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Founded in 1947

The Strolling Astronomer

Volume 53, Number 2, Spring 2011

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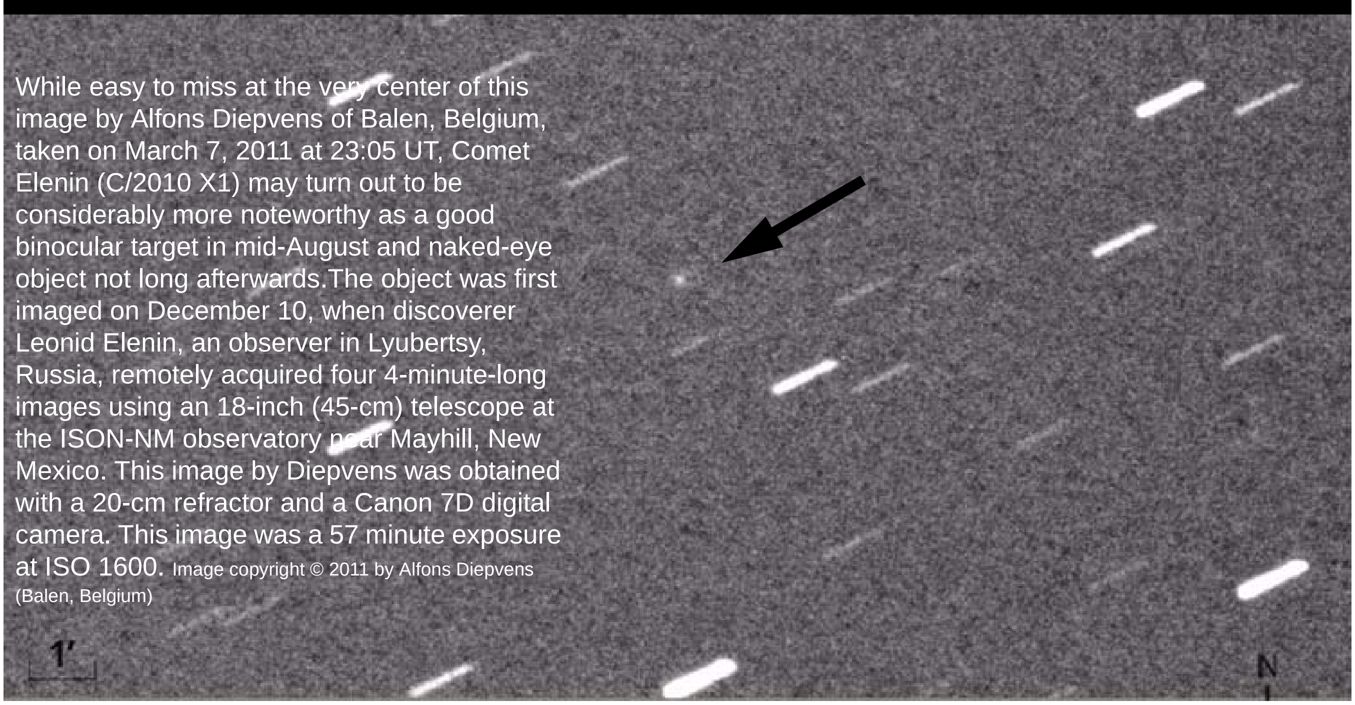
Inside this issue . . .

- ***All the latest on ALPO 2011 at Las Cruces (and your chance to meet our fearless founder, Walter Haas)***
- ***A look at how founding member Elmer Reese contributed to our understanding of the famous Jupiter SEB***
- ***Life on the Moon? Read what the greats had to say about it***
- ***Apparition reports: Jupiter in 2008 . . . plus reports about your ALPO section activities and- much, much more!***



While easy to miss at the very center of this image by Alfons Diepvens of Balen, Belgium, taken on March 7, 2011 at 23:05 UT, Comet Elenin (C/2010 X1) may turn out to be considerably more noteworthy as a good binocular target in mid-August and naked-eye object not long afterwards.The object was first imaged on December 10, when discoverer Leonid Elenin, an observer in Lyubertsy, Russia, remotely acquired four 4-minute-long images using an 18-inch (45-cm) telescope at the ISON-NM observatory near Mayhill, New Mexico. This image by Diepvens was obtained with a 20-cm refractor and a Canon 7D digital camera. This image was a 57 minute exposure at ISO 1600.

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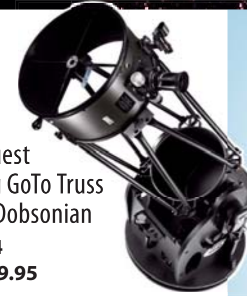
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Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 53, No. 2, Spring 2011
This issue published in March 2011 for distribution in both portable document format (pdf) and also hardcopy format.

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

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

For membership or general information about the ALPO, contact:

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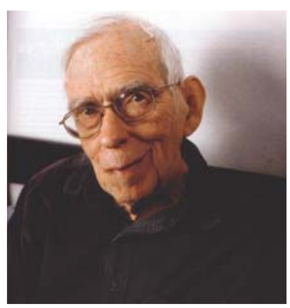
Las Cruces, New Mexico
July 21- 23



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Point of View

The Rewards /Uncertainty of Meteor-Chasing

By Robert D. Lunsford, coordinator, ALPOMeteors Section

I feel it's safe to say that most of us like fireworks and the brilliant displays that can be seen in times of celebration. Nature itself can produce some fine displays, most notably lightening and the resulting thunder. I find myself attracted to a type of celestial fireworks. Most of these are silent, but the resulting streaks of light in the sky can often rival those made by man.

Of course I am talking about the phenomena of meteors and meteor showers. The term "shower" is a misnomer, as even the strongest of the annual meteor showers produce no more than a trickle of meteors. Yet this trickle of meteors is fascinating to watch as the observer does not know when or where in sky these will occur. Nor do they know how bright or what color they will possess. I feel this element of surprise adds to the fascination of viewing meteors.

Every so often there is a prediction of a meteor storm. Now since a shower of meteors gives you a trickle of activity, a storm will actually provide a decent "drenching." The actual definition of a meteor storm is a display that will likely produce a rate of at least 1,000 meteors per hour at maximum activity. These are the events that really get meteor observers excited. Like eclipse chasers, they will travel to the ends of the Earth to be in the right place at the right time to view such an event.

But unlike eclipse chasers, these folks are not guaranteed the event will even occur! Fifty years ago, predictions of meteor storms were based on the prior history of each shower. Even as late as 1972, a few meteor storm chasers went to Japan to view the October Draconid storm that failed to materialize.

More recently, predictions have been based on computer simulations of particle motion in space. These simulations have proved reliable, but not perfect. One factor that is still "a shot in the dark" is the exact strength of each prediction. It is far easier to predict the locations of particle concentrations in space compared to their density. The potential meteor storm chaser has to weigh these factors before setting off to exotic lands.

These events are among the rarest of celestial phenomena, much rarer than the total solar eclipses or the appearance of bright comets. Only four meteor storms occurred during the 20th century. Rates in excess of 1,000/hr lasted less than 12 hours in all four events combined. They are fantastic sights to behold, with the entire sky filled with meteors, one after another.
(See Meteor-Chasing, page 4)

Inside the ALPO
Member, section and activity news

News of General Interest

ALPO 2011 Updates

Arrangements for the 2011 annual conference of the Assn of Lunar & Planetary Observers are being finalized as this issue of your Journal goes to press (late-March).

The event will be held Thursday through Saturday, July 21 - 23, on the campus of New Mexico State University at Las Cruces.

Here are the particulars at this time:

Registration - Individual (includes Friday night dinner

- Before July 1: $65
- After July 1: $80

Registration - Individual plus family member (includes Friday night dinner)

- Before July 1: $75
- After July 1: $95

Check payable to:

- “ASLC ALPO Conference”

Meeting/presentation venue:

- Room 201, Guthrie Hall, New Mexico State University

Banquet:

- $30 per person (location to be determined - check website for updates and speaker)

Lodging:

- Dorm rooms at NMSU -- check website for additional information
- Comfort Inn, 2585 South Valley Dr., Las Cruces, NM, US, 88005; phone: (575) 527-2000; single queen-size bed $69+tax or two queen-size beds $74+tax; reservation phone number, 1-877-424-6423 (call after April 1, 2011)

Special tours (July 21 and July 22; note (all venues may not be available, dates to be determined. See website for current details):

- Very Large Array
- National Solar Observatory
- Apache Point Observatories
- New Mexico Museum of Space History
- White Sands Missile Range

Conference website:

- http://www.morning-twilight.com/alpo

Registration/questions e-mail:

alpoconference@morning-twilight.com

ALPO 2011 conference registrar:

- Robert Williams, 308 N. Mesquite St. #3, Las Cruces, NM 88001

Registration packets will be sent out shortly.

Second Call for Papers: ALPO 2011

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

Topics

Suggested topics for papers and presentations include the following:

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

Submission Format

Please observe and follow these guidelines:

Meteor-Chasing (from page 3)

I myself have been lucky to have witnessed two such storms and just missed another by a couple of hours.

Unfortunately, there are no meteor storms predicted until the 2099 Leonids. We can hope that research will find another one in the near future. Until then, I will be outside watching the trickle of meteors and always hoping for a little bit more.

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- Presentations — The preferred format is Microsoft PowerPoint, though 35mm slides or overhead projector slides are also acceptable. The final presentation should not exceed 45 minutes in length, to be followed by no more than five (5) minutes of questions (if any) from the audience.

- Research Papers — Full and final research papers not being presented as described above should not exceed 5,000 words (approximately 8 pages), including figures and references. ***Important: The results described must not be under consideration for publication elsewhere.***

- Posters — Posters should not exceed 1,000 words. Posters provide an opportunity to present late-breaking results and new ideas in an informal, visual and interactive format. Accepted poster submissions will receive a one-page description in the conference proceedings. The submission abstract must be no longer than one page.

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

Important Dates

- June 15, 2011 - Deadline for four- or five-sentence abstracts / proposals for papers, workshops, and posters.

- March 30, 2011 - Registration opens.

- July 1, 2011 - Late registration fee begins (late registration via mail accepted up to July 15; then in person at conference afterwards).

- July 21 - 23, 2011 - ALPO Con 2011.

Contact

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Professor of Chemistry, Gordon College
Barnesville, Georgia 30204
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schmude@gdn.edu

Worth Watching: Saturnian System Flyby

ALPO member Phil Plante posted a link to a website with a short HD film “Outside In,”a video voyage thru the Saturnian system created from hundreds of thousands of Cassini still photographs and supported as a non-profit project funded by individual supporters.

http://www.outsideinthemovie.com/

Think Kubrick's “2001: A Space Odyssey” when you watch it.

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New Lunar Observing Guide Soon from ALPO Staffer

Yet another book for lunar observing afficiandos is on the way!

Our Journal Book Review Editor Bob Garfinkle reports that he was recently contacted by Dr. Harry Blom, editorial director of the astronomy department at Springer Publishing (formerly Springer-Verlag), wants to publish Bob's own "Luna Cognitum" lunar observers handbook. Bob's been working on this project for about 15 years.

Dr. Bom reports to Bob that Springer may publish the project as a two-volume work. Says Bob: "If they do a hardback first run for institutions (like libraries, observatories and such) the book will probably be priced in the $450 USD range followed by a much cheaper paperback edition two or three years later. They will probably also make an electronic version available right away as well."

Bob adds that there are come minor issues to work out, but it looks very favorable that a publishing contract will be signed soon.

The manuscript is coming along well and is currently is over 900 pages in length, double-column with nearly one-third of the images already placed in the book. "I also figure that I may have about 100 pages of text to create as well.".

Venus Volcano Watch

By Michael F. Mattei
micmattei@comcast.net

The Venus Volcano Watch continues. See the accompanying table for a list of times to be watching Venus for cloud activity both on the terminator and on the bright sun lit side.

Date	Location from Terminator
28 May 2011	Volcanoes on thin terminator.
16 June 2011	Volcanoes on the central meridian; look for circular cloud formations.
29 Jun 2011	Volcanoes midway from CM to bright limb.
13 Jun 2011	Volcanoes approaching bright limb.
17 Jun 2011	Volcanoes pass beyond bright limb.

Watch for a bulge on the terminator where the uplifted sunlit clouds would show on the dark side of the terminator, and on the sunlit side, watch for bulges of circular cloud formation like the tops of cumulus clouds.

There are three volcanoes that are believed to be active; Maat Mons, Ozza Mons and Sapas Mons. All are near the equator centered near CM 165°. From research of cloud formations and lit clouds on the dark side and circular sunlit side clouds, it may be possible to determine if a volcano has erupted. A correlation of these observations can be made to locate volcanoes on the surface of Venus.

Observations should be made at all times because there may be many more volcanoes that could be active. I would be happy to receive observations, drawings, sketches, CCD images. Please be sure of the time in UT and location of observer.

See Volume 51, No. 1, page 21 this Journal for an article of the events and what they look like. You can find the article by going to http://www.alpo-astronomy.org/djalpo/51-1/JALPO51-1%20-%20Free.pdf

ALPO Interest Section Reports

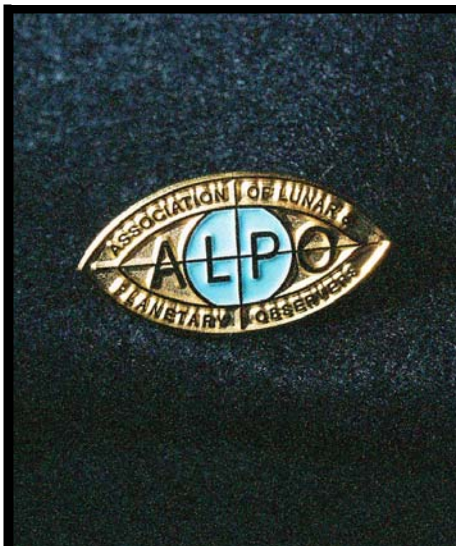
Web Services

Larry Owens, Section Coordinator
Larry.Owens@alpo-astronomy.org

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



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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,
Section Coordinator
cometman@cometman.net

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

ALPO Observing Section Reports

Eclipse Section

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

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

Meteors Section

Report by Bob Lundsford,
Section Coordinator
lunro.imo.usa@cox.net

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 Hill, Section Coordinator
dhill@lpl.arizona.edu

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

Comets Section

Gary Kronk,
acting Section Coordinator
kronk@cometography.com

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

meteors, meteor shower calendar and references.

Solar Section

Kim Hay, Section Coordinator,
kim.hay@alpo-astronomy.org

The prediction is that Solar Cycle 24 is still to peak in May 2013. To date, the activity has been moderate with a few good groups and spots, but most are fading quickly.

The Carrington Rotation numbers for 2011 are CR2105 to CR2118. We are currently in CR2106 with some moderate activity; on the Sun in mide-February were sunspot groups AR1157, AR1159, AR1160 in the northern hemisphere and AR1158 and AR1160 in the southern hemisphere (the latter of which was producing quite a number solar flares). On February 13th at 17:38 UT, the largest

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

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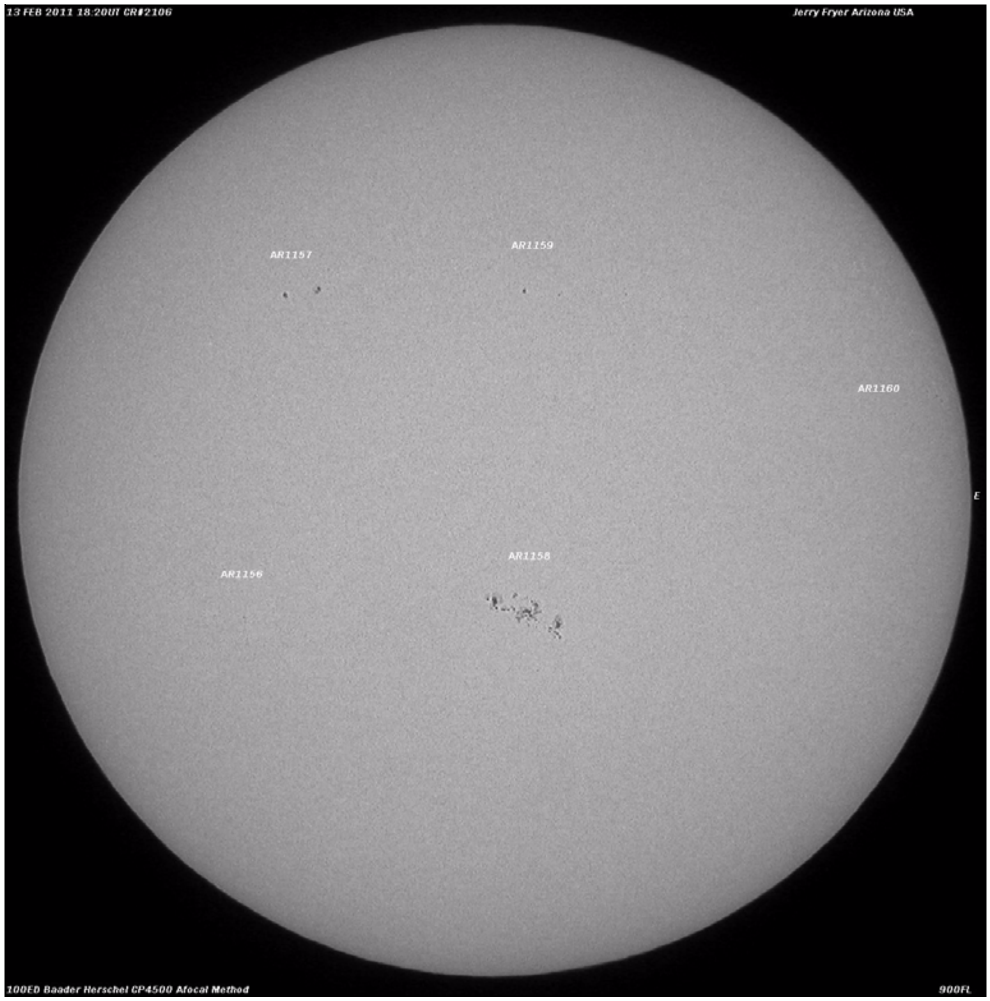
solar flare (M 6.6) this year was produced from AR1158. NASA's Solar Dynamics Observatory (*www.nasa.gov/mission_pages/sdo/main/index.html*) recorded this event. To see that image and hear the solar flare event from amateur radio astronomer Thomas Ashcraft, please go to *www.spaceweather.com* (February 14th, 2011).

Solar observer Jerry Fryer of Arizona, USA, sumitted an image which shows the recent sunspots of February 13th, 2011, CR2106. He used a 100 ED, 18 mm eyepiece, and a Baader Hershel CP4500 with 900 mm focal length. [insert image Feb. 13 # 13- I have asked Jerry for the high res version]

You too can submit digital images and sketches of solar activity by using the guidelines that are on the website, *www.alpo-astronomy.org/solarblog/.*

The publications listed in "Guidelines for the Observation of Monochromatic and White Light Solar Phenomena" have been updated by Jamey Jenkins (originals by Rik Hill). They are there to encourage and answer your questions on the Sun and your submissions. Report forms are also located on the website. Please send your images/sketches to *kim.hay@alpo-astronomy.org*. These images are then archived and placed online as a permanent resource for other solar observers. You can always keep informed on what is happening on the Sun and what other solar observers are doing by joining the ALPO Solar Yahoo Group (*www.groups.yahoo.com*).

In other news, the NOAA / Space Weather Prediction Center webmaster for over 45 years is retiring. Viola Raben was responsible for looking after thee websites and also producing "The Weekly" (formal name: The Preliminary Report and Forecast of Solar Geophysical Data). She has now made this totally automated and solar observers will still receive their report. Many of us receive the daily and weekly updates of the Sun's activity. Congratulations, Viola, for helping so many solar observers, and good luck with your future endeavours.



Solar image of the Sun with sunspots at Carrington Rotation 2106 by Jerry Fryer of Scottsdale, Arizona, USA, taken February 13, 2011. Jerry used a 100 ED, 18 mm eyepiece, and a Baader Hershel CP4500 with 900 mm focal length.

Finally, I include here some of my own favorite sites for you to look up present and past solar data; the Active Region maps at *http://www.solar.ifa.hawaii.edu/ARMaps/armaps.html* and "Today's Space Weather" *http://www.swpc.noaa.gov/today.html*

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

Mercury Section

Report by Frank J. Melillo, Section Coordinator
frankj12@aol.com

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

Venus Section

Report by Julius Benton, Section Coordinator
jlbaina@msn.com

Look for Venus in the Eastern sky before sunrise, drawing nearer and nearer

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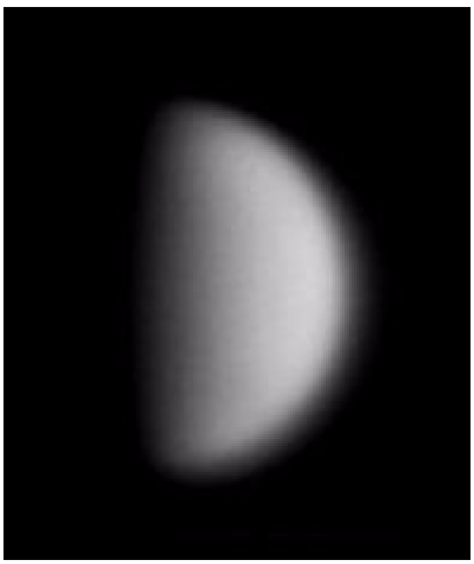
toward the Sun as the apparition progresses. A real benefit of Western (Morning) apparitions is the fact that Venus rises higher and higher in the sky as the morning hours progress, so it can be easily tracked into a daylight sky for viewing when most of the glare associated with the planet against a dark sky is measurably reduced. During the current 2010-11 Western (Morning) Apparition, the planet is passing through its waxing phases (a progression from crescent through gibbous phases). At the time of this report (mid-February), the gibbous disk of Venus is about 17.7" across and roughly 66.5% illuminated.



Gibbous Venus as imaged in UV on January 29, 2011 at 12:02UT by Richard Jakiel of Lithia Springs, GA, USA, with a 30.5 cm (12.0 in.) Schmidt-Cassegrain. Apparent diameter of Venus is 20.2", phase (k) 0.601 (60.1% illuminated), and visual magnitude 4.3. South is at top of image.

This apparition, observers have submitted over 100 images to date. Readers are reminded that high-quality digital images of the planet taken in the near-UV and near-IR, as well as other wavelengths through polarizing filters, continue to be 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.

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, which continues into 2011. Since Venus has a high surface brightness it is potentially observable anytime it is far enough from the Sun to be safely observed.

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).

Geocentric Phenomena of the 2010-2011 Western (Morning) Apparition of Venus in Universal Time (UT)

Inferior Conjunction	2010	Oct 19 (angular diameter = 58.3 arc-seconds)
Greatest Brilliancy	2010	Dec 04 (m_v = – 4.6)
Greatest Elongation West	2011	Jan 08 (47º west of the Sun)
Predicted Dichotomy	2011	Jan 08.28 (exactly half-phase)
Superior Conjunction	2011	Aug 16 (angular diameter = 9.6 arc-seconds)

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 (e.g., 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
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The ALPO Lunar Topographical Studies Section (ALPO LTSS) received a total of 151 new observations from 12 observers during the September-December quarter. Two contributed articles were published, and 11 observations included extensive comments. This quarter's observations also included height measurements for 15

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Lunar Calendar for Second Quarter 2011 (All Times UT)

Apr. 01	22:00	Moon 1.6° SE of asteroid Eunomia
Apr. 02	09:01	Moon at Apogee (406,655 km / 252,684 miles)
Apr. 02	12:00	Moon 5.9° NNW of Mars
Apr. 02	15:00	Moon 5.7° NNW of Uranus
Apr. 03	14:32	New Moon (Start of Lunation 1092)
Apr. 03	20:00	Moon 5.8° NNW of Jupiter
Apr. 04	09:00	Moon 1.4° NW of Mercury
Apr. 08	22:54	Extreme North Declination
Apr. 11	12:05	First Quarter
Apr. 17	03:00	Moon 7.6° SSW of Saturn
Apr. 17	06:01	Moon at Perigee (358,087 km / 222,505 miles)
Apr. 18	02:43	Full Moon
Apr. 21	13:42	Extreme South Declination
Apr. 23	00:00	Moon 3.4° S of Pluto
Apr. 25	02:46	Last Quarter
Apr. 27	05:00	Moon 5.2° NNW of Neptune
Apr. 29	18:03	Moon at Apogee (406,042 km / 252,303 miles)
Apr. 29	23:00	Moon 5.8° NNW of Uranus
Apr. 30	18:00	Moon 6.6° NNW of Venus
May 01	00:00	Moon 7.3° NNW of Mercury
May 01	16:00	Moon 5.6° NNW of Jupiter
May 01	17:00	Moon 5.3° NNW of Mars
May 02	06:50	New Moon (Start of Lunation 1093)
May 06	03:54	Extreme North Declination
May 10	20:32	First Quarter
May 14	10:00	Moon 7.6° SSW of Saturn
May 15	11:19	Moon at Perigee (362,132 km / 225,018 miles)
May 17	11:07	Full Moon
May 18	23:24	Extreme South Declination
May 20	08:00	Moon 3.4° S of Pluto
May 24	15:00	Moon 5.4° NNW of Neptune
May 24	18:51	Last Quarter
May 27	07:00	Moon 5.9° NNW of Uranus
May 27	09:59	Moon at Apogee (405,004 km / 251,658 miles)
May 29	11:00	Moon 5.4° NNW of Jupiter
May 30	20:00	Moon 3.8° N of Mars
May 31	01:00	Moon 4.4° NNW of Venus
May 31	18:00	Moon 3.7° N of Mercury
June 01	21:02	New Moon (Start of Lunation 1094)
June 02	09:54	Extreme North Declination
June 09	02:09	First Quarter
June 10	17:00	Moon 7.6° SSW of Saturn
June 12	01:43	Moon at Perigee (367,187km / 228,159 miles)
June 15	08:48	Extreme South Declination
June 15	20:12	Full Moon (Total Eclipse of the Moon)
June 16	20:00	Moon 3.4° SSE of Pluto
June 20	23:00	Moon 5.4° NNW of Neptune
June 23	11:48	Last Quarter
June 23	19:00	Moon 5.9° NNW of Uranus
June 24	04:14	Moon at Apogee (404,274 km / 251,204 miles)
June 26	04:00	Moon 5.2° NNW of Jupiter
June 28	20:00	Moon 1.9° NNE of Mars
June 29	17:48	Extreme North Declination
June 30	06:00	Moon 1.0° W of Venus

Table courtesy of William Dembowski

features; measurements that I hope will continue and attract more observers. Upcoming "Focus-On" subjects include the Marius-Reiner Gamma area, Central Peaks with Craters, and Alphonsus. The photo of Maurice Collins that was omitted from the last report due to space limitations is included here.

The radiance images from the Moon Mineralogy Mapper instrument on the Chandrayaan-1 spacecraft are now available. The images cover 85 spectral bands from the visible through the near infrared. The reflectance images are scheduled for release in July 2011. The Lunar Reconnaisance Orbiter Camera (LROC) also continues producing images (see links below).

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(Editor's Note: The following writeup on valued contributor Maurice Collins ran in JALPO53-1 without his photo. It is repeated here with photo included.)

The One of the most prolific and innovative contributors to this section is Maurice Collins who grew up in a rural area near Dannevirke in the North Island of New Zealand, and now lives in Palmerston North.

Maurice writes: "I have always liked the Moon. I started out with binoculars and a small toy telescope, and then bought a larger 60mm refractor after leaving high school. My telescopes include a Meade ETX-90/RA, which I use for visual observing and afocal photography. My main instrument is a Celestron 8-inch SCT which lets me do imaging easier because it is computer-controlled and can be used remotely from inside the house when it is cold outside.

"Today, my lunar work involves imaging the Moon every clear night as well as using spacecraft data for studying the lunar surface. One bit of work I am involved with is in creating Digital Terrain Models of the Moon using the Lunar Terminator Visualization Tool (LTVT) and

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Maurice Collins with his Celestron 8-inch SCT.

Lunar Orbiter Laser Altimeter (LOLA) data. I am interested in all aspects of the Moon, from lunar rocks to large-scale topography and origin of the Moon. I am also interested in spaceflight and Apollo missions especially. I have travelled around the U.S. space centers to see the hardware and Moon rocks. I also gained my private pilot license in 1988.

"I like to do a mix of my own imaging and computer-based investigations. Mostly, I do imaging rather than visual observing with my telescope, but do enjoy visual observing in the summer months. Each clear night, I try to complete a full mosaic of the Moon. I am always trying to think of new ways of looking at the Moon with the images and other data just to see what I can see up there on the Moon. It is a fascinating place and there is so much the amateur can do!"

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Visit the following online web sites for more info:

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

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

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

Lunar Transient Phenomena
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Only one LTP was reported from May to December 2010.

During 00:50-01:02 UT on 2010 Aug 19, Jay Albert (Lakeworth, FL) observed that Tycho had a very faint hint of redness in a pencil-thin arc (< 1/4 circumference of the rim) confined to the top of the rim of the well-lit northeast wall. The colored arc had a thickness similar to Rupes Recta, but not as sharply defined. The outer east edge was perhaps sharper than the inner edge. The redness was more on the inside of the top of the rim. The outside of the rim was bright white.

This effect was seen in three eyepieces, at 311x, 224x and 400x. The color could not be seen on other nearby craters and had disappeared by 01:02 UT, taking about 1-2 minutes to fade. Observation of Tycho continued until 01:06 UT, and quick checks were made periodically until 02:50 UT, but the color failed to return.

Jay used a C11 telescope, the transparency was 3/10, seeing 7-9/10, and the Moon's altitude was 38°. A monochrome image was obtained by Bill Dembowski at 01:25 UT and processed by myself in order to computer-simulate terrestrial spectral dispersion; however, the effect seen by Jay Albert could not be reproduced without adding significant spurious color to other craters, too. Later color images taken by Maurice Collins and Kerry Koppert (New Zealand) between 06:18-08:05 UT failed to detect any color in the crater.

This report has been given a LTP weight of 3,"an unconfirmed report by an experienced observer".

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Note that live LTP alerts are now available via Twitter at http://twitter.com/lunarnaut.

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

Mars Section

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

Minor Planets Section

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Minor Planet Bulletin Vol. 38, No. 1, 2011 January - March, is the first issue of the publication to be published only in electronic format. and downloaded freely from http://www.MinorPlanetObserver.com/astlc/default.htm.

Printed versions continue tobe sent to astronomical libraries retaining archival collections.

Annual voluntary contributions of $5 or more in support of the publication are welcome.

We congratulate veteran asteroid lightcurve observer Robert Stephens, winner of the American Astronomical Society's 2010 Chambliss Amateur Achievement Award, for his excellent article in Sky And Telescope, Oct. 2010, Vol. 120, pp 60-65. Here he describes several important objectives in asteroid lightcurve research. This is a "must read" paper for anyone interested in what amateurs are contributing to this subject.

Brian Warner has established for the binary asteroid 2577 Litva the primary rotation period 2.8129 hours, secondary rotation period 5.6830 hours, and the orbital period 35.88 hours. For binary (8026) 1991 JA1 he has found a super slow primary rotation period 373 hours with short secondary period 2.2981 hours.

Lightcurves with derived rotation periods are published for 165 other asteroids, numbers 27, 103, 266, 287, 295, 296, 308, 326, 369, 370, 448, 500, 504, 573, 575, 605, 620, 664, 665, 672, 687, 762, 787, 822, 836, 850, 860, 869, 878, 884, 938, 996, 1018, 1027, 1142, 1146, 1158, 1162, 1164, 1211, 1258, 1260, 1282, 1373, 1375, 1453, 1469, 1521, 1600, 1619, 1625, 1643, 1659, 1685, 1719, 1730, 1834, 1987, 1996, 2074, 2105, 2189, 2261, 2287, 2375, 2501, 2639, 2642, 2650, 2860, 2961, 2983, 3076, 3145, 3285, 3387, 3431, 3447, 3560, 3695, 3774, 3833, 3870, 3991, 4029, 4116, 4223, 4391, 4440, 4483, 4674, 4786, 4928, 5175, 5325, 5333, 5452, 5968, 6087, 6139, 6163, 6170, 6244, 6265, 6838, 7087, 7173, 7741, 7816, 8523, 9297, 10091, 10179, 10936, 11058, 11277, 11424, 11549, 13009, 14691, 14790, 14815, 15822, 15964, 16525, 19261, 20037, 20038, 20453, 21688, 29729, 31956, 33203, 34817, 35404, 39087, 45436, 46559, 47081, 49574, 49675, 49678, 57219, 61907, 66146, 66193, 68350, 72693, 76864, 76929, 82060, 84944, 101769, 102063, 154029, 164400, 174633, 2006 WL15, 2009 EW, 2009 FD, 2009 NH, 2009 QH34, 2009 UD, 2009 WV51, 2010 EX11, 2010 GF7.

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

To repeat what was stated earlire in this report, the *Minor Planet Bulletin* is a refereed publication and that it is available on line from http://www.MinorPlanetObserver.com/astlc/default.htm.

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

Jupiter Section

Richard W. Schmude, Jr., Section Coordinator
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The South Equatorial Belt continues to grow. In a February 8 image (System 2 longitude = 260° W) by Don Parker, the SEB has a wide SEB zone, whereas in a February 8 image (System 2 longitude = 31° W) by Damian Peach, the SEB is complete but has a lot of smaller white spots.

Oval BA has a reddish color also in Damian Peach's February 8 image. The North Equatorial Belt has several barges. Jupiter is a few percent brighter than what it was during 1999-2009, due to the South Equatorial Belt being fainter than normal. Jupiter is expected to have normal brightness once the SEB returns completely.

I hope to start working on the 2010-2011 Jupiter apparition report this summer. A referee has already examined the 2008 Jupiter report and the appropriate corrections have been made. It should be published shortly. The 2009-2010 Jupiter report has been examined by a referee as well and should also be published shortly.

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

Galilean Satellite Eclipse Timing Program

John Westfall, Assistant Jupiter Section Coordinator
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New and potential observers are invited to participate in this worthwhile ALPO observing program.

Contact John Westfall via regular mail at P.O. Box 2447, Antioch, CA 94531-2447 USA 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

Julius Benton, Section Coordinator
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The table of geocentric phenomena for 2010-11 apparition is presented here for the convenience of observers.

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Saturn appeared in mid-February at apparent visual magnitude +0.6° and was well up in the East after midnight. The planet's northern hemisphere and north face of the rings are becoming increasingly visible as the ring tilt toward Earth increases throughout the next several years, with regions south of the rings becoming progressively less favorable to view. Right now the rings are inclined about +10.6° towards Earth and will reach as much as +11.5° during the apparition.

With inclinations of the rings round +9.0°, observers can still witness and digitally image transits, shadow transits, occultations, and eclipses of satellites lying near Saturn's equatorial plane. Apertures great than about 20.3 cm (8.0 in.) will likely offer the best opportunities for observing and imaging these events, except perhaps in the case of Titan.

Those who can image and obtain precise timings (UT) to the nearest second of ingress, CM passage, and egress of a satellite or its shadow across the globe of Saturn should send their data to the ALPO Saturn Section as quickly as possible. Notes should be made of the belt or zone on the planet crossed by the shadow or satellite, and visual numerical relative intensity estimates of the satellite, its shadow, and the belt or zone it is in front of is important, as well as drawings of the immediate area at a given time during the event.

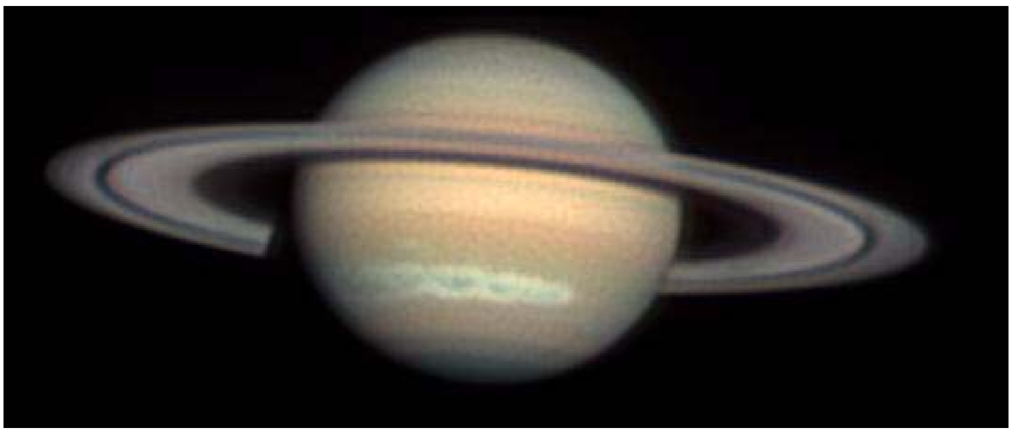
So far this apparition there have been over 300 visual observations and digital images submitted. The real highlight of this apparition has been the presence of a particularly noticeable white spot in Saturn's North Tropical Zone (NTrZ) that was first detected by ALPO observers in early December 2010. The apparent long-enduring NTrZ white spot has brightened and undergone fairly rapid evolution, becoming morphologically complex with widening and considerable longitudinal growth along the NTrZ, extending almost halfway around the planet's globe.

It is thought that as the inclination of Saturn's northern hemisphere toward the Sun increases, with subsequently greater solar insolation affecting these regions, conditions are more favorable for activity to develop, such as the NTrZ white spot currently being observed. Only time will tell if further activity emerges, but observers should definitely not miss an opportunity to view or image the continued development of the NTrZ white spot over the coming months, especially with opposition approaching in early April.

Comparing what can be seen visually with various instruments with digital imaging results is meaningful. Color filter techniques can be used by visual observers to determine which visual wavelengths produce the best views of the NTrZ white features, and digital imaging at visual, infrared, UV, and methane (CH4) wavelength bands is particularly important.

The observation programs conducted by the ALPO Saturn Section are listed on the Saturn page of the ALPO website at http://www.alpo-astronomy.org/ 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 ighly 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.

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 amateur observers around the globe in an active Pro-Am



Beautiful digital image of the rapidly evolving NTrZ white spot feature taken on February 9, 2011, at 18:17UT by Christpoher Go of Cebu, Philippines using a 28.0 cm (11.0 in.) SCT in visible light (RGB). Seeing = 7.5, Transparency = 4.0. Ring tilt is +10.0º. CMI = 84.2°, CMII = 314.0°, CMIII = 34.7°. S is at the top of the image.

h

Geocentric Phenomena for the 2010-2011 Apparition of Saturn in Universal Time (UT)	
Conjunction	2010 Oct 01^d
Opposition	2011 Apr 04^d
Conjunction	2011 Oct 13^d
Opposition Data:	
Equatorial Diameter Globe	19.3 arc-seconds
Polar Diameter Globe	17.5 arc-seconds
Major Axis of Rings	43.8 arc-seconds
Minor Axis of Rings	6.6 arc-seconds
Visual Magnitude (m_v)	0.4 m_v (in Virgo)
B =	+8.6º

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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

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Jim Fox has done an outstanding job of measuring the brightness of Uranus and Neptune from his new observatory in New Mexico. He recorded 26 sets of blue (B) and visual (V) magnitude measurements of Uranus and 19 sets of Neptune form a total of 90 brightness measurements. Richard Schmude, Jr., has also measured the brightness of Uranus. Most of his measurements were made in red (R) and infrared (I) filters.

Several other observers had also submitted observations of the remote planets in 2010 and early 2011. If you have observations of Uranus or Neptune, please send them to Richard Schmude, Jr., as soon as possible. I plan to complete the 2010-2011 apparition report of Uranus and Neptune in this summer (2011).

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

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

Book Review: "Carl Sagan: A Biography"

Review by Robert A. Garfinkle, FRAS
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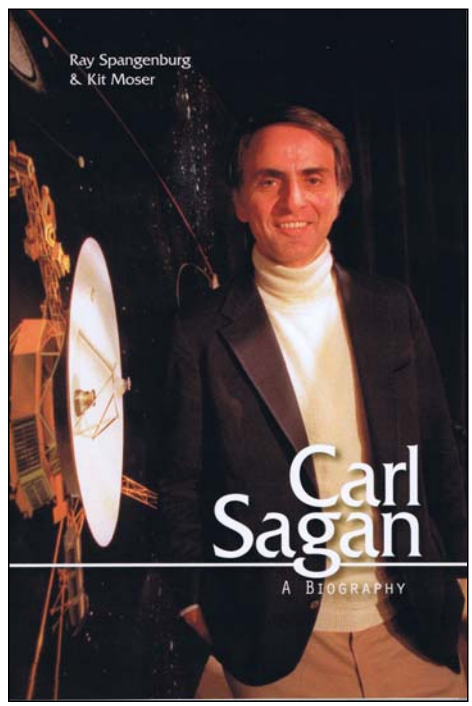

Carl sagan: A Biography, by Ray Spangenburg and Kit Moser, 2009, published in New York by Prometheus Books (ISBN 978-1-59102-658-7); 181 pages, paperback; list price $16.98.

Carl Sagan was probably the most widely known American astronomer of the last century, due in part to his books and as the host and star of the popular PBS television series *Cosmos*. Freelance journalists Ray Spangenburg and Kit Moser have packed a fascinating look at Sagan in this thin biography. Though a little on the thin side for such an extraordinary scientist, exobiologist, teacher, astrophysicist, and public figure, the authors have delivered enough concise information in this book to give the reader a full understanding of what made Carl Sagan tick and why the public embraced him. He made the technical and bewildering world of the whole cosmos understandable by non-scientists.

The authors present the early years of Carl Edward Sagan's life and the backgrounds of his immigrant parents and grandparents. We learn about his school years, and I found it fascinating that he entered the University of Chicago at the age of only 16. Sagan was able to work summers for several prominent scientists, including Nobel laureates Herman Joseph Muller (1952), physicist George Gamow (1957), chemist Melvin Calvin (1959), geneticist Joshua Lederberg, along with planetary scientist Gerard Kuiper in 1956. Sagan built friendships easily and these people helped him to establish his place among the best of American scientists.

I am somewhat dismayed at the lack of information about Sagan's role in the development of the search for extraterrestrial life in the chapter that covers this aspect of his career. That chapter seems to be devoted to the efforts of Frank Drake, while Sagan is hardly mentioned.Bits and pieces of Sagan's work in this area are mentioned in other parts of the book.

Overall, I enjoyed the brief look into the life and times of Carl Sagan and recommend it to anyone interested in him. I also suggest that anyone interested in learning more about Sagan use this book as a primer, then consult any of the more detailed Sagan biographies or read the more than 500 scientific papers that he published and his books.

Feature Story:

A Brief History of Life on the Moon

By William M. Dembowski, FRAS, Asistant Coordinator, Lunar Topographical Studies/
dembowski@zone-vx.com

Online Readers

Left-click your mouse on the e-mail address in blue text to contact the author of this article, and selected references also in blue text at the end of this paper for more information there.

Introduction

Our Moon is virtually airless, waterless, and its surface temperature varies from -233° to +123° C (-387° to +253° F); therefore, it is obviously impossible for life to exist there. But things have not always been that simple.

There have long been legends, myths, and works of fiction that spoke of life on the Moon; but what of scientific works? What have men of science had to say about this dead world?

Baron Franz Von Gruithuisen

In 1824, Baron Franz von Gruithuisen, a German physician and astronomer, reported his discovery of "many distinct evidences of lunar inhabitants, in particular a colossal artificial structure by the same." The main wall of the structure he called "Wallwerk" (6° N – 8° W) is approximately 5 miles long with smaller walls branching off at 45° angles (**Figure 1**). In addition, he observed a roughly star-shaped structure near its northwest wall which he postulated was a temple built by the same lunar inhabitants (the Selenites).

These features lie north of the crater Schröter and south of Sinus Aestuum and, based on their size, they should be easily seen in modest telescopes when the Moon is 8-1/2 and 23 days old. However, many observers find it difficult to separate them from the jumbled terrain of the region (**Figure 2**).

Gruithuisen defended his belief in lunar life by noting and confirming Johann Schröter's observation of an extension of the Moon's horns when in a crescent phase. This "twilight" extension was taken to prove that the Moon had an appreciable atmosphere. Gruithuisen attributed hints of brown and yellow patches on the maria to the existence of plant life and even believed that meandering rilles were created by herds of lunar animals. Smaller, straighter rilles could, in his mind, only be roads. "Such an extensive transportation system" he wrote "could be completed only with shrewd planning and concerted effort, and would be inconceivable without a civilization of Selenites."

At first Gruithuisen's "discoveries" were embraced by many prominent astronomers of the day. He was offered — but declined — professorships at several universities, and in 1826 was appointed Professor of Astronomy at the University of Munich. But eventually the scientific community tired of Gruithuisen's "mad chatter" and astronomy journals refused to accept any more of his submissions. Finally, in 1828, his announcement of the discovery of another "Wallwerk" went virtually unnoticed.

Sir John Herschel

Although belief in Gruithuisen's Selenites quickly subsided, the desire to believe in lunar life did not. A series of six articles in the New York Sun newspaper in August 1835 claimed to be "great astronomical discoveries lately made by Sir John Herschel at the Cape of Good Hope". Herschel, it said, was using a "telescope of vast dimensions and an entirely new principle." And that his most stunning discovery was life on the Moon.

Herschel was, in fact, making astronomical observations in Africa at the time, but had no connection with, nor even knowledge of, the New York Sun articles. They were a complete hoax, probably perpetrated by a

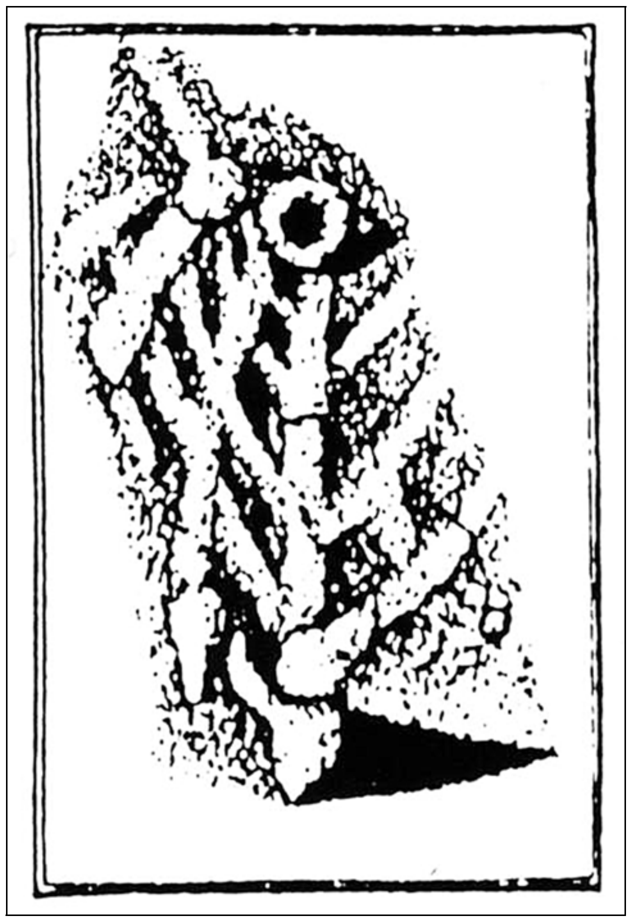

Figure 1. Baron von Gruithuisen's drawing of his Wallwerk.

Cambridge-educated journalist, Richard Adams Locke, although the identity of the author has never been absolutely proven. I include reference to the articles here because of the level of acceptance by what some have called a "gullible generation".

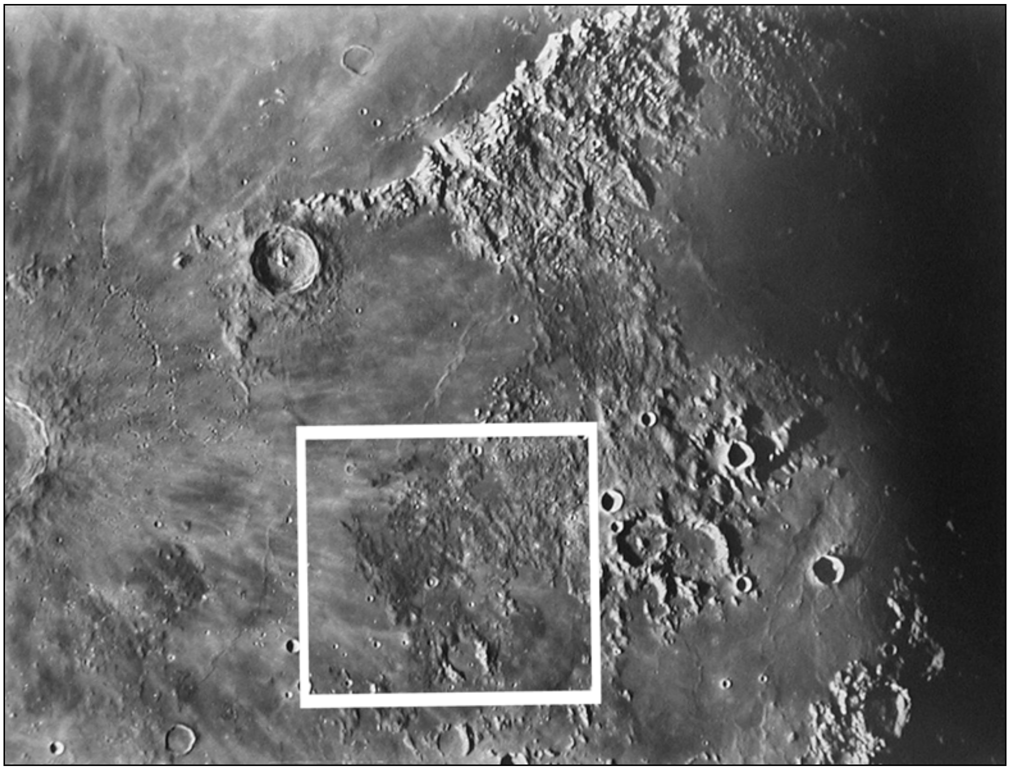

Figure 2. Vicinity of Wallwerk with crater Schröter near bottom of box. (Consolidated Lunar Atlas, Lunar & Planetary Institute)

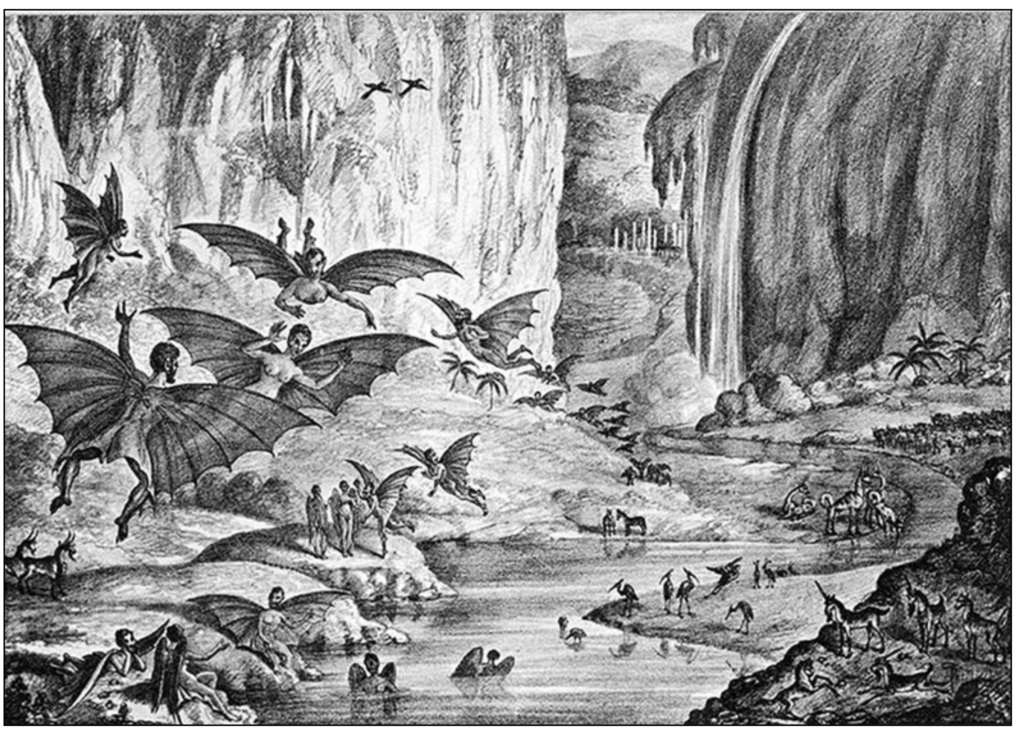

Figure 3. Lithograph of William Herschel's supposed discoveries, New York Sun, August 1835.

The articles, supposedly composed of excerpts from The Edinburgh Journal of Science (a non-existent publication), began by describing herds of quadrupeds similar to bison and goats. Then came reports of bipedal beavers which lived in huts and intelligent bat-winged humans. Each installment was more fanciful than the last, finally culminating with accounts of superior, angel-like creatures living near a mysterious sapphire temple (**Figure 3**).

As farfetched as the reports were, they were accepted as genuine because the thought of the great Herschel lying was even more ridiculous than the discoveries themselves. Even a group of prominent scientists at Yale University breathlessly awaited each daily installment, eager to learn what Herschel had discovered next.

But the impossibility of a telescope powerful enough to reveal individual plants and animals on the Moon finally became apparent; and the slow communication networks of the day, which had worked to the advantage of the six-day hoax, eventually bridged the time gap. Herschel denied everything in the reports and the hoax fell apart. Even so, the concept of lunar life would survive.

William C. Pickering

By the end of the 19th century, a majority of astronomers were convinced that life on the Moon was impossible; but William C. Pickering was not among them. In the autumn of 1891, Pickering announced his "discovery" of an erupting geyser at the mouth of SchrÖter's Valley (Vallis SchrÖteri – 26° N - 51° W; **Figure 4**). He described the eruption as, "Dense clouds of white vapor apparently arising from its bottom and pouring over its southeastern wall in the direction of Herodotus."

Pickering proceeded to make a series of drawings of the region and determined that there were variations in the apparent vapor column. He came to the following conclusion: "The most marked of these changes depend for their existence upon the altitude of the Sun, for apparently no volcanic activity whatever is exhibited until about one day after sunrise. The activity then increases to maximum, diminishes, and finally ceases a few days after sunset." This is, of course, precisely what one would expect to see when observing any amorphous patch of lunar soil that is significantly brighter than its surroundings. Pickering, however, offered his finding as proof of the existence of carbon dioxide and water vapor in the lunar atmosphere.

Encouraged by this discovery, Pickering turned to the "variable spots" and "pseudo-shadows" he found on the floors of several craters, most notably Alphonsus (13° S - 3° W; **Figure 5**). These, too, appeared to change in darkness and shape which he considered to be the growth patterns of "some form of organic life resembling vegetation" sustained, of course, by the carbon dioxide and water vapor seeping from volcanic vents. He surmised that his failure to find any dark variable spots beyond the latitudes of 55° N and 60° S was evidence that it was too cold there for even the hardiest of organisms.

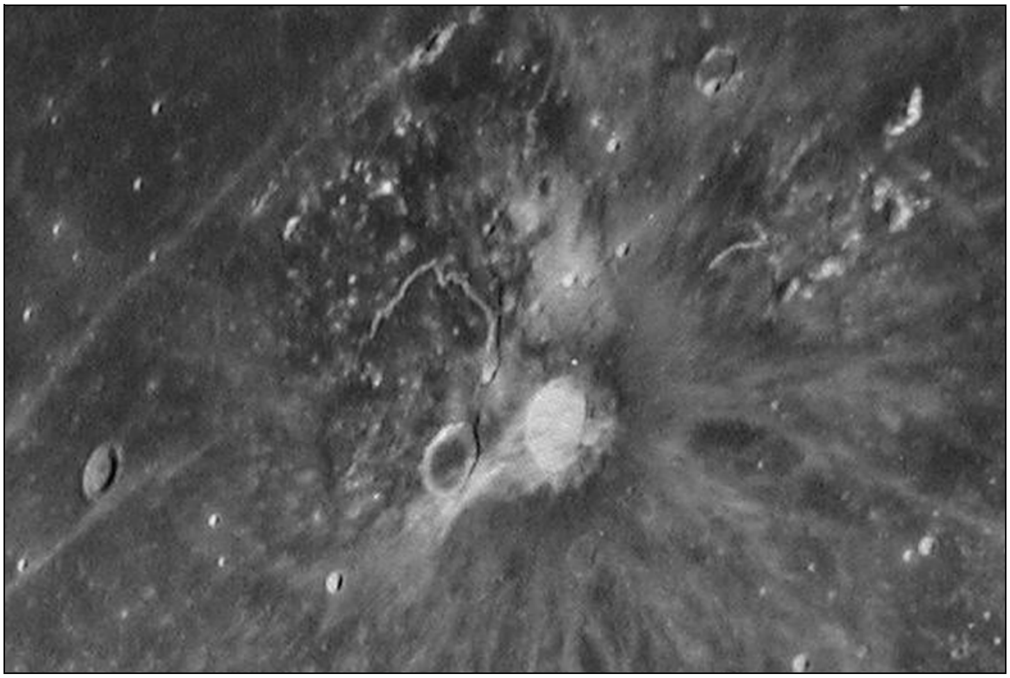

Figure 4. Vallis Schröteri. (Consolidated Lunar Atlas, Lunar & Planetary Institute)

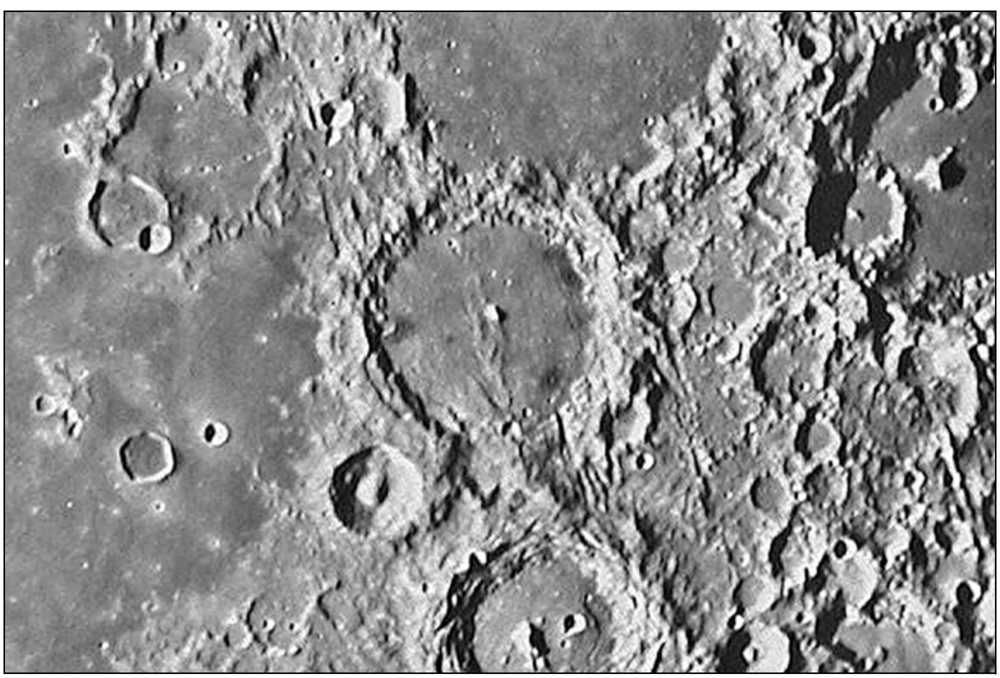

Figure 5. Dark spots within crater Alphonsus. (Consolidated Lunar Atlas, Lunar & Planetary Institute)

These dark spots are now known to be halos of volcanic ash surrounding craterlets and pits on the crater floors. As with Pickering's vapor column, the apparent variability of these features is merely an illusion caused by the changing angle of the sunlight as the lunar day progresses.

In 1924, Pickering published his final paper on the subject of lunar life. Still fascinated with dark variable spots, he conducted an intensive five-year study of the crater Eratosthenes (15° N - 11° W). He felt that the dark spots within Eratosthenes (**Figure 6**) were not like those in Alphonsus (**Figure 5**), but instead moved about in a manner similar to that of animal herds. Estimating their speed to be only a few feet per minute, he deduced that they could not be composed of individual animals as large as bison and would most likely be insects. William Pickering died in 1938, never having relinquishing his belief that life existed on the Moon.

Bacteria On the Moon

It might be said that for a few days between 1969 and 1972, there really was life on the Moon as 12 Apollo astronauts spent time on the lunar surface; but they could not have survived without artificial life support systems. Astronauts, in this author's opinion, do not qualify as lunar life; not because they were of Earthly origin but because of the aforementioned need for life support systems. Humans, however, were not the only Earth creatures to visit the Moon. In April 1967, an unmanned lunar lander, Surveyor 3, touched down on the southern portion of Oceanus Procellarum. Thirty-one months later, Pete Conrad of the Apollo 12 crew retrieved a camera from Surveyor 3 (**Figure 7**) and returned it to Earth.

Microscopic examination of the polyurethane foam insulation covering the circuit boards of the camera revealed the presence of common bacteria, Streptococcus mitis. One of the construction crew probably had a cold and sneezed near the camera. For nearly three years, the microbes had been exposed to the vacuum of space without nutrients, water, or protection from intense radiation; they were apparently dead. Incredibly, a culture of the Surveyor 3 bacteria successfully reanimated the microbes.

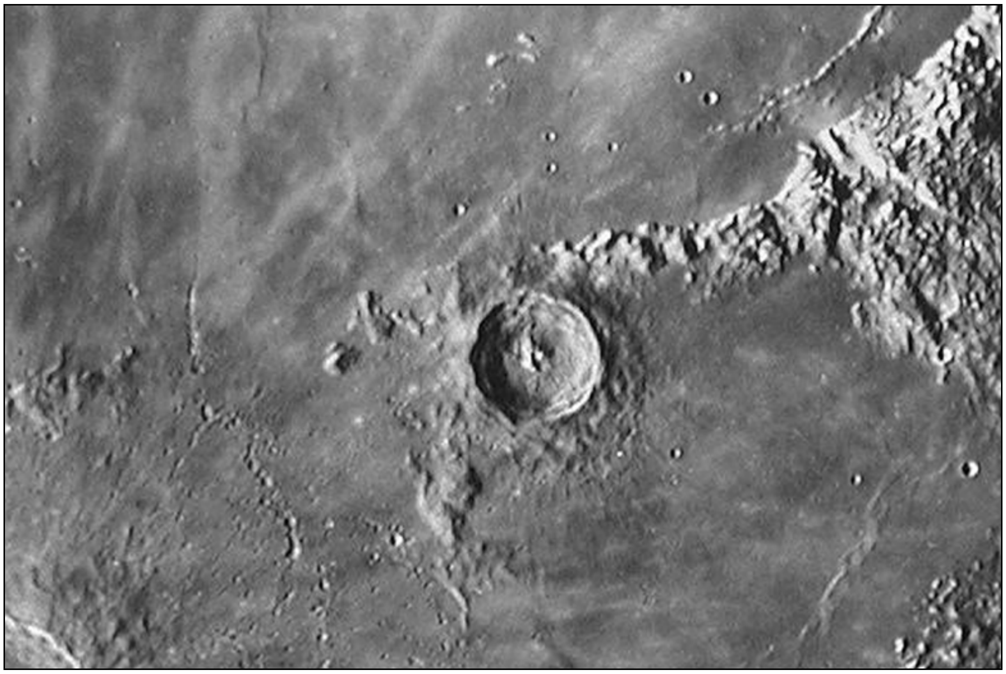

Figure 6. Crater Eratosthenes. (Consolidated Lunar Atlas, Lunar & Planetary Institute)

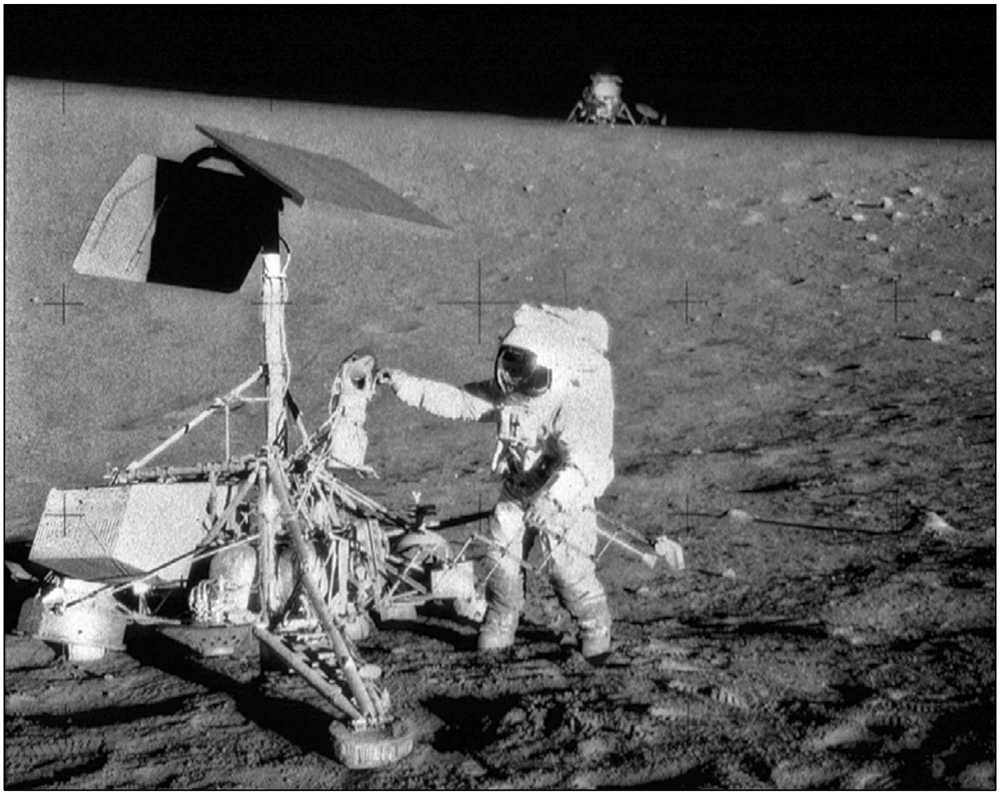

Figure 7. Astronaut Pete Conrad and Surveyor 3 with Apollo 12 lunar lander in the background. (NASA)

Does this mean that there might be lunar bacteria living in the regolith? Hardly. Many other types of bacteria, some protozoa, and perhaps even more complex organisms such as the tardigrade could have survived the harsh environment of the Moon, but only by going into a state of suspended animation. That is a far cry from living and thriving under the same conditions.

Of all the necessities for life as we know it, none is more critical than liquid water. Even organisms found living in ice, rock, or salt crystals on Earth are actually living in thin layers of liquid water within those substances. The thickness of such a water layer need only be incredibly small; only enough to cover a small bacterium, 0.3 µm (0.0003 mm or 1/100000 in.) in diameter. But, even at that remarkably tiny scale, the Moon is devoid of liquid water. And so, on this single factor alone, even lunar bacterial life would be impossible.

Some of the above stories don't sound as farfetched when they are viewed in the light of the limited knowledge of their day. And it makes one wonder how much our presumptions about extra terrestrial life are also being influenced by the limited knowledge of our day.

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A.L.P.O. Lunar Section: Selected Areas Program

Albedo and Supporting Data for Lunar Drawings

Lunar Feature Observed : ______________________________

(use ***Drawing Outline Chart*** for making drawings and attach to this form)

Observer: ____________________________________ Observing Station: ________________________________

Mailing Address: ____

street city state zip

Telescope: ____

instrument type aperture (cm.) focal ratio

Magnification(s): __________X __________X __________X Filter(s): F1 _________ F2 _________

Seeing: ____________________ [A.L.P.O. Scale = 0.0 (worst) to 10.0 (perfect)]

Transparency: _______________________ [Faintest star visible to unaided eye]

Date (UT): ______________________ Time (UT): ___________ ___________

year month day start end

Colongitude: ________________° ________________°

start end

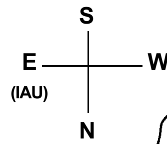
Albedo Data

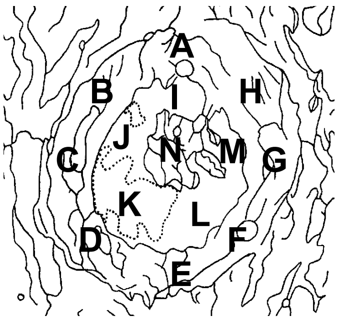
(refer to ***Albedo Reference Chart*** which shows "Assigned Albedo Indices" for feature and attach to this form)

Assigned Albedo Index	Albedo IL	Albedo F1	Albedo F2	Assigned Albedo Index	Albedo IL	Albedo F1	Albedo F2
A				J			
B				K			
C				L			
D				M			
E				N			
F				O			
G				P			
H				Q			
I				R			

NOTES:

A.L.P.O. Lunar Selected Areas Program





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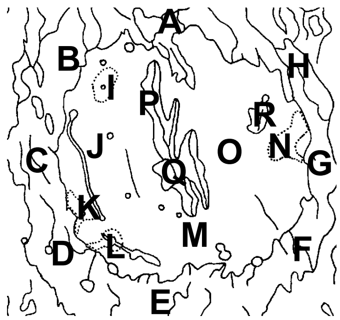

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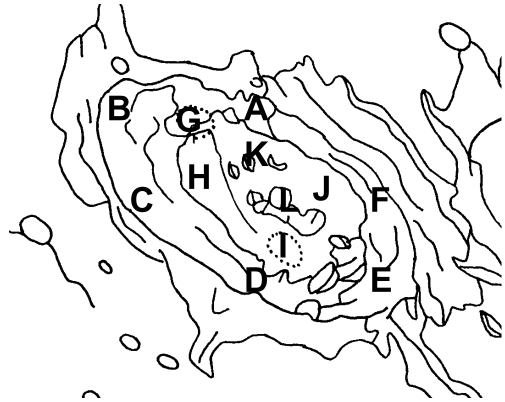

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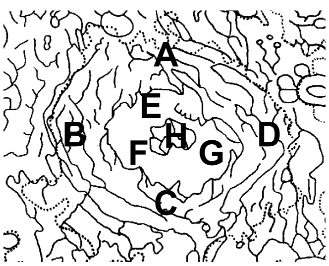

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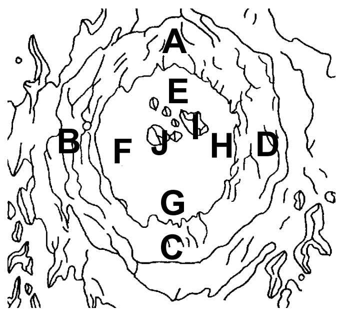

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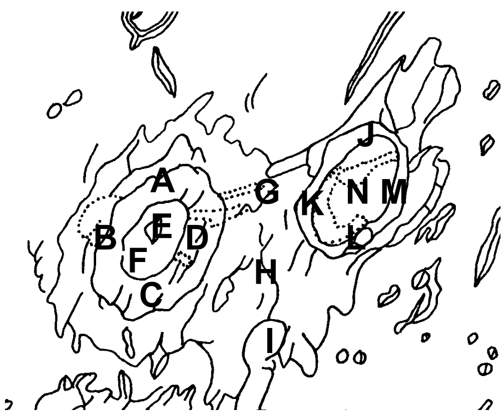
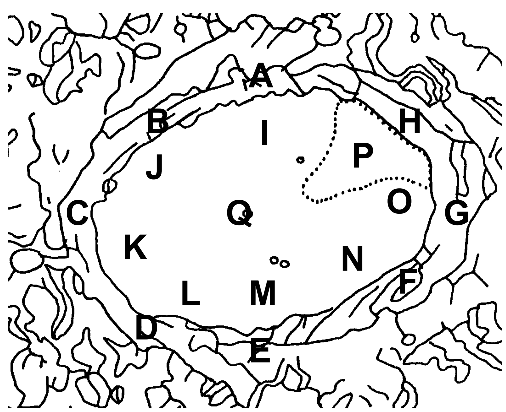
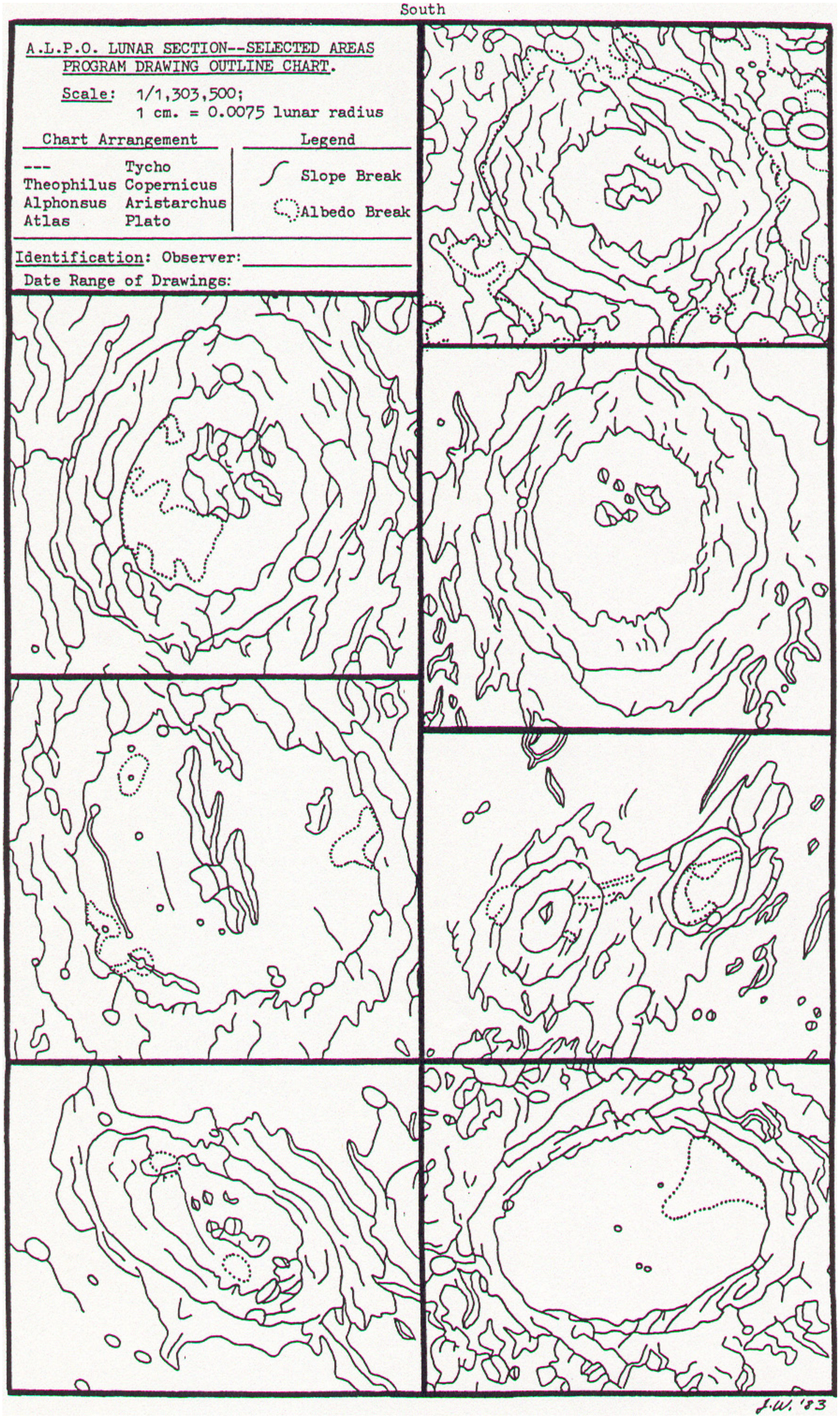


Aristarchus



Plato


South
A.L.P.O. LUNAR SECTION--SELECTED AREAS
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Scale: 1/1,303,500;
1 cm. = 0.0075 lunar radius
Chart Arrangement
--- Tycho
Theophilus Copernicus
Alphonsus Aristarchus
Atlas Plato
Legend
Slope Break
Albedo Break
Identification: Observer:
Date Range of Drawings:
J.W. '83

Feature Story: Jupiter

Jupiter's Deepest Mystery: The ALPO Connection

By: Tom Dobbins
tomdobbins@gmail.com

The following article serves to underscore the importance of amateur contributions to astronomy and to honor the memory of the late Elmer J. Reese, a founding member of the ALPO who headed the Jupiter Section at various times.

The British physicist Sir Arthur Eddington once remarked that practically all of the matter in the universe is tucked away and forever hidden behind impenetrable barriers. Eddington was thinking principally of stars, which are only observed by the light that emanates from the rarefied layers of their outermost surfaces, but the same insight applies to planets as well.[1] This is why astronomy is essentially a theoretical science, for it is only by theoretical means that the structure and properties of the huge invisible fraction of the matter in the universe can be inferred from the radiation that is emitted or reflected by the miniscule portion that is accessible to human eyes and instruments.

Astrophysicists estimate the depth of Jupiter's hydrogen-rich atmosphere at about 1,000 kilometers. At greater depths, the crushing pressure of the overlying atmosphere causes hydrogen to behave more like a liquid than a gas. The transition from highly compressed gases to a deep, hot ocean must be almost imperceptibly gradual. Another change in phase occurs at a depth of about 20,000 kilometers, where pressures exceed 2 million atmospheres and hydrogen is compressed to a viscous, syrupy consistency, an exotic state known as "metallic hydrogen." This fluid, which would probably look like mercury if we could see it, is a conductor of electricity. The very center of the planet is probably occupied by a dense core of metal and silicate rock

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

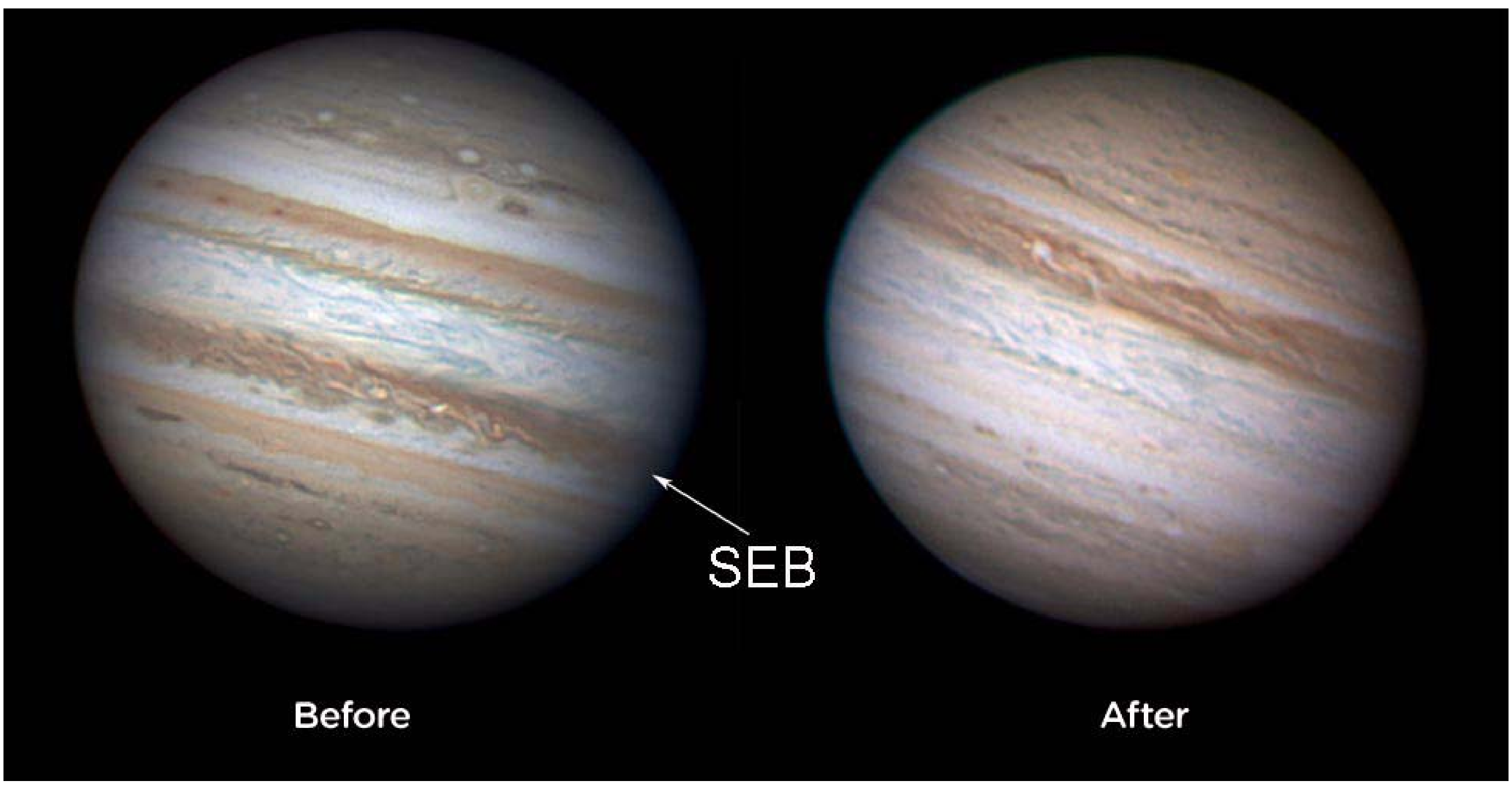

Figure 1. Jupiter with and without SEB. Source: http://gizmodo.com/5537697/the-before-and-after-of-jupiters-belts

five to ten times more massive than the Earth.

The telescopic observer sees only an impenetrable canopy of clouds floating in the uppermost layers of Jupiter's atmosphere, a churning, roiling chaos of alternating dark belts and bright zones, where winds howl at half the speed of sound. Despite being limited to superficial views of this thin veneer of gases and aerosols, one observer of the planet did manage to piece together intriguing evidence of mysterious structures far below the visible clouds. The tantalizing clues emerged from his studies of the phenomenon known as a "South Equatorial Belt Revival."

All of Jupiter's atmospheric belts vary in hue and intensity, but these changes are usually so subtle and gradual that they escape the notice of casual observers. The South Equatorial Belt is a notable exception to this rule. Girdling Jupiter's southern latitudes of 7 degrees to 20 degrees, the SEB is normally a prominent reddish- or grayish-brown feature that is often divided into discrete northern and southern components (the SEBn and SEBs) by a lighter zone (the SEBZ). At irregular intervals, the SEB fades over a period of several months, often to the point that hardly a trace remains to be seen. Following a virtual absence of several months to as much as two years, it is suddenly restored to its former prominence by a dramatic revival that is one of the most spectacular phenomena visible through a telescope.

The first well-recorded SEB revival occurred in 1919, although astronomer Thomas Hockey of the University of Northern Iowa has amassed convincing evidence that 19th century observers witnessed the phenomenon in 1859, 1871, and 1882.[2] The restored SEB remained in a "normal" state until 1928, when a sequence of events eerily similar to those of 1919 was repeated. Another SEB revival occurred in 1937, followed by a series of six events at three-year intervals that began in 1943 and ended in 1958. A closely spaced pair occurred in 1962 and 1964, followed by a second pair in 1971 and 1975. After a long hiatus in the 1980s, two SEB revivals occurred in the last decade of the 20th century, one in 1990 and a second in 1993. A fading of the SEB in 2007 seemed to end prematurely and was not followed by a revival, but a vigorous revival is currently underway as this article goes to press.

Although the 15 SEB revivals observed during the 20th century varied in vigor, they all shared a common plot. The harbinger of an SEB revival is the fading of the SEB over a period of several months as it is veiled by a thickening deck of cirrus clouds composed of tiny crystals of frozen ammonia. The SEBs invariably all but disappears, but the SEBn is usually more persistent, growing narrower and losing its ruddy tint to take on a steel grey hue. The adjacent creamy Equatorial Zone often develops a yellow or orange cast while the Great Red Spot grows darker and more prominent. These events constitute the proverbial calm before the storm.

Several months to as much as two years after the SEB fades, an extremely dark spot will suddenly appear near the southern edge of the SEBn. On several occasions observers have noticed a very compact white spot with the appearance of a brilliant pearl in the precise location where the dark spot materializes a few days later.

According to Augustin Sánchez-Lavega of the University of the Basque Country in Bilbao, Spain, a leading authority on planetary atmospheres, these compact white spots are intense convective storms that generate turbulence that propagates in a wave-like fashion along the SEB, clearing the veil of ammonia cirrus.[3]

The dark material welling up from this eruptive point source encounters a tremendous gradient of opposing currents in the Jovian atmosphere. The winds along the northern edge of the SEB in the South Equatorial Jet Stream blow at over 90 meters per second (201 miles per hour) in the direction of Jupiter's preceding limb, while the prevailing winds along the southern edge of the SEB in the SEBs Jet Stream blow toward the planet's following (or trailing) limb at speeds that can exceed 150 meters per second (336 miles per hour). Subjected to this violent wind shear, erupting material rapidly takes on the form of an elongated filament or streak that soon smears out into a shallow, ever-lengthening letter "S."

For several weeks, additional dark spots clustered around the site of the original outbreak continue to tunnel through the cloud canopy. Most SEB revivals feature subsequent eruptions from secondary or even tertiary sites. The exceptionally vigorous 1975 revival featured an unprecedented four discrete eruption sites. Changes can unfold at such a dizzying pace that even seasoned observers find it difficult to recognize individual markings on successive nights.

Upwelling dark material spreads out at a rate of several degrees of longitude per day, principally in the direction of decreasing longitude. After two to three months, this "wave of darkening" completely encircles Jupiter, restoring the SEB to a feature that rivals or even surpasses its northern counterpart in prominence. As the SEB darkens, the Great Red Spot fades as it is obscured by a layer of haze until it is reduced to a muted oval that is often surrounded by a dark ring of SEB material.[4]

SEB revivals provide a glimpse of violent upheavals deep in Jupiter's interior, a realm that remains every bit as mysterious today as the abyssal depths of this planet's oceans were to our forebears two centuries ago.

Surprisingly, the most profound insight into the mechanism of SEB revivals is not the brainchild of a theoretical astrophysicist, but instead of an amateur astronomer, Elmer J. Reese. The story is a remarkable exception to the role of the amateur in astronomical research that had emerged by the middle of the 20th century.

The Industrial Revolution had engendered unprecedented wealth for members of the middle and upper classes in Europe and the United States, who were suddenly able to convert leisurely pursuits like science and travel into full-time hobbies. Tension soon arose between the academic professionals and the amateur dilettantes, who were often regarded as little more than "butterfly collectors." Reprimanding an African explorer whose report contained speculations about the origins of the geological formations he had encountered in his travels, one official of the Royal Geographical Society wrote: "What you can do is state accurately what you saw, leaving it to the stay-at-home men of science to collate the data of many travelers in order to form a theory." [5]

This remark certainly typified the prevailing attitude in the astronomical community by the middle of the 20th century as well, although the African explorer John Hanning Speke's denunciation of geographers "who sit in carpet slippers and criticize those who labor in the field" [6] would no doubt have resonated with amateur astronomers of Elmer Reese's caliber.

The son of a Uniontown, Pennsylvania, grocer, Reese was a founding member of the Association of Lunar and Planetary Observers in 1947. During the heyday of amateur planetary studies in the 1950s and early 1960s, he was a prolific contributor of Jupiter observations and occasionally served as the organization's Jupiter Section Recorder. ALPO founder and Director Emeritus Walter Haas remembers Reese as "modest and unassuming, but arguably the most talented of the thousands who have submitted observations to the ALPO over the last 50 years, the very rare combination of a doggedly persistent observer who not only records his observations with great accuracy and aesthetic appeal, but who is also capable of gleaning original and valuable inferences from the masses of data that he accumulates." [7]

Despite the fact that most of Reese's observations were made with a humble 6-inch Newtonian reflector, his work was of such high quality that he eventually made the transition from amateur to professional astronomer. In 1963, he was invited to join the staff of the New Mexico State University Observatory, where he played a pivotal role in establishing the Planetary Patrol and Study Project founded by another amateur-turned-professional, Pluto discoverer Clyde Tombaugh. Notable among the project's many accomplishments was the 1968 discovery by Reese and his colleagues Bradford Smith and Gordon Solberg that the Great Red Spot is a vortex that rotates once every 6 days, a finding that was confirmed by the Voyager space probes 21 years later.[8] Today the NMSU archives include more than a million photographs of the planets, almost half of them of Jupiter.

Reese published his first musings on the subject of SEB revivals in 1953. He reasoned that because these phenomena "invariably begin with the sudden appearance of a small dark spot near the latitude of the middle of the South Equatorial Belt, we might infer that material reaches the visible surface from an eruption of some kind. Then it is scattered longitudinally by prevailing atmospheric winds." [9]

Eruptions so localized and energetic might not be from merely ephemeral sources. To Reese, this line of inquiry promised to reveal nothing less than the rotation period of Jupiter's surface far beneath the visible cloud canopy: "If the source of these eruptions is fixed in position on the solid core of the planet, or is at a suitable depth for fluid friction to be a dominating factor, the observed longitudes of the initial outbreak should fit a constant rotation period."[10]

In his classic tome The Planet Jupiter, written at the very dawn of the Space Age, Bertrand Peek explained Reese's approach by means of a clever analogy:

> Let us imagine for a moment the Earth's atmosphere to be so opaque that no terrestrial landmarks can be seen by an observer on the Moon; also that a volcano, by intermittent eruptions, projects vast clouds of dust into the upper atmosphere, where the lunar observer can see them and note their times of transit across the central meridian [an imaginary line running from one pole of rotation through the center of a planet's disc to the opposite pole]. If now the earliest observations only of each new cloud are reduced, its subsequent atmospheric drift being irrelevant, a uniformly rotating system can be found in which the derived longitudes are constant, being that of the volcano, and of which the period is equal to the rotation period of the Earth.[11]

After a painstaking review of the observational record, Reese proposed that the eruptive dark spots that signaled the onset of SEB revivals might be attributable to a pair of "volcanoes" located beneath the southern edge of the SEBn at approximately the same latitude but separated by 88 degrees of longitude, both rotating about five minutes slower than the features in the overlying cloudscape.[12] However, Reese cautioned that the fit with the observational data was less than perfect. He added that it was difficult to imagine why any volcano would become active only when superficial atmospheric features far above it assume a particular aspect (like a faded SEB), but he did propose a possible explanation:

> I suggest that continuous volcanic activity maintained the dark aspect of the SEB prior to 1918. Since the volcanic vent was open during those years, no unusually great internal pressure could build up. However, beginning around 1918, the volcanic vent became sealed from time to time. When this happened, the SEB would fade away while internal pressure would mount. When a certain critical pressure was attained, an explosion would reopen the vent and a disturbance in the SEB would be the visible result.[13]

In 1955, intermittent bursts of radio waves generated deep in the interior of Jupiter were detected that suggested a rotation period for the planet's core of 9 hours 55 minutes 29.4 seconds. When Reese turned his attention to the subject of SEB revivals again in the early 1970s, he began by tentatively assigning this radio-derived rotation period to the sites of his volcanoes. This time, three loci of activity began to emerge from the data. When Reese introduced a very slow drift corresponding to a rotation period of 9 hours 55 minutes 30.1 seconds, the fit with the observational data became uncannily precise. Reese designated these sites simple as sources A, B, and C.

Reese's hypothesis of permanent vents beneath the SEB first demonstrated its predictive power during the SEB revival of 1975, when eruptions appeared within 2 degrees of longitude of sources A and C. The eruptions during the 1990 and 1993 revivals coincided closely with Source B.[14] Source A seems to be the locus of the most vigorous revivals

(1919, 1928, 1971, and 1975), while Source C is responsible for the weakest episodes. Curiously, when SEB revivals have featured multiple eruptions, the successive outbreaks of spots have occurred sequentially, first from Source A, followed by Source B, and finally from Source C.

Given our present knowledge of Jupiter's internal structure, Reese's sources cannot literally be volcanoes in any form resembling the topographic features found on the small, rocky planets. As early as 1957, Walter Haas cautioned that "the term 'volcano' should probably not be taken too literally here; we have in mind sources of activity below the visible surface of the Giant Planet and capable of affecting the surface markings."[15]

According to John Rogers, the current Director of the Jupiter Section of the British Astronomical Association, these features may be "long-lived circulations or waves or even floating objects at a deep level… Whatever the Reese sources may be, the instability always breaks first over them, just as clouds on Earth first form over mountains."[16]

The author has a hunch that the most inspired guess about nature of Reese's "volcanoes" is a notion advanced decades ago by Valdemar Axel Firsoff, a versatile polymath who frequently championed contrarian viewpoints. Rather than a homogeneous "spinning ball of liquid hydrogen," Firsoff suggested that Jupiter may be a "world of worlds" dotted with aggregations of material floating at various levels depending on their density. "The dense layer of stratified gas beneath the convection zone," he speculated, "may be full of solid and liquid bodies of considerable size, forming as it were minor tributary worlds of their own and held together by the force of their own gravitation."[17]

At a depth of about a thousand kilometers beneath Jupiter's cloud tops, condensed silicate minerals would float in the hot sea of liquefied gases. The spectroscope has revealed that cool red giant stars are enveloped in a thick smoke of metal silicates, oxides, carbides, nitrides, and other refractory compounds that form an opaque layer, doubly compressed by the pressure of radiation from within and gravitation from without. On Jupiter, aptly characterized by Firsoff as a "potted star," he conjectured that "local hot spots (flares) may form beneath the opaque envelope, and occasionally break through in a great eruption, vast amounts of incandescent gas pouring out into the overlying cooler regions. The erupting mass may be compared to a laccolith [an intrusion of magma between two layers of sedimentary rock that forces the overlying strata upward to form a characteristic dome] and may eventually set into a kind of floating island at a level corresponding to its specific gravity."[18]

Our present knowledge of Jupiter's interior does not permit more than intuitive guesswork like Firsoff's. The mechanism which causes SEB fadings and revivals is still poorly understood. Will future SEB revivals continue to emanate from the sites of Reese's mysterious "volcanoes"? Will the regular cycle of SEB revivals at three-year intervals that occurred between 1943 and 1958 prove to be the norm or the exception?

It is also quite puzzling that the South Equatorial Belt was subject to revivals throughout the 20th century, but its northern counterpart was not. Between 1893 and 1915, the North Equatorial Belt (NEB) experienced gradual fadings and sudden revivals at three-year intervals, just like the SEB during the 1950s. By poring over older sketches and verbal descriptions of Jupiter, John Rogers has uncovered evidence of earlier NEB revivals in 1837, 1856, 1861, and 1872[19]. These events all mimicked the SEB phenomena that have been occurring since 1919. The last NEB revival occurred in 1915. What has become of any vents beneath the NEB? What caused the pattern of activity to switch hemispheres? Will it switch hemispheres again? It's a safe bet that observations by amateur astronomers following in the footsteps of Elmer Reese will play a vital role in solving these mysteries.

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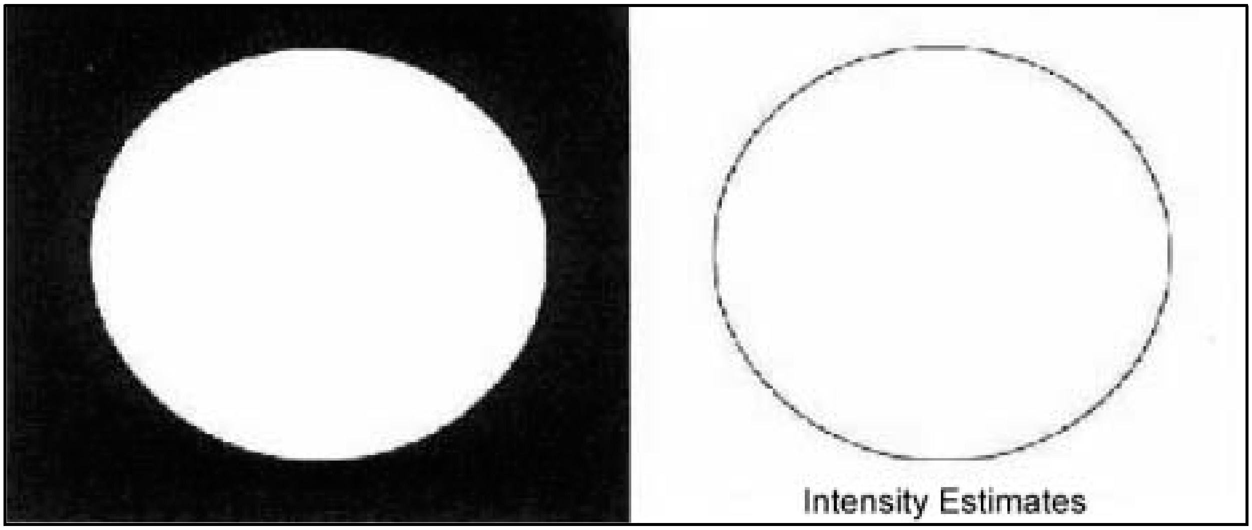
ALPO Jupiter Section Observation Form No. _____



Date (UT): ______________________________

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CM I _____ CM II ____ CM III _______

Begin (UT): _____________ End (UT) ____________

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Magnification: _______x ________x ________x

Filters: ______________________________(W / S)

Trnasparency (1 - 5): ____ (Clear / Hazy / Int. Clouds)

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No.	Time (UT)	S I (°)	S II (°)	S III (°)	Remarks

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ALPO Jupiter Sectional Sketch

Time (UT): ____

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CM I _____ CM II ____ CM III _______

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Magnification: _______ x ________ x ________x

Filters: ______________________(W / S)

Seeing (1 - 10): ________ Antoniadi (I - V): _______

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No.	Time (UT)	S I (°)	S II (°)	S III (°)	Remarks

Notes

Feature Story: Jupiter

Observations During the 2008 Apparition

By: Richard W. Schmude, Jr., coordinator, ALPO Jupiter Section
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This paper includes Jupiter images submitted by a number of observers.

Abstract

Drift rates of 110 different features in over a dozen currents on Jupiter are reported. Two small spots followed the elusive S^3TC jetstream and had an average system II drift rate of -95.3°/30 days. Drift rates of other currents were consistent with historical values. The selected normalized magnitudes are: B(1,0) = -8.53±0.03, V(1,0) = -9.43±0.02, R(1,0) = -9.89±0.02 and I(1,0) = -9.72±0.02. The purpose of this paper is to present observed drift rates and brightness measurements. Drift rates were computed by measuring longitudes from images. An analysis of multi-year trends in drift rates and brightness will be carried out in a future study.

Introduction

The characteristics of Jupiter for 2008 are listed in Table 1. Abbreviations are used throughout this report.

Two significant developments in 2008 were the darkening of the NTB and the observation of the rarely observed S^3TC jetstream. In addition to this, four oval-shaped features developed along the northern edge of the STrZ. One of these features (D1) was destroyed by the GRS in mid-April. Rogers (2008a, 242-244) gives an overview of the first half of the 2008 apparition. Rogers (2008b-g) has also posted six Jupiter reports summarizing major events that occurred during the 2008 apparition at: *http://www.britastro.org/jupiter/2008reports.htm*.

The people who submitted observations, images or measurements of Jupiter during the 2008 apparition are listed in Table 2. Belt and zone names and their abbreviations are listed in Table 3.

This paper will follow certain conventions. The planetographic latitude is always used. “West” refers to the direction of increasing longitude. Longitude is designated with the Greek letter λ, followed by a subscript Roman numeral that is the longitude system. For example, $\lambda_I = 54°$ means that the system I longitude equals 54° W. The three longitude systems are described in (Rogers, 1995, 11; 2006, 334), (Astronomical Almanac, 2003, L9). All dates and times are in Universal Time (UT). Belts and currents are abbreviated. Unless stated otherwise, all data are based on visible light images. All methane band images were made in light with a wavelength near 0.89 μm. All currents, except where noted, are named in accordance with Rogers (1990, 88).

All Readers

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

Online Features

Left-click your mouse on:

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

Observing Scales

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

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

Scale of Transparency Conditions:
- Magnitude of the faintest star visible near Jupiter when allowing for moonlight and twilight

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

Table 1: Characteristics of the 2008 Apparition of Jupiter[a]

First conjunction date	2007 Dec 23
Opposition date	2008 Jul 09
Second conjunction date	2009 Jan 24
Brightness at opposition (stellar magnitude)	-2.7
Equatorial angular diameter at opposition	47.0 arc-seconds
Right Ascension at opposition	19h 16m
Declination at opposition	22.5º S
Planetocentric latitude of the Earth at opposition	1.7° S
Planetocentric latitude of the Sun at opposition	1.8° S

[a]Data are from the Astronomical Almanac (2005, 2006, 2007)

Table 2: Contributors to the 2008 Jupiter Apparition Report.[a, b, c]

Name; Location (Type of Observation)	Name; Location (Type of Observation)	Name; Location (Type of Observation)
P. Abel, UK (I)	C. Hernandez, USA (D, DN)	M. Phillips, USA (I)
M. Adachi, Japan (D)	R. Hill, USA (I)	J. Poupeau, France (I)
G. Adamoli, Italy (D, DN)	C. Hsuan-Hsiao, Taiwan (I)	D. Pretorius, Australia (I)
J. Adelaar; The Netherlands (I)	I. Hwang, Korea (I)	J.-P. Prost, France (I)
T. Akutsu; Philippines (I)	Y. Iga, Japan (DN)	Z. Pujic, Australia (I)
E. Allen, USA (I)	T. Ikemura, Japan (I)	D. Pye, Canada (I)
A. Alonso, Spain (I)	M. Jacquesson (DN)	K. Quin, USA (I)
V. Amadori, Italy (I)	R. Jakiel, USA (I)	T. Ramakers, USA (I)
K. Ando; Japan (I)	S. Kanno, Japan (I)	E. Rivera, USA (I)
T. Arakawa, Japan (I)	M. Kardasis, Greece (I)	S. Robbins, USA (D)
D. Arditti; UK (I)	J. Kazanas, Australia (I)	J. Rogers, UK (DN)
T. Ashcraft, USA (R)	A. Kazemoto, Japan (I)	C. Roussell, Canada (D, DN)
L. Azorin, Spain (I)	B. Kendrick, USA (I)	N. Ryan, UK (I)
G. Bailey, USA (I)	T. Kumamori, Japan (I)	J. Sabia, USA (I)
G. Bertrand; France (I)	L. Lauri, Italy (D)	T. Saitou, Japan (I)
K. Bhattacharya, UK (I)	P. Lazzarotti, Italy (I)	S. Saltamonti, Italy (I)
R. Bosman; The Netherlands (I)	E. Lomeli, USA (I)	M. Salway, Australia (I)
A. Carbognani, Italy (I)	C. Lopez, Spain (I)	J. Sanchez; Spain (I)
F. Carvalho; Brazil (I)	O. Lopez (I)	J. Sandel, USA (D, DN, TT)
P. Casquinha; Portugal (I)	R. Mackintosh, Argentina (I)	J. Sanford, USA (I)
C. Cellini, Italy (I)	I. Marios-Strikis, Greece (D)	G. Santacana, USA (D, I)
D. Chang; Hong Kong, China (I)	M. Mattei, USA (I)	R. Schmude, Jr.; USA (D, DN, PP)
G. Chester; USA (I)	U. Maurer, Germany (I)	J. Soldevilla, Spain (I)
A. Cidadao, Portugal (I)	P. Maxson, USA (I)	A. Sonka, Romania (I)
B. Colville, Canada (I)	G. Medina, Spain (I)	N. Sotera, Italy (I)
E. Crandall, USA (I)	A. Medugno, Italy (I)	S. Spampinato, Italy (I)
B. Cudnik, USA (D, DN)	F. Melillo, USA (I)	J. Sussenbach, The Netherlands (I)
V. da Silva, Jr., Brazil (I)	T. Mishina, Japan (I)	I. Takimoto, Japan (I)
M. Delcroix, France (I)	I. Miyazaki, Japan (I)	G. Tarsoudis, Greece (I)
X. Dupont, France (I)	D. Moore, USA (I)	A. Tasselli, UK (DN)
P. Edwards, UK (I)	E. Morales, USA (I)	R. Tatum, USA (I)
H. Einaga, Japan (I)	R. Mykytyuki, Argentina (I)	K. Tokujiro, Japan (I)
C. Fattinnanzi, Italy (I)	K. Nakai (I)	Y. Tomita, Japan (I)
J. Ferreira, USA (I)	J. Nakamura, Japan (I)	D. Tyler, UK (I)
H. Fukui, Japan (I)	M. Neichi, Japan (I)	T. Usude, Japan (I)
S. Ghomizadeh, Iran (I)	D. Niechoy, Germany (D)	M. Valimberti, Australia (I)
T. Ghouchkanlu, Iran (I)	T. Nonoguchi, Japan (I)	S. Walker, USA (I)
C. Go, Philippines (I)	Y. Okamoto, Japan (D)	R. Walls, USA (I)
G. Grassmann, Brazil (I)	T. Olivetti, Thailand (I)	J. Warren, USA (I)
B. Haberman, USA (I)	L. Owens, USA (I)	A. Wesley, Australia (I)
P. Haese, Australia (I)	K. Ozaki, Japan (I)	R. Wheeler (I)
T. Hansen, Germany (I)	D. Parker, USA (I)	B. Worsley, USA (I)
A. Hatanaka, Japan (I)	D. Peach, Barbados and UK (I)	M. Yamamoto, Japan (I)
T. Hayashi, Japan (I)	C. Pellier, France (I)	S. Yoneyama, Japan (I)
R. Heffner, Japan (I)	J. Phillips, USA (I)	K. Yunoki, Japan (I)

[a]Type of observation: D = drawing, DN = descriptive notes, I = image, PP = photoelectric photometry, R = radio studies and TT = transit times

[b]All people who submitted images to http://www.arksky.org in the ALPO Jupiter archive and in the ALPO Japan Latest website in the Jupiter archive are acknowledged in this table.

[c]The writer would also like to acknowledge the Asociacion Amigos de la Astronomia for their contributions.

Table 3: Names and Abbreviations of Belts and Zones on Jupiter

Belt and Zone Name	Abbreviation	Belt and Zone Name	Abbreviation
South Polar Region	SPR	North Equatorial Belt	NEB
South Polar Belt	SPB	North Tropical Zone	NTrZ
South Temperate Zone	STZ	North Temperate Belt	NTB
South Tropical Zone	STrZ	North Temperate Zone	NTZ
South Equatorial Belt	SEB	North North Temperate Belt	NNTB
Equatorial Zone	EZ	North Polar Region	NPR
Equatorial Band	EB	Great Red Spot	GRS

Disk Appearance

Cudnik, Roussell and the writer made over 200 intensity estimates of Jupiter's features. These estimates were made between January and December of 2008. The average light intensities based on the ALPO scale (10 = white and 0 = black) are: SPR (6.1), STrZ (9.5), SEB (4.5), EZ (8.6), EB (7.5), NEB (3.4), NTrZ (8.9), NTB (6.1), NTZ (8.1), NNTB (6.2), GRS (6.4) and NPR (6.1). The STrZ, EZ, NTrZ and NTZ were much brighter in 2008 than in 2006-07. The NEB and SEB, however, were a little darker in 2008 than in the previous apparition (Schmude, 2010, 31).

The writer measured latitudes of Jovian belts from images made in July 2008. Latitudes were measured using the procedure described in Peek (1981, 49). Latitudes were measured from images in each of the six 60°–longitude intervals (system II) starting with the 0° to 60° interval. Average latitudes were then computed and are listed in Table 4 (visible wavelengths) and Table 5 (methane-band wavelength).

Figure 1 shows a selection of images made of Jupiter. Figures 2 and 3 show several graphs of the longitude versus date for features on Jupiter during the 2008 apparition.

Table 4: Planetographic Latitudes of Belts on Jupiter (All Latitudes are Based on Images Made in Visible Wavelengths in July 2008)

Feature	South Edge	North Edge
South Polar Belt	69.0° S ± 1°	64.3° S ± 0.5°
South Equatorial Belt	23.5 ± 0.5°	7.5° S ± 0.5°
North Equatorial Belt	7.4° N ± 0.5°	16.7° N ± 0.5°
North Temperate Belt	23.3° N ± 0.5°	31.4° N ± 0.5°
North North Temperate Belt	35.5° N ± 0.5°	40.1° N ± 1°

Table 5: Planetographic Latitudes of Belts on Jupiter (All Latitudes Based on Methane-Band Images Made at a Wavelength of 0.889 M in July 2008)

Feature	Latitude	Feature
South Polar Cap	---	65.6° S ± 0.5°
South Equatorial Belt	21.1° S ± 1°	3.6° S ± 1°
North Equatorial Belt	7.9° N ± 1°	17.2° N ± 0.5°
North Temperate Belt	25.5° N ± 0.5°	30.6° N ± 0.5°
North North Temperate Belt	34.6° N ± 0.5°	37.8° N ± 0.5°
North Polar Cap	66.2° N ± 1°	---

Tables 6 through 8 list the planetograhic latitudes and drift rates of features on Jupiter. Table 9 summarizes wind speeds for over a dozen currents. Tables 10 and 11 summarize whole-disk photometric magnitude measurements of Jupiter.

Most feature names in this report have a letter followed by a number. Names follow the convention described in Schmude (2010, 33).

Region I: Great Red Spot

Images of the GRS are shown in Figures 1C and 1D. In methane band light (889 nm), the GRS appeared as a white oval (Figure 1E). Cudnik described the GRS as having a "brownish-salmon" color on July 4. Hernandez described the GRS as having a "salmon-pink" color on August 3. Adamoli selected an orange-red color for it based on several observations.

The system II drift rate of the GRS was 1.0°/30 days. This is lower than in the previous apparition but is more consistent with historical values (Peek, 1981, 144), (Rogers, 1995, 192).

Between June 24 and July 24, 2008 the average system II longitude of the GRS was 125.8° ± 0.3°. This is 5.8° further west than 13 months ago.

Region II: South Polar Region to the South Tropical Zone

The NPR and SPR had the same light intensity (6.1) in 2008. The SPR had a dark belt (the SPB). A similar belt was observed in the previous apparition (Schmude, 2010, 34). Latitudes for this belt are listed in Table 4 and it is shown in Figures 1C and 1D. The writer suspected

Table 6: Planetographic Latitudes and Drift Rates of Features South of the Equatorial Zone; 2008 Jupiter

Feature	Number of Points	Planetographic Latitude	Drift Rate Deg./30 days System II	Feature	Number of Points	Planetographic Latitude	Drift Rate Deg./30 days System II
South Polar Current at 60° S (SPC at 60° S)							
A1	76	60.1° S	-4.5	A2	76	60.7° S	-17.7
A4	20	60.5° S	-11.9				
Average		60.4°S	-11.4				
South South South South Temperate Current (S^4TC)							
A5	16	54.8° S	-22.1				
South South South Temperate Current (S^3TC)							
A3	62	51.6° S	-18.5				
South South South Temperate Current Jetstream (S^3TC jetstream)							
A12	5	44.8° S	-93.0	A13	13	44.6	-97.7
Average		44.7°S	-95.3				
South South Temperate Current (SSTC)							
B1	37	41.4° S	-27.2	B2	52	42.1° S	-28.3
B3	49	41.0° S	-26.9	B4	53	41.7° S	-27.7
B5	46	42.1° S	-27.1	B6	61	41.9° S	-29.4
B7	44	42.0° S	-29.5	B8	31	40.0° S	-26.9
B9	36	42.1° S	-30.7	B10	43	41.1° S	-25.0
B11	10	40.8° S	-30.2				
Average		41.5°S	-28.1				
South Temperate Current (STC)							
C1	47	34.9° S	-12.1	C2	7	30.3° S	-18.9
C3	13	34.5° S	-12.2	C4	13	34.4° S	-11.7
C5	10	33.3° S	-8.9	C6	9	30.3° S	-15.2
C7	18	34.8° S	-28.6	C8	23	31.6° S	-15.3
C9	12	33.5° S	-1.0	C10	8	32.5° S	0.5
BA	92	33.7° S	-11.4				
Average		33.1°S	-12.3				
South Tropical Current (STrC)							
D1	16	23.1	30.9	D2	40	24.4	-8.2
D3	36	24.4	-11.5	D8	13	23.0	21.1
D9	6	24.0	9.2	D14	13	23.9	-8.8
GRS	103	23.3	1.0				
Average		23.7°S	4.8				
South Equatorial Belt Current barges (SEBC barges)							
D4	6	17.7° S	6.9	D5	39	17.0° S	6.6
D7	8	16.5° S	6.4	D10	24	17.4° S	9.7
D11	7	17.1° S	12.2	D12	6	16.8° S	7.0
Average		17.1°S	8.1				
South Equatorial Belt Current oval (SEBC oval)							
D6	8	14.7° S	-22.8				

a second polar belt at latitudes of between 78° S (south edge) to 74° S (north edge). Parts of this belt are visible in Wesley's July 5, 2008, image along with Christopher Go's April 3 and 9 images; all three images are on the ALPO Japan Latest Website: *http://alpo-j.asahikawa-med.ac.jp/Latest/Jupiter2008Apparition.htm*.

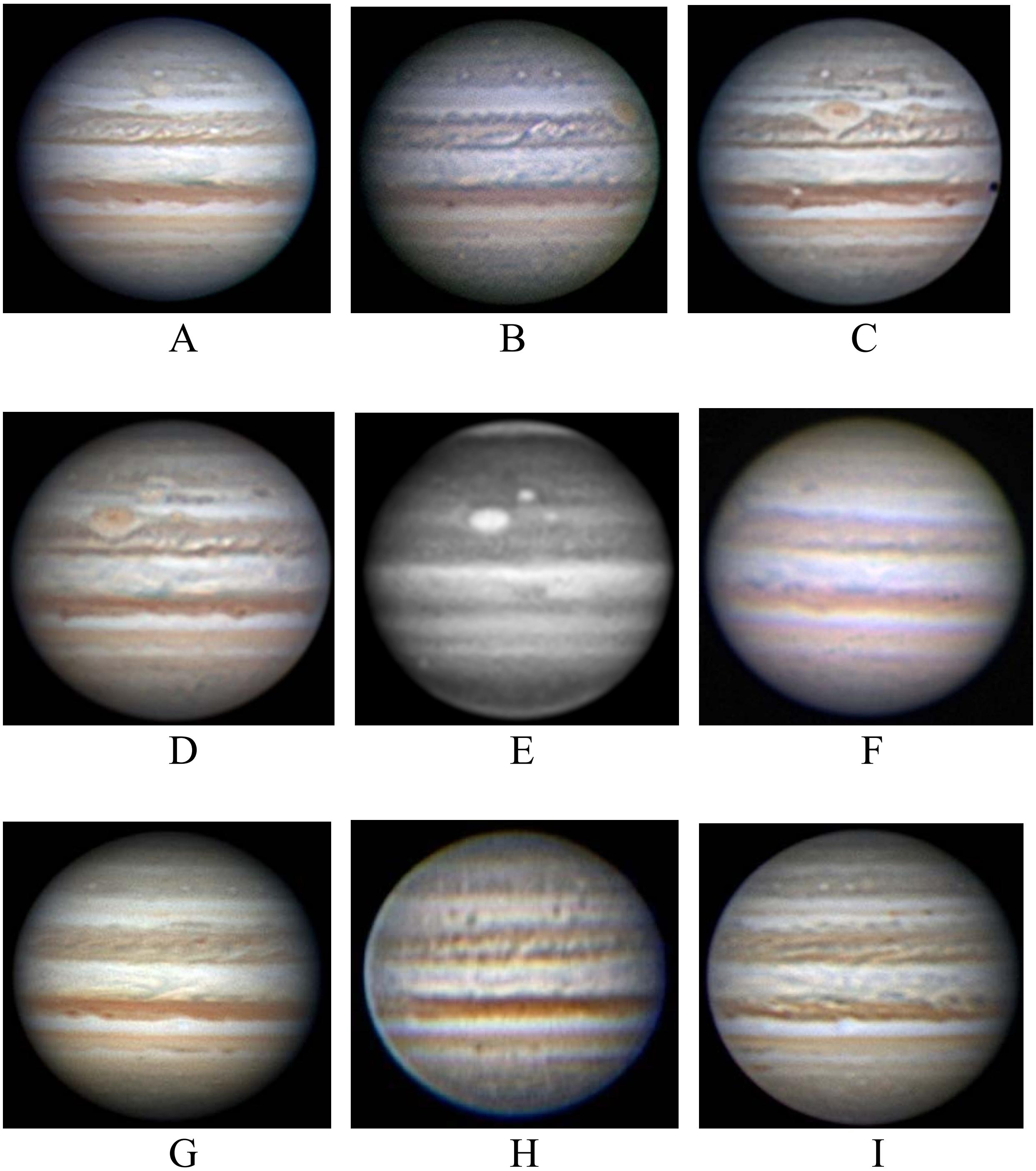

Figure 1: Images of Jupiter made in 2008. In all cases, south is at the top and the preceding limb is on the left. All images except where noted were made in visible light. **A**: March 14 (17:55 UT) by Anthony Wesley, $\lambda_I = 16°$, $\lambda_{II} = 179°$; **B**: April 3 (21:18 UT) by Tomio Akutsu, $\lambda_I = 57°$, $\lambda_{II} = 66°$; **C**: May 12 (10:18 UT) by Don Parker and Sean Walker, $\lambda_I = 54°$, $\lambda_{II} = 129°$; **D**: June 3 (8:55 UT) by Don Parker, $\lambda_I = 239°$, $\lambda_{II} = 147°$; **E**: June 3 (8:36 UT) by Don Parker in methane band light, $\lambda_I = 228°$, $\lambda_{II} = 135°$; **F**: July 14 (18:48 UT) by Sadegh Ghomizadeh, $\lambda_I = 240°$, $\lambda_{II} = 192°$; **G**: Aug. 4 (13:54 UT) by Christopher Go, $\lambda_I = 139°$, $\lambda_{II} = 292°$; **H**: Sept. 2 (23:59 UT) by Randy Tatum, $\lambda_I = 48°$, $\lambda_{II} = 336°$; **I**: Oct. 18 (10:34 UT) by Tomio Akutsu, $\lambda_I = 334°$, $\lambda_{II} = 276°$.

Three white ovals (A1, A2 and A4) were near 60° S. These features followed the SPC. The average system II drift rate for this current is -11.4°/30 days. This is close to the corresponding value for the SPC (61° S) in the previous apparition (Schmude, 2010, 35).

One dark bar (A5) at 54.8° S followed the S^4TC. This feature was about 14° long between August 9 and September 17. Its length increased to 23° by September 24. The center of this feature had a system II drift rate of -22.1°/30 days. A close inspection of Figure 2A, however, shows that the longitude of the center of A5 was a bit further west than expected on September 24. This may be due to the westward expansion of A5 between September 17 and 24. The drift rate of A5 is a bit more negative than the three features at 55° S listed in Rogers (1995, 240).

The white oval (A3) in the S^3TC oscillated (see Figure 2A). The amplitude (defined as half of the peak-to-peak change) was about 7° in longitude and the period was 105 days. The average drift rate of A3 is -18.5°/30 days. This rate is similar to the average drift for the S^3TC in the previous apparition (Schmude, 2010, 35).

The two white ovals A12 and A13 were only about one-fourth the area of the white ovals in the SSTC. These two ovals were just south of the SSTC at 44.7° S and had an average system II drift rate of -95.3°/30 days. Features A12 and A13 are placed in a special S^3TC Jetstream. Rogers (2008g, 12) reports that four features followed this current with an average system II drift rate of -100°/30 days; this result is consistent with the results in this paper.

The 11 white ovals (B1-B11) followed the SSTC. The average system II drift rate of these ovals is -28.1°/30 days. This value is similar to what it was in the previous apparition (Schmude 2010, 35). It is also similar to historical values (Rogers, 1995, 238-239) for the SSTC.

Five white ovals (C1-C2, C5-C7) and five dark spots (C3-C4, C8-C10) and Oval BA followed the STC. The average system II drift rate of these features is -12.3°/30 days. This is a bit more negative than the corresponding value for the STC in the previous apparition (-7.3°/30 days). Peek reports a rotation rate of 9h 55m 20s for this current which is consistent with a system II drift rate of -15°/30 days. Rogers (1995, 222) reports a similar drift rate for the STC between 1900 and 1940. Hence, the 2008 drift rate is close to historical values.

There appears to have been three groups of features in the latitude band corresponding to the STrC in 2008. These groups are based on drift rate. White ovals D1, D8 and D9 were east of the GRS and constitute the first group. White oval D14 and festoons D2 and D3 were all west of the GRS and constitute the second group. The third group is the GRS. The average system II drift rate of the first, second and third groups (in degrees per 30 days) are 20.4, -9.5 and 1.0, respectively. The GRS is believed to affect the drift rates of the other features. Essentially features east of the GRS had more positive drift rates than features west of this feature. The average drift rate of all seven features (D1-D3, D8-D9, D14 and the GRS) is 4.8°/30 days. This rate is consistent with historical rates (Rogers, 1995, 164-165) for the STrC.

Feature D2 is shown in Figure 1D as a bump on the south edge of the SEB. This same feature shows up in Figure 1E (methane band image) as a small bright spot. Rogers calls this spot the "Little Red Spot". He also describes its encounter with the GRS (Rogers 2008e, 2; 2008f, 1).

Region III: South Equatorial Belt

Cudnik observed that the SEB had an orange-brown color on July 4. Hernandez reported that the SEB "appeared dark to dusky" on August 3 and 9. Adamoli reported a gray-brown color for the SEB based on several observations. The general appearance of the SEB is shown in Figure 1.

Six dark spots or barges (D4-D5, D7, D10-D12) were within the SEB. These features followed the SEBC. Feature D10 is the small dark bar just right of the central meridian in Figure 1G. The average system II drift rate of these features is 8.1°/30 days. Rogers (1995, 399) reports an average latitude of 16.7° S for dark spots in the SEB(S) between 1979 and 1992. This latitude is similar to those of the six barges in 2008.

One large white oval (D6) was near the center of the SEB during early March. It faded after March 18. Its system II drift rate was -22.8°/30 days. This drift rate is similar to spots in the middle of the SEB as reported in Peek (1981, 111).

Table 7. Planetographic Latitudes and Drift Rates of Festoons in the North Equatorial Current (NEC; 2008 Apparition)

Feature	Number of Points	Planetographic Latitude	Drift rate Deg./30 days System I	Feature	Number of Points	Planetographic Latitude	Drift rate Deg./30 days System I
E1	12	7.4 ° N	9.4	E2	13	7.4 ° N	1.1
E3	9	7.4 ° N	-14.4	E4	8	7.4 ° N	4.1
E5	64	7.4 ° N	5.2	E6	60	7.4 ° N	7.5
E7	22	7.4 ° N	9.4	E8	9	7.4 ° N	11.1
E9	6	7.4 ° N	0.4	E10	12	7.4 ° N	-2.4
E11	8	7.4 ° N	3.5	E14	19	7.4 ° N	-8.6
E15	28	7.4 ° N	-7.1	E17	9	7.4 ° N	2.9
E18	26	7.4 ° N	6.3				
Average		**7.4° N**	**1.9**				

Table 8: Planetographic Latitudes and Drift Rates of Features North of the Equatorial Zone; Jupiter 2008

Feature	Number of Points	Planetographic Latitude	Drift rate Deg./30 days System II	Feature	Number of Points	Planetographic Latitude	Drift rate Deg./30 days System II
North Tropical Current barges (NTrC barges)							
N1	4	16.2° N	-7.8	N2	94	15.3° N	1.9
N3	55	15.1° N	2.0	N4	9	14.9° N	-2.1
N5	106	15.7° N	-2.9	N6	90	15.7° N	2.6
N7	36	17.2° N	8.1	N8	5	14.3° N	-4.0
N9	21	15.2° N	-1.7	N10	17	14.3° N	-15.3
N11	29	14.4° N	-10.3	N14	30	15.6° N	0.5
N20	7	13.9° N	-6.1	N21	7	15.6° N	-8.6
N22	56	15.0° N	-10.3	N23	56	15.2° N	-12.6
Average		15.2° N	-4.2				
North Tropical Current ovals (NTrC ovals)							
N12	86	17.8° N	1.0	N13	69	17.5° N	2.2
N15	7	17.5° N	6.3	N16	7	17.9° N	-4.9
N17	51	17.8° N	-10.0	N18	12	17.4° N	9.6
N24	12	15.0° N	7.2				
Average		17.3° N	1.62				
North Tropical Current festoon (NTrC festoon)							
N19	31	19.8° N	-3.9				
North Temperate Current (NTC)							
F1	22	31.4° N	26.1	F2	17	31.7° N	25.4
F3	13	32.2° N	12.9	F4	5	31.6° N	29.0
F5	5	31.7° N	19.6	F6	8	30.6° N	28.6
F7	39	31.2° N	25.2				
Average		31.5° N	23.8				
North North Temperate Current B (NNTBs Jetstream)							
H1	24	34.7° N	-82.0	H2	19	34.9° N	-83.5
H3	14	35.2° N	-88.3				
Average		39.4° N	-84.6				
North North Temperate Current (NNTC)							
G1	82	40.9° N	-0.8	G3	15	40.7° N	-9.4
G4	90	40.7° N	-5.6	G6	14	42.1° N	-4.4
G9	53	41.3° N	0.9	G10	52	42.5° N	-4.7
G11	12	39.2° N	10.8	G12	22	42.7° N	9.7
Average		41.3° N	-0.4				
North North North Temperate Current (N^3TC)							
G2	24	43.9° N	-15.4	G5	11	44.5° N	-21.6
G7	14	45.6° N	-17.9	G8	11	45.4° N	-23.4
G13	8	46.0° N	-16.1	G14	54	46.0° N	-17.7
G15	12	46.4° N	-24.9	G16	9	45.7° N	-19.5
Average		45.4° N	-19.6				
North North North North Temperate Current (N^4TC)							
I1	15	51.8° N	7.4	I3	34	51.3° N	8.2
Average		51.6° N	7.8				

Table 9: Average Drift Rates, Rotation Periods and Wind Speedsa for Several Currents on Jupiter (2008 Apparition)

Current	Feature(s)	Drift Rate (degrees/30 days)			Rotation Rate	Wind Speed (m/s)
		Sys. I	Sys. II	Sys. III		
SPC at 60° S	A1-A2, A4	217.5	-11.4	-3.4	9h 55m 25s	0.8 ± 0.4
S^4TC	A5	206.8	-22.1	-14.1	9h 55m 11s	4.1 ± 2[b]
S^3TC	A3	210.4	-18.5	-10.5	9h 55m 15s	3.3 ± 2[b]
S^3TC jetstream	A12-A13	133.6	-95.3	-87.3	9h 53m 31s	30.8 ± 0.5
SSTC	B1-B11	200.8	-28.1	-20.1	9h 55m 02s	7.4 ± 0.2
STC	C1-C10, Oval BA	216.6	-12.3	-4.3	9h 55m 24s	1.8 ± 0.4
STrC	D1-D3, D8-D9, D14, GRS	233.7	4.8	12.8	9h 55m 47s	-5.7 ± 1.0
SEBC barges	D4-D5, D7, D10-D12	237.0	8.1	16.1	9h 55m 52s	-7.4 ± 0.3
SEBC oval	D6	206.1	-22.8	-14.8	9h 55m 10s	6.9 ± 2[b]
NEC	E1-E11, E14-E15, E17-E18	1.9	-227.0	-219.0	9h 50m 27s	104.5 ± 0.3
NTrC barges	N1-N11, N14, N20-N23	224.7	-4.2	3.8	9h 55m 35s	-1.8 ± 0.3
NTrC ovals	N12-N13, N15-N18, N24	230.5	1.6	9.6	9h 55m 43s	-4.4 ± 0.5
NTrC festoon	N19	225.0	-3.9	4.1	9h 55m 35s	-1.9 ± 2[b]
NTC	F1-F7	252.7	23.8	31.8	9h 56m 13s	-13.3 ± 0.4
NNTBs jetstream	H1-H3	144.3	-84.6	-76.6	9h 53m 45s	30.8 ± 0.4
NNTC	G1, G3-G4, G6, G9-G12	228.5	-0.4	7.6	9h 55m 40s	-2.8 ± 0.4
N^3TC	G2, G5, G7-G8, G13-G16	209.3	-19.6	-11.6	9h 55m 14s	4.0 ± 0.2
N^4TC	I1, I3	236.7	7.8	15.8	9h 55m 51s	-4.9 ± 0.2

[a]The wind speed is the speed that a current moves with respect to the system III longitude; it is computed from the equation in Table A1.2 (Rogers, 1995, 392).

[b]Estimated uncertainty [c]Circulating Current south end [d]Circulating Current north end

Region IV: Equatorial Zone

This area was brighter than in the previous apparition. Adamoli reported a yellow-white color for this area in 2008 based on several observations. Hernandez reported that the EZ appeared "shaded to bright" on August 3 and 9.

Fifteen festoons (E1-E11, E14-E15, E17-E18) followed the NEC. The average system I drift rate for these features is 1.9/30 days. This is similar to the corresponding rate in the previous apparition (Schmude, 2010, 38).

Region V: North Equatorial Belt

Adamoli reports that the NEB had a brownish-red color. Hernandez described the NEB as "dark" on August 3 and "dark to dusky" on August 9. Cudnik reports that the NEB had an orange-brown color on July 4. The general appearance of the NEB is shown in Figure 1.

The NEB had several rifts in it during 2008. Figures 1C and 1I show two of these. These two rifts changed from one day to the next and as a result, it was difficult to measure drift rates. In Figure 2G, the writer plotted the system II longitudes of the following end (E12) and preceding end (E13) of a rift that appeared in May and the following end (E16) of a second rift that appeared in August.

The NEB had up to 12 different barges. Figures 1A, 1B, 1C and 1G show a few of them. Barges N9 and N10 merged to form Barge N21. Barges N11 and N20 merged to form Barge N22. Barges N14 and N21 merged to form Barge N23. There may have been other merges as well. The latitudes of the NEB barges ranged from 13.9° N to 17.2° N. These latitudes are consistent with historical values (Rogers, 1995, 399). The average system II drift rate of the NEB barges is -4.2°/30 days. This rate is similar to barges imaged in 1979 (Rogers, 1995, 121).

Seven white ovals (N12-N13, N15-N18, N24) were at the southern edge of the NEB. Figure 1C shows N12 near the central meridian and N13 about 30° west (or right) of the central meridian. These features were often difficult to detect on computer printouts, but were easier to spot from a computer monitor. The average latitude and system II drift rate for these features are 17.3° N and 1.6°/30 days, respectively. These values are close to those in the previous apparition (Schmude, 2010, 40).

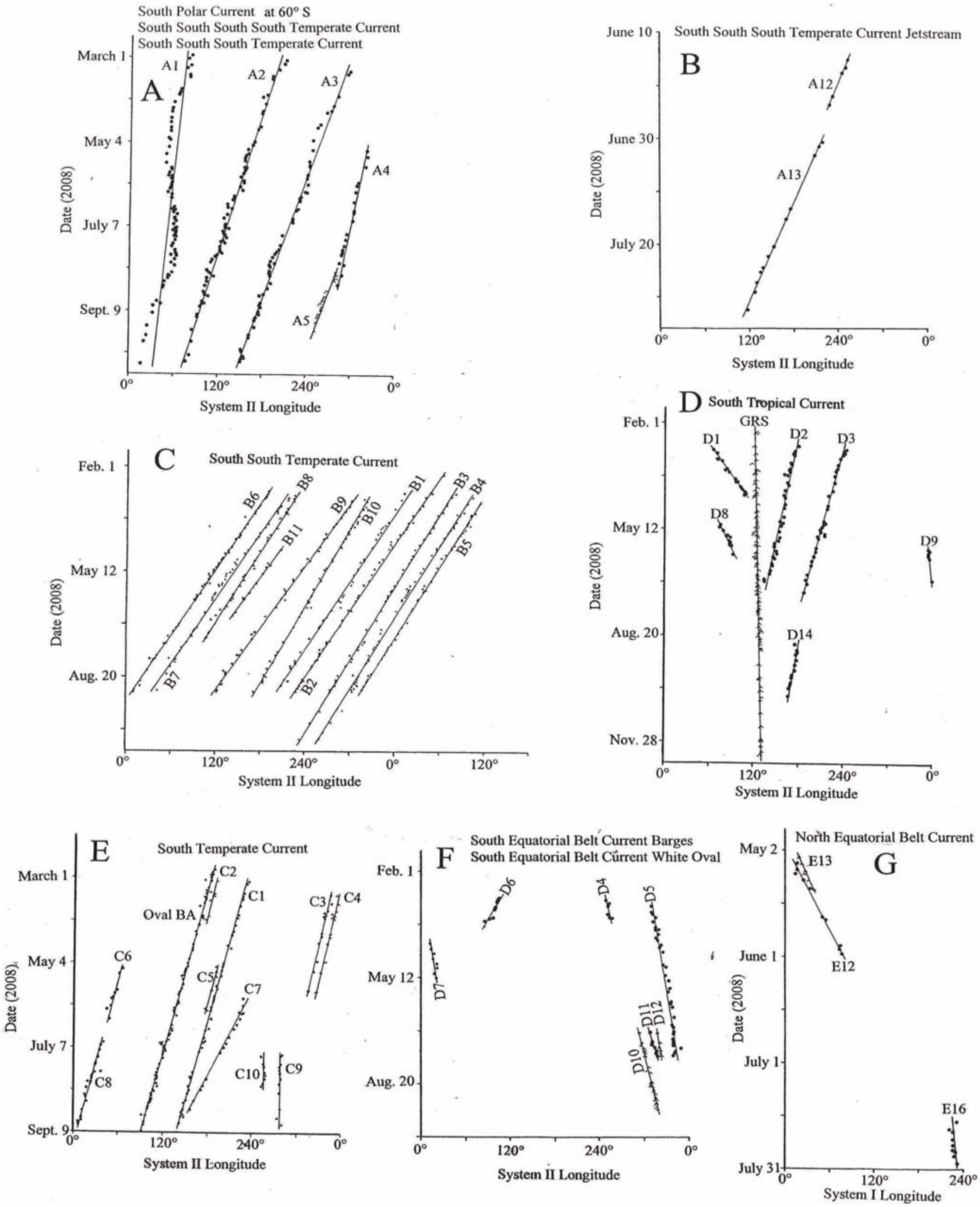

Figure 2: Drift rates for various features in Jupiter' southern hemisphere and in the North Equatorial Belt Current during the 2008 apparition.

Table 10: Photometric Magnitude Measurements of Jupiter (2008 Apparition)

Date (2008)	Filter	α (deg.)	Measured Magnitude	X(1,α)	Date (2008)	Filter	a (deg.)	Measured Magnitude	X(1,α)
Apr. 9.426	V	11.1	-2.21	-9.36	May 13.386	I	9.6	-2.79	-9.70
Apr. 14.400	V	11.1	-2.23	-9.34	June 8.307	V	6.2	-2.66	-9.41
Apr. 14.420	B	11.1	-1.35	-8.46	June 8.342	B	6.2	-1.78	-8.53
Apr. 16.399	R	11.1	-2.77	-9.86	June 8.370	R	6.2	-3.11	-9.86
Apr. 16.415	I	11.1	-2.62	-9.72	June 8.390	I	6.2	-2.90	-9.65
Apr. 22.361	R	10.9	-2.78	-9.83	July 1.240	V	1.7	-2.76	-9.44
Apr. 22.375	I	10.9	-2.64	-9.70	July 1.267	B	1.7	-1.85	-8.53
Apr. 22.390	V	10.9	-2.28	-9.34	July 1.294	R	1.7	-3.21	-9.89
Apr. 22.407	B	10.9	-1.34	-8.39	July 2.224	I	1.5	-3.06	-9.74
Apr. 30.358	R	10.6	-2.78	-9.77	July 2.269	V	1.5	-2.76	-9.43
Apr. 30.374	I	10.6	-2.67	-9.67	July 3.224	V	1.3	-2.76	-9.43
Apr. 30.388	V	10.6	-2.30	-9.30	July 3.249	B	1.3	-1.81	-8.48
Apr. 30.404	B	10.6	-1.39	-8.39	July 3.274	R	1.3	-3.20	-9.87
May 13.338	V	9.6	-2.42	-9.33	July 3.299	I	1.3	-3.05	-9.72
May 13.355	B	9.6	-1.54	-8.45	July 8.263	V	0.2	-2.73	-9.39
May 13.372	R	9.6	-2.92	-9.82					

Region VI: North Tropical Zone to the North Polar Region

The general appearance of the NTB is shown in Figure 1. The NTB was wide and often appeared as a double belt separated by a thin, white zone. Hernandez reported that it was “dark to dusky” and was “divided by a thin bright” zone on August 9. On July 4, Cudnik drew the NTB as two thin belts separated by a thin and bright zone.

Seven features were tracked along the northern edge of the north component of the NTB. Four of these features (F1, F3-F5) were north-pointing projections and the other three (F2, F6-F7) were barges. The average system II drift rate for these seven features is 23.8°/30 days. This rate is consistent with historical values of the NTC (Peek, 1981, 84), (Rogers, 1995, 102-103).

Three small dark spots (H1-H3) followed the NNTCs jetstream or the North North Temperate Current B. The average latitude and average system II drift rate for these three features are 34.9° N and -84.6°/30 days. These values are consistent with those in the previous apparition (Schmude, 2010, 40). They are also consistent with the historical record (Peek, 1981, 78), (Rogers, 1995, 97).

Six white ovals G1, G3-G4, G6, G10, G12), one red oval (G9) and one dark oval (G11) followed the NNTC. The average system II drift rate of the eight features is -0.4°/30 days. This value is somewhat different from the corresponding value in the previous apparition (Schmude, 2010). The average drift rate in 2008, however, is close to historical values (Rogers, 1995, 88-89).

Eight white ovals (G2, G5, G7-G8, G13-G16) followed the N^3TC. The average system II drift rate of these ovals is -19.6°/30 days. This rate is close to the historical record (Rogers, 1995, 90).

Two white ovals (I1 and I3) followed the N^4TC. The average drift rate of these ovals is 7.8°/30 days. This rate is close to the rate in the previous apparition (Schmude, 2010, 40) and is close to values in previous years (Rogers, 1995, 90).

Wind Speeds

Table 9 summarizes wind speeds. The wind speeds are with respect to the system III longitude. They were computed in the same way as in Rogers (1995, 392). Uncertainties were computed in the same way as in Schmude (2003, 50).

Satellite Observations

Ikemura imaged both Callisto and its shadow transit Jupiter on July 19 at 14:55 UT. In this image, the shadow diameter was about 25% larger than the diameter of Callisto. The shadow also appeared a bit darker than Callisto. Callisto appeared much lighter when it was near Jupiter’s edge.

Einaga captured an image of Ganymede as it was transiting Jupiter on July 7. That moon was darker than the SEB and NEB. It was also darker than the dark spot C8. In Yunoki’s July 14 image, Ganymede is

Table 11: Photometric Constants of Jupiter (2008 Apparition)

Filter	X(1,0)	c_x (magnitude/ degree)
B	-8.53 ± 0.03	0.010 ± 0.006
V	-9.43 ± 0.02	0.009 ± 0.003
R	-9.89 ± 0.02	0.0006 ± 0.004
I	-9.72 ± 0.02	-0.003 ± 0.004

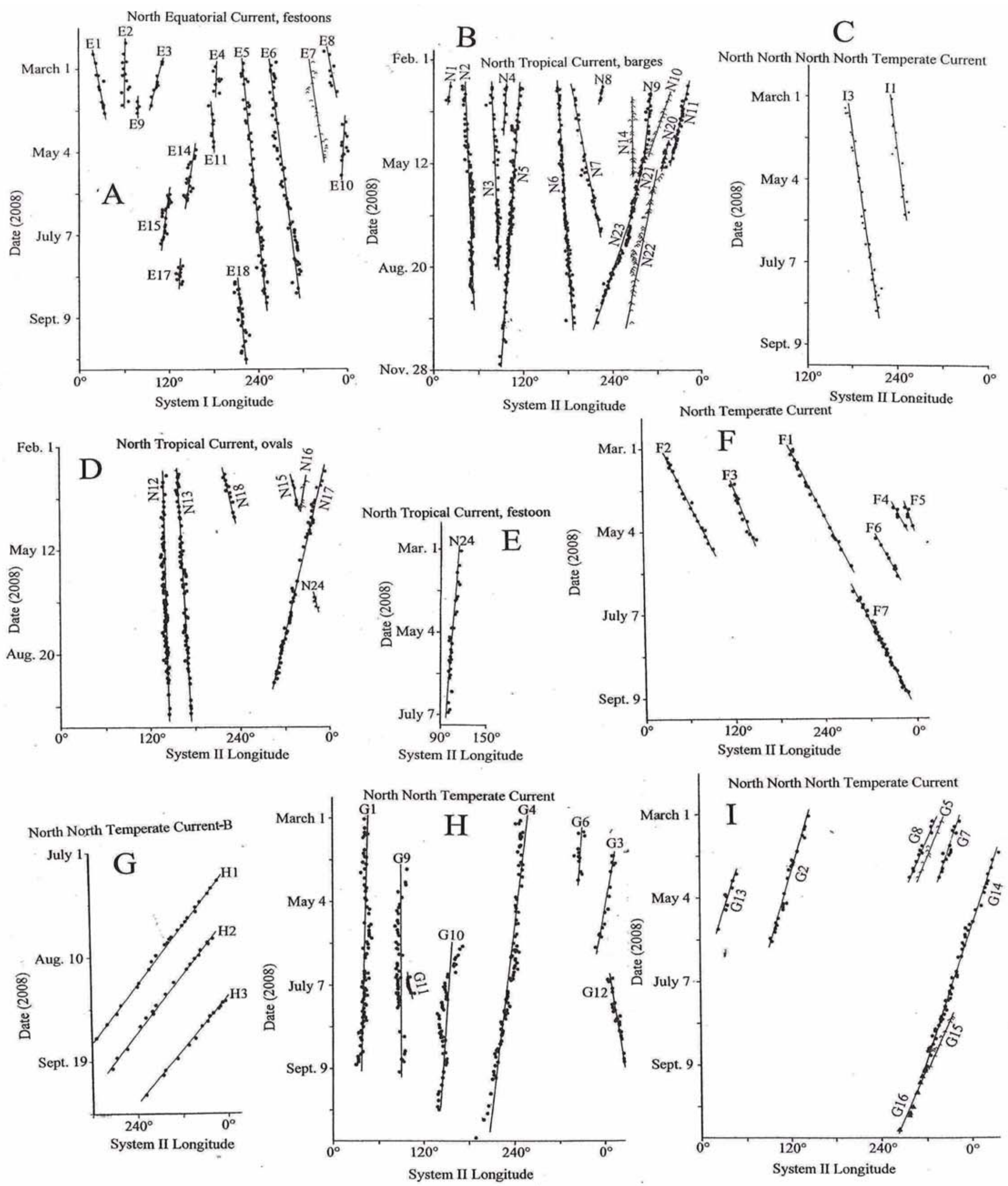

Figure 3: Drift rates for various features in Jupiter's northern hemisphere during the 2008 apparition.

about 20% smaller than its shadow. Ganymede is darker than all features on Jupiter except for areas pole ward of about 60°. Ganymede had a grayish color which was much different than the colors of the SEB, NEB and NTB.

Photoelectric Photometry

The writer used an SSP-3 solid-state photometer along with a 0.09 m (3.5 inch) Maksutov telescope and color filters transformed to the Johnson B, V, R and I system in making all photometric magnitude measurements in Table 10. The method and equipment are described elsewhere (Schmude, 1992, 20; 2008, 161-167), (Optec, 1997, 1-26). All measurements were corrected for both atmospheric extinction and color transformation in the same way as in Hall and Genet (1988, 189-201). The comparison star for all measurements was Xi-2-Sagittarii. Its brightness values are from (Irairte et al, 1965, 30).

Normalized magnitudes, $X(1,\alpha)$, were computed in the same way as in Schmude and Lesser (2000, 68-69); X represents the B, V, R or I filter. The $X(1,\alpha)$ and α values were fitted to linear equations using a least squares routine (Schmude and Lesser, 2000, 68-69). The resulting solar phase angle coefficients c_X and normalized magnitudes X(1,0) are summarized in Table 11. Uncertainties for the values in Table 11 were computed in the same way as in Schmude (1998, 178-179).

The normalized magnitude or V(1,0) value of Jupiter was -9.43 ± 0.02. This is a bit brighter than the corresponding value for the previous apparition (Schmude, 2010, 42). Much of this difference is believed to be due to the brightening of the STrZ, EZ, NTrZ and NTZ.

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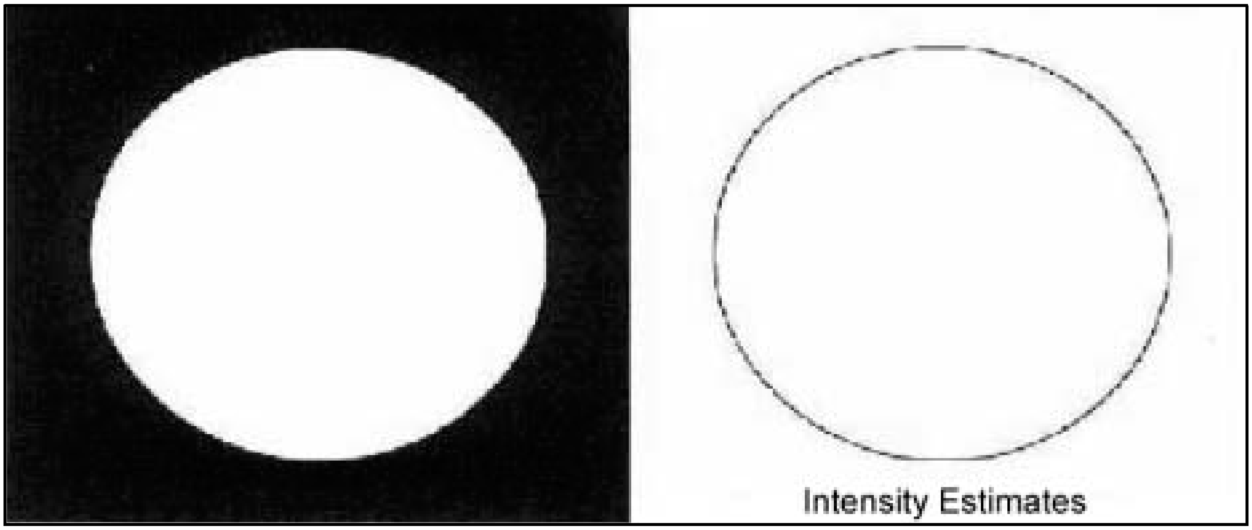

Date (UT): ______________________________________

Time (UT): ______________________________________

CM I _____ CM II ____ CM III _______

Begin (UT): _____________ End (UT) ____________

Telescope: f/ ___ Size: __________ (in./cm.; RL/RR/SC)

Magnification: _______x ________x ________x

Filters: _________________________________(W / S)

Trnasparency (1 - 5): ____ (Clear / Hazy / Int. Clouds)

Seeing (1 - 10): _________ Antoniadi (I - V): _________

Name: ______________________________________

Address: ______________________________________

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Observing Site: _______________________________

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No.	Time (UT)	S I (°)	S II (°)	S III (°)	Remarks

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Time (UT): ____________________

S I (°): ____________________

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Time (UT): ____________________

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Date (UT): ____________________

Begin (UT): ______________ End (UT) ___________

Telescope: f/ ____ Size: ______ (in./cm.; RL/RR/SC)

Magnification: _______ x _________ x _________x

Filters: ____________________(W / S)

Seeing (1 - 10): _________ Antoniadi (I - V): ________

Tranparency (1 - 6) _____ (Clear / Haze / Int. Clouds)

Name: ____________________

Address: ____________________

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Observing Site: ____________________

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No.	Time (UT)	S I (°)	S II (°)	S III (°)	Remarks

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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
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(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
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(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
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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.

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

Lunar Transient Phenomena

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

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

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Saturn Section

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

Remote Planets Section

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Comets Section

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

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Meteors Section

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

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Meteorites Section

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

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Eclipse Section

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

- Coordinator; Mike D. Reynolds, Dean of Mathematics & Natural Sciences, Florida State College, 3939 Roosevelt Blvd, F-112b, Jacksonville, FL 32205

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ALPO Publications

The Monograph Series

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

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

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- **Monograph No. 1.** *Proceedings of the 43rd Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, August 4-7, 1993. 77* pages. File size approx. 5.2 megabytes.

- **Monograph No. 2**. *Proceedings of the 44th Convention of the Association of Lunar and Planetary Observers. Greenville, South Carolina, June 15-18, 1994. 52* pages. File size approx. 6.0 megabytes.

- **Monograph No. 3**. *H.P. Wilkins 300-inch Moon Map.* 3rd Edition (1951). Available as one comprehensive file (approx. 48 megabytes) or five section files (Part 1, 11.6 megabytes; Part 2, 11.7 megabytes; Part 3, 10.2 megabytes; Part 4, 7.8 megabytes; Part 5, 6.5 megabytes)

- **Monograph No. 4.** *Proceedings of the 45th Convention of the Association of Lunar and Planetary Observers. Wichita, Kansas, August 1-5, 1995.127* pages. Hard copy $17 for the United States, Canada, and Mexico; $26 elsewhere. File size approx. 2.6 megabytes.

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People, publications, etc., to help our members

- **Monograph No. 5.** *Astronomical and Physical Observations of the Axis of Rotation and the Topography of the Planet Mars. First Memoir; 1877-1878.* By Giovanni Virginio Schiaparelli, translated by William Sheehan. 59 pages. Hard copy $10 for the United States, Canada, and Mexico; $15 elsewhere. File size approx. 2.6 megabytes.
- **Monograph No. 6.** *Proceedings of the 47th Convention of the Association of Lunar and Planetary Observers, Tucson, Arizona, October 19-21, 1996.*20 pages. Hard copy $3 for the United States, Canada, and Mexico; $4 elsewhere.File size approx. 2.6 megabytes.
- **Monograph No. 7.** *Proceedings of the 48th Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, June 25-29, 1997.*76 pages. Hard copy $12 for the United States, Canada, and Mexico; $16 elsewhere.File size approx. 2.6 megabytes.
- **Monograph No. 8.** *Proceedings of the 49th Convention of the Association of Lunar and Planetary Observers. Atlanta, Georgia, July 9-11,1998.*122 pages. Hard copy $17 for the United States, Canada, and Mexico; $26 elsewhere.File size approx. 2.6 megabytes.
- **Monograph Number 9**. *Does Anything Ever Happen on the Moon?* By Walter H. Haas. Reprint of 1942 article. 54 pages.Hard copy $6 for the United States, Canada, and Mexico; $8 elsewhere.File size approx. 2.6 megabytes.
- **Monograph Number 10.** *Observing and Understanding Uranus, Neptune and Pluto*. By Richard W. Schmude, Jr. 31 pages. File size approx. 2.6

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ALPO Resources

People, publications, etc., to help our members

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

ALPO Observing Section Publications

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

- **Solar:** Totally revised *Guidelines for the Observation and Reporting of Solar Phenomena*, $10 USD; includes CD with 100 page-manual in pdf with up-to-date techniques, images, and links to many solar references. Produced by ALPO Solar Section Assistant Coordinator and Archivist Jamey Jenkins, this publication replaces *Observe and Understand the Sun* and its predecessor, *The Association of Lunar& Planetary Observer's Solar Section Handbook for the White Light Observation of Solar Phenomena*, both by the ALPO's own Rik Hill. To order, send check or US money order made payable to Jamey Jenkins, 308 West First Street, Homer, Illinois 61849; e-mail to *jenkinsjl@yahoo.com*

- **Lunar & Planetary Training Section:** *The Novice Observers Handbook* $15. An introductory text to the training program. Includes directions for recording lunar and planetary observations, useful exercises for determining observational parameters, and observing forms. Available as pdf file via e-mail or send check or money order payable to Timothy J. Robertson, 195 Tierra Rejada Rd., #148, Simi Valley, CA 93065; e-mail *cometman@cometman.net*.

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

- **Lunar**: *The Lunar Observer*, official newsletter of the ALPO Lunar Section, published monthly. Free at *http://moon.scopesandscapes.com/tlo.pdf* or $1.25 per hard copy: send SASE with payment (check or money order) to: Wayne Bailey, 17 Autumn Lane, Sewell, NJ 08080.

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

- **Venus (Benton):** Introductory information for observing Venus, including observing forms, can be downloaded for free as pdf files at *http://www.alpo-astronomy.org/venus*. The *ALPO Venus Handbook* with observing forms included is available as the *ALPO Venus Kit* for $17.50 U.S., and may be obtained by sending a check or money order made payable to "Julius L. Benton" for delivery in approximately 7 to 10 days for U.S. mailings. The *ALPO Venus Handbook* may also be obtained for $10 as a pdf file by contacting the ALPO Venus Section. All foreign orders should include $5 additional for postage and handling; p/h is included in price for domestic orders. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Venus section. Observers should make copies using high-quality paper.

- **Mars:** *(1) ALPO Mars Observers Handbook,* send check or money order for $15 per book (postage and handling included) to Astronomical League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail *leaguesales@astroleague.org*. *(2) Observing Forms;* send SASE to obtain one form for you to copy; otherwise send $3.60 to obtain 25 copies (send and make checks payable to "Deborah Hines", see address under "Mars Section").

- **Jupiter:** *(1) Jupiter Observer's Handbook*, $15 from the Astronomical League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759);

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e-mail *leaguesales@astroleague.org*. (2) *Jupiter*, the ALPO section newsletter, available online only via the ALPO website at *http://mysite.verizon.net/macdouc/alpo/jovenews.htm;* (3) *J-Net*, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougal. (4) *Timing the Eclipses of Jupiter's Galilean Satellites* 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 Kit*, $3 from Richard Schmude, Jupiter Section coordinator.

- **Saturn (Benton):** Introductory information for observing Saturn, including observing forms and ephemerides, can be downloaded for free as pdf files at *http://www.alpo-astronomy.org/saturn*; or if printed material is preferred, the *ALPO Saturn Kit* (introductory brochure and a set of observing forms) is available for $10 U.S. by sending a check or money order made payable to "Julius L. Benton" for delivery in approximately 7 to 10 days for U.S. mailings. The former *ALPO Saturn Handbook* was replaced in 2006 by *Saturn and How to Observe It* (by J. Benton), and it can be obtained from book sellers such as *Amazon.com*. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Saturn Section.

- **Meteors:** (1) *The ALPO Guide to Watching Meteors* (pamphlet). $4 per copy (includes postage & handling); send check or money order to Astronomical League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail *leaguesales@astroleague.org*. (2) *The ALPO Meteors Section Newsletter*, free (except postage), published quarterly (March, June, September, and December). Send check or money order for first class postage to cover desired number of issues to Robert D. Lunsford, 1828 Cobblecreek St., Chula Vista, CA 91913-3917.

- **Minor Planets (Derald D. Nye):** *The Minor Planet Bulletin*. Published quarterly; free at *http://www.minorplanetobserver.com/mpb/default.htm*. 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.

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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).

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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.

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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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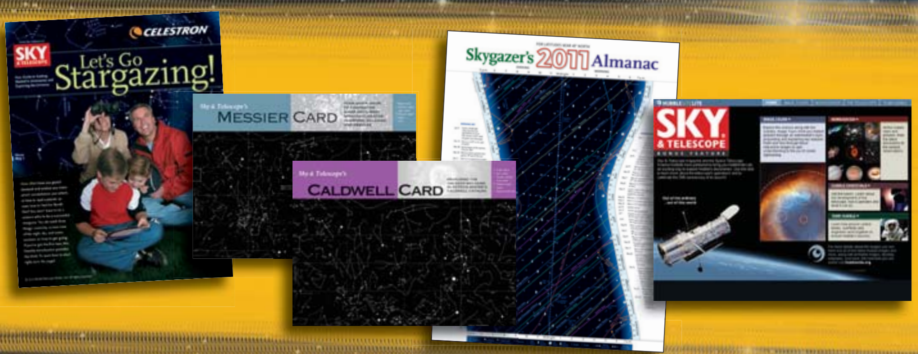

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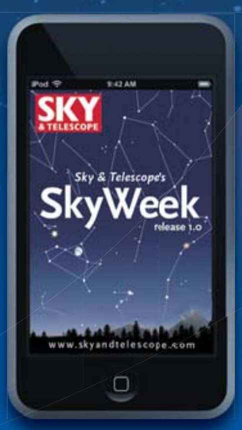

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