ISSN-0039-2502

Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 50, Number 3, Summer 2008

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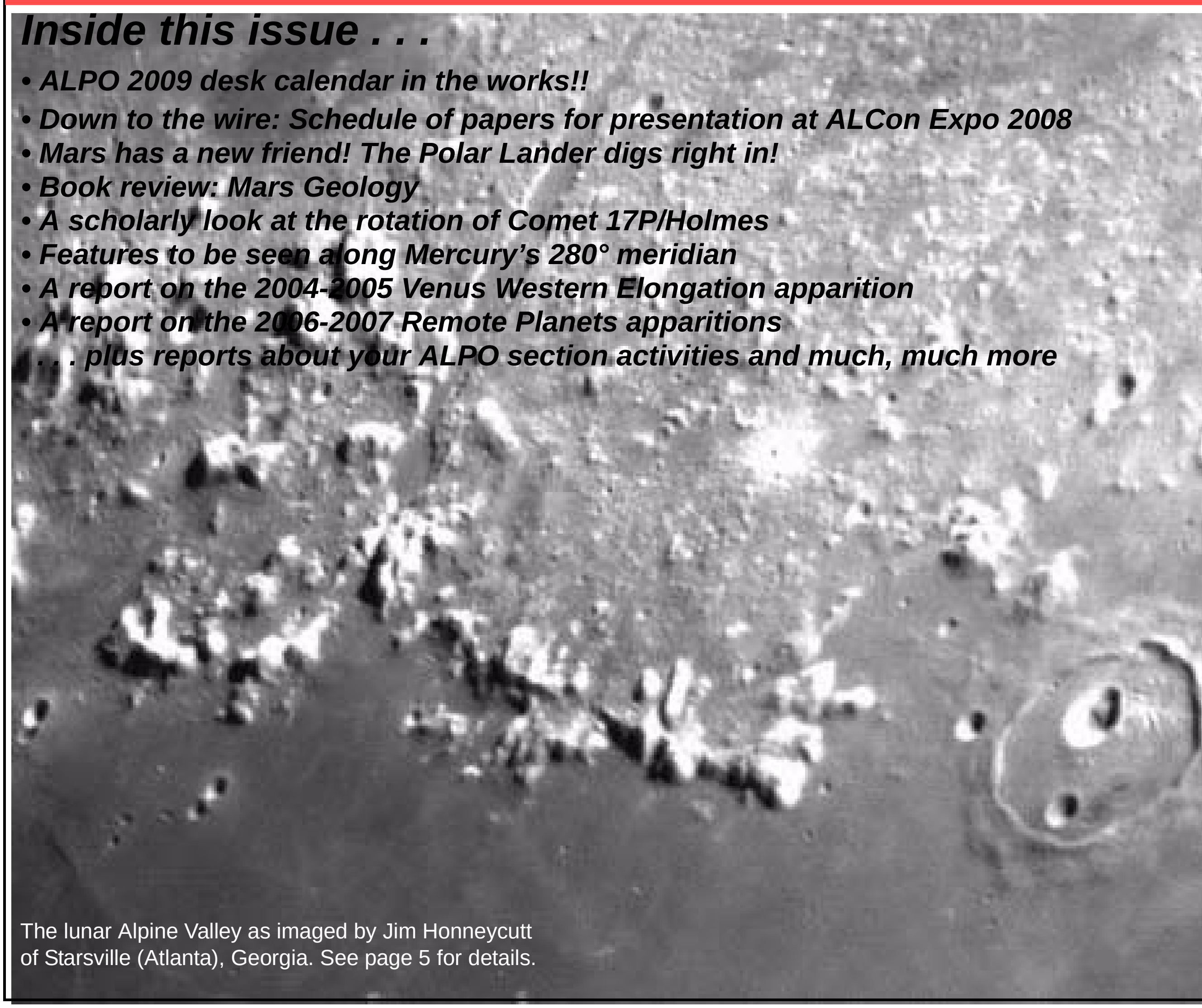
Inside this issue . . .



The lunar Alpine Valley as imaged by Jim Honneycutt of Starsville (Atlanta), Georgia. See page 5 for details.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Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 50, No. 3, Summer 2008
This issue published in June 2008 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.

For membership or general information about the ALPO, contact:

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ALPO Membership Secretary/Treasurer
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E-mail to: will008@attglobal.net

Visit the ALPO online at:
http://www.alpo-astronomy.org

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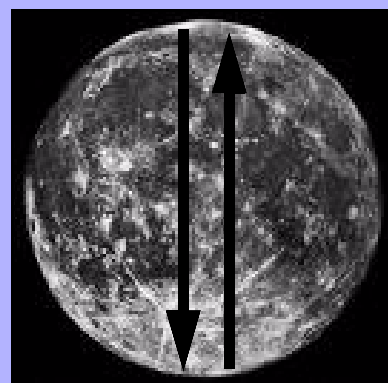
Inside the ALPO
Member, section and activity news

Association of Lunar & Planetary Observers (ALPO)

Point of View
This Side Up!!
By John E. Westfall, ALPO science editor



There is no preferred direction in space, so I suppose that, had we only a single glimpse of a single celestial body, its orientation wouldn't matter. The problem is that we usually need to compare our view with other views, be they visual impressions, drawings, images or even maps. Also, we might need to compare our view with views of other celestial bodies, or to interpret our view in terms of the direction of sunlight (not always obvious). Suddenly we need to know which way is up.

Thus, the basic requirement is to know whether north or south is up; indeed this should be marked directly on any graphic observation because it is easy to lose track of the original orientation. The next need is to know a simple fact: Is the image reversed or not? (By "reversed", I mean a mirror image, such as one gets with a star diagonal or any optical system with an odd number of reflections.)

These basic facts should be conveyed with any observation submitted to an ALPO section coordinator – this information is not always obvious when simply looking at an image. Likewise, the coordinator should make sure this information is retained when submitting a report for publication or for posting on a website.

There should be no debate about the above (sorry to sound undemocratic). What is a matter of judgment is which direction should be at top, north or south. (Let's leave alone the further question of which north or south – celestial, ecliptic or planetary).

Certainly north or south should be consistently at top throughout an article or report. I'm finicky enough to hope that the same orientation should apply throughout an entire publication. Picking JALPO, volume 50, number 2 as an example, I see that the cover illustration has north at top, as do the illustrations for the Mercury Section report and the banded craters report (although

(Continued on page 17)

ALConExpo 2008

In the Heart of the Heartland

Des Moines, Iowa • July 18-19, 2008

Hosted by the Des Moines Astronomical Society

Please join us for a weekend filled with blue skies, clean air, and plenty of Iowan hospitality during the 66th Annual Astronomical League Convention and Exposition. The Des Moines Astronomical Society will host the convention at the newly renovated Downtown Marriott. To make this event special for 2008, The Association of Lunar and Planetary Observers will be joining us with special speakers, fellowship, and insights. The conference will also feature a special seminar focusing on astronomy club/society improvement coordinated by John Goss, AL Secretary. On Friday, July 18th, a down-home picnic at Ashton Observatory will be held. The event will showcase local foods,a special guest speaker, and a public night of viewing sponsored by Meade Telescopes.

Speakers

Tomas Gonzalez-Torres

Tomas is the goto EVA guy for the next Hubble Space Telescope repair mission. We are pleased Tomas will be with us to explain what will be done to extend the life of the greatest telescope ever constructed by humans to date.

Jason Rhodes

Jason specializes in weak gravitational lensing research, and is currently working on several NASA projects; including the DUNE mission (Dark UNiverse Explorer) and the Gravitaitonal Lensing Experiment.

Norma Cutsforth

Norma is a working mother from Cedar Rapids, Iowa who enjoys her astronomy hobby to the degree she wrote a book about it! "Keeping Starwatch" is a wonderful collection of Norma's insights on astronomy.

Dr. Donald Parker

Don Parker is a well known figure in the amateur astronomy world. His work in astro-imaging has been recognized internationally recording th wonders of our closest neighbors is legendary.

The organizers reserve the right to make such changes to the program and speakers as may be necessary due to conditions outside of their control.

ALConExpo 2008 Registration Information — Fees

(please print)

First Name ______ Last Name ______

Email Address ______

Mailing Address ______

City, State, Country, ZIP/Postal Code ______

Home Phone ______ Phone #2 ______

Club/Society Affiliation ______

Direct questions to: chairman@alconexpo.com • registrar@alconexpo.com

INSTRUCTIONS: Please use one form per attendee; however, one check may be submitted for a group. Payment must be postmarked by June 30 to receive the early registration rate. Mail completed form with a check or money order payable to **ALConExpo2008** - *PLEASE NO CASH*.

ALConExpo 2008
P.O. Box 111
Des Moines, Iowa 50301-0111

REGISTER ONLINE AT:
www.alconexpo.com

LODGING: All lodging will be pre-arranged by attendees by contacting Marriott International, Inc. at **1-800-514-4681** and request the "Alcon 2008 Room Rate." Participants can also register for lodging by visiting **www.marriott.com**.

NOTE: Advance registrations must be received by July 10, 2008; registration and dinners limited to maximum capacity of facilities. All tours subject to cancellation if minimums are not met. Children under 16 must be accompanied by an adult on all tours.

Membership Affiliation ☐ AL ☐ ALPO

☐ **Two Days** .... $60 ______
After June 30 ... $70

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☐ **Star Bar-B-Que** .... $30 ______
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☐ ***Council Tour** .... $10 ______
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• Drake Observatory

☐ ***Madison County Tour** ... $40 ______
Friday, 9:45 AM - 3:00 PM
• John Wayne Birthplace
• Covered Bridges

☐ ***Mansion Tour** .... $40 ______
Saturday, 9:30 AM - 3:45 PM
• Hoyt Sherman Place
• Salisbury House

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☐ **Astronomical League Donation** ______

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Member, section and activity news

News of General Interest

ALPO 2009 desk calendar in the works!!

Work is in progress on the first-ever ALPO desk calendar (also suitable for wall placement, too) with plans to make the 2009 publication available for general sale to all in the last quarter of 2008.

Featured will be images of solar system objects taken by ALPO members, plus highlights of useful astronomical data as well as important (or at least interesting) anniversary dates about people, places and things important in solar system astronomy.

A final selling price has not yet been determined, but hopes are to keep it competitive with the hundreds of similar calendars available towards the end of the year. We plan to announce more about this worthwhile project in JALPO50-4 (Autumn 2008) when it is released in mid-September.

ALPO / ALCon Expo 2008 Update

The following is the schedule of ALPO presentations / papers to be given at ALCon Expo 2008, to be held in Des Moines, Iowa, July 18 and 19:

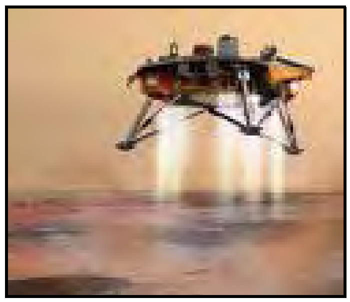
Friday, July 18

9:30 a.m. – Welcoming Remarks by ALPO Executive Director Mike Reynolds
(Immediately following) – *ALPO Membership Update* by ALPO Membership Secretary / Treasurer Matt Will
10 a.m. – *The Apparitions of Mercury 2006 and 2007* by ALPO Mercury Section Coordinator Frank J Melillo
10:20 a.m. – *Formation of the North Polar Cap of Mars* by Acting Assistant ALPO Mars Section Coordinator Roger Venable
10:50 a.m. – Break / Recess
11 a.m. – *Jupiter's Oval BA* by ALPO Jupiter Section Coordinator Richard Schmude, Jr.

Yea, Phoenix!!

The Assn of Lunar & Planetary Observers salutes and congratulates NASA and the Jet Propulsion Lab and all of its respective personnel on the sucessful launch, trajectory follow-up and soft touchdown of the Phoenix Mars Lander on May 25, 2008.

From the NASA website *www.nasa.gov/pdf/213817main_mars-phoenix2.pdf*: "Like its namesake mythological bird, Phoenix rises from remnants of its predecessors. It will use many components of a spacecraft originally built for a 2001 Mars lander mission, which was kept in careful storage after that mission was cancelled. The science payload for Phoenix includes instruments built for the 2001 lander and improved versions of others flown on the lost Mars Polar Lander in 1999."



Job well-done, ladies and gentlemen!

By the time you read this, experiments will have long been underway to search for water and signs of life at the landing site at Vastitas Borealis in the northern Martian arctic region.

This Month's Front Cover

The Moon's Alpine Valley as imaged by Jim Honeycutt of Starsville (near Atlanta), GA, USA on March 16, 2008, 01:25 UT. Celestron 9.25-in. CPC Schmidt-Cassegrain telescope, 2x Barlow, IR filter, DMK 41AU02.AS monochrome USB camera (1/2 in. CCD chip, progressive scan, 1280 x 960 dpi resolution). Exposure: 15 frames-per-second, 540 images obtained, 85 images stacked using Registax version 4.0; follow-up processing with PhotoShop CS. Other data: seeing = approx. 4; transparency data not recorded; lunar colongitude = 16°. north towards top.

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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11:20 a.m. – *LCROSS: An Opportunity for Amateurs* by John Westfall
11:45 a.m. to 1 p.m. – Lunch
1 p.m. – *Observations of "'Skinakas Basin" and Crater Ejecta Rays Between 280 and 360 Degrees Longitude on Mercury* by ALPO Mercury Section Coordinator Frank J Melillo
1:20 p.m. – *Strange Cloud Formation on the Terminator of Venus* by Michael F. Mattei
1:50 p.m. – *Recent Observations of Saturn and Current Observing Programs* by ALPO Saturn Section Coordinator Julius L. Benton
2:20 p.m. – *Uranus and Neptune in 2007* by ALPO Remote Planets Section Coordinator Richard Schmude, Jr.
2:50 p.m. – Break / Recess
3 p.m. – ALPO Board Meeting, ALPO Board members

Saturday, July 19
9 a.m. – Welcoming Remarks by ALPO Executive Director Mike Reynolds
(Immediately following) – *Mercury Observations During the First Messenger Flyby* by ALPO Mercury Section Coordinator Frank J Melillo
9:20 a.m. – *Mission Updates: Venus and Juno Mission to Jupiter* by Sanjay Limaye
9:50 a.m. – *Comet Holmes* by Richard Schmude, Jr.
10:10 a.m. – *The Total Lunar Eclipses of 2007 and 2008* by ALPO Eclipse Section Coordinator Mike Reynolds
10:30 a.m. – End of ALPO presentations

In addition, the following talks by ALPO speakers will be given at the main conference itself:

Friday, July 18
11:00 a.m. – Meteoritics by Mike Reynolds

Saturday, July 19
10 a.m. – *Astro-Imaging* by Don Parker
11 a.m. – *Facilities and Equipment for Astro-Imaging* by Don Parker & J. R. Paulson

Hosting the conference will be the Des Moines Astronomical Society. Meeting information can be found at http://www.alconexpo.com/. The venue for the Conference will be the Marriott Hotel, located at 700 Grand Avenue in Des Moines; phone 800-514-4681.

Contacts for ALCon Expo 2008:

DMAS / ALConExpo 2008
P.O. Box 111
Des Moines, IA 50301

info@alconexpo.com

Promotion for Dr. Reynolds

ALPO Executive Director Dr. Mike Reynolds nowhere near Jacksonville, FL.

The ALPO organization congratulates Executive Director Dr. Mike Reynolds on his new position at the Kent Campus/Cecil Center, Florida Community College at Jacksonville, FL.

After a national search, Dr. Reynolds was selected from a pool of over 36 candidates to assume the Dean of Liberal Arts and Sciences position. He brings to the position years of scientific research, scholarly pursuits, grant writing, teaching and demonstrated leadership.

Dr. Reynolds will begin his new assignment on August 15, 2008.

Dr. Reynolds attended his first ALPO conference in 1971, he was named permanent coordinator of the ALPO Eclipse

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Section in 2002, appointed to the ALPO Board of Directors in 2003; in 2007, Dr. Reynolds began his two-year term as ALPO executive director and also assumed acting coordinator status of the ALPO Instruments Section.

Again, congratulations to Dr. Reynolds on his new postion with Jackonville Community College..

Join/ renew your ALPO Membership Online

Save yourself 42 cents and either join or renew your ALPO membership at

http://www.galileosplace.com/ALPO/

The ALPO thanks *Telescopes by Galileo* for providing this service. See the ALPO membership application form near the back of this issue of your Journal for dues and other details.

ALPO Interest Section Reports

Web Services

Report by Larry Owens, acting section coordinator
Larry.Owens@alpo-astronomy.org

Our website continues to play a role in the success of ALPO. Over the past month the site has averaged 200-300 megabytes of bandwidth usage per day, which translates to a substantial number of visitors. The interesting part about this is that there is a pronounced upward trend in usage. This means that our site is gaining momentum and reaching the public in increasing numbers.

To add to this momentum, we've tested several applications in recent weeks that could add features to our website and provide a means for coordinators to update sections of the website themselves, even without web publishing skills or software. The latter feature promises to make our website much more dynamic since coordinators would be able to post alerts immediately.

The application we're currently evaluating is called WordPress. It's commonly referred to as a "Blog" but it is actually a complete web publishing system, with a blog. Basically, WordPress runs on the webserver in the background and manages the features and appearance of our website. Updates and postings to the website are done using a web browser, and by using a unique user ID and password. The browser screens used are intuitive and posting to the website is no more difficult than writing an email. Yet, the system offers some advanced features, like automatic postings of section alerts to both the website and a Yahoo group, hierarchical menus of web pages and postings, automatic ALPOD's (ALPO picture of the day) for each ALPO section and advanced search features.

The WordPress blogging system works a bit differently than its web "page" publishing system, in that the blog is a rolling list of posts, placed there by registered users much like a Yahoo group. But the blog is in no way intended as a replacement for the Yahoo groups we use now. With our unique situation, I'd recommend restricting the blog to coordinators, and using it for the purpose of posting section alerts. The added feature of automatically posting a Yahoo group message from the alert would save time.

Each section would have a complete and independent WordPress managed website, which of course would be linked from the main ALPO web page, and updated only by section coordinators.

If this new system is implemented, it will be optional. If you are currently a coordinator and would like to continue to update your site as is, that's certainly understandable and we will respect your desire to do so. If you think you'd like to use it for your section, I will import your existing website for you and make the new site public only with your approval.

I think this new system would finally serve to unify our website, and give it a much more functional and professional appearance. I'm currently testing the system under our service provider and evaluating "Themes" and "Plug-ins" for use with the site. You'll hear much more from me about this in the near future.

If you want to learn more about WordPress, simply do a Google search. There is a wealth of information on the web about it, and it's currently used by many large organizations and universities around the world.

Please let me know what you think.

Visit the ALPO home page on the World Wide Web at http://www.alpo-astronomy.org

Computing Section

Report by Kim Hay, section coordinator,
kim@starlightcascade.ca

The ALPO Computing Section (ALPOCS) web page has undergone some changes, but more information and program links to our programs would be welcome.

There are several talented computer programmers on the ALPOCS list who can help anyone who has a question on their own computer programming or if you are looking for a program. You can sign up at http://groups.yahoo.com/group/alpocs/

We currently have 256 members signed up to the list. I invite any and all ALPO members to sign up to the ALPOCS e-mail list and help share your knowledge of computer programs – either custom-written or commercial. We can all benefit to know how programs work, and which ones are your best and why!

Important links:

- To subscribe to the ALPOCS yahoo e-mail list, http://groups.yahoo.com/group/alpocs/

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- To post messages (either on the site or via your e-mail program), alpocs@yahoogroups.com.
- To unsubscribe to the ALPOCS yahoo e-mail list, alpocs-unsubscribe@yahoogroups.com
- Visit the ALPO Computing Section on the World Wide Web at http://www.alpo-astronomy.org, then Computing Section.

Lunar & Planetary Training Program

Report by Tim Robertson, section coordinator
cometman@cometman.net

The ALPO Training Program currently has 2 active students at various stages of training. In the past 12 months, we have had orders for 18 copies of the *Novice Observers Handbook*.

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 a short amount of time. The 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 more information on the ALPO Training Program, contact Tim Robertson at: cometman@cometman.net, or Tim Robertson, 2010 Hillgate Way #L, Simi Valley CA, 93065.

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

Instruments Section

Mike Reynolds, acting section coordinator
alpo-reynolds@comcast.net

A special report on the Telescope Grid Project by Marc Frincu appears later in this issue.

Visit the ALPO Instruments Section on the World Wide Web at http://www.alpo-astronomy.org, then Instruments Section.

ALPO Observing Section Reports

Eclipse Section

Report by Mike Reynolds, section coordinator
alpo-reynolds@comcast.net

Please visit the ALPO Eclipse Section on the World Wide Web at http://www.alpo-astronomy.org, then Eclipse Section.

Comets Section

Gary Kronk, acting section coordinator
kronk@cometography.com

A special report on the Rotational Period of Comet 17/P Holmes appears later in this issue.

Visit the ALPO Comets Section on the World Wide Web at http://www.alpo-astronomy.org, then Comets Section.

Meteors Section

Bob Lundsford, section coordinator
lunro.imo.usa@cox.net

Visit the ALPO Meteors Section on the World Wide Web at http://www.alpo-astronomy.org, then Meteors Section.

Solar Section

Report by Kim Hay, section coordinator
kim@starlightcascade.ca

As we exit Solar Cycle 23 and enter Solar Cycle 24, this is a good time to think about submitting your images or sketches to the ALPO Solar Section (ALPOSS). We archive all submissions (sketches, white light, H-alpha, Calcium) and are very interested in the morphology of the groups and spots. If you have a special

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movie or animation that you would like to submit, that is accepted as well. The submissions should be 200K files in jpeg format and forwarded to me at *Kim.Hay@alpo-astronomy.org*

For all members who are currently submitting images, please change your current e-mail to the above e-mail address, so your images will be archived.

Over the last few months, since CR2067 (Carrington Rotation 2067), there have been some interesting developments on the Sun, and the general thought was that Cycle 24 had started, however on March 28, 2008 there were three groups (AR10987, AR10988, and A10989) that had the same magnetic properties of Cycle 23. Heres a link to a story from NASA: *http://science.nasa.gov/headlines/y2008/28mar_oldcycle.htm?list778348*

Another interesting story from NASA told of a solar flare unleashed towards Earth on September 1, 1859 that resulted in Northern Lights as far south as Cuba, the Bahamas and Hawaii. This ties in nicely with the book review in JALPO Journal 50-2, Spring 2008 (The Sun Kings, by Stuart Clark, ISBN-13-978-0-691-12660-9). That story talks about Richard Carrington's observation of the Sun, his sketches and the Sept. 1, 1859 flare. *http://science.nasa.gov/headlines/y2008/06may_carringtonflare.htm?list778348*

As of May 4, sunspot group AR10993 was emitting magnetics that is consistent with the new Cycle 24. See *http://www.bbso.njit.edu/Research/ActivityReport/brep200805.html* for full details.

On May 15, three new groups appeared on the Sun; though not very strong, it was hoped they would form into stronger magnetic groups.

Some important links:

- To join the ALPO Solar Section e-mail list, *http://groups.yahoo.com/Solar-ALPO*
- To see a tip on a new version of Phil Rousselle's spectroheliograph, *http://astrosurf.com/spectrohelio/index-en.php*
- For more information on observing the Sun and images, go to *http://www.alpo-astronomy.org*

Mercury Section

Report by Frank J. Melillo, section coordinator
frankj12@aol.com

A report on the 2006 apparitions appears later in this issue.

After the Mariner 10 flyby of Mercury in 1975, it would be another 33 years before another spacecraft would swing by.

Finally, on January 14, 2008, we were treated to a part of Mercury previously unseen at close range. It was on that date that the MESSENGER spacecraft made its first flyby, skimming only 126 miles above the surface. Transmitted back to Earth were over a thousand images showing double-ring craters, smooth plains, bright rayed craters and dark maria. It reminds us of our Moon at a quick glance, but when looking closely at the surface, Mercury seems a lot different.

Ed Lomeli of California and John Boudreau of Massachusetts have imaged Mercury nearly at the same longitude as seen from new MESSENGER sight. There will be a paper prepared with images and drawings for publication in an upcoming isue of this Journal.

Visit the ALPO Mercury Section on the World Wide Web at *http://www.alpo-astronomy.org*, then Mercury Section.

Venus Section

Report by Julius Benton, section coordinator
jlbaina@msn.com

A report on the 2004 - 2005 Western (Morning) Apparition appears later in this issue.

Venus is extremely difficult to detect in the Eastern sky before sunrise, approaching Superior Conjunction on June 9, 2008, and must be located in daylight for the best views when it is away from the horizon where seeing conditions are extremely bad. This apparition, which is essentially over, the planet passed through its waxing phases (a gradation from crescentic through gibbous phases), and as of this writing, its gibbous disk is only 9.8 arc-seconds across and 98.9% illuminated (full phase). Venus reached greatest brilliancy September 23, 2007, theoretical dichotomy (half phase) on October 27, and Greatest Elongation West on October 28. During the 2007-08 Western (Morning) Apparition, observers have been seeing the trailing hemisphere (dawn side) of Venus at the time of sunrise on Earth. With this apparition rapidly drawing to a close, observer should begin preparing for the 2008-09 Eastern (Evening) Apparition, for which the following Geocentric Phenomena in Universal Time (UT) are presented:

Geocentric Phenomena of the 2008-09 Eastern (Evening) Apparition of Venus in Universal Time (UT)

Superior Conjunction	2008	Jun 09^d (angular diameter = 9.6 arc-seconds)
Greatest Elongation East	2009	Jan 14 (47º east of the Sun)
Predicted Dichotomy	2009	Jan 17.02 (exactly half-phase)
Greatest Brilliancy	2009	Feb 18 (m_v = – 4.7)
Inferior Conjunction	2009	Mar 27 (angular diameter = 59.7 arc-seconds)

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A recent drawing of Venus' nearly full disk in a daylight sky on April 17, 2008 at 15:17UT by Carl Roussell of Canada using a 15.2 cm (6.0 in) REF employing W47 (violet), W25 (red), and W58 (green) filters to help reveal subtle contrasts and banded dusky markings. S=7.5, Tr=daylight sky. Apparent diameter of Venus is 10.1 arc seconds, phase (k) 0.971 or 97.1% illuminated, and visual magnitude -3.89. South is at top of image.

The Venus Express (VEX) mission started systematically monitoring Venus at UV, visible (IL) and IR wavelengths back in late May 2006. As part of an organized Professional-Amateur (Pro-Am) effort, a few ALPO Venus observers 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 submitted in JPEG format to the ALPO Venus Section as well as to the VEX website at:

http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=38833&fbodylongid=1856.

Routine observations of Venus are needed throughout the period that VEX is observing the planet, which continues in 2008-09 and a year or two afterwards. Since Venus has a high surface brightness it is potentially observable anytime it is far enough from the Sun to be safely observed.

Key observational endeavors include:

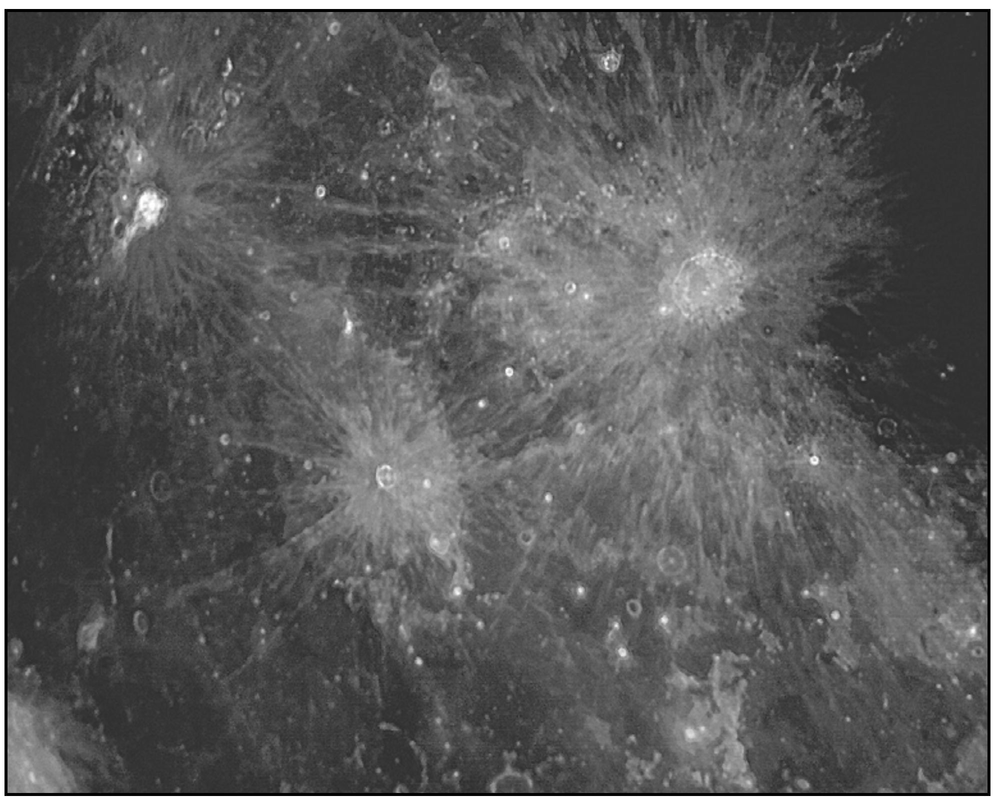
- Visual observations and drawings in dark, twilight, and daylight skies to look for atmospheric phenomena including dusky shadings and features associated with the cusps of Venus
- Visual photometry and colorimetry of atmospheric features and phenomena
- Monitoring the dark hemisphere for Ashen Light
- Observation of terminator geometry (monitoring any irregularities)
- Studies of Schröter's phase phenomenon near date of predicted dichotomy
- Routine digital imaging of Venus at visual, UV, and IR wavelengths
- Special efforts to accomplish simultaneous observations (observers are always encouraged to try to view and image Venus simultaneously; that is, as close to the same time and date as circumstances allow, which improves confidence in results and reduces subjectivity.

Contribution of observation data and images to the Venus Express mission is encouraged

The ALPO Venus Section encourages 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.alpo-astronomy.org*, then Venus Section.



Digital image of Oceanus Procellarum near Full Moon, taken by William M. Dembowski, Elton, Pennsylvania, USA. August 29, 2007, 02:05 UT, Colongitude: 101.6°, Celestron 8 in. SCT, Orion StarShoot II Camera.

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Lunar Calendar for Third Quarter, 2008 (all times in UT)

July 01	14:00	Moon 7.7 N of Mercury
July 01	21:00	Moon at Perigee (359,512 km - 223,390 miles)
July 02	23:00	Moon 0.96 Degrees NNE of asteroid Ceres
July 03	02:19	New Moon (Start of Lunation 1058)
July 03	14:00	Moon 1.7 Degrees NNE of Venus
July 06	16:00	Moon 2.3 Degrees SSW of Mars
July 06	20:00	Moon 3.1 Degrees SSW of Saturn
July 10	04:34	First Quarter
July 14	04:00	Moon at Apogee (405,451 km - 251,936 miles)
July 17	14:00	Moon 2.6 Degrees SSE of Jupiter
July 18	07:59	Full Moon
July 20	13:00	Moon 0.80 Degrees NNW of Neptune
July 22	18:00	Moon 3.7 Degrees NNW of Uranus
July 25	18:42	Last Quarter
July 29	23:00	Moon at Perigee (363,886 km - 226,108 miles)
July 31	04:00	Moon 0.87 Degrees SSW of asteroid Ceres
Aug. 01	10:13	New Moon (Start of Lunation 1059)
Aug. 01	16:00	Moon 1.3 SSW of Mercury
Aug. 02	13:00	Moon 2.1 Degrees SSW of Venus
Aug. 03	10:00	Moon 3.4 Degrees SSW of Saturn
Aug. 04	09:00	Moon 3.6 Degrees SSW of Mars
Aug. 08	20:20	First Quarter
Aug. 10	20:00	Moon at Apogee (404,556 km - 251,379 miles)
Aug. 13	15:00	Moon 2.8 Degrees SSE of Jupiter
Aug. 16	19:00	Moon 0.77 Degrees N of Neptune
Aug. 16	21:17	Full Moon (Partial eclipse of the Moon)
Aug. 18	23:00	Moon 3.7 Degrees NNW of Uranus
Aug. 23	23:50	Last Quarter
Aug. 26	04:00	Moon at Perigee (368,692 km - 229,095 miles)
Aug. 30	19:58	New Moon (Start of Lunation 1060)
Aug. 31	02:00	Moon 3.7 Degrees SSW of Saturn
Sept. 01	16:00	Moon 4.7 Degrees SSW of Venus
Sept. 01	21:00	Moon 2.6 Degrees SSW of Mercury
Sept. 02	03:00	Moon 4.5 Degrees SSW of Mars
Sept. 07	14:04	First Quarter
Sept. 07	15:00	Moon at Apogee (404,209 km - 251,164 miles)
Sept. 09	21:00	Moon 2.7 Degrees S of Jupiter
Sept. 13	01:00	Moon 0.71 Degrees NW of Neptune
Sept. 15	05:00	Moon 3.6 Degrees NNW of Uranus
Sept. 15	09:14	Full Moon
Sept. 20	03:00	Moon at Perigee (368,888 km - 229,216 miles)
Sept. 22	05:05	Last Quarter
Sept. 27	16:00	Moon 4.0 Degrees SSW of Saturn
Sept. 29	08:12	New Moon (Start of Lunation 1061)
Sept. 30	10:00	Moon 1.1 Degrees SW of Mercury

(Table courtesy of William Dembowski)

Lunar Section:

Lunar Topographical Studies / Selected Areas Program

Report by William M. Dembowski, FRAS, program coordinator

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During the relatively slow first quarter of 2008, the ALPO Lunar Topographical Studies Section received a total of 191 new observations from 18 observers in 9 countries and 6 of the United States. Emphasis during the period was on the study of Wrinkle Ridges and the crater Alphonsus. Reports on both projects were compiled and published in *The Lunar Observer.*

The Bright Lunar Rays Project and the more formal Banded Craters Program continue to be well-received and are generating a heightened interest in observing the Moon under high Sun conditions, traditionally considered to be unfavorable for lunar observing.

Ties with other astronomical organizations (most notably the British Astronomical Association, the Society for Popular Astronomy, and the American Lunar Society) remain strong, with a free and frequent exchange of observations and other information between this coordinator and his counterparts in those groups.

Important links:

- The Moon-Wiki: *http://the-moon.wikispaces.com/Introduction*
- ALPO Lunar Topographical Studies Section *http://www.zone-vx.com/alpo-topo*
- ALPO Lunar Selected Areas Program *http://www.alpo-astronomy.org*, then Lunar Section.
- ALPO Lunar Topographical Studies Smart-Impact WebPage *http://www.zone-vx.com/alpo-smartimpact*
- *The Lunar Observer (current issue) http://www.zone-vx.com/tlo.pdf*

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- *The Lunar Observer* (back issues): http://www.zone-vx.com/tlo_back.html
- Selected Areas Program: http://www.zone-vx.com/alpo-sap.html
- Banded Craters Program: http://www.zone-vx.com/alpo-bcp.html

Lunar Domes Survey

Marvin Huddleston, FRAS, program coordinator
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Visit the ALPO Lunar Domes Survey on the World Wide Web at http://www.geocities.com/kc5lei/lunar_dome.html

Lunar Transient Phenomena

Report by Dr Anthony Cook, program coordinator
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Since the last ALPO-LTP subsection report (JALPO50-1), three new LTPs have come to light:

- 2006 Feb 09, evening (UK time) John Armitage (Cannock, UK) observed a bright spot on the rim of Aristarchus which caught his attention.
- 2008 Feb 10, 19:21 UT Herbert Bradley (Great Malvern, UK) reported an LTP near the crater Proclus and described it as a pin-point source of light almost as bright as Aristarchus.
- 2008 Apr 13, an alert was issued concerning bright spots seen in the Apennine Mountain range, prior to 20:50 UT, by observers A. Jaworsk (Burntwood, UK) and John Armitage (Cannock, UK). Unfortunately, these turned out to be mountain peaks and slopes catching sunlight.

The LTP coordinator has been experimenting with 10 nm wide narrow band interference filters centered on Radon (860 nm), Argon (840 nm) and Hydrogen (656 nm) emission lines built into an electronic Moon **CCTV** Blink device. The technique is ~50x more color-sensitive than the human eye at detecting spectral emissions from these gases. It is hoped that this approach may be able to confirm the theory suggested by Professor Arlin Crotts, of Columbia University, that Radon gas emissions may be the cause of some LTP? To date (2008 May 15), 18 hours worth of video have been recorded. Fifty percent of the recordings have been examined, but as yet with no sign yet of any spectral emissions.

Further details about these reports and general articles on LTP can be found in "The New Moon" newsletter published by the ALPO Lunar Section.

Visit the ALPO Lunar Transient Phenomena program on the World Wide Web at

- http://www.alpo-astronomy.org , then Lunar Section, then Transient Phenomena
- http://www.ltpresearch.org/

Lunar Meteoritic Impact Search

Report by Brian Cudnik, program coordinator
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Monitoring of the Moon continued during the past months, with two confirmed impact observations recorded by George Varros. Both confirmations were made outside of normal shower activity. In addition to routine non-shower monitoring of impact activity, the Moon was watched during the Leonids of 18 November 2007, the Geminids of 14 December 2007, and the Quadrantids of 4 January 2008. The Moon was not favorably placed for any of the subsequent and significant meteor showers that occurred from mid-January to mid-May.

The February total eclipse was to be monitored for meteor impacts, but bad weather across much of the U.S. hindered observations. No reports of impact candidates have been received as of mid-May.

The proposal for a book, now titled "Lunar Meteoroid Impacts and How to Observe Them" has been accepted for publication by Springer publishing. If all goes according to plan, the book should be out by early- to mid-2009 (this is merely an estimate, the exact date of availability is unknown at this time). The latest version of this book (formerly called "An Observer's Guide to Lunar Meteor Phenomena") adds information about craters and how to observe them. This information includes crater morphology versus size, morphology versus age, and other aspects to look for when observing lunar craters. Work is currently underway to add this material, prior to submitting the manuscript later in the summer.

For information on impact-related events, please visit the ALPO Lunar Meteoritic Impact Search site on the World Wide Web at http://www.alpo-astronomy.org.

Mars Section

Report by Roger Venable, acting assistant section coordinator
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Mars has fascinated observers this spring with a continuous presentation of cloud features. We expect the cloudiness to last for months, as the North Polar Cap sublimates and releases water vapor into the atmosphere. Filters are especially helpful in identifying clouds, whether one is observing visually or by camera. In the words of one well-known, macho observer, "Real men use filters!"

High altitude clouds typically are highly reflective of blue light, while red light penetrates them, so that they appear bright in blue, less bright in green, and least bright in red light. This is exemplified in Figure 1, in both the equatorial cloud band and in the clouds of the developing South Polar Hood.

Surface frosts appear differently from clouds in that they reflect red well. They also reflect green and blue, but since the

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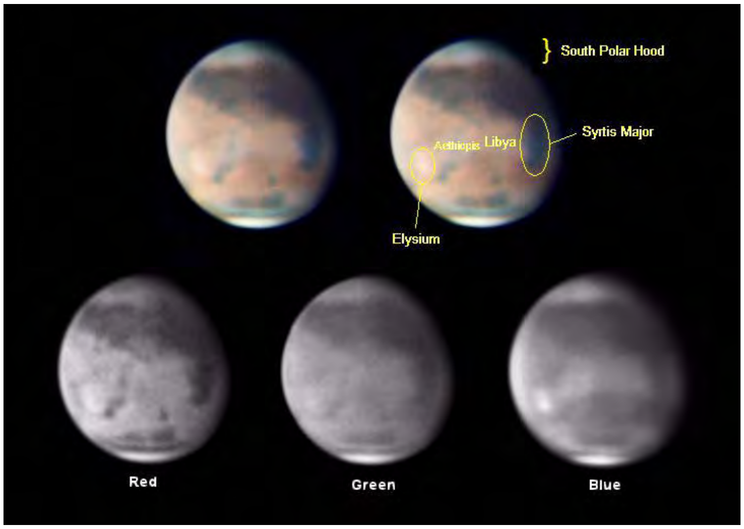

Figure 1. Don Parker captured this image on March 11, 2008. The annotated image at the top right is identical to the image at the top left. The equatorial cloud band extends across Syrtis Major, Libya, and Aethiopis. It is brightest in blue light, faint in green, and undetectable in red. The South Polar Hood is developing, and it, too, is brightest in blue and least bright in red. Syrtis Major is distinctly blue in the top image, the 'Syrtis Blue Cloud.' Elysium appears bright in blue and in red, and less so in green, suggesting that it has not only an orographic cloud but also a deposit of frost on the mountain slopes. Ls = 43.4, CM = 255, imaged from 01:09 to 01:15 UT. Newtonian telescope of 16-inch aperture, Skynyx 2.0 camera, Astrodon filters.

Martian atmosphere is usually opaque to blue light, most of the blue is absorbed by the atmosphere. Consequently, frosts look brighter in red and green than they do in blue (see Figure 2). They are often detected near the sunrise terminator, which is visible now that Mars is past opposition. (Although frosts are also exemplified by the polar caps, the caps have such a thick frost that they appear fairly bright in blue.)

Ground fogs and clouds that are low in the atmosphere are penetrated by red light, like other clouds, but they are less bright in blue due to the atmospheric absorption of blue. Consequently, they may appear brightest in green light. They commonly form over Libya and Syrtis Major, where they are known as the Syrtis Blue Cloud, and near the edges of the polar caps. The Syrtis Blue Cloud appears green when Syrtis Major is near the limb, because the long atmospheric light path then attenuates the blue most strongly. The green color may appear quite striking visually, especially when viewed with a yellow filter. Good examples of such low clouds, brightest in green light, are in Figures 1 and 3. Note that in all imagew, Ls = Aerocentric longitude of the Sun.

There are some situations that make this really confusing, so that it can be difficult to know for certain whether one is looking at clouds or frosts. For example, there are often high clouds over an area of surface frost, especially in high latitudes, so that the area looks bright in red (due to frost) and in blue (due to cloud), and may be less bright in green! This is seen in Figure 1, in which there appear to be both cloud and frost in Elysium.

As if that weren't confusing enough, clouds and frosts can sometimes be indistinguishable from dust clouds! Dust is usually identified by two characteristics: (1) it is a moving obscuration of the underlying albedo feature, and (2) it is bright in red light. However, in the northern plains, there are few albedo features to obscure, so that dust may be identified simply as a spot that is bright in red light (Figure 4). Although the original observer initially thought that Figure 4 showed a dust cloud, scrutiny of the THEMIS data failed to reveal any dust on that date. Perhaps the red-bright feature was actually frost with its reflected green and blue light thoroughly attenuated by the long atmospheric path, since it was near the limb. Or, perhaps there was a dust cloud that was too cold to be detected by the thermal eye of THEMIS.

Now is the time to be looking for clouds, and if you are lucky, to see Syrtis Major at its bluest. As Mars shrinks into the sunset glow, you will want to be watching the shrinkage of the North Polar Cap. The northern albedo features are now presenting themselves well to the keen eye (Figure 5.)

Figure 2. This image was made by Akinori Nishita on March 15, 2008. Chryse is bright in red and green but not in blue. This is probably morning frost. Ls = 45°, CM = 22°, imaged at 12:30 UT. Newtonian telescope of 30 cm aperture, Lu075M camera.

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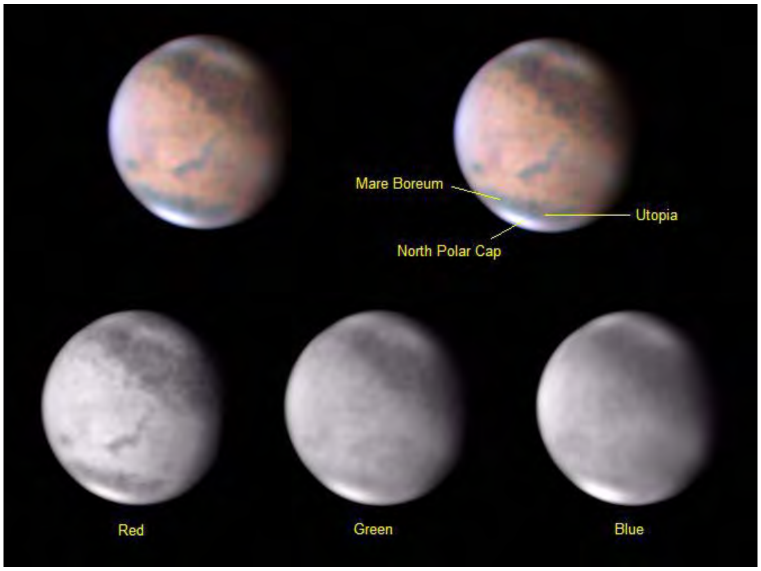

Figure 3. Sean Walker obtained this image on March 10, 2008. The dark albedo features bordering the North Polar Cap, including Utopia and Mare Boreum, look blue. The North Polar Cap looks wider in blue light than it does in red, because of low clouds that extend beyond its southern edge. These give a blue cast to the dark albedo features under them. As presented here, these dark albedo features are brightest in the green image. Ls = 43°, CM = 234°, imaged at 23:40 to 23:46 UT. Newtonian telescope of 32 cm aperture, DMK021AU04.AS camera, CS filters.

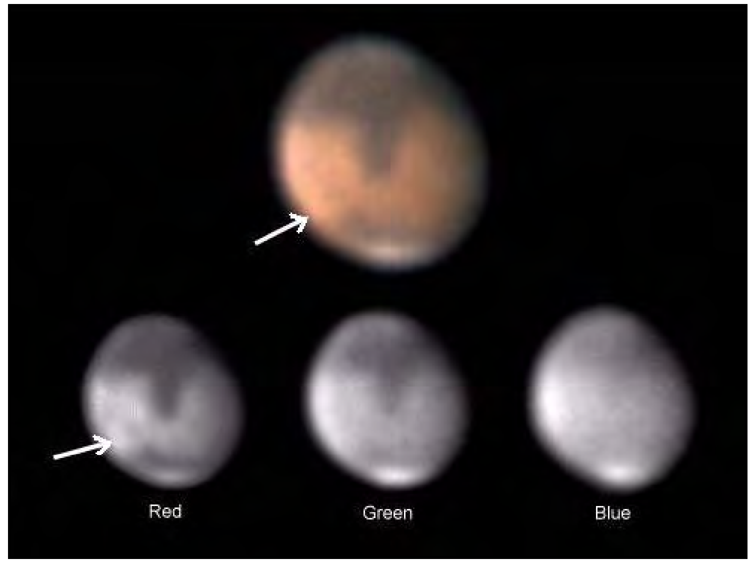

Figure 4. Jim Melka captured this image on April 15, 2008. Aetheria (arrowed) is quite bright in red light, faintly brighter than it surroundings in green, and normal in blue. This is the usual appearance of a dust cloud. See text. Ls = 59°, CM = 298°, imaged at 02:10 to 02:18 UT. Newtonian telescope of 30 cm aperture, DBK21AF01.AS camera.

From the foregoing, it is evident that the most useful observations are those made with red, green, and blue filters. But make no mistake about it: we study every image, drawing, and description we receive. We want to hear from you, too. Join us online in the Yahoo Mars Observers Group at http://tech.groups.yahoo.com/group/marsobservers , and keep sending us your stuff!

Join us on the Yahoo Mars observers' message list at http://tech.groups.yahoo.com/group/marsobservers . There you can share in discussions of observing Mars and post your images and drawings.

Visit the ALPO Mars Section on the World Wide Web at http://www.alpo-astronomy.org, then Mars Section.

Minor Planets Section

Report by Frederick Pilcher, section coordinator
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As reported in the *Minor Planet Bulletin* 35-2, 2008 April-June, amateurs continue their successes in spin/shape modeling of asteroids, with the first-ever models constructed for 5 Astraea, 24 Themis, 76 Freia, and 105 Artemis, and improved models for 2 Pallas and 349 Dembowska.

Albino Carobnani and six colleagues obtained a rotation period of the Amor-type asteroid 2007 PU11 and searched for cometary activity with negative results. Hungaria-type asteroid 1453 Fennia was found to be a binary with non-synchronous rotation and revolution.

Lightcurves of 113 other asteroids were published in the *Minor Planet Bulletin*, a record total for publication in a single issue. Some of lightcurves are for objects

Figure 5. Paul Maxson made this image on April 5, 2008. Sinus Meridiani and Sinus Sabeus are at the upper left, and Mare Erythraeum is at upper right. The detail in the northern albedo features, including Mare Acidalum and Niliacus Lacus, are well-displayed, below the center of the image. Ls = 55°, CM = 34°, imaged at 02:26 UT. Dall-Kirkham telescope of 25 cm aperture, Lumenara 075C camera.

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with no previous photometry, others are improvements on previous results, and some are to contribute to spin/shape modeling. Some of the results are secure, and others are tentative and/or ambiguous.

Lightcurves are published for asteroids 26, 35, 78, 84, 98, 102, 112, 131, 162, 167, 176, 178, 180, 232, 242, 252, 287, 348, 365, 368, 446, 493, 531, 589, 607, 639, 650, 669, 756, 793, 845, 872, 905, 913, 929, 959, 1013, 1084, 1112, 1119, 1143, 1194, 1208, 1222, 1325, 1352, 1388, 1436, 1487, 1565, 1590, 1607, 1626, 1696, 1741, 2005, 2118, 2275, 2291, 2347, 2445, 2648, 2857, 2920, 3509, 3544, 3573, 3628, 3709, 3754, 3873,3885, 4078, 4464, 4483, 4554, 5144, 5638, 5653, 5720, 6572, 7086, 7169, 7186, 7187, 8309, 8348, 9928, 10328, 10496, 10936, 11904, 12706, 15161, 17738, 20936, 21028, 24391, 25332, 30105, 31793, 34746, 38050, 42811, 43203, 44892, 46436, 48438, 52314, 74590, 77290, 114728, and 2006 VV2.

We remind all users and inquirers that the *Minor Planet Bulletin* is a refereed publication and that it is 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.alpo-astronomy.org, then Minor Planets.

Jupiter Section

Report by Richard W. Schmude, Jr., section coordinator
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Jupiter will reach opposition in early July. Before then, it will be visible after midnight low in the southeastern sky for observers in the USA; it is currently in the constellation of Sagittarius and favorably placed for people in the southern hemisphere.

Observers in Brazil, the Philippines and Australia have contributed the majority of Jupiter images in early 2008. Some important contributors include: Christopher Go (Philippines), Anthony Wesley (Australia), Tomio Akutsu (Philippines), Fabio Carvalho (Brazil), Mike Salway (Australia), David Pretorius (Australia), and Sol Robbins (USA). As a result, we have a good idea of Jupiter's appearance during the first four months of 2008. The writer has made five brightness measurements of Jupiter in April, 2008.

Anthony Wesley imaged both Jupiter and Callisto on April 10. His image shows bright polar caps on Callisto. I am hoping that others can image Callisto – especially when it transits Jupiter to confirm these bright caps.

The 2006 Jupiter Sectoin report is nearly complete, and the 2007 report will be started sometime later this summer.

Last but not least, please be sure to find and get at John McAnally's book *Jupiter and How to Observe It*.

Visit the ALPO Jupiter Section on the World Wide Web at http://www.alpo-astronomy.org, then Jupiter Section.

Galilean Satellite Eclipse Timing Program

John Westfall, assistant section coordinator
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New and potential observers are invited to participate in this worthwhile ALPO observing program.

Contact John Westfall via regular mail at P.O. Box 2447, Antioch, CA 94531-2447 USA; e-mail to johnwestfall@comcast.net to obtain an observer's kit, which includes Galilean satellite eclipse predictions for the 2007-9 appparition.

Saturn Section

Report by Julius Benton, section coordinator
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As of this writing (mid-May), the ALPO Saturn Section has received over 275 reports and images for the 2007-08 observing season. Saturn reached opposition to the Sun on February 24, 2008, so although the planet is reasonably well-placed for observing and imaging, the apparition has only until late July in August before Saturn becomes too low in the western sky as it approaches conjunction on September 4, 2008. Geocentric phenomena for 2007-08 are presented for the convenience of observers.

The southern hemisphere and south face of the rings are visible from Earth during this observing season, but more and more of the northern hemisphere of Saturn is coming into view since the inclination of

Two small STrZ white spots are visible in this digital image taken by Jim Melka of St. Louis, Missouri, on April 30, 2008 at 03:18UT using a 30.8 cm (12.0 in.) SCT. Seeing was rated at 3.0 on the ALPO scale of 0-10 (with 10 = best possible seeing conditions); transparency was estimated to be 4.0 as the faintest visual magnitude star detectable by the unaided eye in the proximity of the object being observed. In this image, the leading white spot (which appears to be near the CM) has been monitored since December 2007 and is becoming elongated and more diffuse. The trailing spot is relatively new and more compact, yet also starting to evolve longitudinally. CMI=154.2° CMII=68.5° and CMIII=294.2°. The tilt of the rings is -10.0°. South is at the top in the image.

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the rings to our line of sight was only -8.4° at opposition. There has been considerable discrete activity situated chiefly in the STrZ this apparition in the form of two or possibly three small white spots emerging and developing as the apparition has progressed. They have been imaged repeatedly, especially since opposition back in late February.

The small inclinations of Saturn's rings have already afforded opportunities for imaging and viewing transits of one or more of Saturn's satellites. With the next edgewise orientation of the rings of Saturn occurring next year (September 9, 2009), small inclinations of the rings of Saturn to our line of sight will increasingly permit observations of satellite phenomena such as transits, shadow transits, etc. In 2009, when the plane of the rings actually passes through the Sun, optimum chances exist for observing transits, shadow transits, occultations, and eclipses of those satellites which are near the Saturn's equatorial plane. Small apertures are usually insufficient to produce good views of most phenomena of Saturn's satellites, except perhaps with the case of Titan.

Larger telescopes generally make observations of events involving the satellites more worthwhile. It will be interesting to see what imaging with various instruments will reveal, since there are conflicting views on whether shadow transits or satellites other than Titan are visible from Earth with large instruments. Nearly all of the satellites are presumed to be too small to cast umbral shadows onto the globe of the planet Saturn.

Those individuals who can image and obtain precise timings (UT) to the nearest second of ingress, CM passage, and egress of a satellite or its shadow across the globe of the planet at or near edgewise presentations of the rings should immediately dispatch such data to the ALPO Saturn Section. The belt or zone on the planet crossed by the shadow or satellite should be included in the reported data. Intensity estimates of the satellite, its shadow, and the belt or zone it is in front of can be very useful as well, and drawings of the immediate area at a given time during the event can be especially valuable.

Geocentric Phenomena for the 2007-2008 Apparition of Saturn in Universal Time (UT)	
Conjunction	2007 Aug 21^d
Opposition	2008 Feb 24^d
Conjunction	2008 Sep 4^d
Opposition Data:	
Equatorial Diameter Globe	20.0 arc-seconds
Polar Diameter Globe	17.8 arc-seconds
Major Axis of Rings	45.2 arc-seconds
Minor Axis of Rings	6.6 arc-seconds
Visual Magnitude (m_v)	–0.2m_v (in Leo)
B =	–8.4°

For 2007-08, the following are activities that are continuing by ALPO Saturn observers:

- 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 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.

Observers are urged to carry out digital imaging of Saturn at the same time that others are imaging or visually watching Saturn (i.e., simultaneous observations).

All observers should compare what can be seen visually with 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. Although regular imaging of Saturn is extremely important and encouraged, far too many experienced observers have neglected making intensity estimates, which are badly needed for a continuing comparative analysis of belt, zone, and ring component brightness variations over time, so this type of visual work is strongly encouraged before or after imaging the planet.

The Saturn Pro-Am effort that began back on 2004 Apr 01 when Cassini started observing the planet at close range is still

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underway. Observers are encouraged to participate in this effort during the 2007-08 apparition and beyond. Employing classical broadband filters (Johnson UBVRI system) on telescopes with suggested apertures of 31.8cm (12.5in.) or more, Saturn should be imaged as often as possible, as well as through a 890nm narrow band methane (CH_4) filter. Observers should make note of any features, their motions and morphology, and report such observations promptly. 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 Integrated 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 professional ground-based observatories. Observations should be immediately dispatched to the ALPO Saturn Section throughout 2007-08 for immediate dispatch to the Cassini team. Be sure to include all supporting data such as time and date (UT), instrumentation used, observing conditions and location, etc., since without such fundamental information, observations are essentially useless.

The ALPO Saturn Section appreciates the work of so many dedicated observers who continue to submit observations and images, prompting more and more professional astronomers to request drawings, digital images, and supporting data from amateur observers around the globe.

Information on ALPO Saturn programs, including observing forms and instructions, can be found on the Saturn pages on the official ALPO Website athttp://www.alpo-astronomy.org, then Saturn Section.

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

Remote Planets Section

Report by Richard W. Schmude, Jr., section coordinator
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A report on the Remote Planets during 2006-2007 appears later in this issue.

Both Uranus and Neptune reached conjunction in late winter. Both planets will be visible in the early morning before sunrise in June. Unfortunately, the skies are often hazy during this time for much of the USA. Some of the moons are still transiting Uranus. The best way to look for these is to use the software program *Uranus Viewer 2.2* (just do a search for this free software). Titania will probably be the easiest shadow to image; however Umbriel is the darkest moon and it will probably be the easiest moon to image as it transits Uranus.

Three people made important contributions in 2007; these people were Roger Venable (USA), Richard Miles (UK) and Jim Fox (USA). Roger Venable measured the brightness of Titania and Umbriel as Umbriel partially eclipsed Titania on Dec. 8. Richard Miles carried out a series of brightness measurements of Uranus in September, 2007 and detected a small brightness change as that planet rotated. Jim Fox continued to make excellent brightness measurements of Uranus and Neptune. All three of these fine people have done outstanding work and have made an important contribution to our understanding of Uranus and Neptune.

The 2007 Rremote Planets report is currently being complied and written and will be submitted for publication in this Journal shortly. Please keep up the good work.

Visit the ALPO Remote Planets Section on the World Wide Web at http://www.alpo-astronomy.org, then Remote Planets.

This Side Up
(from page 3)

not stated for the latter). The Jupiter report's illustrations have south up, however, as do the drawing of Venus on page 10 and the images of Mars and Saturn on pages 13 thru 15. Three of the four comet images (pages 7 and 8) have no orientation indicated; likewise with the sunspot image on page 9.

So, to summarize, the observer should supply orientation information to the coordinator, and the coordinator should pass it on to the editor or website manager. It would be frosting on the cake were the orientation the same throughout a website or a publication; the important thing is that this information be clearly stated.

As to whether north or south should be up, I note that professional publications consistently have north at top in their illustrations. So the question becomes one of whether we wish our observations to be compatible with, and as convenient as possible for use by, the planetary science community; I think we should.

Inside the ALPO
Member, section and activity news

Sponsors, Sustaining Members, and Newest Members

by Matthew L. Will, A.L.P.O. Membership Secretary/Treasurer

The ALPO wishes to thank the following members listed below for voluntarily paying higher dues. The extra income helps in maintaining the quality of the Journal while helping to keep the overall cost of the Journal in check. Thank you!

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Inside the ALPO
Member, section and activity news

NEWEST MEMBERS...

The ALPO would like to extend a warm welcome to our newest members. Below are those who joined July 16, 2007 through May 8, 2008, their location and their interests in lunar and planetary astronomy. The legend for the interest codes is at the bottom of the page. Welcome aboard!

Member	City	State	Country	Interest(s)
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Member, section and activity news

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Interest Code Abbreviations			
0 = Sun	6 = Saturn	D = CCD Imaging	P = Photography
1 = Mercury	7 = Uranus	E = Eclipses	R = Radio Astronomy
2 = Venus	8 = Neptune	H = History	S = Astronomical Software
3 = Moon	9 = Pluto	I = Instruments	T = Tutoring
4 = Mars	A = Asteroids	M = Meteors	
5 = Jupiter	C = Comets	O = Meteorites	

Book Review

The Geology of Mars: Evidence from Earth-Based Analogs

Review by Robert A. Garfinkle
ragarf@earthlink.net

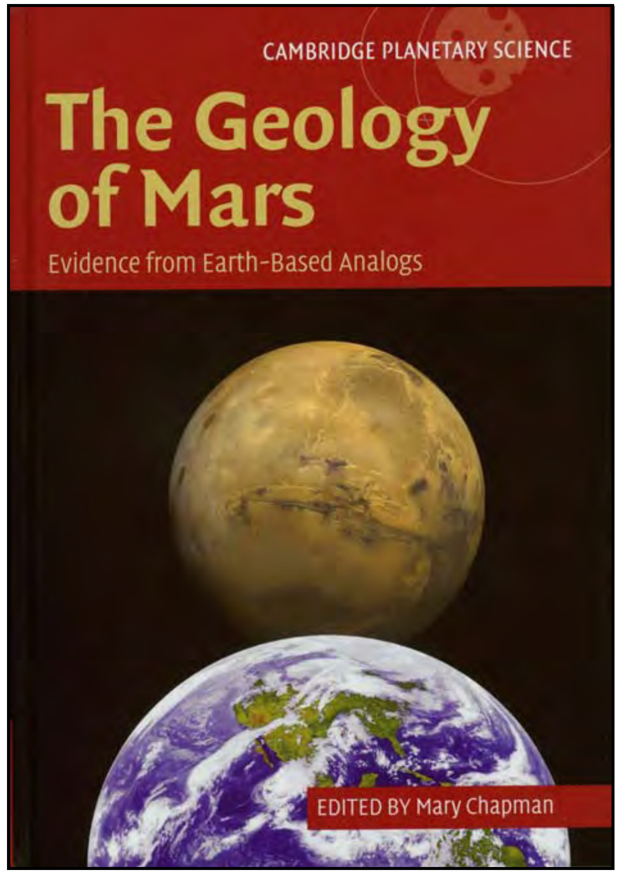
The Geology of Mars: Evidence from Earth-Based Analog, edited by Mary Chapman, Cambridge: Cambridge University Press; 2007; 460 pages; Index; $135.00; ISBN 978-0-521-83292-2.

In the past few years, we have sent spacecraft to the planet Mars and received valuable data returned from them. In this compilation, editor, Mary Chapman has put together a package of 17 articles that reveal what we have learned from the data sent back by the Mars Global Surveyor, Mars Odyssey, Mars Express and the two Mars Exploration Rovers. Planetary geologists have now used these data to compare Martian features with similar features here in order to try to understand the formation process of the topography of the red planet. These scientists have discovered many parallels as well as differences in how these two planets have evolved since their formations billions of years ago.

In the first chapter, James W. Head gives an overview of the geology of Mars and discusses the major dynamic forces that have shaped the surfaces, crusts and lithospheres of both planets. Both the internal processes (volcanism) and the external forces (impact cratering) that have created the topography that we see today are covered. Head writes, "The stratigraphic record of a planet represents the products or deposits of these processes and how they are arranged relative to one another."

The rest of the chapters cover various landforms on both Mars and Earth and compare their physical similarities and differences along with their creative processes. The major thrust of the book is to show the reader the planetary features of Mars and Earth that are similar and what are different features, and what we can learn about the geological history of both planets by studying these features in detail. Are we similar or are we totally different bodies geologically?

Another chapter shows us where and how impact structures are analogous on both planets. On Earth, the constant forces of erosion have obliterated most of the impacts that the Earth received during the era of about 3.8 billion years ago known as the late heavy bombardment period. On Mars, approximately 60 percent of the impact cratering from that era remains and gives us a good glimpse into the early record of our Solar System.



The third chapter is a fascinating look at terrestrial volcanoes and how they compare with the giant calderas of the Tharsis region on Mars. There are a lot of similarities between these large Martian calderas and the calderas on the Hawaiian Islands.

In the fifteenth chapter, the authors compare Martian grabens to those found in Canyonlands National Park in Utah here on Earth as well as on the Moon. They have developed a new model for the evolution of grabens on the three bodies. We used to think that the parallel faulting that created a graben formed a V-shaped block, but the authors theorize that maybe the block is actually an hourglass, which is evidenced by the asymmetrical elevations in the height of the opposing walls of the graben. The authors feel that by studying grabens they can gather a clearer picture of the "near-surface planetary stratigraphy and strain."

Other chapters compare volcanic features in New Mexico with similar ones on Mars. We read about flood lavas found on both planets and compare rootless volcanic cones on Iceland with analogous features on Mars. The Earth has many playa regions (dry lakes) that today are large flat deserts. We think that similar features exist on Mars as well, and if Mars does have playas, then that would have significant implications for the planet's hydroclimatic history. If Mars had water, did it also have life? This is probably a primary question that still needs to be conclusively answered.

The book is rather technical in its presentation and language, and is geared for the more experienced Martian observer or planetary geologist. The book is packed with numerous spacecraft images of the Martian features being discussed and terrestrial and some lunar features. At the end of each chapter are extensive lists of the reference articles called out in the text.

I enjoyed reading this book and learning about the latest theories about the evolution of Mars. The chapter authors are very knowledgeable in their areas of expertise. I highly recommend this book to those with the scientific background or good understanding of geology in order to get the most out of this book. Even casual observers of the Red Planet will learn from it as well.

Feature Story:

The Synodic Rotation Period of Comet 17/P Holmes

By Alberto Silva Betzler[1,2] (a_betzler@yahoo.com), Diego Henrique Ferreira[1], Tárcio Henrique Ribeiro dos Santos[1], Alberto Brum Novaes[1], and Julian Hermógenes Quezada Celedon[2]

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Abstract

Comet 17P/ Holmes was observed in October and November 2007, after the brightness outburst of 24 October. Approximately 11.5 hours of data were collected. A time series analysis reveals a periodicity of 6.29 ± 0.01 hour in the brightness of the inner coma with a single-peak light curve. The object probably has an extremely active area in the nucleus. Therefore, the synodic rotation period is probably equal to the 6.29-hour the periodicity that we found.

Introduction

Comet 17P/Holmes, a comet of the Jupiter family, was chosen as the target of this investigation due to its outburst of October 24, 2007. In this event, the object changed its magnitude from V ~17 to V ~2.5 in approximately two days. This magnitude variation was at least 100 times greater than any of those that have been occasionally observed in other comets of the Jupiter family (Miles, 2007.) A similar tremendous outburst gave opportunity for the initial discovery of this comet by Edwin Holmes in London on November 6, 1892. At that time, the comet had passed perihelion approximately five months earlier (T = June 13). The present event occurred nearly six months after perihelion passage (T = May 4 2007.)

Outbursts of such magnitude, though uncommon, are well documented in the literature and may or may not be associated with nuclear fragmentation (Boehnhardt, 2002). In the case of 17P/Holmes, Montalto, *et al* (2008) estimated the loss of mass from the nucleus at one percent of its total mass and concluded that the outburst may have been associated with an event of disintegration of the nucleus. Miles (2007) suggested that the outburst may be due to heterogeneity on a large scale in the nucleus of the object. In his model, the nucleus possesses a mantle rich in water in which there are isolated agglomerates that are rich in metal, especially iron. Such composition might enable hydrogen peroxide to form slowly, and later undergo explosive catalytic decomposition. He proposed that such rapid decomposition is the origin of the outbursts observed in 17P/Holmes and other short period comets.

Table 1: Observational Geometric Circumstances of Comet 17P/Holmes

UT date	Δ	r	Ecliptic Longitude	Phase Angle
Oct. 27	1.630	2.447	53.1°	16.3°
Oct. 28	1.628	2.451	53.4°	16.0°
Nov. 2	1.622	2.471	54.9°	14.8°
Nov. 4	1.621	2.478	55.4°	14.3°
Nov. 11	1.623	2.506	57.5°	12.8°

Δ is the distance from Earth in AU.
r is the distance from the Sun in AU.
Ecliptic Longitude is in degrees.
Phase Angle is the degrees of separation of the Earth and Sun as seen from the comet

Several phenomena of cometary physics, such as the dynamic evolution of the objects, cannot be correctly explained without considering the rotational state of the nucleus (Neishtadt, *et al*, 2002). However, little information about the rotation of active comets is available. Fewer than 20 of the comets of the known cometary dynamical families have had rotational periods calculated accurately.

In general, when near the Sun, the nucleus of a comet is completely hidden by its coma. In this circumstance, periodic variation in the brightness of the inner coma can be linked to the rotation of the nucleus. Such brightness changes are not associated with the variation in the amount of light reflected directly from the nucleus' surface, but rather with the variation of the level of activity of discrete deposits of volatiles that are exposed to solar radiation by the object's rotation (Schleicher, *et al.*, 1998). This assumption seems to be inappropriate for the nuclei of some short period comets, such as 4P/Faye, due to the observed lack of structure in the coma of these objects (Lamy, *et al*, 1996). However, close-up inspection by spacecraft of the nuclei of the comets 1P/Halley and 19P/Borrely clearly revealed non-homogeneity in the activity of volatiles at the surface of the nucleus.

Snodgrass, *et al* (2006) observed 17P/Holmes on two nights in March, 2005, and concluded that the nucleus was inactive at its distance of 4.66 AU from the Sun. They found the R magnitude (the magnitude of the object obtained by Bessel R filter band and then calibrated in the photometric system Kron-Cousins) to be 22.86 ± 0.02, which yielded a nuclear radius of 1.62 ± 0.01 kilometers. They also considered the shape of the nucleus, as follows. If the nucleus is a triaxial ellipsoid with $a \; b = c$, then a light curve with an amplitude of 0.3 magnitude implies a ratio $a / b \; 1.3$. This ratio corresponds to a nucleus with dimensions a and b of 1.9 and 1.4 kilometers, assuming a bare (coma-free) nucleus for this object. This hypothesis was tested by calculating the V-R and R-I colour indices in various rota-

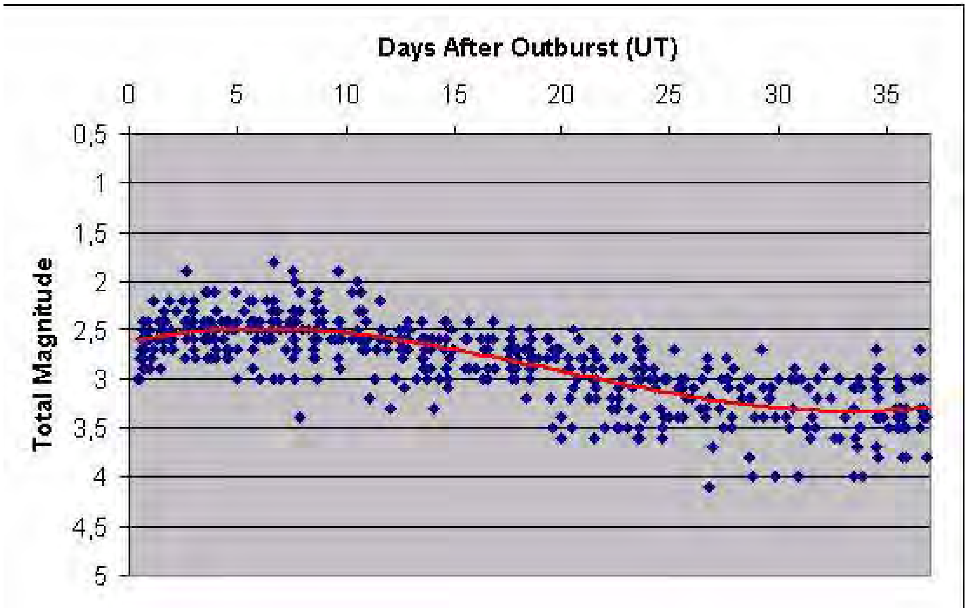

Figure 1. The light curve of 17P/Holmes after the October 24 outburst, as determined by 547 estimates of the total magnitude taken from the International Comet Quarterly database (*http://www.cfa.harvard.edu/icq/CometMags.html*). (Our observations did not contribute to these data.) On the abscissa, the zero point is the fractional date October 24.21 UT, which is the time of the first mention by Kugel in the database of the occurrence of the outburst. The observational period of our study was days 03 through 18. The solid wavy (red) line is a nearest-fit curve of a third degree polynomial. The brightness variations are due to the combination of variation in the intensity of the outburst and the effect of changing distance.

tional phases. The phase-specific color indices revealed evidence of homogeneity in the chemical composition and topography of the surface, implying that the variation in the object's brightness may be caused by variation in the size of the surface the object presented to the observer, that is, rotation. A double-peaked light curve is expected for such an object. An analysis of the photometric data indicated possible periodicities of 3.6, 4.3, 5.2 and 6.4 hours, corresponding to possible rotation periods of 7.2, 8.6, 10.4 and 12.8 hours.

In our observing campaign, photometric observations of the inner coma of 17P/Holmes were carried out. In this study, we assumed that the variations in the flow of the inner coma materials were associated with rotation of the nucleus rather than irregularities in the intensity of the outburst. This assumption appears to be true in view of the slowness of the change in the comet's brightness during the observational period (*Figure 1*.)

Equipment, methods, and observations

The Holmes comet was observed in Salvador, State of Bahia, Brazil, using a 0.3m (12 in.) *f*/3.3 Schmidt-Cassegrain telescope manufactured by Meade, and an ST-7XME CCD camera made by the Santa Barbara Instrument Group (SBIG). The angular scale was 1.8 arc seconds per pixel. The CCD's field of view was 23.5 arc minutes by 15.7 arc minutes. The 523 images obtained in this project were taken with 10-second exposure times through a Bessell V filter. Images were taken continuously at one-minute intervals during the whole of each of the observing sessions. The observations were carried out from UT October 27 to November 11, 2007, during five nights with an interval of 15 days between the first and the last observation.

The Bessell V filter was chosen because it not only transmits most of the wavelengths reflected and emitted by the coma, but also absorbs certain undesirable wavelengths of the background, such as those associated with light pollution (Mikuz and Dintinjana, 1994). The combination of these two factors increased the signal-to-noise ratio (SNR) of the object.

The images were calibrated with median images of bias, dark and dome flat exposures. For the measurement of the instrumental magnitudes of the inner coma and the comparison stars and for the search for periodicities by time series analysis, we used the CANOPUS program by Brian Warner, version 9.3.1.0. The instrumental magnitudes were obtained using aperture photometry.

For each observing session, the diameter of the aperture that we used for aperture photometry was chosen based on our measurement of the size of the seeing disc. We used four times the average value of the FWHM ("Full-Width Half-Maximum") of an unsaturated comparison star that was present in every image of an observing session. For instance, in the observations on UT November 11, 2007, the aperture used was 45 arc seconds. In none of the sessions did the use of this photometric aperture result in contamination by the light of background stars.

[FWHM is used to describe a measurement of the width of an object in a picture when that object does not have sharp edges. The image of a star in an astronomical picture has a profile which is closer to a Gaussian curve. The FWHM can be calculated from this curve that is adjusted to the stellar profile.]

The aperture used to measure the background was placed at a distance from the central condensation of the comet in a way that the flux contamination due to light from the outer coma was equal to zero (i.e., it was unmeasurable.)

During the entire observation period, the seeing varied from 6 to 8 on the ALPO scale (with 0 = worst and 10 = best). The comet's geometric circumstances during the observation period are shown in *Table 1*.

Data and Reductions

Based on the instrumental magnitudes of the inner coma of 17P/Holmes and at least three comparison stars in each observing session, the differential magni-

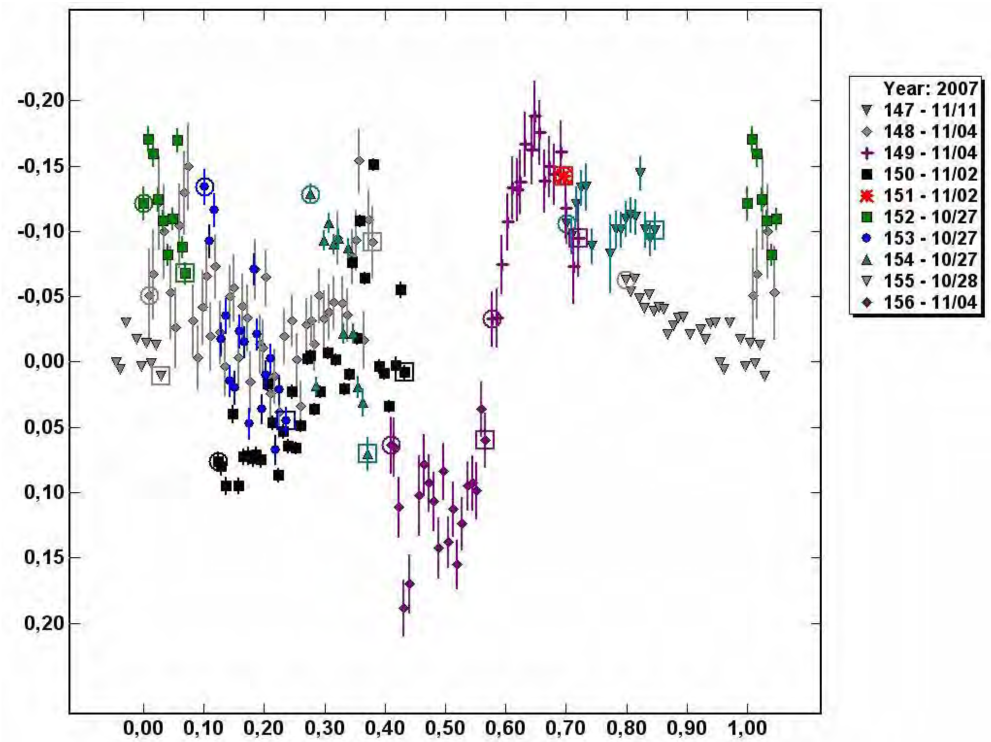

Figure 2. Light curve of Comet 17P/Holmes adjusted based on the periodicity of 6.29h. The phase 0% of the curve corresponds to HJD 2454400.647475 corrected to the light time. This curve has 208 points obtained from the average of three consecutive measurements in the sample. This procedure was applied to reduce the noise level in the lightcurve. In this case, as the number of points in the sample is not divisible by three, the remaining points are still averaged to form a single data point. The box in the figure represents the session of reduction of data in order of entry into the programme Canopus (147, 148, etc...) and the corresponding date of observation.

tude was calculated. Due to discrepancies in the differential magnitudes from one session to another, the session of November 11 was used as a reference. From this session, a factor was added or subtracted from all differential magnitudes of the others nights, this factor being constant for each night but differing from night to night, thus offsetting the differences in scale in order to connect the parts of the light curve of the object. (These differences of differential magnitudes among the sessions are probably due to the slow variation in the intensity of the outburst, rather than due to the nucleus' rotation.) After this correction, the search for periodicity in the 523 differential instrumental magnitudes was done using the Fourier analysis algorithm FALC, developed by Harris, *et al* (1989,) and included in the CANOPUS program.

The solution is unambiguous, with a periodicity of 6.29 ± 0.01 hour in the brightness of the inner coma. In order to arrive at this value, four harmonics in the Fourier series were required, generating a root mean square error of 0.05 magnitudes. A single peak light curve with amplitude of 0.38 ± 0.06 magnitude was obtained from the adjusted data (*Figure 2*.)

Conclusion

Our result of a 6.29 ± 0.01 hour periodicity may be considered in the light of the results of Snodgrass, *et al* (2006), that suggested that the nucleus is elongated when it is inactive, so that a double-peak light curve is expected; as well as the four possible periodicities that Snodgrass's group detected in their data. Thus, we could convert our 6.29 ± 0.01 hour, single-peak periodicity to a synodic rotation period of 12.58 ± 0.02 hours, with two peaks in the light curve. This value would agree with the largest of Snodgrass's periodicities with a measurement error of 1.7%. This difference cannot be attributed to a period modification due to the recent outburst or to a complex rotational state of the nucleus. It is due to an error in the previous estimate of the rotation period, supposedly in the order of 0.1 hour, due to the insufficient sampling of the previous light curve. Our measurement has a smaller theoretical error, and if one accepts the idea that the light curve should have two peaks, it should be used as the best measure to date of the rotation period of Comet 17P/Holmes.

However, it does not appear that a double-peak light curve is appropriate. Furthermore, our data do not adjust well to a period of 12.58 hours. The results obtained by Trigo-Rodríguez, *et al* (2008), and the single peak light curve of this study suggest a single active area of great proportion in the nucleus after the outburst. This active region can account for our light curve's features each 6.29 hours. For a comet with a bright coma, periodicity found in the brightness of the inner coma can be equal to the rotational synodic period of the comet. We conclude that the rotation period of Comet 17P/Holmes is 6.29 ± 0.01 hours.

To the extent that the synodic rotation period is ambiguous, we recommend more observations of this object. Such observations should concentrate on the visualization of coma structures, like shells, fans and jets. The variation of position angle of these structures can be connected with rotation of nucleus. This procedure was used by Pittichová (1997) in the study of the comet IRAS-Araki-Alcock.

Discussion

Insofar as the parameters presented in *Table 1* varied only a small amount during the observation period, the comet was observed in relatively stable geometric circumstances.

The same seeing-related variable aperture scale that we used was previously used by Kidger, *et al* (1998), in the observation of C/1995 O1 (Hale-Bopp). This choice may have been motivated by the observation of time variations in the instrumental magnitudes of objects having extended angular diameters, such as comets, associated with fluctuations in the seeing. The possibility that this phenomenon generates spurious brightness periodicities in comets was suggested later by Licandro, *et al* (2000). Though Licandro's group suggested a corrective method for this effect, this correction was not applied in the present study. Our analysis of the instrumental magnitudes that we obtained suggests that the seeing effect was not observed with our use of these apertures. However, a slight reduction of the signal-to-noise ratio was detected, which implies an increase in the errors of the instrumental magnitudes.

Our careful separation of the background measurement aperture from the light of the coma may have been unnecessary. A comparison of the instrumental magnitudes obtained on UT October 27, 2007 (a few days after the beginning of the outburst,) using one aperture that could have led to contamination by the extended coma and another that could not have done so, revealed a difference of 0.03 magnitude. This error is smaller than the error in the instrumental magnitudes of the comparison stars.

Thus, the error in the instrumental magnitudes caused by possible inclusion in the background of light from the outer coma is insignificant. Furthermore, with the eventual expansion of the outer coma beyond the limits of the CCD field so that the outer coma's brightness was necessarily included in the background, we verified that this contamination decreased to less than 0.03 magnitude, undoubtedly due to the reduction of the coma's surface brightness.

Acknowledgement

Thanks to the Vitae Foundation, MCT (Ministry of Science and Technology) and the Institute of Physics of Universidade Federal da Bahia (IF-UFBA) for supporting the "Discovering the Sky" Project. We are also grateful to R. Venable for the detailed revision and many suggestions which much improved this work.

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Comet Holmes as imaged by M. Jäger on 2007 October 31.8 and presented online at ALPO Comet Section Coordinator Gary Kronk's "Cometography" website at *http://cometography.com/pcomets/017p.html*. This image is a combination of three 180-second exposures obtained using a 30-cm Deltagraph, a Sigma 6303 CCD camera, and a blue filter. Although a few overly-processed images from October 29 and 30 hinted at this type of tail, which led to excessive discussion on the internet, this is the first image to conclusively prove its existence. The tail appears extremely short, because the tail is heading almost directly away from our line of sight. Image copyright © 2007 by Michael Jäger (Austria).

Feature Story:

Observations of Mercury's 280-Degrees Longtitude Region

By Frank J Melillo, coordinator, ALPO Mercury Section
E-mail: *frankj12@aol.com*

Abstract

Since 2001, the ALPO Mercury Section has received numerous, high-quality drawings and images that depict the range of 280 degrees longitude. These observations have made a significant contribution toward mapping the portion of the planet that was not imaged by the Mariner 10 spacecraft. A previously suspected feature of relatively low albedo, possibly a basin or a large, dark-floored crater, is being consistently recognized. It is the most prominent feature on the entire surface of Mercury.

Introduction

In 1974 and 1975, the Mariner 10 spacecraft made three flybys of Mercury and imaged 45% of its surface, mapping longitudes from 10 degrees to 190 degrees. The images showed heavily cratered, flat plains and hilly areas, reminiscent of the Moon (Greeley, 1985). Longitudes from 190 degrees through 360 degrees to 10 degrees remained unknown. During the 1990's, improvements in radio telescope imaging technology gave us hints of what the remaining portion of the surface is like, particularly in the identification of relatively fresh impact ejecta, thus identifying some craters. However, large surface features may not show consistent characteristics when detected by radio imaging. For example, the 1,550-km diameter Caloris Basin, which was imaged by Mariner 10, shows radar reflection characteristics that are very different from those of the Solitudo Aphrodites feature (Harmon, *et al*, 2007).

Meanwhile, amateurs have begun to have success in identifying albedo features in images made with webcams (Melillo, 2006). Since 2001, contributors to the ALPO Mercury Section have repeatedly recorded a dark marking on the unmapped surface at approximately 280 degrees longitude, just north of the equator. According to the old map (Murray, *et al*, 1972), which incorporates feature names approved by the IAU (International Astronomical Union, 1971-1986), this feature is known as Solitudo Aphrodites. This map is in agreement with the map by Mario Frassati (Melillo, 2004) regarding the presence of a large albedo marking at this location. The purpose of this paper is to document this feature by describing the observations of ALPO members.

Directions, Please

In this paper, the planetographic longitude convention, with increasing longitude toward planetary west, is used exclusively. This is the convention that ALPO Mercury and Mars observers have long used, and it differs from the planetocentric longitude system, in which longitude increases to the east.

Modern optical-wavelength observations by professional astronomers

The best map available today in depicting Mercury's surface as seen from Earth is probably the chart by Murray, Smith and Dollfus of 1972 (Murray, *et al*, 1972). It shows a particularly dark marking in the area of interest.

On the morning of August 29, 1998, a group led by Dantowitz succeeded in imaging Mercury by taking many, very brief exposures and selecting only the best images for stacking, a technique that amateur astronomers have copied with webcam imaging. Using Mount Wilson's 60-in. telescope and a video imager, they captured the planet as a crescent that was 36% illuminated. With a CM of 254 degrees, the images show some albedo features over the longitude range 270 – 330 degrees (Dantowitz, *et al*, 2000). There was a large "maria-like" region seen at 280 degrees, but it lay too close to the terminator for a definitive view. Nevertheless, this gave us an important clue that something of interest was to be seen in this region.

Johan Warell and Sanjay Limaye used the 0.5-m Swedish Vacuum Solar Telescope on La Palma from 1995 to 1999 to obtain excellent images sufficient for the creation of an albedo map. Its resolution is similar to that of the video images taken by the Dantowitz group, and it too shows the dark albedo feature at 280 degrees longitude (Warell and Limaye, 2001).

All Readers

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

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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 visible near Mercury when allowing for daylight and twilight

IAU directions are used in all instances (so that Mercury rotates from west to east).

The 280-degree longitude meridian of Mercury will be well-positioned during the morning apparition of the planet in the last two weeks of October 2008. On October 15, the CM longitude will be 233 degrees, October 24, the CM will be 283 degrees and October 31, the CM will be 316 degrees — all at 0:00 UT.

On May 2, 2002, Leonid Ksanfomality of the Space Research Institute of the Russian Academy of Science used the 1.29-m telescope at the Skinakas Observatory of Iraklion University in Greece to obtain some excellent images of Mercury during a favorable evening apparition. With a central meridian (CM) of 290 degrees and a crescentic phase of 46% illumination, the longitude of 280 degrees was right on the terminator. His image showed a large shady area there, centered at 8 degrees north latitude, half obscured by the terminator. It was the most prominent feature on the disk. This observation was in good agreement with those of both the Dantowitz group and Warell and Limaye. The feature is now often called the "Skinakas Basin," but this informal designation is not a name approved by the IAU.

Is the feature called Solitudo Aphrodites on the map of Murray, Smith, and Dollfus the same feature as this "Skinakas basin?"

Our observations

Each year, there is at least one apparition of Mercury in which the 280-degrees longitude region can be favorably seen. Participants in the ALPO Mercury Section have used these opportunities to obtain good coverage of this area. Here are some of our observations of it.

In July of 2001, this author, in Holtsville, NY, USA, and Mario Frassati of Crecentino, Italy, made observations of Mercury during a favorable morning apparition. Melillo imaged at CM = 263, CM = 269 and CM = 295 degrees on July 14, 15 and 21, respectively. Frassati made his observations at CM = 295 and CM = 299 degrees on July 21 and 22, respectively. These observations were made in very good seeing, and so were of high resolution. In each image, there is an unmistakable dark feature centered at 280 degrees longitude, north of the equator, near the terminator. It was obviously the darkest feature on the disk. We reported the detection of Solitudo Aphrodites.

In April and May of 2002, the ALPO Mercury Section coordinated an observing campaign during that year's best evening apparition. (This is the apparition during which Ksanfomality recorded the feature, as mentioned above.) Unfortunately, the Solitudo Aphrodites marking was so close to the terminator that only part of it could be seen. The atmospheric stability was not so favorable, but nevertheless the ALPO Mercury Section obtained great coverage. Tim Wilson of Missouri, USA, this author, Mario Frassati and a few others made excellent observations showing a marking on the terminator at the exact location of the feature that Ksanfomality imaged. While Ksanfomality dubbed the feature, "Skinakas Basin," the ALPO Mercury Section was not aware of his work. In June and July of the same year, Mercury was visible in the morning sky, and the 280-degrees longitude region was very well-positioned for observation. This author, Tim Wilson and Mario Frassati made excellent observations, clearly showing the feature.

In January, 2004, when Mercury appeared in the morning sky, Michael Amato of Connecticut, USA, Carl Roussell of Ontario, Canada, and Tim Wilson made drawings that faintly showed a dark region near 280 degrees longitude, at the terminator. Unfortunately, their depictions of the dark area did not catch our attention because the observers were concentrating on bright spots.

Our next good opportunity was a year later, during the morning apparition of December 2004, and January 2005. Mario Frassati made a series of drawings of Mercury showing a marking just north of the equator along the terminator (see Figure 1.) This author made images on December 25 and December 28 showing the dark area unmistakably. Excellent drawings showing the same feature were made by Brian Cudnik of Houston, TX, USA, and Tim Wilson on December 27 and 31, respectively. Also, this author took

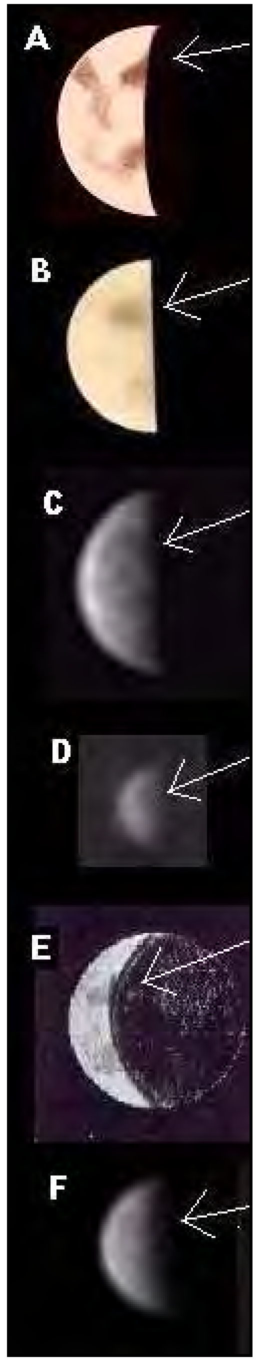

Figure 1. North is up and planetary east is to the right. The "Skinakas Basin" feature, located at or near the terminator (longitude 275°), is arrowed in each image. These images are from morning apparitions. **A.** Drawing by Mario Frassati, Dec. 23, 2004; CM = 267°; instrument, 23.5 cm Schmidt-Cassegrain.

B. Drawing by Tim Wilson, Nov. 22, 2006; CM = 271°; terminator longitude 270°; instrument, 9.0 cm refractor.

C. Webcam image by Andy Allen, Nov. 23, 2006; CM = 271°; terminator longitude 271°; instrument, 25.0 cm Newtonian.

D. Webcam image by Frank Melillo, Nov. 24, 2006; CM = 282°; terminator longitude 272°; instrument, 20.3 cm Schmidt-Cassegrain.

E. Drawing by Carl Roussell, Nov. 2, 2007, CM = 246°; terminator longitude 271°; instrument, 15 cm refractor.

F. Webcam image by John Boudreau, Nov. 4, 2007; CM = 257°; terminator longitude 270°; 27.5 cm Schmidt-Cassegrain.

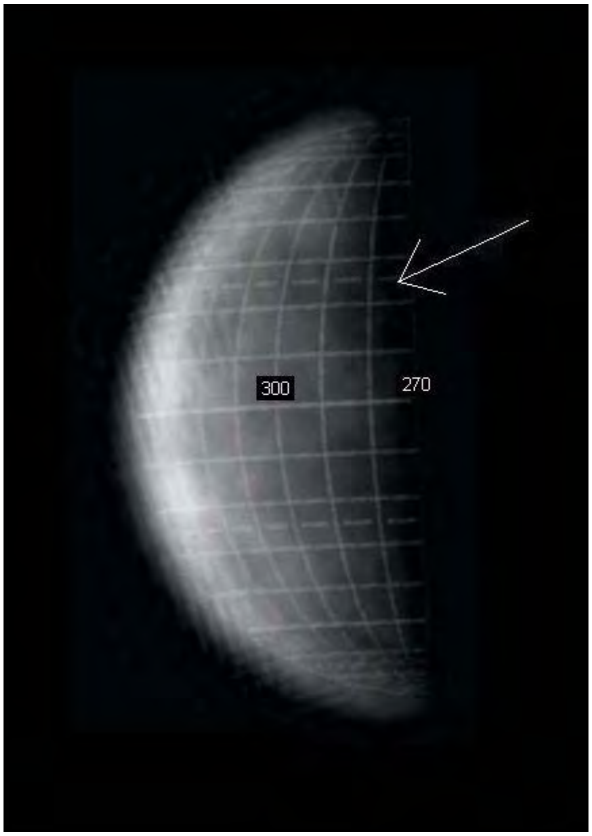

Figure 2. This image by Andy Allen is the same one shown in Figure 1, image C. The grid lines were prepared by Tim Wilson. The so-called "Skinakas Basin" is arrowed, appearing as a large, dark area near the terminator.

images on January 1 that revealed a dark spot at the same location. Finally, on January 13, late in the apparition, Carl Roussell drew a dark spot there.

Another fine opportunity took place during the December, 2005, morning apparition as the Solitudo Aphrodites feature faced the Earth. It was seen with some difficulty due to mediocre atmospheric conditions. These observations demonstrated that this feature can be seen under less than optimal seeing conditions.

In the morning skies of November 2006, the "Skinakas Basin" was again facing us. Andrew Allen of California, USA, using a 10-inch telescope, made an outstanding image of Mercury that showed Skinakas right on the terminator, half-illuminated (see Figures 1 and 2.) This image is very similar to the one that was taken by the Dantowitz group using the 60-in. Mt Wilson telescope (Dantowitz, *et al*, 2000). The images and drawings of other observers also recorded this feature well.

In the morning apparition of November 2007, John Boudreau of Massachusetts, USA, took some excellent images that showed the feature as a circular dark spot near the terminator. His series of images during that apparition have been assembled into a short animation of the Skinakas Basin moving across the terminator as the planet rotates! The animation can be found at *http://www.alpo-astronomy.org/mercury/images/mercury_110407_to_111707.bmp*

This feature is large. According to our observations, it spreads some 40 degrees in longitude, from 260 to 300 degrees, and perhaps 25 degrees in latitude, from 5 to 30 degrees north. When near the terminator, it is easily seen. This ease of detection and the consistency by which it has been detected in recent years suggest that it is the most prominent spot on the unmapped half of the planet. It appears similar to large, dark features on the Moon such as Mare Imbrium. Such smooth lunar basins, with their dark floors, show enough albedo contrast to be seen easily when near the terminator, either with the naked eye or binoculars. Nevertheless, it is precipitous to state that this feature is a basin. What we know is that it is real and well recognized.

ALPO observers of this feature used instruments from 90-mm to 200-mm in aperture. Thus, large telescopes are not needed for this kind of work.

Conclusion

ALPO members have consistently recorded the Solitudo Aphrodites albedo feature in recent years. Using very modest equipment, amateur observers are able to make a real contribution to planetary astronomy by observing Mercury. We do not know the geological nature of this albedo feature, but it is natural to think that it is an impact basin. We shall have to wait for the images from the MESSENGER spacecraft before we know for sure.

There is great potential for further observation of Mercury by amateur astronomers. We hope to detect other albedo features and make an albedo map of not only the unknown half of the planet, but also the part that was imaged by Mariner 10. We hope to accomplish this before MESSENGER enters orbit around the planet, and we need the help of more observers.

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Feature Story: Venus

ALPO Observations of Venus During the 2004 - 2005 Western (Morning) Apparition

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

An ALPO Venus Section Observing Report Form is located at the end of this report.

Abstract

The report summarizes the results of an analysis of 250 photo-visual observations submitted to the ALPO Venus Section during the 2004-05 Western (Morning) Apparition by observers residing in Italy, Germany, France, Canada, Japan, Puerto Rico, the United Kingdom 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 at visible, UV, and IR wavelengths, as well as drawings made in integrated light and with color filters. Included is a continuing statistical analysis of the categories of markings seen or suspected at visible 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 250 visual drawings and digital images of Venus were contributed to the ALPO Venus Section during the 2004-05 Western (Morning) Apparition. Geocentric phenomena in Universal Time (UT) for this observing season appear in **Table 1**, while **Figure 1** presents the distribution of observations by month during the apparition.

This apparition, observational monitoring of the planet was reasonably consistent. Observers made drawings or images of Venus from just four days after the Inferior Conjunction of June 8, 2004, up to about a month before Superior Conjunction, which occurred on March 31, 2005. Observational coverage of Venus from start to finish throughout every apparition is always very important, and the good news is that such consistent surveillance of the planet is becoming more commonplace in recent years. The 2004-05 viewing season ranged from June 12, 2004 to February 27, 2005, with 83.2 percent of the observations occurring between July and November 2004. Over this time span Venus passed through greatest brilliancy (-4.5mv), dichotomy (half-phase), and maximum elongation (45.8°) from the Sun. Sixteen observers submitted visual reports, drawings, and images in 2004-05, and **Table 2** shows their observing location, number of observations submitted, and instruments used.

Figure 2 shows the distribution of contributed observations by nation of origin for the 2004-05 Western (Morning) Apparition, while **Figure 3** shows the breakdown of observers by nation. A smaller percentage than usual of those participating in our observing programs (43.8 percent) were from the United States, and they contributed to only 29.2 percent (see **Figure 3**) of all reports, drawings, and images received; in contrast, the majority of observations and contributing observers (70.8 percent and 56.2 percent, respectively) came from other countries.

All Readers

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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:
- Estimated magnitude of the faintest star observable near Venus, allowing for daylight or twilight

IAU directions are used in all instances.

Terminology: Western vs Eastern

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

"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.

The international flavor of our programs, therefore, continued during 2004-05; indeed, the ALPO Venus Section seeks to sustain this global cooperation of observers in the future as we collectively tackle the unique challenges presented by Venus to both visual observers and imagers.

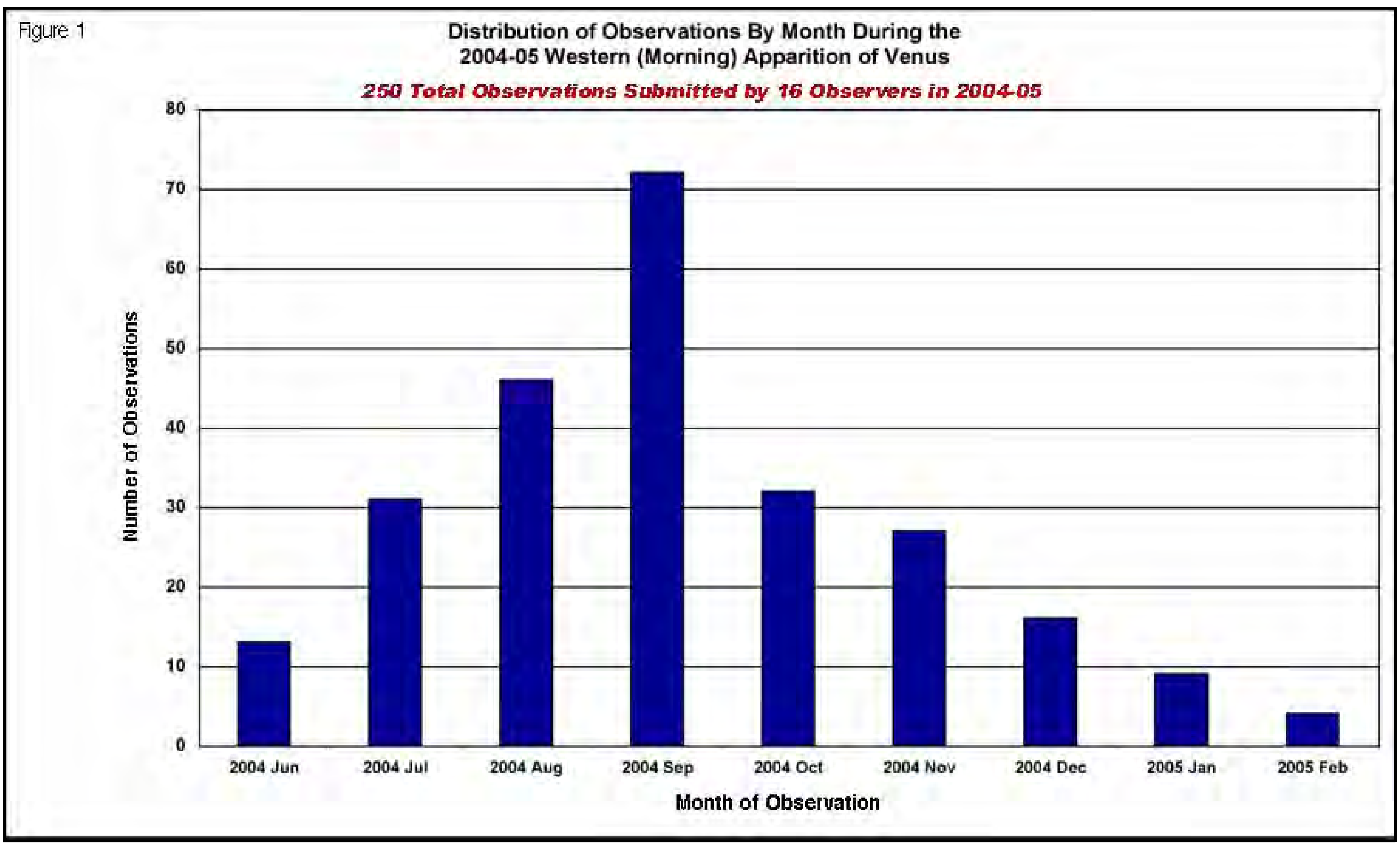
Telescope types used in making observations of Venus in 2004-05 are shown graphically in **Figure 4**, where it can be seen that Schmidt-Cassegrains were employed slightly more than half (58.0 percent) of the time for digital imaging and visual studies of Venus during the apparition. Including Maksutov-Cassegrains, catadioptrics accounted for nearly three-fourths (73.6 percent) of all observations in 2004-05. Visual observers typically utilized refractors and Newtonians, which produced 26.4 percent of the data. The majority (84.0 percent) of all observations were made with telescopes of 15.2-cm (6.0-in) aperture or greater Throughout the apparition, all observations were made under twilight or generally light-sky conditions, and some individuals tracked Venus into the bright daylight sky after sunrise to reduce the negative effects of glare associated with the planet. This procedure also allowed observers to see and image Venus when it was higher in the sky, thus avoiding the image degradation due to less-than-favorable seeing near the horizon.

The author extends his sincere thanks to all sixteen observers mentioned in **Table 2** for their digital images, superb drawings, and accompanying descriptive reports during the 2004-05 observing season. The dedicated efforts of such observers are highly commended, because viewing the planet before sunrise often necessitated getting up early and fitting in an observing run prior to heading off to work the same day. Readers aspiring to learn more about the planet Venus and our numerous observing endeavors are cordially invited to join the ALPO and become regular contributors to the ALPO Venus Section in upcoming apparitions.

For the last several apparitions, there has been a considerable growth in the number

Table 1: Geocentric Phenomena in Universal Time (UT) for the 2004-05 Western (Morning) Apparition of Venus

Inferior Conjunction	2004 Jun 08^d 09^h UT
Initial Observation	Jun 12 11
Greatest Brilliancy	Jul 15 01 (m_v = –4.5)
Dichotomy (predicted)	Aug 17 11.80 (k=0.500)
Greatest Elongation West	Aug 17 19 (45.8°)
Final Observation	2005 Feb 27 12
Superior Conjunction	Mar 31 03
Apparent Diameter (observed range):	57.76” (2004 Jun 12) ↔ 9.92” (2005 Feb 27)
Phase Coefficient, ***k*** (observed range):	0.005 (2004 Jun 12) ↔ 0.991 (2005 Feb 27)



of submitted digital images of Venus taken at visible and other wavelengths, and nearly all of the results have been truly amazing, especially the UV and IR images. Indeed, the ALPO Venus Section always encourages those who possess CCD cameras to image the planet routinely at different wavelengths. However, as crucial as these newer high-tech methods are to the success of our programs, observers should not mistakenly believe that well-executed drawings of the planet are obsolete. Observers with trained eyes, painstakingly 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 is extremely important, since some of the features sketched by experienced observers also appear with the same morphology on digital images made at the same time and on the same date. Of course, visual observations always suffer from an inherent level of subjectivity, but that is precisely why we emphasize the enormous value of making simultaneous observations as a means of improving opportunities for confirmation of discrete phenomena. There is no doubt that routine simultaneous visual observations concurrent with digital imaging add a valuable collaborative dimension to data acquisition.

Table 2: Participants in the ALPO Venus Observing Program During the 2004-05 Western (Morning) Apparition

Observer and Observing Site	No. of Observations	Telescope(s) Used*
1. Akutsu, Tomio; Tochigi, Japan	4	31.8-cm (12.5-in) NEW
2. Benton, Julius L.; Wilmington Island, GA	35	12.7-cm (5.0-in) MCT
3. Boisclair, Norman J., South Glens Falls, NY	4 2	9.0-cm (3.5-in) MCT 50.8-cm (20.0-in) NEW
4. Crandall, Ed; Winston-Salem, NC	1	25.4-cm (10.0-in) NEW
5. Cudnik, Brian; Weimar, TX	4 4 1 3	20.3-cm (8.0-in) SCT 25.4-cm (10.0-in) NEW 31.8-cm (12.5-in) NEW 35.6-cm (14.0-in) SCT
6. del Valle, Daniel; Aquadillo, Puerto Rico	1 7	12.0-cm (4.7-in) REFR 20.3-cm (8.0-in) SCT
7. Gasparri, Daniele; Perugia, Italy	6	23.5-cm (9.25-in) SCT
8. Hatton, Jason P.; Mill Valley, CA	5	23.5-cm (9.25-in) SCT
9. Ikemura, Toshihiko; Osaka, Japan	2	31.0-cm (12.2-in) NEW
10. Lazzarotti, Paolo; Massa, Italy	7	25.4-cm (10.0-in) NEW
11. Melillo, Frank J.; Holtsville, NY	13	20.3-cm (8.0-in) SCT
12. Niechoy, Detlev; Göttingen, Germany	103	20.3-cm (8.0-in) SCT
13. Peach, Damian; Norfolk, UK	4	23.5-cm (9.25-in) SCT
14. Pellier, Christophe; Bruz, France	15	18.0-cm (7.1-in) NEW
15. Roussell, Carl; Hamilton, ON, Canada	28	15.2-cm (6.0-in) REFR
16. Tatum, Randy; Richmond, VA	1	17.8-cm (7.0-in) REFR
Total No. of Observers	**16**	
Total No. of Observations	**250**	
* MCT = Maksutov-Cassegrain, NEW = Newtonian, REF = Refractor, SCT = Schmidt-Cassegrain		

Observations of Venusian Atmospheric Details

Different methods and techniques for performing observations of the vague and elusive "markings" in the atmosphere of Venus are covered in detail in the newest edition of *The Venus Handbook*. This valuable guidebook for observing the planet is now available either as a printed manual or as a pdf (portable document format) 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.

A substantial number of the Venus observations in 2004-05 used for this analysis were made at visible wavelengths (in integrated light and with color filters), but the ranks of those regularly capturing digital images of the planet in visible, UV, and IR light are growing each observing season. Representative drawings, as well as some of the best digital images, accompany this report as illustrations.

After a thorough study of the photo-visual data for the 2004-05 Western (Morning) Apparition, all of the traditional categories of dusky and bright markings in the atmosphere of Venus were seen or suspected by observers (see the references at the end of this report). **Figure 5** shows the frequency of the specific forms of markings that were reported by visual observers or captured by digital imagers at visible, near-IR, and near-UV wavelengths. The majority of the observations referred to more than one category of marking or feature, so totals exceeding 100 percent are possible. Although conclusions from these data appear reasonable, readers should be aware that some level of subjectivity exists in at least the visual accounts of the normally elusive atmospheric markings of Venus. It is likely that this factor affected visual impressions of atmospheric phenomena, thus the need for regular simultaneous observing efforts, ideally at the same time that imaging occurs at visible and other wavelengths.

Many who carried out purely visual studies during the 2004-05 apparition often described how difficult the faint dusky atmospheric markings on Venus are to detect. This is a well-known characteristic of the planet that is usually independent of the experience of the visual observer,

Figure 2

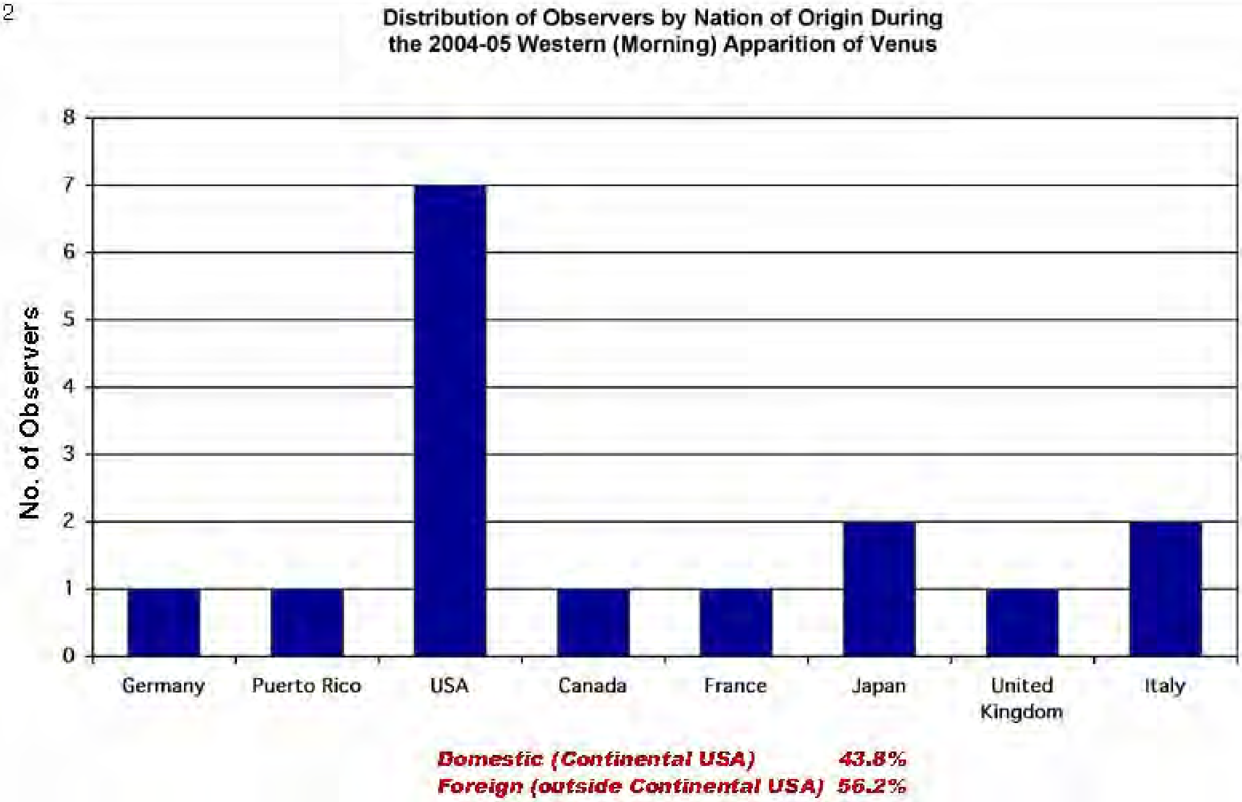


Figure 3

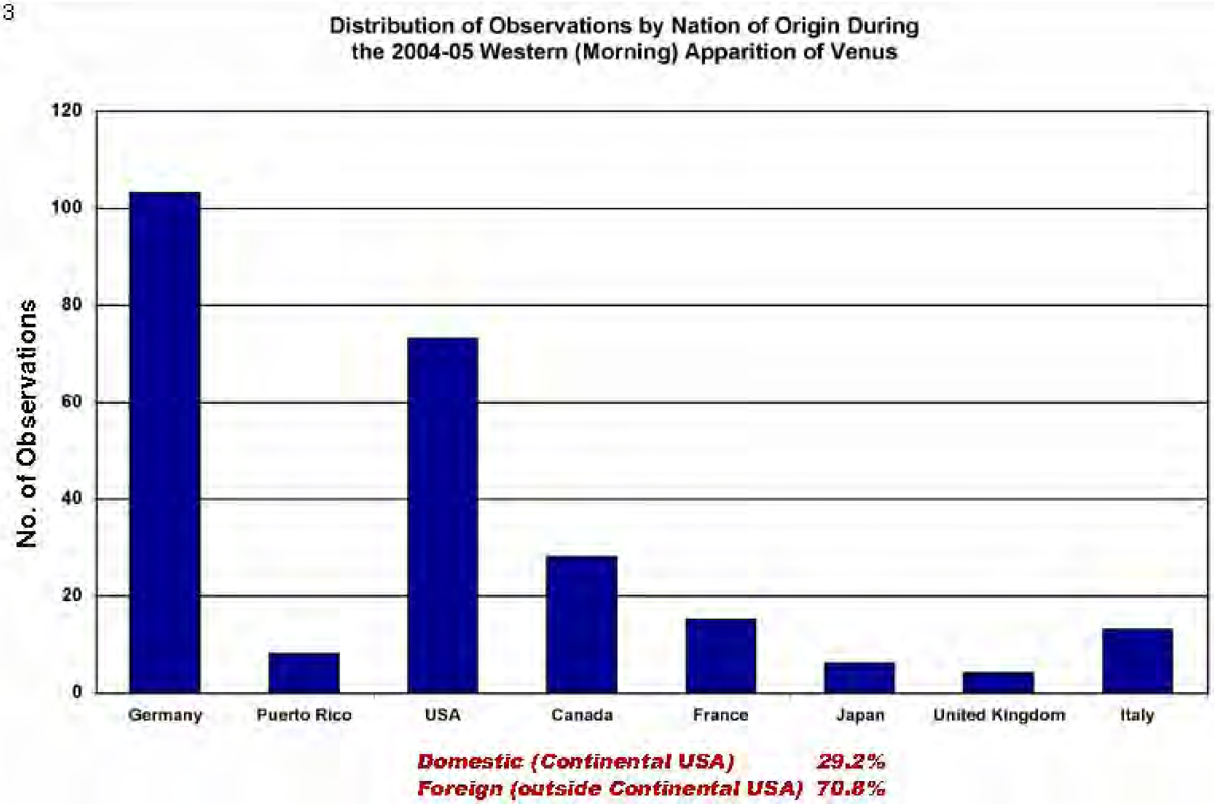
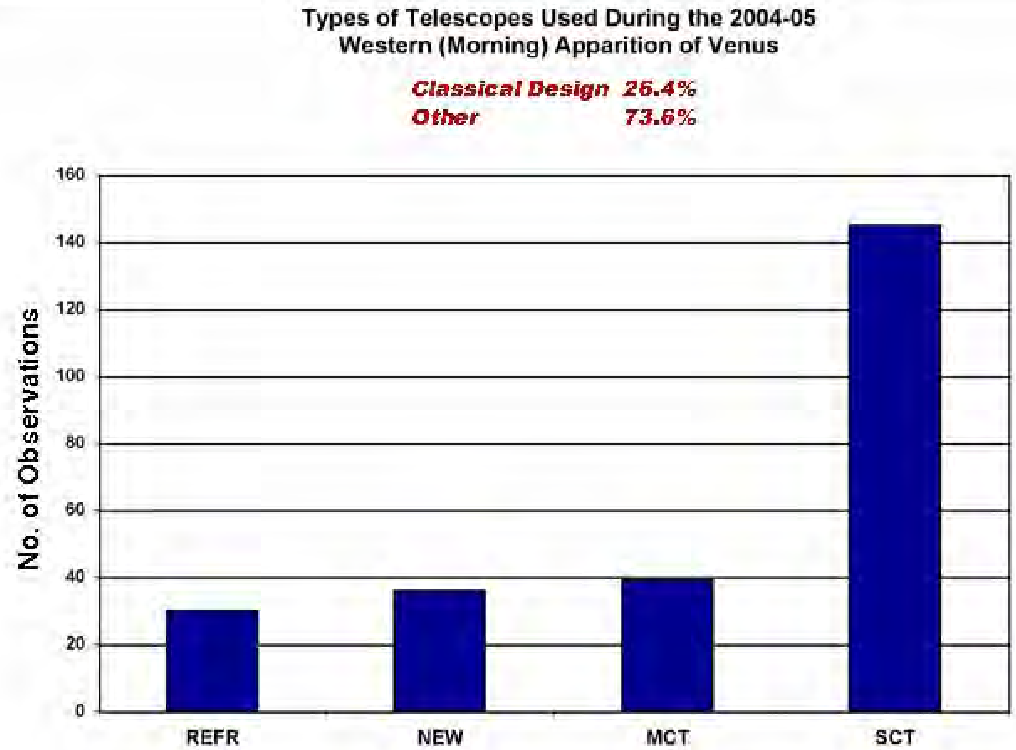


Figure 4



and is a factor that often exasperates and discourages many who are viewing Venus with their telescopes for the first time. At visible wavelengths, employing color filters and variable-density polarizers improves opportunities for seeing subtle cloud detail on the planet. The morphology of features revealed in images taken at near-UV or near-IR wavelengths is often quite different from what is seen visually, especially in terms of radial dusky spokes or shadings. Yet, sometimes digital images show almost exactly what careful visual observers have sketched with color filters. So, in addition to visual work, the ALPO Venus Section urges observers to obtain images of the planet at various wavelengths for comparative analysis.

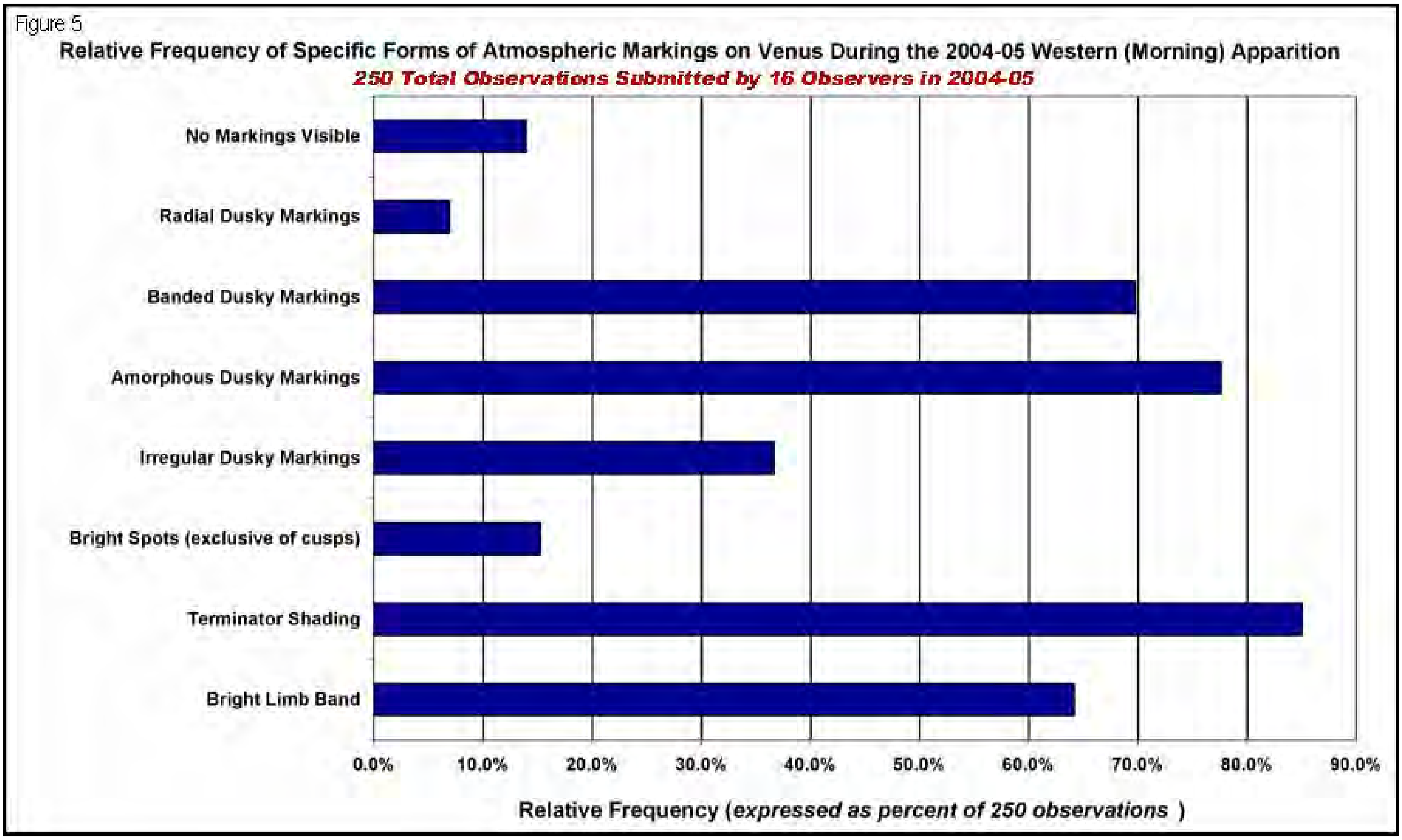
Table 3: Observed vs. Predicted Dichotomy of Venus: 2004-05 Western (Morning) Apparition

Observers	Daniel del Valle	Detlev Niechoy
	UT Dates	
Observed (O)	2004 Aug 17.39	2004 Aug 20.22
Predicted (P)	2004 Aug 17.49	2004 Aug 17.49
Difference (O-P)	00.10d	02.65d
	Phase (*k*)	
Observed (O)	0.500	0.515
Predicted (P)	0.500	0.500
Difference (O-P)	0.000	+0.015
	Phase Angle (*i*)	
Observed (O)	90.0	88.3
Predicted (P)	90.0	90.0
Difference (O-P)	00.0	01.7

Figure 5 shows that only 14.0 percent of the observations and images of Venus in 2004-05 showed a brilliant disc that was completely devoid of any markings whatsoever, probably because more observers are employing good filter techniques coupled with a growing incidence of digital images that show detail. When faint dusky features were seen, suspected, or imaged, most fell in the categories of “Amorphous Dusky Markings” (77.7 percent), “Banded Dusky Markings” (69.8 percent), and “Irregular Dusky Markings” (36.7 percent) during the 2004-05 Western (Morning) Apparition, with 7.0 percent falling into the “Radial Dusky Markings” category (f**igures 8, 9, 11, and 1**3).

Terminator shading was visible during much of the 2004-05 observing season and reported in 85.1 percent of the observations (see **Figure 5**), usually extending from one cusp region to the opposite one and assuming a higher intensity progressively from the region of the terminator toward the bright planetary limb (**Figure 9**). This gradation in brightness culminated in the Bright Limb Band in most accounts. This apparition, most of the digital images at near-UV wavelengths showed terminator shading as well.

The mean relative intensity (as expressed on the ALPO Scale which ranges from 0.0 for black to 10.0 for the brightest possible markings) of all of the dusky features on

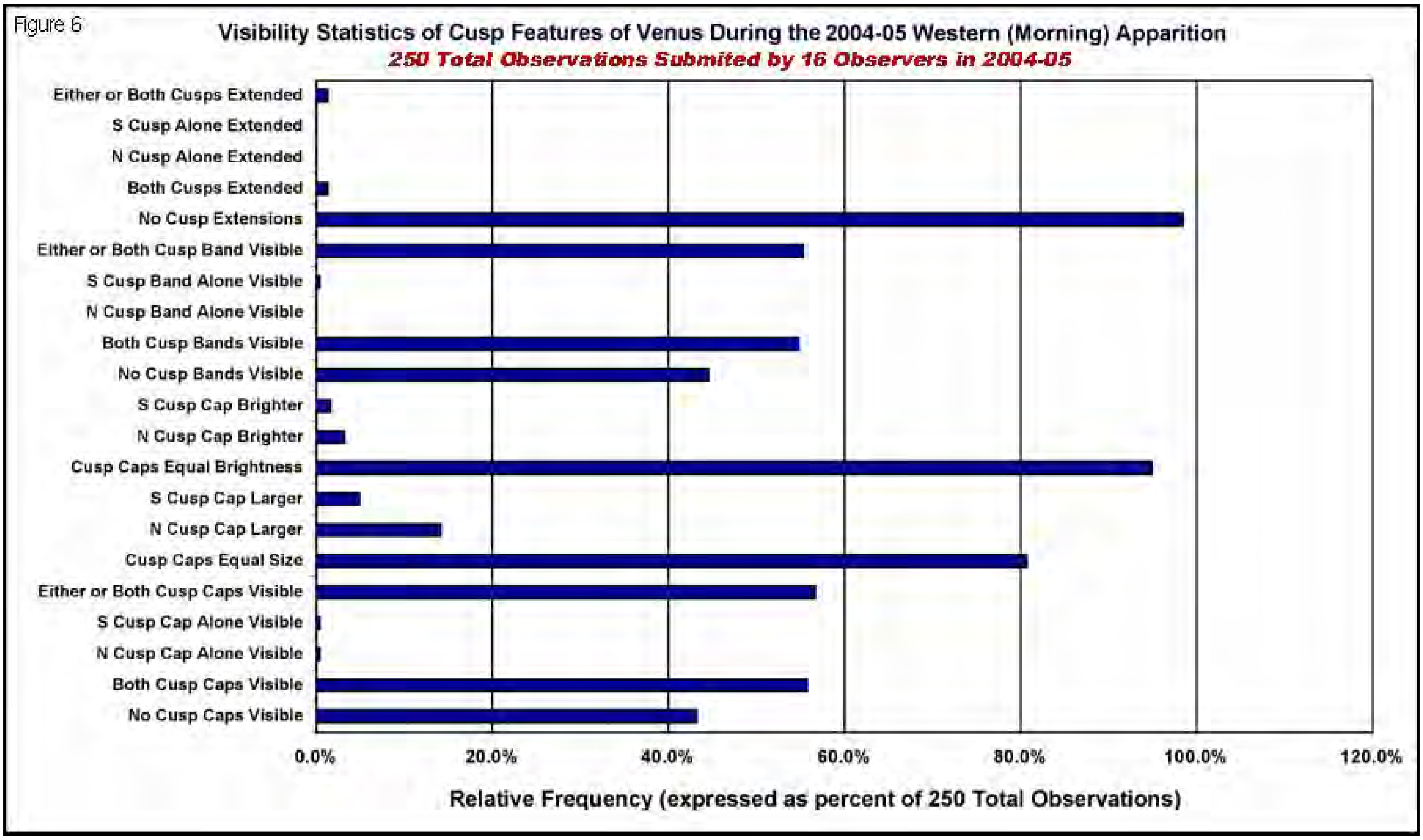


Venus during the observing season ranged from 8.6 to 9.2. The ALPO Scale of Conspicuousness (running sequentially from 0.0 for "definitely not seen" up to 10.0 for "certainly seen") was used by observers during 2004-05 to rate their visual impressions at the eyepiece. On this scale, the dusky markings referenced in **Figure 5** had a mean conspicuousness of about 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 suspected and sometimes imaged in 15.3 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.

Visual observers employed color filters and variable-density polarizers during 2004-05 to help enhance the visibility of vague atmospheric phenomena on Venus. This may be why some of the best drawings by experienced observers showed features similar to those that were captured on some of the digital images obtained during this apparition.

The ALPO Venus Section is always searching for ways to cooperate with the professional community in studies of the atmosphere of Venus. Ground-based observers, many of them amateur astronomers, have contributed vital information about the atmosphere of Venus over many years. Mikhail Lomonosov was the first to hypothesize the presence of an atmosphere on the planet when he made observations of the transit of Venus in 1761 in a small observatory near his home in St. Petersburg, Russia. In 1961 Charles Boyer and Pierre Guérin in France called attention to dark "y-shaped" features seen on UV images, then calculated a 4d retrograde rotation period for Venus, which was later confirmed for the higher atmospheric clouds. Most recently, on May 24, 2004 between 20:04-20:43 UT, Christophe Pellier of Bruz, France, using a 35.6-cm (14.0-in) SCT with a 1000-nm (1-micron) IR filter, captured historically unprecedented amateur digital images of the night side emission from the hot surface of Venus. Observers in ever-increasing numbers have captured digital images of changing cloud features on Venus in the near-UV as well as thermal emissions from its surface in the near-IR. So, amateurs with CCD cameras and the appropriate filters can effectively contribute useful data to support professional studies of Venus. Regular amateur UV and polarized-light imaging of the planet's atmosphere as a means for studying circulation patterns will be valuable for quite some time to come. Furthermore, the Venus Express (VEX) spacecraft began systematically monitoring Venus at near-UV, visible and near-IR wavelengths back in May 2006 and will continue to do so for another three years or so, although the mission could be extended. Even though spacecraft images of Venus are naturally higher resolution than those from Earth-based observers, monitoring of the planet by the VEX cameras will not be continuous. So, this is a superb opportunity for more advanced amateurs to try to take high-quality digital images of Venus in the wavelength range of 350 nm to 1000 nm (near-UV to near-IR). For example, con-



sider a UV image of Venus taken by Paolo Lazzarotti of Massa, Italy on September 19, 2004 at 05:43 UT using a 25.4-cm (10.0-in) Newtonian (**Figure 12**) and another UV image captured by Damian Peach of Norfolk, UK on the same date at 06:07 UT with a 23.5-cm (9.25-in) Schmidt-Cassegrain (**Figure 13**). These two near-simultaneous observations, which were made less than a half hour apart, show very similar markings in the near-UV, and they exemplify exactly the kind of work we are seeking from as many observers as possible. The Venus Amateur Observing Project (VAOP) has been organized in cooperation with the European Space Agency (ESA) where such images can be contributed by amateur astronomers to complement the Venus Express (VEX) spacecraft results. More information about this project, as well as prerequisites for participations and instructions for uploading images, can be obtained by contacting the ALPO Venus Section or by visiting the VAOP website at:

http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=38833&fbodylongid=1856.

In addition to dispatching images to the VAOP project, observers should also send results to the ALPO Venus Section, which will be archived for analysis and comparison with results on the planet's atmospheric circulation obtained from the VEX mission. The ALPO Venus Section looks forward to successful Pro-Am cooperation during this mission, and we heartily encourage observers throughout the world to participate.

The Bright Limb Band

Figure 5 shows that two-thirds (64.2 percent) of the submitted observations and images in 2004-05 showed a "Bright Limb Band" on the illuminated hemisphere of Venus. When this feature was recorded, it appeared as a continuous, brilliant arc extending from cusp to cusp 98.6 percent of the time, and interrupted or only partially visible along the limb of Venus in 1.4 percent of the positive sightings. The mean numerical intensity of the Bright Limb Band was 9.8, becoming more apparent visually when color filters or variable-density polarizers were utilized, while showing up on digital images that were taken at near-UV wavelengths.

Terminator Irregularities

The terminator is the geometric curve that separates the sunlit and dark hemispheres of Venus. Observers described or imaged an irregular or asymmetric terminator in 31.2 percent of the observations in 2004-05. Amorphous, banded, irregular, and radial 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 2004-05 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. This effect also was more pronounced in near-UV images of Venus.

Figure 7. Digital image of Venus by Christophe Pellier. 2004 Jun $12^d14^h00^m$ UT. 18.0-cm (7.1-in) NEW, ATK-1HS Camera + 1000-nm IR filter. Seeing 5.0. Phase (k) = 0.005, Diameter = 57.8". South is at the top in Figures 7-19. When given, Seeing is in the standard ALPO Scale (ranging from 0.0 = worst possible conditions to 10.0 = perfect) and Transparency is the limiting naked-eye magnitude. Telescope types are abbreviated as in Table 2. The diameter of Venus is the apparent disk diameter (i.e., of Venus' cloud tops rather than of its surface). Contrasts have been exaggerated for reproduction.

Cusps, Cusp-Caps and Cusp-Bands

In general, when the *phase coefficient* (the fraction of the disc that is illuminated), **k**, lies between 0.1 and 0.8, features on Venus with the most contrast and prominence are frequently sighted and sometimes imaged at or near the planet's cusps. These cusp-caps are often bordered by dusky, usually diffuse, cusp-bands. **Figure 6** shows the visibility statistics for cusp features of Venus in 2004-05.

When the northern and southern cusp-caps of Venus were observed in 2004-05, **Figure 6** illustrates that they were equal in size 80.8 percent of the time and equal in brightness in 95.0 percent of the observations (**Figure 16**). The northern cusp-cap was considered larger 14.2 percent of the time and brighter in 3.3 percent of the observations, while the southern cusp-cap was larger in 5.0 percent of the observations and brighter 1.7 percent of the time. Neither cusp-cap was visible in 43.3 percent of the reports. The mean relative

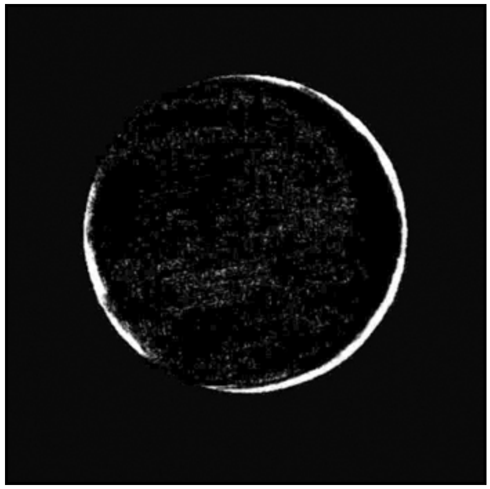


Figure 8. Drawing of Venus by Detlev Niechoy. 2004 Jun $13^d13^h13^m$ UT. 20.3-cm (8.0-in) SCT, 225X, IL (no filter). Seeing 5.0 (interpolated). Phase (k) = 0.010, Diameter = 57.4".

intensity of the cusp-caps was about 9.7 during the 2004-05 apparition. Dusky cusp-bands bordering the bright cusp-caps (**Figure 18**) were not reported in 44.7 percent of the observations when cusp-caps were visible, and the cusp-bands displayed a mean relative intensity of about 6.5 (**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 98.6 percent of the observations (in integrated light and with color filters). Early in the 2004-05 apparition, as Venus progressed through its waxing crescentic phases following inferior conjunction on June 8, 2004, several observers recorded cusp extensions that ranged from 1° to 45°.

In his image on June 12, 2004 at 14:00 UT (roughly four days after inferior conjunction), Christophe Pellier in France captured subtle cusp extensions using an 18.0-cm (7.1-in) Newtonian in the near-IR at 1,000 nm (**Figure 7**). Approximately one day later, on June 13, 2004 at 13:13 UT, Detlev Niechoy sketched what appeared to be somewhat "broken" cusp extensions using a 20.3-cm (8.0-in) SCT at 225X with a W47 blue filter and integrated light, again at 13:13 UT on June 19, using the same instrument, magnifica-

Figure 9. Drawing of Venus by Daniel del Valle. 2004 Jul $28^d09^h28^m$ UT. 12.0-cm (4.7-in) REFR, 222X, IL, W12 (yellow), W25 (red) and variable-density polarizing filters. Seeing 6.0, Transparency 2.0. Phase (k) = 0.375, Diameter = 30.6".

Figure 10. Digital Image of Venus by Daniel del Valle. 2004 Aug $17^d09^h24^m$ UT. 20.3-cm (8.0-in) SCT, IL. Logitech QuickCam. Phase (k) = 0.499, Diameter = 23.9".

tion, and filter techniques, he drew suspected cusp extensions(**Figure 8**). Cusp extensions, if present, typically show up better with color filters and variable-density polarizers, which enhance their appearance and minimize irradiation. Observers are encouraged to try their hand at recording cusp extensions using digital imagers.

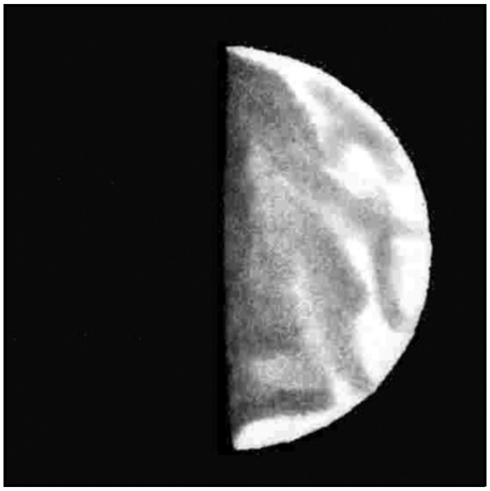


Figure 11. Drawing of Venus by Detlev Niechoy. 2004 Aug $20^{d}05^{h}14^{m}$ UT. 20.3-cm (8.0-in) SCT, 225X,IL. Seeing 5.0 (interpolated). Phase (k) = 0.515, Diameter = 23.1".

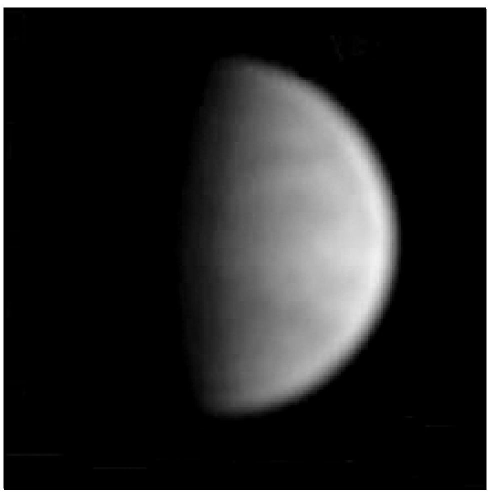


Figure 12. Digital Image of Venus by Paolo Lazzarotti. 2004 Sep $19^{d}05^{h}43^{m}$ UT. 25.4-cm (10.0-in) NEW, Lumenera LU-075 Camera, UV and W47 (blue) filters. Seeing 7.0, Transparency 3.0. Phase (k) = 0.654, Diameter = 17.6".

Estimates of Dichotomy

A discrepancy between the predicted and the observed dates of dichotomy (half-phase), known as the "Schröter Effect" on Venus, was reported by two observers during the 2004-05 Western (Morning) Apparition (**figures 10 and 11**). The predicted half-phase occurs when k = 0.500, and the phase angle, i, between the Sun and the Earth as seen from Venus equals 90°. The observed-minus-predicted discrepancies for 2004-05 are given in **Table 3**.

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. Although the latter has a different origin, the Ashen Light resembles Earthshine on the dark portion of the Moon. 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 viewed against a twilight sky.

Detlev Niechoy of Göttengen, Germany was the only observer in 2004-05 to report suspicions of the visibility of the Ashen Light in integrated light using a 20.3-cm (8.0-in.) SCT at 225X on June 12, 2004 June from 11:29-11:33 UT. No other observers mentioned seeing the Ashen Light. Daniel del Valle of Aguadillo, Puerto Rico, using a 12.0-cm (4.7-in) refractor at 222X with W12 (yellow) and W25 (red) filters on July 28, 2004 from 09:28-38UT, was the only observer to note that the dark hemisphere of Venus appeared slightly *darker* than the background sky, almost certainly a contrast effect.

Conclusions

Visual observations contributed to the ALPO Venus Section during the 2004-05 Western (Morning) Apparition suggested only minor activity in the atmosphere of Venus. It was already 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 visible wavelengths. Higher confidence in visual impressions will improve as observers pursue simultaneous work, so the ALPO Venus Section is stressing combined visual observations and digital imaging for comparative analysis of resultant data. Digital images of Venus captured in the near-UV in 2004-05 often showed banded features, and in a number of cases, radial atmospheric cloud patterns were also apparent. There were several instances when visual impressions with a W47 (blue) filter were consistent with what was shown on submitted images of the planet. Some observers apparently have a slight visual sensitivity in the near-UV range, so they sometimes report radial dusky features that are normally more apparent on UV images. Thus, there is an enduring need for additional near-UV images of Venus taken simultaneously with visual observations for comparative analysis.

ALPO studies of the Ashen Light, which reached a peak during the Pioneer Venus Orbiter Project, are continuing every apparition. Sustained simultaneous visual monitoring and digital imaging of the planet at

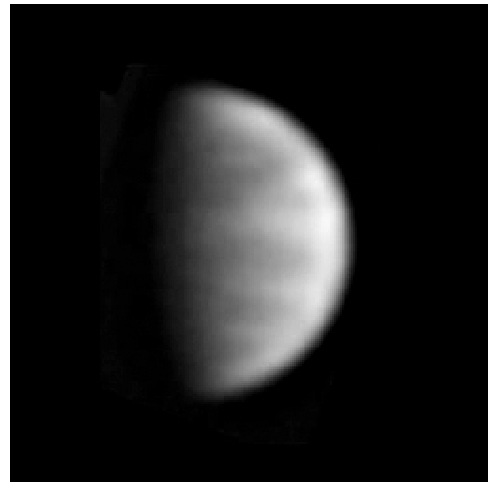


Figure 13. Digital Image of Venus by Damian Peach. 2004 Sep $19^{d}06^{h}07^{m}$ UT. 23.5-cm (9.25-in) SCT, Philips ToUcam + 365-nm UV filter. Seeing conditions not specified. Phase (k) = 0.654, Diameter = 17.6".

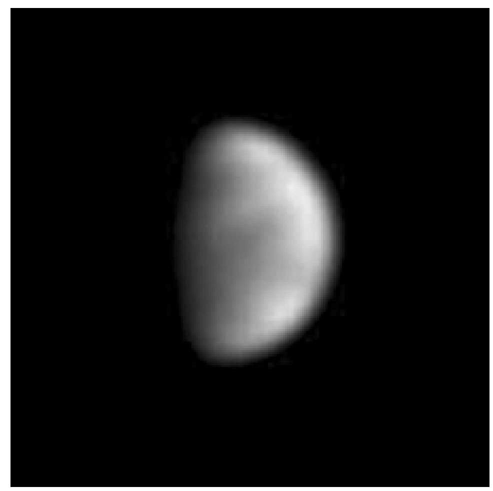


Figure 14. Digital Image of Venus by Toshihiko Ikemura. 2004 Oct $13^{d}20^{h}09^{m}$ UT. 31.0-cm (12.2-in) NEW, ATK-1HS Camera + 360-nm UV filter. Seeing 4.0, Transparency 6.0. Phase (k) = 0.744, Diameter = 14.9".

crescent 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 as we tackle the unique observational challenges that the planet presents in the years to come.

Figure 15. Digital Image of Venus by Frank J. Melillo. 2004 Nov $01^d14^h28^m$ UT. 20.3-cm (8.0-in) SCT, Starlight Xpress MX-5 Camera, Schott UG-1 UV and IRB filters. Seeing 8.0. Phase (k) = 0.802, Diameter = 13.5".

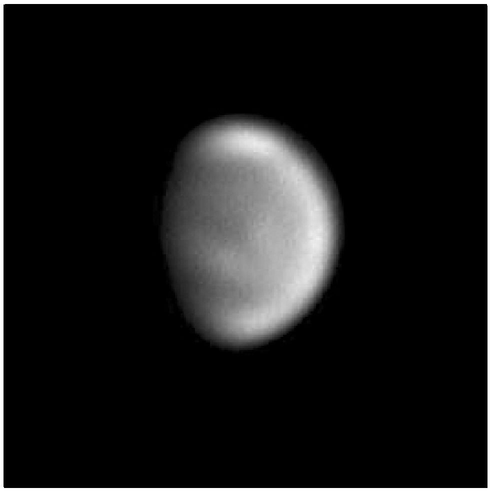


Figure 16. CCD UV Image of Venus by Tomio Akutsu. 2004 Nov $09^d21^h12^m$ UT. 31.8-cm (12.5-in) NEW, ATK-1HS Camera + 340-nm UV filter. Seeing 5.5, Transparency 4.0. Phase (k) = 0.825, Diameter = 13.0".

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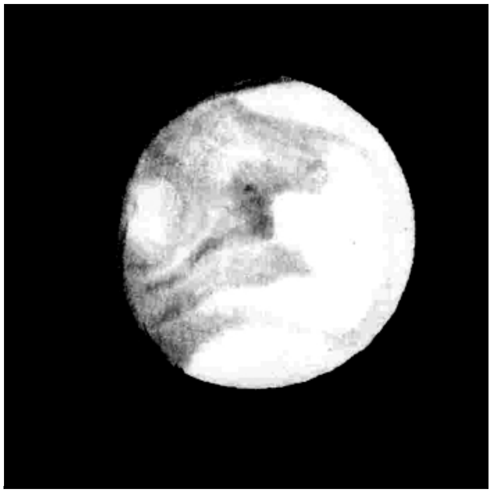

Figure 17. Drawing of Venus by Detlev Niechoy. 2004 Dec $11^d10^h55^m$ UT. 20.3-cm (8.0-in) SCT, 225X, IL. Seeing 4.0 (interpolated). Phase (k) = 0.898, Diameter = 11.6".

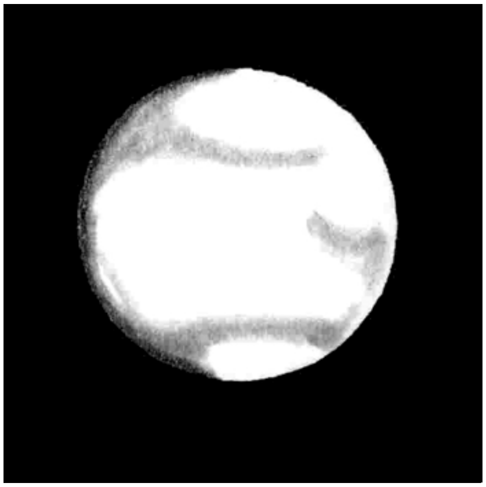

Figure 18. Drawing of Venus by Detlev Niechoy. 2005 Jan $15^d11^h47^m$ UT. 20.3-cm (8.0-in) SCT, 225X, IL. Seeing 5.0 (interpolated). Phase (k) = 0.953, Diameter = 10.6".

Figure 19. Drawing of Venus by Detlev Niechoy. 2005 Feb $05^d11^h52^m$ UT. 20.3-cm (8.0-in) SCT, 225X, IL. Seeing 4.5 (interpolated). Phase (k) = 0.975, Diameter = 10.2".

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

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

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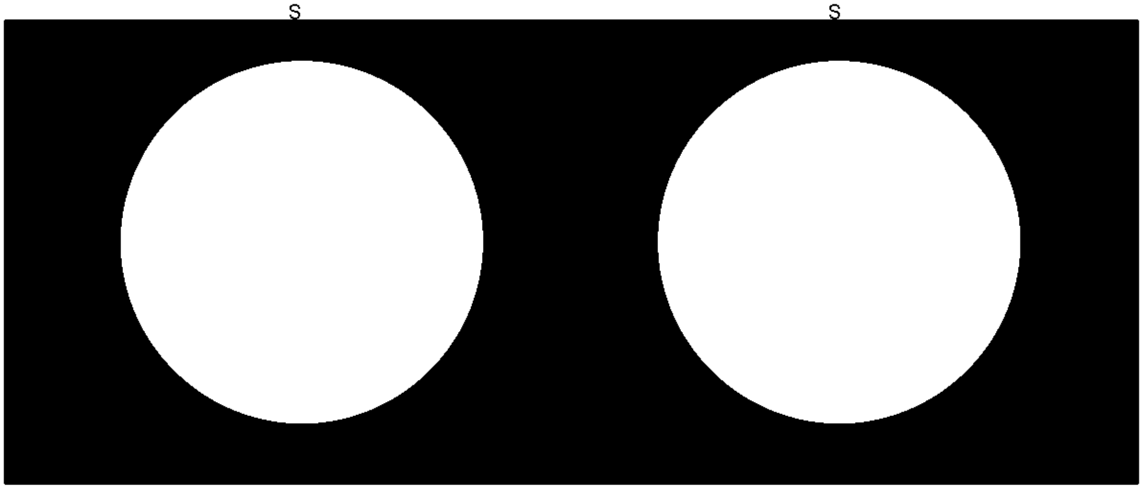

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N (*all coordinates are IAU*) N

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 do not 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.

Feature Story:

The Remote Planets in 2006-07

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

Abstract

Almost three-dozen people imaged, observed or measured the brightness of the remote planets in 2006-07. The selected normalized magnitudes of Uranus are: B(1,0) = -6.60±0.02, V(1,0) = -7.11±0.02, R(1,0) = -6.68±0.05 and I(1,0) = -5.9±0.1; the corresponding values for Neptune are: B(1,0) = -6.60±0.02 and V(1,0) = -7.00±0.02. ALPO members imaged limb darkening, limb brightening and a bright south polar limb on Uranus in 2006.

Introduction

Professional astronomers published the results of several important remote planets studies in 2006-2007. In addition to this, they re-classified Pluto.This paper summarizes some of the more significant remote planets developments that were published in 2006 and early 2007.

Grundy and co-workers (2006) detected part of the spectrum of carbon dioxide (CO_2) ice on two of Uranus' moons, Umbriel and Titania. They compared the strength of their spectra to previously measured CO_2 spectra on Ariel and report that the strength of the CO_2 ice spectrum is strongest on Ariel and that it gets weaker with increasing distance from Uranus. This group was unable to detect CO_2 on Oberon, which is consistent with the trend of decreasing CO_2 as one gets farther from the planet.

Elliot et al. (2006, 541); Ruhland et al. (2006, 541) and Sicardy et al. (2006, 542) studied Pluto as it occulted a star on June 12, 2006. They noted the time when the starlight began to dim as a result of its passage through Pluto's atmosphere, and again when the starlight was fully blocked by the planet. By looking at these data, they concluded that Pluto's thin atmosphere was a little more dense than it was in 2002, and was much denser than in 1988.

Pascu and co-workers (2006) used Hubble Space Telescope (HST) images made in 1997 to measure the brightness and color of Neptune's two largest moons Triton and Proteus. They found that Triton's leading side was brighter than its trailing side. This group also reports that Triton was a bit brighter in 1997 than in the 1970s and 1980s. They explain that this brightness increase was due to the fact that Triton's South Polar Cap faced us more directly in 1997 than in the 1970s and 1980s. Pascu and co-workers also reported that Proteus' leading side in 1997 was 0.1 magnitude brighter than its following side. The average color indexes of Proteus in 1997 were: B-V = 0.72 and V-I = 0.74.

Hammel and Lockwood (2007) reported that between 1950 and 2005, both Uranus and Neptune were brightest near solstice and dimmest near equinox. The brightness difference for both planets between equinox and solstice in green light is 0.1 to 0.2 magnitudes. Data recorded by members of the ALPO over the last 15 years are consistent with this trend.

The most publicized event related to the outer solar system in 2006 was the re-classification of Pluto. Hundreds of astronomers making up the International Astronomical Union (IAU) representing many countries met in Prague in the Czech Republic and debated the definition of a planet. After much discussion a definition was adopted that reclassified Pluto as a “dwarf planet”. According to the new definition, a planet is any object that: a) orbits the Sun, b) is large enough to have a nearly spherical shape and c) has cleared the neighborhood around its orbit. Since Pluto has not cleared its orbit of other objects, it is not considered to be a planet like Earth and Jupiter. Instead, Pluto is classified as a dwarf planet.

In addition to these developments, ALPO members have also carried out important remote planets work. This author will discuss brightness measurements, visual observations and images of Uranus and Neptune made by ALPO members in 2006. Orbital characteristics of Uranus, Neptune and Pluto are summarized in **Table 1** and observers who submitted observations or measurements of these planets in 2006 and early 2007 are summarized in **Table 2**.

All Readers

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

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- The references in blue text to jump to source material or information about that source material (Internet connection must be ON).

Table 1: Characteristics of the 2006 Apparitions of Uranus, Neptune and Pluto[a]

	Uranus	Neptune	Pluto
First conjunction date	Mar. 1, 2006	Feb. 6, 2006	Dec. 16, 2005
Opposition date	Sep. 5, 2006	Aug. 11, 2006	June 16, 2006
Angular diameter (opposition)	3.7 arc-sec.	2.4 arc-sec.	0.1 arc-sec
Right ascension (opposition)	22h 58m	21h 24m	17h 41m
Declination (opposition)	7.5° S	15.5° S	15.7° S
Sub-Earth latitude (opposition)	5.1° S	29.1° S	36.6° S
Second conjunction date	Mar. 5, 2007	Feb. 8, 2007	Dec. 18, 2006

[a]All data are from the Astronomical Almanac for the years 2005-2007.

Photoelectric Photometry

Fox, Melillo, Westfall and this author carried out brightness measurements of Uranus and Neptune in 2006. These results are summarized in **Table 3** and **Table 4**. All brightness measurements are corrected for extinction and transformation. Melillo's transformation coefficients are:

ε_V = -0.017 and ε_I = -0.162 for his 0.20 m (8 in.) telescope

ε_V = -0.017 and ε_I = -0.168 for his 0.25 m (10 in.) telescope

This writer used the two-star method described in Hall and Genet (1988, 200) to compute Melillo's transformation coefficients. Footnotes describing both the comparison stars and their respective magnitudes used by each observer are given below **Table 3** and **Table 4**. Comparison star magnitudes are from Iriarte et al. (1965) except for HD 205132; this star's magnitudes are from Hirshfeld et al. (1991). Since the planet-Sun and planet-Earth distances change, normalized magnitudes, V(1,0), were computed from the equation:

$$V(1,0) = V_{mag} - 5 \log[r \times d] + (c_V \times \alpha) \quad (1)$$

In this equation, V_{mag} is the V filter magnitude, c_V is the solar phase angle coefficient in the V filter, α is the solar phase angle, which is the angle between the Sun and the observer measured from the target, r is the planet-Earth distance and d is the planet-Sun distance; both distances are in astronomical units. The $c_V \times \alpha$ term is always below 0.01 magnitudes for Uranus and Neptune and is thus ignored in the evaluation of V(1,0). The advantage of the V(1,0) value is that it does not change with changing distances. The V(1,0) value will change, however, if a highly reflective cloud suddenly forms or if a highly reflective portion of a planet begins tipping towards the Earth. The normalized magnitudes, B(1,0), R(1,0) and I(1,0), for the B, R and I filters were computed in the same way as in equation (1), except that the B, R and I magnitudes were used in place of the V magnitude.

The average normalized magnitudes are listed in **Table 5**. The B(1,0) and V(1,0) values for Uranus and Neptune are similar to their 2003-05 values (Schmude, 2005, 38); (Schmude, 2006a, 41); (Schmude, 2006b, 32). Uranus has remained dim, which is consistent with the trend of it being dimmest near equinox. Uranus reached equinox in December 2007. Neptune has remained bright and this is consistent with the trend of being brightest near solstice. Neptune reached solstice in 2005. The uncertainties (u) for the B(1,0) and V(1,0) values in magnitudes (mag.) were computed from:

$$u = [(\sigma^2/N) + (0.01 \text{ mag.})^2]^{0.5} \quad (2)$$

where σ is the standard deviation in magnitude and N is the number of measurements. The 0.01 mag. represents the uncertainty in the comparison star magnitude. The writer estimated the uncertainty for the R(1,0) and I(1,0) values.

Frank Melillo made nine I-filter measurements of Uranus in 2006. This writer computed a value of I(1,0) = -5.9 ± 0.1 for Uranus based on these measurements. Due to the low signal of Uranus in near-infrared

Table 2: Contributors to the Remote Planets 2006 Apparition Report (Mid-2006 to Early 2007)

Name and location	Telescope[a]	Type of observation[b]
Abbott, Patrick; Leduc AB Canada	10x50 Bin	VP
Adelaar, Jan; The Netherlands	0.23 m SC	I
Amato, Michael; CT USA	0.46 m RL	C
Bell, Charles; MS USA	0.30 m SC	I
Boisclair, Norman; NY USA	0.76 m RL	C, DN
Bosman, Richard; The Netherlands	0.28 m SC	I
Chavez, Rolando; GA USA	0.36 m SC & 0.15 m RR	I
Cudnik, Brian; Columbus, TX USA	0.36 m SC	C, D, VP
Delcroix, Marc; Tournefeuille, France	0.25 m SC	I
Fattinnanzi, Cristian; Macerata, Italy	0.25 m RL	I
Fox, James; MN USA	0.25 m SC	PP
Go, Chris; Philippines	0.28 m SC	DN, I
Heffner, Robert; Nagoya, Japan	0.28 m SC	I
Houston-Jones, Jane; near Brawley, CA USA	Several	C
Jakiel, Rich; GA USA	0.30 m SC	D, DN, PP[c]
Johnson, Gus; MD USA	Camera	PhP
Lazzarotti, Paolo; Italy	0.32 m DK	I
Loader, Brian; New Zealand	0.25 m	PP
Lomeli, Ed; Sacramento, CA USA	0.23 m SC	I
Melillo, Frank; NY USA	0.25 m SC	I, PP, S
Niechoy, Detlev; Germany	0.20 m SC	D
Owens, Larry; GA USA	0.36 m SC	I
Parker, Don; FL USA	0.41 m RL	I
Parker, Stuart; New Zealand	0.30 m SC	I
Plante, Phil; OH USA	0.64 m RL	D, DN
Pretourius, Dave; Tasmania, Australia	0.25 m RL	I
Roberts, Elisa; GA USA	---	PP[c]
Roussell, Carl; Hamilton, ON Canada	10x50 Bin & 0.15 m RR	C, D, VP
Salway, Mike; NSW Australia	0.25 m RL	I
Schmude, Richard; GA USA	Several	C, DN, PP, VP
Sussenbach, John; The Netherlands	0.28 m SC	I
Tasselli, Andrea; Great Britain	0.25 m RL	I
Tobal, Tòfol; Ávila Spain	0.22 m RL	D
Vandebergh, Ralf; The Netherlands	0.25 m RL	I
Westfall, John; Antioch, CA USA	0.36 m SC	VP

[a]Bin = binoculars; RL = reflector, RR = refractor, SC = Schmidt=Cassegrain, M=Maksutov, DK = Dall Kirkham
[b]C=Color, D=drawings, DN=descriptive notes, I=electronic images, S=spectra, PhP=photographic photometry, PP=photoelectric photometry, VP=visiual photometry
[c]Assisted Richard Schmude, Jr. with photoelectric magnitude measurements

light, the brightness values are reported to only one decimal point.

Visual Magnitude Estimates

Abbott, Cudnik, Roussell, Westfall and this writer made visual magnitude estimates of Uranus and Neptune during their 2006 apparitions. These estimates were made with the eye and optical aid such as binoculars. The average normalized visual magnitude estimates are: $V_{vis}(1,0) = -7.1$ (Uranus) and $V_{vis}(1,0) = -7.0$ (Neptune). The visual magnitudes for both planets are plotted in **Figure 1**. The top portion of Figure 1 shows that Uranus reached peak brightness in September and the bottom portion of **Figure 1** shows that Neptune reached peak brightness in August. The ~0.2 magnitude change due to changing distances for both planets is evident.

Drawings and Images

More than a dozen observers imaged Uranus and Neptune in 2006, and a few others observed these planets with their eyes and a telescope. The three irregularities imaged on Uranus were limb darkening, limb brightening and bright polar spots. A planet with limb darkening has dark outer edges, whereas one with limb brightening has bright outer edges.

Parker took an image of Uranus under excellent sky conditions on Sep. 8, 2006, and it shows some limb brightening. The limb brightening is discontinuous, which is probably due to different types (or amounts) of limb hazes along the circumference of the planet's disk. Heffner, Sussenbach and Vandebergh made separate images of Uranus in the blue, green and red filters. The writer examined these images and found that Uranus had significant limb darkening in blue images and moderate limb darkening in green images. Heffner and Sussenbach's R images show a moderate amount of limb darkening, but Vandebergh's R images show a combination of limb darkening and limb brightening.

Chavez imaged a slight brightening on Uranus' south limb under fair sky conditions (**Figure 2**). Go saw a brightening on Uranus' southern limb in August and Jakiel observed a similar bright area two months later. Vandebergh also imaged a bright area near Uranus' southern limb on August 7, 2006.

How can a planet have both limb brightening and limb darkening? The answer is that planetary atmospheres interact with different wavelengths of light in different ways. The high altitude hazes on Uranus and Neptune scatter some types of red and near-infrared light and when this occurs, limb brightening is observed. When blue and green light reach these planets, however, it passes through the high altitude hazes and limb darkening is observed. Since different observers use different filters and different filter combinations, their images may not show the same amount of limb darkening.

This writer measured the border of the bright south polar region in three images made by

Table 3: Magnitude Measurements of Uranus During the 2006 Apparition.

Date (UT)	Filter	Mag. +	X(1,0) -	Date (UT)	Filter	Mag. +	X(1,0) -
May 23.385[c]	V	5.92	7.13	Sep. 27.229[a]	I	7.1	5.8
May 30.373[c]	V	5.99	7.05	Sep. 29.201	V	5.80	7.13
May 31.373[c]	V	5.93	7.10	Oct. 14.089	V	5.88	7.06
June 7.369[c]	V	5.90	7.12	Oct. 14.102	B	6.29	6.66
Aug. 20.247[b]	B	6.34	6.58	Oct. 14.115	R	6.26	6.68
Aug. 20.247[b]	V	5.82	7.10	Oct. 15.172[b]	B	6.33	6.62
Sep. 14.199[b]	B	6.34	6.57	Oct. 15.172[b]	V	5.84	7.11
Sep. 14.199[b]	V	5.82	7.10	Oct. 18.188	V	5.83	7.12
Sep. 17.198[a]	V	5.78	7.14	Oct. 20.209	V	5.84	7.11
Sep. 17.201[a]	I	7.0	5.9	Oct. 21.219	V	5.83	7.12
Sep. 17.205[a]	V	5.78	7.14	Oct. 22.037[c]	V	5.95	7.00
Sep. 17.208[a]	I	7.0	5.9	Oct. 22.049[c]	B	6.40	6.55
Sep. 17.212[a]	I	7.1	5.8	Oct. 22.185	V	5.83	7.13
Sep. 18. 215[a]	V	5.77	7.15	Oct. 24.175	V	5.85	7.11
Sep. 18.222[a]	V	5.69	7.23	Oct. 26.203	V	5.84	7.12
Sep. 18.233[a]	I	7.0	5.9	Oct. 27.186	V	5.85	7.12
Sep. 21.208[a]	V	5.79	7.13	Oct. 28.187	V	5.85	7.12
Sep. 21.212[a]	I	7.0	5.9	Oct. 29.211	V	5.85	7.12
Sep. 21.219[a]	I	7.0	5.9	Oct. 30.149	V	5.84	7.12
Sep. 21.222[a]	V	5.79	7.13	Nov. 9.179	V	5.86	7.13
Sep. 21.240	V	5.81	7.12	Nov. 24.117	V	5.88	7.13
Sep. 26.096[c]	V	5.79	7.13	Nov. 28.115	V	5.89	7.13
Sep. 26.108[c]	V	5.84	7.08	Nov. 30.101	V	5.90	7.12
Sep. 26.117[c]	V	5.82	7.10	Dec. 1.109	V	5.89	7.13
Sep. 26.128[c]	V	5.81	7.12	Dec. 2.114	V	5.91	7.11
Sep. 26.138[c]	V	5.89	7.03	Dec. 4.111	V	5.90	7.12
Sep. 26.148[c]	V	5.85	7.08	Dec. 5.106	V	5.90	7.13
Sep. 27.208[a]	I	7.0	5.9	Dec. 18.115	V	5.93	7.12
Sep. 27.219[a]	V	5.80	7.13	Dec. 19.110	V	5.95	7.11
Sep. 27.222[a]	I	7.1	5.8	Dec. 28.124	V	5.95	7.12

[a] Measurements by Frank Melillo, using ψ^2 Aquarii as the comparison star with respective magnitudes of V = 4.40 and I = 4.59. These measurements received a weight of one third of the other values because they are based on fewer readings.
[b] Measurements by Jim Fox, using ψ^1 Aquarii as the comparison star with magnitudes of B = 5.36 and V = 4.25.
[c] Measurements by this writer along with the assistance of Elisa Roberts on Oc t. 22,using ψ^1 Aquarii as the comparison star with magnitudes of B = 5.36 and V = 4.25.
Remainder of measurements by John Westfall (no a, b or c), using ψ^1 Aquarii as the comparison star with magnitudes of B = 5.36 and V = 4.25.

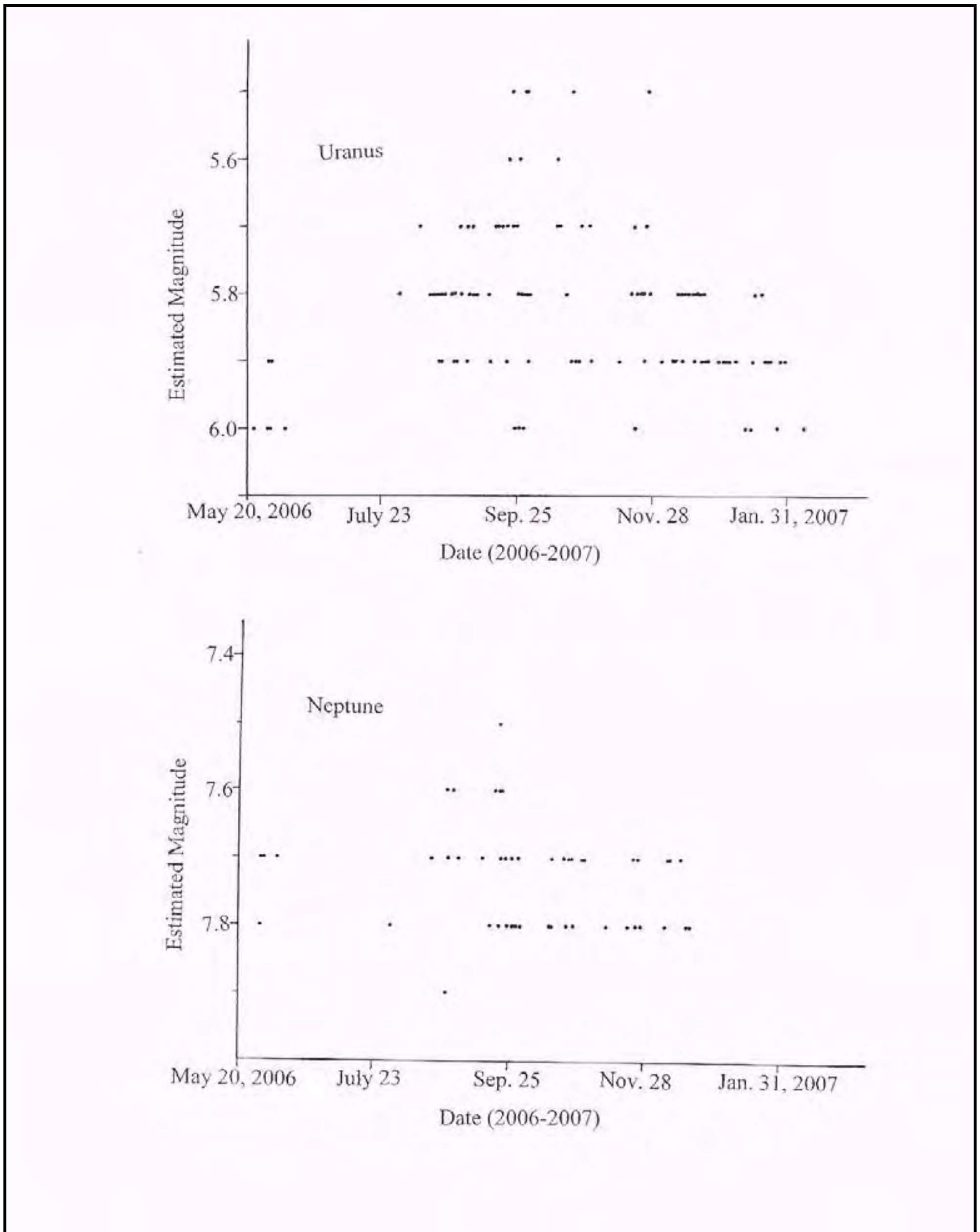

Figure 1. Top: Visual magnitude estimates of Uranus plotted versus the date in 2006; bottom: Visual magnitude estimates of Neptune plotted versus the date in 2006.

Chavez, Parker and Vandebergh and in one drawing made by Jakiel. The same procedure described in Peek (1981, 49) was used in measuring planetographic latitudes except that a value of 1.023 (equatorial to polar diameter ratio) was used for Uranus instead of the 1.0714 ratio for Jupiter. An average planetographic latitude of 36° S was determined for the edge of the bright South Polar Region on Uranus; the estimated uncertainty for this measurement is 5°.

During the early 20th century, Uranus had a similar orientation to that in 2006. Alexander (1965) summarizes Fournier's, Heath's and Antoniadi's observations during the 1913-1924 time period. In most of the observations, there was no mention of a bright South Polar Region. In fact, Antoniadi noted that Uranus had "grayish polar caps" in 1924 through the 0.84 meter (33 in.) Meudon refractor (Alexander, 1965, 235). Antoniadi went on to estimate a polar flattening (ellipticity) of $^1/_{12}$ or 0.083 for Uranus. The dark polar regions are probably why Antoniadi overestimated Uranus' ellipticity.

During the 1960s, Uranus also had a similar orientation to that in 2006 except that the northern hemisphere (and not the southern hemusphere) was now facing the Sun. Two experienced observers, Eugene Cross (April 11 and 15, 1965) and Richard Hodgson (April 7, 1969) did not see any brightening near the polar regions. Hodgson, in fact, drew dusky polar caps.

This writer feels that over the past few decades, Uranus' polar regions were not always bright. More observations in future decades are needed to reveal the true nature of its polar regions.

The writer examined several images and carefully measured both the north-south and the east-west dimensions of Uranus. The ellipticity of Uranus was 0.03 ± 0.01 in green and color images and it was 0.02 ± 0.01 in red and infrared images. These values are close to the literature value of 0.023, but are inconsistent with the much higher values noted in the 1920s (Alexander, 1965, 235). Part of this inconsistency may be due to the differing appearances of the polar regions in the 1920s and in 2006. Dark polar regions will cause Uranus to appear to have a greater ellipticity than is actually the case.

Amato, Boisclair, Cudnik, Delcroix, Roussell and this writer estimated the colors of Uranus and Neptune. The general trend was that the colors became more washed out with larger telescope diameters. In almost all cases, Neptune had a stronger bluish hue than Uranus.

Satellites

Melillo imaged Uranus' two largest moons Titania and Oberon three times; on Sep. 13, 2006 (twice) and Sep. 22, 2006. He found that Titania was 0.2, 0.16 and 0.22 magnitudes brighter than Oberon. This result is consistent with measurements made in 2003-2005.

Pluto

Bell, Delcroix and Melillo imaged Pluto. There appears to be a small southern extension in Melillo's June 21, 2006 image of Pluto; this southern extension may be Charon since it was at southern elongation near the time of the image.

Acknowledgements

I would like to thank Rich Jakiel for his assistance. I am also grateful to Truman Boyle for allowing me to measure Uranus from his dark observing site location. Finally, I am grateful to everyone who submitted observations of Uranus, Neptune and Pluto in 2006.

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Table 4: Magnitude Measurements of Neptune During the 2006 Apparition

Date (UT)	Filter	Mag. +	X(1,0) -	Date (UT)	Filter	Mag. +	X(1,0) -
May 31.742[a]	B	8.14	6.61	Sep. 17.455[a]	V	7.70	7.02
May 31.717[a]	V	7.73	7.02	Sep. 17.543[a]	V	7.72	7.00
Aug. 20.224[b]	B	8.16	6.55	Sep. 21.063[c]	V	7.73	6.99
Aug. 20.224[b]	V	7.73	6.98	Sep. 21.081[c]	V	7.72	7.00
Sep. 14.175[b]	B	8.17	6.55	Nov. 11.018[b]	B	8.12	6.66
Sep. 14.175[b]	V	7.71	7.01	Nov. 11.018[b]	V	7.81	6.97
Sep. 17.484[a]	B	8.10	6.62				

[a] Measurements by Brian Loader, using γ-Capriconri as his comparison star with magnitudes of B = 3.99, V = 3.67 and R = 3.44.

[b] Measurements by Jim Fox, using γ-Capriconri as his comparison star with magnitudes of B = 3.99, V = 3.67

[c] Measurements by this writer, using HD 205132 as the comparison star with respective magnitudes of B = 7.66 and V = 7.21.

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Figure 2. Uranus as imaged by Rolando Chavez on Aug. 26, 2006 (5:58 UT) with a 0.36 m Schmidt-Cassegrain telescope at f/22. He used a ToUcam camera and stacked 500 frames using Registax 3.0 to make this image. Transparency was a 4/6 and the seeing was 4/10 on the ALPO scale. South is at top.

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Table 5: Selected Normalized Magnitudes for Uranus and Neptune During Their 2006 Apparitions

	B(1,0)	V(1,0)	R(1,0)	I(1,0)
Uranus	-6.60 ± 0.02	-7.11 ± 0.02	-6.68 ± 0.05	-5.9 ± 0.1
Neptune	-6.60 ± 0.02	-7.00 ± 0.02	---	---

ALPO Remote Planets Section Report Form

General Information

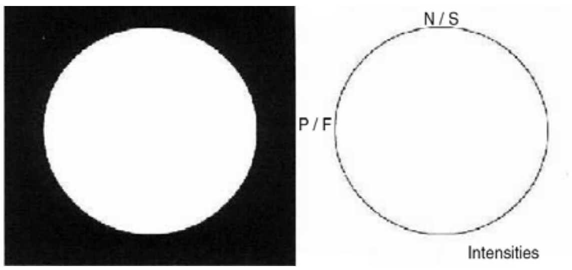
Name: ____ Location: ________________________

Date (UT): ____________________ Start: _______________(UT) Finish _______________ (UT)

Telescope: Type: ______________ Aperture: _____________ Magnification: ________________

Seeing: ____________ Transparency:_________________ Your Latitude: ___________________

A. Visual Observations



Planet: ______________________________

Circle N (North) or S (South)
P (Preceding) or F (Following)

Comments: ________________________
____
____
____

C. Color Estimate

Planet: ______________________________

Color description: _____________________
____
____

B. Photography / CCD Imaging

Method (circle your choice):
Prime Focus / Eyepiece Projection / CCD / Film

Exposure time: ___________________________

f / ratio: _______________________________

Developer: ______________________________

Comments: ______________________________
____

D. Occultations / Near Misses

Planet: ________________________________

Star occulted: ___________________________

Planet: RA _____________ Dec ____________

Star: RA _____________ Dec ____________

Comments: ______________________________
____
____

E-1 Photoelectric Photometry (use separate sheet for reduction calculations)

Time (UT)	Star/Planet	Filter U B V R I	Scale	Integration Time	Count	Sky Brightness

E-2 Visual Photometry

Comparison Star 1 (HD or SAO#) ____________ Mag. ___________ Source_______________
Comparison Star 1 (HD or SAO#) ____________ Mag. ___________ Source_______________
Planet ______________________ Estimated Mag. ___________ (Note: "Mag." = Magnitude)

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Venus Section

http://www.alpo-astronomy.org , then Venus Section

- Coordinator; Julius L. Benton, Jr., Associates in Astronomy, P.O. Box 30545, Wilmington Island, Savannah, GA 31410

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http://www.alpo-astronomy.org , then Mercury/Venus Transit Section

- Coordinator; John E. Westfall, P.O. Box 2447, Antioch, CA 94531-2447

Lunar Section

Lunar Topographical Studies

http://www.zone-vx.com/alpo-topo

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 Selected Areas Program

http://www.alpo-astronomy.org, then Topographical Studies and Selected Areas HomePage, also

http://www.zone-vx.com/alpo-sap.html

Banded Craters Program

http://www.zone-vx.com/alpo-bcp.html

- Coordinator, Lunar Topographical Studies / Lunar Selected Areas Program; William Dembowski, 219 Old Bedford Pike, Windber, PA 15963

Lunar Meteoritic Impacts

http://www.alpo-astronomy.org , then Lunar Meteoritic Impact Search

- Coordinator, Lunar Meteoritic Impacts Search; Brian Cudnik, 11851 Leaf Oak Drive, Houston, TX 77065

Lunar Transient Phenomena

http://www.alpo-astronomy.org , then Transient Phenomena;
also http://www.ltpresearch.org

- Coordinator, Lunar Transient Phenomena; Dr. Anthony Charles Cook, Institute of Mathematical and Physical Sciences, University of Aberystwyth, Penglais, Aberystwyth, Ceredigion. SY23 3BZ, United Kingdom
- Assistant Coordinator, Lunar Transient Phenomena; David O. Darling, 416 West Wilson St., Sun Prairie, WI 53590-2114

Lunar Domes Section

http://www.lunar-dome.com

- Coordinator, Lunar Dome Survey; Marvin W. Huddleston, 2621 Spiceberry Lane, Mesquite, TX 75149

Mars Section

http://www.alpo-astronomy.org , then Mars Section

- Coordinator (dust storm reports); Daniel M. Troiani, P.O. Box 1134 Melrose Park, IL 60161-1134
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Minor Planets Section

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Jupiter Section

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Saturn Section

http://www.alpo-astronomy.org , then Saturn Section

- Coordinator; Julius L. Benton, Jr., Associates in Astronomy, P.O. Box 30545, Wilmington Island, Savannah, GA 31410

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- Coordinator; Dolores Hill, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721

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http://www.alpo-astronomy.org , then Eclipse Section

- Coordinator; Michael D. Reynolds, associate dean, Math & Science, Florida Community College, 3939 Roosevelt Blvd, E-345, Jacksonville, FL 32205

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The Monograph Series

http://www.alpo-astronomy.org , then Publications Section

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- **Monograph No. 1.** *Proceedings of the 43rd Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, August 4-7, 1993.77* pages. Hard copy $12 for the United States, Canada, and Mexico; $16 elsewhere .
- **Monograph No. 2**. *Proceedings of the 44th Convention of the Association of Lunar and Planetary Observers. Greenville, South Carolina, June 15-18,*

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1994.52 pages. Hard copy *$7.50* for the United States, Canada, and Mexico; $11 elsewhere.

- **Monograph No. 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 No. 4.** *Proceedings of the 45th Convention of the Association of Lunar and Planetary Observers. Wichita, Kansas, August 1-5, 1995.127* pages. Hard copy $17 for the United States, Canada, and Mexico; $26 elsewhere.

- **Monograph No. *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. Hard copy $10 for the United States, Canada, and Mexico; $15 elsewhere.

- **Monograph No. *6.*** *Proceedings of the 47th Convention of the Association of Lunar and Planetary Observers, Tucson, Arizona, October 19-21, 1996.20* pages. Hard copy $3 for the United States, Canada, and Mexico; $4 elsewhere.

- **Monograph No. 7.** *Proceedings of the 48th Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, June 25-29, 1997.76* pages. Hard copy $12 for the United States, Canada, and Mexico; $16 elsewhere.

- **Monograph No. 8**. *Proceedings of the 49th Convention of the Association of Lunar and Planetary Observers. Atlanta, Georgia, July 9-11,1998.122* pages. Hard copy $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.Hard copy $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.Hard copy $4 for the United States, Canada, and Mexico; $5 elsewhere.

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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 many solar references. Produced by ALPO Solar Section Assistant Coordinator and Archivist 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 (Dembowski):** (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.alpo-astronomy.org* (then Topographical Studies and Selected Areas Home Page), 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 *harry@persoftware.com*

- **Venus (Benton):** (1) *ALPO Venus Observing Kit,* $17.50; includes introductory description of ALPO Venus

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observing programs for beginners, a full set of observing forms, and a copy of *The Venus Handbook.* (2) *Observing Forms,* free at http://www.alpo-astronomy.org (then Venus Section), 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) *Jupiter*, the ALPO section newsletter, available online only via the ALPO website; (3) *J-Net*, 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 Kit*, $3 from Richard Schmude, Jupiter Section coordinator.

- **Saturn (Benton):** (1) *ALPO Saturn Observing Kit*, $20; includes introductory description of Saturn observing programs for beginners, a full set of observing forms, and a copy of *The Saturn Handbook*. 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 t http://www.alpo-astronomy.org (then Saturn Section), 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. 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 $24 per year via regular mail in the U.S., Mexico and Canada, $34 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.

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- ***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 with 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)***. Download JALPO43-1 thru present issue in pdf from http://www.justfurnfurn.org/DJALPO (no charge).

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The Association of Lunar & 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.

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