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The Strolling Astronomer

Volume 55, Number 4, Autumn 2013

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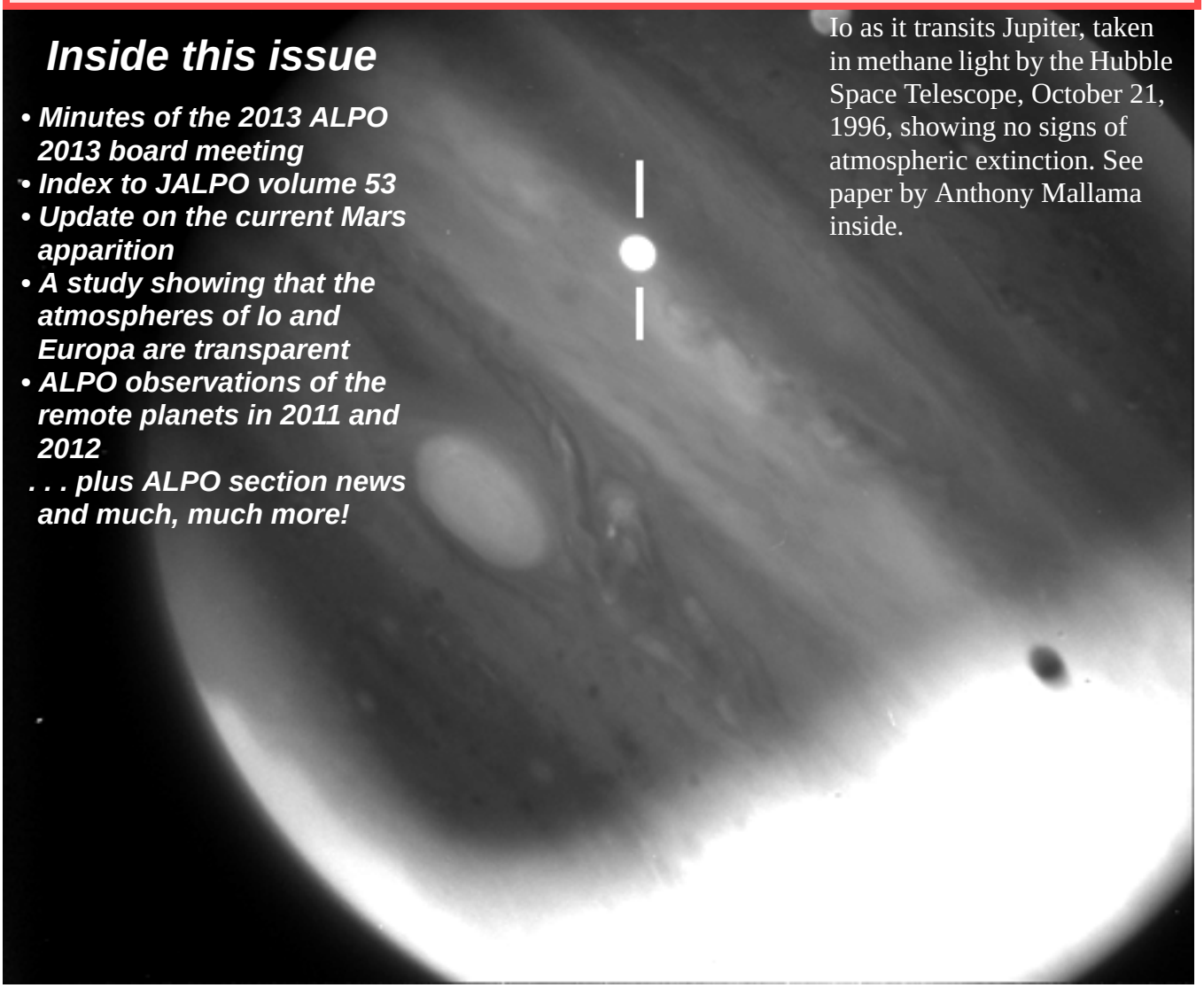
Inside this issue

- ***Minutes of the 2013 ALPO 2013 board meeting***
- ***Index to JALPO volume 53***
- ***Update on the current Mars apparition***
- ***A study showing that the atmospheres of Io and Europa are transparent***
- ***ALPO observations of the remote planets in 2011 and 2012***

. . . plus ALPO section news and much, much more!



Io as it transits Jupiter, taken in methane light by the Hubble Space Telescope, October 21, 1996, showing no signs of atmospheric extinction. See paper by Anthony Mallama inside.

Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 55, No.4, Autumn 2013
This issue published in October 2013 for distribution in both portable document format (pdf) and also hardcopy format.

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

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

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http://www.alpo-astronomy.org

Founded in 1947

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Point of View
Coming Up –Two Years of Doing the Best I Can

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

Well, I guess it was bound to happen. After years of passing on accepting the top ALPO job when my turn came, I finally gave in and decided to give it my own best shot and serve a term as executive director. After all, it's not like I didn't help out already behind the scenes with all the other executive directors. So now, it's officially and publicly my turn.

Kind of odd, though. When I joined the ALPO for the first time in I think 1962 at age 12, my only interest was poring through the pages of this publication – edited then by founder and now director emeritus Walter Haas – and just wish I could do lunar sketches like the masterpieces that graced these pages back then. My crude attempts were kinda-sorta rebuffed, but them's the breaks.

So here I am, all these years later, having rejoined in 1990 and now with plans to serve as caretaker and let a well-running machine keep on doing what it seems to be doing pretty well – serving as the official organization for you who are truly serious about solar system astronomy.

Like any chief exec who has the best interests of his organization at the forefront, I'm truly open to hearing/reading/considering/discussing any suggestions from all of you that might result in more growth, more success, a more better Assn of Lunar & Planetary Observers. No matter what it's about, membership, observing, fundraising, etc., I'm here to listen and hopefully help spread the joy.

****

We've got a very special issue this time, with top-notch work for you to peruse. We've got the usual minutes of our recent board meeting held at ALCon 2013 in Atlanta, the index to Volume 53 of this Journal, a great article on the current Mars apparition, a very well thought-out paper on the atmospheres of the Jovian satellites Io and Europa, plus of course, a scientifically rich remote planets report.

Please note that this publication invites ALL of you to participate with contributions of your own, whether it be a long or short paper on observing techniques, something on your own favorite solar system object, a great computer or cellphone app, or whatever you think your fellow ALPO members should know about.

Inside the ALPO
Member, section and activity news

ALPO Interest Section Reports

Web Services
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Follow us on Twitter, become our friend on FaceBook or join us on MySpace.

Section Coordinators: If you need an ID for your section's blog, contact Larry Owens at *larry.owens@alpo-astronomy.org*

For details on all of the above, visit the ALPO home page online at *www.alpo-astronomy.org*

Computing Section
Larry Owens, 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,
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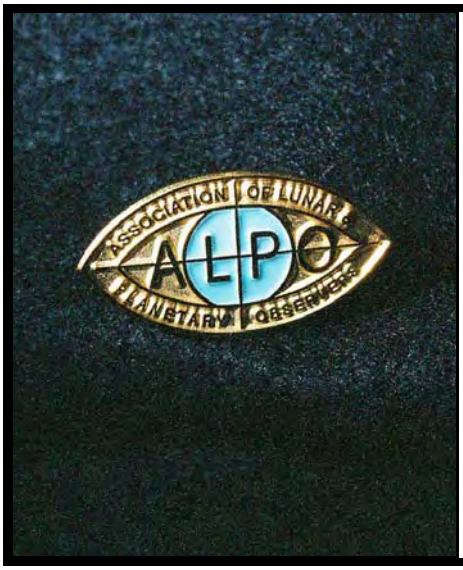
cometman@cometman.net



Announcing, the ALPO Lapel Pin

Now you can display your affiliation with our fine organization proudly with the new, colorful ALPO Lapel Pin.

With bright raised gold lettering against a recessed gold sandblast finish, each pin features the pupil of the ALPO "eye" in fluorescent aqua blue. A "pinch" clasp at the rear secures the pin in place. Pin dimensions are 1 $^{1}/_{8}$ in. by $^{9}/_{16}$ in.

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Only $8.50 for all other ALPO members.
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Price includes shipping and handling.

Send orders to: ALPO, PO Box 13456, Springfield, IL 62791-3456. E-mail to: *matt.will@alpo-astronomy.org*

Those interested in this VERY worthwhile program (or even those who wish to brush up on their skills) should contact Tim Robertson at the following addresses:

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ALPO Training Program
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Simi Valley, California 93065

Send e-mail to:
cometman@cometman.net

Please be sure to include a self-addressed stamped envelope with all correspondence.

For information on the ALPO Lunar & Planetary Training Program, go to:
www.cometman.net/alpo/

ALPO Observing Section Reports

Mercury / Venus Transit Section
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Visit the ALPO Mercury/Venus Transit Section online at *www.alpo-astronomy.org/transit*

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

Meteors Section
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Visit the ALPO Meteors Section online at *www.alpo-astronomy.org/meteorblog/* Be sure to click on the link to viewing meteors, meteor shower calendar and references.

Meteorites Section
Dolores H. Hill, section coordinator
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Visit the ALPO Meteorite Section online at *www.alpo-astronomy.org/meteorite/*

Inside the ALPO
Member, section and activity news

Comets Section

Report by Carl Hergenrother, acting assistant section coordinator
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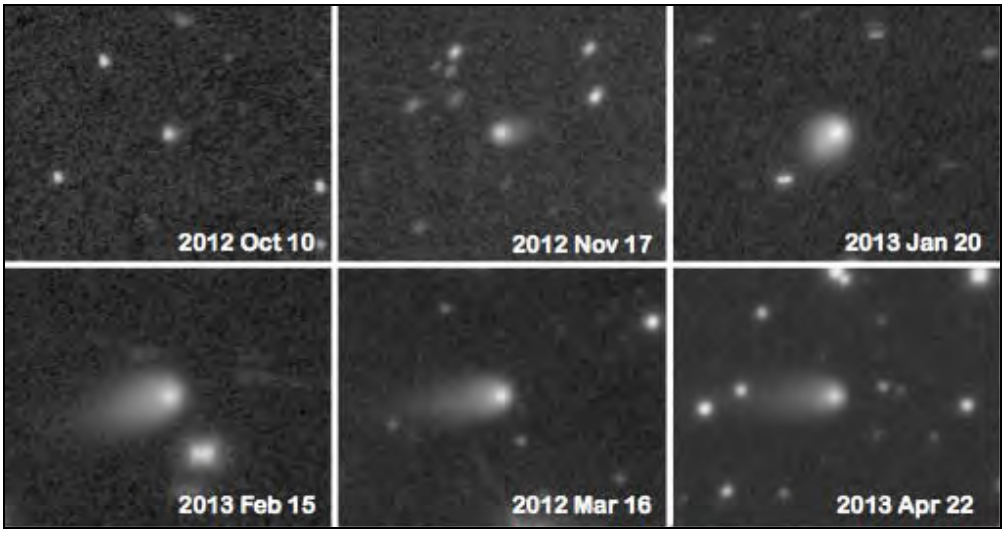
This autumn presents an opportunity to observe two very different comets. The first, Comet C/2012 S1 (ISON), is a dynamically new comet making its first trip into the inner Solar System in billions of years. ISON has the potentially to be a brilliant naked eye object, especially after its November 28 (Thanksgiving Day in the U.S.!) perihelion. The second, Comet 2P/Encke, will be making its 63rd observed orbit about the Sun since it was first seen in 1786.

In early September, the magnitude of ISON, based on visual and CCD observations, was ~12.5-13.0. This confirms that the comet's activity is once again increasing after a period of depressed activity during the first half of the year. There is still uncertainty as to how bright the comet will get or even if the nucleus is large enough to survive perihelion.

The comet should brighten from ~13th magnitude in early September to magnitude 10 by mid-October and naked-eye brightness in early- to mid-November. The comet may be observable telescopically or even by naked-eye near perihelion when it will be 1.1 million km (621,371 miles) from the surface of the Sun. If it survives perihelion (even by a day or two), a long high-surface brightness tail may be observable throughout the month of May long after the coma has faded.

Comet Encke, which will be sharing the early morning sky with Comet ISON, should brighten from its current ~14th magnitude in early September to ~6-7th magnitude in mid-November.

Three additional comets should be brighter than or approaching 10th magnitude this autumn (C/2012 V2 (LINEAR), 154P/Brewington, and 290P/Jager). Look for updates and guides to locating these and other comets on the ALPO Comet Section website.



(Comet ISON) The comet's rapid tail development and fast and then slow brightening is evident in a series of images taken with the University of Arizona (UA) Kuiper 1.5-m and Vatican Observatory/UA VATT Lennon 1.8-m telescopes between October 2012 and April 2013.

The ALPO Comet Section solicits all observations of comets, including drawings, magnitude estimates, images and spectra. Drawings and images of current and past comets are being archived in the ALPO Comet Section image gallery at http://www.alpo-astronomy.org/gallery/main.php?g2_itemId=4491

Please send all observations and images to Carl Hergenrother at the e-mail address shown at the beginning of this section report.

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

Solar Section

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

If you would like to include your images or sketches for archival purposes, please send tem to kim.hay@alpo-astronomy.org. Images/sketches should be no larger than 250 kb in size and include the CR number, date, UT and all other observing information available. If you would like to "talk" Solar and show your images online for all, join in on the Solar-ALPO Yahoo Group. There are currently 317 members.

We are always looking for members to submit an article to the JALPO on solar imaging and solar phenomena. Please send to myself (kim.hay@alpo-astronomy.org) or to Ken Poshedly (ken.poshedly@alpo-astronomy.org)

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

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Member, section and activity news

Mercury Section

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

By the time you read this, Mercury will be favorably positioned in the morning sky for viewing this Fall. On November 1st, it will be at Inferior Conjunction, but by November 18th, Mercury will be at its Greatest Western Elongation (at 19° degrees west of the Sun) and 63% illuminated. At that time it will be 6.6 arc-seconds in diameter at visual magnitude-0.5 magnitude. Observers should take this opportunity to see Mercury during what will be the best morning apparition of the year!

Please, make some observations while you can take this opportunity of the best morning apparition of the year! Otherwise, there's not much happening in the ALPO Mercury Section. But a few things are worth a mention.

Daniel Gasparri of Italy and John Boudreau made some excellent images during an evening apparition in June. Their images are two days apart and they are practically consistent with each other. More on that will be included in the 2013 Mercury apparition report.

John Boudreau did an excellent job for the updated version of the WinJupos (10.0.8) astrosoftware program. This version includes a tweaked MESSENGER map of Mercury's skin texture. He has taken the full resolution MESSENGER global map and corrected the longitude. Also, he corrected some rough spots that didn't display well in Photoshopped images from the previous WinJupos version.

ALPO Mercury Section Coordinator Frank Melillo with the 60-inch telescope at Mt. Wilson Observatory.

Finally, he adjusted the lighting problems that produced artifacts when used as a texture map.

Now, the map is all corrected!

Here is the link for those of you interested in downloading the latest version of the WinJupos 10.0.8 - including the MESSENGER Mercury map:

http://www.grischa-hahn.homepage.t-online.de/winjupos_download.htm

Over the past summer, I traveled to California where one day, I had an opportunity to visit the Mt. Wilson Observatory near Los Angeles. I was even lucky enough to go into the dome of the 60-inch telescope where our tour guide briefly explained the first high-resolution image of Mercury. There is a board showing all the important discoveries that were taken with the 60-inch telescope.

Of course, there is a report of Ron Dantowitz and a few others who used new video imaging techniques to capture the highest resolution of Mercury ever.

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

Venus Section

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

Venus is visible toward the southwestern horizon as twilight diminishes in September at apparent visual magnitude -4.2, moving eastward relative to the Sun as the 2013-14 Eastern (Evening) Apparition progresses.

Venus is now passing through its waning phases (a progression from fully illuminated through crescentic phases) as observers witness the leading hemisphere

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of Venus at the time of sunset on Earth. Venus will reach theoretical dichotomy (half phase) on October 31 and attain Greatest Elongation East of 47° on November 1, and reach Greatest Illuminated Extent (greatest brilliancy) on December 6.

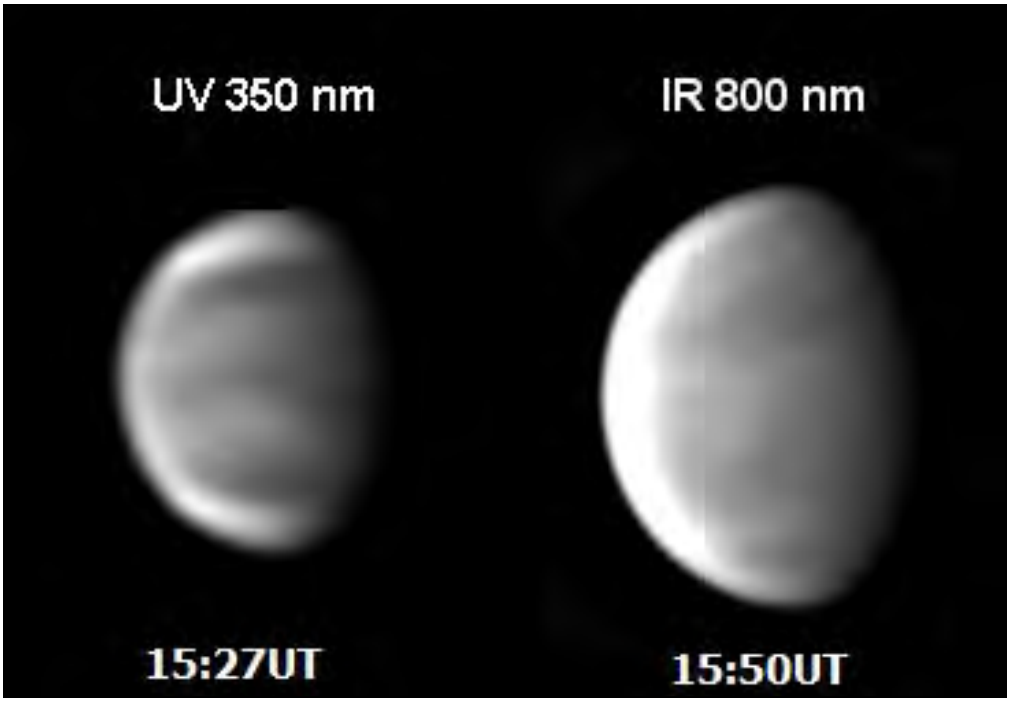
The accompanying table of Geocentric Phenomena in Universal Time (UT) is presented here for the convenience of observers for the 2013-14 Eastern (Evening) Apparition for planning purposes.

Observers have already submitted 100 drawings and images of Venus for the 2013-14 Eastern (Evening) Apparition, and as the planet becomes more favorably placed this fall, contributions will continue to increase.

Geocentric Phenomena of the 2013-2014 Eastern (Evening) Apparition of Venus in Universal Time (UT)

Superior Conjunction	2013	Mar 28^{d} (angular diameter = 9.8 arc-seconds)
Predicted Dichotomy		Oct 31.14 (exactly half-phase predicted)
Greatest Elongation East		Nov 01 (Venus will be 47º east of the Sun)
Greatest Illuminated Extent		Dec 06 (m_v = –4.9)
Inferior Conjunction	2014	Jan 10 (angular diameter = 63.1″)

Observers are reminded that images are still needed by the Venus Express (VEX) mission, which started systematically monitoring Venus at UV, visible (IL) and IR wavelengths back in May 2006. This Professional-Amateur (Pro-Am) effort continues, and observers should submit images 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*.



Images by Christophe Pellier of Bruz, France; adjacent IR 800nm and UV 350nm Venus' gibbous; August 10, 2013, between 15:27UT and 15:50UT using a 62.0 cm (24.4 in.) Cassegrain in good seeing. The bright limb band, cusp caps, and banded dusky markings are apparent in both images, but particularly so at UV wavelengths. Apparent diameter of Venus is 13.3", phase (k) 0.801 (80.1% illuminated), and visual magnitude -4.0. South is at top of image.

Regular Venus program activities (including drawings of Venus in Integrated Light and with color filters of known transmission) are also valuable throughout the period that VEX is observing the planet.

On November 19, 2010 ESA's Science Program Committee approved the extension of VEX mission operations until December 31, 2014, so Pro-Am cooperation fortunately continues this apparition.

The observation programs conducted by the ALPO Venus Saturn Section are listed on the Venus page of the ALPO website at *http://www.alpo-astronomy.org/venus* as well as in considerable detail in the author's ALPO Venus Handbook available from the ALPO Venus Section. Observers are urged to carry out digital imaging of Venus at the same time that others are imaging or making visual drawings of the planet (i.e., simultaneous observations).

Although regular imaging of Venus in both UV, IR and other wavelengths is extremely important and highly encouraged, far too many experienced observers have neglected making visual numerical relative intensity estimates and reporting visual or color filter impressions of features seen or suspected in the atmosphere of the planet (for instance,

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categorization of dusky atmospheric markings, visibility of cusp caps and cusp bands, measurement of cusp extensions, monitoring for the Schröter phase effect near the date of predicted dichotomy, and looking for terminator irregularities).

Routine use of the standard ALPO Venus observing forms will help observers know what needs to be reported in addition to supporting information such as telescope aperture and type, UT date and time, magnifications and filters used, seeing and transparency conditions, etc.

The ALPO Venus Section urges 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 *http://www.alpo-astronomy.org/venusblog/*

Lunar Section

Lunar Topographical Studies / Selected Areas Program

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

The ALPO Lunar Topographical Studies Section (ALPO LTSS) received a total of 109 new observations from 13 observers during the April-June quarter.

One contributed article was published in addition to numerous commentaries on images submitted.

The *Focus-On* series in this sections's newsletter *The Lunar Observer* continued with an article on Mare Insularum. Upcoming *Focus-On* subjects will include Mare Domes, Mons Rumker, Schickard-Wargentin, and Aristarchus.

NASA launched the LADEE (Lunar Atmosphere and Dust Environment Explorer) from the Mid-Atlantic Regional Spaceport at the Wallops Island Flight Facility on Sept. 6. It should enter lunar orbit 30 days later. (Editor's Note: NASA engineers were able to overcome a navigational hardware glitch that occurred about 24 hours after launch.)

After many years of service as coordinator and then assistant coordinator of the LTSSA program, Bill Dembowski has asked to reduce his work load. Therefore, I'm looking for a volunteer to serve as assistant coordinator. If you're interested, please e-mail me at *wayne.bailey@alpo-astronomy.org* or by regular mail at the address given in the ALPO Resources section of this Journal.

Visit the following online web sites for more info:

- ALPO Lunar Topographical Studies Section *moon.scopesandscapes.com/alpo-topo*
- ALPO Lunar Selected Areas Program *moon.scopesandscapes.com/alpo-sap.html*
- The Lunar Observer (current issue) *moon.scopesandscapes.com/tlo.pdf*
- The Lunar Observer (back issues) *moon.scopesandscapes.com/tlo_back.html*
- Banded Craters Program: *moon.scopesandscapes.com/alpo-bcp.html*
- The Lunar Discussion Group: *tech.groups.yahoo.com/group/Moon-ALPO/*
- The Moon-Wiki: *the-moon.wikispaces.com/Introduction*
- Chandrayaan-1 M3: *pds-imaging.jpl.nasa.gov/portal/chandrayaan-1_mission.html*
- LADEE: *www.nasa.gov/mission_pages/ladee/main*
- LROC: *lroc.sese.asu.edu/EPO/LROC/lroc.php*
- GRAIL: *http://www.nasa.gov/mission_pages/grail/main/*

Lunar Meteoritic Impacts

Brian Cudnik, program coordinator
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On September 6, 2013, the Lunar Atmosphere and Dust Environment Explorer (LADEE) was successfully launched from Wallops Island, Virginia, and is on a 30-day trip to the Moon. Once it arrives, it will undergo 30 days of scientific and systems checkout before entering into its science phase which is expected to last up to 120 days. Ground-based lunar meteor observations are requested in support of this mission, with the objective of monitoring the Moon for meteoroid impact flashes to relate these events to any observed changes in the dust environment in low lunar orbit. One can view the launch from here: *http://www.youtube.com/watch?v=hf0SIRxXvRo*.

Monthly routine observations commenced in June and continue into the fall, with about a half-dozen active observers regularly reporting in. There may be more that are observing but have not indicated their actions as of late. We also made observations of the Earthlit part of the crescent Moon during the August 12 Perseid maximum but as of this writing (mid-September), no positive reports of lunar Perseids have been received.

The ALPO-LMIS will work with NASA-Ames and NASA-MSFC Meteoroid

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Lunar Calendar for Fourth Quarter 2013 - All Times UT

Oct. 01	02:00	Moon 6.4 degrees SSW of Mars
Oct. 05	00:33	New Moon (Start of Lunation 1123)
Oct. 06	24:00	Moon 2.8 degrees NNE of Mercury
Oct. 07	02:00	Moon 2.0 degrees SW of Saturn
Oct. 08	14:00	Moon 4.6 degrees N of Venus
Oct. 09	23:54	Extreme South Declination
Oct. 10	23:07	Moon at Perigee (369,811 km – 229,790 miles)
Oct. 11	05:00	Moon 2.0 degrees NW of Pluto
Oct. 11	23:03	First Quarter
Oct. 13	05:00	Moon 1.2 degrees WSW of asteroid 3-Juno
Oct. 15	02:00	Moon 5.5 degrees NNW of Neptune
Oct. 17	21:00	Moon 3.3 degrees N of Uranus
Oct. 18	23:36	Full Moon (Penumbral eclipse of Moon)
Oct. 23	09:18	Extreme North Declination
Oct. 25	14:26	Moon at Apogee (404,560 km – 251,382 miles)
Oct. 25	21:00	Moon 5.0 degrees S of Jupiter
Oct. 26	23:41	Last Quarter
Oct. 29	21:00	Moon 6.1 degrees SSW of Mars
Nov. 03	05:00	Moon 1.3 degrees WNW of Mercury
Nov. 03	12:48	New Moon (Start of Lunation 1124)
Nov. 03	12:48	Annular eclipse of Moon
Nov. 03	19:00	Moon 1.9 degrees SSE of Saturn
Nov. 06	06:48	Extreme South Declination
Nov. 06	09:29	Moon at Perigee (365,361 km – 227,025 miles)
Nov. 06	24:00	Moon 8.0 degrees N of Venus
Nov. 07	14:00	Moon 1.9 degrees N of Pluto
Nov. 10	05:58	First Quarter
Nov. 11	06:00	Moon 5.5 degrees NNW of Neptune
Nov. 14	00:00	Moon 3.2 degrees NNW of Uranus
Nov. 17	15:15	Full Moon
Nov. 19	17:18	Extreme North Declination
Nov. 22	03:00	Moon 5.0 degrees SSW of Jupiter
Nov. 22	09:51	Moon at Apogee (405,445 km – 251,932 miles)
Nov. 25	19:29	Last Quarter
Nov. 27	13:00	Moon 5.4 degrees SSW of Mars
Dec. 01	08:00	Moon 1.5 degrees SW of Saturn
Dec. 01	23:00	Moon 0.53 degrees NE of Mercury
Dec. 03	00:21	New Moon (Start of Lunation 1125)
Dec. 03	16:42	Extreme South Declination
Dec. 04	10:16	Moon at Perigee (360,063 km – 223,733 miles)
Dec. 04	24:00	Moon 1.8 degrees N of Pluto
Dec. 05	22:00	Moon 7.5 degrees N of Venus
Dec. 08	15:00	Moon 5.4 degrees NNW of Neptune
Dec. 09	15:12	First Quarter
Dec. 11	04:00	Moon 3.3 degrees NNW of Uranus
Dec. 17	01:06	Extreme North Declination
Dec. 17	09:28	Full Moon
Dec. 19	04:00	Moon 5.0 degrees SSW of Jupiter
Dec. 19	23:50	Moon at Apogee (406,267 km – 252,443 miles)
Dec. 25	13:49	Last Quarter
Dec. 25	24:00	Moon 4.4 degrees SSW of Mars
Dec. 29	00:00	Moon 0.98 degrees SSW of Saturn
Dec. 31	04:48	Extreme South Declination

Table courtesy of William Dembowski

Environment Office to coordinate ground-based observations of the lunar dark side by interested members of the general public, both nationally and internationally. The ALPO-LMIS website is being updated monthly (more frequently as needed) and will include links to information needed to ensure success to one's observation program. In addition, the e-group *lunar-impact@yahoogroups.com* provides real-time dialogue on events and activities related to this on-going campaign.

As mentioned in an earlier communication and is worth repeating here: for lunar meteor monitoring efforts, we welcome observations from interested individuals; local astronomy clubs; schools, colleges, and universities; professional observatories; and Pro-Am groups like the ALPO, the British Astronomical Association, the Astronomical Society of the Pacific, and others. The goal of this effort is to provide ground-based "ground truth" to support the important scientific mission known as LADEE and give interested people the opportunity to play a key role in the science. Data provided by the public will assist impact modelers in their study of the physics of hypervelocity collisions.

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

Lunar Transient Phenomena

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

Dates and UTs on which to see features under similar illumination conditions to past LTPs, can be found at *http://users.aber.ac.uk/atc/tlp/tlp.htm*

Twitter LTP alerts are available at *http://twitter.com/lunarnaut*

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Finally, please visit the ALPO Lunar Transient Phenomena site online at *http://alpo-astronomy.org/lunar/ltp.html*

Mars Section

Report by Roger Venable, section coordinator
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See the fine article on the current Mars apparition in this issue of your ALPO Journal.

Visit the ALPO Mars Section online and explore the Mars Section's recent observations: *www.alpo-astronomy.org/mars*

Minor Planets Section

Frederick Pilcher, section coordinator
fpilcher35@gmail.com

Some highlights published in the *Minor Planet Bulletin*, Volume 40, No. 3, 2013 July - September, are hereby presented.

Dolores Hill and Carl Hergenrother, Lunar and Planetary Laboratory, lead the NASA sponsored "Target Asteroids!" citizen science program in support of the OSIRIS-REx (Origins Spectral Interpretation Resource Identification Security - Regolith Explorer) space mission to rendezvous with asteroid 101955 Benu in 2018 and return a surface sample in 2023.

The goal of "Target Asteroids!" is to encourage astronomers to make astrometric, photometric, and spectroscopic observations of near-Earth asteroids which are possible targets of future space missions, and to increase our knowledge of near-Earth asteroids in general and larger main belt asteroids whose known surface properties are similar to those of near-Earth asteroids.

In particular, observations over a large range of phase angles are especially requested. In *Minor Planet Bulletin* Volume 40, No. 3, July - September 2013, these authors provide further details of their program and a list of suitable targets observable during this three-month interval.

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The list of small, rapidly rotating asteroids found to have binary companions continues to grow. Reported in this issue of asteroids newly found to have satellite companions are 1052 Belgica, 1727 Mette, 3034 Climenhaga, 4383 Suruga, 4440 Tchantches, 16525 Shumarinaiko, (27568) 2000 PT6, (53432) 1995 UT55, and possibly (15430) 1998 UR31 (although the last named is very uncertain).

The paper by Brian Warner on detection of satellite companions for 4383 Suruga, 4440 Tchantches, and (53432) 1995 UT55 is being reprinted in an upcoming issue of this Journal so that the methods to find satellites of asteroids and their results may become better known to general readers.

Bruce L. Gary obtained an all-night lightcurve on Feb. 16 UT of 2012 DA14 starting only 6 hours after it passed within 27,000 kilometers (16,777 miles) of Earth. He publishes a lightcurve with period 9.1 +/- 0.5 hours, amplitude 1.2 +/- 0.2 magnitudes.

Lightcurves with derived rotation periods are published for 110 other asteroids, 12, 102, 108, 177, 215, 221, 227, 255, 271, 331, 577, 644, 729, 745, 785, 850, 852, 906, 964, 973, 1016, 1024, 1473, 1509, 1599, 1802, 1822, 1827, 1925, 1979, 2007, 2034, 2046, 2048, 2182, 2239, 2308, 2334, 2491, 2512, 2556, 2709, 2730, 3007, 3024, 3063, 3076, 3140, 3558, 3647, 3704, 3720, 3872, 3920, 4100, 4188, 4611, 4613, 4719, 4736, 5317, 5418, 5841, 5953, 6384, 6394, 7213, 7545, 7569, 8077, 8417, 8825, 9231, 9247, 9387, 11063, 11405, 11437, 11705, 14873, 16669, 18486, 24844, 27713, 28126, 28788, 29242, 29298, 29308, 29729, 31354, 32750, 32772, 35340, 41044, 46436, 56318, 66092, 66419, 68537, 75648, 99008, 125738, 135486, 137199, 154347, 343098, 349068, 2012 TC4, 2013 BE19.

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

The *Minor Planet Bulletin* is a refereed publication and that it is available online at *http://www.minorplanet.info/mpbdownloads.html*. Annual voluntary contributions of $5 or more in support of the publication are welcome.

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 is visible in the early morning sky before sunrise and will reach opposition in January of 2014. Christophe Pellier, Michel Jacquesson, Mike Hood, and Manos Kardasis have already submitted images of Jupiter. These images show the Great Red spot and other familiar spots.

Richard plans to continue measuring the brightness of Jupiter later this year.

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

Galilean Satellite Eclipse Timing Program

Report by John Westfall, program coordinator
johnwestfall@comcast.net

A reminder that a schedule of Galilean satellite eclipses for the new apparition is available on the Jupiter page of the ALPO website (*http://alpo-astronomy.org*). We welcome observers to send us their timings of these events, using the observing form also available on the webpage.

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 fast approaching the time when it will be too low in the western sky during September for truly favorable viewing conditions, with conjunction with the Sun occurring on November 6, 2013.

By the time December arrives, Saturn will appear low in the eastern sky before sunrise, marking the start of the 2013-14 apparition. The planet's northern hemisphere and north face of the rings will continue to be seen to greater in the forthcoming 2013-14 observing season as the ring tilt toward Earth increases.

The accompanying table of geocentric phenomena for the upcoming 2013-14 apparition is presented for the convenience of readers who wish to plan their Saturn observing activities.

Observers have so far contributed over about 750 images and drawings of Saturn during the 2012-13 apparition, recording multiple compact bright spots in the region of the past NTrZ great white storm as well as a bright spot in NTeZ. A recurring dark condensation just

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below the NTeZ was imaged repeatedly during 2012-13 at the north edge of the NTeB.

There have been multiple small bright areas within the EZn (Equatorial Zone, northern half) ever since mid-February, particularly prominent at IR wavelengths. Of interest also have been amateur images of the remarkable hexagonal feature at Saturn's North pole at different wavelengths. Views of the major ring components, including Cassini's and Encke's divisions, improved this apparition due to the favorable ring tilt toward Earth of about 18°, and in 2013-14, circumstances will be even better with the value of B increasing to about +22°.

Observers are alerted to keep watching and imaging Saturn carefully throughout the rest of the apparition and into the 2013-14 observing season for current and possible newly emerging activity in the northern hemisphere of the planet.

The observation programs conducted by the ALPO Saturn Section are listed on the ALPO Saturn Section web page at *www.alpo-astronomy.org/saturn* as well as in considerable detail in the author's book, *Saturn and How to Observe It*, available from Springer, Amazon.com, etc., or by writing to the ALPO Saturn Section for further information.

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). Although regular imaging of Saturn is extremely important and highly encouraged, far too many experienced observers have neglected making visual numerical relative 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.

Image taken on August 24, 2013, at 09:20UT by Trevor Barry observing from Australia using a 40.6 (16.0 in.) Newtonian at visual (RGB) wavelengths. Notice the hexagonal feature within the NPR (North Polar Region) in this colorful image. Apparent diameter of Saturn's globe is 16.2" with a ring tilt of +18.0°. CMI = 131.0°, CMII = 310.9°, CMIII = 354.0°. S is at the top of the image.

The ALPO Saturn Section appreciates the dedicated work by so many observers who regularly submit their reports and images. *Cassini* mission scientists, as well as other professional specialists, are continuing to request drawings, digital images, and supporting data from

Geocentric Phenomena for the 2013-14 Apparition of Saturn in Universal Time (UT)	
Conjunction	2013 Nov 6^{d}
Opposition	2014 May 10^{d}
Conjunction	2014 Nov 18^{d}
Opposition Data:	
Equatorial Diameter Globe	18.6 arc-seconds
Polar Diameter Globe	16.6 arc-seconds
Major Axis of Rings	42.1 arc-seconds
Minor Axis of Rings	15.6 arc-seconds
Visual Magnitude (m_v)	0.1 m_v (in Libra)
B =	+21.8°

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amateur observers around the globe in an active Pro-Am cooperative effort.

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@gordonstate.edu

In July, Richard gave a talk to a group of professional astronomers in Alexandria, Virginia, about brightness measurements of Uranus. I believe that the talk was well received.

In early August, Richard submitted the 2012-2013 Uranus-Neptune apparition report to Ken Poshedly. This report will be published in the JALPO in 2014.

Christophe Pellier, Peter Gorczynski, F. Colas, Marc Delcroix, P. Valeau, A. Manach, B. Noiret, P. Tortech and R. Paret have submitted some excellent images of Uranus and Neptune. The images were made in red and near-infrared light. The images show cloud features on both planets and will be summarized in the 2013-2014 apparition report.

A reminder that the book *Uranus, Neptune and Pluto and How to Observe Them* is 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 *www.alpoastronomy.org/remote*.

Obituary: Cecil Post

Cecil Comer Post, 95, a 63-year-resident of Las Cruces, passed peacefully away on March 25, 2013. He was born in Weiser, Idaho, on Oct. 2, 1917, the son of Alexander and Willa Pearl Barham Post. He was raised by his maternal grandparents James Newson and Ada Florence Comer Barham. He is survived by Joan McClure-Post, his wife of nearly 25 years; sons, James of Albuquerque, David of West Gardiner, Maine, daughter Jeanne (Alton) Luper of Las Cruces, and stepson Daniel Guziec of Savannah, Ga. He also is survived by grandchildren, Nieve Pearl Robinson of Maui, Hawaii, Nathan Post of Albuquerque, Janice Horn of Las Cruces, and Kimberly (Jeremy) Klassen of Arvada, Colo.; great-grandchildren Rowan Robinson of Maui, and Austin Horn of Trinidad, Colo. He graduated from Woodrow Wilson High School, Dallas, Texas, in 1935. During World War II he served with the Merchant Marines as Chief Radio Officer in both the Pacific and Atlantic theaters. He graduated from New Mexico State University with a bachelor of science degree in physics in 1956. He came to Las Cruces to work in the Electromagnetics Section of the Physical Science Laboratory at New Mexico State University where he became the Antenna Project Manager. He also worked at the White Sands Missile Range. In 1962, he was elected to the science honorary society Sigma Xi for his research and promotion of science. At the time of his retirement in 1981, he was the senior physicist-project manager in the Electromagnetics Section, Engineering Division of PSL. He was active in the community. As a member of St. Andrews Episcopal Church, he served as Senior Warden, usher, and member of many committees. **He was a founding member of the Astronomical Society of Las Cruces where he participated as an active amateur astronomer and served in various offices including president. He included many astronomers as his friends, including Clyde Tombaugh who discovered Pluto. In 2001, he was the recipient of the Society's Outstanding Service Award. As a member of the Association of Lunar and Planetary Observers, he kept meticulous records of his observations. He used telescopes he had made for himself.** He was an avid photographer. His black and white photographs of Western landscapes and migratory birds grace New Mexico homes. He was a former member of the Professional Photographers of America. After retirement, he distinguished himself as a long-distance bicyclist. In June 1982 he rode from Missoula, Mont. to Anchorage, Alaska, a distance of 3,235 miles, on a 15-speed bicycle loaded with gear. He also rode on a three-week bicycle tour of the People's Republic of China. He liked to travel, whether abroad, to the Annual Conference of the Association of Lunar and Planetary Observers, or to the top of A Mountain. He was a positive person who when asked, "How are you?" always responded, "Never better!" He was preceded in death by his grandparents; his parents; his stepfather Billy McKesson; and by his first wife and mother of his children Barbara Joyce Flesher. Also preceding him in death were his siblings Raymond, Chester, Oakley, Clay, Mildred Zoe Post Jessen and stepsister Betty Thelma McKesson His memorial service will be held Tuesday, April 2, at St. Andrew's Episcopal Church, 518 Alameda Blvd., Las Cruces, at 1 p.m. In lieu of flowers, the family requests donations be made in Cecil Post's memory to St. Andrew's or to the Astronomical Society of Las Cruces (ASLC, PO Box 921, Las Cruces, NM 88004) for its outreach programs in local schools. Service arrangements have been entrusted to the care of Baca's Funeral Chapels and Sunset Crematory, 300 E. Boutz Road, Las Cruces. 527-2222. Your exclusive provider for "Veteran's and Family Memorial Care"

(Source: http://www.legacy.com/obituaries/lcsun-news/obituary.aspx?n=cecil-post&pid=163918588#fbLog)

Feature Story:

ALPO Board Meeting Minutes, July 26, 2013, Atlanta, Georgia

Minutes provided by Matt Will, ALPO Secretary / Treasurer
matt.will@alpo-astronomy.org

Call to Order

On Friday, July 26, 2013, at 9:14 a.m. EDT (Eastern Daylight Time), ALPO Executive Director and Board Chairman Julius L. Benton, Jr., called the ALPO Board to order in the Meteorology Classroom of the Fernbank Science Center in Atlanta, Georgia. The ALPO Board meeting was held during the 2013 AL/ALPO Atlanta Conference (ALCon 2013).

Board Members Attendees

ALPO board members Julius L. Benton, Jr. (Executive Director and Chairman), Donald C. Parker, Ken Poshedly (Associate Executive Director), Michael D. Reynolds, Richard W. Schmude, Jr., John E. Westfall, and Matthew L. Will (Secretary and Treasurer) were present in Atlanta.

Board members Sanjay Limaye and Walter H. Haas (founder and Director Emeritus of the ALPO) could not attend this year's conference.

A teleconference phone line was provided for Board members not attending the meeting in person; however, no one was on the teleconference line prior to the start of the meeting.

Guests at the business meeting included ALPO members Theo Ramakers, Howard Eskildsen, Michael Mattei and Wayne Bailey. Other guests that joined the meeting in progress included Wayne Green and Dan Joyce.

Issue One: Approval of the Board Meeting Minutes of 2012 (Introduced by Matthew L. Will)

Board meeting minutes for our 2012 ALPO Board meeting were approved by all the board members present.

Issue Two: Review of Financial Report and Endowment (Introduced by Matthew L. Will)

ALPO Secretary and Treasurer Matthew Will reported to the ALPO Board the ALPO's finances for the preceding year in the annual report submitted to the Board last February. The ALPO finished the Year 2012 with a deficit of $1,962.68. This was due to a fall-off of revenue coming into the organization and not caused by increases in expenses.

The drop in revenue primarily occurred because of a surge in early renewals toward the end of 2011 in which members avoided the scheduled increase starting in 2012. Hence the absence of many members renewing at the usual, scheduled time. There was some concern that the deficit trend would continue in 2013 as membership levels continued to drop.

For the first half of 2013, the ALPO operated at a deficit of $574.93, which was substantially lower than what was anticipated earlier in the year and which is good news. Thanks to extra funds from an anonymous donor, ALPO finances will likely break even toward the end of the year. Officially, the ALPO Springfield account's balance was $3,962.80 as of June 30, 2013.

Considering that longer-term revenue issues will still need to be addressed, the ALPO treasurer recommended a dues increase in the not-too-distant future. Currently, a one-year, four-issue membership in print costs members $33.00 while the expense of producing and mailing those issues over a year for one member costs $48.00. Sustaining and sponsor members pay the difference in dues versus cost, but even these revenues aren't making up the difference.

Revenue from members receiving the digital version is significant, but only accounts for revenue equivalent to our service and outreach cost. Roughly 85 to 90 percent of our revenue goes to printing and mailing the journal while 10 to 15 percent goes to the previously mentioned service and outreach cost.

The dues increase could apply as early as July 1, 2014, but could be deferred until

The ALPO board of directors present for the 2013 meeting in Atlanta. From left (clockwise) are John E. Westfall, Richard W. Schmude, Matthew L. Will, Julius L. Benton, Jr, Donald C. Parker, Michael D. Reynolds and Ken Poshedly. (Photo by Howard Eskildsen)

The ALCon 2013 check-in and registration table at the Fernbank Science Center in Atlanta. (Photo by Phil Johnson)

January 1, 2015. The below are the proposed membership dues increases.

These rates are tentative. They could rise slightly or even be lowered, considering a number of factors. The ALPO is looking to expand its advertising base in both the Journal and on the ALPO website. How much additional revenue we could collect is still an unknown, but this source of income still holds promise (see Issue Six: Advertising on the ALPO Website and the Journal). Other expenses not currently incurred could give cause for adjusting the dues structure still further. For example, additional support services may be needed for the Journal if our current editor or a future editor wants to be relieved of final production aspects for our publication. This would incur as much as a 25 percent increase in production cost for the Journal.

On the other hand, higher cost for printing and mailing the Journal could still be offset by entering into legal contracts with the printer extending over multiple issues. Ken also mentioned that he was still pursuing underwriting for the Journal from other sources that might be willing to grant us funding on a regular basis.

Table of Proposed Dues Increases (2015)

Type of Membership	Old Rates	New Rates
One-Year Paper Domestic	$33.00	$39.00
Two-Year Paper Domestic	$60.00	$72.00
One-Year Paper International	$40.00	$46.00
Two-Year Paper International	$74.00	$86.00
One-Year Digital	$12.00	$14.00
Two-Year Digital	$20.00	$24.00
Sustaining Member	$65.00	$75.00
Sponsor	$130.00	$150.00

The motion for the dues increase was made by Julius Benton with Ken Poshedly seconding. The vote from the ALPO Board was 7 voting yes and 0 voting no. The motion carried.

The ALPO membership continues to drop off. At the start of 2013, there were 371 members. That number is now down to 358. The ALPO Secretary gave a talk about membership issues at ALCon 2013 about these matters. While some things like the changing media culture are out of our control, the Secretary proposed forming an ALPO Membership Work Group that could address some of these issues. The purpose of this working group is to propose and study different approaches in stabilizing the organization and possibly enlarging membership in the ALPO.

The Secretary is looking for ALPO members and non-members alike to offer input to this group. The presentation given at the ALCon 2013 event will be posted on the ALPO and Astronomical League websites in the near future. One and all are welcome to join and offer their inspiration and creativity to this group in making a better ALPO.

While e-mail traffic on the ALPO Yahoo Groups has been extensive, such social media as Facebook, Twitter, and MySpace have not been fully utilized even though the ALPO does have a presence on these social media forums. Steve Siedentop, a member of the Atlanta Astronomy Club, was to give a presentation at this ALPO Board meeting about how the ALPO could more effectively use social media to engage non-members and give them a reason to join the ALPO. Unfortunately, Steve fell ill before the meeting and could not be present for his talk with us. Steve will submit a video of his talk to the Board at a later date.

Mike Reynolds reinforced the importance of social media by observing that, as a college professor, he has noted the dropping of traditional hard-copy textbooks for digital versions of these textbooks, but noticed the transference of college course materials on social media as well.

The ALPO table display. (Photo by Phil Johnson)

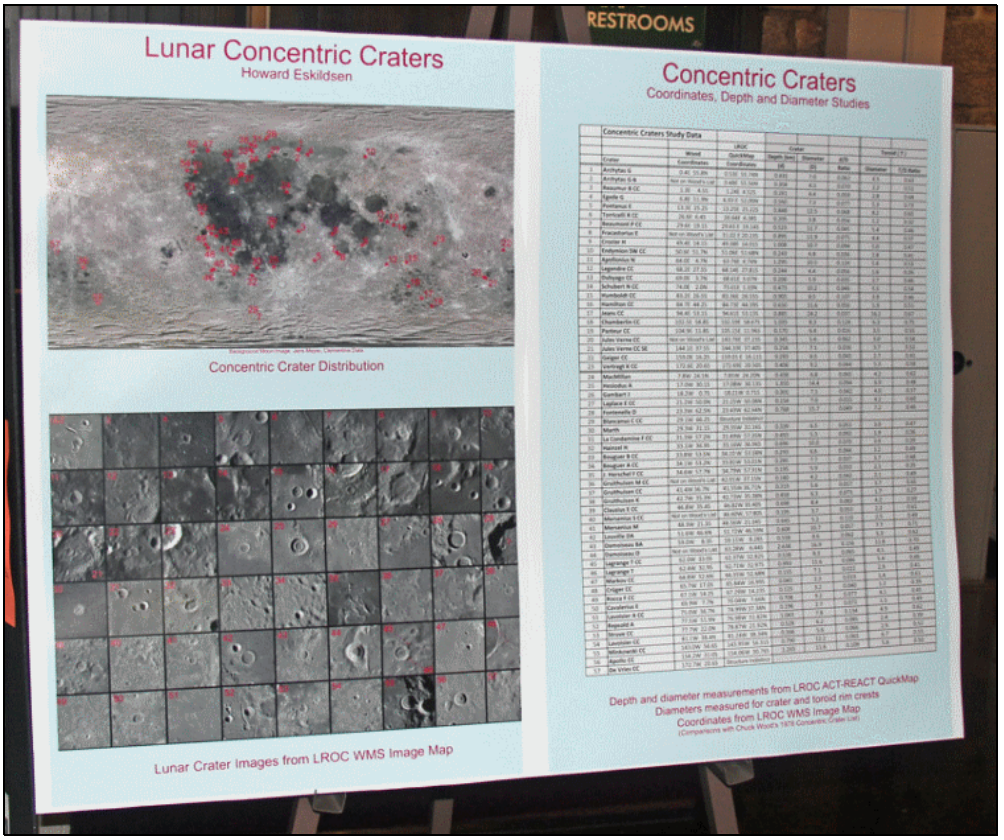
Issue Three: The Central Headquarters Concept and the Proposed Fundraising Plan (Introduced by Michael D. Reynolds and Matthew L. Will)

Michael D. Reynolds informed the ALPO Board about an exciting prospect for a possible future central office for the ALPO. PARI (Pisgah Astronomical Research Institute) is a 501 (c) (3) non-profit organization dedicated to providing educational and research opportunities for a broad spectrum of science, technology, engineering and math disciplines. The organization maintains a 200-acre campus that was the site of the old Rosman tracking station that was formerly managed by NASA, and later by the Dept. of Defense, located near Rosman, North Carolina, about 50 miles south of Ashville. The facility operates radio telescopes and other scientific instrumentation for both educational and research purposes. PARI had a booth located near the ALPO booth at ALCon 2013.

PARI's educational coordinator, Christi Whitworth, was managing the PARI booth and was intrigued with our brochure that was being distributed from our booth, "Think of the Possibilities" informing the reader for our prospects for a central office and soliciting higher-level memberships and donations for that cause.

Ms. Whitworth expressed to Mike that PARI might be in a position to offer us office and storage space as well as possibly providing some support for archiving our observational data for less funding than if we were to develop something on our own. Mike Reynolds and Matt Will talked to Ms. Whitworth about the possibility of engaging in correspondence and talks with the PARI staff and management about the prospects for an ALPO central office on their campus. Mike and Matt will coordinate communications with PARI and have a face-to-face meeting with them this fall or later to explore and discuss the terms of an agreement with PARI for space at their campus.

If the ALPO and PARI can agree to an overall plan for office and storage space and other considerations, a MOU (memorandum of understanding) would be produced from such an agreement, subject to approval by both boards of directors (ALPO and PARI). Mike Reynolds stressed at our board meeting that this is all very tentative and that



Lunar Concentric Crater poster by Howard Eskildsen outside the presentation hall. (Photo by Phil Johnson)

ALCon 2013 keynote speaker Chuck Wood (left) with ALPO's Howard Eskildsen. (Photo by Phil Johnson)

more details were needed from PARI for a full understanding on what it could offer the ALPO. Mike also advised the Board to read more about PARI in the recent article written about this organization in the September issue of Sky & Telescope.

Ken Poshedly made the motion that the ALPO Board engage in talks with PARI that could lead to a MOU with PARI concerning the acquisition of space for a central office and storage of archival materials. Richard Schmude seconded the motion. There were seven votes in the affirmative and none voting no.

Matthew Will informed the ALPO board that the current value of the ALPO Endowment is now $29,604.63. Members are now receiving a brochure inviting them to renew at the expanded membership levels along with the regular "first notice" membership renewal forms now being mailed to members in standard No. 10-size envelopes.

Members are also being informed about the ALPO's charitable bequest options. Even if the prospects for PARI become a reality, the management of a central office still is dependent on paid personnel. As Mike Mattei pointed out at the board meeting, such organizations as AAVSO still rely on income derived from an endowment.

The ALPO is also looking into funding from other revenue streams such as corporate sponsorships and possibly grants to build up the ALPO Endowment.

Issue Four: Location for the ALPO to Convene in 2014 (Introduced by Michael D. Reynolds, Richard W. Schmude and Matthew L. Will)

There was considerable discussion concerning where the ALPO would meet in 2014 and beyond. Matt Will mentioned that the Society of Astronomical Sciences (SAS) might be a good group to meet with. SAS has extensive Pro-Am collaborations with its own observers. Some of these involve Solar System astronomy. SAS will be meeting in Ontario, California, in 2014, probably at a hotel or other meeting venue, which should be a more accessible location than their traditional Big Bear Lake location.

Dates had not been set, however; since they are also meeting with AAVSO next year, they would probably be meeting in the spring and therefore may not be a suitable time for the ALPO members that are used to meeting in the summer. We should, however, keep this highly skilled group of observers in mind for future meetings.

Richard Schmude mentioned possibly meeting with the RASC (Royal Astronomical Society of Canada) in the near future. The RASC is planning to meet in Victoria in 2014, Halifax in 2015, and either Regina or Saskatoon in 2016. Richard will contact the RASC to express an interest in a future meeting jointly with the ALPO.

Mike Reynolds said that, among other things discussed, PARI's educational coordinator, Christi Whitworth, suggested that the ALPO could meet at its facility in Rosman for the ALPO annual meeting in 2014.

While the ALPO Board was receptive to meeting at PARI, given the unique setting of this facility and a possible future relationship with PARI, John Westfall had some concerns about good motel accommodations in the immediate Rosman area. The road leading to the PARI campus is a rather winding, uphill ride to the facility. John suggested meeting in nearby Asheville and taking an all-day field trip to the PARI campus instead, as part of our meeting. Contact will be made with PARI to confirm that it would like to host us next year and to find dates next summer when that would be convenient.

If PARI doesn't wish to host the ALPO in 2014, the ALPO will meet with the Astronomical League next year its ALCon in San Antonio, Texas. There is a tentative ALCon scheduled for Las Cruces in 2015, which the ALPO may also be interested in attending.

The motion to meet with PARI in the Asheville, North Carolina, in 2014, with

the ALCon in San Antonio, Texas, as a fall-back site should the PARI arrangement be precluded, was made by John Westfall with Julius Benton seconding. The Board voted seven in the affirmative with none voting no.

In a related issue, Wayne Green informed the ALPO Board that the American Astronomical Society – Division of Planetary Sciences would be meeting in Denver, Colorado, the week of October 6, 2013. Being a professional organization that is engaged in Pro-Am collaborations, there are tentative plans to hold a Pro-Am seminar prior to the general professional proceedings of that week. Wayne said that there would be a day of presentations and discussions about Pro-Am involvement and that ALPO representatives were welcome to participate.

Issue Five: The Future of the Position of Editor for the Journal (Introduced by Julius Benton and Kenneth T. Poshedly)

This issue was discussed extensively at the last annual ALPO Board meeting and documented in the Board minutes (see Journal issue, Volume 54, Number 3, Fall 2012). Journal Editor-in-Chief Ken Poshedly had stated previously at last year's meeting his desire to discontinue editing and publishing the Journal by the end of 2014 with the completion of Volume 56.

Since the last Board meeting, Ken posed a number of options for the Board to ponder. One option was to have the new editor provide final technical review of previously peer-reviewed submissions, but to have the final proofreading, layout, and go-to-press interactions with the printer assigned to a paid professional editor.

Ken has been in touch with a person who can assist us with the final production aspects of publishing the Journal. While this arrangement would relieve the future editor of some of the more tedious and time-consuming aspects of publishing the Journal, an additional cost would have to be paid by the ALPO for this service, raising dues even more than currently projected in the proposed dues increase.

ALPO board member and Eclipse Section coordinator Mike Reynolds and his meteorites display. (Photo by Phil Johnson)

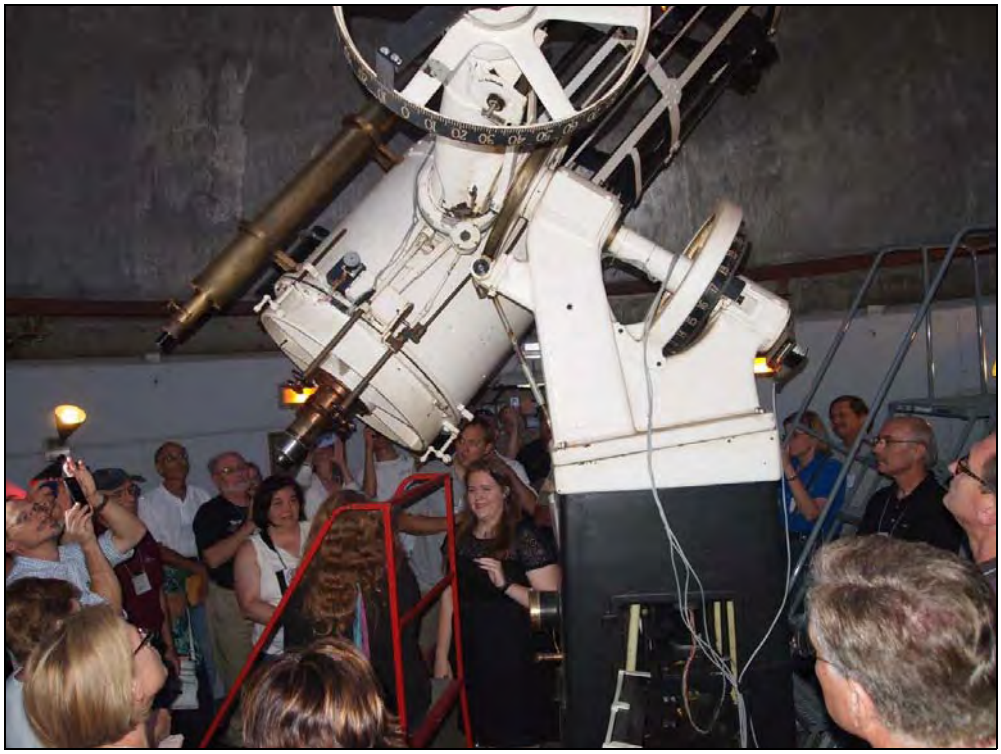
Richard Schmude has offered to assume the editorship of the Journal provided that he could find someone to replace himself as Jupiter Section coordinator. Unfortunately, Richard has not yet found anyone to take his place with that section. Coordinating a section of this size can demand more skills than just understanding how to observe Jupiter. Richard would have to explain to someone interested in doing this work the protocols and approaches to analyzing observations as well as overall management of the section.

John added that we really need to have more volunteers helping our staff who are actually managing these sections to provide support for the chief coordinator and to be in a position to succeed that person when the time comes. Richard said the number of images available for analysis from the last apparition numbered over 10,000. More images for the next apparition could make this an overwhelming task for just one person.

Wayne Bailey, our coordinator for the Lunar Topographic Studies Program, said that he was in need of help in managing this program as well. Ken Poshedly said that he could help broadcast an appeal for volunteers in the Journal.

From the observer prospective, other ALPO members at the meeting expressed their difficulties with managing electronic media as well. Theo Ramakers said having to send observations over multiple channels to various archiving organizations and just not to the ALPO coordinators makes sharing images difficult. Making distribution easier would help.

Ken Poshedly said that he could continue editing the Journal beyond 2014, using the editorial services of the paid professional to do the final editing, layout, and final production steps with the printer. This would relieve him of a considerable burden that he has managed in the past. Richard Schmude made a motion to support Ken in seeking this help. John Westfall seconded the motion. The Board vote was seven in the affirmative and none voting no.



After dinner and with the 30-inch Beck reflecting telescope at the Bradley Observatory at Agnes Scott College on Friday evening. (Photo by Phil Johnson)

Issue Six: Advertising on the ALPO Website and the Journal (Introduced by Matthew L. Will)

Matthew Will said that he would like to research the possibilities of advertising on the ALPO website as an additional means of creating revenue and, in turn, keeping the membership dues as low as possible. Matt is proposing to evaluate an advertisement schedule based on the amount of web traffic on our website and what other groups are charging based on their traffic. A brochure could be developed and mailed out to prospective companies that might consider advertising on our website. The brochure could be expanded to cover advertising in the Journal as well. Matt will work on this project and present his findings, as well as a preliminary draft of the brochure, to the Board at a later date.

Issue Seven: ALPO Exposure (Introduced by Michael D. Reynolds)

Mike Reynolds has discussed with the Astronomical League the possibility of having a scheduled column devoted to lunar and planetary topics as presented by ALPO staff in the League's publication, *The Reflector*. The League is interested in providing space for such articles from the ALPO in *The Reflector*. Mike has agreed to coordinate this effort and will solicit short articles regarding specialty areas that ALPO coordinators are knowledgeable about.

On a related topic, John Westfall chimed in saying that the old reading list for lunar and planetary observing that the ALPO used to distribute needs to be updated. John suggested that each coordinator from the various observing sections and programs could contribute a few recent book titles (including anything that they may have written), along with useful periodicals and websites, to provide guidance to observers with the very latest information and knowledge in their subject areas.

Also, Mike informed the Board that he will make arrangements for the Astronomical League to start selling the ALPO lapel pins from their online store. Several of these pins sold at ALCon 2013 and could help promote the ALPO.

Issue Eight: Review of Current Staff Status (Introduced by Julius Benton)

There were no changes in staff status. Executive Director Julius Benton appointed Carl Hergenrother as an acting assistant coordinator with the Comets Section last spring. Mr.

Solar observing during break-time in front of the Fernbank Science Center, hosted by Stephen Ramsden (at far left).

Hergenrother should be up for consideration as a permanent staff member next year.

Issue Nine: New Officers (Introduced by Julius Benton)

In accordance with a long-standing agreement among the Board members, the rotation for the positions of Executive Director and Associate Executive Director continues. Ken Poshedly will become our new Executive Director for the next two years and Mike Reynolds will be the new Associate Executive Director. Matthew Will shall continue as both Secretary and Treasurer.

Don Parker made a motion to affirm the approval of these proposed officers serving for the next two years and Richard Schmude seconded the motion. The vote was an affirmative seven to zero. The newly elected officers begin their terms of office effective immediately after the vote.

Issue Ten: Observer's and Service Awards (Introduced by Julius Benton)

The ALPO has two awards to honor persons providing outstanding work for our programs.

- The Walter H. Haas Observer's Award is bestowed annually to an amateur astronomer for excellence in observational Solar System astronomy. This award is named after our founder and Director Emeritus and was established in 1985. The selection of this award is conducted by a committee convened by its committee chairman, Don Parker. The composition of the committee changes from year to year so that the responsibility of selection is shared by a wider group of well-qualified members of the ALPO, while allowing others that vote one year to be considered for the award in another year when not serving on the committee.

  The Award itself consists of an engraved plaque. The awardee also receives a two-year complementary membership in the ALPO.

  This year's recipient is Brian Warner. Brian is well-known for his observations of minor planets. He quite literally "wrote the book" on performing light curve analyses for minor planets, having authored *A Practical Guide to Lightcurve Photometry and Analysis*, as well as creating programming for lightcurve analyses with the software package *MPO Canopus* and the camera/telescope software package *MPO Connections*. Brian is also assistant editor, and contributing editor to *The Minor Planets Bulletin*. He has been a prolific observer of minor planets over the years and has led other observers toward focusing on minor planets in need of better observational data. Congratulations Brian!

- The Peggy Haas Service Award was established to recognize a member of the ALPO for outstanding service to our organization. This award was named after our founder's late wife for her past support of the ALPO in many meaningful and indispensable ways, from assisting her husband with the Journal to creating a banner that hangs in front of the rostrum at ALPO paper sessions at our annual meetings. She was also the ALPO's Librarian for its book-lending service from 1966 to 1985. The award was inaugurated in 1997. The current executive director solely selects the recipient for this award. The Peggy Haas Award can recognize an ALPO officer, board member, volunteer staff member, or non-staff member who has contributed outstanding service in some way to the organization, in a capacity excluding observational skills. (Observational skills are recognized by the Walter H. Haas Award.) Considered not to be an annual award, presentation will occur when appropriate and not at any specific time interval.

  The award itself consists of an engraved plaque. The awardee also receives a lifetime membership in the ALPO.

  ALPO Webmaster and Computer Section Coordinator Larry Owens was this year's recipient. Larry Owens succeeded our inaugural webmaster, Rik Hill, in managing the ALPO website in 2007. Like Rik Hill, Larry assumed an enormous time-consuming task of having to please almost 40 ALPO staff members with various submissions that come in literally on a daily basis for posting on our website. Larry has brought to this volunteer position his experience and expertise as a professional website developer and expanded the ALPO's capabilities to include blogs and a presence for the ALPO on social media.

  Larry freely shares his knowledge of all facets of cyberspace with ALPO staff, making us all wiser in utilizing this important resource. In addition to the ALPO website, Larry has also managed the ALPO Computing Section since June 2009, procuring and making available all sorts of lunar and planetary programs and software freely downloadable from our website for the benefit of our observers. Congratulations Larry!

Issue Eleven: Organizational Issues (Introduced by Julius Benton)

Ken Poshedly said that as our new executive director he would evaluate section activities, looking at the ones that need help. Ken asked just how extensive our Pro-Am collaborations are in the ALPO.

John Westfall responded that all you need to do is comb through copies of past issues of Icarus and look at the credits on papers concerning Solar System astronomy to measure the ALPO's contributions to professional work. Don Parker pointed out that most ALPO observing sections have a professional astronomer who serves as scientific consultant to the section. Julius Benton and Richard Schmude have ongoing contact with the professionals using ALPO observational data.

Newer fields of study, such as exoplanet occultations, were brought up by Dan Joyce, along with newly emerging techniques with spectroscopy that are becoming readily available for use by the amateur.

Adjournment

With no other business to transact, Matt Will made a motion to adjourn the Board meeting. John Westfall seconded. The motion passed with the board members present voting unanimously in the affirmative with the board meeting adjourning at 11:26 p.m. EDT on July 26, 2013.

Feature Story:

Index to Volume 53 (2011) of The Strolling Astronomer

By Michael Mattei
E-mail: *micmattei@comcast.net*

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Feature Story

A Preview of the 2013 – 2015 Apparition of Mars

By Roger Venable *rjvmd@hughes.net* **and Jeff Beish**

Introduction

Mars is now visible before dawn in the morning sky – a new apparition is underway. As always, we'll be watching its changing clouds and polar caps as its seasons evolve, and its changing tilt and phase caused by Earth's overtaking it in revolution. The changes in albedo features are slower, barely detectable from apparition to apparition, but change they do. There is always a chance that an observer will detect an exciting dust storm or a new cloud feature, small or large. What will we find this apparition?

With its high contrasts of ocher, aquamarine, and snow white, Mars is the most colorful planet. It also presents the best view of any astronomical surface except our Moon. Whether you study it for science, for personal edification, or for awe, you will find it to be special.

The ALPO Mars Section seeks your observation reports. In each apparition we receive, on average, about two thousand images, drawings, and descriptive reports, and every one is studied and archived. Many observers post their images and drawings in the photos section of our Mars observers group at *tech.groups.yahoo.com\group\marsobservers* and post their comments and descriptions on the message board there. Alternatively, you can send your observation directly to Roger Venable at the e-mail address at the beginning of this paper.

The ALPO's ongoing compilation of Mars observations from all over the world is a continuation of the International Mars Patrol organized by Chick Capen when he was the ALPO Mars Section Recorder in 1962.

The Apparition

Mars goes through a cycle of apparitions consisting of three perihelic apparitions followed by four aphelic apparitions. The period of optimal observing is briefer in the aphelic apparitions. The present apparition is the fourth aphelic apparition in the present group of four. Accordingly, the number of days that the apparent diameter of Mars stays above 6 arc seconds – 289 days – will be longer than it was last apparition (262 days) but briefer than in the coming perihelic apparition of 2015-2017 (341 days.) Table 1 shows some salient dates of the present apparition. Figure 1 depicts the orbital relationships of Earth and Mars that will prevail during the central part of the apparition.

Table 1: Characteristics of the 2013 - 2015 Apparition of Mars*

Event	Date	Earth Dist.	Diam
Solar conjunction	2013 Apr 18	2.433	3.85
6 arcsec diam	2013 Dec 12	1.561	6.00
Western quadrature	2014 Jan 03	1.345	6.96
Retrograde begins	2014 Mar 01	0.802	11.69
Opposition	2014 Apr 09	0.620	15.10
Closest approach	2014 Apr 14	0.618	15.16
Retrograde ends	2014 May 21	0.733	12.78
Eastern quadrature	2014 July 19	1.108	8.45
6 arcsec diam	2014 Oct 06	1.561	6.00
Solar conjunction	2015 Jun 14	2.568	3.65

Earth Dist is distance from Earth in astronomical units.
Diam is apparent diameter in arc seconds.
*Data from Horizons ephemeris of Jet Propulsion Laboratory on the Web at *ssd.jpl.nasa.gov/horizons.cgi*

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.

Figure 1 includes L_S numbers for the four seasons and the perihelion and aphelion. L_S is the areocentric longitude of the Sun, measured from the northern vernal equinox by which the zero point of L_S is defined. It designates the season on Mars, and thereby suggests the expected axis tilt and propensity to clouds and dust storms. Observers are helpful when they include the L_S information together with the CM, date, time, and telescope information that they report. L_S is often written Ls, with a small letter 's' instead of a subscript letter 's.'

Mars in the Sky

Figure 2 shows the path of Mars amid the stars. Figure 3 graphs the elongation and declination versus the date, and includes the phase angle. Phase angle peaks at the times of quadrature. Observers who wish to make polarized measurements or images will find that polarization is greatest when the phase angle is greatest.

The declination of the planet has a big impact on its observability. Early in the

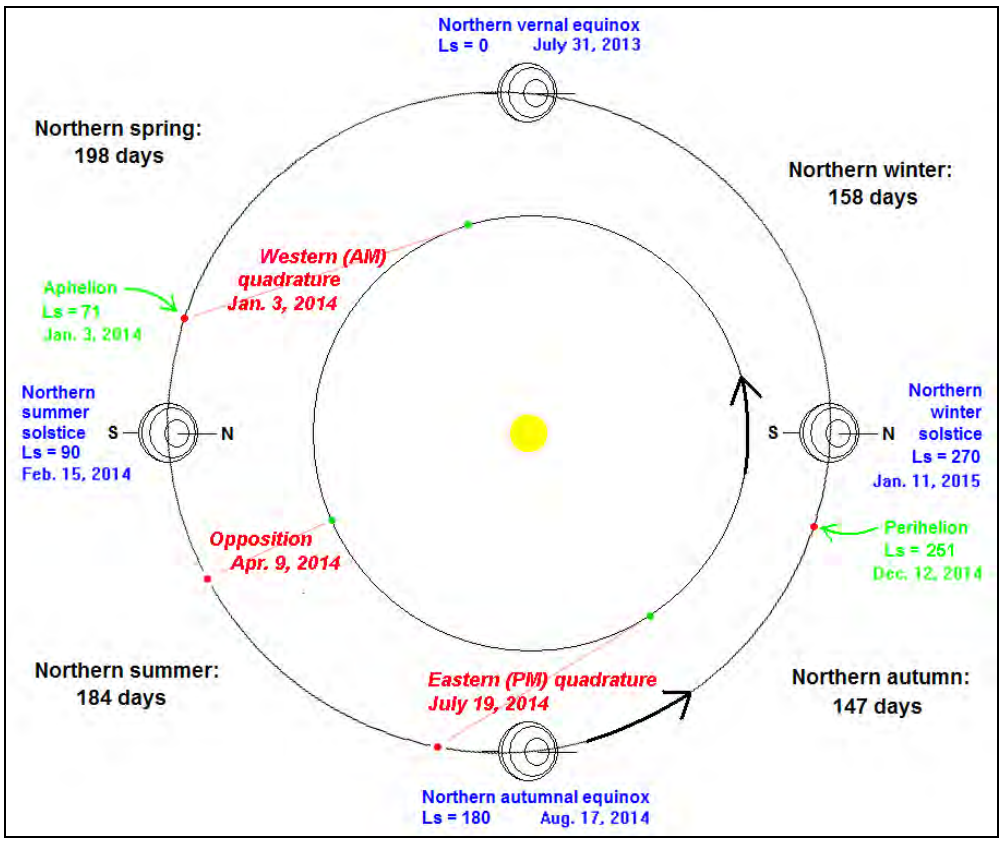

Figure 1. A diagram of the orbits of Earth and Mars. The planets and the Sun are exaggerated in size but the orbital sizes and orientations are relatively accurate. Since Earth's orbit is nearly circular while that of Mars is eccentric, the opposition distance between the two planets, and consequently the apparent size of Mars at opposition, depends on where along the course of Mars's orbit the opposition occurs. Another effect of the eccentricity is to cause the durations of the seasons on Mars to be unequal, as stated in the diagram, with northern spring being 51 days longer than northern autumn. (In contrast, the longest season on Earth, northern summer with 92 days, is only 2 days longer than the shortest season, northern winter.) Of course, the Martian southern seasons are opposite to the northern seasons that are labeled. The annotations show that, during the present apparition, the period of best observing is from Mars's aphelion to about halfway to perihelion, which will be from late Martian northern spring through the Martian northern summer.

apparition, the northern declination of Mars will allow Southern Hemisphere observers only a brief window of observability before sunrise, due to the low altitude of the planet in southern skies, while Northern Hemisphere observers are favored. Late in the apparition, the southern declination of the planet will limit observations by Northern Hemisphere observers in the evening, while Southern Hemisphere observers are favored.

The Appearance of the Planet

At closest approach on April 14, Mars will be 15.2 arc seconds in apparent diameter. This is an improvement over the 2011-2012 apparition, in which its diameter peaked at 13.9 arc seconds, but it is still much smaller than the 25 arc second diameter seen in 2003. Its brightness will peak at magnitude -1.48, as compared to -1.2 last apparition. Figure 4 graphs the apparent diameter and magnitude during the apparition. The trough in the brightness curve on the left side of the graph is due to the recession of Mars from the Sun as it transits from the perihelic side to the aphelic side of its orbit, while staying approximately the same distance from Earth.

Inspection of Figure 1 reveals that the North Pole of Mars will be tilted toward Earth during most of the apparition. Jeff Beish has prepared simulations of the appearance of the planet at intervals, and these are presented in Figure 5. Note that the North Pole is visible in all but the October 4, 2014 image on the right, in which the South Pole can be glimpsed.

The areocentric declinations of Earth and Sun are presented in Figure 6. This is a graphical representation of what is seen in the simulations of Figure 5. It explains why sometimes the North or South Pole is not visible even when tilted toward Earth.

Some highly skilled imagers have succeeded in making detailed images of Mars when the planet appears as small as 4.5 arc seconds. The classical limit of 6.0 arc seconds may no longer be applicable to imagers, but it still appears to be a useful rule of thumb for visual observers. The planet is small, and the poor seeing that prevails in daytime causes daytime observations to be disappointing.

Special Events

Dust storms can occur at any time of the Martian year, so we should always be alert to this possibility. Indeed, small storms are detected by amateurs in virtually every apparition. However, the ten great planet-encircling dust storms that have been observed have begun at L_S 204 at the earliest and L_S 312 at the latest, with a mean of L_S 255 for the time of onset. This suggests that a planet-encircling dust storm could start as early as September 28, 2014, with a mean expectation of December 18, 2014, and a latest expectation of March 21, 2015. It is therefore possible that we shall detect the onset of a major dust storm late in this apparition, when the planet is low in the southeastern sky after dusk. Keep watching, late in the apparition!

Clouds are very dense in Tharsis, Arcadia, and Amazonis from about L_S 70 to L_S 123, the heart of the cloudy season. This period will transpire over about 3 months immediately before opposition. However, scattered clouds will be visible across the planet during most of the apparition. Sometimes a bright cloud is mistaken for a polar cap and *vice versa*, so be careful in identifying them. Those who observe early in the apparition will be able to detect the dissipation of the North Polar Hood in the

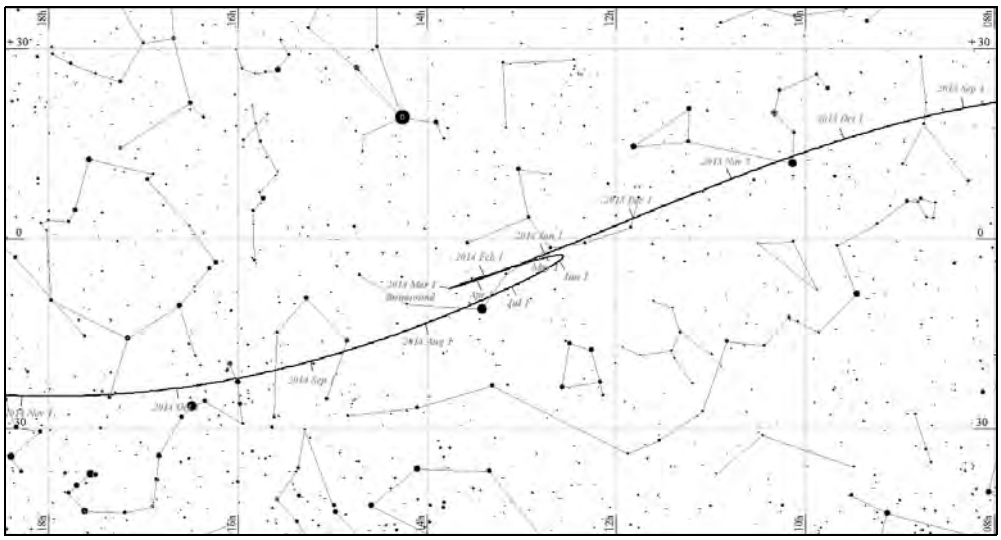

Figure 2. The path of Mars amid the stars during the greater part of this apparition. Note that Mars starts at the upper right (northwest) part of the map and advances to the middle in Virgo where there is the period of retrograde motion surrounding opposition, followed by movement to the lower left (southeast.) When Mars is in the upper right parts of the map, it is rising before the Sun in the morning sky; when it is in the middle of the map it is rising in the middle of the night; and when it is in the lower left part of the map it rises in daytime and can be seen in the southwestern sky before sunset. (The reader should not interpret the map as indicating that Mars moves from right to left on the sky. Though its overall motion is from west to east amid the stars, the stars themselves appear to be moving from east to west at a faster clip, due to the revolution of Earth around the Sun. Consequently, the net movement of Mars can be seen from night to night as being toward the west of the sky.)

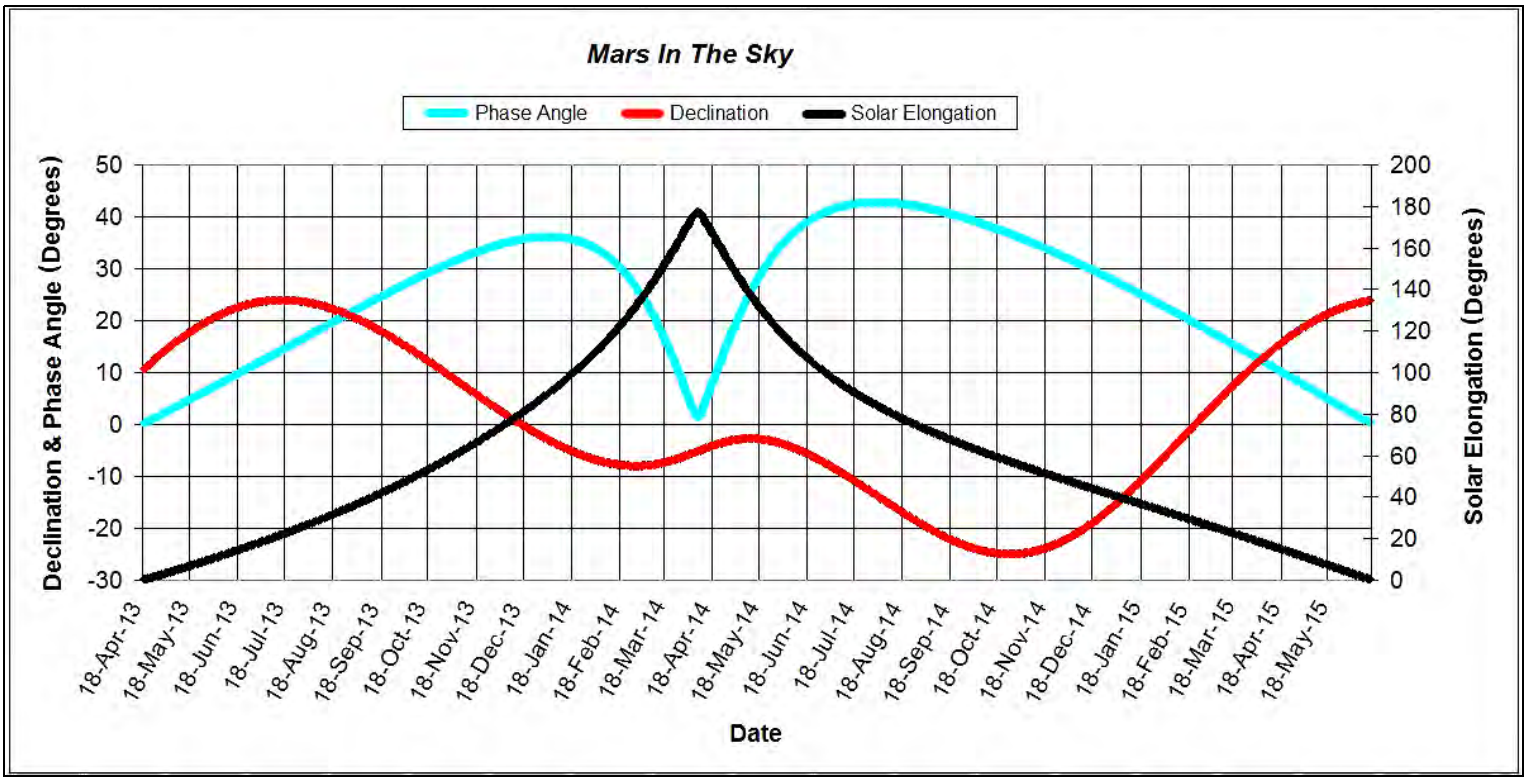

Figure 3. See text.

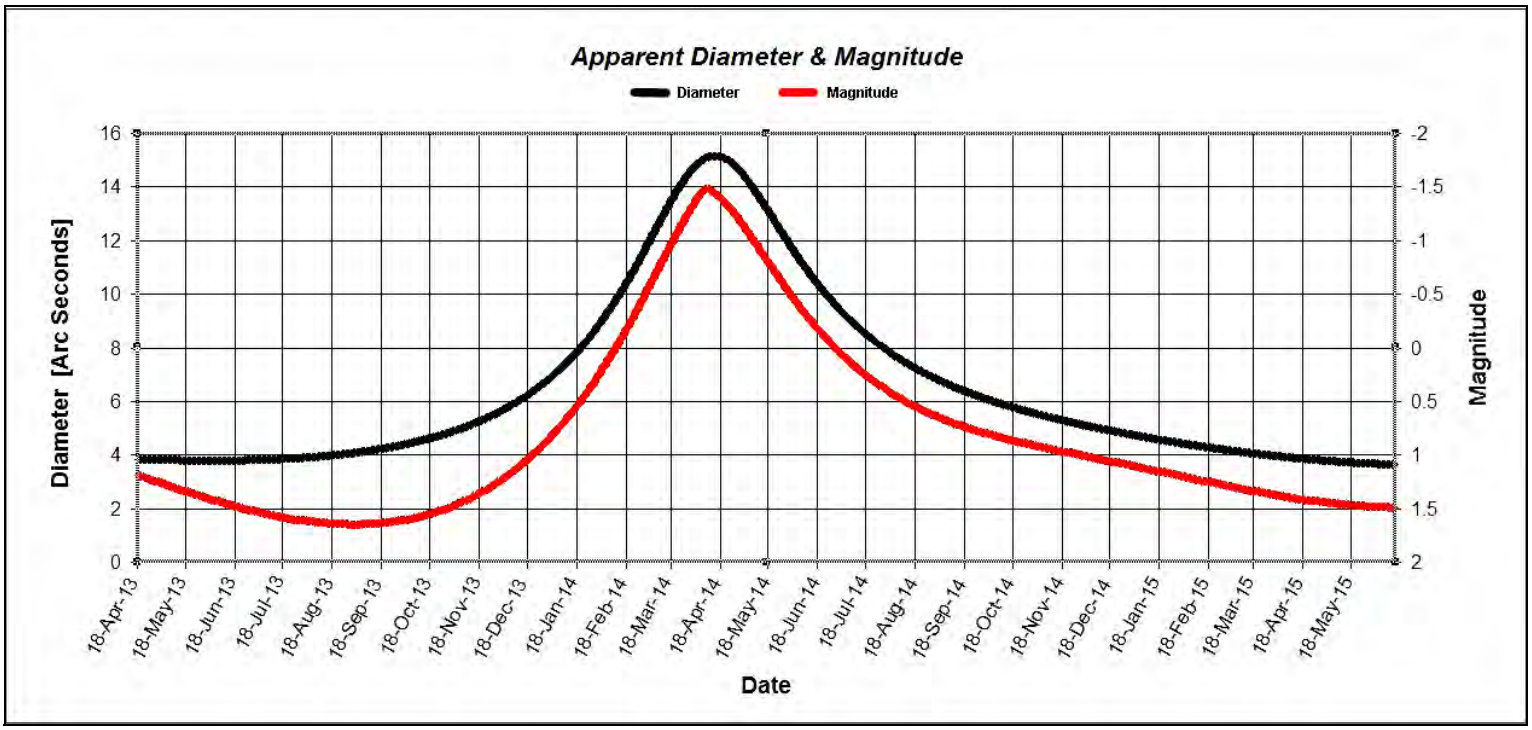

Figure 4. See text.

weeks right after the Northern Spring Equinox of July 31, 2014. Those who observe late in the apparition will be able to detect the dissipation of the South Polar Hood in the weeks right after the Northern Autumnal Equinox of July 19, 2014.

"Jaeschke's cloud" is the high-latitude, terminator cloud that was first detected by Wayne Jaeschke (pronounced, "Jeh'-skee") last apparition. It was at about 45 degrees S latitude, and though faint, it appeared to project beyond the terminator. It can only be seen when the morning terminator is visible – that is, after opposition.

Last apparition it was imaged by a number of observers at L_S 85 to 87, and by one observer at L_S 96, and all of these observations were just a few weeks after opposition. Image enhancement was helpful in displaying the faint feature on images, and no visual observer reported it. Its detection will be a prize for successful observers. We don't know whether it will be detectable at all, this apparition. Perhaps it is present only in the L_S range in which it was seen, in which case it will not be visible this apparition, and may not be detected until an apparition with circumstances similar to those of 2012 occurs.

Perhaps it is so subtle that a long visual path through it is required in order to detect it – such was the case in 2012. This apparition, try to see it within a couple weeks after opposition.

Olympus Mons often can be imaged as a spot either slightly brighter or slightly darker than its surroundings. When surrounded by a large dust storm or by clouds, it appears as a dark spot. John Westfall has suggested that it can be detected in images or visually when it is on the terminator, as its slope at such times will make it brighter than its surroundings.

Figure 5. Simulations of the appearance of Mars on the dates given. Geocentric south is up in all pictures. Note that the South Pole can be seen only in the right-most picture.

Table 2. Occurrences of Olympus Mons on the Martian Terminator

UT Date	UT Time	Phase Angle	CM	Visible From
2014-03-23	0000	13.5	219.3	Europe & Middle East
2014-03-24	0040	12.8	220.3	Europe & Middle East
2014-03-25	0117	12.0	220.5	Europe & Middle East
2014-03-26	0157	11.3	221.4	Europe
2014-03-27	0237	10.5	222.4	E. Americas & Europe
2014-03-28	0315	9.7	222.9	E. Americas & Europe
2014-03-29	0352	8.9	223.1	E. Americas & Europe
2014-03-30	0433	8.1	224.4	E. Americas & W. Europe
2014-03-31	0510	7.3	224.7	Americas
2014-04-01	0550	6.5	225.7	Americas
2014-04-02	0637	5.7	228.4	Americas
2014-04-03	0710	4.9	227.7	Americas & Hawaii
2014-04-04	0743	4.1	227.0	Americas & Hawaii
2014-04-05	0820	3.3	227.3	Americas & Hawaii
2014-04-06	0850	2.6	225.9	Americas & Hawaii
2014-04-07	0927	2.0	226.3	W. Americas & Hawaii
2014-04-08	1000	1.6	225.6	W. Americas & Hawaii

All times are for Olympus Mons's position on the terminator on the preceding side of the planet (planetary east, celestial west.)
CM is central meridian.

Jeff Beish has made a list of times when it is on the terminator – *see* Table 2.

Flashes of specular reflections from the surface have not been reported in the last several apparitions. Observers are encouraged to monitor the planet for them. The development of techniques to make such monitoring effective is an area open to investigation by interested observers.

Appulses of Mars to other celestial objects are of interest to many, as part of their general appreciation of astronomy. We have included a table of some of the salient opportunities for viewing such appulses (*see* Table 3). Two occultations of Mars by the Moon will occur -- *see* Figure 7.

Finally, we include Jeff Beish's traditional table of events, as Table 4.

Table 3. Appulses by Mars to Celestial Objects

yyyy-mm	Dates	Object	Constellation	Description
2013-09	7-10	M44	Cancer	Passes through bright open cluster.
2013-09	15 ff	C/2012 S1	Leo	Path similar to ISON, 2 deg W of comet 9/15, tapering to 1 deg W of comet 10/15
2013-10	15	Regulus	Leo	Passes 57' NNE of Regulus
2014-09	22-24	M80	Scorpius	Passes on N edge of globular cluster. Closest at 17:00 UT on 23rd, 8.6' from cluster's center.
2014-10	29	NGC 6544	Sagittarius	At 00:00 UT, passes 4' from center of small but bright globular cluster.
2014-11	3	M28	Sagittarius	At 06:00 UT, passes 3' from center of globular cluster.
2014-11	6	M22	Sagittarius	At 20:00 UT, passes 46' S of center of very large, bright globular cluster.
2014-12	4	M75	Sagittarius	At 00:00 UT, passes 14.5' NNW of center of globular cluster.
2014-12	8	SAO 189142	Capricornus	Occults this 6.8 mag star from about 04:36:00 to 04:38:30 UT. Visible from Hawaii and S. Pacific islands only.
2015-02	22	Venus	Pisces	Venus passes 30' SSE of Mars, closest at about 07:00 UT.

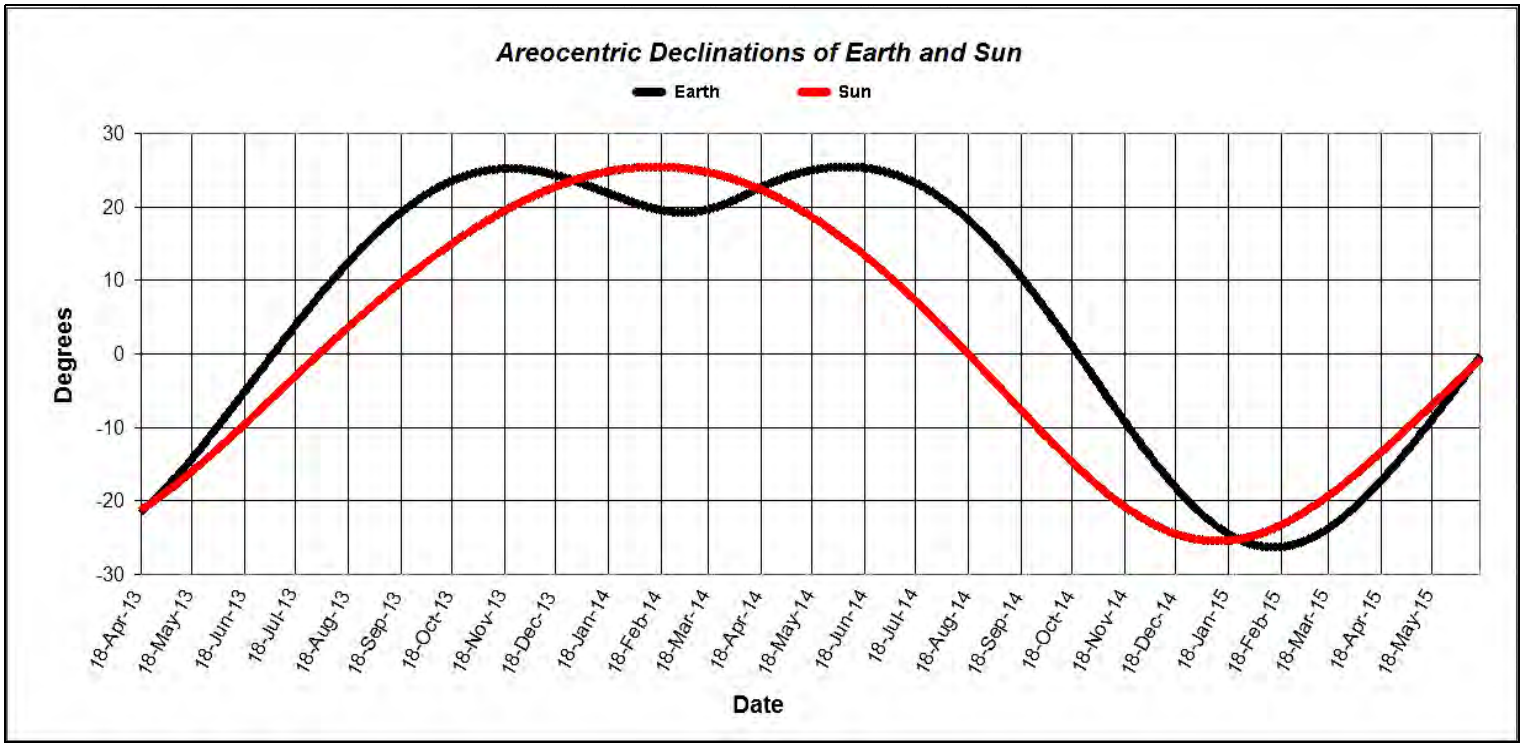

Figure 6. The declinations of Earth and Sun in the Martian sky, with respect to the Martian equator. The solar declination is related solely to the progress of Mars in its orbit and is a smooth, sinusoidal curve with approximately 1.14 cycles during the course of an apparition. The solar declination stays positive longer than negative because the northern spring and summer together (positive solar declination) comprise the time of slower, aphelic orbital motion. In contrast, the declination of Earth is related not only to Mars's position in its orbit, but also to our changing perspective on Mars due to Earth's changing position in its own orbit.

The interplay of the declinations of Earth and Sun causes some interesting but subtle effects on the visibility of the poles. The bright poles are important features that orient the observer's perception, and one can become confused when they are expected to be visible but are not. Here's how it works. These effects are seen very often in images, and also noticed often when observing visually.

(1) When the areocentric declination of the Sun is positive, the Martian North Pole is illuminated, and:
  (a) if the declination of the Earth is positive, we can see the North Pole; or
  (b) if the declination of the Earth is negative, we cannot see the North Pole, as the illuminated Pole is beyond the northern limb of the planet.

(2) When the declination of the Sun is negative, we cannot see the North Pole because it is not illuminated, and:
  (a) if the declination of the Earth is negative, the unseen Pole is beyond the northern limb of the planet; or
  (b) if the declination of the Earth is positive, the unseen Pole is in the dark crescent beyond the terminator but not beyond the theoretical limb.

Similar but opposite effects are evident with the visibility of the South Pole. Studying the graph will enable the observer to better understand what he is seeing on the planet.

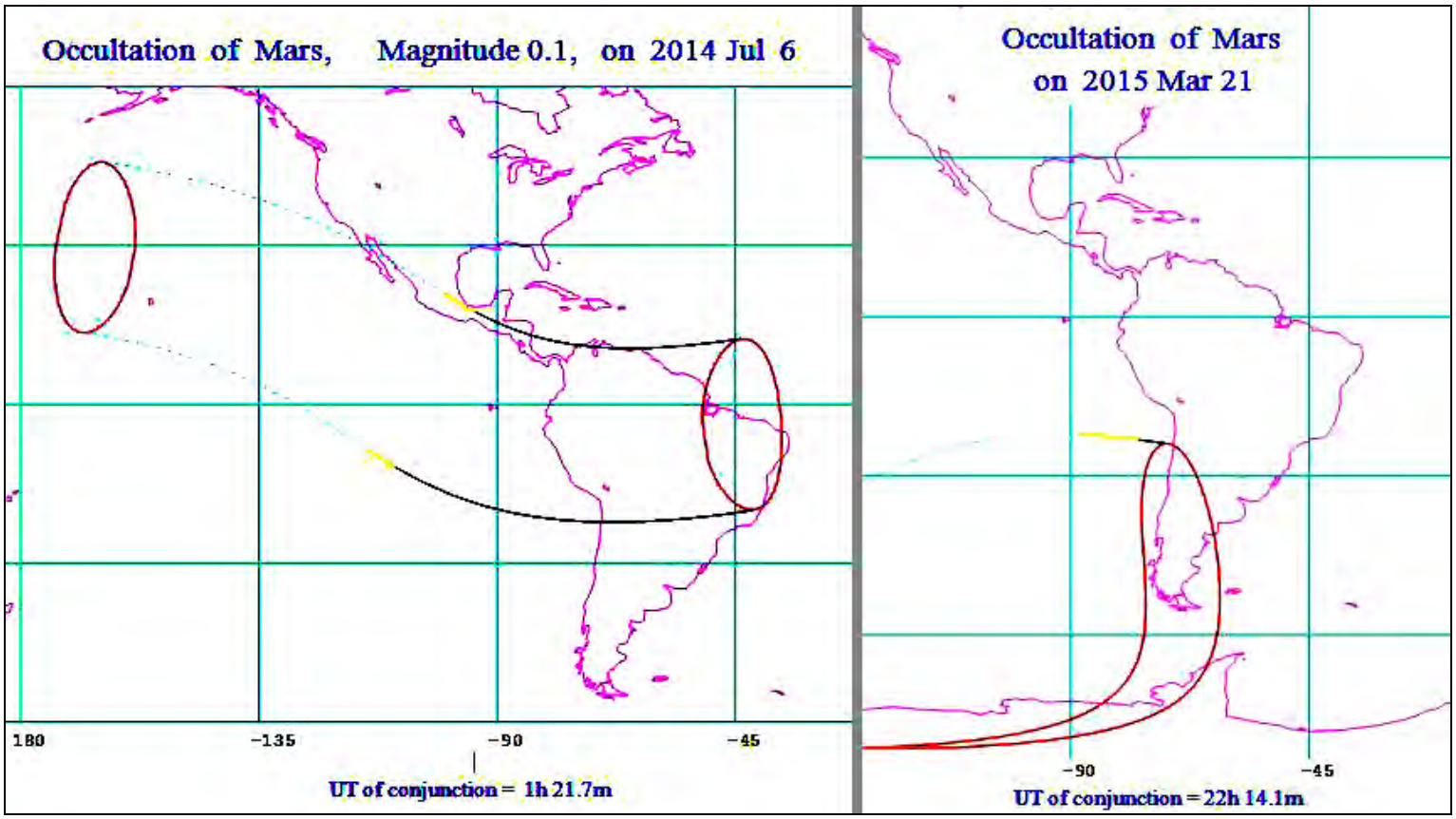

Figure 7. The visibility paths of two lunar occultations of Mars during this apparition. The ovals at the ends of the paths indicate the visibilities of disappearance and reappearance with regard to the observer's horizons. The solid lines indicate visibility after sunset, while the dotted lines indicate daytime visibility of an event. The July 6, 2014, event will be well placed for after-sunset observation from northern South America and parts of Central America and southern Mexico, while it will be visible in daytime from the western coast of Mexico, Baha California, and Hawaii. The more challenging March 22, 2015, event will be seen only as a disappearance, on the dark side of the 1.6 day old, waxing crescent Moon, 22 degrees from the Sun; visible from southern South America. Diagrams made with David Herald's *Occult 4* program for prediction of occultations.

Table 4. Calendar of Events, Mars 2013-2015 Apparition

Date	Physical	Remarks
2013 Apr 18	Ls 303°	**Conjunction.** Mars is behind the Sun ~2.431 AU.
2013 Aug 01	Ls 0° De 0.0° Ds -0.1° RA 06:54 Dec 23.61° A.Dia 3.9”	**Equinox - Northern Spring/Southern Autumn.** North Polar Hood (NPH) begins to break up. North Polar Cap (NPC) should be exposed at approximately 65° Areographic latitude. (“Areo-” is a prefix often employed when referring to Mars or “Ares.”)
2013 Dec 11	Ls 61.1° De 24.0° Ds 21.5° RA 12:08 Dec 1.1° A.Dia 6”	Apparition begins for observers using 4-inch to 8-inch apertures telescopes and up. Begin low-resolution CCD imaging. Views of surface details not well defined. Novus Mons reduced to a few bright patches and soon disappears. Windy season on Mars begins, dust clouds present? Watch for initial dust clouds in south. White patches in bright areas? Hellas bright spots? Numerous bright patches? Watch for “Aphelic Chill” in NPR – (usually between 60° and 70° Ls) and possible halt in thawing of NPC. Views of surface details well defined. Rima Tenuis may appear (140° and 320° Areographic meridians). Cloud activity in north increasing (NPC Width ~42° ±4°).
2014 Jan 01	Ls 70.2° De 23.1° Ds 23.7° RA 12:46 Dec -2.6° A. Dia 6.9”	**Mars at Aphelion.** Is NPC fairly static or entering rapid retreat phase. Watch for “Aphelic Chill” in NPR (usually between 60° and 70° Ls). NPC Rima Tenuis may appear. Antarctic hazes, hood. South polar regions becoming difficult to observe. Any signs NPC width ~33° ±5°
2014 Jan 20	Ls 78.5° De 21.4° Ds 24.7° RA 13:14 Dec -5.3° A. Dia 8”	NPC in rapid retreat? Are limb arcs increasing in frequency, intensity? Antarctic hazes/hood. Cloud activity increases. “Aphelic Chill” in NPR should be ended. (NPC Width ~28° ±4°).
2014 Feb 15	Ls 90° De 19.5° Ds 25.3° RA 13:41 Dec -7.6° A.Dia 10.1”	**Solstice - Northern Summer/Southern Winter.** Orographic clouds over the Tharsis volcanoes – W-Cloud? Local seasonal clouds should wrap around Syrtis Major and be prominent in Libya. Hellas white cloud and Ice-fog activity? Discrete clouds? NPC remnant? Lemuria (210° W, 82° N) detached from NPC? Any other detachments (projections at 135° W and 290° W) near NPC remnant, NPC Width ~20° ±4°.
2014 Mar 01	Ls 96.1° De 19.0° Ds 25.1° RA 11:40 Dec 6.1° A.Dia 11.6”	**Retrogression Begins**. Mars begins retrogression, or retrograde motion against the background stars nearly 317 days after conjunction, when it appears to move backwards toward the west for a brief period before, during and after opposition. Watch for dust clouds and possible dust storms. (NPC Width ~19° ±3°).
2014 Apr 08	Ls 113.3° De 21.4° Ds 23.1° RA 13:15 Dec -5.3° A.Dia 15.1”	**Mars at Opposition.** NPC in rapid retreat? Are limb arcs increasing in frequency, intensity? Antarctic hazes, hood? Cloud activity high? Tempe-Arcadia-Tharsis-Amazonis regions bright in a pattern appearing as the “domino effect.” Discrete clouds? NPC width ~15° ±2°
2014 Apr 14	Ls 116.1° De 22.0° Ds 22.5° RA 13:06 Dec -04.6° A.Dia 15.1”	**Mars at Closest Approach**. Is Mare Acidalium broad and dark? Bright spots in Tempe-Arcadia-Tharsis-Amazonis? “Domino effect” appears around 120° - 125° Ls. Topographic clouds increase. NPC width ~15° ±2°

Table 4. Calendar of Events, Mars 2013-2015 Apparition (Continued)

Date	Physical	Remarks
2014 May 20	Ls 133.1° De 24.8° Ds 18.1° RA 12:34 Dec -2.8° A.Dia 12.9”	**Retrogression Ends.** Mars begins westward motion against the background stars. White clouds and ice-fogs frequent. Syrtis Major and Mare Acidalium broad and dark? Orographic cloud over Olympus Mons. NPC width ~13° ±1°
2014 Jun 23	Ls 150.1° De 24.9° Ds 12.3° RA 12:56 Dec -06.3° A.Dia 10”	Mid-summer. Northern clouds frequent. Syrtis Major maximum width. Are both polar hoods visible?
2014 Jul 29	Ls 169.6° De 21.7° Ds 4.9° RA 12:56 Dec -6.3° A.Dia 8”	Late southern winter. Edge of NPH should be visible and the SPH should begin to clear. Hellas frost covered? Are W-clouds present?
2014 Aug 18	Ls 180° De 18.0° Ds -0.1° RA 14:40 Dec -16.9° A.Dia 7.3”	**Equinox - Northern Autumn/Southern Spring**. South Polar Cap (SPC) maximum width. Is the North Polar Hood present? Does SPH or frost cover Hellas? Hellas should begin to clear and darken. Are W-clouds present? South cap emerges from darkness of Winter. SPH thinning and forms “Life Saver Effect”?
2014 Oct 08	Ls 210.1° De 4.3° Ds -12.4° RA 17:01 Dec -24.3° A.Dia 6”	SPC develops dark Magna Depressio at (270°W, 80°S). Syrtis Major narrows rapidly. W-clouds? At 215°Ls Rima Australis (a dark rift) appears connected with Magna Depressio from 20° to 240° longitude; and SPC develops bright projection at 10° - 20° longitude in Argenteus Mons (10°-20°W). Dust cloud in Serpentis-Hellespontus or Noachis-Hellas? Syrtis Major very narrow? SPC width ~ 49° ±3°
2014 Dec 11	Ls 250.2° De -16.1° Ds -23.7° RA 20:29 Dec -20.5° A.Dia 5”	**Mars at Perihelion.** SPC in rapid retreat. Novus Mons smaller. Dust clouds expected over Serpentis-Hellespontus (Ls 250° - 270°). Syrtis Major beginning to narrow. Frost in bright deserts? Orographic clouds (W-clouds) possible. Elysium and Arsia Mons bright? **Note:** Several “planet-encircling dust storms have been reported during this season. High probability 255° Ls. SPC width ~ 24° ±3°
2015 Jun 14	Ls 358°	**Conjunction**. Mars is behind the Sun ~2.57AU.

Feature Story:

The Atmospheres of Io and Europa Are Transparent

By: Anthony Mallama
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Abstract

This paper refutes recent claims that the atmospheres of Io and Europa measurably diminish the light from objects behind them during eclipses and occultations. Evidence from Hubble Space Telescope images, high quality ground-based light curves and close approaches to both moons by the Galileo spacecraft all contradict these assertions. The techniques used to bolster these spurious claims are found to be faulty. Shortcomings include the use of substandard imaging devices, the application of inaccurate data processing methods and failure to account for the rotational brightness variations of the satellites.

Introduction

Jupiter's satellites Io and Europa possess extremely tenuous atmospheres and ionospheres that are sometimes termed "exospheres". The particle densities in these regions are billions of times less than in the Earth's troposphere.

Volcanic eruptions and the sublimation of surface frosts feed the exosphere of Io. This exceedingly sparse halo was evident from narrow absorption lines of sulfur dioxide and other chemical species in a study by Burger et al. (2001) based on high-resolution spectroscopy from the Keck 10 m telescope and other large instruments. Ultraviolet observations below 200 nm from the New Horizons spacecraft and the Hubble Space Telescope show that aurorae occur within this halo (Retherford et al., 2007).

Europa has a very rarified oxygen atmosphere derived from the water ice on its surface (Hall et al., 1995). This satellite also possesses an ionosphere that was detected in radio occultation data from the Galileo spacecraft (Kliore et al., 1997).

The exospheres of Io and Europa are so tenuous that they have only been detected within limited wavelength regimes using specialized observational techniques made with large telescopes and by instruments onboard spacecraft. The optical opacities in these regions are vanishingly small.

Therefore, it is incongruous that two articles (Degenhardt et al., 2010 and Degenhardt et al., 2013) report significant broad band extinction of light by the exospheres of both satellites. The authors of the studies term this supposed phenomenon "Jupiter Extinction Events", or "JEE". Those papers offer light curves which are interpreted as evidence that the atmospheres of both Io and Europa significantly dim the light from more distant moons when passing in front of them. This fading is said to be observed during both occultations (when the bodies are aligned as seen from the Earth) and during eclipses (when they are aligned as seen from the Sun).

All Readers

Your comments, questions, etc., about this report are appreciated. Please send them to: ken.poshedly@alpo-astronomy.org for publication in the next Journal.

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- 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).

The principal goal of this paper is to examine the JEE claim of atmospheric extinction using images from the Hubble Space Telescope as well as ground-based photometry. These results flatly contradict the conclusions of the JEE group. Then several criticisms of the JEE methods are discussed. Finally, evidence against significant atmospheres for Io

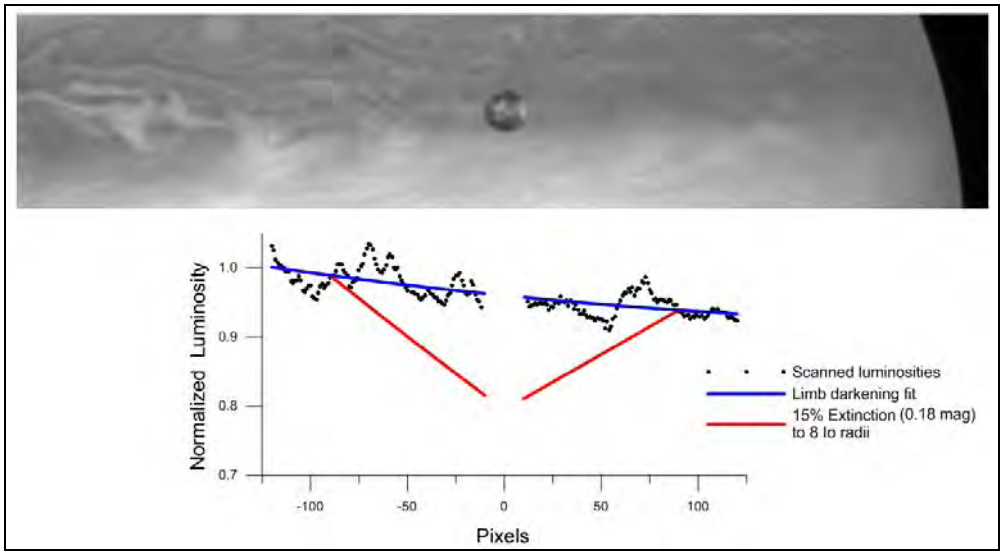

Figure 1. A Jovian transit image of Io (top) and the corresponding luminosity scan measured horizontally beyond the satellite limbs (bottom). The blue (slightly tilted) line is a best fit to the observed data that takes limb-darkening into account. The red line is the reduced brightness according to the JEE model which does not fit the observed data at all. Supporting data for the images in Figures 1 through 3 are given in Table 1.

and Europa based on close approaches by the Galileo spacecraft is presented.

Finding #1: The Atmospheres of Io and Europa Do Not Appreciably Hinder Light During Transits

If the atmospheres of Io and Europa obscured the light from other satellites, then they would do the same to the light of Jupiter during transits of the disk. However, no such halo of darkening is seen around either satellite in HST images.

Figures 1 and 2 show images of Io and Europa during transits. The figures are accompanied by plots of luminosity measurements and a best-fitting line (blue) to account for limb-darkening. A second line (red) indicates how faint the measurements would be, based on the claim made by Degenhardt et al. (2013) of up to 0.18 magnitude (15%) of dimming that tapers off out to 8 Io radii, and 0.25 magnitude (20%) out to 18 Europa radii. There is obviously no measurable extinction.

A total of 50 such images were examined and found to be lacking any perceptible darkening. The data set spans the years 1994 through 2007 and includes ultraviolet, visible and infrared imagery.

Finding #2: The Atmospheres of Io and Europa Do Not Appreciably Scatter Light

If the atmospheres of Io and Europa were dense enough to measurably scatter light, then some of it would be redirected towards the Earth. In that case, the satellite atmospheres would be directly visible beyond their limbs because they would shine by reflected sunlight. Figure 3 shows non-transit images of Io and Europa along with luminosity scans. Ganymede is also shown as a reference. Again, there is no evidence for appreciable scattering of light in the satellite atmospheres.

Finding #3: Light Curves Do Not Support Claims of Extinction

Mutual eclipses and occultations of the Galilean satellites have been recorded over many decades for the purpose of deriving astrometric data on the satellites (e.g., Mallama 1992, Arlot et al., 1997 and Arlot et al., 2009). Observations have been made at dozens of observatories, yet no one — except for the JEE group — has ever detected evidence for extinction. Figure 4 shows a non-JEE light curve of Io occulting Europa, while Figure 5 shows Europa occulting Ganymede. The data clearly do not correspond with the extinction parameters claimed by Degenhardt et al. (2013).

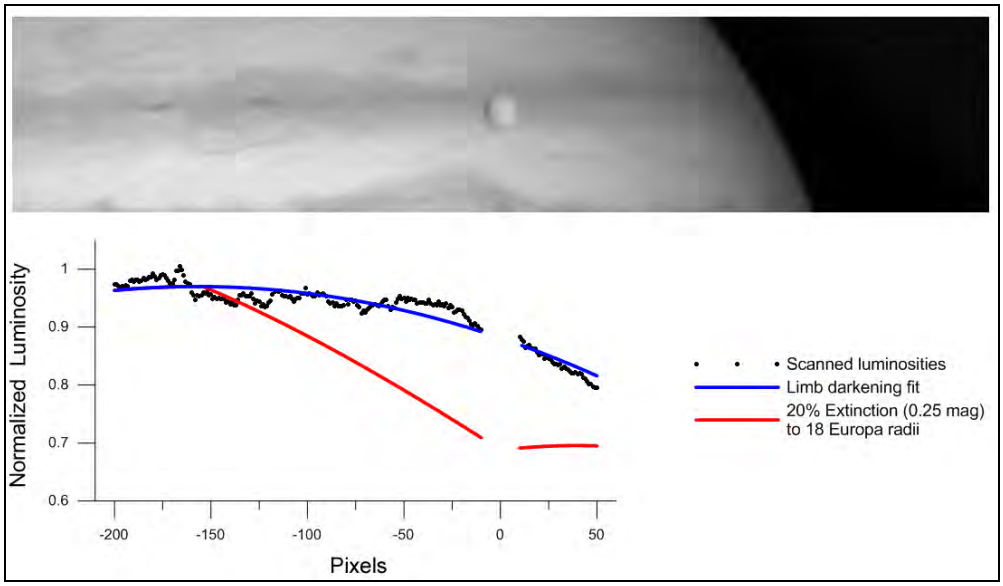

Figure 2. Same as Figure 1, but for Europa. Limb-darkening is more pronounced in this image.

The most recently published mutual event results (Arlot et al., 2009) include many hundreds of light curves compiled by more than 100 professional and amateur astronomers from around the world. These were closely inspected for this paper to identify any that might show evidence for atmospheric extinction. The criteria for the search were that the light curve had to be very high quality (little scatter) and that the amount of time outside of the eclipse or occultation had to be much longer than that inside (to allow for Io or Europa to move at least several radii relative to the other satellite). Among the collection, there are 11 light curves of Io (including that in Figure 4) and 8 of Europa (including Figure 5) that meet these criteria. However, not even one of them shows evidence for atmospheric extinction.

In addition to the mutual event light curves that contradict JEE claims, a further refutation comes from the occultation of the star Beta Scorpii C by Io which occurred on 1971 May 14. No dimming was observed outside of the occultation itself and O'Leary (1971) determined an upper limit of 1 microbar for Io's atmospheric pressure.

Criticisms of "Jupiter Extinction Events" Methods

Dubious light curves

The purported evidence for extinction according to JEE is based on light curves recorded when Io or Europa pass in front of another satellite. Some of the luminosity functions they report, such as that reproduced here as Figure 6, are impossible. The light curves recorded by two separate observers appear to indicate brightening and dimming simultaneously!

Use of non-linear sensors

Degenhardt et al. (2010) attempt to explain away their bizarre light curves by appealing to a mysterious phenomenon called "photon doubling", which is an

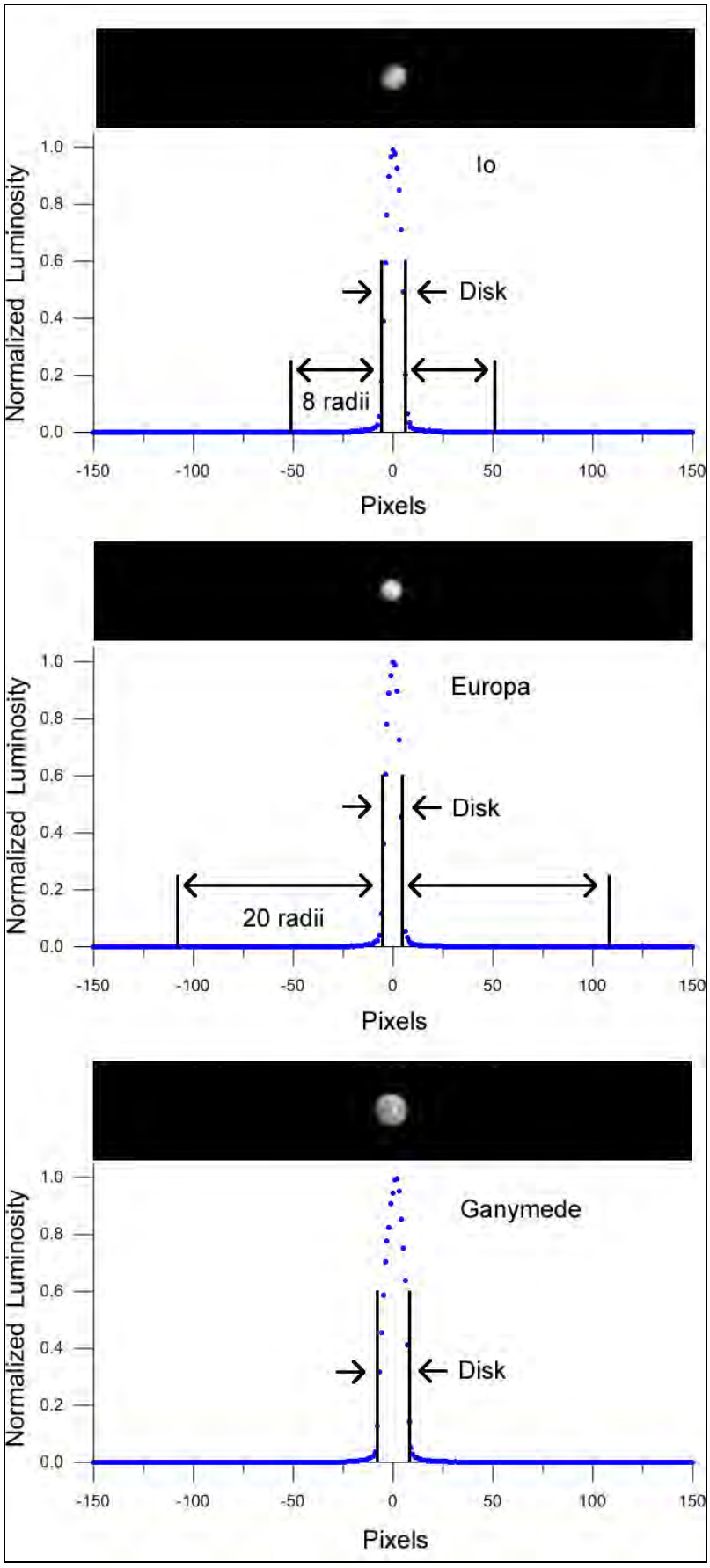

Figure 3. Non-transit images and scans of Io and Europa do not reveal scattered light significantly beyond their limbs. Ganymede is included for comparison and to illustrate the optical point-spread-function that accounts for a very small amount of light scatter a few pixels outside of the disk.

invention of the JEE group and cannot be found anywhere else in the realm of science. The root cause of their problem, however, is that the sensors they use do not produce images that are a linear representation of the scene. Degenhardt (private communication) states the photometric results depend on the exact setting of the camera. In that case, all of the JEE photometry is suspect because accurate photometry can only be derived from sensors that reliably produce linear output.

Inaccurate sky background subtraction

The extraction of photometric data from imagery requires careful subtraction of the sky background sampled from the vicinity of the observed objects. The LiMovie program used by JEE for analysis of their video data samples the sky on both sides of the target. (See their Figure 9 in Degenhardt et al., 2013.) When two satellites are in close proximity, background subtraction using this method gives spurious results, though, because scattered light from each satellite will spill into the area where the background for the other satellite is sampled. In some cases, the satellites themselves will enter the sky background area of their companion. When the distance between the satellites is changing, sky subtraction becomes even more problematic because the amount of light spillage from the other satellite varies with time. The problem is compounded by scattered light from Jupiter itself, a source hundreds of times brighter than either satellite. The failure of JEE to control for sky background introduces luminosity gradients into their light curves, and it is the most likely explanation for the effect that they attribute to extinction.

Critical data omitted

Degenhardt et al. (2010) state, "Donald Parker contributed two photographs of Io transiting Jupiter to this study. Through an advanced processing

Table 1. Hubble Space Telescope Images

Figure	Image	Date	Satellite	Filter
1	U3AP0308T	10/21/1996	Io	F555W
2	U2YHA305T	10/4/1995	Europa	F410M
3	UB060408M UB060408M UB06010BM	6/28/2008 6/28/2008 05/15/2008	Io Europa Ganymede	F469N F469N F502N

NOTE: The HST images in Figures 1 through 3 are standard calibrated data products for scientific research obtained from the HST MAST archive.

technique, the intensity surrounding Io and Io's shadow showed an extinction trend as it neared the limb of Io (Figure 10). The same extinction trend was measured in the intensity surrounding Io's shadow projected on Jupiter".

Their Figure 10 is reproduced in this paper as Figure 7. Notice that luminosity is only shown on the left side of the satellite. There will always be an apparent dimming on one side or the other of a satellite due to limb darkening unless the satellite is precisely in the middle of the Jovian disk. (Figures 1 and 2 in this paper demonstrate the effect of limb-darkening.) Furthermore, the details of the "advanced processing technique" used by the JEE group are not explained, so it is impossible to assess whether the techniques are valid or whether they corrupted the photometric fidelity of the data.

JEE data that does not support the extinction model

Another image taken by Donald Parker is described by Degenhardt et al. (2010) in this way: "Probably the most interesting transit result was found by taking a processed background image of Jupiter and subtracting it from an Io transit photo. Figure 11a shows Io's shadow as the white disk in the middle of the photo. A concentric disturbance is visible beyond the white disc out to almost 2 Io radii".

The term "processed background image" is not explained, so the reader cannot determine whether the processing invalidated the photometric accuracy of the original. Furthermore, this "disturbance" has a sharp edge at 2 Io radius that is inconsistent with the JEE data finding that extinction tapers off gradually out to a distance of 8 radii. The "disturbance" is more likely to be an image artifact of terrestrial origin than a phenomenon in the Jovian system.

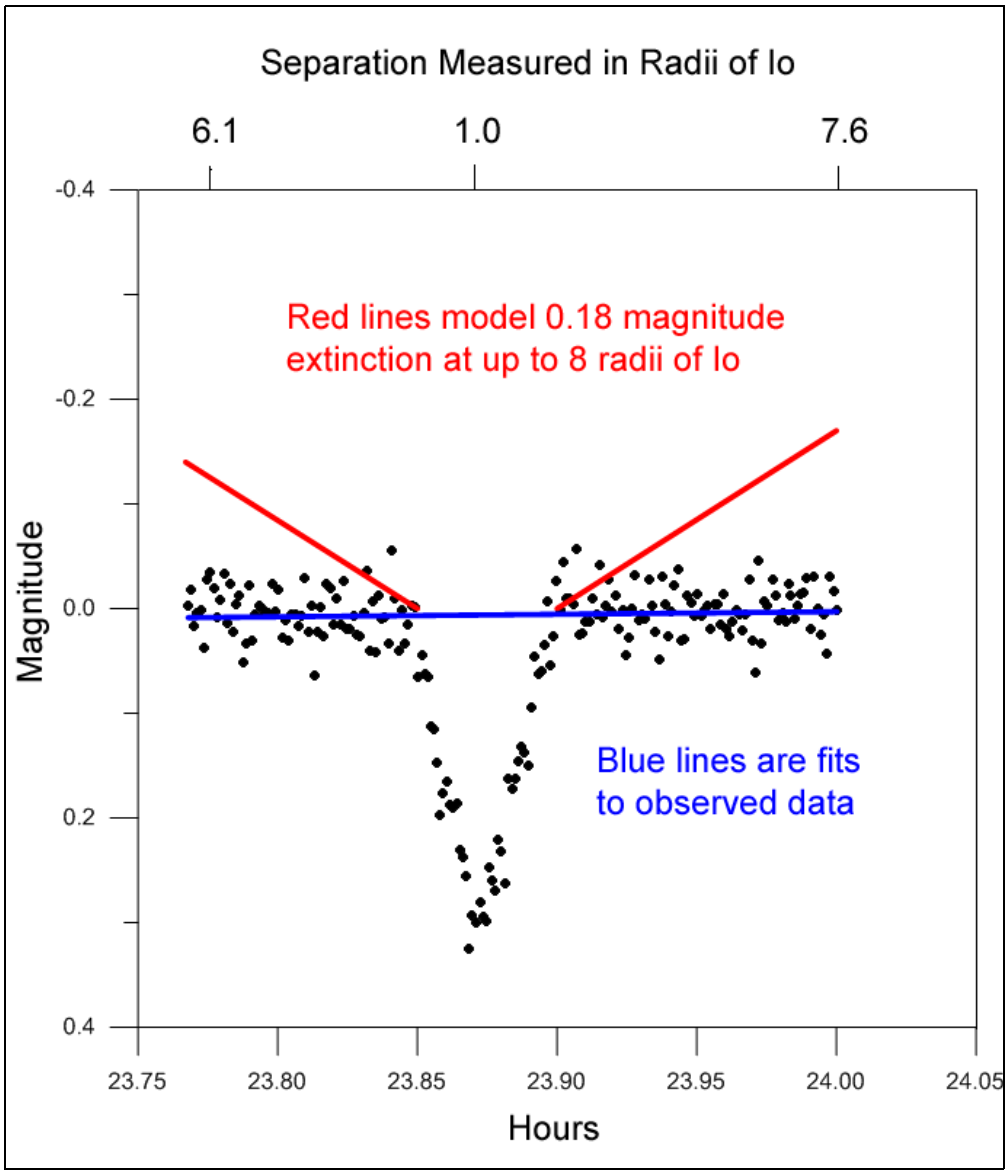

Figure 4. Light curve of the occultation of Europa by Io recorded 2003 March 20. If there were extinction from the atmosphere of Io corresponding with the JEE model, the observed magnitudes would follow the red (diagonal) lines. Data are from Arlot et al. (2009).

No correction for rotational brightness changes

The leading hemispheres of Io and Europa are brighter than their trailing sides. So, as these tidally locked bodies orbit Jupiter, their brightness is always changing (Morrison et al., 1974). The variation for Io is about 0.3 magnitude in the V band and that for Europa it is about 0.5 magnitude. Since JEE does not model these rotational brightness changes, they can result in unexplained luminosity trends in observed light curves. JEE would interpret these trends as the result of atmospheric extinction.

Evidence Against Significant Atmospheres Based on Spacecraft Close Approaches

The remote sensing data from Hubble and the ground-based data presented earlier in this paper conclusively demonstrate that the JEE models for light extinction in the atmospheres of Io or Europa are wrong. There are also *in situ* results, which prove that Io and Europa are surrounded by extremely tenuous exospheres and not the dense atmospheres required for extinction.

No damage to the Galileo spacecraft

The Galileo Orbiter flew within 300 km of Io and within just 200 km of Europa. If the JEE claims for extinction out to thousands of km from Io and Europa were true, then atmospheric friction would have heated the spacecraft to red-hot temperatures, the science instruments would have been destroyed and the high-gain antenna would have been shorn off. Of course none of this occurred.

No measurable drag on the Galileo spacecraft

The friction described above would also have slowed the spacecraft (an effect called *drag*) thus changing the vehicle's orbit. When there is a significant mass nearby (such as Io or Europa), the density of the atmosphere, in addition to the satellite's own gravity, will also alter the orbiter's direction of motion. The spacecraft navigation group at JPL looked for the effect of drag in the radio tracking data for Galileo, but none was detected.

Summary

This paper demonstrates beyond a reasonable doubt that that the atmospheres of Io and Europa are nearly 100 percent transparent. Evidence from Hubble Space Telescope images, high-quality ground-based light curves and close approaches to the moons by the Galileo spacecraft all contradict the JEE thick atmosphere hypothesis. The extremely rarified exospheres of Io and Europa do not cause measurable extinction. A list of criticisms of the techniques used by JEE has been presented. Their claims of extinction are spurious and likely result from a combination of factors. These include the use of substandard imaging devices, the application of inaccurate data processing methods and failure to account for the satellites' rotational brightness variations.

Acknowledgements

The Hubble Space Telescope images used for the analysis illustrated in Figures 1, 2 and 3 were retrieved from the MAST archive at the Space Telescope Science Institute. The light curve data used for the analysis illustrated in Figures 4 and 5 was obtained from the Centre de Données Astronomiques de Strasbourg through VizieR (Ochsenbein et al., 2000). John Westfall and Robert Modic kindly reviewed earlier versions of this paper and provided helpful comments.

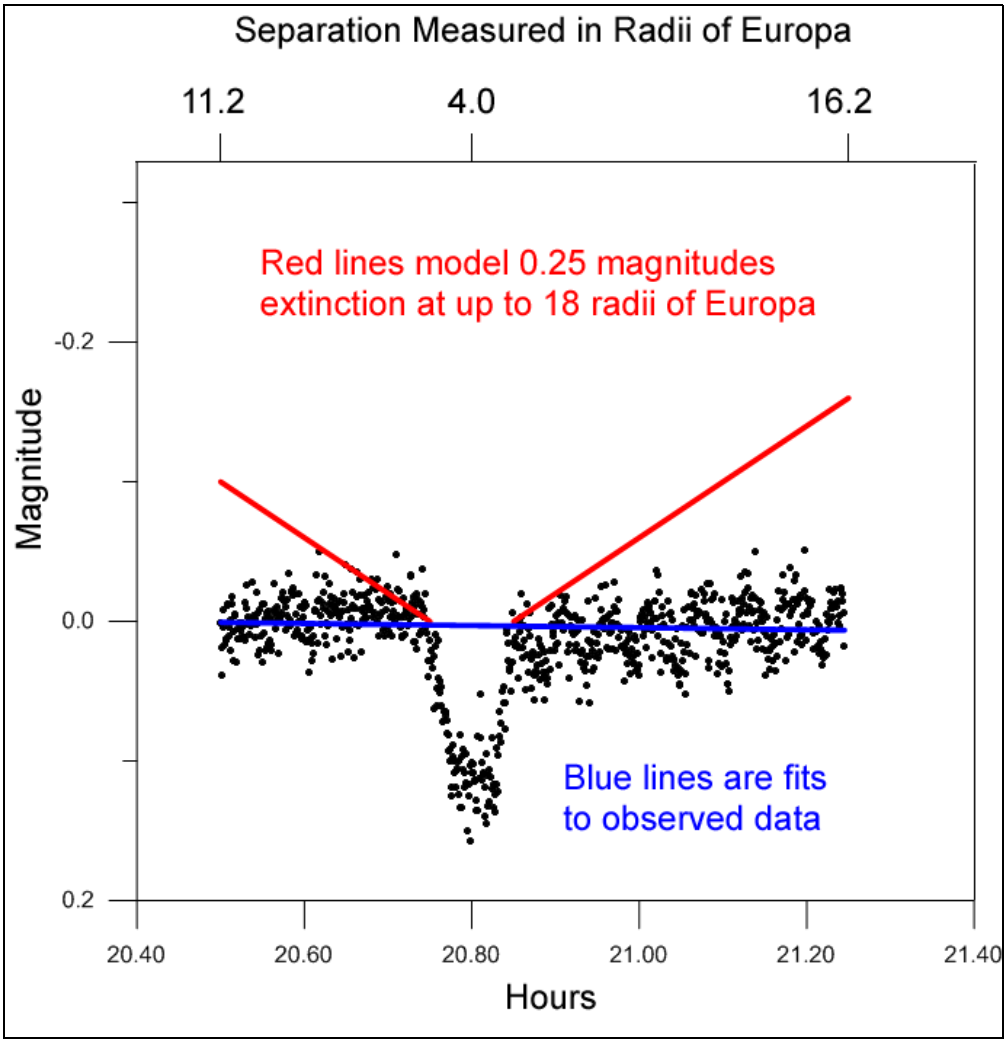

Figure 5. Light curve of the occultation of Ganymede by Europa recorded 2003 March 25. The photometry demonstrates that the atmosphere of Europa does not cause significant extinction. Data are from Arlot et al. (2009).

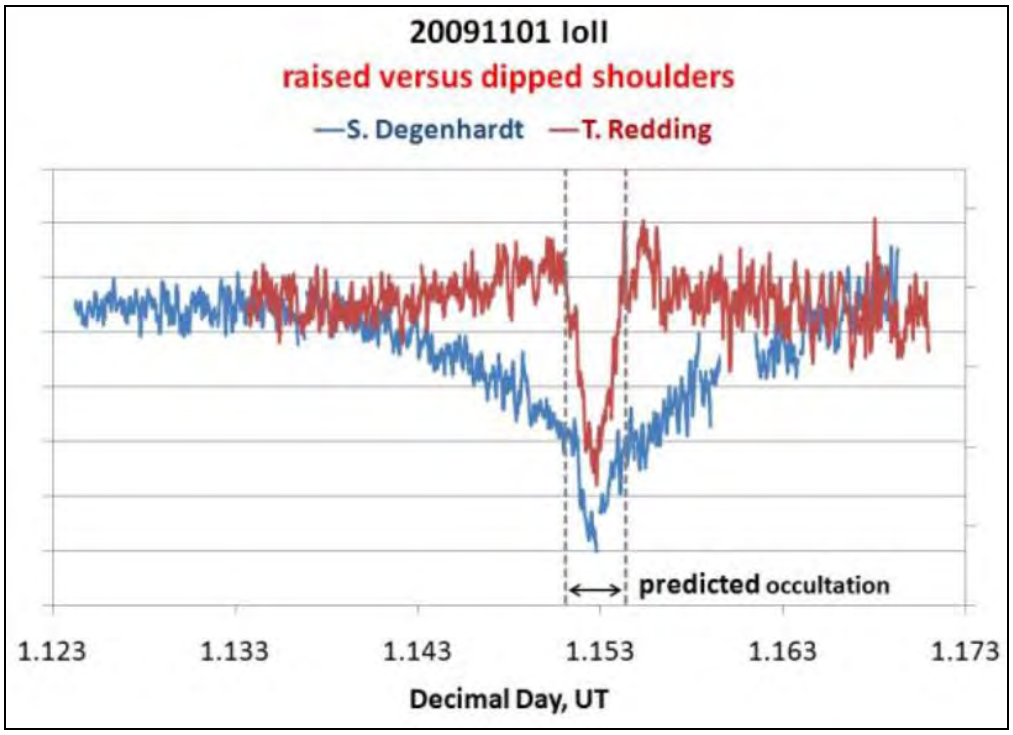

Figure 6. The illustration is Figure 14 from Degenhardt et al. (2010) used by permission of the Society for Astronomical Sciences. One observer recorded fading while the other observer recorded brightening during the same close approach of Io and Europa.

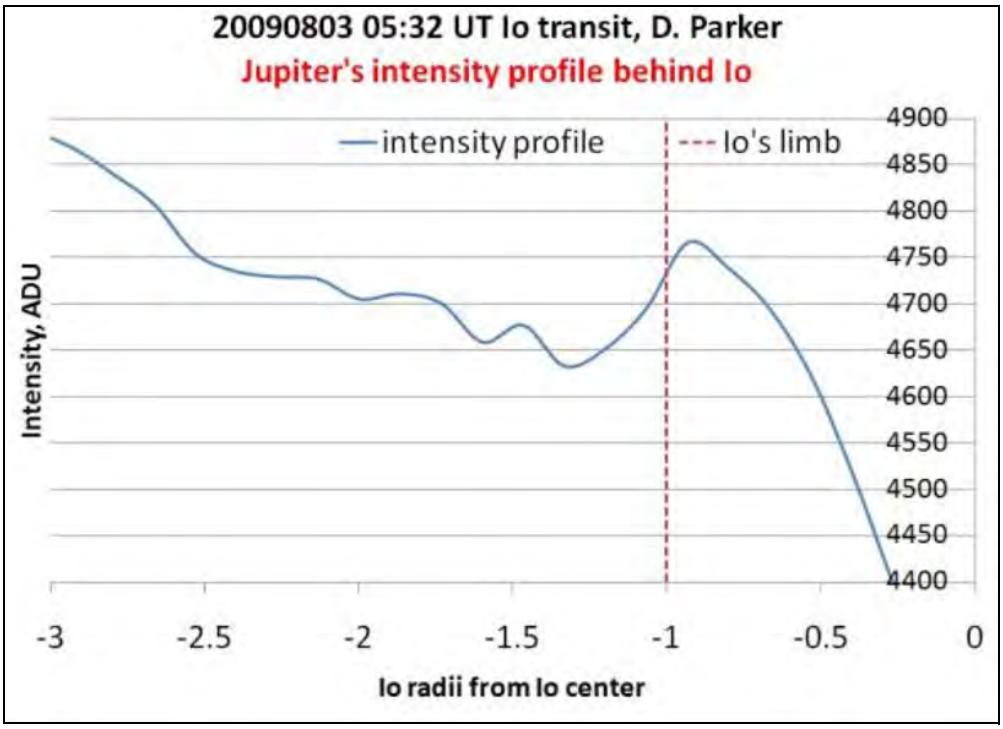

Figure 7. The illustration is Figure 10 of Degenhardt et al (2010) used by permission of the Society for Astronomical Sciences. The apparent dimming on the left side of Io can be explained by limb-darkening or by the presence of a dark cloud feature.

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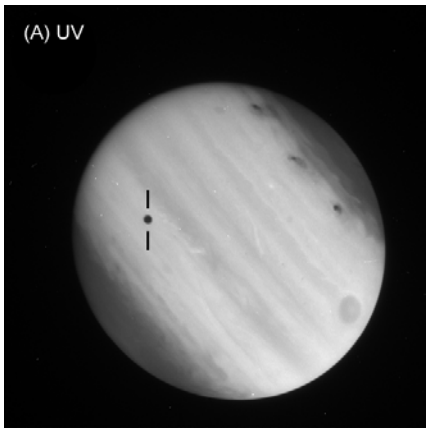
Addenda

Like the visible wavelength images of Io and Europa analyzed in the main article, those at other wavelengths also contradict the claims being made by the JEE group.

An atmosphere causing measurable extinction out to 8 Io radii would appear as a distinct dark halo around the satellite during transits of Jupiter.

The Hubble Space Telescope ultraviolet image U2FI0101T shown here was acquired with the F225W filter on 1994 July 17. The vertical bar extends 8 Io radii, which is the size of the satellite's atmosphere claimed by JEE.



This image — and dozens more like it — shows no evidence for atmospheric extinction and further refute the JEE hypothesis.

When Amateur Science Goes Awry

Professional astronomers are divided on the topic of amateur research. Most of them respect observations made by nonprofessionals and some even rely upon them for their research. However, there is also a significant minority who are skeptical of contributions from backyard observers and a few who malign amateur data. Therefore it is very important to hold amateur science to high standards. Otherwise, when false results are published and disseminated to the astronomical community, those results will taint the reputation of all amateur research.

My paper "The Atmospheres of Io and Europa are Transparent", appearing in this issue, rebuts the spurious claims of a group who insist that Jupiter's satellites Io and Europa have thick atmospheres extending out to thousands of kilometers. The atmospheres supposedly dim the light from objects behind them and the group refers to these purported phenomena as "Jupiter Extinction Events" (JEE).

Anyone who has observed either Jovian satellite knows that the notion of a thick, light-scattering atmosphere around Io or Europa is ridiculous. If the atmospheres were thick, they would either be evident as a bright halo shining by reflected sunlight around the satellite when off Jupiter's disk, or as a dark halo during transits of the planet. In my paper, I develop this argument using Hubble Space Telescope images of the satellites taken during transits and when the moons are offset from the Jovian disk. Additional evidence from ground-based photometry and other evidence gathered during close approaches of the Galileo orbiter spacecraft to the satellites thoroughly debunks this unsupported idea. This paper also points out deficiencies in the instrumentation, data processing and other methods used by the JEE group.

I do not wish to unfairly rebuke amateur researchers, even if their results are wrong. Therefore, I went to great lengths and exchanged dozens of e-mail messages with the lead author of the JEE group, and the editor of the Proceedings where the papers were published. Despite all the evidence that the idea of extinction atmospheres was preposterous and after pointing out that irresponsible papers are injurious to amateur research, my suggestion to retract the papers was refused. Finally, I concluded that JEE is, at best, misguided. Only then did I write the paper published in this issue of the JALPO as a last resort to correct the highly erroneous JEE articles.

Journal articles published without being reviewed, like the JEE papers in the *Proceedings of the Society for Astronomical Science*, can cause significant harm, especially when the conclusions are widely distributed. Far more care should be taken by editors and publicists to protect the reputation of responsible amateur researchers. Peer review and sanity checking would help to insure that unfortunate incidents like the publication of the JEE reports do not reoccur.

-- Anthony Mallama, September 2013

ALPO Galilean Satellite Eclipse
Visual Timing Report Form

Describe your time source(s) and estimated accuracy	Observer Name: Apparition: 20_____-20_____ (conjunction to conjunction)

Event Type (a)	Predicted UT		Observed UT Time (9d)	Telescope Data (e)			Sky Conditions (0-2 scale) (f)			Notes (g)
	Date (b)	Time (c)		Type	Aperture (cm)	Mag.	Seeing	Transparency	Field Brightness	

(a) 1 = Io, 2 = Europa, 3 = Ganymede, 4 = Callisto; D = Disappearance, R = Reappearance
(b) Month and Day
(c) *Predicted* UT to 1 minute
(d) *Observed* UT to 1 second; corrected to watch error if applicable; indicate in "Notes" if Observed UT date differs from Predicted UT date
(e) R = Refractor, N = Newtonian Reflector, C = Cassegrain Reflector, X = Compound/Catadioptric System; indicate in "Notes" if other type.
(f) These conditions, including field brightness (due to moonlight, twilight, etc.), should be described as they apply to the actual field of view, rather than to general sky conditions. Use whole numbers only, as follows:
0 = Condition not perceptible; no effect on timing accuracy
1 = Condition perceptible; possible minor effect on timing accuracy
2 = Condition serious; definite effect on timing accuracy
(g) Include here such factors as wind, drifting cloud(s), satellite near Jupiter's limb, moonlight interference, etc.

At the end of the apparition, return this form to:
John E. Westfall, ALPO Assistant Jupiter Coordinator, P.O. Box 2447, Antioch, CA 94531-2447 USA
E-mail to: johnwestfall@comcast.net

Feature Story:

ALPO Observations of the Remote Planets in 2011-2012

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

Abstract

This report summarizes observations of Uranus, Neptune and Pluto that members of the Association of Lunar & Planetary Observers (ALPO) made in late 2011 and early 2012. The selected normalized magnitude values of Uranus are: B(1,0) = -6.575 ± 0.009, V(1,0) = -7.141 ± 0.009, R(1,0) = -6.81 ± 0.02 and I(1,0) = -5.73 ± 0.05. The corresponding values for Neptune are: B(1,0) = -6.632 ± 0.009 and V(1,0) = -7.014 ± 0.009. The difference between maximum and minimum brightness for Pluto as it rotated was 0.20 magnitudes. This is based on unfiltered CCD images made in mid 2011.

Introduction

During 2011, professional astronomers reported several new Uranus, Neptune and Pluto findings. For example, de Pater et al (2011) and Sromovsky et al (2009) report that a white spot on Uranus named "Berg" faded in 2009. This spot was imaged in infrared light. It oscillated between 32° S and 36° S during the 1990s and early 2000s. These groups also report that in 2005, "Berg" drifted northwards at a rate of a few degrees in latitude per year. In November 2009, it was near 5° S and was very faint. In a second study, Karkoschka (2011a) reanalyzed Voyager 2 images of Neptune. He reported that 10 features are consistent with a rotational period of 15.9663 ± 0.0002 hours. This is almost 1% lower than the accepted value of 16.108 ± 0.006 hours. Karkoschka (2011b) also analyzed Hubble Space Telescope images of Neptune recorded in ultraviolet and visible light between 1994 and 2008. He reported a solar phase angle coefficient of 0.0028 ± 0.0010 magnitudes/degree for that planet. Finally, Zalucha and co-workers (2011) reported that Pluto's surface pressure rose from 12.5 microbars in 1988 to 18.5 microbars in 2006. They also reported Pluto having a radius of 1,173 km (728.9 miles) with an uncertainty of several kilometers.

Table 1: Characteristics of the 2010 - 2011 Apparitions of Uranus, Neptune and Pluto[a]

Parameter	Uranus	Neptune	Pluto
First conjunction date	Mar. 21, 2011	Feb. 17, 2011	Dec. 29, 2011
Opposition date	Sept. 26, 2011	Aug. 22, 2011	June 28, 2011
Angular diameter (opposition)	3.7	2.4	0.1
Sub-Earth latitude (opposition)	15.4° N	28.2° S	46.1° S
Right ascension (opposition)	00h 11m	22h 07m	18h 25m
Declination (opposition)	00° 19m	-12° 09m	-18° 49m
Second conjunction date	Mar. 24, 2012	Feb. 19, 2012	Dec. 29, 2011

[a]Data are from the Astronomical Almanac for the years 2010 - 2012

All Readers

Your comments, questions, etc., about this report are appreciated. Please send them to: *ken.poshedly@alpo-astronomy.org* for publication in the next Journal.

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The 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).

Members of the ALPO also made important contributions to our knowledge of the remote planets during 2011. I will summarize these in this report.

Table 1 lists characteristics of Uranus and Neptune during their 2011-2012 apparitions. The people who submitted observations of these planets are summarized in Table 2. This report summarizes brightness measurements and drawings made during late 2011 and early 2012.

Brightness Measurements: Photoelectric Photometry

Jim Fox and this writer made brightness measurements with an SSP-3 solid state photometer along with filters transformed to the Johnson B, V, R and I system. More information on the equipment can be found elsewhere (Optec, Inc, 1997), (Schmude, 1992,

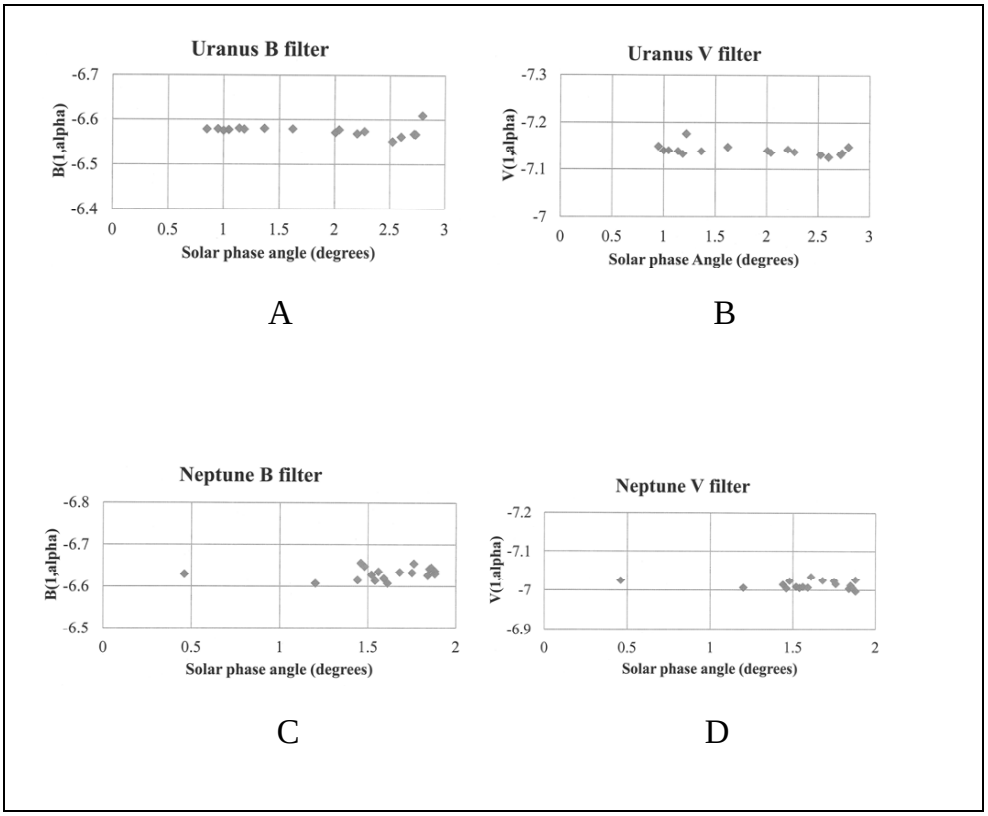

Figure 1. Graphs of the normalized magnitudes B(1,alpha) and V(1,alpha) values versus the solar phase angle, alpha, for Uranus and Neptune. The values are from Tables 4 and 5.

20; 2008, Chapter 5). The transformation coefficients for Jim Fox's equipment are 0.0609 and -0.0547 for the B and V filters respectively. The transformation coefficients for the equipment used by this writer are -0.060, -0.024 and -0.117 for the V, R and I filters respectively. The comparison stars and their brightness values are summarized in Table 3.

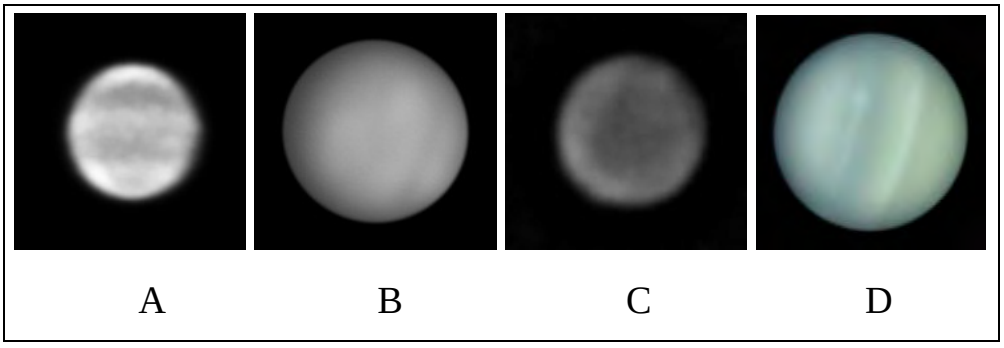

Figure 2. Images and drawings of Uranus made in late 2011. South is at top in images C and D; no orientation information was provided for images A and B. A: An infrared image of Uranus made by J.L. Dauvergne at Pic du Midi observatory on August 10 at 2:40 UT. B: A drawing of Uranus made by D. Gray on August 15 at 2:25 UT; seeing = II (Antoniadi scale); 0.42 m Dall Kirkham, 365 and 535 X with binoviewer. C: An image made by A. Kazemoto on September 28 at 15:19 UT in infrared light with a wavelength of 742 nm; 0.5 m Cassegrain telescope. D: A drawing with intensities made by D. Gray on November 1 at 19:50 UT with a 0.42 m Dall Kirkham with seeing = I/II (Antoniadi scale).

Tables 4 and 5 summarize brightness measurements made of Uranus and Neptune. The date, observer's initials, filter, measured brightness value and normalized magnitude value are listed in columns 1-5 and 6-10 in each table. Values of the normalized magnitudes are computed in the same way as in Schmude (2012, pp. 33-38). Extinction and color transformation corrections are included in all brightness measurements in the same way as is described in Schmude (2008, pp. 161-168).

Jim Fox and this writer used specific comparison and check stars for their Uranus measurements. Jim used 21-Piscium as a comparison star and the writer used lambda-Piscium as a comparison star. Jim used HD6 as a check star. This writer computed brightness values of 6.290 and 7.411 for the B and V filter magnitudes of this star based on Jim's data. These values are consistent with those in Table 3. On one occasion, this writer used 21-Piscium as a check star. The measured V filter brightness was 0.03 to 0.04 magnitudes fainter than the corresponding value in Table 3.

Jim used 38-Aquarii and Iota-Aquarii as the comparison and check star for his Neptune measurements respectively. Once again, this writer computed average B and V filter magnitude values for Iota-Aquarii from Jim's data. The corresponding values are 4.195 and 4.274 for the B and V filters respectively. These measured values are within 0.01 magnitudes of the values in Table 3. The close agreement between measured and literature magnitude values of the check stars for the Uranus and Neptune measurements is evidence that Jim's brightness values have a high degree of accuracy.

Table 6 lists selected normalized magnitudes for Uranus and Neptune. As in previous studies, the affect of the solar phase angle was neglected. Uranus and Neptune were both a bit brighter than in the previous year. Uranus was 0.01 to 0.02 magnitudes brighter than when it

Table 2: Contributors to this Report[a]

Name (location)[a]	Type of Observation[b]	Telescope[c]	Name (location)[a]	Type of Observation[b]	Telescope[c]
Patrick Abbott (Canada)	VP	B	Stanislas Maksymowicz (France)	D, DN	0.28 m SC
Paul Abel (UK)	D	0.20 m RL	Make Mattei (USA)	PP	0.36 m SC
Richard Broadbent (UK)	D	0.51 m DK	Frank Melillo (USA)	I, PP, S	0.25 m SC
Brian Cudnik (USA)	D, DN	0.2 m SC	Detlev Niechoy (Germany)	D, I	0.20 m SC
Marc Delcroix (France)	I	0.25 m SC	Christophe Pellier (France)	I	0.25 m C
Jim Fox (MN, USA)	PP	0.25 m SC	Dennis Put (The Netherlands)	I	0.23 m SC
David Gray (UK)	D	0.42 m DK	Richard Schmude, Jr. (USA)	PP, VP	0.20 m SC & B
Manos Kardasis (Greece)	I	0.28 m SC			

[a]The following people contributed valuable observations to the ALPO Japan latest website and are not listed above: G. Bianchi, J. L. Dauvergne, F. Gabriele, A. Germano, A. Kazemoto, A. Lasala, S. Mogami, L. Pelizzari, J. Sussenbach, F. Willems and S. Yoneyama. The following observer contributed to the Arkansas Sky Observatory archive: E. M. Rivera.

[b]Type of observation: D = drawings, DN = descriptive notes, I = images, PP = photoelectric photometry, S = spectra, 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, DK = Dall Kirkham, RL = reflector, and SC = Schmidt-Cassegrain

Table 3: Comparison and Check Stars Used in Photometric Studies of Uranus and Neptune

Comparison Star	Brightness (in stellar magnitudes)				Source
	B filter	V filter	R filter	I filter	
21-Piscium	5.99[b]	5.763[a]	—	—	a, b
HD6	7.40	6.296	—	—	c
Lambda-Piscium	4.71	4.49	4.30	4.20	d
38-Aquarii	5.31	5.431	—	—	a
Iota-Aquarii	4.191	4.266	—	—	a

[a] Westfall (2008) who cites Mermilliod (1991).

[b] A value of B-V = 0.227 was used by Jim Fox. This value is close to 0.23 which is listed in Hirshfeld et al. (1991). The B - V value that Jim used, however, is much larger than the one (0.149) reported by Mermilliod (1991).

[c] Hirshfeld et al (1991).

[d] Iriarte et al (1965).

reached equinox at the end of 2007 (Meeus, 1997, p. 332).

Uranus brightened in late 2011 in red and infrared wavelengths. The I(1,0) value in 2011 was -5.73 ± 0.05 which is 0.12 magnitudes brighter than in the previous apparition. This brightening may be the result of a bright spot imaged in the fall of 2011.

Linear fits of $B(1,\alpha)$ and $V(1,\alpha)$ versus α for Uranus and Neptune are:

$$B(1,\alpha) = -6.582 + 0.0036\alpha \quad \text{Uranus} \qquad (1)$$

$$V(1,\alpha) = -7.145 + 0.0033\alpha \quad \text{Neptune} \qquad (2)$$

$$B(1,\alpha) = -6.615 - 0.010\alpha \quad \text{Uranus} \qquad (3)$$

$$V(1,\alpha) = -7.024 + 0.0066\alpha \quad \text{Neptune} \qquad (4)$$

Figure 1 shows graphs for all four equations. The second term in each equation describes the slope and equals the solar phase angle coefficient. This term describes the rate that a planet dims as its phase decreases. Table 7 lists measured solar phase angle coefficients for Uranus and Neptune for the Johnson V system. The average values for 2007-2012, in units of magnitudes/degree, are 0.0008 ± 0.0011 and 0.0052 ± 0.0026. The selected values (in magnitudes/degree) based on an equally weighted average of the 2007-2012 values and those in Schmude (2008, p. 17) are 0.001 ± 0.001 and 0.003 ± 0.002 for Uranus and Neptune respectively. The Neptune value is consistent with that in Karkoschka (2011b).

Brightness Measurements: Visual Photometry

Patrick Abbott and this writer report brightness estimates of Uranus and Neptune. The selected Vvis(1,0) values for the 2011-2012 apparition are -7.2 (Uranus) and -6.9 (Neptune). These values are based on 63 brightness estimates of Uranus and 19 estimates of Neptune. The value of Vvis(1,0) is

Table 4: Brightness Measurements of Uranus in 2011 and Early 2012

Date	Obs.[a]	Filter	Brightness (magnitudes)		Date	Obs.[a]	Filter	Brightness (magnitudes)	
			Meas. (+)	Normalized (–)				Meas. (+)	Normalized (–)
Oct. 13.189	JF	V	5.782	7.140	Nov. 9.150	JF	V	5.809	7.140
Oct. 13.190	JF	B	6.343	6.579	Nov. 9.151	JF	B	6.378	6.571
Oct. 15.149	JF	V	5.773	7.150	Nov. 10.161	JF	V	5.815	7.136
Oct. 15.150	JF	B	6.344	6.579	Nov. 10.162	JF	B	6.373	6.578
Oct. 16.187	JF	V	5.784	7.140	Nov. 15.113	JF	V	5.815	7.143
Oct. 16.187	JF	B	6.348	6.576	Nov. 15.113	JF	B	6.389	6.569
Oct. 17.180	JF	V	5.784	7.141	Nov. 17.165	JF	V	5.824	7.137
Oct. 17.180	JF	B	6.347	6.578	Nov. 17.165	JF	B	6.387	6.574
Oct. 19.158	JF	V	5.787	7.139	Dec. 14.057	RS	I	7.277	5.731
Oct. 19.159	JF	B	6.345	6.581	Dec. 14.072	RS	R	6.157	6.851
Oct. 20.144	JF	V	5.794	7.133	Dec. 14.090	RS	I	7.196	5.812
Oct. 20.144	JF	B	6.348	6.579	Dec. 14.111	RS	R	6.131	6.877
Oct. 21.008	RS	V	5.751	7.177	Dec. 14.129	RS	I	7.141	5.867
Oct. 21.023	RS	R	6.150	6.778	Dec. 28.076	JF	V	5.885	7.149
Oct. 21.037	RS	I	7.333	5.595	Dec. 28.077	JF	B	6.425	6.609
Oct. 21.051	RS	R	6.186	6.742	Jan. 5.087	JF	V	5.913	7.136
Oct. 21.064	RS	I	7.281	5.647	Jan. 5.088	JF	B	6.481	6.568
Oct. 21.077	RS	R	6.105	6.823	Jan. 6.094	JF	V	5.919	7.131
Oct. 24.152	JF	V	5.792	7.139	Jan. 6.094	JF	B	6.482	6.568
Oct. 24.153	JF	B	6.350	6.581	Jan. 14.078	JF	V	5.939	7.125
Oct. 30.111	JF	V	5.788	7.149	Jan. 14.078	JF	B	6.502	6.562
Oct. 30.111	JF	B	6.357	6.580	Jan. 18.076	JF	V	5.940	7.131
					Jan. 18.076	JF	B	6.519	6.552

[a]Initials: JF = Jim Fox; RS = Richard Schmude, Jr.

computed in the same way as in Schmude, 2012, pp. 33-38.

Pluto's Lightcurve

As Pluto rotates, brighter and dimmer areas face the Earth. Pluto's lightcurve consists of brightness measurements made when different longitudes of that planet face the Earth. For over 50 years, astronomers have measured that planet's light curve. Frank Melillo carried out such a study during 2011. He based his study on unfiltered CCD images that he made with his telescope. He reports that the difference between maximum and minimum brightness of Pluto as it rotates is 0.20 ± 0.05 magnitudes. This is half the value that it had in 2000. The 2011 result is consistent with part of Pluto's atmosphere condensing on the surface and blanketing dark areas. It will be interesting to see if Pluto's albedo has changed over the last decade.

Drawings and Images

Several people submitted images and drawings of Uranus and Neptune. A few of these are shown in Figure 2. An infrared image made at Pic du Midi observatory (Figure 2A) shows irregular limb darkening. This irregularity is also visible in Kazemoto's infrared image in Figure 2C. This writer's belief is that infrared images are more likely to show albedo irregularities on Uranus than those made in visible wavelengths. Infrared images require larger telescopes. This is because Uranus reflects less infrared light than visible light. David Gray used a 0.42 meter telescope to observe Uranus. He may have glimpsed a bright spot on Uranus. See Figure 2D. The spot is just above and left of the disc center.

Table 5: Brightness Measurements of Neptune in 2011

Date	Obs.[a]	Filter	Brightness (magnitudes)		Date	Obs.[a]	Filter	Brightness (magnitudes)	
			Meas. (+)	Normalized (–)				Meas. (+)	Normalized (–)
Sept. 6.200	JF	V	7.674	7.026	Oct. 20.118	JF	V	7.697	7.036
Sept. 6.201	JF	B	8.070	6.630	Oct. 20.119	JF	B	8.125	6.608
Oct. 1.143	JF	V	7.708	7.006	Oct. 24.124	JF	V	7.711	7.026
Oct. 1.144	JF	B	8.107	6.607	Oct. 24.124	JF	B	8.103	6.634
Oct. 11.157	JF	V	7.709	7.015	Oct. 29.137	JF	V	7.719	7.024
Oct. 11.158	JF	B	8.108	6.616	Oct. 29.138	JF	B	8.110	6.633
Oct. 12.142	JF	V	7.720	7.005	Oct. 30.086	JF	V	7.728	7.016
Oct. 12.142	JF	B	8.068	6.657	Oct. 30.086	JF	B	8.089	6.655
Oct. 13.163	JF	V	7.701	7.024	Nov. 7.086	JF	V	7.750	7.003
Oct. 13.163	JF	B	8.077	6.648	Nov. 7.086	JF	B	8.127	6.626
Oct. 15.124	JF	V	7.719	7.008	Nov. 9.125	JF	V	7.744	7.012
Oct. 15.124	JF	B	8.099	6.628	Nov. 9.125	JF	B	8.113	6.643
Oct. 16.147	JF	V	7.723	7.005	Nov. 10.135	JF	V	7.751	7.006
Oct. 16.147	JF	B	8.114	6.614	Nov. 10.135	JF	B	8.112	6.645
Oct. 17.138	JF	V	7.721	7.008	Nov. 15.088	JF	V	7.736	7.027
Oct. 17.138	JF	B	8.094	6.635	Nov. 15.089	JF	B	8.133	6.630
Oct. 19.129	JF	V	7.725	7.007	Nov. 17.139	JF	V	7.769	6.997
Oct. 19.130	JF	B	8.112	6.620	Nov. 17.140	JF	B	8.129	6.637

[a]Initials: JF = Jim Fox; RS = Richard Schmude, Jr.

Spectra

Frank Melillo submitted spectra of both Uranus and Neptune. The spectra were made in mid-2011. There are minor differences between the 2011 spectra and those recorded a decade earlier.

Satellites

Dennis Put reports brightness values for Titania, Oberon and Ariel of 14.0, 14.2 and 14.5 restively. From these measurements, I compute brightness differences (compared to Titania) in stellar magnitudes of: Ariel - Titania = 0.5 and Oberon - Titania = 0.2. Melillo reports that Neptune's largest Moon Triton has a brightness of 13.51 stellar magnitudes. This measurement is based on an unfiltered CCD image. This value is close to the expected V filter brightness for that moon.

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Table 6: Selected Normalized Magnitudes for Uranus and Neptune

Filter	Planet	Normalized magnitude (stellar magnitudes)	Solar phase angle coefficient (magnitude/degrees)	Number of measurements
B	Uranus	-6.575 ± 0.009	0.0033	17
V	Uranus	-7.141 ± 0.009	0.0036	18
R	Uranus	-6.81 ± 0.02[a]	Not measured	5
I	Uranus	-5.73 ± 0.05[a]	Not measured	5
B	Neptune	-6.632 ± 0.009	0.0066	18
V	Neptune	-7.014 ± 0.009	-0.010	18
[a] Includes measurements made before and after the discovery of a bright spot on Uranus.				

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Table 7: Solar Phase Angle Coefficients for Uranus and Neptune Based on V Filter Brightness Measurements

Apparition	Uranus	Neptune	Source
2011-2012	0.0033	0.0066	Current work
2010-2011	-0.0016	-0.0009	Schmude (2012)
2008-2009	-0.00001	Not measured	Schmude (2010)
2007-2008	0.0041 and -0.0018	0.010	Schmude (2009)
Average	0.0008 ± 0.0011	0.0052 ± 0.0026	
Up to 2006	0.0011 ± 0.0011	0.0015 ± 0.004	Schmude (2008)
Selected values[a]	0.001 ± 0.001	0.003 ± 0.002	Current work
[a] Equally weighted values of the 2007-2012 average and the value in Schmude (2008, p. 17)			

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

- **Minor Planets (Derald D. Nye):** *The Minor Planet Bulletin*. Published quarterly; free at *http://www.minorplanetobserver.com/mpb/default.htm*. Paper copies available only to libraries and special institutions at $24 per year via regular mail in the U.S., Mexico and Canada, and $34 per year elsewhere (airmail only). Send check or money order payable to "Minor Planet Bulletin", c/o Derald D. Nye, 10385 East Observatory Dr., Corona de Tucson, AZ 8564I-2309.

- **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); 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.

ALPO Resources

People, publications, etc., to help our members

- **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 Newsletter*, free (except postage), published quarterly (March, June, September, and December). Send check or money order for first class postage to cover desired number of issues to Robert D. Lunsford, 1828 Cobblecreek St., Chula Vista, CA 91913-3917.

Other ALPO Publications

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

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

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

Back Issues of The Strolling Astronomer

- Download JALPO43-1 thru the latest current issue as a pdf file from the ALPO website at *http://www.alpo-astronomy.org/djalpo* (free; most recent issues are password-protected, contact ALPO membership secretary Matt Will for password info).

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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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