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Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 52, Number 2, Spring 2010

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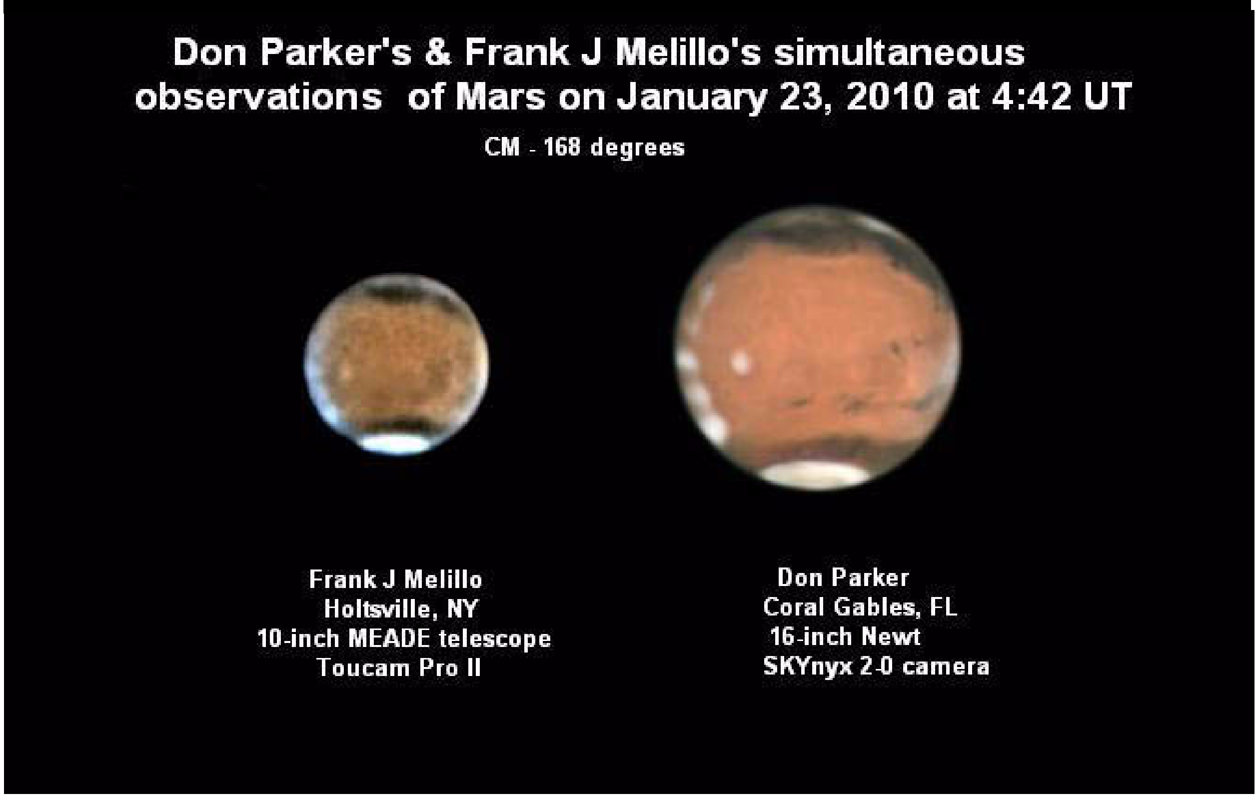
Inside this issue . . .

- *Announcement of and call for papers for the 2010 ALPO Conference!*
- *Book review -- The Sun and How to Observe It*
- *Color Imaging of the Moon*
- *Apparition reports: Venus in 2006 and the remote planets in 2008*

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

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Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 52, No. 2, Spring 2010
This issue published in March 2010 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:

Matthew Will
ALPO Membership Secretary/Treasurer
P.O. Box 13456
Springfield, Illinois 62791-3456

E-mail to: matt.will@alpo-astronomy.org

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

Founded in 1947

In This Issue:

Inside the ALPO

Feature Stories

ALPO Resources

Our Advertisers

Announcing the…

2010 ASSOCIATION OF LUNAR & PLANETARY OBSERVERS CONFERENCE

July 29th through July 31st

Jacksonville, Florida

Join your fellow Association of Lunar & Planetary Observers' members for:

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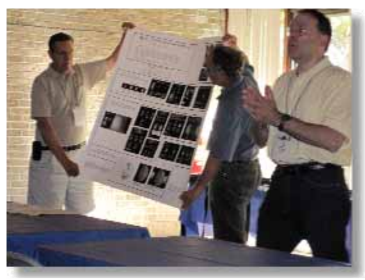
- **Cookout and Observing at the Beach! (Hanna Park)**
- **Closing ALPO Banquet (Hospitality Inn)**



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2010 Conference Hosts:

FLORIDA STATE COLLEGE at Jacksonville

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Northeast Florida Astronomical Society

Call for Papers will be issued by Dr. Richard Schmude, ALPO Director

Registration information posted at www.alpo-astronomy.org

For additional information please contact Dr. Mike Reynolds; mreynold@fscj.edu

Inside the ALPO
Member, section and activity news

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Computing Section: Larry Owens
Youth Section: Timothy J. Robertson
Historical Section: Richard Baum
Eclipse Section: Michael D. Reynolds
ALPO Website: Larry Owens

Point of View
ALPO Website Resources

By Ken Poshedly, editor & publisher *The Strolling Astronomer*

Well folks, in case you hadn't noticed and just take things for granted, we have one heck of a website guru in our midst, that being Larry Owens. Besides doing website work for his employer (AT&T), Larry also handles online work for one of the Atlanta (Georgia) astronomy clubs (*www.ceastronomy.org*) .

Even if you check the ALPO website sporadically, you're sure to notice the professional hand he lends to our important activities. From the ALPO Picture of the Day (though it tends to last much longer) to the simple layout and easy navigation of the entire website, it's Larry's doing.

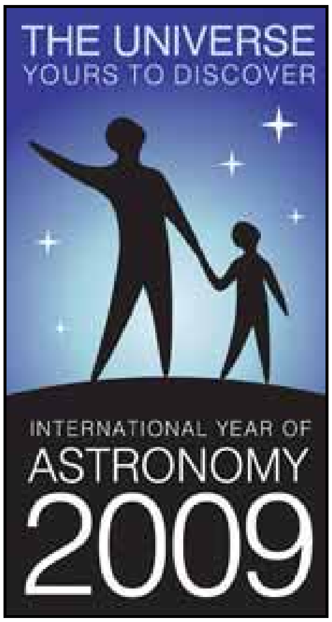
One of the most useful features I've found is the bank of utilities located on the right side of the ALPO homepage.

- JPL Space Calendar
  With a listing of thousands of astronomical events to help you plan observing.
- JPL Ephemeris Generator
  This will make an observing ephemeris for any location, any solar system object, any time or date.
- JPL Solar System Simulator
  See any major body in the solar system as it looks at any time from any other major body!
- An Excellent Astronomy Resource Site
  Lots of tables, charts and lists for educators and observers!
- The Astronomy Yellow Pages
  Your one-stop shopping guide to all things astronomical!
- Universe Today
  Space news from around the Internet, updated every weekday.
- SpaceWeather.com
  Space/Astronomy news, updated every day.
- Space Viz Productions
  Astronomy documentaries.

Inside the ALPO
Member, section and activity news

IYA 2009 Updates

GLOBE at Night featured on Earth Science Picture of the Day
A photo of the constellation Orion high above Portugal's noble Cape Espichel Lighthouse has been selected as today's Earth Science Picture of the Day. The picture illustrates GLOBE at Night. *http://www.astronomy2009.org/news/updates/844/*



10 ways to participate in Global Astronomy Month this April!
With three weeks remaining until Global Astronomy Month (GAM) begins in April, Astronomers Without Borders (AWB) has developed Global Programs everyone can take part in. Professional and amateur astronomers, educators and all astronomy enthusiasts worldwide can chose between global star parties, meteor watching, events dedicated to the Moon, the Sun and to Saturn, dark sky pledges, virtual meetings with famous astronomers, remote observations of exoplanets, asteroid discoveries and much more. Below are 10 highlights of these global programs, and there's much more on the GAM website. Join the global celebration of the Universe this April! *http://www.astronomy2009.org/news/updates/843/*

My name is Galileu Galilei
In the framework of IYA2009, a biographic children book about the life and work of Galileo Galilei has been publish in the framework of IYA2009 in Portuguese, Spanish and Catalan. *http://www.astronomy2009.org/news/updates/842/*

Less of Our Light for More Star Light
Over 3700 Globe at Night measurements from around the world so far! Help us reach 10,000 by March 16. With half of the world's population now living in cities, many urban dwellers have never experienced the wonderment of pristinely dark skies and maybe never will. Light pollution is obscuring people's long-standing natural heritage to view stars. The GLOBE at Night program is an international citizen-science campaign to raise public awareness of the impact of light pollution by encouraging everyone everywhere to measure local levels of night sky brightness and contribute observations online to a world map. All it takes is a few minutes to participate between 8-10 pm, March 3-16. Your measurements will make a world of difference. For more information, visit the website at: *http://www.globeatnight.org/*

Interview with Robert Naeye, Editor-in-Chief of Sky & Telescope
The 365 Days of Astronomy podcast has featured an interview with Robert Naeye, Editor-in-Chief of Sky & Telescope magazine, an IYA2009 Media Partner. He talks about amateur astronomy, its past and future. *http://www.astronomy2009.org/news/updates/837/*

Upcoming tribute to the late Arthur C Clarke
19 March 2010 marks the 2nd year death anniversary of late Sir Arthur Clarke. It is hard to imagine we have already made two orbits around the Sun without his presence. Of course his contributions still lives on and will continue to do so. As a tribute to him, the Sri Lanka Astronomical Assn in partnership with Arthur C Clarke Estate and the British Council has organised an event for 17 March. This will feature, among other things, an illustrated talk by Arthur C Clarke's research assistant, a question and answer session, and a screening of the film 2010: The Year We Make Contact. *http://www.astronomy2009.org/news/updates/836/*

Hubble's 20th Anniversary brings special opportunity for European science centres and planetariums
This April will mark 20 years in orbit for the NASA/ESA Hubble Space Telescope! In honour of this incredible milestone, ESA, along with American partners NASA and the Space Telescope Science Institute (STScI) will offer a limited number of high-quality large Hubble prints to selected European science centres and planetariums. Click on the link below for more information and to sign up for this exciting opportunity. *http://www.astronomy2009.org/news/updates/840/*

Beyond IYA2009 shop now taking orders
Demand for Beyond IYA2009 logo-adorned items has resulted in the creation of a shop specifically tailored to cater for those who wish to express their support of continuing astronomy popularisation. *http://www.astronomy2009.org/news/updates/839/*

International Women's Day: science's talents celebrated on AthenaWeb
Together with the L'Oréal-UNESCO For Women in Science programme AthenaWeb would like to take the opportunity of this International Women's Day to celebrate the major contributions of women scientists by featuring the videos of the five laureates of the 2010 For Women In Science awards. *http://www.astronomy2009.org/news/updates/835/*

ISU's 14th Annual International Symposium "The Public Face of Space" resources are online
Resources from the recent symposium "The Public Face of Space" are now online. These include the programme of events, copies of the 48 presented papers, additional manuscripts, copies of the 26 posters, compressed video files of the keynote address and the panel discussions at the end of each session, and a full list of participants. *http://www.astronomy2009.org/news/updates/833/*

The IYA 2009 international home page can be found at *www.astronomy2009.org/general/*

The IYA 2009 United States node home page is at *www.astronomy2009.us/*

A full list of all Organizational Nodes can be found online at *www.astronomy2009.org/organisation/nodes/organisational/*

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News of General Interest

Call for Papers: ALPO 2010

The 2010 annual conference of the Assn of Lunar & Planetary Observers will be held Thursday through Saturday, July 29 - 31, at Florida State College at Jacksonville.

Participants are encouraged to submit research papers, presentations, and experience reports concerning Earth-based observational astronomy of our solar system for presentation at the event.

Topics

Suggested topics for papers and presentations include the following:

- New or ongoing observing programs and studies of solar system bodies, specifically, how those programs were designed, implemented and continue to function.
- Results of personal or ALPO group studies of solar system bodies possibly including (but not limited to) Venus cloud albedo events, dust storms and the polar caps of Mars, the various belts and Great Red Spot of Jupiter, the various belts and ring system of Saturn, variances in activity of periodic meteor showers and comets, etc.
- New or ongoing activities involving astronomical instrumentation, construction or improvement.
- Challenges faced by Earth-based observers including increased or lack of interest, deteriorating observing conditions brought about by possible global warming, etc.

Submission Format

Please observe and follow these guidelines:

- Presentations — The preferred format is Microsoft PowerPoint, though 35mm slides or overhead projector slides are also acceptable. The final presentation should not exceed 45 minutes in length, to be followed by no more than five (5) minutes of questions (if any) from the audience.
- Research Papers — Full and final research papers not being presented as described above should not exceed 5,000 words (approximately 8 pages), including figures and references. ***Important: The results described must not be under consideration for publication elsewhere.***
- Posters — Posters should not exceed 1,000 words. Posters provide an opportunity to present late-breaking results and new ideas in an informal, visual and interactive format. Accepted poster submissions will receive a one-page description in the conference proceedings. The submission abstract must be no longer than one page.

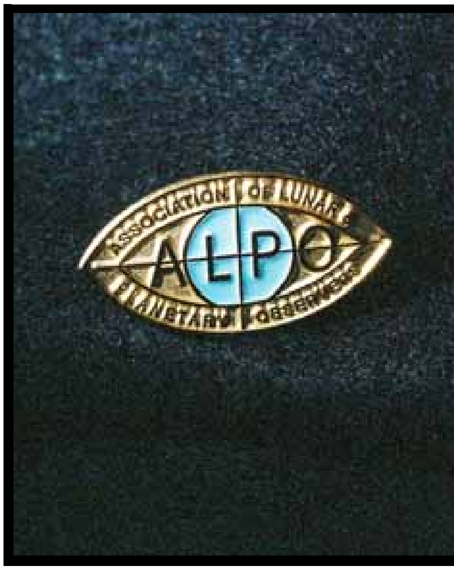
Acceptance for presentation is contingent on registration for the conference. In the case of multiple authors, at least one must register.

Important Dates

- June 15, 2010 – Deadline for abstracts proposals for papers, reports, workshops, and posters.
- June 15, 2010 - Deadline for four- or five-sentence abstracts / proposals for papers, reports, workshops, and posters.
- March 30, 2010 - Registration opens.
- July 1, 2010 - Late registration fee begins (late registration via mail accepted up to July 15; then in person at conference afterwards).
- July 29 - 31, 2010 - ALPO Con 2010.

Contact

Dr. Richard Schmude
Professor of Chemistry
Gordon College
Barnesville, Georgia 30204
770-358-0728
schmude@gdn.edu



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- Telescopes by Galileo www.galileosplace.com/ALPO/
- The Astronomical League, (online readers click here); hard copy readers, go to http://www.astroleague.org, then left-click on "Login for AL Store" in the left panel, then left-click on ALPO in the list of categories page, then left-click on the ALPO membership choice.

The ALPO thanks both *Telescopes by Galileo* and *The Astronomical League* for providing this valuable online service.

Venus Volcano Watch, 2010

By Michael F. Mattei
micmattei@comcast.net

The possibility of catching a volcanic eruption can be determined by disturbances in the clouds if this can happen. By observing and checking with the surface location of these volcanos, we may catch a possible erupting.

On the 27 of February the three volcanoes Maat Mons, Ozza Mons, and Sapas Mons began to appear on the bright limb of Venus. Please note that on March 13, Venus is still relatively close to the Sun, so use proper caution while observing at this time.

I would appreciate any observations of bulges and bright white areas in the clouds on the bright side of Venus. As the volcanoes approach and pass the terminator, look for bulges on the dark side of the terminator. For further information and images see JALPO Volume 51, No. 1 (Winter 2009), pages 21-23; a Venus observing form is on page 24. Drawings and images are welcome.

The following list of dates, times and distance from the bright limb (BL) or the terminator (TERM) are given, times are for 00 UT, of Greenwich England. Dates are every 10 days.

The watch extends from Jan 11, 2010 (Superior Conjunction) to Aug 20, 2010 (Eastern Elongation). Note that there are gaps in the dates because this list is set for the three volcanoes Maat Mons, Ozza Mons, and Sapas Mons.

Table of Venus Volcano Watch Data for 2010

Date	Time	Distance from BL/Term in Degrees	Elongation
13 Mar	00 UT	60° from bright limb near center of disk	14.56°
23 Mar	00 UT	60° from terminator or just past disk center	16.98°
02 Apr	00 UT	30° from terminator	19.42°
12 Apr	00 UT	At the terminator	21.87°
17 Apr	00 UT	Beyond the terminator on the dark side 10°	33.15°
06 July	00 UT	At the bright limb	41.12°
16 July	00 UT	40° from the bright limb	42.8°
26 Jul	00 UT	30° from the terminator	44.21°
05 Aug	00 UT	At the terminator	45.27°
10 Aug	00 UT	10° past terminator	45.63°

ALPO Interest Section Reports

Web Services

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

Visit the ALPO home page online at www.alpo-astronomy.org

Computing Section

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

Important links:

- To subscribe to the ALPOCS yahoo e-mail list, http://groups.yahoo.com/group/alpocs/
- 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 online at www.alpo-astronomy.org/computing.

Lunar & Planetary Training Program

Tim Robertson,
section coordinator
cometman@cometman.net

For information on the ALPO Lunar & Planetary Training Program, go to www.cometman.net/alpo/; regular postal mail to Tim Robertson, 195 Tierra Rejada Rd. #148, Simi Valley CA, 93065; e-mail to cometman@cometman.net

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ALPO Observing Section Reports

Eclipse Section

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

Please visit the ALPO Eclipse Section online at *www.alpo-astronomy.org/eclipse*.

Comets Section

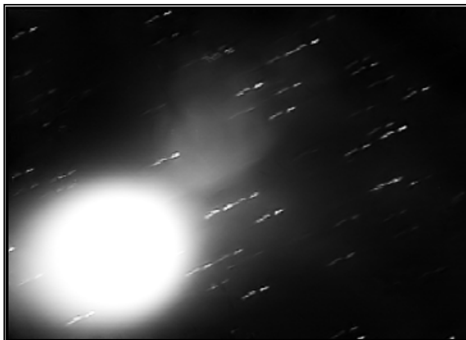
Gary Kronk,
acting section coordinator
kronk@cometography.com

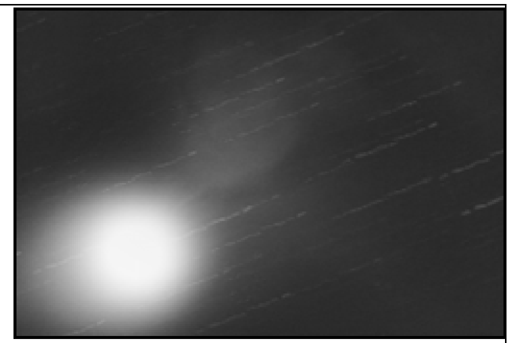
The year 2009 was a decent year for comets. Comet Lulin put on a nice show during January and February and attained a magnitude near 5, but, after that, we had one comet that reached a magnitude of about 7, another which reached a magnitude of about 8, and a handful of comets that managed to reach magnitude 9.

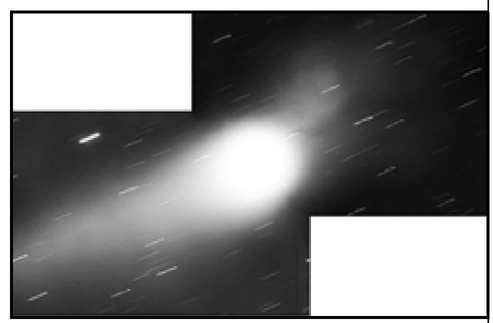
Although no one knows what comets may be discovered in 2010, we do already know of several that could make 2010 a fun one for comet observers. Both C/2009 R1 (McNaught) and periodic comet 103P/Hartley 2 are both expected to reach magnitude 5.

Comet C/2009 R1 is the trickiest of the two comets to predict a maximum brightness. It was discovered on 2009 September 9 by R. H. McNaught. Although several observations were obtained by numerous observers during the remainder of September, the comet has not been seen since September 26. The reason is because it moved into a region too close to the Sun for observations. After passing about 2° from the Sun in mid-February 2010, the comet will steadily move out of the Sun's glare. It will probably come under observation in March or April. Only then will we know if the comet is still following the same brightness trend as when it was in the outer reaches of the asteroid belt last September. There is certainly a chance the comet could become brighter than magnitude 5, but there is also a chance it will be fainter. But there is also another factor to contend with; when the comet is at its brightest, it will be on the other side of the Sun from Earth and, again, lost in the Sun's glare. Because of the geometry of this apparition, the comet will probably be at its best during June, when it brightens from about magnitude 8 to 6.

The upcoming apparition of periodic comet 103P/Hartley 2 is certainly a lot easier to outline. Discovered in 1985, this comet has been observed at four returns. The result is that astronomers have a good understanding of the comet's brightness behavior. From the very favorable apparitions of 1991 and 1997, we know that the comet's brightening shifts into high gear about six months







Comet Lulin (C/2007 N3) as imaged by ALPO Comets Section Coordinator Gary Kronk on February 22, 2010. “These reveal an ejection of dust that occurred. In these images, the coma is in the lower left corner, while the roundish mass is above left of the center. Image 06-08 (top left) spans 5 minutes, 12 seconds. Image 06-16 (top right) spans 23 minutes, 42 seconds. Image 2007n3_20090222_mallincam (bottom right) is composed of two exposures of just over 5 minutes.

“Note that the ejected cloud of dust represents what makes observing comets so exciting. I have seen comets with no tails, short tails, and long tails. I have seen comets undergo strong outbursts in brightness and I have seen comets that broke up and faded from existence. This was the first comet for which I observed such an impressive ejection of dust.” (No other image details available.)

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 matt.will@alpo-astronomy.org as soon as possible.

Inside the ALPO
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prior to perihelion, it peaks about three weeks after passing perihelion, and then fades rapidly for the next three months. How does this fit in with the 2010 apparition? First of all, the 2010 apparition is particularly favorable because the comet will be passing only 0.12 AU (11,160,000 miles) from Earth on October 20. This is the closest this comet passes to our planet during the period of 1900 to 2100. The maximum brightness is expected to reach 5. During October, the close approach will cause the comet to move from Cassiopeia, through Perseus and Auriga, and almost completely through Gemini. Because 103P is moving in a direct orbit, as does Earth, the optimum period of viewing should easily cover the months of October through November.

Visit the ALPO Comets Section online at *www.alpo-astronomy.org/comet*.

Meteors Section

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

For the third time during the past four years, Robin Gray and I met in the Mojave Desert to view the Orionid meteor shower. This particular location, situated between Las Vegas, Nevada, and Basrtow, California, has ideal weather in mid-October. The days have cooled down considerably and the nighttime temperatures are also mild. This time period is usually before the first rains of the season so the skies are generally clear.

The Orionid meteor shower has recently been more active than normal. Normal peak rates for the Orionids is near 20 meteors per hour, as seen from dark-sky sites. It has recently been as high as 60 per hour with numerous fireballs, meteors that exceed a maximum magnitude of -4. This trip was no exception as Orionid rates topped 30 per hour on both the nights of October 20/21 and 21/22. Several fireballs were witnessed on the 20/21. Robin and I easily surpassed 100 meteors each of the three nights we were out there. Observing sessions were usually four hours long, between the hours of 1 and 5 a.m. PDT.

Unfortunately the 2010 Orionid display is badly affected by the Full Moon. We will probably decide to wait this year until December and view the Geminid shower.

Visit the ALPO Meteors Section online at *www.alpo-astronomy.org/meteor*.

Meteorites Section

Dolores Hill, section coordinator
dhill@lpl.arizona.edu

Visit the ALPO Meteorite Section online at *www.alpo-astronomy.org/meteorite/*

Solar Section

Kim Hay, section coordinator,
kim.hay@alpo-astronomy.org

See feature story on this section later in this issue of your Journal.

For information on solar observing – including the various observing forms and information on completing them – go to *www.alpo-astronomy.org/solar*

Mercury Section

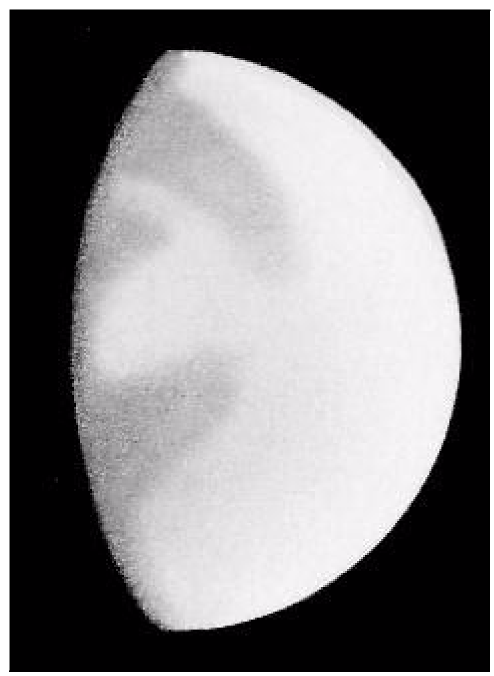
Report by Frank J. Melillo, section coordinator
frankj12@aol.com

I would like to thank John Boudreau of Massachusetts and Stuart Parker of New Zealand for their outstanding lectures on Mercury at the ALPO / ALCON 2009 meeting in New York. It was such a thrill to see Stuart from half-way around the world at the ALPO conference. On the first day of the meeting, the entire morning was dedicated just to Mercury presentations. Our talks and lectures covered apparitions reports, CCD imaging and the MESSENGER flybys. It was amazing that no other planet like Mercury had so much attention at this meeting.

John Boudreau was in a spotlight again for his outstanding images of Mercury during the planet's morning apparition. His images show details also captured by MESSENGER just four days after its closest approach to the planet. To my knowledge, there have never been such incredible images of Mercury by an amateur. John's techniques have certainly improved every year and his images can be compared easily with those by MESSENGER.

Also, Ed Lomeli of California has his own fair share of showing incredible images of Mercury and with his own techniques also having improved over the years.

MESSENGER flew by Mercury for its final time on September 29, 2009. After the flyby, scientists are sure that we are on



Mercury – December 16, 2009 at 16:26 UT. CM – 262 degrees longitude / Seeing: III-IV (Ant). Phase estimate, 64%; Instrumentation, SCT 203mm F/10; Filter: Wr. #23A / Magnification: 230X; Solitudo Pheonicis is a band on the north side, Solitudo Croiphori is a band on the south side. North at top. Observer: Mario Frassati, location: Crescentino (VC) Italy.

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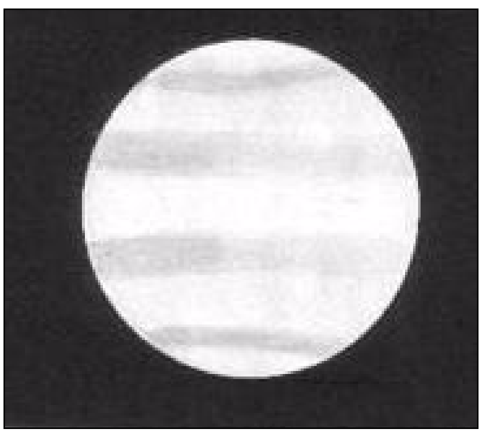
course (so to speak) for insertion into orbit around Mercury in March 2011.

Visit the ALPO Mercury Section online at *www.alpo-astronomy.org/mercury*.

Venus Section

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

Venus reached superior conjunction with the Sun on January 11, 2010, concluding the 2009-10 Western (Morning) Apparition. The planet now appears low in the West after sunset marking the beginning of the 2010 Eastern (Evening) Apparition during which Venus will pass through its waning phases (a progression from fully illuminated through crescentic phases). At the time of this report, the gibbous disk of Venus is about 10.0" across and 99.1% illuminated [see attached illustration]. During the 2010 Eastern (Evening) Apparition observers will see the leading hemisphere of Venus at the time of sunset on Earth. The accompanying table of Geocentric Phenomena in Universal Time (UT) are presented for the convenience of observers for the 2010 Eastern (Evening) Apparition.



Carl Roussell of Hamilton, Ontario, Canada, was the first to submit an observation of Venus during the 2010 Eastern (Evening) Apparition. He made a drawing of Venus on February 8, 2010 at 16:48 UT using a 15.2cm (6.0 in.) refractor in integrated light (no filter) and with W25 (red), W58 (green), and W47 (violet) filters, showing vague banded dusky features. Seeing = 4, Transparency = unspecified (Venus was seen in daylight hazy sky). Apparent diameter of Venus is 9.9", phase (k) 0.993 (99.3% illuminated), and visual magnitude -3.9. South is at top of image.

During the 2009-10 Western (Morning) Apparition of Venus, observers contributed over 200 visual drawings, descriptive reports and images of the planet at various wavelengths (many in the UV and near-IR), and analysis of the data has begun. A detailed apparition report will be published at a future date in this Journal.

Less than a month after Venus emerged from superior conjunction, observers started sending in observations for the 2010 Eastern (Evening) Apparition, Readers are reminded that high quality digital images of the planet taken in the near-UV and near-IR, as well as other wavelengths through polarizing filters, are still needed by the Venus Express (VEX) mission, which started systematically monitoring Venus at UV, visible (IL) and IR wavelengths nearly four years ago in late May 2006.

This Professional-Amateur (Pro-Am) effort continues, and observers should submit images in *.jpg 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 still needed throughout the period that VEX is observing the planet, which continues into 2010. Since Venus has a high surface brightness it is potentially observable anytime it is far enough from the Sun to be safely observed.

Regular observational work carried out by the ALPO Venus Section includes:

- 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.

Geocentric Phenomena of the 2010 Eastern (Evening) Apparition of Venus in Universal Time (UT)

Superior Conjunction	2010	Jan 11 (angular diameter = 9.8 arc-seconds)
Predicted Dichotomy	2010	Aug 17.65 (exactly half-phase)
Greatest Elongation East	2010	Aug 20 (46° east of the Sun)
Greatest Brilliancy	2010	Sept 24 (m_v = – 4.8)
Inferior Conjunction	2010	Oct 29 (angular diameter = 62.0 arc-seconds)

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Lunar Calendar, April thru June 2010 (all times UT; Geocentric Data)

Apr. 04	05:24	Extreme South Declination (-25.31 Degrees)
Apr. 05	07:00	Moon 2.9 Degrees S of asteroid 1 Ceres
Apr. 06	09:37	Last Quarter
Apr. 09	02:46	Moon at Apogee (404,997 km - 251,653 miles)
Apr. 09	12:00	Moon 0.85 Degrees S of asteroid 6 Hebe
Apr. 09	22:00	Moon 3.8 Degrees NNW of Neptune
Apr. 11	18:00	Moon 5.5 Degrees NNW of Jupiter
Apr. 12	08:00	Moon 5.5 Degrees NNW of Uranus
Apr. 14	12:29	New Moon (Start of Lunation 1080)
Apr. 15	23:00	Moon 1.4 Degrees N of Mercury
Apr. 16	11:00	Moon 4.0 Degrees NNW of Venus
Apr. 18	17:18	Extreme North Declination (+25.19 Degrees)
Apr. 21	18:20	First Quarter
Apr. 22	05:00	Moon 4.4 Degrees SSW of Mars
Apr. 24	21:00	Moon at Perigee (367,141 km - 228,131 miles)
Apr. 25	19:00	Moon 7.4 Degrees SSW of Saturn
Apr. 28	12:18	Full Moon
May 01	14:00	Extreme South Declination (-25.11 Degrees)
May 02	21:00	Moon 1.4 Degrees SE of asteroid 1 Ceres
May 06	04:15	Last Quarter
May 06	21:54	Moon at Apogee (404,230 km - 251,177 miles)
May 07	05:00	Moon 4.0 Degrees N of Neptune
May 07	23:00	Moon 1.8 Degrees N of asteroid 6 Hebe
May 09	12:00	Moon 5.9 Degrees NNW of Jupiter
May 09	21:00	Moon 5.7 Degrees NNW of Uranus
May 12	12:00	Moon 7.4 Degrees NNW of Mercury
May 14	01:04	New Moon (Start of Lunation 1081)
May 15	23:12	Extreme North Declination (+25.05 Degrees)
May 16	10:00	Moon 0.09 Degrees N of Venus (Occultation)
May 20	07:00	Moon 4.8 Degrees S of Mars
May 20	08:40	Moon at Perigee (369,728 km - 229,738 miles)
May 20	23:43	First Quarter
May 22	23:00	Moon 7.4 Degrees SSW of Saturn
May 27	23:07	Full Moon
May 28	22:12	Extreme South Declination (-25.03 Degrees)
May 29	22:00	Moon 0.09 Degrees S of asteroid 1 Ceres (Occultation)
June 03	15:00	Moon 4.3 Degrees NNW of Neptune
June 03	16:52	Moon at Apogee (404,264 km - 251,298 miles)
June 04	05:00	Moon 4.8 Degrees N of asteroid 6 Hebe
June 04	22:13	Last Quarter
June 06	04:00	Moon 6.3 Degrees NNW of Jupiter
June 06	05:00	Moon 5.9 Degrees NNW of Uranus
June 11	01:00	Moon 5.2 Degrees N of Mercury
June 12	11:15	New Moon (Start of Lunation 1082)
June 12	07:06	Extreme North Declination (+25.03 Degrees)
June 15	04:00	Moon 3.7 Degrees SSW of Venus
June 15	14:55	Moon at Perigee (365,936km - 227,382 miles)
June 17	15:00	Moon 5.3 Degrees SSW of Mars
June 19	04:29	First Quarter
June 19	04:00	Moon 7.5 Degrees SSW of Saturn
June 25	05:06	Extreme South Declination (-25.04 Degrees)
June 25	20:00	Moon 1.0 Degree N of asteroid 1 Ceres
June 26	11:30	Full Moon (Partial Eclipse)
June 30	22:00	Moon 4.3 Degrees NNW of Neptune

(Table courtesy of William Dembowski)

- 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.

Individuals interested in participating in the programs of the ALPO Venus Section are encouraged to visit the ALPO Venus Section online at www.alpo-astronomy.org/venus.

Lunar Section:

Lunar Topographical Studies / Selected Areas Program

Report by Wayne Bailey, acting program coordinator
wayne.bailey@alpo-astronomy.org

During this quarter, the ALPO Lunar Topographical Studies Section (ALPO LTSS) received a total of 168 new observations from 20 observers. Of these, 13 observations were submitted on Banded Crater Observing Forms and 10 were submitted for "Focus On" topics. I'll periodically remind observers, however, that a list of data that should accompany observations is published monthly in *The Lunar Observer*. Partial data is better than none, but as much data as is available concerning the observations should be submitted. Additional notes and comments on the observations are also always welcome.

"Focus On" features in *The Lunar Observer* continued with an article on Atlas-Hercules. Future subjects include Snellius-Furnerius, Ray Craters, and Dark-Halo Craters. In addition to individual observations and the continuing Feature of the Month note by Robert Hays, five articles on Cassini, Cauchy, Lacus Mortis, Mare Nectaris and Archimedes by Charles Galdies, Phil Morgan, Maurice Collins, Howard Eskildsen, and Antonius Schalken were published.

Visit the following online web sites for more info:

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- The Moon-Wiki: *http://the-moon.wikispaces.com/Introduction*
- ALPO Lunar Topographical Studies Section *moon.scopesandscapes.com/alpo-topo*
- ALPO Lunar Selected Areas Program *moon.scopesandscapes.com/alpo-sap.html*
- ALPO Lunar Topographical Studies Smart-Impact WebPage *moon.scopesandscapes.com/alpo-smartimpact*
- The Lunar Observer (current issue) *moon.scopesandscapes.com/tlo.pdf*
- The Lunar Observer (back issues) *moon.scopesandscapes.com/tlo_back.html*
- Selected Areas Program: *moon.scopesandscapes.com/alpo-sap.html*
- Banded Craters Program: *moon.scopesandscapes.com/alpo-bcp.html*

Lunar Domes Survey

Marvin Huddleston, FRAS, program coordinator
kc5lei@sbcglobal.net

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

Lunar Meteoritic Impacts

Report by Brian Cudnik, program coordinator
cudnik@sbcglobal.net

Routine monitoring of the Moon by several active observers as well as the NASA Marshall Spaceflight Center (who now report 192 impact events since the start of their campaign in November 2005) continued throughout the fall of 2009 and into the winter of 2010. With one exception, no reports of lunar meteor impact events have been received. Mr. Robert Spellman recorded a very likely impact candidate on the 22 Oct. 2009 at 2:08:45 UT. This is likely a member of the annual Orionid meteor shower which was active at the time. Images and information about this and other impacts that Mr. Spellman has observed can be seen at *http://www.angelfire.com/space2/robertspellman/*

The campaign to monitor the Moon for the October 9 LCROSS double-impact event was successful with one drawback: no observer — including those on the

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Palomar 200-inch telescope with adaptive optics — observed anything at the time of the impacts. I visually observed through clouds with a small 4.5-inch scope at 225x and saw nothing. It was not until the LRO orbiter imagery was processed to bring out a faint impact plume. Information and images can be obtained from *http://www.nasa.gov/mission_pages/LCROSS/main/index.html*

Lunar Meteoroid Impacts and How to Observe Them (ISBN: 978-1-4419-0323-5) is now available at a bookstore near you. One can go to Amazon.com or a popular bookstore such as Barnes and Nobles to obtain a copy. The following website has more information on this book:

http://www.springer.com/astronomy/book/978-1-4419-0323-5

This book not only discusses lunar meteor impact events themselves, but also elaborates about lunar craters and what to look for when observing them. I discuss such information such as crater morphology versus size, crater morphology versus age, and other interesting physical aspects of craters. Craters elsewhere in the solar system are also discussed in fair detail. The second half of the book gives practical guidelines for observing the phenomena with both visual and video techniques.

One major drawback, however, is that the timestamping unit that is featured prominently in the book is no longer available. The KIWI-OSD (On-Screen Display) video time inserter with GPS capability ceased being produced during 2009 while the book was in the production phase (too late to make any further changes). I have a KIWI and it has been a very convenient and useful tool to have. I plan to provide information on comparable, alternative time-insertion equipment on the ALPO-LMIS website in the near future (by March or April 2010).

Please visit the ALPO Lunar Meteoritic Impact Search site online at *www.alpo-astronomy.org/lunar/lunimpacts.htm*.

Lunar Transient Phenomena

Dr Anthony Cook, program coordinator
tony.cook@alpo-astronomy.org

Since the last ALPO-LTP program report, six new LTP candidates have come to light (so to speak). I am including weights on a scale of 1 (only a slight chance this was a LTP) to 5 (scientifically proven LTP) to show the relative merit of each report. For the full details on each LTP, please see the Lunar Section publication "The Lunar Observer":

- 2009 Jul 16, 09:54 UT, and 2009 Aug 28, 17:00-17:01 UT; Shavarsh Khachatryan (Armenia) observed a red-yellow spark like appearance in the Chacornac area (Weight=2).
- 2009 Sep 03, 23:15-23:17 UT; Barry Gibbs (UK) took some digital SLR telephoto shots of the Moon. These showed some apparent brightness variations in Aristarchus (Weight=1).
- 2009 Sep 09, 23:31:43 UT; Peter Grego (UK) suspected seeing a fraction of a second flash just south of Cabeus (Weight=1).
- 2009 Sep 11, 00:15-01:05 UT; Clive Brook (UK) observed the central peak of Alphonsus to be brightening (Weight=1).
- 2009 Sep 11/12, 23:28-00:00UT; Marie Cook (UK) observed pink on the northwest rim of Tycho and green-blue on the inner southwest rim. No color was seen elsewhere on the Moon, and the effect faded by the end of the session (Weight=1).
- 2009 Nov 25, 18:42-21:03 UT; Paul Abel, Trevor Little, and Chris North (UK) all saw orange-colored patches appear on the inner north west rim of Eratosthenes in a 15-in. telescope. No color was seen elsewhere on the Moon. CCD images were obtained and are undergoing careful examination (Weight=3/4(?)).

Although not an LTP, on 2009 Dec 28 17:35 UT; Simon Kidd (UK) took a CCD image of Aristarchus which showed a bright blob just inside the inner east rim, in shadow – this is not normal. However this was later found it to be an imaging artifact produced by the image stacking program.

Jay Albert (Florida) attempted to observe the LCROSS impact but saw nothing.

Finally, live LTP alerts are now available via Twitter at *http://twitter.com/lunarnaut*.

Please visit the ALPO Lunar Meteoritic Impact Search site online at *www.alpo-astronomy.org/lunar/lunimpacts.htm*.

Mars Section

Report by Roger Venable, section coordinator
rjvmd@hughes.net

The ALPO Mars Section has received many excellent images, drawings, and descriptions of the planet. A number of new observers are participating this year.

Mars is now past opposition and well-positioned in the evening sky for observation. Despite its smaller apparent size, Mars is proving to be as interesting as ever.

Several small dust storms were detected in January and February, but perhaps the most exciting ones involved the incursion of dust clouds onto the North Polar Cap (NPC.) Although an image by Jim Melka (USA) on February 1 shows a hint of it, one major dust event was not noticed until it was beautifully displayed on February 2 by Jesus Sanchez (Spain) and by Efrain Morales Rivera (Puerto Rico) as shown in Figure 1 here. Dennis Fell (Canada) visually detected a dark streak on that area of the NPC as late as

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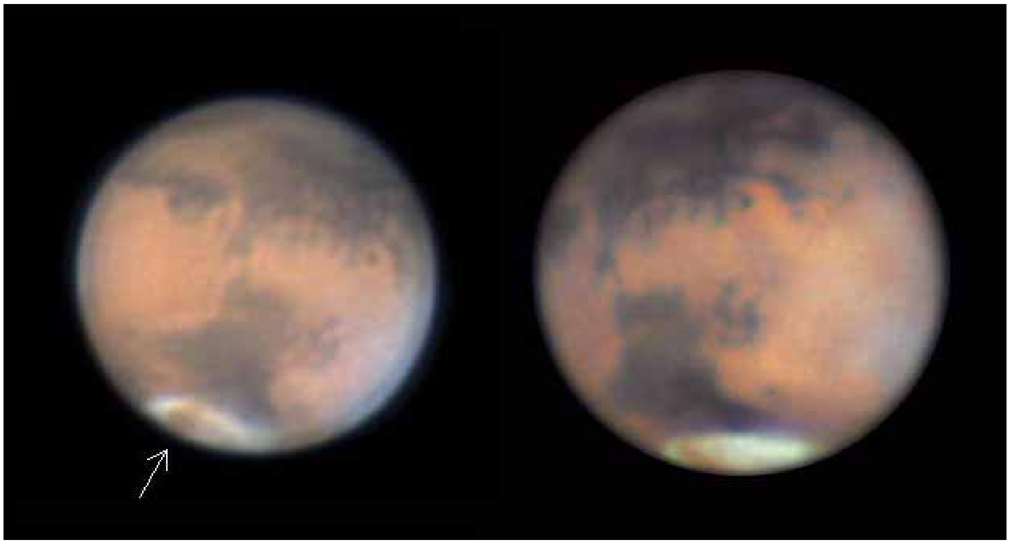

Figure 1. These two images show the NPC dust storm well. The image on the left, with the arrow pointing to the dust storm, was made by Jesus Sanchez on February 2, 2010, at 01:00 UT, using a 260 mm aperture telescope, DMK 21 camera, and RGB filters. Central meridian is longitude 27°. The image on the right was made by Efrain Morales Rivera at 03:16 UT of the same date, with CM 60°. He used a Schmidt-Cassegrain telescope of 300 mm aperture, a DMK21AF04 camera, and LRGB filters. In addition to the dust on the NPC, notice the atmospheric haze that is widespread on the morning (right) side of the planet in both images. Here and in Figure 2, south is up and planetary east is to the left.

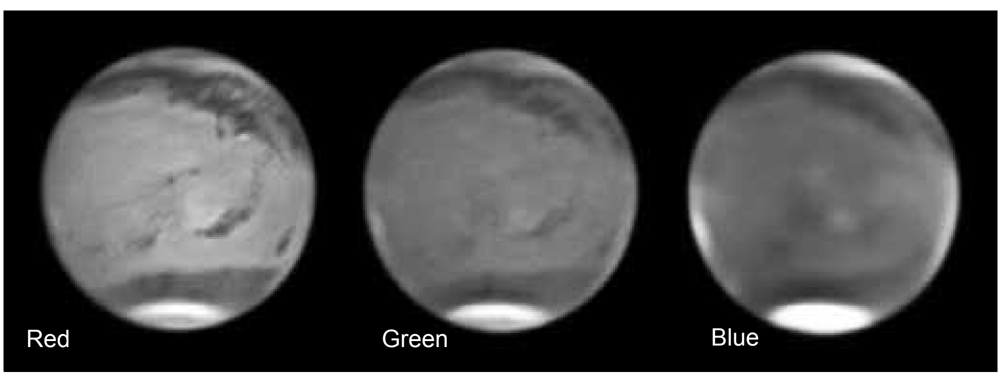

Figure 2. This set of images shows a number of clouds and also a small dust event. It was made by Don Parker on January 20, 2010, at 05:24 UT, using a Newtonian telescope of 400 mm aperture at f/22, a SKYnyx 2-0 camera, and RGB filters. CM is 205°. From left to right, the images are in red light, green light, and blue light respectively. Notice that the red image shows surface albedo features crisply, while the blue image shows them softly, due to scattering of blue light by Mars' atmosphere. The intensely bright area at the bottom is the North Polar Cap, while the bright area at the top is the South Polar Hood cloud. Other light areas in the blue image are clouds. On the west (right) limb are morning clouds, while on the east (left) limb is a bright orographic cloud associated with Olympus Mons. This bright appearance led to its designation as Nix Olympica ("the snows of Olympus") by Antoniadi, long before spacecraft revealed it to be an immense mountain. To its north there is a cloud in Arcadia, while to its south there is a cloud in Amazonis. Near the center of the image there is a trio of clouds. The northern one of these is an orographic cloud over Elysium Mons. Extending from its southeastern edge, visible in the red image only, is a bright line that curls around southern Elysium. Its visibility in red but not in blue confirms that it is dust, and its shape is consistent with that of a small dust storm.

February 6. A similar dust incursion occurred in December 2009 and was well-documented by ALPO observers.

Clouds and haze have been a regular feature on the planet, and most images and drawings include evidence of them. The image by Don Parker (USA) shows a number of them (Figure 2.)

The second half of this apparition will be just as interesting. Every observer is invited to join us in the Yahoo Mars observers group, *http://tech.groups.yahoo.com/group/marsobservers*, where you can participate in conversation about your observations, as well as upload your own images and drawings.

Also, check in often at the Mars Section of the ALPO website, *http://www.alpo-astronomy.org/mars*, where many of the most interesting happenings are announced and displayed. We are grateful to Geoff Gaherty for his faithful management of the Yahoo Mars observers group, and to Jim Melka for his creative management of the ALPO Mars Section observing alerts and recent observations pages of the ALPO website.

Visit the ALPO Mars Section online at *www.alpo-astronomy.org/mars*.

Minor Planets Section

Report by Frederick Pilcher, section coordinator
pilcher@ic.edu

In *Minor Planet Bulletin* Vol. 37, No. 1, 2010 Jan. - March, Donald Pray and Russell Durkee report a rotation period of 1069 +/- 3 hours for minor planet (4524) Barklajdetolli. This is the fourth longest rotation period found to date among more than 3,000 periods reported. Gary Vander Haagen has revisited the nonsynchronous binary Apollo type asteroid (35107) 1991 VH and confirmed a 2.6239-hour rotation period for the primary with 0.19 magnitude amplitude and, by timing 0.16 magnitude dips in the

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lightcurve caused by transit/occultation/eclipse events, a period of revolution of 32.26 hours.

Lightcurves with derived rotation periods are also published therein for 88 other asteroids, numbers 23, 65, 131, 204, 207, 237, 255, 397, 434, 514, 579, 740, 764, 790, 890, 950, 1175, 1203, 1276, 1341, 1575, 1621, 1732, 2009, 2217, 2621, 2636, 2665, 2670, 2776, 3219, 3280, 3748, 3940, 3999, 4154, 4357, 4358, 4417, 4601, 4820, 4925, 5153, 5350, 5479, 5567, 5620, 5639, 5787, 5839, 5986, 6073, 6447, 6461, 6463, 6859, 6867, 7036, 7255, 7421, 8639, 8885, 9068, 12868, 13018, 14968, 15374, 15527, 16404, 20614, 21607, 26916, 31867, 32209, 39828, 44060, 46818, 46953, 50879, 56367, 77799, 88161, 90698, 96178, 120928, 154244, 1995 UX1, 2007 PU11.

Some of these provide secure period determinations, some only tentative ones. Some are of asteroids with no previous lightcurve photometry, others are of asteroids with previous determinations and may be consistent or inconsistent with the earlier values.

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

In addition, please visit the ALPO Minor Planets Section online at http://www.alpo-astronomy.org/minor.

Jupiter Section

Report by Richard W. Schmude, Jr., section coordinator
schmude@gdn.edu

Jupiter will reach conjunction in late February and will be visible in the pre-dawn sky during April. The South Equatorial Belt was faint at the end of 2009 and it will be interesting to see if this belt is faint in April. This belt often returns in a sudden revival and so it is important that people monitor Jupiter during the spring.

The 2006-07 Jupiter apparition report is now finished and will be sent to the editor of this Journal soon. The 2006-07 report summarizes many interesting currents including a circulating current that was in the South Tropical Zone. This coordinator plans to start writing the 2008 apparition report in late February and the 2009 apparition report in May.

Please be sure to send me your Jupiter images directly or send them to the Jupiter group. You may also post images on the Arkansas Sky Observatory website. Please be aware that time does not permit me to view or acknowledge images that are posted on the Yahoo file upload space.

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

Galilean Satellite Eclipse Timing Program

John Westfall, assistant Jupiter section coordinator
johnwestfall@comcast.net

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 or e-mail to johnwestfall@comcast.net to obtain an observer's kit, also available on the Jupiter Section page of the ALPO website.

Saturn Section

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

Saturn is now visible well in the East before sunrise, situated in the constellation of Virgo at apparent visual magnitude +0.7, and observers have

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We ask all who are considering an online purchase of Orion astronomical merchan-

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been submitting drawings and images of Saturn in increasing numbers as the apparition progresses. Saturn will reach opposition on March 22, 2010, when the planet will be placed for favorable viewing most of the night. The northern hemisphere and north face of the rings are becoming increasingly visible as the ring tilt toward Earth increases throughout the next several years. Right now, the rings are inclined about +3.5° toward Earth. The table of geocentric phenomena for the 2009-10 apparition which accompanies this report is presented for the convenience of observers.

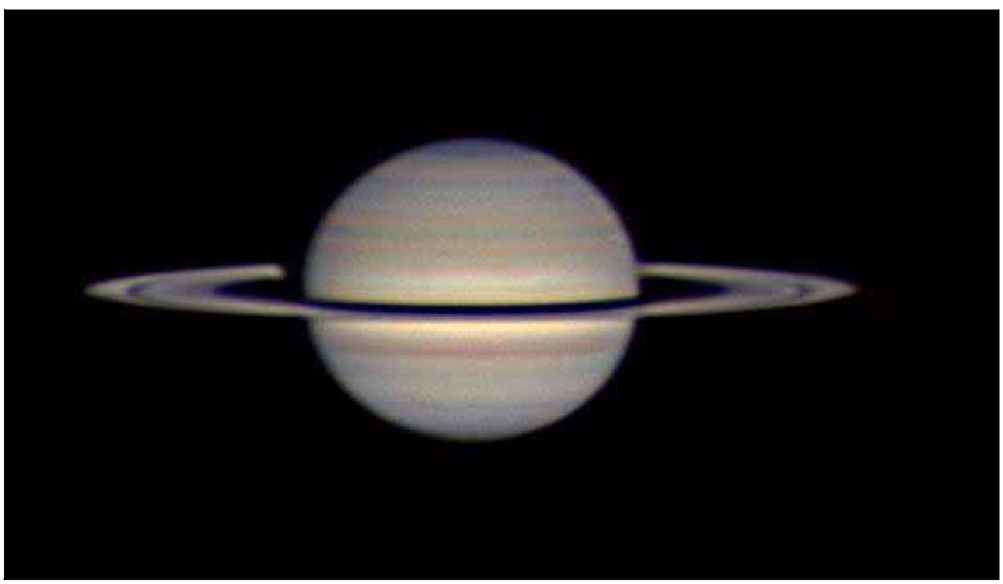
For the 2009-10 apparition, as was the case during the immediately preceding observing season, small inclinations of rings will allow observers to continue to witness transits, shadow transits, occultations, and eclipses of satellites lying near Saturn's equatorial plane. Apertures under about 20.3 cm (8.0 in.) are usually unable to produce the best views of these events, except perhaps in the case of Titan. Those 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 send their data to the ALPO Saturn Section as quickly as possible. Notes should be made of the belt or zone on the planet crossed by the shadow or satellite, and visual numerical relative intensity estimates of the satellite, its shadow, and the belt or zone it is in front of is important, as well as drawings of the immediate area at a given time during the event.

The following are important activities for ALPO Saturn observers and include Pro-Am opportunities in support of the ongoing Cassini mission:

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

Geocentric Phenomena for the 2009-2010 Apparition of Saturn in Universal Time (UT)

Conjunction	2009 Sep 17^d
Opposition	2010 Mar 22^d
Conjunction	2010 Oct 01^d
Opposition Data:	
Equatorial Diameter Globe	19.5 arc-seconds
Polar Diameter Globe	17.6 arc-seconds
Major Axis of Rings	44.4 arc-seconds
Minor Axis of Rings	2.4 arc-seconds
Visual Magnitude (m_v)	0.5 m_v (in Virgo)
B =	+3.2°



.Saturn image taken on February 6, 2010, 17:56 UT by Tomio Akutsu of Cebu, Philippines, at visual wavelengths using a 35.6 cm (14.0 in.) SCT in S = 6 and Tr = 4. South is at the top of the image. Ring tilt is +4.5°. CMI = 62.4°, CMII = 299.0°, CMIII = 103.5°.

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- Multi-color photometry and spectroscopy of Titan at 940 nm – 1,000 nm.

- Imaging Saturn using a 890 nm narrow band methane (CH_4) filter with apertures of 31.8 cm (12.5 in.) or larger to alert the Cassini team of interesting large-scale targets and suspected changes in belt and zone reflectivity.

- Regular digital imaging of Saturn and its satellites at various wavelengths.

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 ALPO Saturn Section appreciates the dedicated work by so many observers who faithfully submit their reports and images. Professional astronomers are continuing 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 at *www.alpo-astronomy.org/saturn*.

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
schmude@gdn.edu

Feb. 14 - -The planets Uranus and Neptune are in conjunction with the Sun during March and February, respectively. By early May, they should be visible in the pre-dawn sky. Pluto will be in the morning sky during March-May. It will reach opposition in late June. Pluto is undergoing changes according to recent images made by the Hubble Space telescope. Any brightness measurements of Pluto would be greatly appreciated.

I am planning to write the 2009 apparition report for Uranus and Neptune sometime in June. I will also send out finder charts for both planets at that time.

There were not many observations submitted during 2009 and, hence, the apparition report will be thin. Brian Loader was able to continue making brightness measurements in 2009 from his site in New Zealand. If you have observations/measurements of the remote planets in 2009, then please forward them to me as soon as possible.

A reminder that my book, *Uranus, Neptune and Pluto and How to Observe Them*, is now available from Springer at *www.springer.com/astronomy/popular+astronomy/book/978-0-387-76601-0* or elsewhere (such as *www.amazon.ca/Uranus-Neptune-Pluto-Observe-Them/dp/0387766014*) to order a copy.

Visit the ALPO Remote Planets Section online at *http://www.alpo-astronomy.org/remote*.

ALPO Solar Section Report

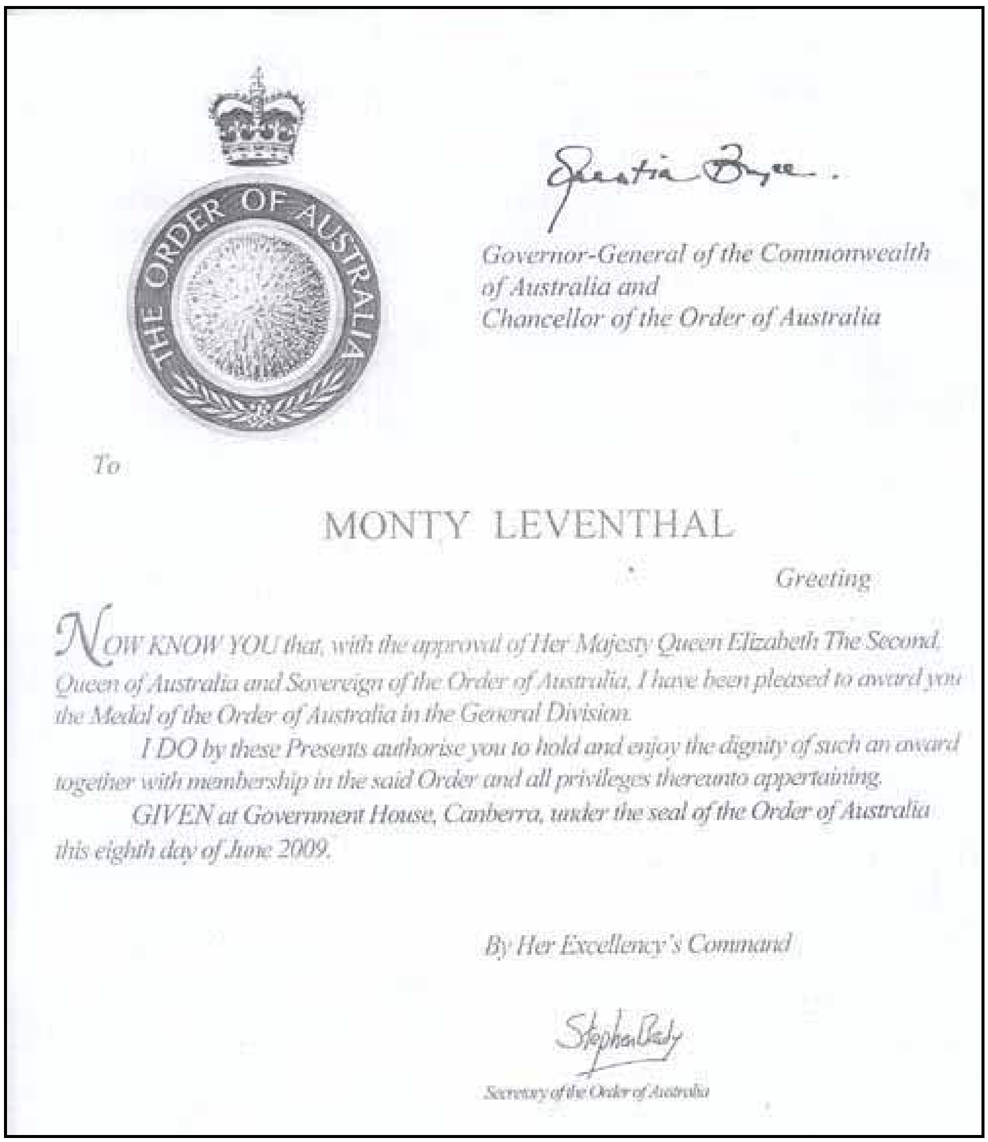
Report by Kim Hay, coordinator
ALPO Solar Section
kim.hay@alpo-astronomy.org

Back in 2008, David Salinger contacted me for information about an application for the Order of Australia for one of our long-time solar observers, Monty Leventhal (Figure 1). I am proud to announce that on June 7, 2009, Monty was presented with this great honor and, as he states, "It was one of the greatest moments of my life which I will never forget."

The information given to David Salinger for Monty's award (Figure 2) was about his long-time contribution to amateur solar observing. Monty sketches sunspots and solar phenomena on a well-documented form, and also uses his H-alpha filter to sketch on the prominences that are seen on the same observation sheet. The equipment used for his observing is a 10-inch Schmidt-Cassegrain telescope at focal length 2,500 mm, with an f/10 focal ratio. He observes with a 40-mm eyepiece giving a magnification of 62.5, a full-aperture solar filter, and a 6 Å H-alpha filter at f/30. In addition, he takes digital filtergrams of the prominences and flares. Monty is also a member of the British Astronomical Association (*http://britastro.org/baa/*), Astronomical Association of Queensland (*http://www.aaq.org.au/cms/index.php*), and the Sydney City Skywatchers (*http://www.sydneycityskywatchers.asn.au/*), whose Solar Section he looks after.

Monty has been submitting images to the ALPO Solar Section since Carrington Rotation 1992 (July 2002). On behalf of the ALPO, I extend our congratulations to Monty on such a wonderful and well-deserved award. Please keep up the great work and thank you for your contributions to amateur science and solar observing.

Solar observers have certainly been on a roller coaster ride these last few months. Since the last noted ALPO Solar Section report of sunspot activity back in December 2009 (CR2091), we were coming out of Cycle 23 and waiting in anticipation of Cycle 24. With a few groups in January 2010 with magnetics of Cycle 23, soon there were groups appearing with the Cycle 24 magnetics. In particular, in mid-February, as AR1045, AR1046 (Cycle 24) and AR1047 (Cycle 23) spots emerged on the Sun, we were


THE ORDER OF AUSTRALIA

Governor-General of the Commonwealth of Australia and Chancellor of the Order of Australia

To

MONTY LEVENTHAL

Greeting

NOW KNOW YOU that, with the approval of Her Majesty Queen Elizabeth The Second, Queen of Australia and Sovereign of the Order of Australia, I have been pleased to award you the Medal of the Order of Australia in the General Division.

I DO by these Presents authorise you to hold and enjoy the dignity of such an award together with membership in the said Order and all privileges thereunto appertaining.

GIVEN at Government House, Canberra, under the seal of the Order of Australia this eighth day of June 2009.

By Her Excellency's Command

Secretary of the Order of Australia

Figures 1 and 2. (Above) ALPO Solar Section honoree Monty Leventhal; (right) certificate announcing his being awarded the Medal of the Order of Australia.

treated with groups from both cycles, as pointed out by one of our members, Alan Buck. This was confirmed by images and information on the SOHO site (*http://*

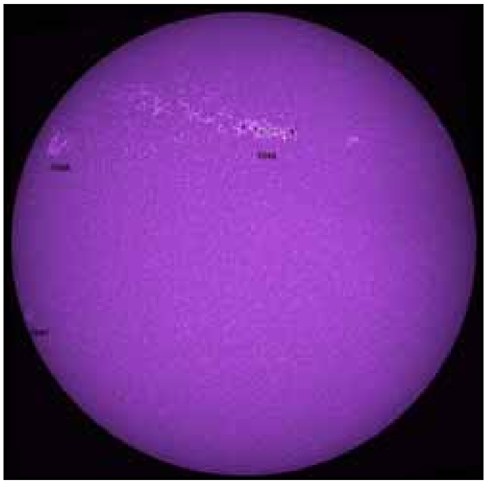


Figure 3. Two-image composite of Carrington Rotation No. 2093 by Howard Eskilden of Ocala, Florida, USA, taken February 8, 2010, 13:06 UT. Solar altitude, 14°; seeing, 3/10; sky conditions, scattered clouds with light wind. Equipment details: Orion 80 ED refractor, equatorial mount,electric drive; aperture, 80 mm; focal length, 600 mm; focal ratio, 7.5; solar filter, Lunt B600 Calcium K-Line. Imaging system, DMK 41 AU02.AS. North at top, east at left.

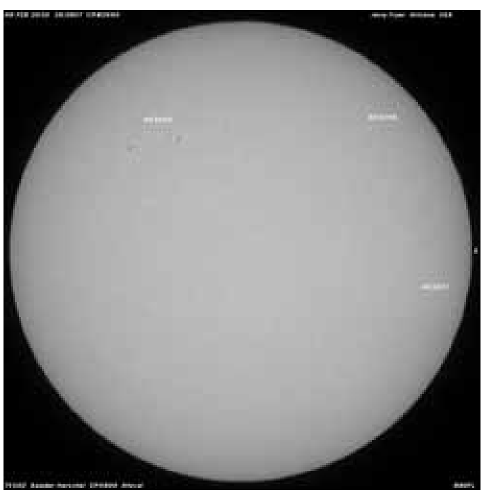


Figure 4. Image of Carrington Rotation No. 2093 by Jerry Fryer of Scottsdale, Arizona, USA taken February 9, 2010, 18:08 UT. Equipment details: Tele Vue TV-102 (2-element, f/8.6, APO air-spaced doublet) refractor; Baader Herschel Wedge; aperture, 4 in. (102 mm); focal length, 880 mm. Afocal imaging system: Nikon CP4500. North at top, east at left. No other details available.

sohowww.nascom.nasa.gov/data/realtime/realtime-update.html)

An image (Figure 3) by Howard Eskildsen in CaK taken on February 8, 2010, of the above-mentioned solar groups and a white-light image (Figure 4) by Jerry Fryer taken on February 9, 2010 shows the same groups and the changes in their growth or morphology.

Howard did an experiment and took two images on February 8, four hours apart in CaK, and showed the morphology of sunspot group AR1045 (see Figure 5). This particular sunspot group produced several M-class flares throughout the week, ranging from M2.97 to M6.4. There had been reports of aurora in the high northern latitudes, but nothing down in the middle latitudes. For more information on auroral activity go to *http://www.swpc.noaa.gov/pmap/*NOAA Space Weather Prediction Center.

Watching the morphology of any sunspot group – especially now with digital cameras and video equipment – is something that our observers should do more often. By studying the morphology, you can learn about the magnetics of the Sun and its changing structure. The Sun is always changing and we are now coming into a time of solar observing as never before.

Once the NASA Solar Dynamics Observatory (SDO) is in its final orbit after being launched on February 11, it will be sending back terabytes of solar information daily. This satellite is under the NASA “Living with a Star” program, and is scheduled to operate for five years. However, SOHO just celebrated its 10th year in operation — way past its original life-expectancy.

Keep those observations coming in, and send them to *kim.hay@alpo-astronomy.org*. Make sure that the time recorded is in UT time, date, and that your equipment is listed; also record the Carrington Rotation number. For a listing of these, go to the web page address below (it is listed under the right column under ALPO Carrington Solar Section Rotations). Record the eyepieces and filters used. Please submit your images in file sizes between 200-250 kilobytes.

When marking your sunspots or when you see pores, make sure you use only the NOAA information for sunspots. In order for a sunspot to be classified, it must go through a list of criteria before becoming a

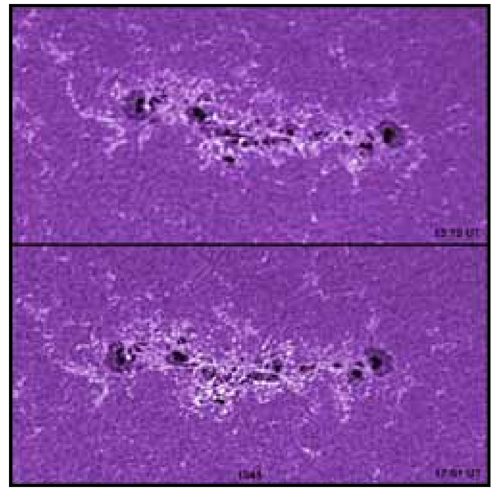


Figure 5. Two images of Carrington Rotation No. 2093 by Howard Eskilden of Ocala, Florida, USA, taken February 8, 2010; top image taken at 13:10 UT, bottom image taken at 17:01 UT; seeing, 3/10. Equipment details: Orion 80 ED Refractor, equatorial mount,electric drive; aperture, 80 mm; focal length, 600 mm; focal ratio, 7.5; solar filter, Lunt B600 Calcium K-Line. Imaging system, DMK 41 AF02.AS 2X Barlow. North at top, east at left in both images.

sunspot; pores can come and go in only minutes. Only record what you see and not what others may see; that is what makes our solar observing very informative, and archived with documentation of current conditions which are different everywhere around the world. Join our Solar ALPO group at yahoo.com and learn what others are seeing and doing. We now allow file attachments to come through to the list, so images are being posted of the recent activities on the Sun.

I urge you all to make written submissions to me on your observing techniques, studies and research.

Finally, our ALPO Solar Section website has now been transformed into the new WordPress layout, and can be seen here by accessing *www.alpo-astronomy.org/solarblog*. Updates will be happening all the time, and some items are still not linked to but will be coming in the near future.

Enjoy observing our Sun in our new Cycle 24, in whatever medium you use, and remember it’s always better to document an observation with more information for future use and to have it archived on our website.

A.L.P.O. Solar Section

OBSERVER____

ADDRESS____

DATE/TIME____UT

SEEING__________ CLOUDS__________ WIND__________

APERTURE________mm FOCAL LENGTH________mm TYPE_____

EYEPIECE_____mm FILTRATION______________________

OBSERVATION: *DIRECT* OR *PROJECTED*? (CIRCLE ONE)

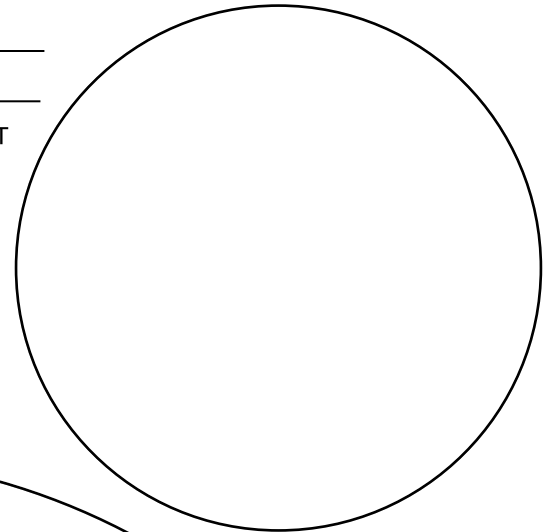
ROTATION___________

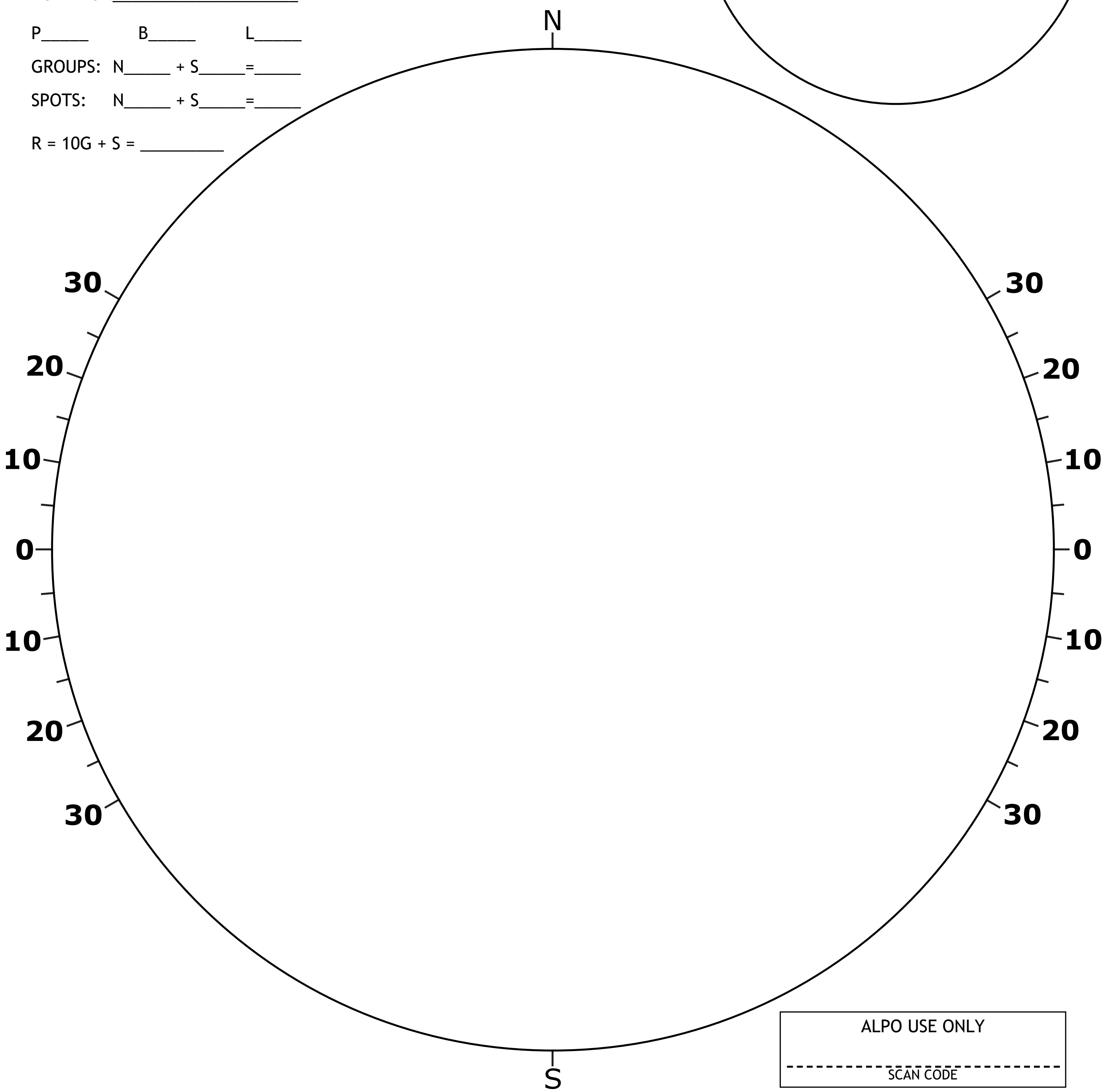
P_____ B_____ L_____

GROUPS: N_____ + S_____=_____

SPOTS: N_____ + S_____=_____

R = 10G + S = _________





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Book Review

The Sun and How to Observe It

Review by Rik Hill,
rhill@lpl.arizona.edu

The Sun and How to Observe It by Jamey L. Jenkins, 2009, published by Springer, ISBN-10: 0387094970 and ISBN-13: 978-0387094977; 210 pages, paperback; 8.8 x 7 x 0.5 inches, list price $34.95, though $22.49 at Amazon.com

With the Sun doggedly clinging to its minimum of activity, it may seem an odd time to bring out a new book on solar observing. Indeed, why even have another book on observing the Sun? Hasn't that topic been worked to death? When Dr. Mike Ingler at Springer first approached me to write this book, I had to turn down the offer. I recommended American amateur solar observer Jamey Jenkins for the job and I must say that I am glad he took on the task as he made an excellent job of it.

In his first chapter, Jenkins gives a concise, yet comprehensive description of our star, the Sun, in only 16 pages. Too many books on the subject get bogged down in this.

From here he moves on to Chapter 2 where he asks the blasphemous question, "Why Study The Sun?". It is answered in both technical as well as aesthetic terms condensed from the comments of "a number of solar observers". I was glad to see that not only does he answer the question in terms that should encourage every amateur astronomer to engage in solar observing, but also addressed the hazards right up front. Too often publishers will shove such warnings to the end of a chapter, or worse the end of the book. In these warnings, he suggests an experiment to impress the novice in the amounts of energy being collected by the telescope. However, he suggests pointing the unfiltered telescope at the Sun to perform the experiment. This is probably not a good idea with compound telescopes like Schmidt-Cassegrains or Maksutov-Cassegrains as the corrector is quite close to the focus of the primary and can heat suddenly and rapidly and crack. I have personally seen this (refer to chapter 2 comments). Also, some manufacturers use plastic parts and adhesives in these telescope that can melt or heat to where they out-gas and coat the optics inside with the fumes. Otherwise I liked the precautions, which included personal experiences.

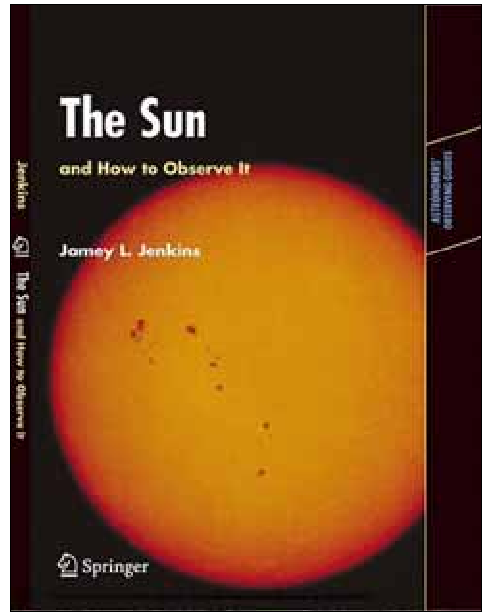
Also in Chapter 2 is a good discussion on observing conditions, how to improve them, and a nice seeing estimator table.

Chapter 3 discusses the advantages and drawbacks of using various nighttime telescopes for solar observing and considerations for designing and building a telescope exclusively for solar observing. Here we do find an admonishment about NOT using catadioptric telescopes for solar projection and avoidance of plastic parts near the focus.

An excellent review of the (unsafe) history of solar filtration and available solar filter materials currently on the market, and how to test them before use and over the years of use is presented.

This is followed by a further overview on dedicated solar telescopes. I was glad to see Art Whipple's telescope highlighted in this chapter. He does some of the finest white light observing in the amateur community.

Solar white light phenomena are discussed in Chapter 4, from the Active Regions to white light flares (WLFs). The author does not go into the physics of these, but rather discusses them from an observational standpoint and then ends the chapter



with a brief description of the heliographic coordinate system and suggestions for recording observations.

The recording of observations is dealt with in greater detail in Chapter 5 as different modes of observing programs are presented. I was glad to see the nice, and accurate, description of the focus of the AAVSO Solar Division program versus the ALPO Solar Section program. This is the first book that has gotten that correct.

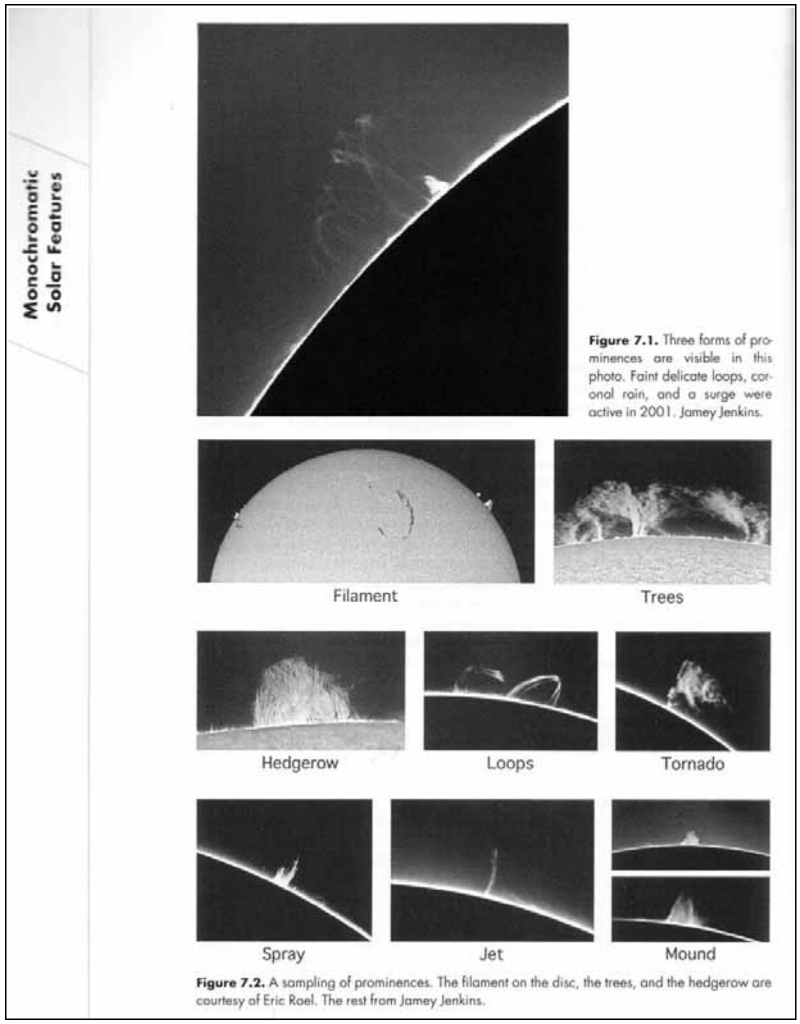
The author takes us on a typical observing session at his observatory and thus answers a lot of questions on procedures. Under the section dealing with sunspot counting, Jenkins takes the time to go into the question of what is a "spot" and what is not in sunspot counting. This is perhaps the most often asked question by the beginning solar observer.

The word "photography" or "photograph" is used a lot, but with no mention of film types and techniques. Does anyone really use film any more? Jenkins takes this on in a parenthetical note that his use of these words as synonymous with "imaging" or "image" in the modern digital vernacular. He discusses many suggestions to the reader for imaging projects and how best to carry these out. Then he gives real life examples of how these have worked in the past.

Monochromatic observing modes are the theme of Chapter 6 with descriptions of instrumentation and even a short gazetteer on the terminology used with these instruments. Jamey helps the new observer determine what kind of telescope to choose for monochromatic observing as well as the filtration systems and what kind of observing for which they are best suited, such as wideband filters for prominence viewing versus sub-angstrom filters for the extreme detail on the chromosphere. He also takes the reader through the pros and cons of filtration systems, those that do most of the filtration at the eyepiece end versus those that do much of the filtering at the objective. He discusses not only H-alpha filters but the Calcium-K filters as well. Many other tips and peripheral devices are included in the material making for a very comprehensive presentation on these instruments.

From here, the author goes on in the next chapter to an overview, with many images as examples, of the monochromatic features visible in both H-alpha and the Calcium. The author even discusses how to use a micrometer to measure some of the features! Way to go Jamey!!

In Chapter 8, Jamey discusses what he calls the "hobby within a hobby", or the art of solar photography — film and digital — including webcams. Many home-brewed gadgets are discussed and photographed to give the observer some inspiration to invent and experiment. This is followed by a few sections that help the solar observer process the images getting the most out of them. I would like to have seen a table of the various freeware and software available and an evaluation of what they can and cannot do in this regard.



Attractive, balanced page layout make for easy reading of *The Sun and How to Observe It*.

The book ends with a two page section entitled "Where do you go from here?" where the "lone wolf" solar observers are directed to clubs and organizations and given some encouragement to build their own website with their own observations.

This is followed by three great appendices. The first lists organizations that engage in solar observing of one type or another, manufacturers of solar equipment, and "Photographic Suppliers" which includes digital equipment.

The second appendix is a fairly comprehensive glossary of solar terms. The reader thoroughly familiar with all of these is anything but a tyro.

The last appendix is the only thing that will surely date the book. It is a solar ephemeris from 2008-2012. I might have referenced two or three on-line sources instead, but these are useful for the interval covered.

Jamey Jenkins has added a lot of new information on equipment, procedures and observations to the large library of solar observing that makes this well worth the read. I believe this book to be a good addition to the collection of such books in existence. In fact, if you only have one book on the Sun in your library, it should be this one. The book is well done, comprehensive without being wordy and an inspirational delight to read and would be particularly useful to observers new to solar observing.

Feature Story: Venus

ALPO Observations of Venus During the 2006 Western (Morning) Apparition

By Julius L. Benton, Jr., coordinator ALPO Venus Section
jlbaina@msn.com

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

Abstract

The report provides a summary of the results of an analysis of 224 photo-visual observations submitted to the ALPO Venus Section during the 2006 Western (Morning) Apparition by a total of 18 observers residing in Italy, Germany, Canada, Japan, The Netherlands, United Kingdom, and United States. Types of telescopes employed when making these observations and data sources are described, along with comparative studies of visual and photographic data. The apparition report is based on images at visual, 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 atmospheric markings on Venus reported at visual wavelengths or captured on digital images 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 noted, as well as status on the continued monitoring of the dark hemisphere of Venus for the Ashen Light.

Introduction

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. Eighteen observers contributed a total of 224 visual drawings and digital images of Venus to the ALPO Venus Section during the 2006 Western (Morning) Apparition, and *Table 2* gives their observing locations, number of observations submitted, and instruments used.

Observational monitoring of the planet this apparition was fairly consistent. Observers made drawings or imaged Venus up to about two weeks before Superior Conjunction, which occurred on October 27, 2006. Observational coverage of Venus from beginning to end during every apparition is always our goal, and such regular surveillance of the planet is becoming the norm in recent years. The 2006 viewing season ranged from January 14 to October 16, 2006, with 77.7% of the observations occurring between March and August 2006. Over this period, Venus passed through greatest brilliancy (-4.6mv), maximum elongation (47.0°) from the Sun, and dichotomy (half-phase).

Figure 2 shows the distribution of observations that were contributed by nation of origin for the 2006 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 (35.3%) were from the United States, and they contributed only 19.6% (see *Figure 3*) of all reports, drawings, and images; in contrast, 64.7% of contributing observers and the 76.2% of all observations came from other countries. The international flavor of our programs, therefore, continued during 2006, and the ALPO Venus Section seeks to sustain this global cooperation of observers in the coming years as we collectively pursue the unique challenges presented by Venus to both visual observers and digital imagers alike.

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.

All Readers

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

Online Features

Left-click your mouse on:

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

Observing Scales

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

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

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

IAU directions are used in all instances.

Telescopes used in making observations of Venus in 2006 are shown graphically in *Figure 4*, where it can be seen that nearly all (99.1%) observations were made with telescopes equal to or exceeding 15.2 cm (6.0 in.) in aperture. Schmidt-Cassegrains were employed nearly two-thirds (62.1%) of the time for digital imaging and visual studies of Venus during the apparition. Visual observers typically utilized refractors and Newtonians to produce 33.1% of the data. Throughout the apparition, all observations were made under twilight or generally light-sky conditions, and several individuals tracked Venus into the bright daylight sky after sunrise to cut down on the overwhelming glare of the planet's illuminated disk. This procedure also allowed observers to see and image Venus when it was higher in the sky, thus avoiding image degradation and less-than-favorable seeing near the horizon.

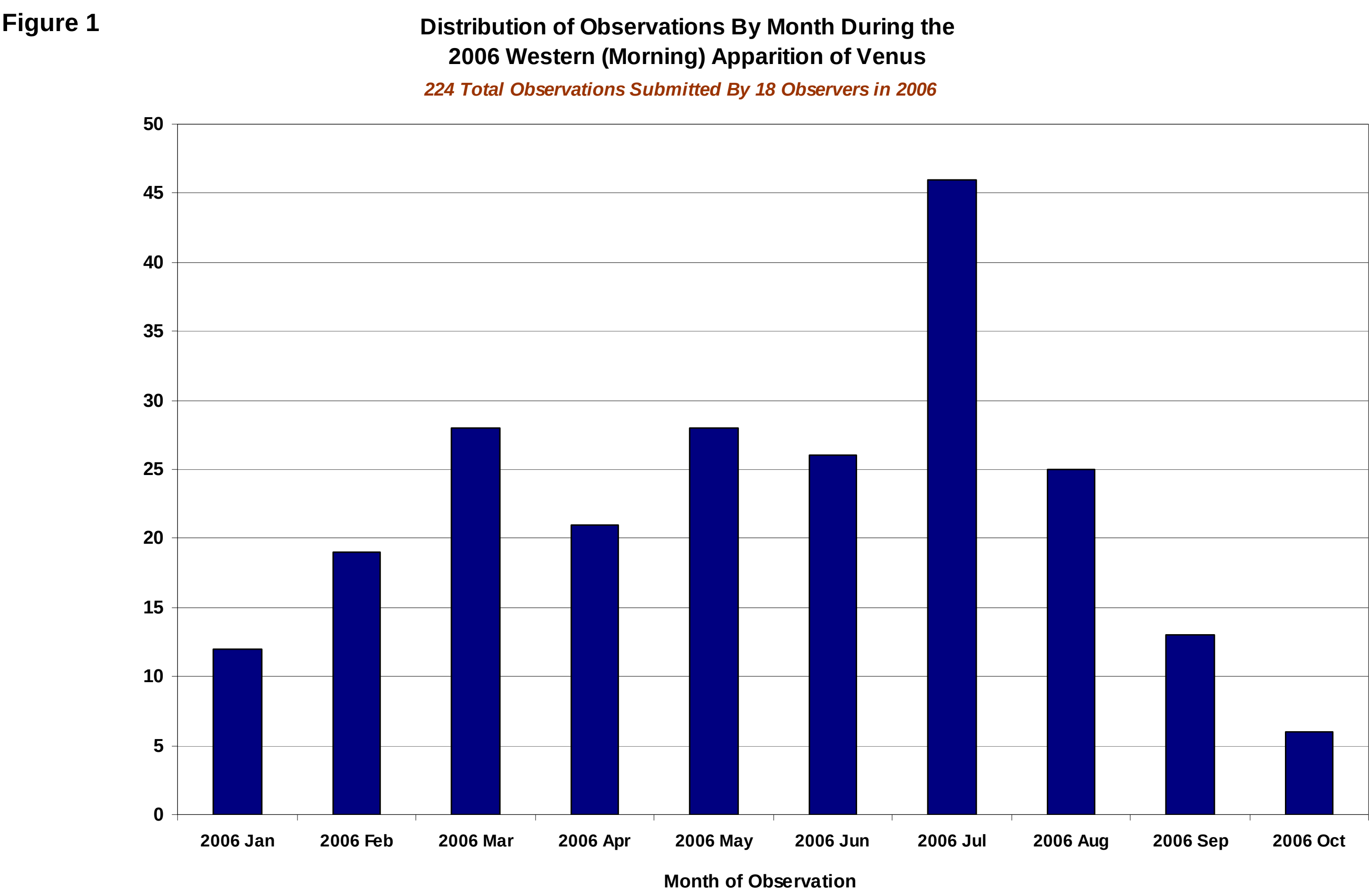
Table 1: Geocentric Phenomena in Universal Time (UT) for the 2006 Western (Morning) Apparition of Venus

Inferior Conjunction	2006 Jan 14^d 00^h UT
Initial Observation	Jan 14 11
Greatest Brilliancy	Feb 17 20 (m_v = –4.6)
Greatest Elongation West	Mar 25 07 (47.0°)
Dichotomy (predicted)	Mar 26 05.04
Final Observation	Oct 16 10
Superior Conjunction	Oct 27 18
Apparent Diameter (observed range): 63.0" (2006 Jan 14) ↔ 9.73" (2006 Oct 16)	
Phase Coefficient, ***k*** (observed range): 0.005 (2006 Jan 14) ↔ 0.998 (2006 Oct 16)	

The author expresses his sincere gratitude to all eighteen observers mentioned in *Table 1* for their digital images, excellent drawings, and accompanying descriptive reports during the 2006 observing season. The diligent efforts of these individuals is highly commendable, since viewing or imaging 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 considerable growth in the number of submitted digital images of Venus taken at visual and other wavelengths, and nearly all of the results have been remarkable, especially UV and IR images. The ALPO Venus Section encourages

Figure 1



digital imagers to routinely image the planet at different wavelengths, but as crucial as these high-tech methods are to the success of our programs, observers should never mistakenly believe that well-executed drawings of the planet are outmoded. 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. While visual observations invariably suffer from an inherent level of subjectivity, it is precisely for that reason that we emphasize the enormous value of simultaneous observations as a means of verifying and confirming the often illusive atmospheric phenomena of Venus. There is no doubt that routine simultaneous visual observations concurrent with digital imaging add a valuable collaborative dimension to data acquisition.

Table 2: ALPO Observing Participants, 2006 Western (Morning) Apparition

Observer and Observing Site	No. Obs.	Telescope(s) Used*
Arditti, David, Middlesex, UK	10	25.4 cm (10.0 in.) DALL
Bee, Ron, San Diego, CA	1	12.7 cm (5.0 in.) REF
Benton, Julius L., Wilmington Island, GA	32	15.2 cm (6.0 in.) EF
Boisclair, Norman J., South Glens Falls, NY	4 2	50.8 cm (20.0 in.) NEW 76.4 cm (30.0 in.) NEW
Bosman, Richard, Enschede, The Netherlands	4	28.0 cm (11.0 in.) SCT
Cudnik, Brian, Weimar, TX	1 3	20.3 cm (8.0 in.) SCT 35.6 cm (14.0 in.) SCT
Gasparri, Daniele, Perugia, Italy	2	23.5 cm (9.25 in.) SCT
Grego, Peter, Rednal, UK	1	12.7 cm (5.0 in.) MAK
Hatton, Jason P., Mill Valley, CA	1	23.5 cm (9.25 in.) SCT
Ikemura, Toshihiko, Osaka, Japan	2	31.0 cm (12.2 in.) NEW
Kingsley, Bruce, Maidenhead, UK	1	28.0 cm (11.0 in.) SCT
Lomeli, Ed, Sacramento, CA	1	23.5 cm (9.25 in.) SCT
Melillo, Frank J., Holtsville, NY	2 6	20.3 cm (8.0 in.) SCT 25.4 cm (10.0 in.) SCT
Niechoy, Detlev, Göttingen, Germany	102	20.3 cm (8.0 in.) SCT
Peach, Damian, Norfolk, UK	4	23.5 cm (9.25 in.) SCT
Roussell, Carl, Hamilton, Ontario, Canada	33	15.2 cm (6.0 in.) REF
Sussenbach, John, Houten, The Netherlands	5	28.0 cm (11.0 in.) SCT
Tyler, David, Bucks, UK	1 6	23.5 cm (9.25 in.) SCT 35.6 cm (14.0 in.) SCT
Total No. of Observers	**18**	
Total No. of Observations	**224**	

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

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 ***The Venus Handbook***. This valuable guidebook for observing the planet is now available either as a printed manual or as a *.pdf file for download. Also, readers with access to prior issues of this Journal may find it worthwhile to study previous apparition reports for a historical perspective on ALPO Venus observations.

A substantial number of the Venus observations in 2006 used for this analysis were made at visual wavelengths (in integrated light and with color filters), but the ranks of those regularly capturing digital images of the planet in integrated light, UV, and IR wavelengths continue to grow every 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 2006 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 literature referenced earlier in this report). *Figure 5* shows the frequency of the specific forms of markings that were reported by visual observers or captured by digital imagers at visual, 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% are not unexpected. Although conclusions from these data appear realistic, 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 visual and other wavelengths.

Many who carried out strictly visual work during the 2006 apparition commented on the difficulty of detecting the faint dusky atmospheric markings on Venus.This well-known characteristic of the planet is generally independent of the experience of the observer, and is a factor that often exasperates and discourages those who view Venus with their telescopes for the first time. At visual wavelengths, employing color filters and variable-density polarizers improves opportunities for seeing subtle cloud detail on the planet. Since the human eye is not sensitive to near-UV and IR wavelengths, the morphology of features revealed in digital images taken at those wavelengths is quite different from what is

Figure 2

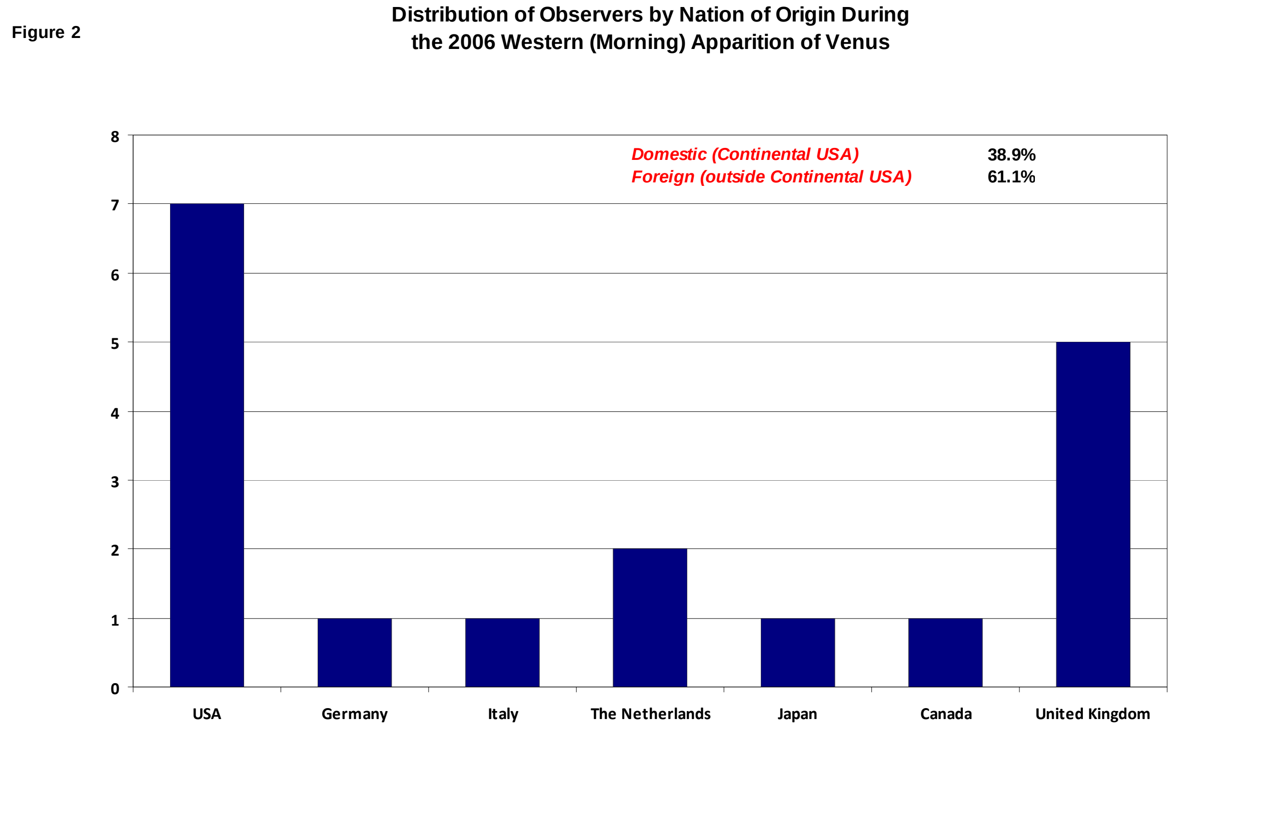
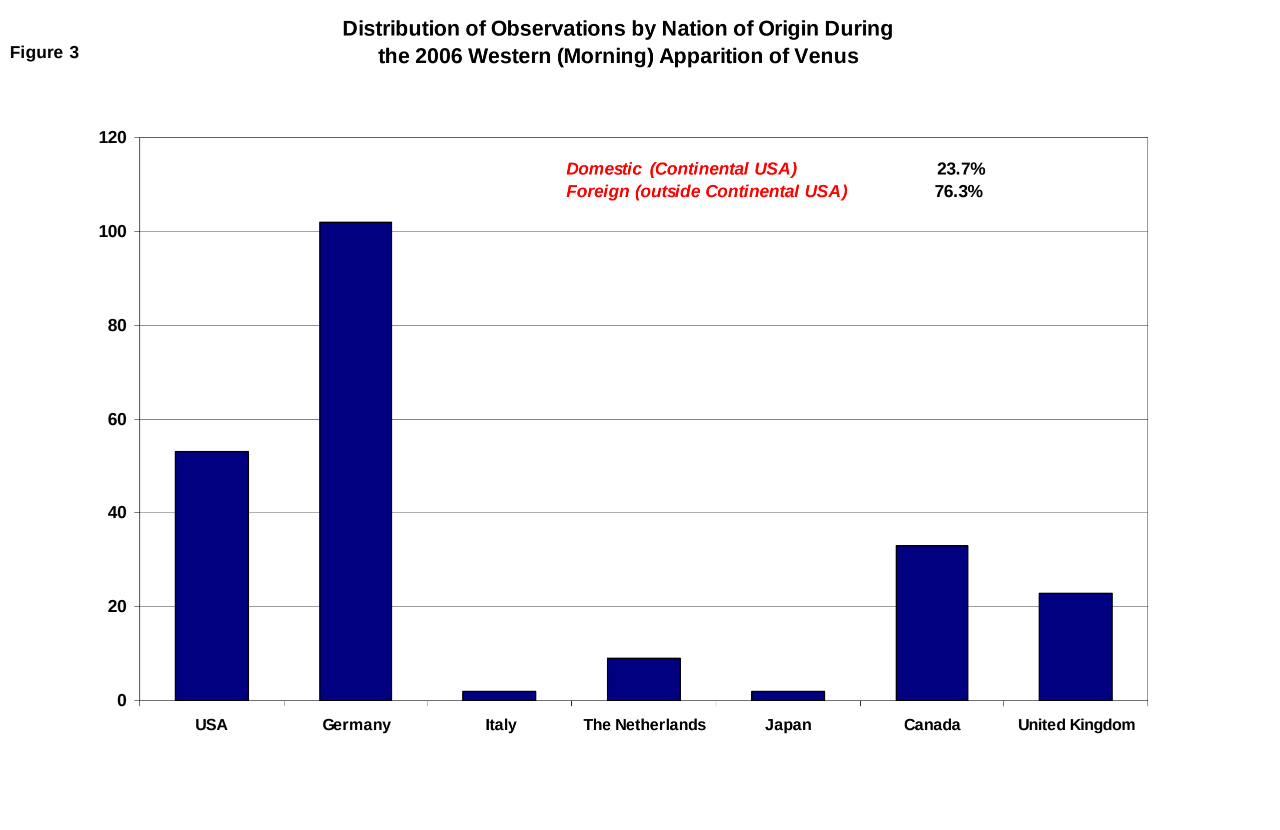


Figure 3



detected visually, especially radial dusky spokes or shadings. Despite this, digital images sometimes show almost exactly what careful visual observers have noted using color filters. So, as mentioned elsewhere in this report, in addition to visual work, we urge observers to attempt to capture images of the planet at various wavelengths for comparative analysis.

Figure 5 shows that only 10.4% of the observations and images of Venus in 2006 recorded a brilliant disc that was completely devoid of any markings, presumably 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" (76.0%), "Banded Dusky Markings" (78.1%), and "Irregular Dusky Markings" (47.4%) during the 2006 Western (Morning) Apparition, with 6.3% falling into the "Radial Dusky Markings" category. [Insert Illustrations No 003, 005, 006, 012, 013, 014, 019, 020, 021, 022)

Terminator shading was visible during most of the 2006 observing season and reported in 84.9% of the observations (see *Figure 5*), usually extending from one cusp region to the opposite one, and exhibited increasing intensity progressively from the terminator towards the bright planetary limb (Image 9). This gradation in brightness culminated in the Bright Limb Band in most accounts. Many of the digital images obtained at near-UV wavelengths this apparition showed terminator shading as well.

The mean relative intensity of all of the dusky features on Venus during the observing season ranged from 8.7 to 9.4. 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 2006 to rate their visual impressions at the eyepiece. On this scale, the dusky markings in Figure 5 had a mean conspicuousness of ~3.9 during the apparition, which suggests that these features fell within the range from very indistinct impressions and 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 5.7% 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 to help enhance the visibility of vague atmospheric phenomena on Venus. This may account for why some of the best drawings by experienced observers showed features similar to those captured on some of the digital images submitted this apparition.

The ALPO Venus Section is always looking 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 Venus over many years. Mikhail Lomonosov first suggested the presence of

Table 3: Discrepancies in Predicted and Observed Dichotomy, 2006 Western (Morning) Apparition of Venus

Observer	Julius L. Benton	Detlev Niechoy
a. UT Dates		
Observed (O)	2006 Apr 04.50	2006 Apr 04.31
Predicted (P)	2006 Mar 26.21	2006 Mar 26.21
Difference (O-P)	+ 09.29^{d}	+ 09.10^{d}
b. Phase (*k*)		
Observed (O)	0.500	0.500
Predicted (P)	0.500	0.500
Difference (O-P)	0.000	0.000
c. Phase Angle (*i*)		
Observed (O)	90.0°	90.0°
Predicted (P)	90.0°	90.0°
Difference (O-P)	00.0°	00.0°

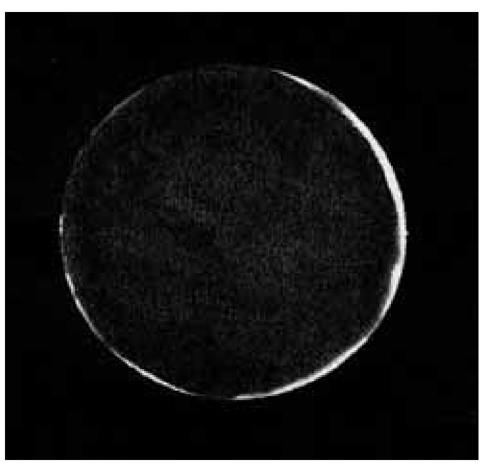


Image (1) Drawing. 2006 Jan 22d13h10m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 225X IL W15 filter, Seeing 5.0 (interpolated), Phase (k) = 0.033, South is at top.

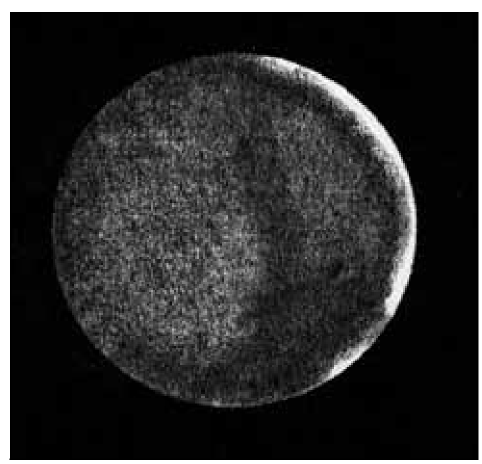


Image (2) Drawing. 2006 Jan 24d12h21m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 225X IL W47 filter, Seeing 5.0 (interpolated), Phase (k) = 0.046, South is at top.

Figure 4

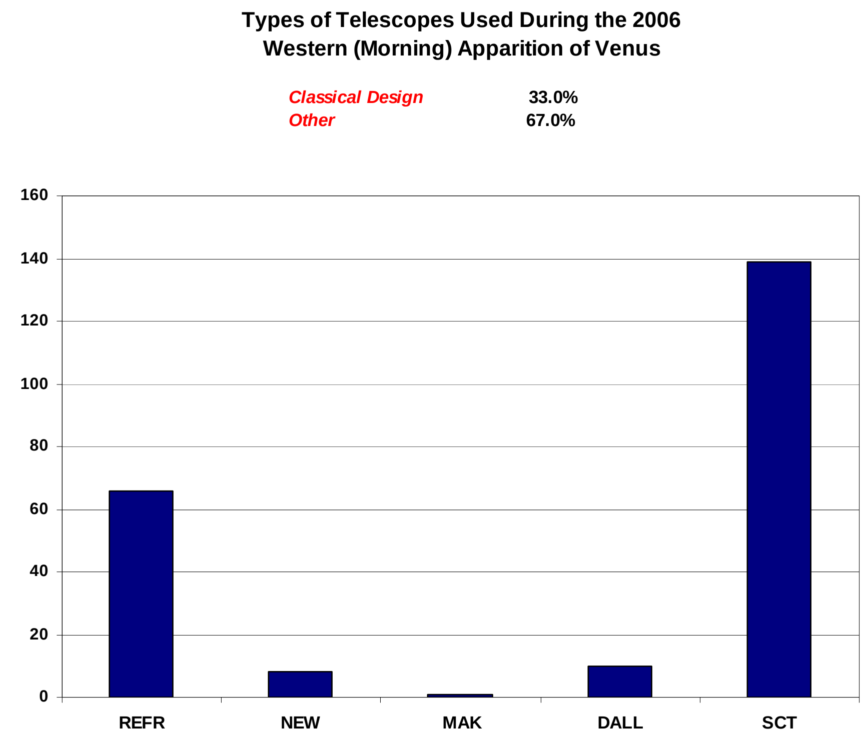
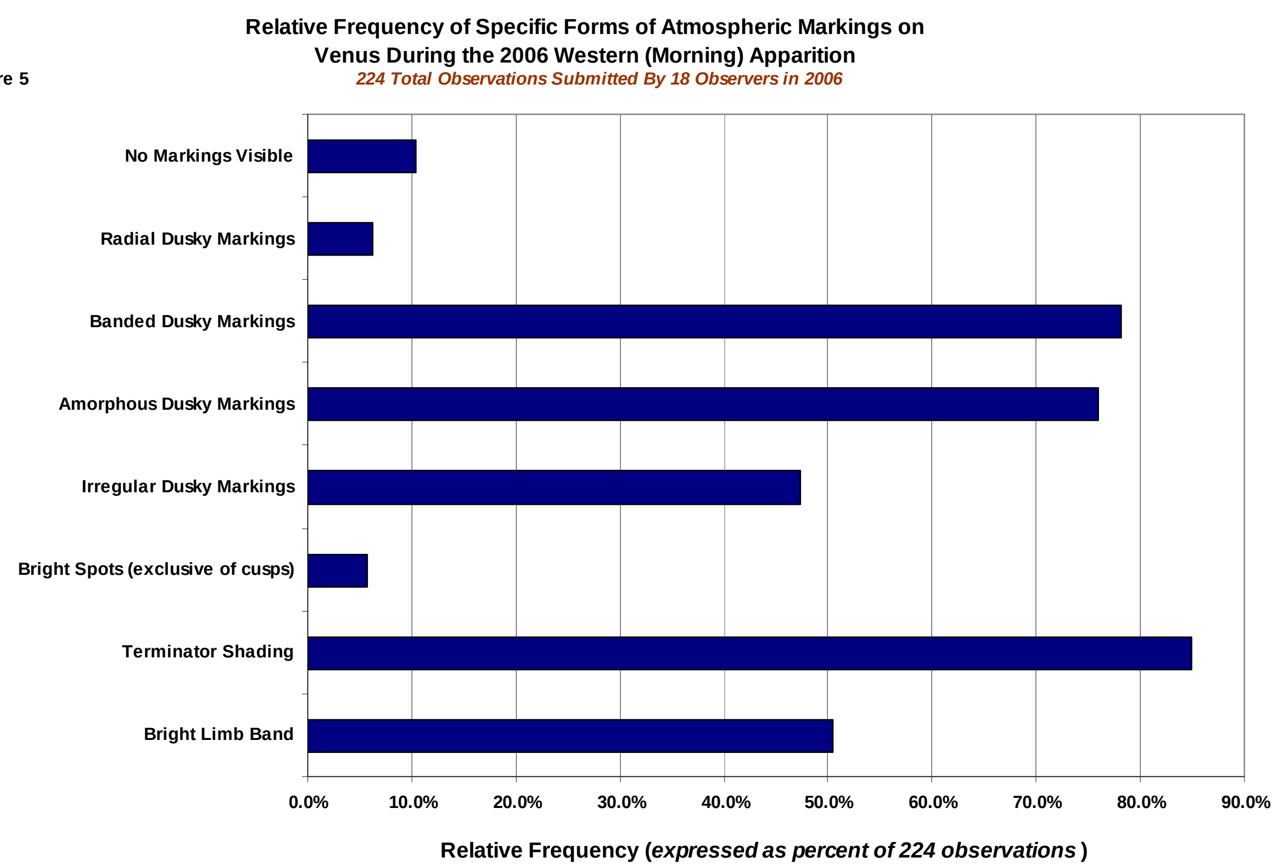


Figure 5



an atmosphere on Venus while observing the planet's solar transit in 1761 from 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. Today, amateur observers in ever-increasing numbers are capturing digital images of changing cloud features on Venus in the near-UV, as well as thermal emissions from its surface in the near-IR. Readers who have been keeping up with Venus reports in this Journal will recall that 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 1,000nm (1m) IR filter, captured historically unprecedented amateur digital images of the planet's night side emissions. Emanating from the hot surface of Venus, such emissions were successfully captured during the current Apparition at 1,000nm (1m) on February 1, 2006 at 05:40 UT with a 23.5 cm (9.25 in.) SCT by Daniele Gasparri of Perugia, Italy (Image 4).

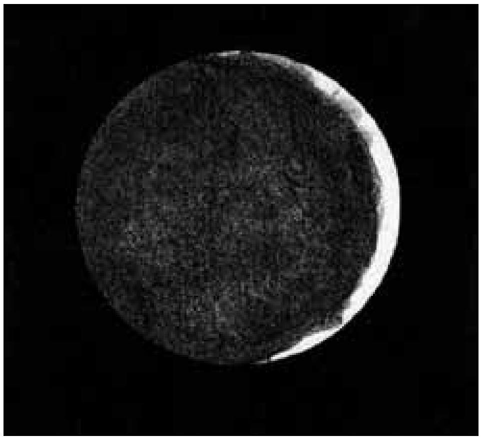


Image (3) Drawing. 2006 Jan 30d06h57m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 225X IL W15 filter, Seeing 5.0 (interpolated), Phase (k) = 0.096, South is at top.

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 in May 2006 and will continue to do so for another three years or so, with the possibility that the mission may get 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 wonderful chance for amateurs to try to get high-quality digital images of Venus in the wavelength range of 350nm to 1,000nm (near-UV to near-IR). For example, consider a UV image of Venus at 370nm taken by John Sussenbach of Houten, The

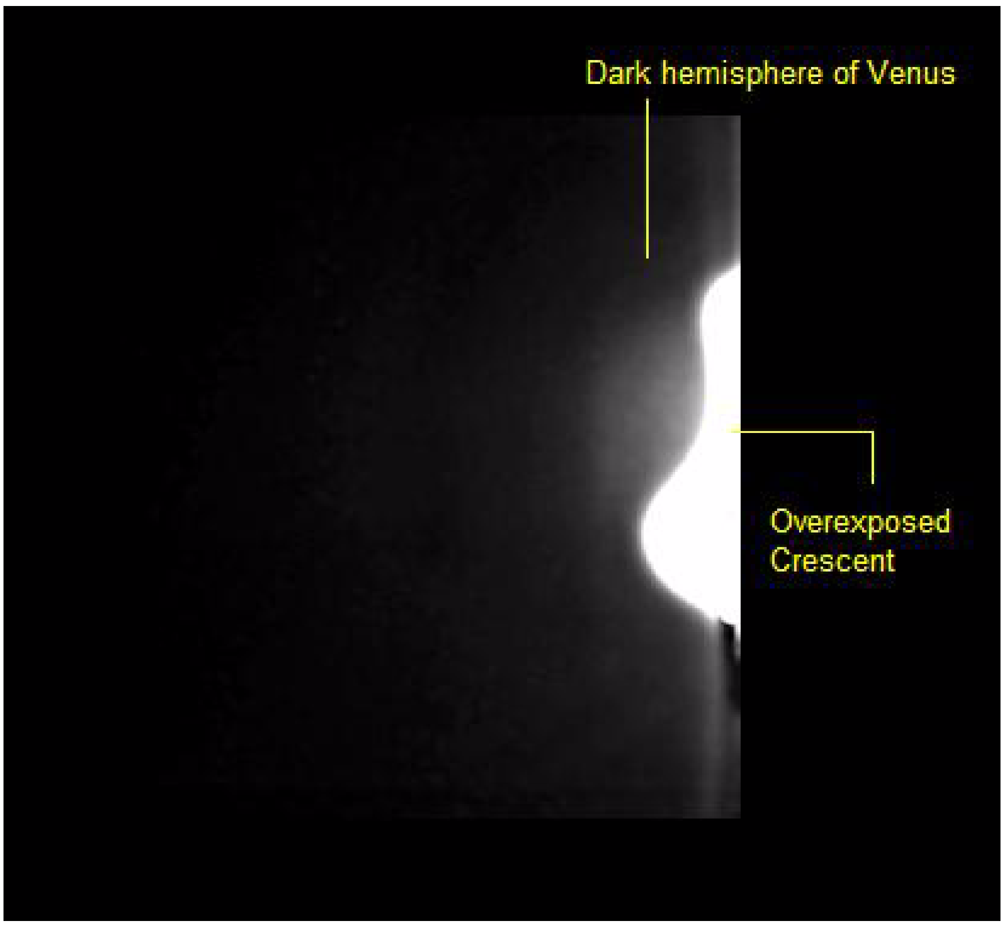


Image (4) Digital Image. 2006 Feb 01d05h40m UT, Daniele Gasparri, Perugia, Italy, 23.5 cm (9.25 in.) SCT, 1000nm IR Filter, Phase (k) = 0.108, South is at top.

Image (5) Digital Image. 2006 Feb 09d07h44m UT, David Arditti, Middlesex, UK, 25.4 cm (10.0 in.) DALL, 320-390nm UV filter, Phase (k) = 0.183, South is at top.

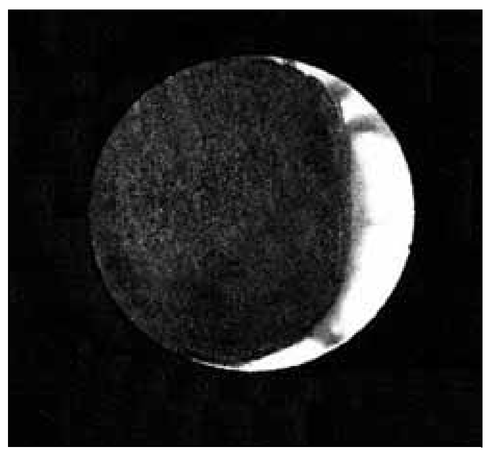


Image (6) Drawing. 2006 Feb 18d06h21m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 51X IL, Seeing 4.0 (interpolated), Phase (k) = 0.262, South is at top.

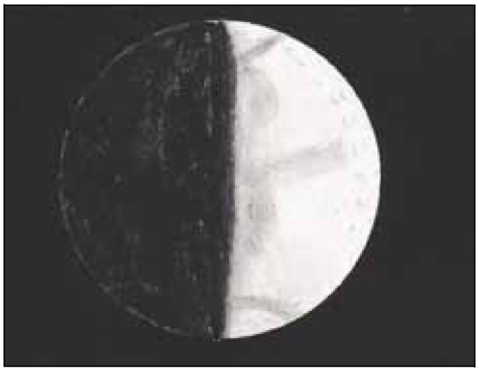


Image (7) Drawing. 2006 Mar 27d11h10m UT, Carl Roussell, Hamilton, Ontario, Canada, 15.2 cm (6.0 in.) REF, 200-400X IL + W25 W47 W58 filters, Seeing 5.0, Phase (k) = 0.507, South is at top.

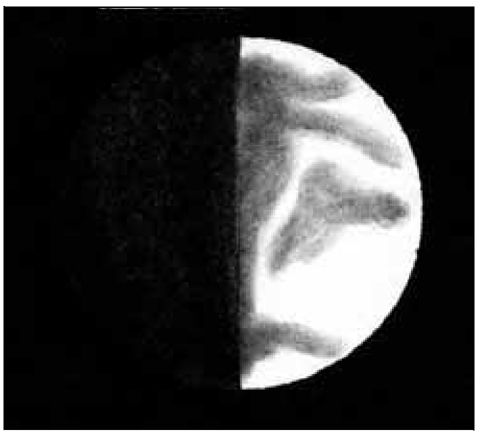


Image (8) Drawing. 2006 Apr 04d07h28m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 225X IL W47, Seeing 4.0 (interpolated), Phase (k) = 0.546, South is at top.

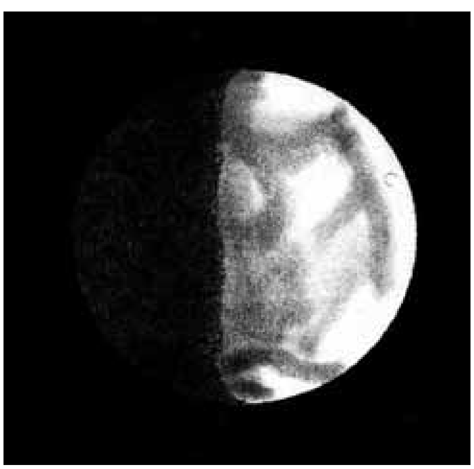


Image (9) Drawing. 2006 Apr 15d05h17m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 225X IL, Seeing 5.0 (interpolated), Phase (k) = 0.595, South is at top.

Netherlands on July 12, 2006 at 05:47 UT using a 28.0 cm (11.0 in.) SCT (Image 17) and another UV image captured by David Tyler of Bucks, UK, on the same date at 06:22 UT with a 35.6 cm (14.0 in.) SCT (Image 18). These two near-simultaneous observations, which were made less than a half hour apart, show very similar markings in the near-UV. Next, compare the features shown on a near-UV image by Damian Peach, observing from Norfolk, UK, on April 15, 2006, taken at 09:40 UT with a 23.5 cm (9.25 in.) SCT (Image 10) and one captured by Bruce Kingsley of Maidenhead, UK on the same date at 09:55 UT with a 28.0 cm (11.0 in.) SCT (Image 11). Now look at a drawing made by Detlev Niechoy observing from Göttingen, Germany using a 20.3 cm (8.0 in.) SCT at 225X with a W47 filter on July 9, 2006 at 07:05 UT (Image 15) and compare his visual impressions with dusky marking revealed on Venus in a near-UV image by Ed Lomeli of Sacramento, CA using a 23.5 cm (9.25 in.) SCT on the same date at 13:37 UT (Image 16). All of these near-simultaneous observations exemplify precisely the kind of work we are seeking from as many observers as possible during every apparition. 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 a continued 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 about half (50.5%) of the submitted observations and images in 2006 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 84.5% of the time, and interrupted or only partially visible along the limb of Venus in 15.5% of the positive sightings. The mean numerical intensity of the Bright

Image (10) Digital Image. 2006 Apr 15d09h40m UT, Damian Peach, Norfolk, UK, 23.5 cm (9.25 in.) SCT, 365nm UV filter, Seeing conditions not specified, Phase (k) = 0.596, South is at top.

Image (11) Digital Image. 2006 Apr 15d09h55m UT, Bruce Kingsley. Maidenhead, UK, 28.0 cm (11.0 in.) SCT, 370nm UV filter, Phase (k) = 0.596, South is at top.

Image (12) Digital Image. 2006 May 18d08h00m UT, Daniele Gasparri, Perugia, Italy, 23.5 cm (9.25 in.) SCT, UV + BG48 filter, Phase (k) = 0.720, South is at top.

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 62.0% of the observations in 2006. Amorphous, banded, irregular and radial dusky atmospheric markings appeared to blend with the shading along the terminator, probably contributing to reported deformities. Filter techniques enhanced the visibility of terminator irregularities and dusky atmospheric features closely associated with it during the current Apparition. Because of irradiation, bright features adjacent to the terminator may occasionally look like bulges, and dark features may look like dusky hollows. The terminator was also was more pronounced in near-UV images of Venus.

Cusps, Cusp-Caps, and Cusp-Bands

In general, when the *phase coefficient*, **k**, lies between 0.1 and 0.8 (the phase coefficient is the fraction of the disc that is illuminated), 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 2006.

When the northern and southern cusp-caps were observed in 2006, *Figure 6* illustrates that they were equal in size 90.1% of the time and equal in brightness in 90.8% of the observations (Image 7). The northern cusp-cap was considered larger 8.3% of the time and brighter in 5.0% of the observations, while the southern cusp-cap was larger in 1.7% of the observations and brighter 4.2% of the time. Neither cusp-cap was visible in about 1/3 of the submitted reports. The mean relative intensity of the cusp-caps was about 9.8 during the 2006 apparition. Dusky cusp-bands bordering the bright cusp-caps (Image 7) were not reported in 40.1% of the observations when cusp-caps were visible, and the cusp-bands displayed a

Image (13) Drawing. 2006 Jun 07d03h55m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 225X IL (no filter), Seeing 4.0 (interpolated), Phase (k) = 0.783, South is at top.

Figure 6

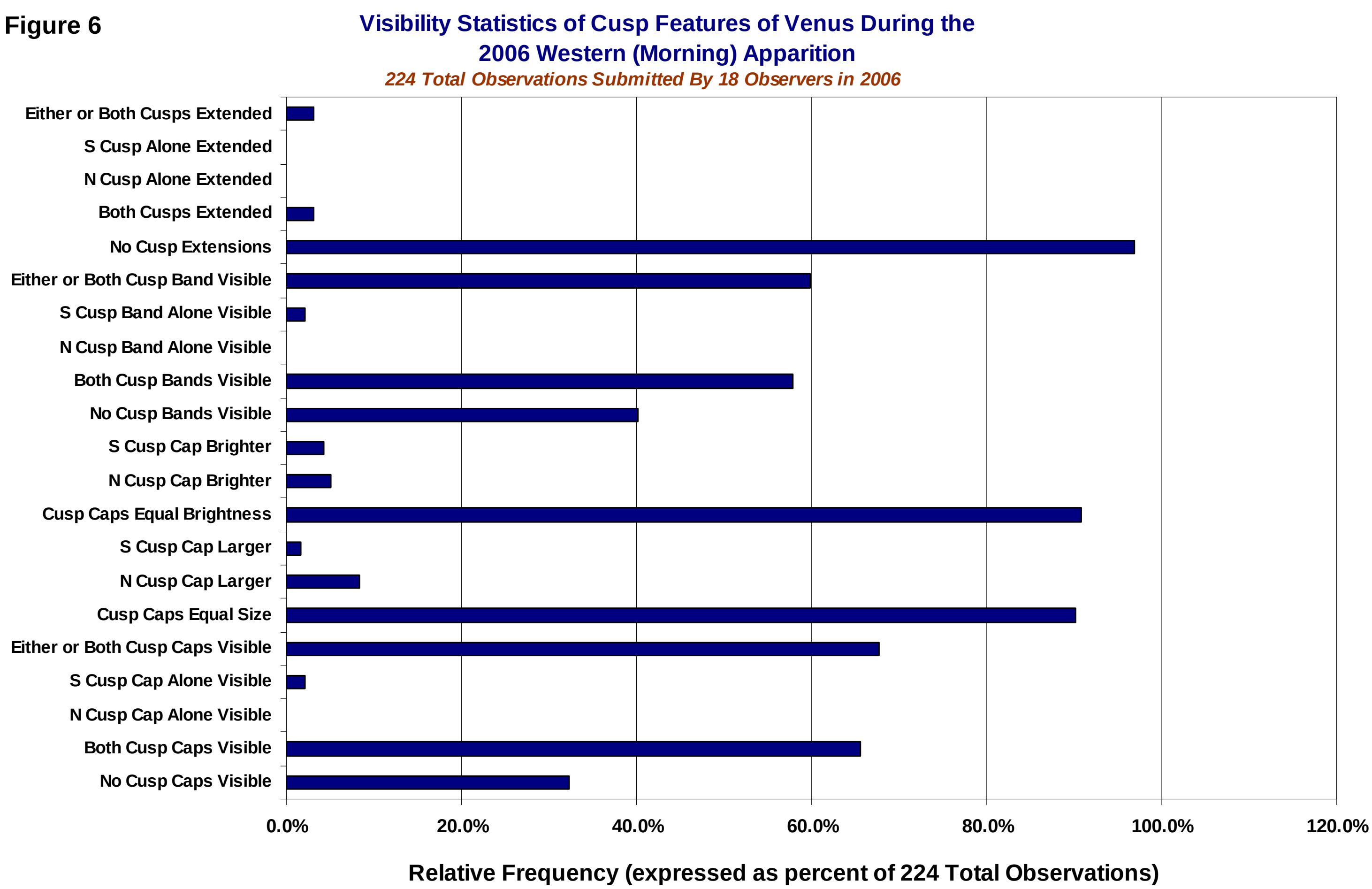


Image (14) Digital Image. 2006 Jun 11d04h02m UT, Richard Bosman, Enschede, The Netherlands, 28.0 cm (11.0 in.) SCT, 370nm UV filter, Phase (k) = 0.795, South is at top.

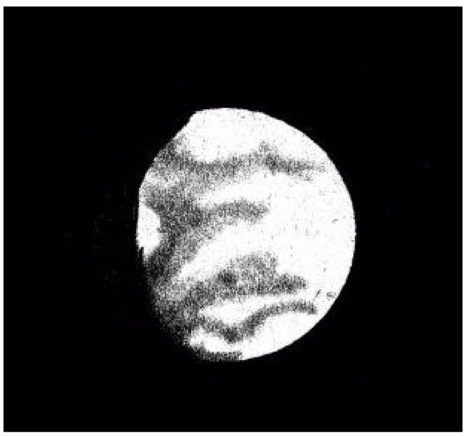


Image (15) Drawing. 2006 Jul 09d07h05m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 225X IL (no filter), Seeing 4.0 (interpolated), Phase (k) = 0.869, South is at top.

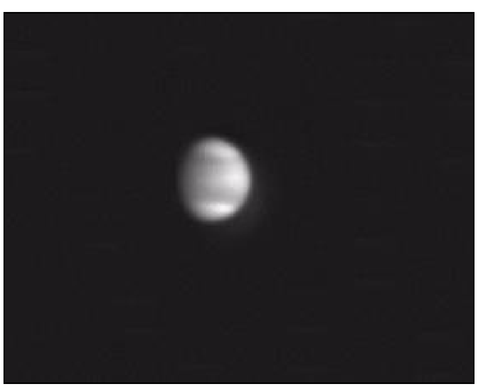


Image (16) Digital Image. 2006 Jul 09d13h37m UT, Ed Lomeli, Sacramento, CA, 23.5 cm (9.25 in.) SCT, UV filter, Seeing 6.0 Transparency 3.0, Phase (k) = 0.869, South is at top.

mean relative intensity of about 6.4 (see *Figure 6*).

Cusp Extensions

As is evident from *Figure 6*, no cusp extensions were reported beyond the 180° expected from simple geometry in 96.9% of the observations (in integrated light and with color filters). Early in the 2006 apparition, as Venus progressed through its crescentic phases following inferior conjunction on January 14, 2006, several observers recorded cusp extensions that ranged from 1° to 45°. For instance, in a drawing made roughly a week after inferior conjunction on January 22, 2006 at 13:10 UT, Detlev Niechoy sketched what appeared to be somewhat "broken" cusp extensions using a 20.3 cm (8.0 in.) SCT at 225X and a W15 deep yellow filter (Image 1). In general, cusp extensions typically show up better (if present) 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.

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 2006 Western (Morning) Apparition (Image 8). 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 2006 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 the Venus is was against a twilight sky.

Image (17) Digital Image. 2006 Jul 12d05h47m UT, John Sussenbach, Houten, The Netherlands, 28.0 cm (11.0 in.) SCT, 370nm UV filter, Seeing 5.0, Phase (k) = 0.876, South is at top.

Image (18) Digital Image. 2006 Jul 12d06h22m UT, David Tyler, Bucks, UK, 35.6 cm (14.0 in.) SCT, Baader UV filter, Phase (k) = 0.876, South is at top.

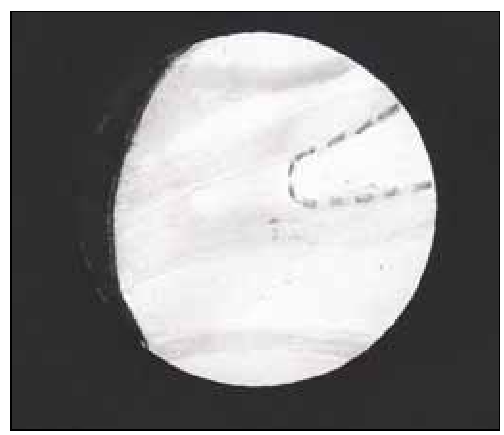


Image (19) Drawing. 2006 Aug 04d10h43m UT, Carl Roussell, Hamilton, Ontario, Canada, 15.2 cm (6.0 in.) REF, 200-400X IL + W25 W47 W58 filters, Seeing 5.0, Phase (k) = 0.924, South is at top.

Detlev Niechoy of Göttengen, Germany, was the only observer in 2006 to report suspicions of visibility of the Ashen Light in Integrated Light using a 20.3 cm (8.0 in.) SCT at 225X during late January into mid-February 2006 (Image 2). No other observers mentioned seeing or suspecting the Ashen Light, and there were no reports of the dark hemisphere of Venus appearing slightly *darker* than the background sky, which is attributable to a contrast effect.

Conclusions

Visual observations contributed to the ALPO Venus Section during the 2006 Western (Morning) Apparition suggested only limited activity in the atmosphere of the Venus. Readers are reminded how difficult it is to differentiate between what are real atmospheric phenomena and what is purely illusory on Venus at visual wavelengths, but higher confidence in visual impressions will improve as observers pursue simultaneous work. 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 2006 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 (violet) filter were consistent with what was shown on submitted images of the planet. Some observers seem to have a slight visual sensitivity in the near-UV range, so they occasionally 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.

Image (20) Digital Image. 2006 Aug 29d06h36m UT, David Arditti, Middlesex, UK, 25.4 cm (10.0 in.) DALL, 320-390nm UV filter, Phase (k) = 0.963, South is at top.

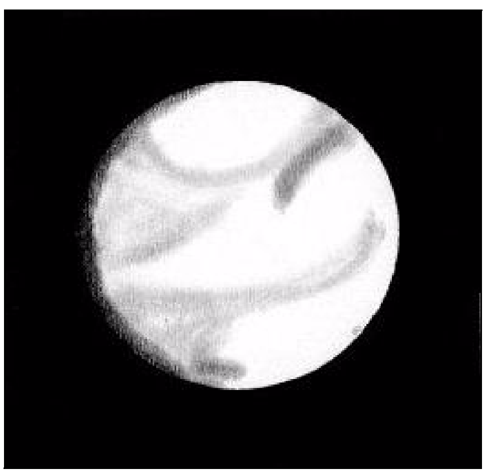


Image (21) Drawing. 2006 Sep 17d07h26m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 112X IL (no filter), Seeing 4.0 (interpolated), Phase (k) = 0.983, South is at top.

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

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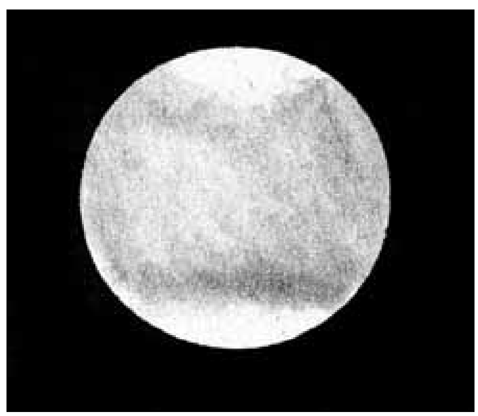

Image (22) Drawing. 2006 Oct 15d10h44m UT, Detlev Niechoy, Göttengen, Germany, 20.3 cm (8.0 in.) SCT, 112X IL UG3 filter, Seeing 4.0 (interpolated), Phase (k) = 0.998, South is at top.

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

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

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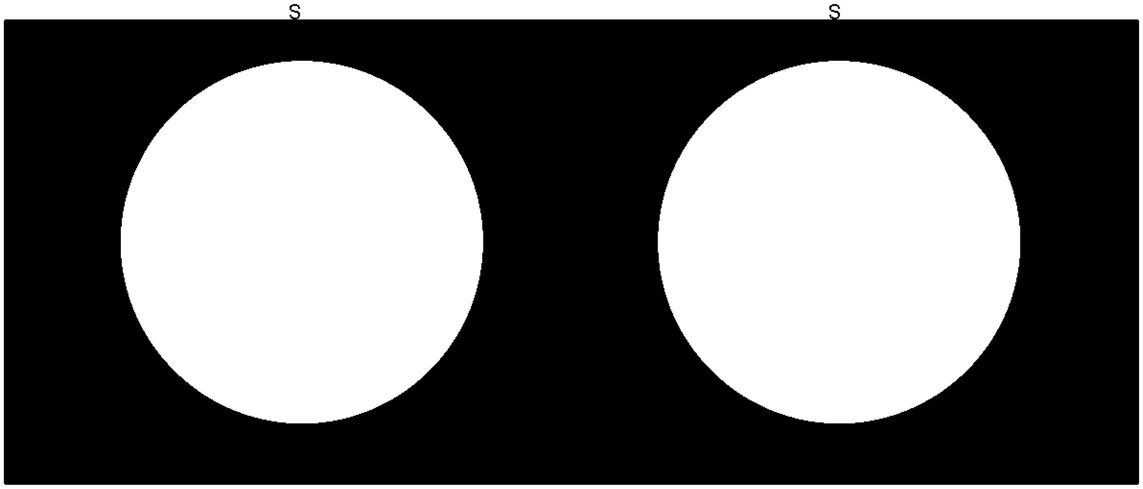

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N (*all coordinates are IAU*) N

Observer________________________________Location____

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

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

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

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

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

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

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

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

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

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

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

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

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

Feature Story:
Color Imaging of the Moon

By Wayne Bailey, FRAS,
Acting Program Coordinator, Lunar Topographical Studies/ Selected Areas Program
wayne.bailey@alpo-astronomy.org

Note that all images have lunar north at the top and lunar east (per IAU) at the right unless otherwise stated.

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Introduction

To the visual observer, the Moon appears nearly monochromatic, with the usual description being gray. Even the overall subtle brownish tint is not commonly recognized, at least partially, because the human eye/ brain tends to interpret the average color of brightly illuminated scenes as white. Color has been seen in some areas of the Moon for close to 200 years (Haas, 1942; McCord *et al*, 1972; North, 2000), although the color differences approach the limits of visual detectability. The introduction of photography, and eventually electronic photodetectors, allowed increasingly precise measurement and enhancement of lunar colors, leading to their interpretation in terms of surface composition (Pieters *et al*, 1975; Sunshine & Pieters, 1990; Whitaker, 1972).

One of the most intensely colored areas on the Moon is the Aristarchus region. This bright crater appears bluish, while the surrounding plateau is faintly yellow or brown with pinkish areas also being sometimes glimpsed (Figure 1). Those whose eyes are sufficiently sensitive to see the colors usually describe mare surfaces as greenish or bluish, and some young craters may show a bluish tinge (Figure 2). Lighting conditions also affect colors to some extent, and transient phenomena have sometimes been associated with color, often a red tint. Project Moonblink tried to detect transient phenomena by observing through alternating red and blue filters to emphasize associated short-term color changes.

This article describes techniques that the amateur can use to record color differences on the surface of the Moon and illustrates typical results of using those techniques. It concentrates on aspects that are directly related to the color content. It will not discuss, for instance, stacking techniques to combine images. I'll assume that has been done, if necessary, and a single

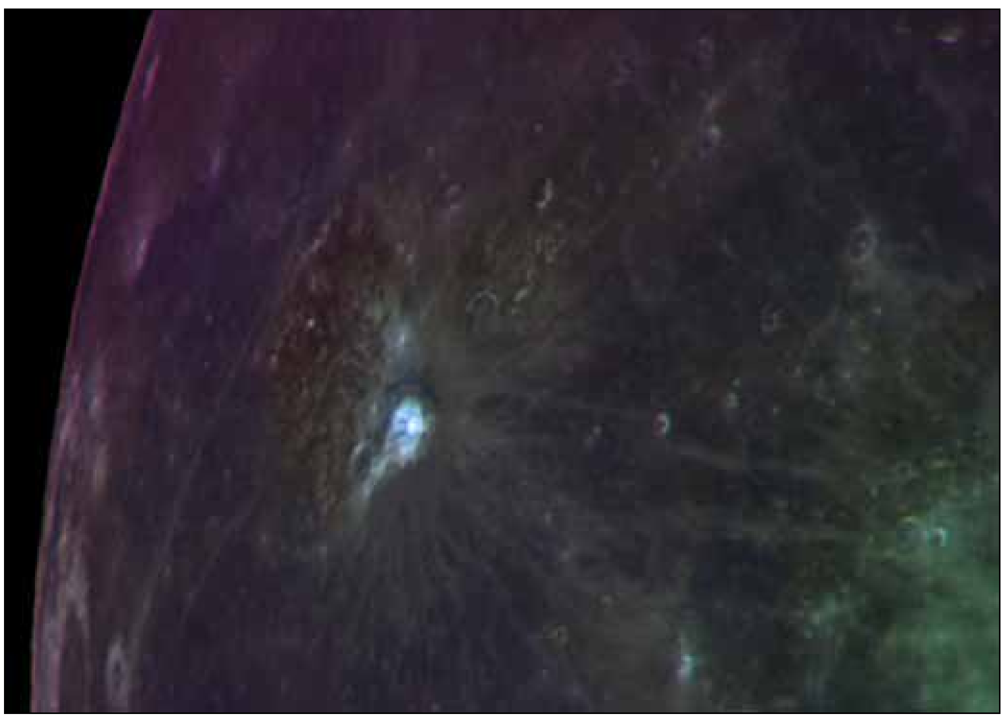

Figure 1. Saturated color image of Aristarchus area. December 9, 2006. Red-Green-Blue (Schuler R, V, B filters). Compare different presentation in figures 4, 10 & 11. All images supplied by the author.

frame represents each color. Some interpretation of the resulting colors will be used to illustrate how it influences the choice of imaging equipment, analysis and presentation. Keep in mind, however, that producing "true" color images is a difficult photometric calibration problem. Consistent color difference images are much easier to accomplish.

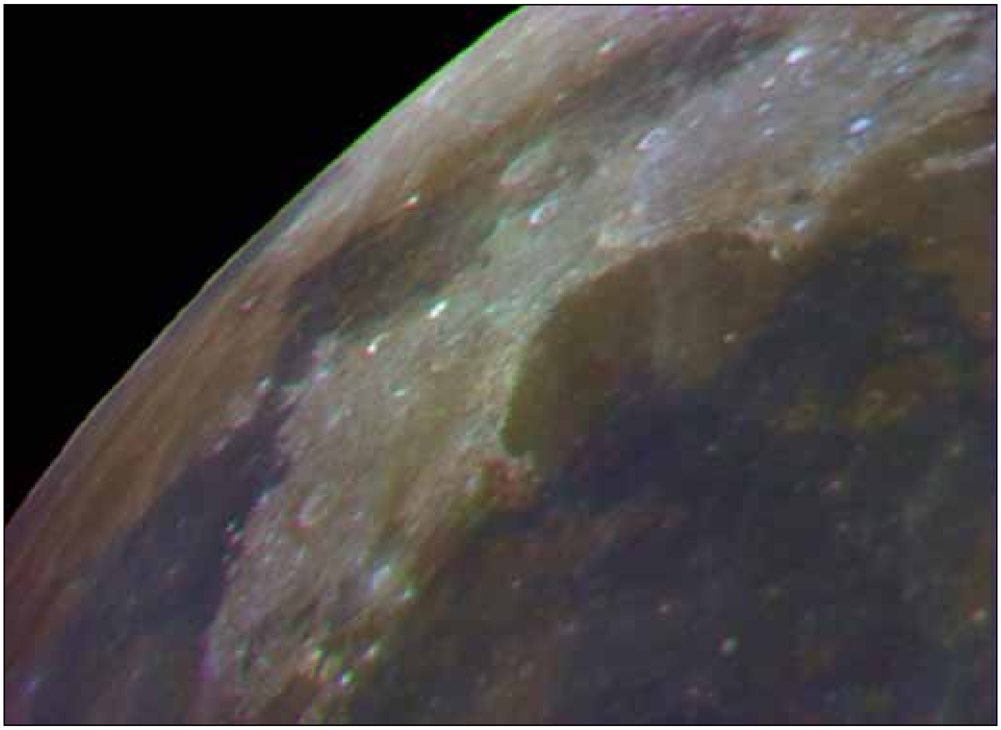

Figure 2. Saturated color image of Sinus Iridum area. January 3, 2007. Red-Green-Blue (Schuler R, V, B filters).

Figure 3a. Same as Figure 1 but without color saturation increase.

Equipment

Useful color images can be produced with any of the typical imagers used by amateurs, but monochromatic imagers coupled with external filters are more versatile than color imagers, since a larger variety of filters can be used. Color imagers do have the advantage of taking three different images simultaneously. The images are, therefore, geometrically aligned (or close to it), and color changes of rapidly varying transient phenomena are easier to follow, since the various color images are simultaneous and not staggered in time.

If possible, images should be saved for processing in a "lossless", uncompressed format such as TIFF, BMP or FITS, at least until processing is completed. Since the intensity difference between colors is usually small, the distortions introduced by compressed formats such as JPEG may significantly affect the final results.

Filters

In the visible and near-infrared, moonlight is merely reflected sunlight modified by the reflection and absorption properties of the lunar surface. Lunar colors exist because various rock types reflect and absorb different wavelengths of light differently. Solid materials, like minerals, tend to have very broad spectral features rather than the narrow lines exhibited by gases. Ideally, we'd like to use filters that isolate the spectral regions that are diagnostic of various rock characteristics. Amateur imaging cameras are only sensitive through the visible and very-near-infrared (typically about 400 nm to 1,000 nm wavelength), but the diagnostic mineral absorption bands are mostly in the near- and mid- infrared beyond 1,000 nm (Clark *et al*, 2007; Karr, 1975; Mustard *et al*, 1989; Sunshine & Pieters, 1990). However, there are some trends across the visible that serve as general composition and/or age indicators (Heiken *et al*, 1991; Bussy & Spudis, 2004). In general, minerals containing iron reflect better at long wavelengths (red) than short (blue), while increased titanium content increases the short wavelength reflectivity giving the rocks a blue tinge. An absorption band centered near 930 nm (extending almost to 800 nm) due to pyroxene minerals is accessible to amateur cameras, darkening near infrared images. Space weathering darkens and reddens exposed surfaces over time, so that young, fresh exposures are brighter and bluer than older surfaces.

Figure 3b. Same as Figure 2 but without color saturation increase.

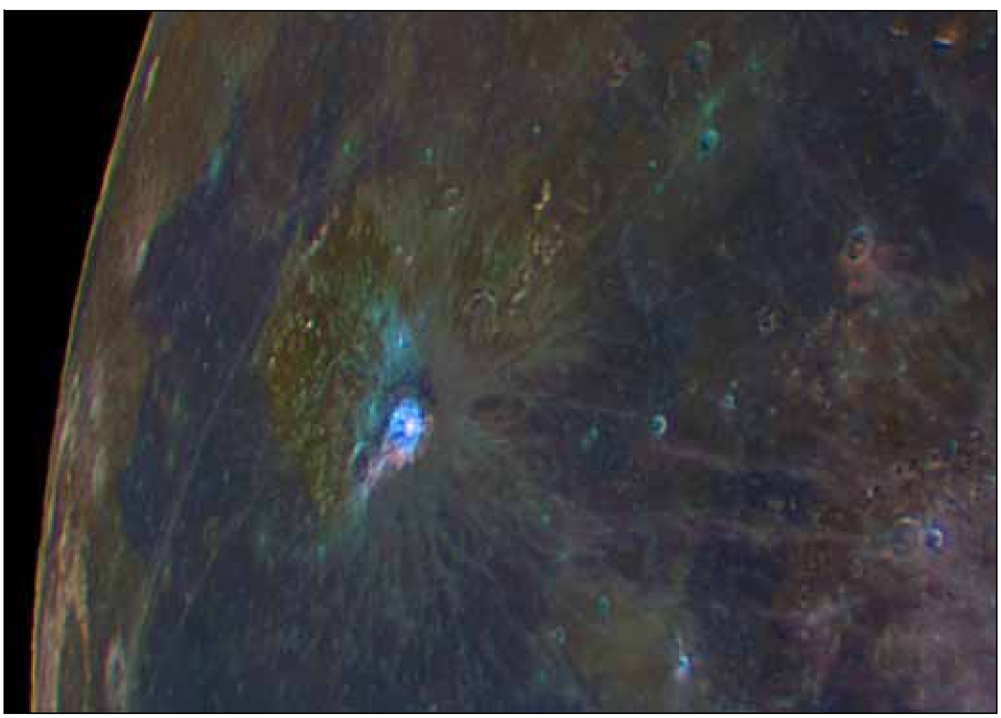

Figure 4. Extended spectral range (false-color), saturated color image of Aristarchus area. December 9, 2006. Infrared (>830 nm)-Red-Blue (Schuler IR83, R, B filters). Compare with different presentation in figures 1, 10 & 11.

The red, green and blue filters of a color camera will capture the color variations of different basalt flows on the maria and the bluish colors of unweathered rocks. They may even show differences between crystallized rocks and glassy debris. While external filters can be used with a color camera, the advantage of three simultaneous images is lost and the result is actually the combination with the internal filters, which isn't the same as the external filter alone.

External filters allow us to compare additional spectral regions, or to compare narrower regions of the spectrum. One possibility is to use a long-pass infrared filter along with blue, green or red filters to extend the spectral range. The complementary idea of using a short-pass ultraviolet filter to extend the short wavelength range is more difficult because of decreased camera sensitivity and increased atmospheric interference. I use Johnson-Cousins U, B, V, R and I photometric filters plus several infrared longpass filters which I happen to have from other projects (the V, or visual, filter is green). Wratten-type color filters, particularly the bandpass ones, should also work. I've very rarely, if ever, gotten a good ultraviolet image, and seldom get good results in the blue from my location in New Jersey (USA) at 100

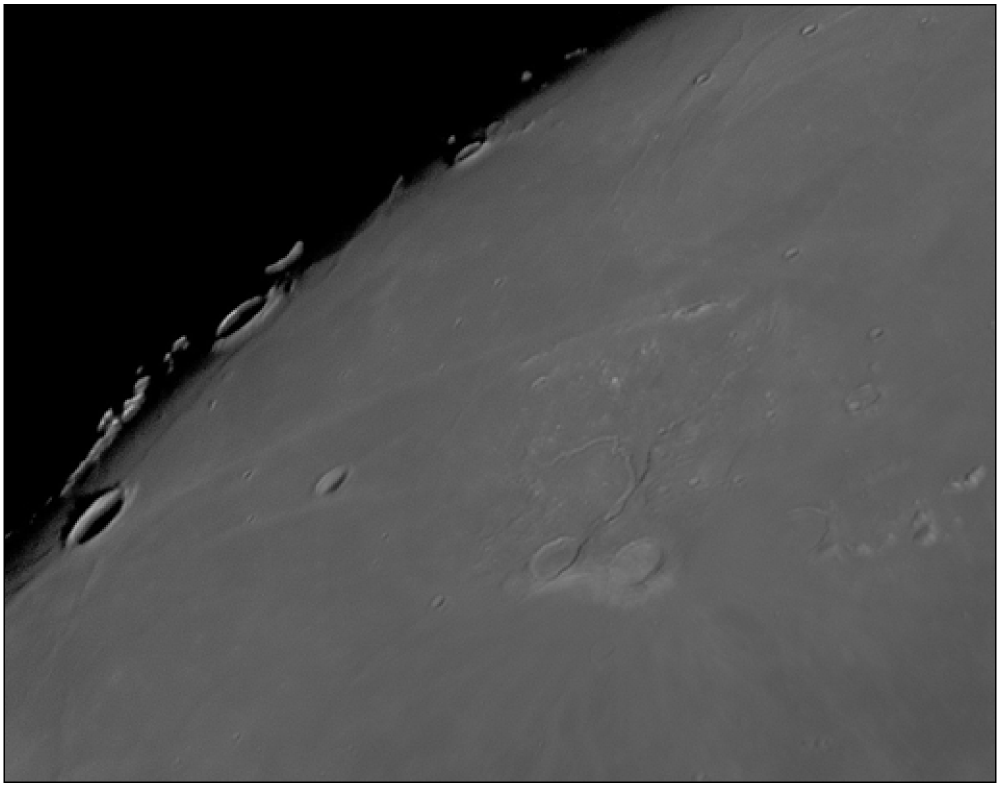

Figure 5. Difference image of the Aristarchus area. November 3, 2006. Infrared (>830 nm) minus Green (Schuler IR83, V filters). Compare with Figure 6.

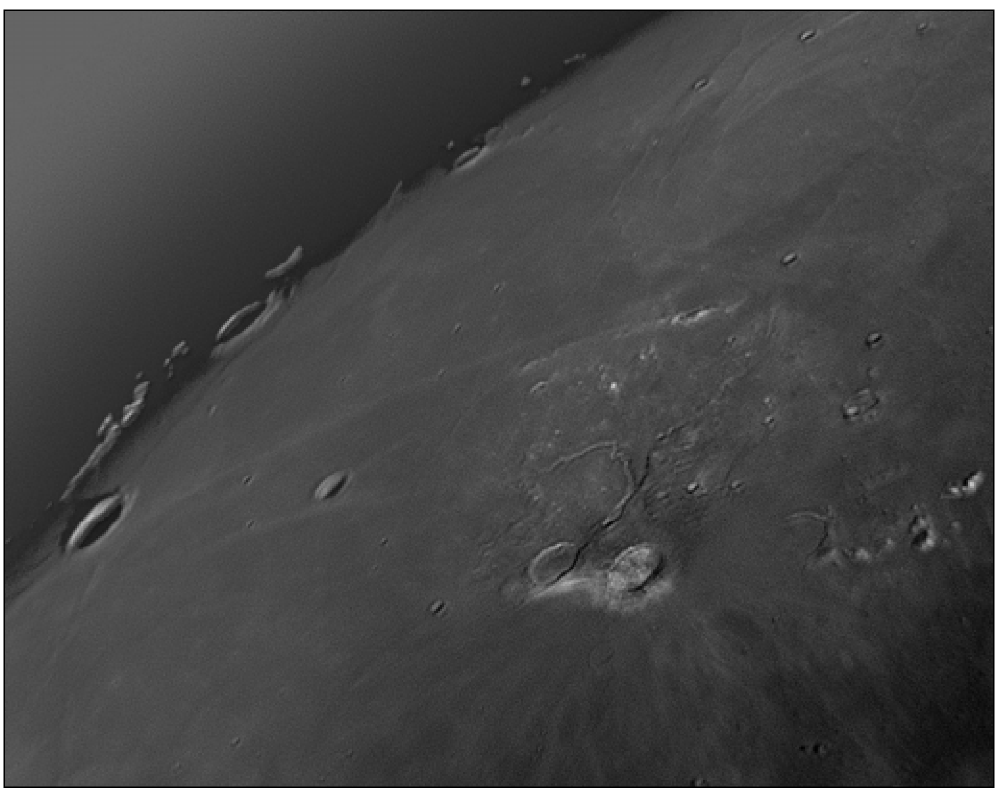

Figure 6. Ratio image of the Aristarchus area. November 3, 2006. Infrared (>830 nm) divided by Green (Schuler IR83, V filters). Compare with Figure 5.

feet elevation. You may get better results depending on your atmospheric conditions.

Narrowband filters, such as H-alpha, H-beta, [S II], [O III] also work, but since the lunar spectral features are broad, they aren't needed and reduce the available light. However, a filter centered on an appropriate emission line could be useful in looking for gaseous emissions associated with transient events since contrast would be increased by elimination of extraneous background light. Also, the methane band filters used by some planetary imagers could be used as a pyroxene band filter, although a longpass infrared filter that isolates the region beyond about 800 nm provides a brighter image due to the wider bandpass.

Color Imager

At first glance, a color camera seems to be the simplest way to get color images. One exposure is all that's needed. The color image that results, however, is actually three separate images, taken simultaneously through three different filters. Each pixel on the CCD is covered by its own filter, and the pattern of red, green and blue filters is chosen to allow interpolation of each color set to the complete array of pixels. So each filter's image actually only uses about 1/3 of the available pixels (the actual fraction is determined by the filter pattern), the remainder are created by interpolation. Since each pixel only “sees” through one filter, the three images are also inherently misaligned by a small amount. Both of these problems can be alleviated by using a large enough image scale that the pixels are significantly smaller than the telescope/seeing resolution.

Proper exposure is critical for color images. Each of the three images must be properly exposed individually. The usual way to accomplish this is by adjusting the white balance to change

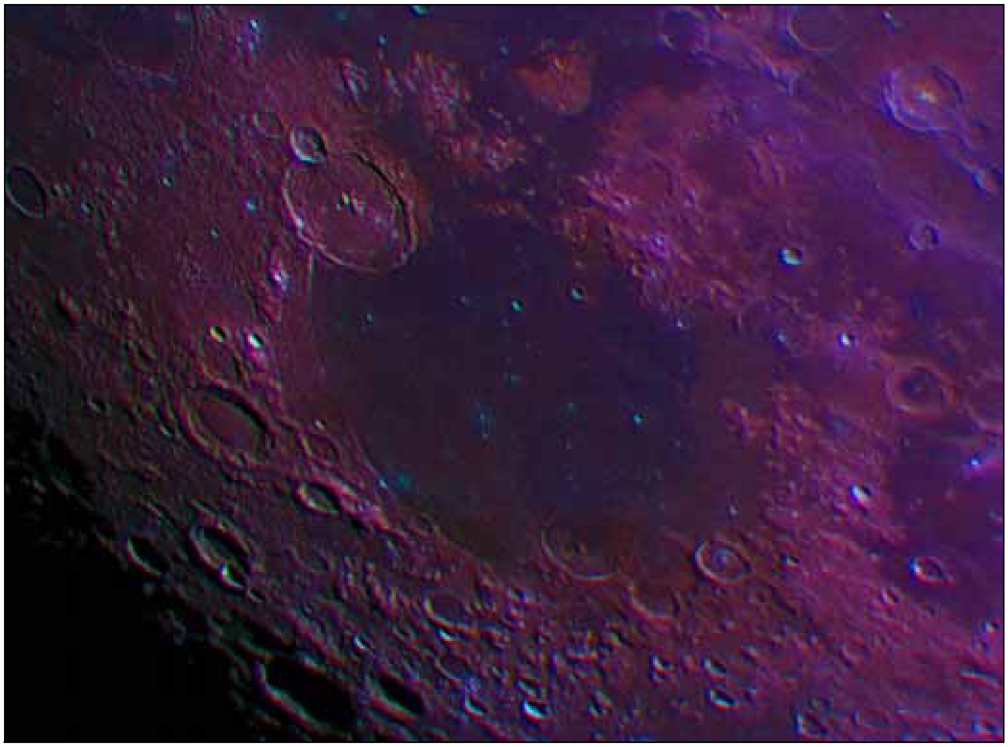

Figure 7. Saturated false color image of Mare Humorum area. March 30, 2007. Infrared (>830 nm)-Red-Blue (Schuler IR83, R, B filters). Compare with Figure 8 which spans a narrower spectral range.

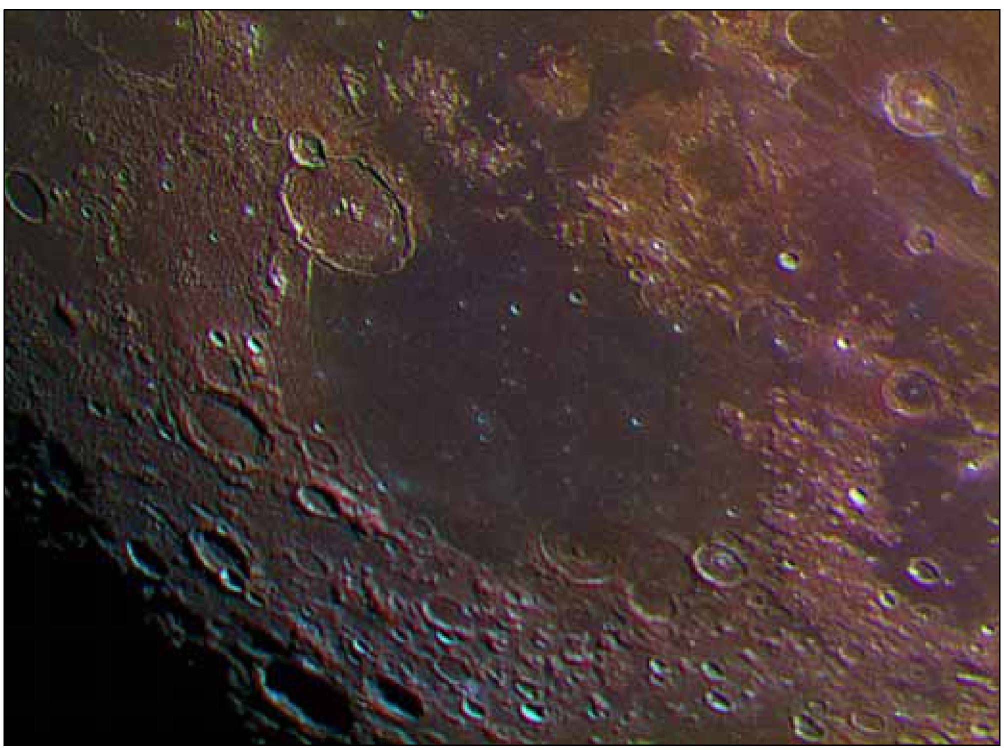

Figure 8. Saturated false color image of Mare Humorum area. March 30, 2007. Infrared (>720 nm)-Red-Green (Schuler IR72, R, V filters). Compare with Figure 7 which spans a wider spectral range.

the relative exposure in each filter, and the exposure time or gain to adjust the overall exposure. If any of the three images is saturated, the color will be wrong for the saturated pixels. The best way to avoid saturation is to look at the image histogram; there should not be any pixels with the maximum pixel value (or even too close, since some of the later processing may stretch the histogram). It is not sufficient to simply check the combined (white light) image because individual color channels can be saturated without saturating the combined image. The histogram for each color needs to be examined. Remember, slight underexposure can be corrected in processing, but saturation is unrecoverable.

Chromatic aberration and differential refraction may also cause problems. Chromatic aberration is not likely to be significant for reflecting telescopes unless you're using a non-achromatic Barlow, or eyepiece projection to enlarge the image. If present, the image scale and focus will be different for each color layer. Differential focus can't be corrected, since the three colors are exposed simultaneously. If the image scale varies among the color layers aligning pixels in one portion of the image results in misalignment at other points that increases with distance from the alignment point. Differential refraction from observing too close to the horizon causes images in different colors to appear at different positions. Registax (and probably other programs) have a facility to shift the color layers to correct this, but the best solution is to avoid low altitude observing.

Once a properly exposed image is available, there are two additional steps:

1. Adjust the color balance

2. Intensify the colors for display.

Figure 9. Saturated false color image of Aristillus area. January 3, 2007. Infrared (>720 nm)-average-Green (Schuler IR72, V filters).

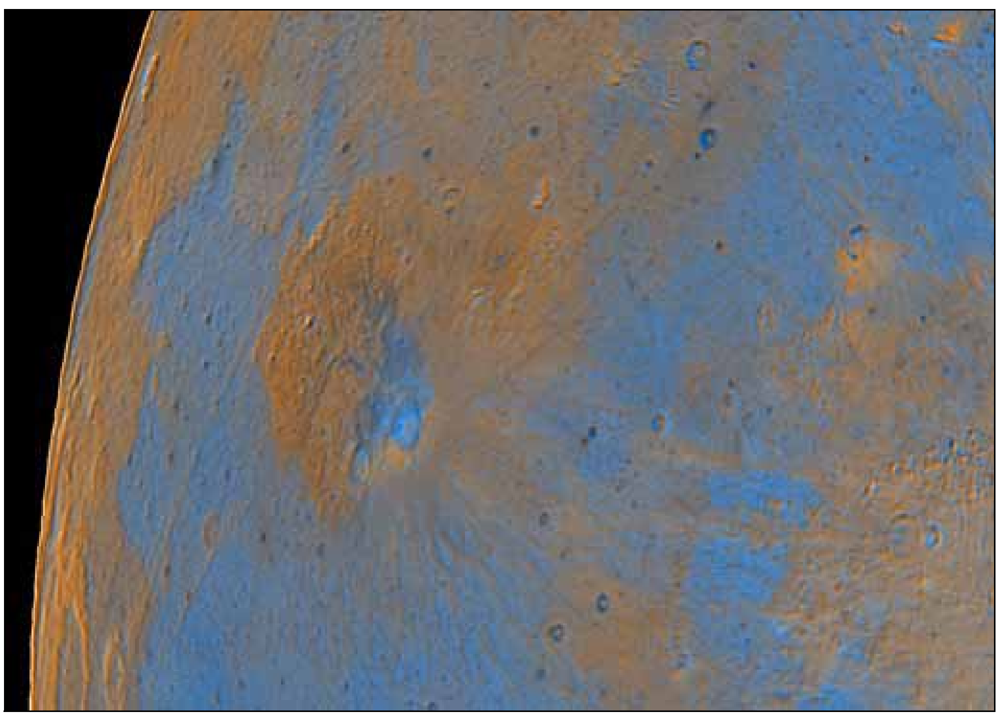

Figure 10. Two ratio, false color image of Aristarchus area. December 9, 2006. Infrared (>830 nm)/Red-average-Blue/Red. (Schuler IR83, R, B filters). Compare with different presentation in figures 1, 4 and 11.

The actual filter characteristics aren't likely to be available for typical amateur color imagers and it's unlikely that there would be sites on the Moon whose brightness was calibrated with similar filters, so direct calibration of the colors isn't feasible. To accurately compare color differences among observations at different times, we should pick a fairly small, uniform, colorless area and adjust each color's histogram so that the average pixel values match within this area. However, we can take advantage of the overall grayness of the Moon to get reasonable color differences by adjusting each color channel of the entire image so that the average pixel intensities are the same. I use Adobe Photoshop's histogram function to determine the average and the level adjust function to adjust it. Other image processing programs should have similar capabilities. Just remember not to saturate any channel and only stretch or compress the histograms, but don't change curves or gamma. An alternate method, that's less deterministic, is to simply adjust the histograms so that they appear to match as closely as possible. This works for demonstrating colors, but the results are not consistent enough for comparison of different images. If the histograms are mismatched, the image will have a uniform background color, which may not be apparent until the saturation is increased.

We now have an approximately true color image. The colors are practically unnoticeable in most cases (Figure 3). So to make them more obvious I use Photoshop to increase the saturation. Again, any image-processing program should have a comparable capability. It's better to increase saturation multiple times than increase an excessive amount in one pass; the results seem to be less harsh.

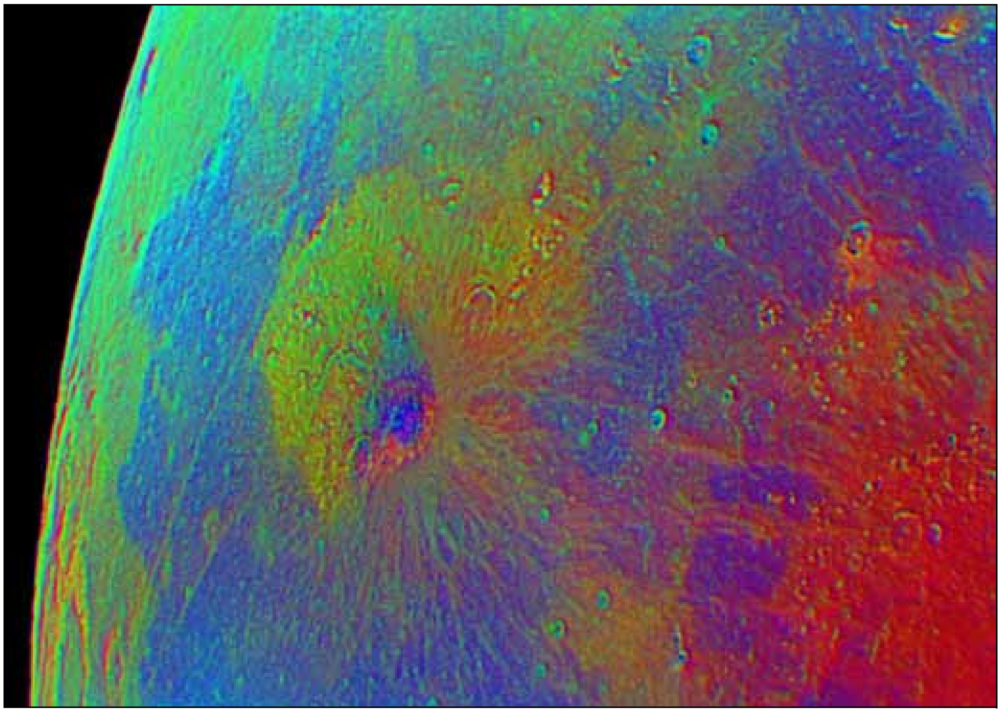

Figure 11. Three ratio, false color image of Aristarchus area. December 9, 2006. Infrared (>830 nm)/Red-Red/Green-Blue/Green (Schuler IR83, R, V, B filters) Compare with different presentation in figures 1, 4 and 10.

Monochromatic Imager with Filters

The principles are the same for using a monochromatic imager. But in order to combine individual images they must be recorded compatibly (inherent with a color imager), and a few extra steps are involved in processing the images (If desired, these techniques can be applied to the images obtained from a color imager by first separating the three color images). When recording images, the spatial resolution, gain and contrast of the images must be the same. Exposure adjustments should be made by changing exposure time, not by changing gain, contrast or gamma. The CCD response is very linear, but the recording process usually isn't. Refocusing will correct any change of focus due to chromatic aberration, changes in image scale can't be easily corrected.

Since monochromatic images are taken sequentially, not simultaneously, it's usually necessary to align and crop the individual images, before combining them for display. I've used a combination of two different techniques in Photoshop to align multiple images; one is a blink comparison approach that animates the shift between two images, the other is a cancellation approach that minimizes the intensity difference between the images. I start by loading all images, pick the best to use as reference, then copy and paste a second image onto it (creating a new layer in the process). For the cancellation approach, set the blending mode for the layer to difference and shift the layer to align the features and create a gray image that is as uniform as possible, then set the blending mode back to normal. I've found this technique is not as accurate as the blink method, so I usually only use it as an initial alignment, or just go directly to the following blink approach. Set the opacity for the layer to about 50% so that both images are visible, then slide the layer around for the best match.

Now to refine the alignment, quickly change the opacity of the layer back and forth between 0 and 100%; any misalignment will cause the image to jump back and forth (chromatic aberration will cause it to enlarge and shrink). Shift the layer to minimize the motion. If there are more images to align, set the layer opacity to 0% so it's transparent, then copy the next image onto a new layer and repeat the process above, using the same reference image. After all the images have been aligned, return all the opacities to 100% and crop the stack to only include the area that's common to all images. Save each layer, including the reference image, as separate files. We now have a set of single filter images that are all aligned and the same size. Adjust the histograms of each image as for the individual colors of a color image, so that the average pixel intensity is the same.

Now it's time to create display images. This is where we have many more choices available than with a color imager. A false color image, made from images through three different filters shows variations among the images by differences in color (red, green and blue images will, of course, produce a true color image). Difference images (one image subtracted from another) and ratio images (one image divided by another) each show the differences as monochromatic variations of intensity. The ratio technique isolates the color variations and suppresses the light/shadow variations so that topographic features tend to disappear, while the difference technique retains some of the light/shadow variation. We can also use the monochromatic ratio or difference images to create a pseudo-color image.

Color image

I use the "merge channels" function in Photoshop to create color images. Simply load the desired three images, select RGB under merge channels, and assign the desired images to the red, green, and blue channels, then treat as any other color image (Figure 4).

Difference image

Unfortunately, the Photoshop difference blending mode calculates the absolute value of the difference between layers. The resulting pixel brightness indicates how much the two layers differ, but not which is brighter. For example, the difference of a red and blue image will be bright wherever the original scene is either red or blue, but dark where it's white. I use MaximDL to create difference images, since the pixel math function allows true subtraction (any other image processing program that has the capability to do pixel math should also work). However, since negative intensity is interpreted as zero, it's necessary to add an offset, at least equal to the most negative value to raise all the pixel values into the displayable range. The histogram of the resulting image should be adjusted for display as described above (Figure 5).

Ratio image

Ratio image creation is very similar to making a difference image. In MaximDL, pixel math allows you to divide one image by another. The resulting pixels however will only cover a small range of values near 1.0, and fractional values will be common. Typically, integer values are used for pixel intensity, so, before saving, multiply the ratio image by a number that will make the highest pixel values somewhat less than the maximum value and spread the fractional values between zero and one (which correspond to the negative values in the difference calculation) over a reasonable range of integers. Then the image can be treated like any other monochrome image (Figure 6).

Examples

Figures 7 through 11 show examples of various filter combinations and display techniques. Details are in the figure captions.

- Figures 7 and 8 are the same region, but the filters used for Figure 7 cover a wider spectral range than Figure 8.
- Figure 9 is a color image created from only two images, infrared for the red channel and blue for the blue channel. The green image is the average of the other two (created using pixel math by adding the images, each scaled by 50%).
- Figure 10 illustrates a different way to display the same infrared-red-blue image as Figure 4. Figure 4 uses the infrared, red and blue images for the red, green and blue color channels. In Figure 10, the red channel is an infrared/red ratio image, the blue channel is a red/blue ratio image, and the green channel is the average of the two ratio images. Notice that Figure 10 has almost entirely eliminated the light/shadow variation visible in Figure 4, presenting just the color variation.
- Figure 11 carries this one step further by also including a green image so that three ratio images can be created. The red channel is the same as Figure 10, but the green channel is now a red/green ratio, and the blue channel is a blue/green ratio. There's more information but it's also harder to decipher.

Conclusion

Color imaging is well within the capabilities of typical amateur imaging equipment, and color provides additional information compared to monochromatic images. To be scientifically useful, careful attention must be paid to consistency in processing images, especially the technique used to match histograms, and any contrast enhancement application such as wavelet processing. Saturation enhancement is a useful method to increase the visibility of color differences for display, but unenhanced images are the basic data (it's always possible to increase the saturation for examination).

The ALPO Topographic Studies/Selected Areas Program welcomes submission of color, as well as monochrome (filtered or white light) images. Send submissions, which should include date, time, and equipment details, to *wayne.bailey@alpo-astronomy.org*. Any suspected transient events should also be sent to Dr. Anthony Cook (ALPO LTP Program) at *tony.cook@alpo-astronomy.org*.

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ALPO LUNAR DOME SURVEY

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Submit electronically (attach photographs and scanned drawings to e-mail)
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***Marvin W. Huddleston*, F.R.A.S.**
kc5lei@comcast.net
or via mail:
2621 Spiceberry Lane
Mesquite, TX 75149-2954

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Domes Observed (Positions)

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Notes: (**Include Observer Location (City, State, and Country) Here**; Use back if necessary):

Feature Story: The Remote Planets

ALPO Observations of the Remote Planets in 2008-2009

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

Abstract

Eighteen people submitted observations of Uranus and Neptune in 2008-2009. The selected normalized magnitudes of Uranus are B(1,0) = -6.658 ± 0.010 and V(1,0) = -7.118 ± 0.010. The selected normalized magnitudes for Neptune are: B(1,0) = -6.60 ± 0.02 and V(1,0) = -7.00 ± 0.02. Brightness measurements made through a V filter in 2008 are consistent with the solar phase angle coefficient being smaller than 0.002 magnitudes/degree for Uranus. The brightness difference (in stellar magnitudes) between Oberon and Titania, two moons of Uranus, has remained nearly constant between 2002 and 2008.

Introduction

Several important papers were published about the outer planets during the past year. I will summarize five of these. Hammel and her co-workers summarized a new dark feature that developed on Uranus. This is the first dark cloud-like feature imaged on that planet. This feature is reported to span 1,300 km in the north-south direction and 2,700 km in the east-west direction. There were also bright companion clouds near this dark spot. In a second study, Mallama and his co-workers reported that three moons of Uranus (Ariel, Umbriel and Titania) were lagging their predicted positions by up to 700 km in 2007. This lag means that the orbital models for these moons need to be readjusted. Meadows and her co-workers reported the discovery of methylacetylene (CH_3C_2H) and diacetylene (C_4H_2) on Neptune. Both gases exist there in trace quantities. In a fourth study, Schaefer and his co-workers analyzed photographs of Pluto made in 1933 and 1934. They reported that Pluto's brightness changed by about 10% in 1933 and 1934 as a result of rotation. Finally Schaefer and his co-workers reported hundreds of brightness measurements of Neptune's moon Nereid. They concluded that Nereid is non-spherical in shape, it has a large opposition surge and it displays year-to-year changes in brightness.

Members of the Association of Lunar & Planetary Observers Remote Planets Section have also carried out important work. *Table 1* summarizes the orbital characteristics of Uranus, Neptune and Pluto during their 2008 apparitions. *Table 2* lists the people who contributed observations of Uranus, Neptune and Pluto during their 2008 apparitions.

Photoelectric Photometry

Jim Fox, Brian Loader, Frank Melillo, John Westfall and this writer made photoelectric brightness measurements of Uranus and Neptune in 2008. All five individuals used an SSP-3 photometer along with filters transformed to the Johnson B V system. The comparison stars used in the photoelectric brightness measurements are summarized in *Table 3*. Individual brightness measurements of the planets Uranus and Neptune are listed in *tables 4 and 5* respectively. All measurements in these two tables were corrected for both atmospheric extinction and color transformation. Color transformation corrections were carried out in the same way as is described in Hall and Genet (1988).

The normalized V filter magnitude, V(1,0), is computed from the equation

$$V(1,0) = M_v + 5 \log[r \times \Delta] + c_v \times \alpha \quad (1)$$

In this equation, M_v is the measured brightness, r and Δ are the Sun-planet and Earth-planet distances in astronomical units, c_v is the solar phase angle coefficient and α is the solar phase angle in degrees. The term $c_v \times \alpha$ is less than 0.005 magnitude for Uranus and Neptune and is considered to be negligible (Schmude, 2008, p. 17 & 62). The V(1,0) value is not affected by distance. Changes in V(1,0) are usually the result of changing albedo. The albedo is the fraction of light

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Table 1: Characteristics of the 2008 Apparitions of Uranus, Neptune and Pluto[a]

Parameter	Uranus	Neptune	Pluto
First Conjunction Date	2008 Mar. 8	2008 Feb. 11	2007 Dec. 21
Opposition Date	2008 Sep. 13	2008 Aug. 15	2008 Jun. 20
Angular diameter (opposition)	3.7 arc-sec.	2.4 arc-sec.	0.1 arc-sec.
Sub-Earth latitude	3.1° N	28.9° S	39.8° S
Right Ascension (opposition)	23h 27m	21 h 41 m	17 h 59 m
Declination (opposition)	4.4° S	14.2° S	17.0° S
Second Conjunction Date	2009 Mar. 13	2009 Feb. 12	2008 Dec. 22

[a]All data are from the *Astronomical Almanac* for the years 2007-2009.

that a planet reflects. The V(1,0) values are especially useful for measuring long term albedo changes on a planet.

Fox used the star SAO 146652 as a check star for his Uranus measurements. He measured respective B and V filter mean magnitude values of 7.237 ± 0.004 and 6.170 ± 0.008 for this star. These values are close to the accepted magnitude values of 7.232 and 6.165. Westfall used 96-Aqr as a check star. He measured a mean V filter brightness of 5.561 ± 0.002 magnitude for this star. This result is 0.011 magnitude fainter than the accepted value of 5.550. This writer feels that part of the discrepancy between the measured and accepted brightness values for the check star in both studies is due to uncertainties in the brightness of the comparison star. This writer has estimated an uncertainty of 0.01 magnitude for the selected B(1,0) and V(1,0) values of Uranus in 2008. This uncertainty is based on the uncertainty of the comparison star brightness and the random error of the Uranus brightness measurement.

In his Neptune measurements, Fox reports mean brightness measurements of V = 5.951 and B = 6.164 for his check star (45-Cap). These results are about 0.02 to 0.03 magnitude brighter than the accepted values. This writer feels that part of the discrepancy between the measured and accepted brightness values for the check star is due to uncertainties in the brightness of the comparison star. This writer has estimated an uncertainty of 0.02 magnitude for the selected B(1,0) and V(1,0) values of Neptune in 2008. This uncertainty is based on the uncertainty of the comparison star brightness and the random error of the Neptune brightness measurements.

The average normalized magnitude values for Uranus and Neptune are summarized in *Table 6*. The selected V(1,0) value of Uranus is close to the value for 2007, -7.128 ± 0.007. The B(1,0) value in 2008 was ~0.02 magnitude brighter than the corresponding value in 2007. The B – V color index in 2008 was only 0.460 ± 0.014. This value is lower than what it was in 2007 (0.486).

The selected value of V(1,0) of Neptune in 2008 is close to that of 2007. The B(1,0) value in 2008, however, is 0.06 magnitude brighter than the corresponding value in 2007. The B – V value in 2008 (0.40 ± 0.03) is a little lower than what it was in 2007 (0.45 ± 0.02).

Figure 1 shows how the V(1,0) values of Uranus and Neptune have changed between 1991 and 2008. Between 1991 and 2008, the V(1,0) value of Uranus dimmed by about 0.06 stellar magnitudes or by about 6%. Neptune, on the other hand, has brightened by about 0.08 stellar magnitude or by about 8% during that same time period.

Uranus appears to have reached a brightness minimum somewhere between 2003 and 2008. This dimming is probably due to the fact that the bright South Polar Region is tipping away from the Earth. The V filter geometric albedo of Uranus was 0.492 in 2008. This is a bit lower than the value halfway between the equinox and solstice points (0.502).

Westfall measured the brightness of Uranus between Sept. 3 and Dec. 18, 2008. During this time, the solar phase angle of Uranus varied between 0.041° and 2.781°. Westfall plotted his normalized magnitude values (uncorrected for the solar phase angle) versus the solar phase angle. His goal was to measure the value of the solar phase angle coefficient of Uranus. He found that the slope of this graph to be -0.00001 magnitude/degree. From this result, this writer concludes the value of the solar

Table 2: Contributors to the ALPO Remote Planets Section in 2008-2009[a]

Name (location)[a]	Type of Observation[b]	Telescope[c]
Patrick Abbott (Canada)	VP	B
David Arditti (UK)	I	0.36 m SC
Norman Boisclair (NY, USA)	DN	0.51 m RL
Richard Bosman (Netherlands)	I	0.28 m SC
Brian Cudnik (TX, USA)	DN	0.36 m SC
Marc Delcroix (France)	I, Sat	0.25 m SC
Jim Fox (MN, USA)	PP	0.25 m SC
Ed Lomeli (CA, USA)	I	0.23 m SC
Brian Loader (New Zealand)	PP	---
Mike Mattei (MA, USA)	VP	B
Paul Maxson (AZ, USA)	I	0.25 m
Frank Melillo (NY, USA)	I, PP, Sat	0.25m SC
Detlev Niechoy (Germany)	D	0.20 m SC
Christophe Pellier (France)	I	0.25m C
Carl Roussell (ON, Canada)	D, DN, VP	0.15 m RR & B
Richard Schmude, Jr. (GA, USA)	PP, VP	0.09 m M & B
Wayne Watson (CA, USA)	Sat	0.20 m SC
John Westfall (CA, USA)	PP	0.36 m SC

[a]The following people contributed valuable observations to the ALPO Japan Latest website: Salvatore Antonio, David Gray, Toshihiko Ikemura, Manos Kardasis, Akira Kazemoto, Willem Kivits, Kenji Nakai, John Sussenbach, Nilde Sotera, George Tarsoudis, Artur Wrembel and Seiichi Yoneyama. The following observer contributed to the Arkansas Sky Observatory archive: Efrain Morales.

[b]Type of observation: D = drawings, DN = descriptive notes, I = images, PP = photoelectric photometry, Sat = satellite studies, VP = visual photometry

[c]Telescope: first quantity lists the diameter and the one or two upper case letters lists the type according to: B = binoculars, C = Cassegrain, M = Maksutov, RL = reflector, RR = refractor and SC = Schmidt-Cassegrain

Table 3: Comparison Stars Used in Photometric Studies of Uranus and Neptune[a]

Comparison Star	Right Ascension (2000.0)	Declination (2000.0)	V filter Magnitude used	B filter Magnitude used
HD 221356	23h 31m 32s	-4° 05′ 14″	6.496	0.53
44-Cap	21h 43m 04s	-14° 23′ 59″	5.88	6.13
45-Cap	21h 44m 01s	-14° 44′ 58″	5.974	6.189
96-Aqr	23h 19m 24s	5° 07′ 28″	5.550	5.949

[a]The right ascension and declination values are from Hirshfeld *et al* (1991); the B and V filter magnitudes are from Westfall (2008) who cites Blanco *et al* (1970) and Mermilliod (1991).

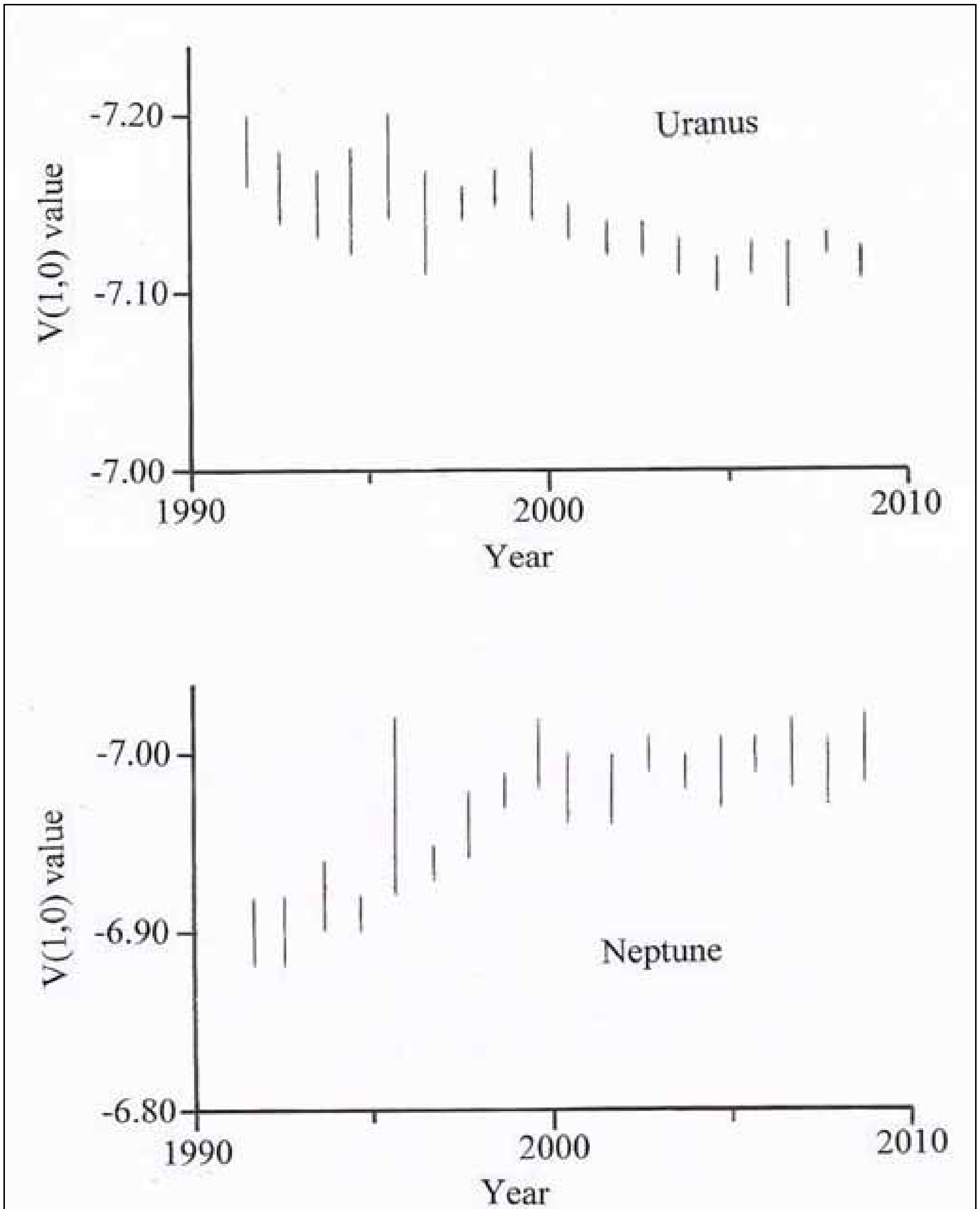

Figure 1. The top graph shows the average normalized magnitude values of the planet Uranus plotted against the year. The lines represent the uncertainty of average normalized magnitude values. The bottom graph shows the average normalized magnitude values of the planet Neptune plotted against the year. The lines represent the uncertainty of average normalized magnitude values.

phase angle coefficient of Uranus is below 0.0015 magnitude/degree. This is consistent with the selected value of the solar phase angle coefficient (Schmude, 2008, p. 17). Furthermore, this is evidence that the $c_V \times \alpha$ term in *equation 1* is below 0.005 magnitudes for Uranus.

Westfall also looked for a brightness change due to the rotation of Uranus. He plotted his brightness measurements as a function of the longitude of Uranus' central meridian. He did not find any periodic brightness change. This writer estimates an upper limit to the amplitude of any rotational brightness change to be 0.005 magnitudes. This upper limit is for the V filter measurements made between Sept. 3 and Dec. 18, 2008.

This writer feels that the brightness of Uranus changed during late 2008 due to the changing sub-Earth latitude. The sub-Earth latitude is the point on Uranus where the Earth is directly overhead. Based on data collected since 1950, we know that Uranus is about 0.1 magnitude brighter when the sub-Earth latitude is 83° S compared to when it is 0°. Therefore, Uranus' brightness changed at an average rate of 0.0012 magnitudes for each 1° change in the sub-Earth latitude between 83° S and 0°. If this trend repeats in the northern hemisphere, then Uranus' brightness changed by about 0.003 magnitude between Sept. 1 and Nov. 30, 2008. This was because the sub-Earth latitude changed from 3.6° N to 1.1° N during this time. This change can mask part or all of the brightness change caused by a changing solar phase angle. It can also create problems for people wanting to use data collected over a long period of time to monitor any brightness changes due to rotation. This writer feels that because of this, the best way to look for brightness changes, due to rotation, is to

Table 4: Photoelectric Magnitude Measurements of Uranus Made in 2008

Date (observer)	Measured magnitude (filter)	X(1,α)	Comparison star
Sept. 3.336 (Westfall)	5.813 (V)	-7.108	HD 221356
Sept. 4.320 (Westfall)	5.809 (V)	-7.112	HD 221356
Sept. 5.209 (Fox)	5.785 (V)	-7.138	96-Aqr
Sept. 5.209 (Fox)	6.249 (B)	-6.672	96-Aqr
Sept. 5.324 (Westfall)	5.806 (V)	-7.115	HD 221356
Sept. 6.328 (Westfall)	5.813 (V)	-7.108	HD 221356
Sept. 7.305 (Westfall)	5.807 (V)	-7.113	HD 221356
Sept. 8.323 (Westfall)	5.802 (V)	-7.118	HD 221356
Sept. 9.309 (Westfall)	5.800 (V)	-7.120	HD 221356
Sept. 10.309 (Westfall)	5.801 (V)	-7.119	HD 221356
Sept. 11.299 (Westfall)	5.803 (V)	-7.117	HD 221356
Sept. 12.306 (Westfall)	5.809 (V)	-7.111	HD 221356
Sept. 13.294 (Westfall)	5.803 (V)	-7.117	HD 221356
Sept. 22.273 (Westfall)	5.805 (V)	-7.117	HD 221356
Sept. 23.280 (Westfall)	5.804 (V)	-7.118	HD 221356
Sept. 24.275 (Westfall)	5.807 (V)	-7.116	HD 221356
Sept. 25.272 (Westfall)	5.808 (V)	-7.115	HD 221356
Sept. 25.433 (Loader)	5.784 (V)	-7.139	96-Aqr
Sept. 25.463 (Loader)	6.284 (B)	-6.639	96-Aqr
Sept. 26.271 (Westfall)	5.808 (V)	-7.115	HD 221356
Sept. 27.274 (Westfall)	5.813 (V)	-7.111	HD 221356
Sept. 28.266 (Westfall)	5.814 (V)	-7.110	HD 221356
Sept. 29.274 (Westfall)	5.808 (V)	-7.117	HD 221356
Sept. 30.272 (Westfall)	5.806 (V)	-7.120	HD 221356
Oct. 1.248 (Westfall)	5.811 (V)	-7.115	HD 221356
Oct. 2.102 (Schmude)	5.819 (V)	-7.108	96-Aqr
Oct. 2.121 (Schmude)	5.810 (V)	-7.117	96-Aqr
Oct. 4.127 (Fox)	5.793 (V)	-7.135	96-Aqr
Oct. 4.127 (Fox)	6.271 (B)	-6.657	96-Aqr
Oct. 5.138 (Fox)	5.797 (V)	-7.132	96-Aqr
Oct. 5.138 (Fox)	6.265 (B)	-6.664	96-Aqr
Oct. 5.249 (Westfall)	5.815 (V)	-7.114	HD 221356
Oct. 6.251 (Westfall)	5.817 (V)	-7.113	HD 221356
Oct. 7.271 (Westfall)	5.819 (V)	-7.112	HD 221356
Oct. 8.232 (Westfall)	5.813 (V)	-7.119	HD 221356
Oct. 9.155 (Fox)	5.797 (V)	-7.135	96-Aqr
Oct. 9.155 (Fox)	6.272 (B)	-6.660	96-Aqr
Oct. 9.229 (Westfall)	5.816 (V)	-7.116	HD 221356
Oct. 10.239 (Westfall)	5.819 (V)	-7.114	HD 221356
Oct. 11.230 (Westfall)	5.816 (V)	-7.118	HD 221356
Oct. 15.230 (Westfall)	5.821 (V)	-7.117	HD 221356
Oct. 17.229 (Westfall)	5.830 (V)	-7.110	HD 221356
Oct. 18.236 (Westfall)	5.826 (V)	-7.116	HD 221356
Oct. 20.223 (Westfall)	5.830 (V)	-7.114	HD 221356
Oct. 21.153 (Fox)	5.817 (V)	-7.128	96-Aqr
Oct. 21.153 (Fox)	6.282 (B)	-6.663	96-Aqr

collect data over a two- to three-day period.

Visual Photometry

Patrick Abbott, Michael Mattei, Carl Roussell and the writer made a total of 100 visual brightness estimates of Uranus and 74 visual brightness estimates of Neptune during their 2008 apparitions. The average normalized magnitude, $V_{vis}(1,0)$ for both Uranus and Neptune was -7.1. The average $V_{vis}(1,0)$ value for Uranus between 1989 and 2008 was between -7.1 and -7.2. This is close to the $V_{vis}(1,0)$ value for 2008. The average $V_{vis}(1,0)$ value for Neptune between 1992 and 2008 was between -6.9 and -7.0. The 2008 value of $V_{vis}(1,0)$ was between 0.1 and 0.2 magnitudes brighter than the 1992-2008 average.

Drawings and Images

Nine people submitted drawings or images of Uranus and/or Neptune to the writer. Several others submitted images or drawings to the ALPO Japan Latest website and to the Arkansas Sky Observatory website. In addition to limb darkening, these drawings and images revealed some polar flattening and possible albedo features on Uranus.

Images of Uranus submitted by Akira Kazemoto, Paul Maxson, Christophe Pellier and Willem Kivits all displayed a slightly flattened disk. These images are consistent with a polar flattening for Uranus of 0.01 or 0.02.

Christophe Pellier recorded several high-quality images of Uranus on September 13, 2008. The most obvious feature on his images was limb darkening. The limb darkening was stronger on his blue image than on his red, green or infrared images. The South Polar Region may have been brighter than the surrounding area in one of his infrared images.

David Gray made three drawings of Uranus on Sept. 26, Oct. 16 and Oct. 27, 2008. In all three drawings, he used a 0.415 meter Dall-Kirkham telescope equipped with a bino-viewer at magnifications of 365X and 535X. On all three dates, he drew dark equatorial belts. This writer measured the zenographic latitudes of the edges of both belts. The

Table 4: Photoelectric Magnitude Measurements of Uranus Made in 2008

Oct. 22.220 (Westfall)	5.826 (V)	-7.120	HD 221356
Oct. 23.209 (Westfall)	5.824 (V)	-7.124	HD 221356
Oct. 24.197 (Westfall)	5.833 (V)	-7.116	HD 221356
Oct. 25.195 (Westfall)	5.834 (V)	-7.116	HD 221356
Oct. 26.224 (Westfall)	5.834 (V)	-7.118	HD 221356
Oct. 27.105 (Schmude)	5.827 (V)	-7.126	96-Aqr
Oct. 27.231 (Westfall)	5.845 (V)	-7.108	HD 221356
Oct. 28.154 (Fox)	5.811 (V)	-7.143	96-Aqr
Oct. 28.154 (Fox)	6.301 (B)	-6.653	96-Aqr
Oct. 30.079 (Schmude)	5.818 (V)	-7.139	96-Aqr
Nov. 8.167 (Westfall)	5.870 (V)	-7.101	HD 221356
Nov. 14.188 (Westfall)	5.860 (V)	-7.121	HD 221356
Nov. 15.168 (Westfall)	5.869 (V)	-7.114	HD 221356
Nov. 17.140 (Westfall)	5.870 (V)	-7.116	HD 221356
Nov. 18.147 (Westfall)	5.876 (V)	-7.112	HD 221356
Nov. 19.143 (Westfall)	5.870 (V)	-7.120	HD 221356
Nov. 24.140 (Westfall)	5.888 (V)	-7.111	HD 221356
Nov. 28.122 (Westfall)	5.893 (V)	-7.113	HD 221356
Dec. 18.116 (Westfall)	5.920 (V)	-7.123	HD 221356

Table 5: Photoelectric Magnitude Measurements of Neptune in 2008

Date (observer)	Measured magnitude (filter)	X(1,α)	Comparison Star
Sept. 5.184 (Fox)	7.719 (V)	-6.988	44-Cap
Sept. 5.184 (Fox)	8.078 (B)	-6.629	44-Cap
Sept. 19.363 (Loader)	7.745 (V)	-6.967	45-Cap
Sept. 19.397 (Loader)	8.097 (B)	-6.615	45-Cap
Sept. 25.363 (Loader)	8.133 (B)	-6.584	45-Cap
Sept. 25.526 (Loader)	7.723 (V)	-6.994	45-Cap
Oct. 4.100 (Fox)	7.726 (V)	-7.002	44-Cap
Oct. 4.100 (Fox)	8.108 (B)	-6.620	44-Cap
Oct. 5.111 (Fox)	7.712 (V)	-7.017	44-Cap
Oct. 5.111 (Fox)	8.153 (B)	-6.576	44-Cap
Oct. 9.099 (Fox)	7.725 (V)	-7.008	44-Cap
Oct. 9.099 (Fox)	8.127 (B)	-6.606	44-Cap
Oct. 21.080 (Fox)	7.749 (V)	-6.997	44-Cap
Oct. 21.080 (Fox)	8.164 (B)	-6.582	44-Cap
Oct. 27.060 (Schmude)	7.709 (V)	-7.045	44-Cap
Oct. 27.072 (Schmude)	7.801 (V)	-6.953	44-Cap
Oct. 27.083 (Schmude)	7.772 (V)	-6.982	44-Cap
Oct. 28.065 (Fox)	7.760 (V)	-6.995	44-Cap
Oct.28.065 (Fox)	8.142 (B)	-6.613	44-Cap
Oct. 30.018 (Schmude)	7.719 (V)	-7.038	44-Cap
Oct. 30.031 (Schmude)	7.717 (V)	-7.040	44-Cap
Oct. 30.045 (Schmude)	7.748 (V)	-7.004	44-Cap
Oct. 30.063 (Schmude)	7.785 (V)	-6.973	44-Cap

average latitudes for the north belt were 19° N (northern edge) and 9° N (southern edge). The average latitudes for the south belt are 6° S (northern edge) and 20° S (southern edge). Gray also drew a dark north polar cap. This writer measured the southern border of this dark cap to be 54° N. During the late 1960s, both Randy Shartle (Shartle, 1968,199) and Cross (Cross, 1969, 153) observed dark, parallel equatorial belts similar to what Gray observed in 2008.

Satellites

A few people imaged the brighter moons of Uranus and Neptune during 2008. Frank Melillo measured the brightness of Triton on Aug. 22 and Aug. 23. His results are summarized in *Table 7*. The normalized magnitude of Triton based on Frank's two unfiltered measurements was X(1,0) = -1.21. This value is close to the V filter normalized magnitude of -1.26 (Schmude, 2008, 90). During the early years of the 21st century, Triton had a relatively warm southern summer. It will be interesting to see how Triton's brightness and color change as the southern hemisphere begins cooling down.

Melillo attempted to image Nereid on Aug. 23, 2008. His equipment is summarized in *Table 7*. He reports that this moon was fainter than magnitude 18.0. This is consistent with the V filter measurements of Schaefer and co-workers (2008a). This group reports an average phase curve for Nereid based on several years of measurements. According to their results, the average maximum brightness of Nereid was magnitude 19.1. This group, however, points out that Nereid undergoes large brightness changes from time to time.

Delcroix reports brightness measurements for three moons of Uranus (Titania, Oberon and Umbriel) and Neptune's largest moon Triton. His measurements were all about 0.2 magnitudes brighter than expected. This writer has computed brightness differences of 0.19 and 0.96 magnitudes for Oberon minus Titania and Umbriel minus Titania respectively. These values are based on Delcroix's Sept. 20 measurements. The relative brightness values of Oberon minus Titania and Umbriel minus Titania for 2002 – 2008

Table 6: Selected Normalized Magnitudes, B – V Values and Geometric Albedos for Uranus and Neptune in 2008

Planet	B(1,0)	V(1,0)	B-V	Geometric Albedo	
				V filter	B filter
Uranus	-6.658 ± 0.010	-7.118 ± 0.010	0.460 ± 0.014	0.492	0.589
Neptune	-6.60 ± 0.02	-7.00 ± 0.02	0.40 ± 0.03	0.467	0.588

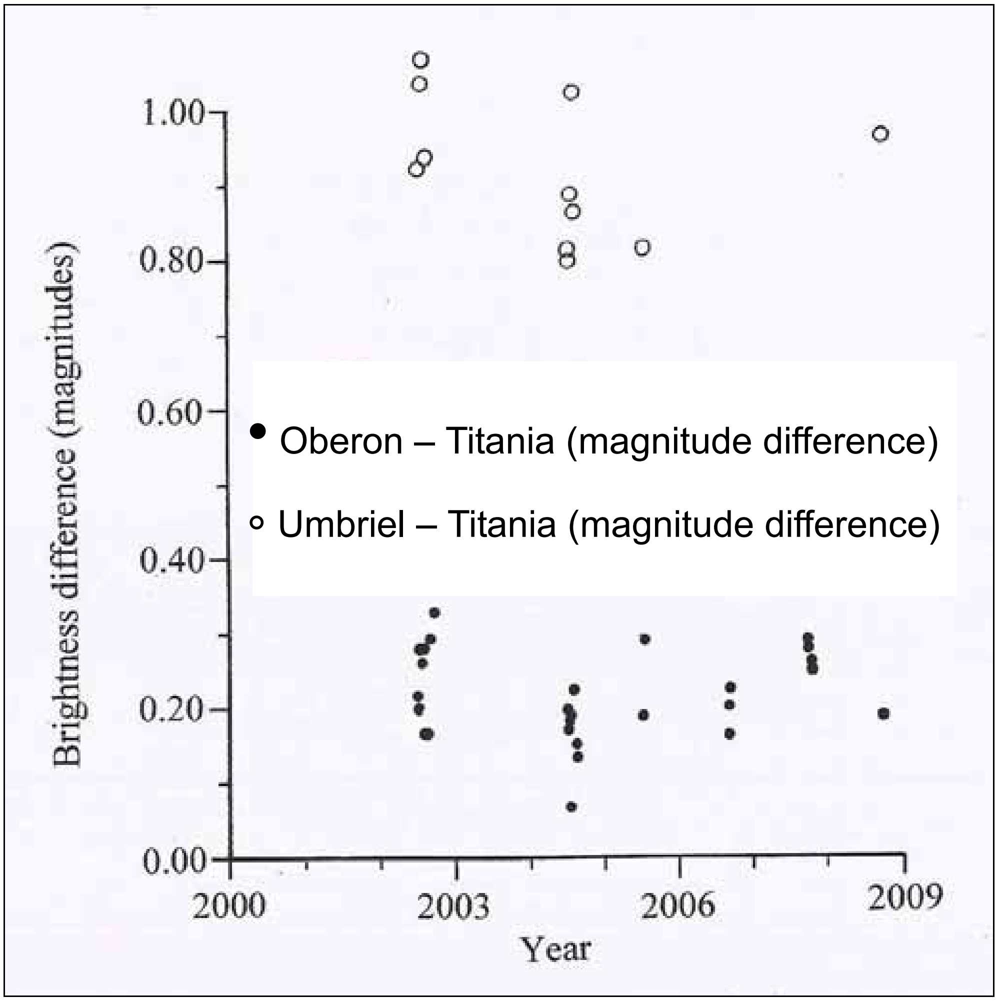

Figure 2. A graph showing the brightness difference for both Oberon minus Titania and Umbriel minus Titania plotted against the year. In all cases, the brightness differences are computed by subtracting the stellar magnitudes between two moons.

are plotted in *Figure 2*. The brightness difference between Uranus' two moons Titania and Oberon has remained nearly constant between 2002 and 2008. It will be interesting to see if this trend continues in the upcoming decade.

John Sussenbach imaged Uranus' moon Miranda on Sept. 26, 2008 at 21:46 UT. He used a 0.28 m Schmidt-Cassegrain telescope along with an ATK 2HS camera to image this elusive moon. This moon is clearly dimmer than Umbriel and Ariel in his image. Miranda is a difficult target because it is very close to Uranus and it is about eight times dimmer than Titania.

Acknowledgements

This writer would like to thank Truman Boyle for allowing me to use his telescope to make several of the Uranus and Neptune brightness measurements. This writer would also like to thank Sue Gilpin for her assistance. Finally, this writer is grateful to everyone who sent in observations of Uranus and Neptune.

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Table 7: Brightness Measurements of a Few Brighter Moons of Uranus and Neptune in 2008

Date (Time - UT)	Camera (filter)	Moon	Brightness (magnitude)	X(1,0)	Comparison Star	Observer
Aug. 22, 2008 (4:35)	Starlight Xpress MX-5 (unfiltered)	Triton	13.50	-1.20	USNO 32139580-141830	Melillo
Aug. 23, 2008 (3:30)	Starlight Xpress MX-5 (unfiltered)	Triton	13.49	-1.21	USNO 32139580-141830	Melillo
Aug. 23, 2008 (3:30)	Starlight Xpress MX-5 (unfiltered)	Nereid	Fainter than 18.0	Fainter than 3.3	USNO 32139580-141830	Melillo
Sept. 1, 2008 (22:19)	Skynyx 2-0M (LRGB)	Triton	13.22	-1.49	---	Delcroix
Sept. 20, 2008 (22:28)	Skynyx 2-0M (LRGB)	Titania	13.48	0.56	---	Delcroix
Sept. 20, 2008 (22:28)	Skynyx 2-0M (LRGB)	Oberon	13.67	0.75	---	Delcroix
Sept. 20, 2008 (22:28)	Skynyx 2-0M (LRGB)	Umbriel	14.44	1.52	---	Delcroix

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ALPO Remote Planets Section Report Form

General Information

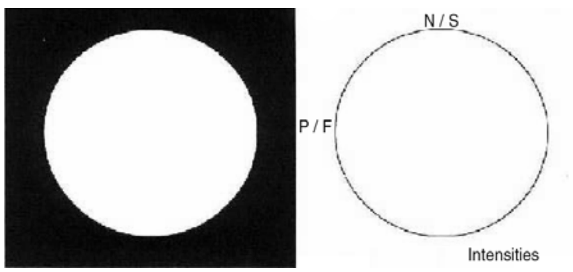
Name: ____ Location: ___________________________

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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Publisher & Editor-in-Chief

- Ken Poshedly (all papers, submissions, etc); 1741 Bruckner Ct., Snellville, GA 30078-2784

Science / Peer Reviewers

- Klaus R. Brasch; 10915 Sage Rd, Flagstaff, AZ, 86004
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Book Review Editor

Robert A. Garfinkle, F.R.A.S., 32924 Monrovia St., Union City, CA 94587-5433

Translators

- Spanish Language Submissions; Guido E. Santacana, San Juan 1678, Venus Gardens, Rio Piedras, PR 00926

Graphics

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****

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Website

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****

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- Coordinator (including all submissions, photo, sketches, filtergrams); Kim Hay, 76 Colebrook Rd, RR #1,Yarker, ON, K0K 3N0 Canada
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- Assistant Coordinator & Archivist; Jamey Jenkins, 308 West First Street, Homer, Illinois 61849
- Scientific Advisor; Richard Hill, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721

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Lunar Section

Lunar Topographical Studies Program

http://moon.scopesandscapes.com/alpo-topo

Smart-Impact Webpage

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

The Lunar Observer

http://moon.scopesandscapes.com/tlo.pdf

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Banded Craters Program

http://moon.scopesandscapes.com/alpo-bcp.htm

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- Assistant Coordinator; William Dembowski, 219 Old Bedford Pike, Windber, PA 15963

Lunar Meteoritic Impacts Search Program

http://www.alpo-astronomy.org/lunar/lunimpacts.htm

- Coordinator; Brian Cudnik, 11851 Leaf Oak Drive, Houston, TX 77065

Lunar Transient Phenomena

http://www.alpo-astronomy.org/lunar/LTP.html; also http://www.LTPresearch.org

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

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- Coordinator; Roger J. Venable, MD, 3405 Woodstone Pl., Augusta, GA 30909-1844
- Assistant Coordinator & Mars section editor; Daniel Joyce, 2008 Barrymore CT, Hanover Pk., IL 60133-5103
- Assistant Coordinator (CCD/Video imaging and specific correspondence with CCD/Video imaging); Donald C. Parker, 12911 Lerida Street, Coral Gables, FL 33156
- Assistant Coordinator (photometry and polarimetry); Richard W. Schmude, Jr., 109 Tyus St., Barnesville, GA 30204
- Assistant Coordinator; Jim Melka, 14176 Trailtop Dr., Chesterfield, MO 63017
- Advisor; Daniel M. Troiani, P.O. Box 1134 Melrose Park, IL 60161-1134
- Assistant Coordinator & Archivist (general correspondence/drawings, visual observations, Intl. Mars Patrol alert notices, ALPO Mars Observing kit); Deborah Hines, P.O. Box 1134 Melrose Park, IL 60161-1134

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- Assistant Coordinator; Lawrence S. Garrett, 206 River Road, Fairfax, VT 05454
- Scientific Advisor; Steve Larson, Lunar & Planetary Lab, University of Arizona, Tuscon, AZ 85721

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http://www.alpo-astronomy.org/jupiter

- Coordinator (Section); Richard W. Schmude Jr., 109 Tyus St., Barnesville, GA 30204
- Assistant Coordinator (Section); Ed Grafton, 15411 Greenleaf Lane, Houston, TX 77062
- Assistant Coordinator & Scientific Advisor; Sanjay Limaye, University of Wisconsin, Space Science and Engineering Center, Atmospheric Oceanic and Space Science Bldg. 1017, 1225 W. Dayton St., Madison, WI 53706
- Assistant Coordinator, Transit Timings; John McAnally, 2124 Wooded Acres, Waco, TX 76710
- Assistant Coordinator, Newsletter; Craig MacDougal, 821 Settlers Road, Tampa, FL 33613
- Assistant Coordinator, Eclipses of Galilean Satellites; John E. Westfall, P.O. Box 2447, Antioch, CA 94531-2447
- Scientific Advisor; Prof. A. Sanchez-Lavega, Dpto. Fisica Aplicada I, E.T.S. Ingenieros, Alda. Urquijo s/n, 48013, Bilbao, Spain wupsalaa@bicc00.bi.ehu.es

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http://www.alpo-astronomy.org/publications/Monographs page.html

ALPO monographs are publications that we believe will appeal to our members, but which are too lengthy for publication in *The Strolling Astronomer*. All are available online as a pdf files. NONE are available any longer in hard copy format.

There is NO CHARGE for any of the ALPO monographs.

- **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. File size approx. 5.2 megabytes.

- **Monograph No. 2**. *Proceedings of the 44th Convention of the Association of*

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Lunar and Planetary Observers. Greenville, South Carolina, June 15-18, 1994. 52 pages. File size approx. 6.0 megabytes.

- **Monograph No. 3**. *H.P. Wilkins 300-inch Moon Map.* 3rd Edition (1951). Available as one comprehensive file (approx. 48 megabytes) or five section files (Part 1, 11.6 megabytes; Part 2, 11.7 megabytes; Part 3, 10.2 megabytes; Part 4, 7.8 megabytes; Part 5, 6.5 megabytes)
- **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. File size approx. 2.6 megabytes.
- **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. File size approx. 2.6 megabytes.
- **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.File size approx. 2.6 megabytes.
- **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.File size approx. 2.6 megabytes.
- **Monograph No. 8**. *Proceedings of the 49th Convention of the Association of*

ALPO Staff E-mail Directory

Bailey, W .... wayne.bailey@alpo-astronomy.org
Benton, J.L. .... jlbaina@msn.com
Benton, J.L. .... jlbaina@gmail.com
Brasch, K.R. .... m_brasch@earthlink.net
Baum, R. .... richardbaum@julianbaum.co.uk
Cook, A. .... tony.cook@alpo-astronomy.org
Cudnik, B. .... cudnik@sbcglobal.net
Darling, D.O. .... DOD121252@aol.com
Dembowski, W. .... dembowski@zone-vx.com
Dobbins, Tom .... r&d@organictech.com
Garfinkle, R.A. .... ragarf@earthlink.net
Garrett, L.S. .... atticaowl@yahoo.com
Grafton, E. .... ed@egrafton.com
Gray, R. .... sevenvalleysent@yahoo.com
Haas, W.H. .... haasw@haasw@agavue.com
Hay, K. .... kim@starlightcascade.ca
Hill, D. .... dhill@lpl.arizona.edu
Hill, R .... rhill@lpl.arizona.edu
Hines, D. .... cmpterdevil@comcast.net
Huddleston, M.W. .... kc5lei@sbcglobal.net
Jakiel, R .... rjakiel@earthlink.net
Jenkins, J. .... jenkinsjl@yahoo.com
Joyce, D. .... djoyce@triton.edu
Kronk, G .... kronk@cometography.com
Larson, S. .... slarson@lpl.arizona.edu
Limaye, S. .... sanjayl@ssec.wisc.edu
Lunsford, R.D. .... lunro.imo.usa@cox.net
MacDougal, C. .... macdouc@verizon.net
McAnally, J. .... CPAJohnM@aol.com
Melillo, F. .... frankj12@aol.com
Melka, J. .... jtmelka@yahoo.com
Owens, L. .... larry.owens@alpo-astronomy.org
Parker, D.C. .... park3232@bellsouth.net
Pilcher, F. .... pilcher@ic.edu
Poshedly, K. .... ken.poshedly@alpo-astronomy.org
Reynolds, M. .... director@alpo-astronomy.org
Robertson, T.J. .... cometman@cometman.net
Sanchez-Lavega, A. .... wupsalaa@bicc00.bi.ehu.es
Sanford, J. .... starhome@springvillewireless.com
Santacana, G.E. .... laffitte@prtc.net
Schmude, R.W. .... schmude@gdn.edu
Slaton, J.D. .... jd@justfurfun.org
Timerson, B. .... btimerson@rochester.rr.com
Troiani, D.M. .... dtroiani@triton.edu
Ulrich, R.K. .... rulrich@uark.edu
Venable, R.J. .... rjvmd@hughes.net
Westfall, J.E. .... johnwestfall@comcast.net
Will, M. .... matt.will@alpo-astronomy.org
Wingate, B. .... astrorock2010@yahoo.com

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Lunar and Planetary Observers. Atlanta, Georgia, July 9-11,1998.122 pages. Hard copy $17 for the United States, Canada, and Mexico; $26 elsewhere.File size approx. 2.6 megabytes.

- **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.File size approx. 2.6 megabytes.

- **Monograph Number 10.** *Observing and Understanding Uranus, Neptune and Pluto*. By Richard W. Schmude, Jr. 31 pages. File size approx. 2.6 megabytes.

- **Monograph No. 11**. *The Charte des Gebirge des Mondes* (Chart of the Mountains of the Moon) by J. F. Julius Schmidt, this monograph edited by John Westfall. Nine files including an accompanying guidebook in German. Note files sizes: Schmidt0001.pdf, approx. 20.1 mb; Schmidt0204.pdf, approx. 32.6 mb; Schmidt0507.pdf, approx. 32.1 mb; Schmidt0810.pdf, approx. 31.1 mb; Schmidt1113.pdf, approx. 22.7 mb; Schmidt1416.pdf, approx. 28.2 mb; Schmidt1719.pdf, approx. 22.2 mb; Schmidt2022.pdf, approx. 21.1 mb; Schmidt2325.pdf, approx. 22.9 mb; SchmidtGuide.pdf, approx. 10.2 mb

ALPO Observing Section Publications

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

- **Solar:** Totally revised *Guidelines for the Observation and Reporting of Solar Phenomena*, $10 USD; includes CD with 100 page-manual in pdf with up-to-date techniques, images, and links to 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 & Planetary Training Section:** *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. Available as pdf file via e-mail or send check or money order payable to Timothy J. Robertson, 2010 Hillgate Way #L, Simi Valley, CA 93065; e-mail cometman@cometman.net.

- **Lunar (Bailey):** (1) *The ALPO Lunar 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) o*bserving forms,* free at http://moon.scopesandscapes.com/alpo-sap.html, or $10 for a packet of forms by regular mail. Specify *Lunar Form*s. 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://moon.scopesandscapes.com/tlo.pdf or $1.25 per hard copy: send SASE with payment (check or money order) to: Wayne Bailey, 17 Autumn Lane, Sewell, NJ 08080.

- **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):** Introductory information for observing Venus, including observing forms, can be downloaded for free as pdf files at http://www.alpo-astronomy.org/venus. The *ALPO Venus Handbook* with observing forms included is available as the *ALPO Venus Kit* for $17.50 U.S., and may be obtained by sending a check or money order made payable to "Julius L. Benton" for delivery in approximately 7 to 10 days for U.S. mailings. The *ALPO Venus Handbook* may also be obtained for $10 as a pdf file by contacting the ALPO Venus Section. All foreign orders should include $5 additional for postage and handling; p/h is included in price for domestic orders. 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, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail leaguesales@astroleague.org. *(2) Observing Forms;* send SASE to obtain one form for you to copy; otherwise

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send $3.60 to obtain 25 copies (send and make checks payable to “Deborah Hines”, see address under “Mars Section”).

- **Jupiter:** *(1) Jupiter Observer’s Handbook*, $15 from the Astronomical League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail leaguesales@astroleague.org. (2) *Jupite*r, the ALPO section newsletter, available online only via the ALPO website at http://mysite.verizon.net/macdouc/alpo/jovenews.htm; (3) *J-Ne*t, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougal. (4) *Timing the Eclipses of Jupiter’s Galilean Satellites* free at http://www.alpo-astronomy.org/jupiter/GaliInstr.pdf, report form online at http://www.alpo-astronomy.org/jupiter/GaliForm.pdf; send SASE to John Westfall for observing kit and report form via regular mail. (5) *Jupiter Observer’s Startup Ki*t, $3 from Richard Schmude, Jupiter Section coordinator.

- **Saturn (Benton):** Introductory information for observing Saturn, including observing forms and ephemerides, can be downloaded for free as pdf files at http://www.alpo-astronomy.org/saturn; or if printed material is preferred, the *ALPO Saturn Kit* (introductory brochure and a set of observing forms) is available for $10 U.S. by sending a check or money order made payable to “Julius L. Benton” for delivery in approximately 7 to 10 days for U.S. mailings. The former *ALPO Saturn Handbook* was replaced in 2006 by *Saturn and How to Observe It* (by J. Benton), and it can be obtained from book sellers such as Amazon.com. 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, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail leaguesales@astroleague.org. (2) *The ALPO Meteors Section Newslette*r, 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).

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THE ASSOCIATION OF LUNAR & PLANETARY OBSERVERS (ALPO)

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 and be used for future research purposes. For the professional astronomer, it is a resource where group studies or systematic observing patrols add to the advancement of astronomy.

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

We have "sections" for the observation of all the types of bodies found in our Solar System. Section coordinators collect and study submitted observations, correspond with observers, encourage beginners, and contribute reports to our quarterly Journal at appropriate intervals. Each section coordinator can supply observing forms and other instructional material to assist in your telescopic work. You are encouraged to correspond with the coordinators in whose projects you are interested. Coordinators can be contacted either via e-mail (available on our website) or at their postal mail addresses listed in our Journal. Members and all interested persons are encouraged to visit our website at *http://www.alpo-astronomy.org*. Our activities are on a volunteer basis, and each member can do as much or as little as he or she wishes. Of course, the ALPO gains in stature and in importance in proportion to how much and also how well each member contributes through his or her participation.

Our work is coordinated by means of our periodical, *The Strolling Astronomer*, also called the *Journal of the Assn. of Lunar & Planetary Observers*, which is published seasonally. Membership dues include a subscription to our Journal. Two versions of our ALPO are distributed — a hardcopy (paper) version and an online (digital) version in "portable document format" (pdf) at considerably reduced cost.

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0 = Sun 1 = Mercury 2 = Venus 3 = Moon 4 = Mars 5 = Jupiter 6 = Saturn 7 = Uranus 8 = Neptune 9 = Pluto A = Asteroids C = Comets D = CCD Imaging E = Eclipses & Transits H = History I = Instruments M = Meteors & Meteorites P = Photography R = Radio Astronomy S = Computing & Astronomical Software T = Tutoring & Training Program (including Youth)