustrates that they were equal in size 82.1 percent of the time and equal in brightness in 79.8 percent of the observations. The northern cusp-cap was considered larger 1.2 percent of the time and brighter in 4.8 percent of the observations, while the southern cusp-cap was larger in 16.7 percent of the observations and brighter 15.5 percent of the time. Neither cusp-cap was visible in 39.9 percent of the reports. The mean relative intensity of the cusp-caps was about 9.8 during the 2002-2003 apparition. Dusky cusp-bands bordering the bright cusp-caps were not reported in 46.6 percent of the observations when cusp-caps were visible, and the cusp-bands displayed a mean relative intensity of about 6.6 (see *Figure 6*).

Cusp Extensions

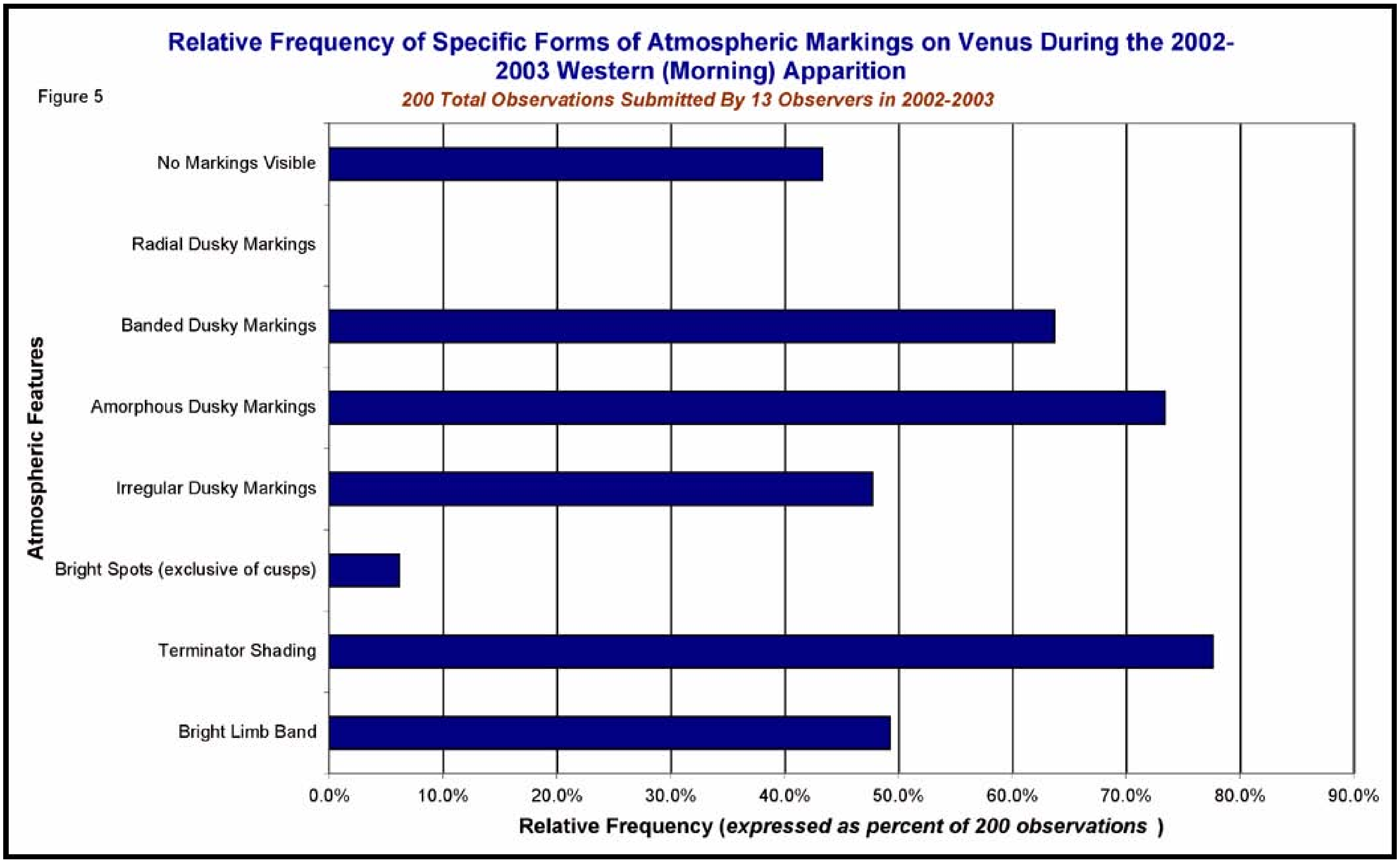
As can be noticed by referring to Figure 6, there were no cusp extensions reported beyond the 180° expected from simple geometry in 80.4 percent of the observations (in integrated light and with color filters). Early in the 2002-2003 apparition, as Venus progressed through its crescentic phases following inferior conjunction on 2002 October 31, several observers recorded cusp extensions that ranged from 1° to 45°. In his observation of 2002 October 31 (just a few hours after inferior conjunction), Cecil Post suspected that the cusps joined along the planet's unilluminated limb, forming a ring of light encircling the whole dark hemisphere of Venus. This same impression was noted by Roger Venable of Wrens, GA on 2002 November 2 and Walter Haas of Las Cruces, NM on 2002 November 5. Cusp extensions were sometimes indicated on drawings, and observers mostly agreed that color filters and variable-density polarizers enhanced their appearance. None of the alleged extensions were photographed or imaged successfully, however, and experience has shown that cusp extensions are very difficult to document on film due to the fact that the sunlit regions of Venus are so much brighter than the faint extensions. Observers are encouraged to try their hand at recording cusp extensions using CCD and digital cameras, as well as webcams.

Estimates of Dichotomy

A discrepancy between the predicted and the observed dates of dichotomy (half-phase), known as the "Schröter Effect" on Venus, was not reported by observers during the 2002-2003 Western (Morning) Apparition. Indeed, no observers submitted systematic phase estimates during the apparition. Theoretical dichotomy was predicted to occur on 2003 January 10^d at 17.76^h UT, when $\boldsymbol{k} = 0.500$ and the phase angle, $\boldsymbol{i}$, between the Sun and the Earth as seen from Venus equals 90°.

Dark-Hemisphere Phenomena and Ashen Light Observations

The Ashen Light, first reported by G. Riccioli in 1643, refers to an extremely elusive, faint illumination of Venus' dark hemisphere. The Ashen Light resembles Earthshine on the dark portion of the Moon, although the origins of the two phenomena must be completely different. Most observers agree that Venus must be viewed against a completely dark sky for



the Ashen Light to be seen, but such circumstances occur only when the planet is very low in the sky where adverse terrestrial atmospheric conditions contribute to poor seeing. Also, substantial glare in contrast with the surrounding dark sky influences such observations. Even so, the ALPO Venus Section continues to hear from observers who say they have seen the Ashen Light when Venus was seen against a twilight sky.

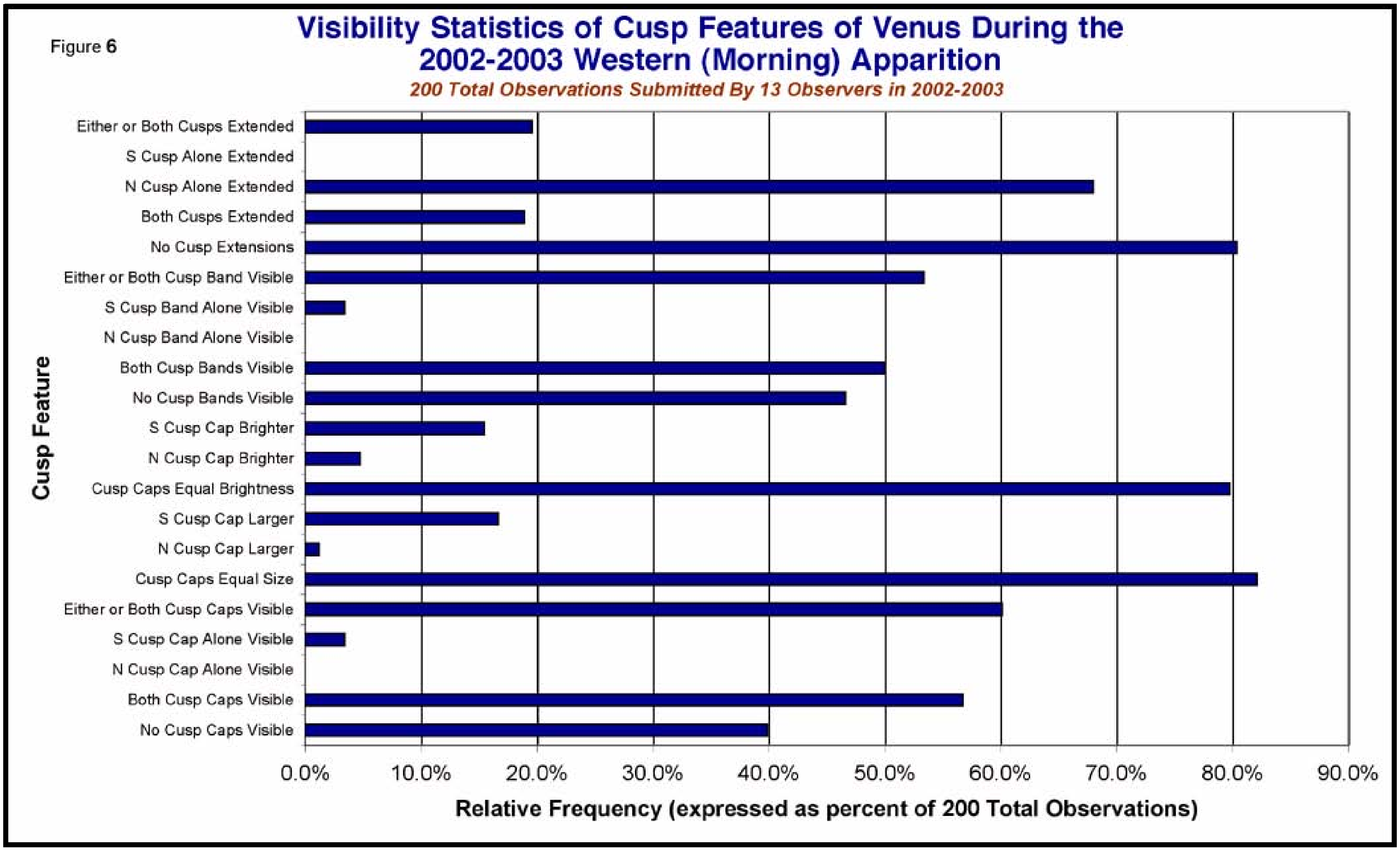
During 2002-2003, the Ashen Light was seen or suspected in Integrated Light, color filters, or variable-density polarizers in only 3.4 percent of the submitted observations. Detlev Niechoy of Göttingen, Germany thought he could see portions of the dark hemisphere illuminated on three consecutive mornings: 2002 December 10 04:49-05:12 UT, December 11 04:38-04:55 UT, and December 12 04:54-05:19 UT. He used a 20.3-cm (8.0-in) SCT at 225X and W12 (yellow), W25 (red), and W47 (dark blue) color filters in fair seeing conditions to record his observations, also reporting another possible sighting of the Ashen Light on 2002 December 20 at 04:38-04:52 UT using the same telescope, magnification, and filters. No other observers mentioned seeing the Ashen Light. Walter Haas of Las Cruces, NM was the only observer to remark that the dark hemisphere of Venus appeared slightly *darker* than the background sky, almost certainly a contrast effect. Consisting entirely of Haas' observations, positive reports of this phenomenon occurred in 10.6 percent of the observations during the 2002-2003 Western (Morning) Apparition.

Conclusions

The analytical results of visual observations and images contributed to the ALPO Venus Section for the 2002-2003 Western (Morning) Apparition suggested only minor activity in the atmosphere of Venus. It was emphasized earlier in this report how difficult it is to differentiate between what are real atmospheric phenomena and what is purely illusory on Venus at visual wavelengths. Higher confidence in visual impressions will improve as observers pursue simultaneous work, so the ALPO Venus Section is stressing combined visual observations and imaging for comparative analysis. There is also a continuing need for more UV imaging of Venus concurrently with visual observations; for example, some observers apparently have a slight visual sensitivity in the near-UV range, whereby they report the radial dusky features that are so readily apparent on UV photographs and images.

ALPO studies of the Ashen Light, which reached a crescendo during the Pioneer Venus Orbiter Project years ago, are continuing every apparition. Steady simultaneous visual monitoring and imaging of the planet at crescentic phases for the presence of this phenomenon by a large number of observers is vital as a means of improving our opportunities for confirming dark-hemisphere events.

The ALPO Venus Section invites interested readers everywhere to join us in our projects and many observational challenges that lie ahead.



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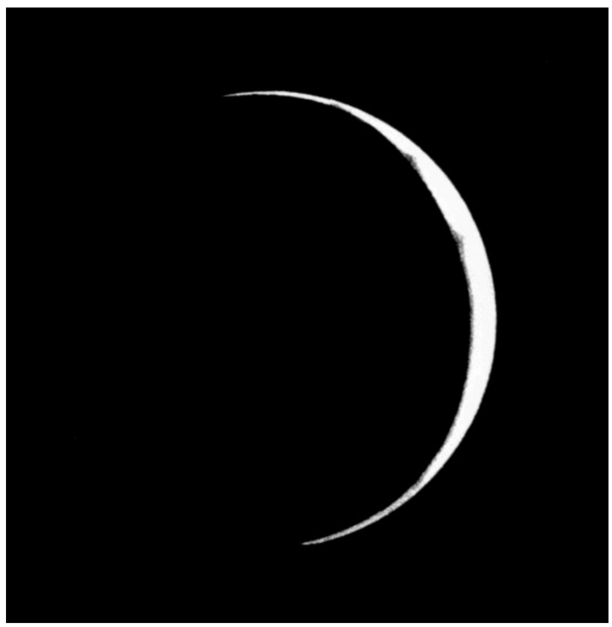

Figure 7. Drawing of Venus by Mario Frassati. 2002 Nov 10d 07h 35m UT, 20.3-cm (8.0-in) SCT, 133X, IL (integrated light) and W80A (blue) filter. Seeing 6.0 (interpolated). Phase = 0.035, Diameter = 59".1. South is at the top in Figures 7-16. When given, Seeing is in the Standard ALPO Scale, ranging from 0.0 for the worst possible conditions to 10.0 for perfect. Telescope types are abbreviated as in Table 2.

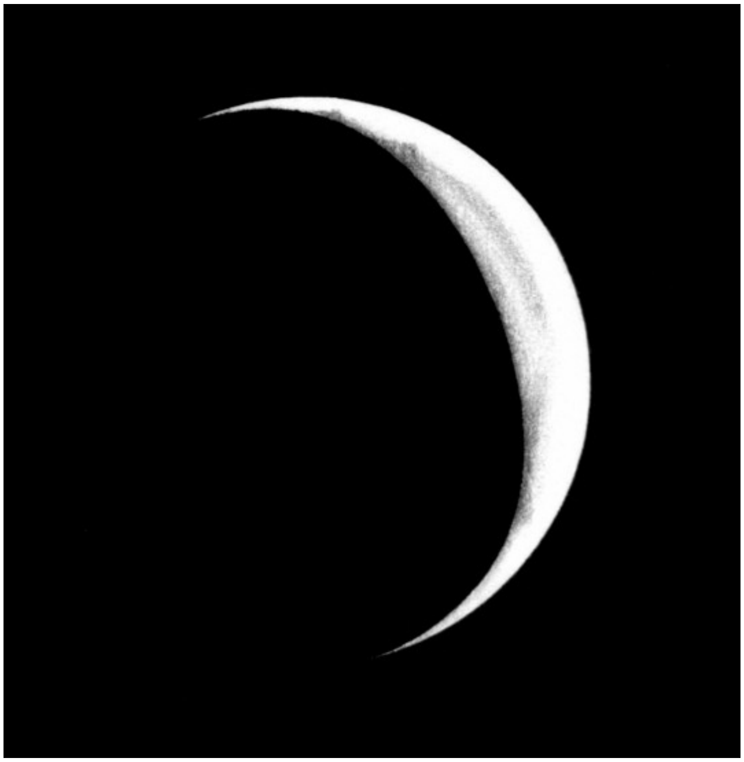

Figure 8. Drawing of Venus by Mario Frassati. 2002 Nov 23d 09h 10m UT. 20.3-cm (8.0-in) SCT, 133X IL and W80A (blue) filter. Seeing 5.0 (interpolated). Phase = 0.143, Diameter = 49".9.

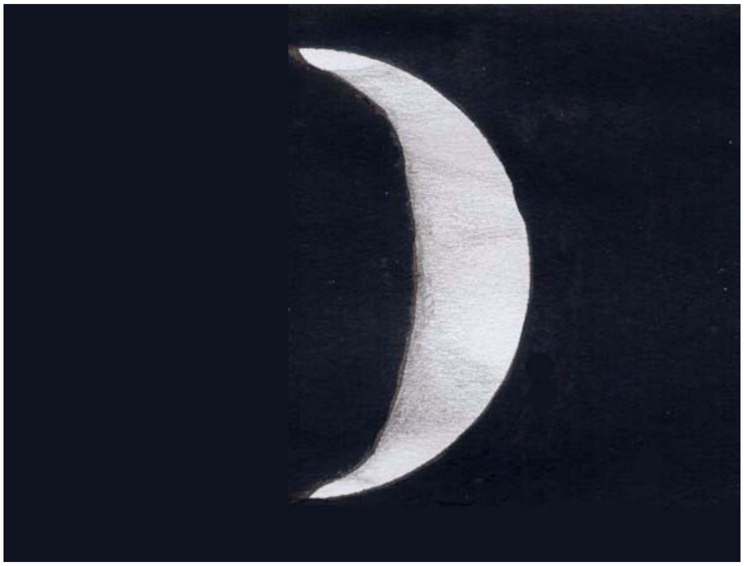

Figure 9. Drawing of Venus by Alexander Vandenbohede. 2002 Dec 03d 06h 45m - 07h 10m UT. 20.3-cm (8.0-in) NEW, 94X IL, W47 (dark blue) Filter. Seeing 7.0, twilight. Phase = 0.234, Diameter 42".5.

Figure 10. Webcam Image of Venus by Daniel del Valle. 2002 Dec 26d 11h 05m UT. 20.3-cm (8.0-in) SCT, IL (no filter). Seeing 5.0, twilight. Phase = 0.411, Diameter = 30".0.

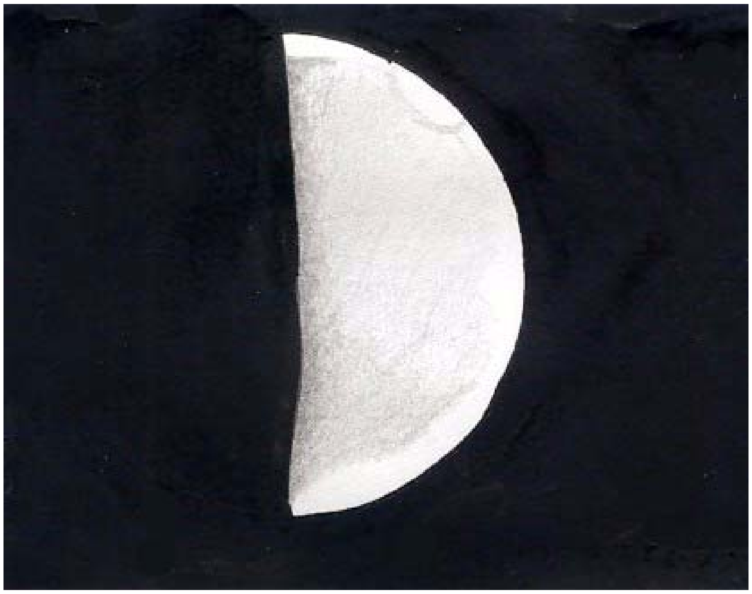

Figure 11. Drawing of Venus by Alexander Vandenbohede. 2003 Jan 09d 06h 45m - 07h 10m UT. 20.3-cm (8.0-in) NEW, 117X IL, W47 Filter. Seeing 8.0, twilight. Phase = 0.492, Diameter = 25".3.

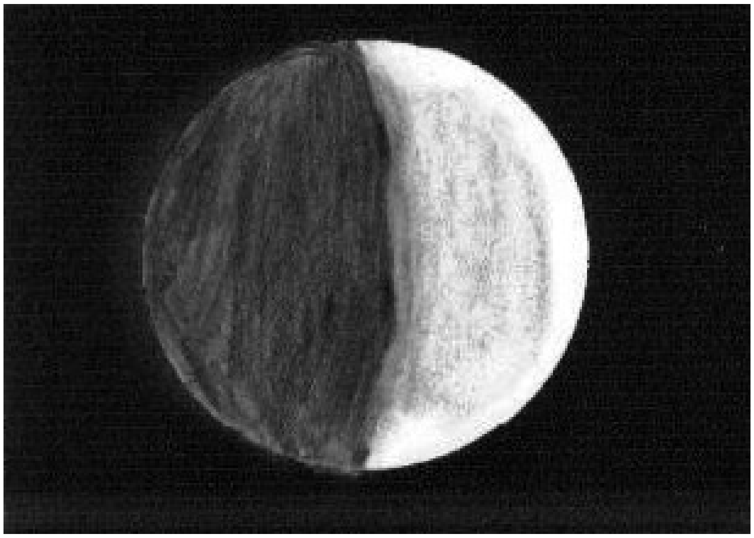

Figure 12. Drawing of Venus by Daniel del Valle. 2003 Jan 12d 10h 20m - 10h 34m UT. 20.3-cm (8.0-in) SCT, 225X IL, W25 (red), W47 and W58 (green) filters. Seeing 8.0, Transparency 3.0 (limiting magnitude). Phase = 0.509, Diameter 22".9.

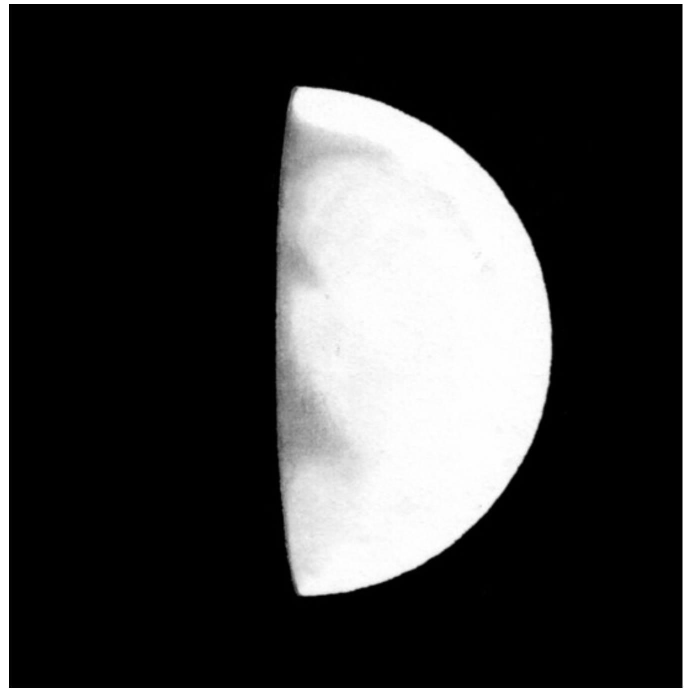

Figure 13. Drawing of Venus by Mario Frassati. 2003 Jan 18d 07h 15m UT. 20.3-cm (8.0-in) SCT, 250X IL. Seeing 5.0 (interpolated). Phase = 0.538, Diameter 22".9.

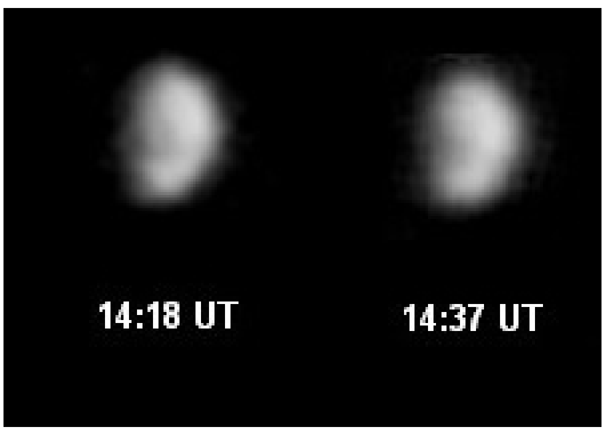

Figure 14. CCD UV (ultraviolet) image by Frank J. Melillo. 2003 Mar 11d 14h 18m UT (left) and 14h 37m UT (right). 20.3-cm (8.0-in) SCT, Starlight Xpress MX-5 camera, Schott UG-1 UV and IRB Filters. Seeing 3.0. Phase = 0.740, Diameter 15".0.

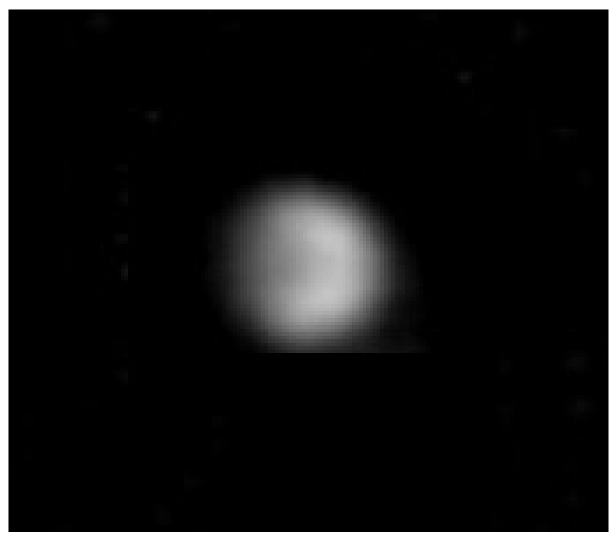

Figure 16. CCD UV image by Frank J. Melillo. 2003 Apr 13d 14h 30m UT. 20.3-cm (8.0-in) SCT, Starlight Xpress MX-5 camera, Schott UG-1 UV and IRB Filters. Seeing 4.5. Phase = 0.830, Diameter = 12".6.

Figure 15. CCD UV image by Frank J. Melillo. 2003 Mar 23d14h 50m UT. 20.3-cm (8.0-in) SCT, Starlight Xpress MX-5 camera, Schott UG-1 UV and IRB Filters. Seeing 3.5. Phase (k) = 0.775, Diameter = 14".0.

Feature Story:

Enigmatic Lunar Craters

By William M. Dembowski, FRAS, coordinator, ALPO Lunar Topographical Studies

Introduction

From the time telescopes were first turned to the Moon, many of the most heated lunar debates centered on the origin of its many craters. Initially, one of the more popular theories was that of volcanism, which is understandable since it was the only known cause for large terrestrial craters at the time.

Gradually, beginning with the work of Grove Carl Gilbert in 1893 and culminating with that of Ralph B. Baldwin and Eugene M. Shoemaker in the mid-20th century, it became accepted that the vast majority of lunar craters were of impact origin.

Concentric Craters

Although it is now clear that impact events account for a majority of lunar craters, there are still a number of craters, albeit relatively small, which may be the result of other processes. One group of craters whose origin is still unresolved are the concentric (double walled) craters which constitute one of the most unique and visually striking classes of features on the lunar surface.

In 1978, Charles A. Wood, then of the Department of Geological Science at Brown University, published a list of 51 concentric craters which he proposed were not of purely impact origin. **(Table of Lunar Concentric Craters)**

Hesiodus A **(Figure 1)**, situated near the southern margin of Mare Nubium, is typical of these concentric craters and differs from lunar craters clearly produced by impact in several significant ways. It has an overall diameter of 15 km with a second, inner ring, one-half that size. The outer rim of Hesiodus A has a concave outer slope, typical of normal impact craters; interestingly, however, the inner ring has a slightly convex outer slope. The overall depth of Hesiodus A is 1.7 km, only half that of known impact craters its size; in addition, the floor of the inner ring is approximately 250 meters lower than the lowest point between the inner and outer rings.

Figure 1. Hesiodus A (#22 on Table of Lunar Concentric Craters).

Seventy percent of the concentric craters on Wood's list share these general characteristics but the remaining 30% present somewhat different morphologies than those exhibited by Hesiodus A. Several of these craters, including Louville DA **(Figure 2)** have not one, but two inner rings. Still others exhibit variations in the shapes of either the inner or outer rings, but all of the craters present enough similarities to suggest a common origin.

Finally, the 51 craters are not randomly distributed across the face of the Moon. Seventy percent are found near the bor

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Table of Lunar Concentric Craters

No.	Designation	Long. Lat.	Dia/km	Ratio	Class	Photo*
1	Archytas G	0.4E 55.8N	6.8	0.54	2M	116-655
2	nr Reaumur B	1.3E 4.5S	4.4	0.64	3C	101-621
3*	Egede G	6.8E 51.9N	6.7	0.66	2M	116-661
4	Fontanus E	13.3E 23.2S	12.7	0.61	3C	95-819
5	nr Torricelli E	26.6E 6.4S	3.9	0.29	3MC	77-480
6	nr Beaumont F	29.6E 19.1S	11.1	0.45	3MC	77-518
7	Crozier H	49.4E 14.1S	11.3	0.37	2C	60-277
8	nr Endymion	50.6E 51.7N	6.9	0.36, 0.64	2M	79-735
9	Apollonius N	64.0E 4.7N	9.4	0.46	2C	1M26-431
10	nr Legendre	68.2E 27.5S	4.6	0.33	3C	38-346
11	nr Dubiago	69.0E 3.7N	4.6	0.36	3M	178-796
12	nr Schubert M	74.0E 2.0N	9.9	0.45	3MC	178-795
13	in Humboldt	83.2E 26.5S	6.7	0.47	1M	27-981
14	nr Hamilton	84.7E 44.2S	9.6	0.55	2M	MII-047
15	nr Jeans	94.4E 53.1S	23.8	0.70	3C	6-154
16*	nr Chamberlin	102.5E 58.8S	8.9	0.75	2MC	9-632
17	in Pasteur	104.9E 11.8S	5.4	0.57	3C	2M196-320
18	nr Jules Verne	144.1E 37.5S	6.4	0.55	2C	2M75-454
19	nr Geiger	159.0E 16.2S	6.5	0.39	3C	2H75-275
20	nr Aitken	172.6E 20.6S	10.0	0.50	3C	A17-150-22961
21	Archimedes F	7.8W 24.1N	7.4	0.54	2MC	114-323
22	Hesiodus A	17.0W 30.1S	14.9	0.41	1M	125-846
23	Gambart J	18.2W 0.7S	7.1	0.44	2M	3H120-772
24*	nr Laplace E	21.2W 50.0N	7.6	0.56	5MC	134-961
25	Fontenelle D	23.3W 62.5N	17.2	0.46	2M	128-213
26*	in Blancanus C	29.1W 66.2S	13.0	0.42	3C	130-444
27	Marth	29.3W 31.1S	6.1	0.44	2M	136-213
28	nr La Cond. F	31.3W 57.2N	5.1	0.37	2M	145-384
29	Hainzel H	33.1W 36.9S	11.2x8.9	0.43	3C	136-224
30	nr Bouguer B	33.8W 53.5N	5.8x6.7	0.43	3C	145-395
31	nr Bouguer A	34.1W 53.2N	7.1	0.47	4C	145-396
32	nr Herschel F	34.6W 57.7N	6.7	0.28	3MC	151-135
33	nr Gruithuisen	41.4W 36.7N	6.8	0.52	3C	151-224
34	Gruithuisen K	42.7W 35.3N	6.9	0.21, 0.50	2MC	145-449
35	nr Clausius E	46.8W 35.4S	9.1	0.40	2C	148-794
36	Mersenius M	48.3W 21.3S	5.5	0.38	2M	149-966
37	Louville DA	51.6W 46.6N	10.5	0.45, 0.72	2M	163-768
38	Damoiseau BA	59.0W 8.3S	8.7	0.57	2C	161-503

* = uncertain crater; nr = near crater; in = within crater; Ratio = dia. ring/dia. crater; Class = 1(sharp) to 5(degraded); M = mare; C = continent or highland; Photo no. = Orbiter 4 unless A (Apollo); 1M (Orbiter I medium resolution); last 3 digits = framelet number; M & H = image taken with a Medium or High resolution camera. The number which precedes it continues to indicate the Orbiter Mission.

Table of Lunar Concentric Craters

No.	Designation	Long. Lat.	Dia/km	Ratio	Class	Photo*
39*	nr Lagrange T	62.0W 33.0S	9.0	0.39	4C	160-360
40	Lagrange T	62.4W 32.9S	11.8	0.45	2C	160-360
41	nr Markov	64.8W 52.6N	7.3	0.37, 0.72	3M	183-376
42	nr Cruger	65.7W 17.0S	2.3	0.58	3C	168-449
43	nr Rocca F	67.1W 14.2S	3.2	0.36	2C	168-441
44	Cavalerius E	69.9W 7.7N	10.9	0.40	2C	169-589
45	nr Lavoisier A	75.0W 36.7N	2.7	0.53	2M	183-422
46*	Repsold A	77.5W 51.9N	8.2	0.58	1C	189-166
47	in Struve	77.7W 22.ON	6.2x5.6	0.37	2MC	182-251
48	in Lavoisier	81.1W 38.4N	5.7	0.51	2C	189-204
49	In Minkowski	143.0W 56.6S	11.0	0.57	2C	5H26-914
50	in Apollo	154.2W 31.0S	11.4	0.49	1C	5H30-407
51	nr De Vries	172.7W 20.6S	12.0x7.0	0.59	3C	2M33-943

* = uncertain crater; nr = near crater; in = within crater; Ratio = dia. ring/dia. crater; Class = 1(sharp) to 5(degraded); M = mare; C = continent or highland; Photo no. = Orbiter 4 unless A (Apollo); 1M (Orbiter I medium resolution); last 3 digits = framelet number; M & H = image taken with a Medium or High resolution camera. The number which precedes it continues to indicate the Orbiter Mission.

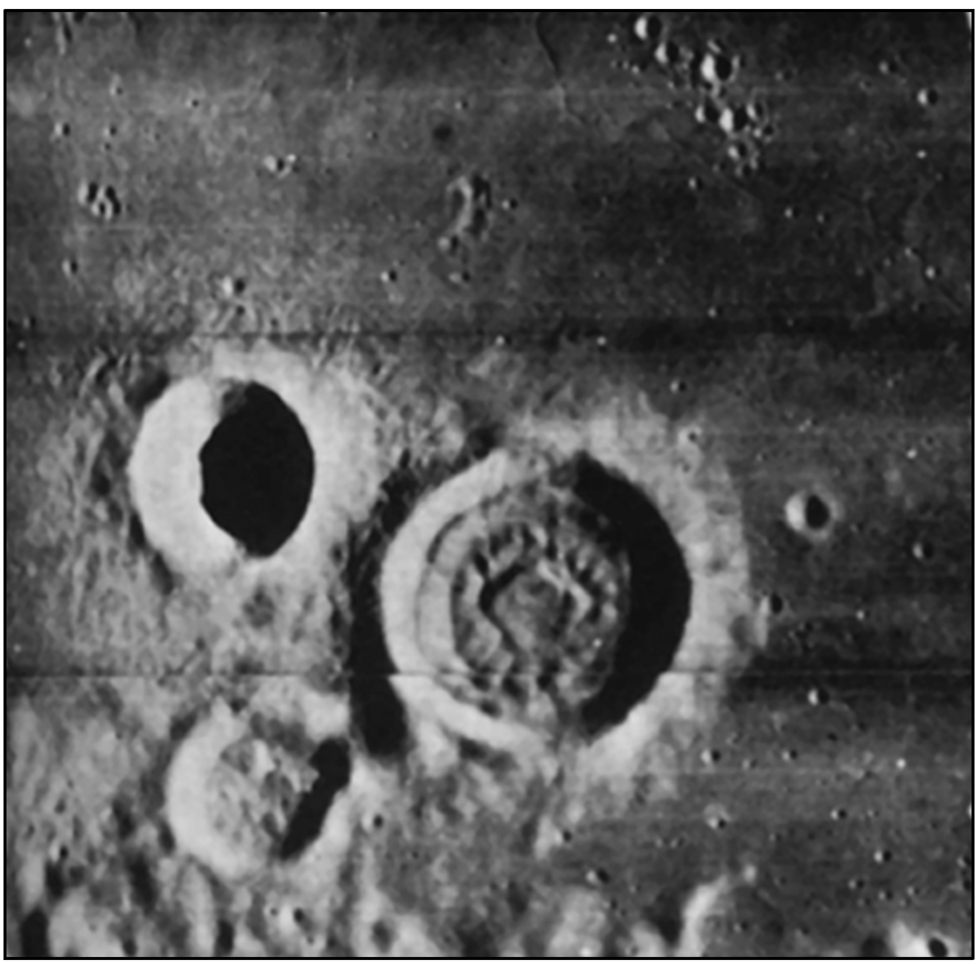

Figure 2. Louville DA (#37 on Table of Lunar Concentric Craters).

ders of maria (on both the maria and highland sides) and another 20%, such as the one in the crater Humboldt **(Figure 3)**, are within the walls of large lava-flooded craters.

“False” Concentric Craters

What is equally important are the apparently concentric craters which do not appear on the list.

The listed craters average about 8 km in diameter and do not include either the large multi-ringed basins (e.g., Mare Orientale) or sub-kilometer secondary craters – both of which exhibit concentric structures but are known to be the result of impacts. Although there is still some disagreement on the details surrounding the formation of large multi-ring basins, there is no question that they are a product of the enormous energy released by large impactors. Secondary craters, by definition, are small craters created by the debris thrown from larger primary impacts.

Some seemingly concentric craters are really chance alignments of multiple impacts **(Figure 4)**. Not only is the inner ring offset from the center of the primary crater, there is an obvious difference in the ages of the two rings as evidenced by the highly eroded walls of the outer ring as compared to the sharper, fresher walls of the inner ring. Also, these “false” concentric craters, though few in number, are randomly distributed over the lunar surface and not concentrated in the aforementioned lava covered locations.

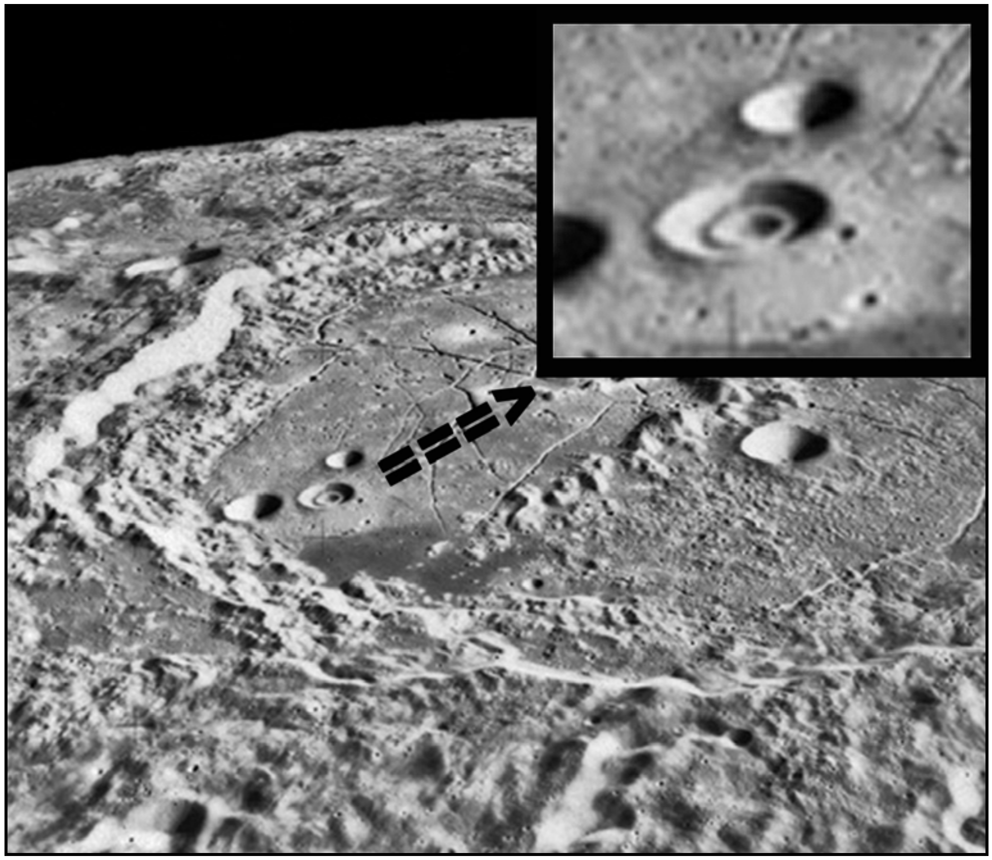

Figure 3. Crater Humboldt (#13 on Table of Lunar Concentric Craters).

Discussion

Most of the characteristics associated with the enigmatic 51 Wood craters seem to indicate volcanic origins. Even their nearly exclusive locations, the maria edges and lava filled craters, have long been associated with lunar volcanic activity. But purely volcanic explanations may not be appropriate. Some writers have suggested that successive eruptions from the same vent would produce a multi-ringed formation, yet the outer rims of concentric craters are indistinguishable from impact craters and some even show evidence of ejecta blankets.

Furthermore, if multiple eruptions were the cause, single eruptions would statistically be more plentiful and call into question the nature of hundreds, if not thousands, of similarly sized craters. Perhaps an initial impact created the outer ring and then caused an endogenic reaction which formed the inner ring(s) of these strange formations. Or, perhaps, there is some as yet unproposed process at work.

Figure 4. Chance alignment of multiple impacts.

Our Moon is not the only cratered body in the Solar System, yet concentric craters appear to be unique to its surface. Features which superficially resemble concentric craters have been found on Mars **(Figure 5)** but they are less than 900 meters in diameter and are the result of impacts into unconsolidated material overlying a more competent layer. A double-ringed structure on Ganymede **(Figure 6)** lies at the other end of the scale (over 100 km) and is an impact crater whose central peak has been blown out because of buried volatiles (ice), making a central pit. It would appear that the solution to the mystery of concentric craters will have to come from additional study of the Moon itself.

Conclusion

As this paper was being written, Charles A. Wood discovered yet another “true” concentric crater by searching a newly released image taken by the ESA’s SMART-1 spacecraft. This crater (now #52 on the Table of Lunar Concentric Craters) lies near Mersenius C and is 3.8 km in diameter with an inner ring that is 1.7 km wide. For additional information on this newest concentric crater, see the URL (website) provided in the Reference section of this paper.

It is exciting to realize that, as the telescopic study of our Moon enters its fifth century, we continue to find topographic features which elude an explanation. With the discovery of a 52nd member of the group, it is evident that neither the list of these enigmatic craters, nor the role of the lunar observer is yet complete.

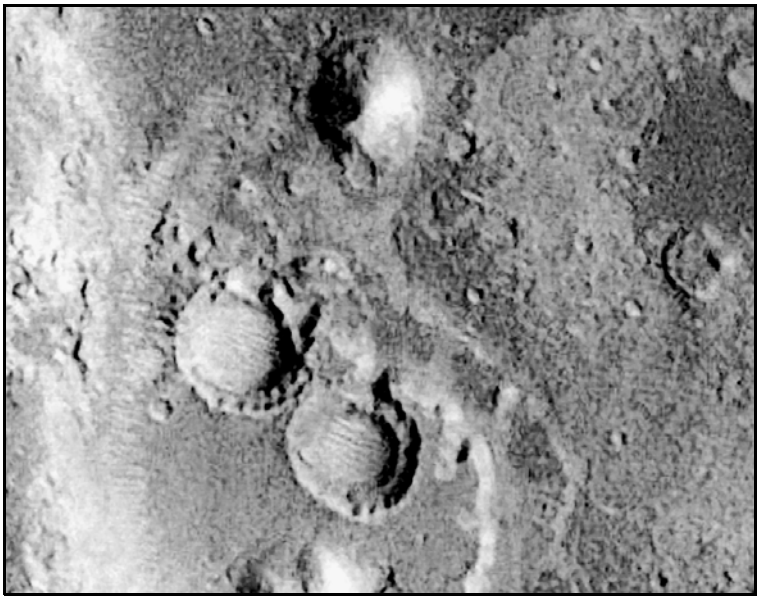

Figure 5. Apparently concentric concentric craters on Mars.

Figure 6. Double-ringed structure on Ganymede.

The author would like to express his deepest appreciation to Charles A. Wood on whose 1978 paper this article is largely based (See URL website in Reference section of this paper). His assistance (via personal communications) in this brief account of a most fascinating subject, along with his enthusiasm and love of the Moon, have been of immeasurable benefit.

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Feature Story:

The Remote Planets in 2005-06

By Richard Schmude, Jr., coordinator, ALPO Remote Planets Section, *Schmude@gdn.edu*

Abstract

Four individuals measured the brightness of Uranus and Neptune with photoelectric equipment. The selected 2005 normalized magnitudes of Uranus are: B(1,0) = -6.66 ± 0.02 and V(1,0) = -7.12 ± 0.01 and the corresponding values for Neptune are: B(1,0) = -6.60 ± 0.03 and V(1,0) = -7.00 ± 0.01. The writer concludes that Uranus and Neptune did not undergo periodic brightness changes with amplitudes exceeding 0.01 magnitudes with periods equal to either the planetary or solar rotation periods during the late months of 2001, 2002 or 2003.

Introduction

Professional astronomers published several recent studies of the remote planets. Hammel and co-workers (2005a, p. 284; 2005b, p. 534) used the 10-meter Keck telescope to capture infrared images of Uranus. They report that Uranus has a faint banded structure and that winds reached speeds of 488 miles per hour in 2003. They also report that a unique cloud developed and then dissipated in the southern hemisphere of Uranus; this cloud was the first one imaged in Uranus' southern hemisphere with the Keck telescope. Sromovsky and Fry (2005, p. 459) also used the Keck telescope to make infrared images of Uranus, imaging 70 clouds and determined their wind speeds. Christou (2005, p. 174-175) reports dates and times of several future mutual eclipses and occultations of Uranus satellites between 2006 and 2009. The predicted dates and times are based on the best available orbital information of Uranus' five brightest moons. By studying these occultations and eclipses, astronomers hope to learn more about the orbits and surfaces of these moons. Lockwood and Jerzykiewicz (2006, p. 442) summarize magnitude measurements of Uranus and Neptune made between 1950 and 2004. They show that Uranus was dimmest around its equinox in 1966, brightest at its solstice in 1985 and close to its dimmest in 2004 near a second equinox. They also point out that the brightness of Neptune may be influenced by a major unknown factor besides seasonal effects. Although professional astronomers have carried out excellent work on the remote planets, ALPO members have also been studying these planets; this paper summarizes work done by ALPO members.

Table 1 summarizes the characteristics of the Uranus, Neptune and Pluto apparitions in 2005, and **Table 2** summarizes the people who sent in remote planets data in 2005.

Photoelectric Photometry

Fox, Loader and the writer all used an SSP-3 solid state photometer and filters transformed to the Johnson B and V system to make magnitude measurements. More information about the equipment can be found elsewhere (Optec Inc, 1997); (Riordan, 1992, pp. 29-34); (Schmude, 1992, p. 20). Transformation coefficients for Fox's, Loader's and Schmude's equipment can be found in (Schmude, 2006, p. 41), (Schmude, 2000, p. 159) and (Schmude, 2002b, p. 106) respectively. Linscott used a Pacific Photometric Instruments Model 110 Laboratory Photometer along with a filter transformed to the Johnson V system. A 1P21 photo-multiplier tube was the detector in Linscott's photometer. The photometer apertures (in arc-seconds) used by Fox, Linscott, Loader and the writer were: 101, 34, 81 and 818 respectively. These apertures were computed from data in Optec, (1995, p. B-1). A transformation coefficient of 0.124 was computed for the V-filter in Linscott's system. The two-star method summarized in Hall and Genet (1988, p. 199) was used in computing all transformation coefficients.

Tables 3 and 4 list magnitude measurements of Uranus and Neptune and **Table 5** lists the comparison star magnitudes used in this study. The date, filter, measured magnitude, normalized magnitude, comparison star and observer are listed in

Table 1: Characteristics of the 2005 Apparitions of Uranus, Neptune and Pluto

	Uranus	Neptune	Pluto
First conjunction date	Feb. 25, 2005	Feb. 3, 2005	Dec. 13, 2004
Opposition date (2005)	Sep. 1	Aug. 8	June 14
Angular diameter (opposition)	3.70 arc-sec.	2.35 arc-sec.	0.11 arc-sec.
Right Ascension (opposition)	22h 42m 50s	21h 14m 54s	17h 31m 44s
Declination (opposition)	-9° 01m 33s	-16° 06m 30s	-14° 58m 35s
Sub-Earth latitude (opposition)	-9.2°	-29.2°	34.8°
Second conjunction date	Mar. 1, 2006	Feb. 6, 2006	Dec. 16, 2005

Data are from the Astronomical Almanacs 2002-2004.

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Table 2: Contributors to the Remote Planets 2005 Apparition Report (mid-2005 to early 2006)

Name & Location	Telescope[a]	Type of Observation[b]	Name & Location	Telescope[a]	Type of Observation[b]
Abbott, Patrick; AB Canada	10x50 Bin	VP	Heffner, Robert; Nagoya Japan	0.28-m SC	I
Amato, Michael; CT USA	0.15-m RR	DN	Johnson, Gus; MD USA	0.20-m U	VP
Armstrong, Jerry; GA USA	0.36-m SC	I	Laux, Lynn; OH USA	0.20-m SC & 0.36-m SC	I
Bell, Charles; MS USA	0.30-m SC	I, PP	Linscott, Stephen; Texas USA	0.20-m SC	PP
Bhanukitsiri, Ron; CA USA	0.13-m RR	I	Loader, Brian; New Zealand	0.25-m	PP
Boisclair, Norman; NY USA	0.51-m RL	DN	Melillo, Frank; NY USA	0.20-m SC	I, PP
Cudnik, Brian; TX USA	several	DN, VP	Niechoy, Detlev; Germany	0.20-m SC	D
Fox, James; MN USA	0.25-m SC	PP	Pellier, Christophe; France	0.20-m Me	I
Gamble, Ken	SC	I	Roussell, Carl; ON Canada	Several	D, DN, VP
Grafton, Ed; TX USA	0.36-m SC	I, PP	Sanford, John; CA USA	0.36-m SC	I
Gray, Robin; NV USA	0.15-m RR & 11x80 Bin	DN, VP	Schmude, Richard; GA USA	0.09-m M & 11x80 Bin	VP, PP

a) Telescopes: Bin = Binoculars, M = Maksutov, RL = reflector, RR = refractor, SC = Schmidt-Cassegrain, Ne = Newtonian
b) Type of observation: D = drawing, DN = descriptive notes, I = images, PP = photoelectric photometry, VP = visual photometry, U = unknown scope type (Gus Johnson)

columns 1-6 of **Tables 3 and 4** respectively. All magnitude measurements in **Tables 3 and 4** were corrected for both atmospheric extinction and color transformation.

Normalized magnitudes were computed for both planets from:

$$X(1,0) = X_{meas} - 5.0 \log [r \times d] \quad (1)$$

where **X** is the B or V filter, $\mathbf{X_{meas}}$ is the measured magnitude in filter **X**, **r** is the planet-Earth distance and d is the planet-sun distance; both expressed in astronomical units. The selected magnitudes are: B(1,0) = -6.66 ± 0.02 and V(1,0) = -7.12 ± 0.01 for Uranus and B(1,0) = -6.60 ± 0.03 and V(1,0) = -7.00 ± 0.01 for Neptune.

Frank Melillo reports that Uranus has grown much dimmer in the Johnson I filter since the late 1990s; however his results have not been corrected for color transformation.

One question is: Do Uranus and Neptune undergo periodic changes in brightness on a timescale of the rotation period of the planet or the Sun? Uranus and Neptune have respective rotation periods of 17.2 and 16.1 hours (Astronomical Almanac, 2004, p. E-4) and the Sun rotates every 27 days; therefore, I looked for cyclic magnitude variations having periods of 16-17 hours and about one month. **Figures 1 and 2** show V(1,0) values for Uranus and Neptune measured in 2001-2003. Any periodic brightness change with a monthly period and amplitude of 0.01 or higher can be ruled out for at least late 2001, 2002 and 2003 in the V-filter. The data in **Figure 1** (from Schmude 2002a, p. 26-27; 2004a, p. 52-53; 2005, p. 41) along with that in Schmude (1998, p. 122; 2002a, p. 23) and Lockwood (1977, p. 418) rule out any brightness changes in the V-filter for Uranus with a period of 17.2 hours and an amplitude of at least 0.01 magnitudes for several dates. Finally there is no evidence for an 8.4-year brightness cycle having an amplitude of 0.01 magnitudes or greater for Uranus (Lockwood and Jerzykiewicz, 2006, p. 448), (Schmude, 2006, p. 42). Keep in mind that the results in **Table 6** apply only to the V-filter and for specific times.

Neptune's brightness changes from 1950-2004 are less understood than those of Uranus (Lockwood and Jerzykiewicz, 2006, p. 448-449). There is some evidence for an 11-year and a seasonal cycle brightness change on Neptune (Sromovsky et al. 2003, p. 256); however, more data over several decades are needed before more definite conclusions can be reached. There is little evidence for either a monthly or a 16.1-hour brightness cycle for Neptune in late 2001, 2002 and 2003; see **Figure 2**. Data for June-August, 1989 also show no evidence of a brightness cycle equal to the Sun's or Neptune's rotation period (Lockwood, et al., 1991, p. 301).

Visual Magnitude Estimates

Visual magnitude estimates are those that are made with just the eye and optical aid such as binoculars. Abbott, Cudnik, Gray, Johnson, Roussell and the writer made visual magnitude estimates of Uranus and/or Neptune. The average normalized magnitudes for Uranus and Neptune respectively are: $V_{vis}(1,0)$ = -7.1 ± 0.01 and -7.0 ± 0.06. The uncertainties include only random errors.

Normalized visual magnitudes made since 1989 are consistent with a gradual dimming of Uranus from 1989 to 2005 at a rate of 0.05 magnitudes per decade. This rate is consistent with photoelectric magnitude data (Lockwood and Jerzykiewicz, 2006, p. 448), (Schmude, 2006, p. 42), but is inconsistent with the trend reported by Hollis (2000, p. 125) which shows Uranus getting brighter between 1987 and 1997. Hollis summarized visual magnitudes made mostly by BAA members. The writer feels that a thorough review of all visual magnitudes should be carried out to determine if Uranus underwent a seasonal brightness change in the late 19th and early 20th century (Alexander, 1965, 252).

Disc Appearance

Bell, Bhanukitsiri, Gamble, Grafton, Heffner, Melillo, Laux, Pellier and Sanford, all took images of Uranus and/or Neptune and Armstrong took an image of the newly discovered object 2003 UB 313, which many people feel is the tenth planet. The only definite albedo feature imaged on Uranus was limb darkening. Strong limb darkening was present in unfiltered images taken on July 8 (Bell), July 10 (Grafton), July 20 (Laux), Aug. 19 (Heffner) and Sep. 4 (Laux), but it was less distinct in the red + infrared images made by Pellier on July 3 and Aug. 25. Neptune's limb darkening was strong on Laux's unfiltered CCD image on July 31.

Armstrong imaged the object 2003 UB 313 which lies beyond the orbit of Neptune and is larger than Pluto. He used a 0.36 m Schmidt-Cassegrain telescope along with an ST-1001 CCD camera and a 300-second exposure time to record his image.

Many people in the 20th century reported seeing the polar flattening of Uranus in the telescope (Alexander, 1965, pp. 226, 235); (Cross, 1969, p. 152); (Hodgson, 1969, p. 168). These observations motivated the writer to measure the polar flattening of Uranus from recent ALPO images. A mean ellipticity of 0.028 ± 0.007 was measured from red-blue-green and red + infrared images in 2004 and 2005. The ellipticity was computed from:

$$\text{Ellipticity} = (De - Dp)/De \quad (2)$$

where **De** is the equatorial diameter and **Dp** is the polar diameter (Beatty and Chaikin, 1990, p. 291). The literature value of the ellipticity of Uranus in visible light is 0.023 but due to geometry, the ellipticity as seen from Earth in 2004 and 2005 was 0.022 (computed from the equation in Lockwood and Thompson, 1999, p. 7). The measured value lies within the uncertainty of the literature value.

Amato, Boisclair, Cudnik and Niechoy made visual observations of Uranus and/or Neptune with a telescope. Boisclair reports that Uranus and Neptune lacked albedo features except for limb darkening on Oct. 4 under nearly perfect seeing conditions. Boisclair used a 0.51 m Newtonian telescope with a magnification of 1016X and 840X for Uranus and Neptune respectively. Five days later Cudnik used a 0.36 m Schmidt-Cassegrain telescope at 489X to observe Uranus and Neptune under good seeing conditions. He reported that Uranus did not have any

Table 3: Magnitude Measurements of Uranus (2005)

Date (2005)	Filter	Measured Magnitude	X(1,0)	Comparison Star	Observer*
May 25.363	V	5.96	-7.07	γ-Cap	RS
May 25.379	V	5.94	-7.10	γ-Cap	RS
Aug. 7.279	V	5.77	-7.15	σ-Aqr	JF
Aug. 7.279	B	6.27	-6.65	σ-Aqr	JF
Aug. 15.234	V	5.77	-7.15	σ-Aqr	JF
Aug. 15.234	B	6.24	-6.68	σ-Aqr	JF
Aug. 21.232	V	5.77	-7.15	σ-Aqr	JF
Aug. 21.232	B	6.25	-6.67	σ-Aqr	JF
Aug. 28.208	V	5.78	-7.14	σ-Aqr	JF
Aug. 28.208	B	6.25	-6.66	σ-Aqr	JF
Sep. 2.198	V	5.77	-7.14	σ-Aqr	JF
Sep. 2.198	B	6.25	-6.66	σ-Aqr	JF
Sep. 3.184	V	5.77	-7.14	σ-Aqr	JF
Sep. 3.184	B	6.25	-6.66	σ-Aqr	JF
Sep. 5.179	V	5.75	-7.16	σ-Aqr	JF
Sep. 5.179	B	6.24	-6.68	σ-Aqr	JF
Sep. 8.182	V	5.77	-7.15	σ-Aqr	JF
Sep. 8.182	B	6.25	-6.66	σ-Aqr	JF
Sep. 9.170	V	5.77	-7.14	σ-Aqr	JF
Sep. 9.170	B	6.25	-6.66	σ-Aqr	JF
Sep. 23.534	V	5.82	-7.10	σ-Aqr	BL
Sep. 23.557	B	6.28	-6.64	σ-Aqr	BL
Oct. 24.371	V	5.86	-7.10	σ-Aqr	BL
Oct. 24.395	B	6.33	-6.63	σ-Aqr	BL
Oct. 29.034	V	5.91	-7.06	σ-Aqr	RS
Oct. 29.044	V	5.87	-7.10	σ-Aqr	RS
Oct. 29.067	V	5.87	-7.10	σ-Aqr	RS
Oct. 29.075	V	5.90	-7.07	σ-Aqr	RS
Oct. 29.084	V	5.88	-7.08	σ-Aqr	RS
Oct. 29.094	V	5.87	-7.10	σ-Aqr	RS
Oct. 29.104	V	5.85	-7.12	σ-Aqr	RS
Oct. 30.032	V	5.87	-7.10	σ-Aqr	RS
Dec. 1.053	V	5.82	-7.21	σ-Aqr	SL

*Observers: JF = Jim Fox; SL = Steve Linscott; BL = Brian Loader; RS = Richard Schmude, Jr.

Table 4: Magnitude Measurements of Neptune (2005)

Date (2005)	Filter	Measured Magnitude	X(1,0)	Comparison Star	Observer*
July 12.552	V	7.72	-7.00	Theta-Cap	BL
July 12.588	B	8.09	-6.63	Theta-Cap	BL
Aug. 7.254	B	8.12	-6.59	Theta-Cap	JF
Aug. 7.254	V	7.76	-6.95	Theta-Cap	JF
Aug. 15.209	B	8.08	-6.63	Theta-Cap	JF
Aug. 15.209	V	7.71	-6.99	Theta-Cap	JF
Aug. 21.207	B	8.07	-6.64	Theta-Cap	JF
Aug. 21.207	V	7.72	-6.99	Theta-Cap	JF
Aug. 28.184	B	8.02	-6.69	Theta-Cap	JF
Aug. 28.184	V	7.72	-6.99	Theta-Cap	JF
Sep. 2.173	B	8.04	-6.67	Theta-Cap	JF
Sep. 2.173	V	7.70	-7.01	Theta-Cap	JF
Sep. 3.159	B	8.10	-6.61	Theta-Cap	JF
Sep. 3.159	V	7.68	-7.03	Theta-Cap	JF
Sep. 8.157	B	8.27	-6.44	Theta-Cap	JF
Sep. 8.157	V	7.69	-7.02	Theta-Cap	JF
Sep. 9.147	B	8.27	-6.45	Theta-Cap	JF
Sep. 9.147	V	7.69	-7.03	Theta-Cap	JF
Sep. 23.350	V	7.75	-6.99	Theta-Cap	BL
Sep. 23.377	B	8.08	-6.66	Theta-Cap	BL
Oct. 22.364	V	7.77	-6.99	Theta-Cap	BL
Oct. 22.396	V	7.77	-6.99	Theta-Cap	BL
Oct. 22.414	B	8.18	-6.58	Theta-Cap	BL

*Observers: JF = Jim Fox; BL = Brian Loader

albedo features but that Neptune's center was brighter than the rest of the planet. Cudnik did not observe this central bright spot a month later on Nov. 6 with the same instrument under nearly the same seeing conditions.

Boisclair reported that Uranus had a pale green-white or a pale green-yellow color, and that Neptune had a bluish or bluish-gray color. Cudnik reported a blue-white color for Uranus and a blue-gray or a green-blue color for Neptune.

Charles Bell captured an image of Pluto on July 4, 2005 at 5:57 UT. Pluto was within 30 arc-seconds of its predicted position (Gupta, 2004, p. 197).

Table 5: Comparison Stars and Magnitudes Used in Photoelectric Measurements Of Uranus and Neptune in 2005

Star Name	Right Ascension (2000)[a]	Declination (2000)[a]	Magnitude[b, c]		Spectral Type[a]
			B-filter	V-filter	
γ-Cap	21h 40m 06s	-16° 39m 44s	3.99	3.67	F0
σ-Aqr	22h 30m 39s	-10° 40m 41s	4.76	4.82	A0
θ-cap	21h 05m 57s	-17° 13m 58s	4.06	4.07	A1

a) Right Ascension, declination and spectral type are from: Hirshfeld et al., 1991.
b) Magnitudes are from Iriarte et al. 1965.
c) Sinnott and Perryman (1997) was also used to check for the stability of the star magnitudes.

Satellites

Bell, Grafton, Laux and Sanford imaged at least one of the moons of Uranus or Neptune. Bell reports magnitudes of 13.96 and 14.15 for Titania and Oberon. He used Hubble guide stars as comparison objects. Based on Bell's measurements, I computed normalized magnitudes of 1.03 and 1.22 for Titania and Oberon; the respective literature V(1,0) values for these two objects are: 1.02 and 1.23. Bell used an SBIG 2000 XCM + AO7 camera without filters to make his magnitude measurements. Grafton used an unfiltered ST402 CCD camera to measure the magnitude differences of Uranus' four brightest moons. Grafton imaged Uranus' four brightest moons on July 10 at 9:43 UT and he reports the following brightness differences (in magnitudes) between Titania and the other moons: 0.289 (Oberon); 0.287 (Ariel) and 0.816 (Umbriel); in all cases, Titania was the brightest object.

The average magnitude difference between Titania and Umbriel for 2002, 2004 and 2005 based on unfiltered CCD images is 0.90 ± 0.05 magnitudes where the uncertainty includes only random errors. According to the Astronomical Almanac (2004, p. F5) the magnitude difference between Titania and Umbriel is 1.08 magnitude in the V-filter. Therefore the unfiltered CCD magnitude difference is 0.18 magnitude less than the literature value. A similar difference occurs for Ariel but not for Oberon. The difference for Ariel and Umbriel may be due to a systematic error in how scattered light from Uranus is subtracted form Ariel and Umbriel; nevertheless, this brightness difference may be real and so I am hoping that people will make more measurements.

Conclusions

The writer makes the following conclusions:

1. The selected 2005 normalized magnitudes for Uranus are: B(1,0) = -6.66 ± 0.02 and V(1,0) = -7.12 ± 0.01.

2. The selected 2005 normalized magnitudes for Neptune are: B(1,0) = -6.60 ± 0.03 and V(1,0) = -7.00 ± 0.01

Table 6: Summary of Brightness Variations for Uranus in Visible Light (wavelength ~540 nanometers)

Period of variability	Brightness Change ?	Date with information on variability	Amplitude (magnitudes)	Source
84 years	Yes	1950-2004 1927-2005	~0.1	Lockwood & Jerzykiewicz (2006, p. 448)Schmude (2004b, pp. 1103)
8.4	No	1950-2004	<0.01	Lockwood & Jerzykiewicz (2006, p. 448)
1 month	No	2001-2003	<0.01	Current work
17.2 hours	No	2001-2003 April 1975	<0.01	Schmude (2006, p. 42)Lockwood (1977, p. 418)

3. There is no evidence to support brightness changes with amplitudes of more than 0.01 magnitudes and with a period of one month or 16-17 hours for Uranus and Neptune.

4. ALPO data confirms the seasonal brightness change of Uranus first pointed out by Lockwood.

5. There were no definite albedo features imaged on Uranus in 2005 except for limb darkening.

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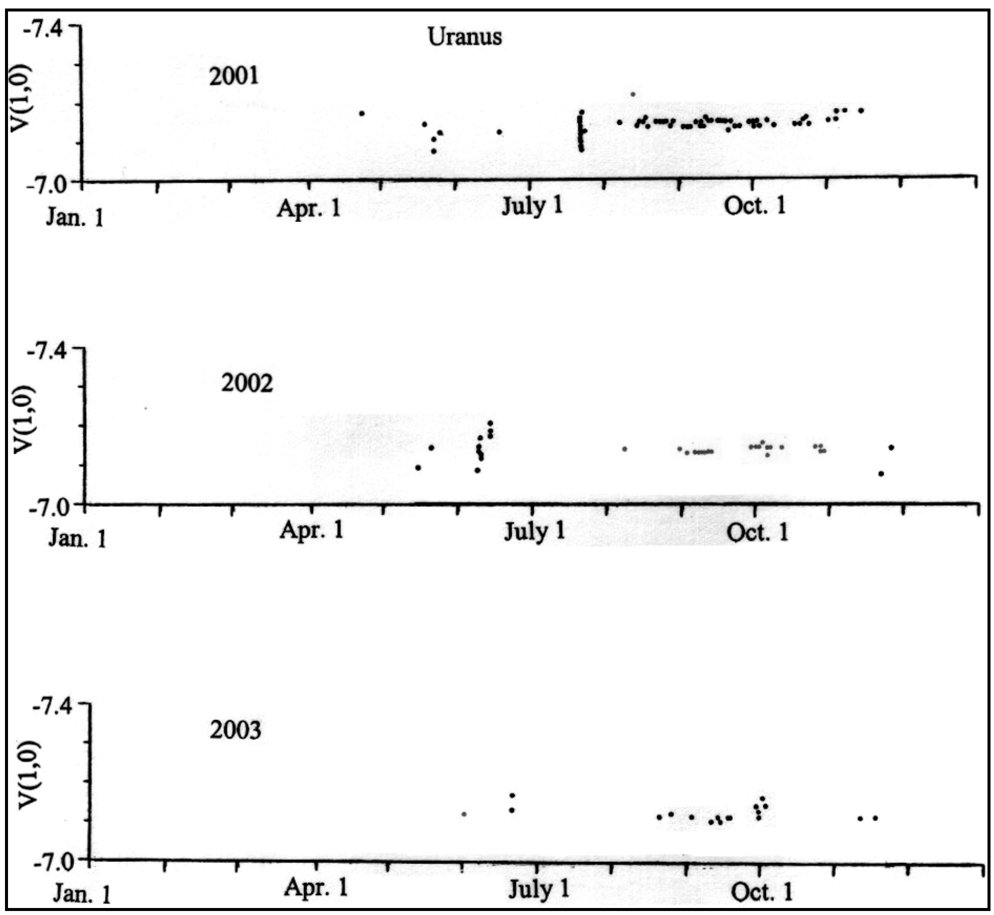

Figure 1. Normalized Magnitudes, V(1,0), of Uranus measured by ALPO members during 2001-2003.

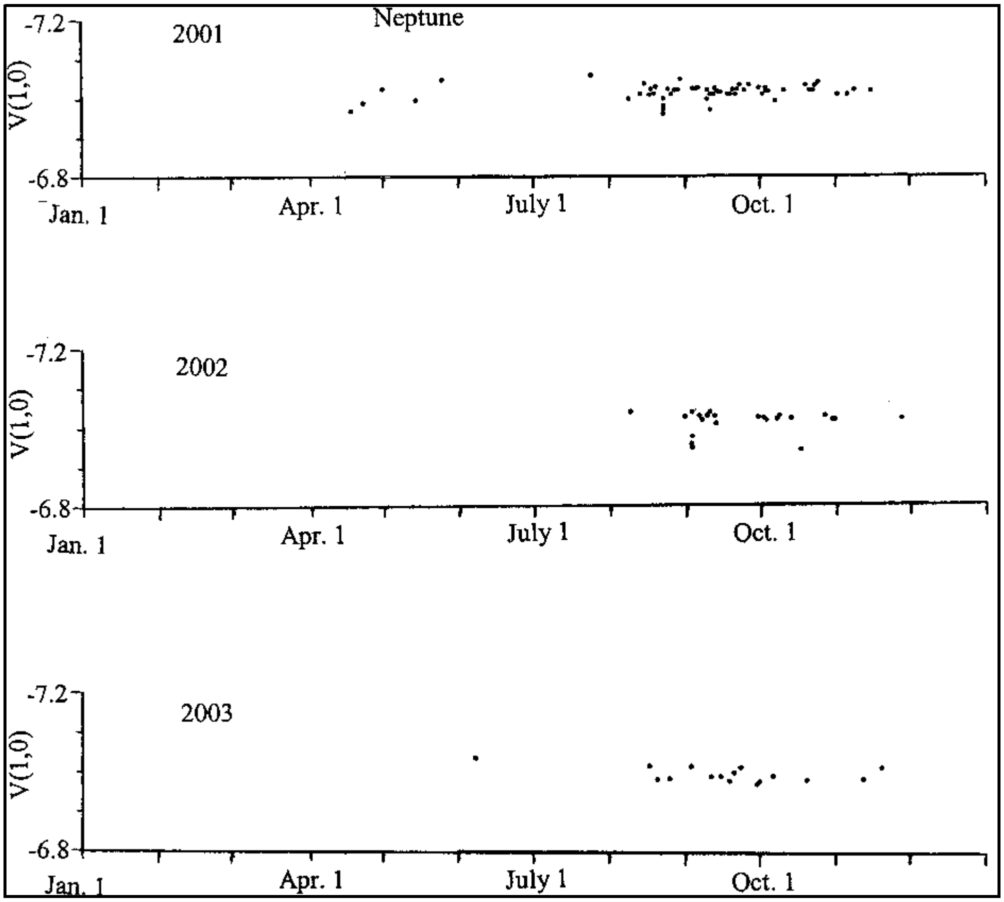

Figure 2. Normalized Magnitudes, V(1,0), of Neptune measured by ALPO members during 2001-2003.

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ALPO Publications:

The Monograph Series

ALPO monographs are publications that we believe will appeal to our members, but which are too lengthy for publication in *The Strolling Astronome*r. They should be ordered from *The Strolling Astronomer* science editor (P.O. Box 2447, Antioch, CA 94531-2447 U.S.A.) for the prices indicated, which include postage. Checks should be in U.S. funds, payable to "ALPO".

- **Monograph Number 1.** *Proceedings of the 43rd Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, August 4-7, 1993.77* pages. Price: $12 for the United States, Canada, and Mexico; $16 elsewhere.
- **Monograph Number 2**. *Proceedings of the 44th Convention of the Association of Lunar and Planetary Observers. Greenville, South Carolina, June 15-18, 1994.52* pages. Price: *$7.50* for the United States, Canada, and Mexico; $11 elsewhere.
- **Monograph Number 3**. *H.P. Wilkins 300-inch Moon Map.* 3rd Edition (1951), reduced to 50 inches diameter; 25 sections, 4 special charts; also 14 selected areas at 219 inches to the lunar diameter. Price: $28 for the United States, Canada, and Mexico; $40 elsewhere.
- **Monograph Number 4.** *Proceedings of the 45th Convention of the Association of Lunar and Planetary Observers. Wichita, Kansas, August 1-5, 1995.127* pages. Price: $17 for the United States, Canada, and Mexico; $26 elsewhere.
- **Monograph Number *5.*** *Astronomical and Physical Observations of the Axis of Rotation and the Topography of the Planet Mars. First Memoir; 1877-1878.* By Giovanni Virginio Schiaparelli, translated by William Sheehan. 59 pages. Price: $10 for the United States, Canada, and Mexico; $15 elsewhere.

ALPO Resources

People, publications, etc., to help our members

- **Monograph Number** ***6.*** *Proceedings of the 47th Convention of the Association of Lunar and Planetary Observers, Tucson, Arizona, October 19-21, 1996.20* pages. Price $3 for the United States, Canada, and Mexico; $4 elsewhere.
- **Monograph Number 7.** *Proceedings of the 48th Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, June 25-29, 1997.76* pages. Price: $12 for the United States, Canada, and Mexico; $16 elsewhere.
- **Monograph Number 8**. *Proceedings of the 49th Convention of the Association of Lunar and Planetary Observers. Atlanta, Georgia, July 9-11,1998.122* pages. Price: $17 for the United States, Canada, and Mexico; $26 elsewhere.
- **Monograph Number 9**. *Does Anything Ever Happen on the Moon?* By Walter H. Haas. Reprint of 1942 article. 54 pages. Price: $6 for the United States, Canada, and Mexico; $8 elsewhere.
- **Monograph Number 10.** *Observing and Understanding Uranus, Neptune and Pluto*. By Richard W. Schmude, Jr. 31 pages. Price: $4 for the United States, Canada, and Mexico; $5 elsewhere.

ALPO Observing Section Publications

Order the following directly from the appropriate ALPO section coordinators; use the address in the listings pages which appeared earlier in this booklet unless another address is given.

- **Solar:** Totally revised *Guidelines for the Observation and Reporting of Solar Phenomena*, $10 USD; includes CD with 100 page-manual in pdf with up-to-date techniques, images, and links to

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Online Readers

Items in blue text in the *ALPO Staff E-mail Directory* above are links to e-mail addresses. Left-click your mouse on the names in blue text and your own e-mail program will open with a blank e-mail preaddressed to the person you chose. NOTE: Your Internet connection MUST be ON for this feature to work.

ALPO Resources

People, publications, etc., to help our members

many solar references. Produced by ALPO Solar Section Assistant Cordinator and Arhivist Jamey Jenkins, this publication replaces *Observe and Understand the Sun* and its predecessor, *The Association of Lunar& Planetary Observer's Solar Section Handbook for the White Light Observation of Solar Phenomena*, both by the ALPO's own Rik Hill. To order, send check or US money order made payable to Jamey Jenkins, 308 West First Street, Homer, Illinois 61849; e-mail to *jenkinsjl@yahoo.com*

- **Lunar and Planetary Training Program:** *The Novice Observers Handbook* $15. An introductory text to the training program. Includes directions for recording lunar and planetary observations, useful exercises for determining observational parameters, and observing forms. Send check or money order payable to Timothy J. Robertson, 2010 Hillgate Way #L, Simi Valley, CA 93065.

- **Lunar (Benton):** (1) *The ALPO Lunar Section's Selected Areas Program* ($17.50). Includes full set of observing forms for the assigned or chosen lunar area or feature, along with a copy of the *Lunar Selected Areas Program Manual.* (2) *Observing Forms,* free at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/selarea.html*, or $10 for a packet of forms by regular mail. Specify *Lunar Forms*. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO lunar SAP section. Observers should make copies using high-quality paper.)

- **Lunar**: *The Lunar Observer*, official newsletter of the ALPO Lunar Section, published monthly. Free at *http://www.zone-vx.com/tlo.pdf* or 70 cents per copy hard copy; send SASE with payment (check or money order) to: William Dembowski, Elton Moonshine Observatory, 219 Old Bedford Pike, Windber, PA 15963

- **Lunar (Jamieson):** *Lunar Observer's Tool Kit*, price $50, is a computer program designed to aid lunar observers at all levels to plan, make, and record their observations. This popular program was first written in 1985 for the Commodore 64 and ported to DOS around 1990. Those familiar with the old DOS version will find most of the same tools in this new Windows version, plus many new ones. A complete list of these tools includes Dome Table View and Maintenance, Dome Observation Scheduling, Archiving Your Dome Observations, Lunar Feature Table View and Maintenance, Schedule General Lunar Observations, Lunar Heights and Depths, Solar Altitude and Azimuth, Lunar Ephemeris, Lunar Longitude and Latitude to Xi and Eta, Lunar Xi and Eta to Longitude and Latitude, Lunar Atlas Referencing, JALPO and Selenology Bibliography, Minimum System Requirements, Lunar and Planetary Links, and Lunar Observer's ToolKit Help and Library. Some of the program's options include predicting when a lunar feature will be illuminated in a certain way, what features from a collection of features will be under a given range of illumination, physical ephemeris information, mountain height computation, coordinate conversion, and browsing of the software's included database of over 6,000 lunar features. Contact *h.jamieson@bresnan.net*.

- **Venus (Benton):** (1) *ALPO Venus Observing Kit,* $17.50; includes introductory description of ALPO Venus observing programs for beginners, a full set of observing forms, and a copy of *The Venus Handbook.* (2) *Observing Forms,* free at *http://www.lpl.arizona.edu/~rhill/alpo/venustuff/venusfrms.html* or $10 for a packet of forms by regular mail (specify *Venus Forms).* To order either numbers (1) or (2), send a check or money order payable to "Julius L. Benton, Jr." All foreign orders should include $5 additional for postage and handling; p/h included in price for domestic orders. Shipment will be made in two to three weeks under normal circumstances. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Venus section. Observers should make copies using high-quality paper.

- **Mars:** *(1) ALPO Mars Observers Handbook,* send check or money order for $15 per book (postage and handling included) to Astronomical League Sales, c/o Marion M. Bachtell, P.O. Box 572, West Burlington, IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. *(2) Observing Forms;* send SASE to obtain one form for you to copy; otherwise send $3.60 to obtain 25 copies (send and make checks payable to "Deborah Hines").

- **Jupiter:** *(1) Jupiter Observer's Handbook*, $15 from the Astronomical League Sales, c/o Marion M. Bachtell, P.O. Box 572, West Burlington, IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. (2) *Jupite*r, the ALPO section newsletter, available onlineonly via the ALPO website; (3) *J-Ne*t, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougal. (4) *Timing the Eclipses of Jupiter's Galilean Satellites* observing kit and report form; send SASE to John Westfall. (5) *Jupiter Observer's Startup Ki*t, $3 from the Richard Schmude, Jupiter Section coordinator.

- **Saturn (Benton):** (1) *ALPO Saturn Observing Ki*t, $20; includes introductory description of Saturn observing programs for beginners, a full set of observing forms, and a copy of *The Saturn Handboo*k. Newly released book *Saturn and How to Observe It* (by J. Benton) replaces to *The Saturn Handbook* in early 2006. (2) *Saturn Observing Forms*, free at *http:www.lpl.arizona.edu/~rhill/alpo/satstuff/satfrms.html* or $10 by regular mail. Specify *Saturn Forms.* NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Saturn section.

- **Meteors:** (1) *The ALPO Guide to Watching Meteors* (pamphlet). $4 per copy (includes postage & handling); send check or money order to Astronomical League Sales, c/o Marion M.

ALPO Resources

People, publications, etc., to help our members

Bachtell, P.O. Box 572, West Burlington, IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. (2) *The ALPO Meteors Section Newsletter*, free (except postage), published quarterly (March, June, September, and December). Send check or money order for first class postage to cover desired number of issues to Robert D. Lunsford, 1828 Cobblecreek St., Chula Vista, CA 91913-3917.

- **Minor Planets (Derald D. Nye):** *The Minor Planet Bulletin*. Published quarterly; free at *http://www.minorplanetobserver.com/mpb/default.htm* or $14 per year via regular mail in the U.S., Mexico and Canada, $19 per year elsewhere (air mail only). Send check or money order payable to "Minor Planet Bulletin" to Derald D. Nye, 10385 East Observatory Dr., Corona de Tucson, AZ 8564I-2309.

Other ALPO Publications

Checks must be in U.S. funds, payable to an American bank with bank routing number.

- ***An Introductory Bibliography for Solar System Observers.*** **No charge.** Four-page list of books and magazines about Solar System objects and how to observe them. The current edition was updated in October, 1998. Send self-addressed stamped envelope witrh request to current ALPO Membership Secretary (Matt Will).

- ***ALPO Membership Directory.*** Provided only to ALPO board and staff members. Contact current ALPO membership secretary/treasurer (Matt Will).

- ***Back issues of The Strolling Astronomer (JALPO)***. Many of the back issues listed below are almost out of stock, and it is impossible to guarantee that they will remain available. Issues will be sold on a first-come, first-served basis. The price is $4 for each back issue; the current issue, the last one published, is $5. We are always glad to be able to furnish old issues to interested persons and can arrange discounts on orders of more than $30. Order directly from and make payment to "Walter H. Haas"(see address under "Board of Directors," on page 38):

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The Association of Lunar and Planetary Observers (ALPO) was founded by Walter H. Haas in 1947, and incorporated in 1990, as a medium for advancing and conducting astronomical work by both professional and amateur astronomers who share an interest in Solar System observations. We welcome and provide services for all individuals interested in lunar and planetary astronomy. For the novice observer, the ALPO is a place to learn and to enhance observational techniques. For the advanced amateur astronomer, it is a place where one's work will count. For the professional astronomer, it is a resource where group studies or systematic observing patrols add to the advancement of astronomy.

Our Association is an international group of students that study the Sun, Moon, planets, asteroids, meteors, meteorites and comets. Our goals are to stimulate, coordinate, and generally promote the study of these bodies using methods and instruments that are available within the communities of both amateur and professional astronomers. We hold a conference each summer, usually in conjunction with other astronomical groups.

We have "sections" for the observation of all the types of bodies found in our Solar System. Section Coordinators collect and study submitted observations, correspond with observers, encourage beginners, and contribute reports to our Journal at appropriate intervals. Each Coordinator can supply observing forms and other instructional material to assist in your telescopic work. You are encouraged to correspond with the Coordinators in whose projects you are interested. Coordinators can be contacted through our web site via e-mail or at their postal mail addresses listed in back of our Journal. Out web site is hosted by the Lunar and Planetary Laboratory of the University of Arizona which you are encouraged to visit at http://www.lpl.arizona.edu/alpo/. Our activities are on a volunteer basis, and each member can do as much or as little as he or she wishes. Of course, the ALPO gains in stature and in importance in proportion to how much and also how well each member contributes through his or her participation.

Our work is coordinated by means of our periodical, "The Strolling Astronomer", also called the Journal of the Assn. of Lunar & Planetary Observers. Membership dues include a subscription to the Journal. The ALPO offers a printed version of the Journal that is mailed out quarterly. An identical digital (portable document file, or pdf) version is available over the internet at reduced cost.

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