

Journal of the Association of Lunar & Planetary Observers



Founded in 1947

The Strolling Astronomer

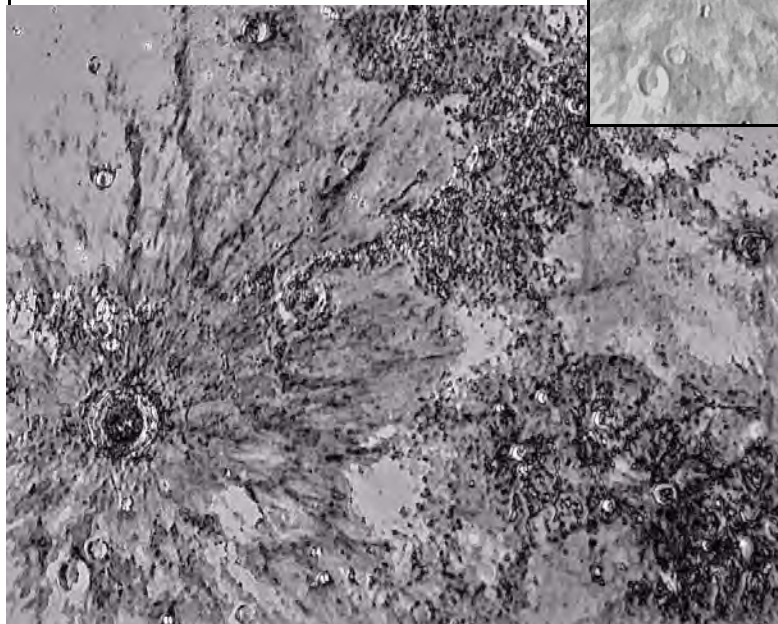
Volume 50, Number 4, Autumn 2008

Now in Portable Document Format (PDF) for Macintosh
and PC-compatible computers

Online and in COLOR at <http://www.alpo-astronomy.org>

Inside this issue . . .

- ***Minutes of the ALPO board meeting at ALCon Expo 2008***
- ***First detections of the North Polar Cap of Mars***
- ***Observing the Quadrantids from 47,000 feet***
- ***A report on the 1997-98 Galilean Satellites eclipse timings***
- ***. . . plus reports about your ALPO section activities and much, much more***



Two images of the northeastern ray system of Copernicus by William Dembowski, FRAS, using "negative difference processing". Look for more on this intriguing technique in JALPO51-1 (Winter 2009 issue). Details on this image: location, Elton, Pennsylvania USA (North 40°.277 - West 78°.798); date, August 13, 2008, 01:46 UT; colongitude, 48.1°; telescope, Celestron 8-inch SCT; seeing: 4/10 (10 = best); camera, Orion StarShoot II; filter: IR Block; exposure: 5 fps, over 60 seconds; RegiStax 4: Stacked 60/300 frames - Wavelet processed.

Anacortes Telescopes

Announcing the New Baby "Q"

*Newest and Smallest member of the
Takahashi FSQ Series of flat field astrographs*

Designed for digital imaging ■ Easily airline transportable ■ 12.68" collapsed and weighs less than 9 lbs. ■ Built-in fine focuser, made for imaging with medium format CCD and DSLR cameras ■ Flat-field color-free high quality images!

TAKAHASHI

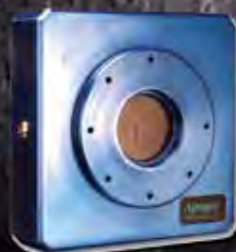


Televue Eyepieces
Nagler, ETHOS, Panoptic
Wide field of view
High contrast



CELESTRON

CGE 1100 11" Schmidt-Cassegrain
Fully computerized Equatorial mount
w/StarBright XLT Coatings



Apogee
Instruments Inc.
High Performance
CCD Cameras



SBIG
ASTRONOMICAL
INSTRUMENTS

Full line of self-guiding
CCD cameras



MEADE

New! mySKY PLUS
Personal Guide for
Sky Exploration
Fun, interactive,
hand-held guide
to the universe
Now faster with
more multimedia!

LX200-ACF 10"
Advanced Coma Free
GPS SmartDrive mount
with AutoStar II
UHTC Coatings



Telescopes ■ Eyepieces ■ CCD Cameras ■ Accessories & More

BuyTelescopes.com

Committed to providing not only the world's best products, but the finest service as well.
Call us or visit us online for competitive pricing and professional service you can rely on again and again.

(800) 850-2001

Secure online ordering 24 Hours a day at BuyTelescopes.com • Auctions ■ Classifieds ■ Forums at Astromart.com

Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 50, No. 4, Autumn 2008

This issue published in September 2008 for distribution in both portable document format (pdf) and also hardcopy format.

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

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

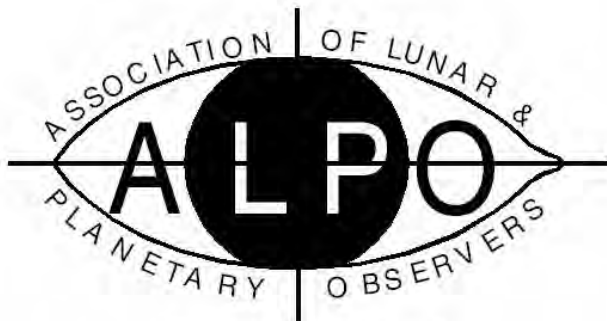
© 2008, Association of Lunar and Planetary Observers (ALPO). The ALPO hereby grants permission to educators, academic libraries and the professional astronomical community to photocopy material for educational or research purposes as required. There is no charge for these uses provided that credit is given to *The Strolling Astronomer*, the "JALPO" or the ALPO itself, as appropriate. All others must request permission from the ALPO.

For membership or general information about the ALPO, contact:

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

E-mail to: will008@attglobal.net

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



Founded in 1947

In This Issue:

Inside the ALPO

<i>Point of View: ALCon Expo 2008 —</i>	
<i>A Look Back.....</i>	3
<i>News of General Interest</i>	
<i>More ALPO observation forms online</i>	4
<i>Orion Telescope partners with the ALPO.....</i>	5
<i>Join/ renew your ALPO Membership Online</i>	4
<i>ALPO Interest Section Reports</i>	4
<i>ALPO Observing Section Reports.....</i>	6
<i>Meet the Member: Howard Eskildsen</i>	14

Feature Stories

<i>ALPO Board Meeting Minutes,</i>	
<i>July 18 and 19, 2008, Des Moines, Iowa.....</i>	15
<i>Book Review: The New Atlas of the Moon.....</i>	20
<i>Bringing the sky to every stargazer:</i>	
<i>The Telescope Grid Project</i>	21
<i>The Quadrantid Multi-Instrument Aircraft Campaign</i>	
<i>(MAC) or Observing the Quadrantids from</i>	
<i>47,000 feet.....</i>	25
<i>First Detections of the North Polar Cap of Mars</i>	
<i>in 2007: A Continuing Conundrum.....</i>	29
<i>Galilean Satellite Eclipse Timings:</i>	
<i>The 1997/98 Apparition</i>	37

ALPO Resources

<i>Board of Directors</i>	47
<i>Publications Staff</i>	47
<i>Interest Sections</i>	47
<i>Observing Sections.....</i>	47
<i>ALPO Publications</i>	48
<i>The Monograph Series</i>	48

Our Advertisers



<i>Anacortes Telescope & Wild Bird</i>	
<i>.....</i>	Inside Front Cover
<i>Orion Telescopes & Binoculars</i>	2
<i>Galileo Telescopes.....</i>	Inside back Cover
<i>Sky & Telescope</i>	Outside Back Cover

ORION Your Affordable Astro-Imaging Source

Smart
Do
Smarter
Design

Orion
does it again.

Labels in diagram:
- Green Laser Guide
- Precision low-speed Coaxial Drive
- An Astro-imaging Assembly for easy transport
- Large diameter altitude bearing with adjustable tension
- An Astro-imaging Assembly for easy transport
- Sub-Equatorial Computerized Mount Location included
- Strong steel on-ship Teflon bearing configuration

ORION TELESOPES & BINOCULARS  **OrionTelescopes.com**
(800) 447-1001  IMAGINOVA



Inside the ALPO Member, section and activity news

Association of Lunar & Planetary Observers (ALPO)

Board of Directors

Executive Director (Chair); Michael D. Reynolds
Associate Director; Richard W. Schmude, Jr.
Member of the Board; Julius L. Benton, Jr.
Member of the Board; Sanjay Limaye
Member of the Board; Donald C. Parker
Member of the Board; Ken Poshedly
Member of the Board; John E. Westfall
Member of the Board & Secretary/Treasurer;
Matthew Will
Founder/Director Emeritus; Walter H. Haas

Publications

Editor & Publisher, Ken Poshedly

Primary Observing Section & Interest Section Staff

(See full listing in *ALPO Resources*)

Lunar & Planetary Training Section:

Timothy J. Robertson

Solar Section: Kim Hay

Mercury Section: Frank Melillo

Venus Section: Julius L. Benton, Jr.

Mercury/Venus Transit Section: John E. Westfall

Lunar Section:

Lunar Transient Phenomena; Anthony Cook

Lunar Meteoritic Impact Search; Brian Cudnik

Lunar Topographical Studies &

Selected Areas Program; William Dembowski

Lunar Dome Survey; Marvin W. Huddleston

Mars Section: Roger Venable

Minor Planets Section: Frederick Pilcher

Jupiter Section: Richard W. Schmude, Jr.

Saturn Section: Julius L. Benton, Jr.

Remote Planets Section: Richard W. Schmude, Jr.

Comets Section: Gary Kronk

Meteors Section: Robert D. Lunsford

Meteorites Section: Dolores Hill

Computing Section: Kim Hay

Youth Section: Timothy J. Robertson

Historical Section: Richard Baum

Eclipse Section: Michael D. Reynolds

ALPO Website: Larry Owens

Point of View

ALCon Expo 2008 — A Look Back

By Michael D. Reynolds, ALPO executive director




The 2008 ALPO Conference with the Astronomical League is now “in the books.” *ALCon Expo 2008*, was held in Des Moines, Iowa, and was superbly hosted by the Des Moines Astronomical Society, DMAS. A solid number of ALPO mem-

bers were in attendance.

The DMAS arranged paper sessions such that there were three parallel sessions held in adjacent rooms, one of which was the ALPO paper sessions. A number of the always-excellent ALPO speakers updated attendees on a variety of observations and projects. The sessions were well-attended, and a number of non-ALPO members attended as well. Matt Will also set up the ALPO display in the vendors' room.

ALPO members were also well-represented at the closing banquet, from receiving a number of awards to the closing banquet talk itself.

Our sincere thanks and congrats go to the Des Moines Astronomical Society for a “Convention well-done!” Next year we're off to New York to again join the Astronomical League on Thursday through Sunday, August 6-8, at Hofstra University, Hempstead, Long Island, NY, as part of the International Year of Astronomy celebration and observance of the 400th anniversary of Galileo Galilei being the first to use the telescope for astronomical observations. 



Inside the ALPO Member, section and activity news

News of General Interest

More ALPO observation forms online

Two additional ALPO forms have been added to the slate of forms already on the ALPO web site:

- active solar region_reportform.pdf
- active solar region_drawingform.pdf

Both are one-page each and serve to ease the job of recording and reporting data for the ALPO Solar Section staff to compile.

All forms are available at [http://www.alpo-astronomy.org/publications/ALPO Observing Forms.html](http://www.alpo-astronomy.org/publications/ALPO%20Observing%20Forms.html) 

Join/ renew your ALPO Membership Online

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


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

Reminder: Address changes

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

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

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

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

ALPO Interest Section Reports

Web Services

**Report by Larry Owens,
acting section coordinator**

Larry.Owens@alpo-astronomy.org

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

Computing Section

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

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 on the World Wide Web at <http://www.alpo-astronomy.org/computing>. 

Lunar & Planetary Training Program

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

The ALPO Training Program currently has 4 active students at various stages of training. And in the past 12 months, we have had orders for 22 copies of the *Novice Observers Handbook*.

The ALPO Lunar & Planetary Training Section uses a two-step program with no time requirement for completing the steps. But I have seen that those students who are motivated usually complete the steps in a short amount of time. The motivation comes from the desire to improve their observing skills and contribute to the pages of the Journal of the ALPO.

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

Late Again . . .

Scottish poet Robert Burns said it best: "The best-laid plans of mice and men often go awry". And that's just what happened this time when with only a few minor matters left to go to complete this issue of *The Strolling Astronomer* even earlier than usual, a major computer crash occurred, requiring repairs/replacements and pushing everything back more than a week. My apologies to all who were inconvenienced. -- Ken Poshedly, editor & publisher



Inside the ALPO Member, section and activity news

Orion® SkyQuest XX12 IntelliScope® Truss Tube Dobsonian

Orion Telescopes & Binoculars announces the SkyQuest XX12 IntelliScope® Truss Tube Dob. It's a deep-sky observer's dream scope, offering jumbo 12-inch Pyrex optics, a stylish, reduced-weight base outfitted with IntelliScope object location technology; and a sturdy, truss tube design (four captive pairs) that easily disassembles into compact, easily portable components. It comes equipped with a dual-speed (11:1) 2-inch Crayford focuser, large 8-inch altitude bearings, Ebony Star on virgin Teflon azimuth bearings, a full set of great accessories, and a computerized database of 14,000 celestial objects.

Price: \$1,299.95 (sku 9793)
(t): 800.447.1001
(w): www.oriontelescopes.com



The course of instruction for the training program is two-tiered. The first tier is known as the "Basic Level" and includes reading the ALPO's *Novice Observers*

Handbook and mastering the fundamentals of observing. These fundamentals include performing simple calculations and understanding observing techniques.

Orion Telescope partners with the ALPO

The Assn of Lunar & Planetary Observers announces that it has joined an affiliate program operated by Orion Telescopes & Binoculars.


Visitors to the ALPO website at <http://www.alpo-astronomy.org> will now see a series of small Orion-sponsored "banners" for the new Celestron Product Center, the Starry Night software store, and the main site for Orion Telescopes & Binoculars.

Clicking on any of these banners and then completing an online purchase within 30 days of that "click" supports the ALPO with a small percentage of the purchase price going to the ALPO.

The Orion product line includes a myriad of merchandise indispensable to lunar and planetary observers including not only telescopes, but eyepieces of various types, sizes and powers, contrast filters for enhancing easily missed details, mounts for tracking, charts, books, and so much more.

The high quality of Orion products is also indisputable.

Most of you may already know that Orion Telescopes & Binoculars is the largest multi-channel brand of quality optics for amateur astronomers and outdoor enthusiasts in North America. Established in 1975, Orion built its reputation on providing high-quality products backed by a 100% satisfaction guarantee, competitive prices, and the best customer service and support in the industry.

We invite all who are considering an online purchase of astronomical merchandise to do so via this online method and also support the ALPO. 



Starry Night Enthusiast 6.2

NEW 6.2 Version

Bring the Moon, the stars, the galaxy to your computer desktop

Starry Night Store

Learn More

Your Affordable Astro-Imaging Source

Innovative Astro-Imaging Gear for Non-Gazillionaires!

StarShoot™ Pro Deep Space CCD Color Imager (telescope not included)

\$1299.00

NEW!

ORION TELESCOPES & BINOCULARS

BUY NOW! telescope.com

We've Got Hot

NEW

Fall Products!



ORION TELESCOPES & BINOCULARS

telescope.com


BUY NOW! ▶



Inside the ALPO Member, section and activity news

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

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

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

ALPO Observing Section Reports

Eclipse Section

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

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

Comets Section

Gary Kronk,
acting section coordinator
kronk@cometography.com

Visit the ALPO Comets Section on the World Wide Web at <http://www.alpo-astronomy.org/comet>. 

Meteors Section

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

A special report on participation by Assistant Section Coordinator Robin Gray in a NASA study of the Quadrantids appears later in this issue.

Visit the ALPO Meteors Section on the World Wide Web at <http://www.alpo-astronomy.org/meteor>. 

Meteorites Section

Report by Dolores Hill,
section coordinator
dhill@jpl.arizona.edu

The ALPO Meteorites Section encourages the appreciation and understanding of meteorites. Serious amateurs are excited to examine physical samples of the bodies they study via telescope and CCD. The ALPO Meteorites Section website provides some basic information about meteorites, identification, and classification. Note that although it may be possible to identify a meteorite on visual inspection, a real classification and name require chemical analysis and subsequent approval by the Meteoritical Society's Nomenclature Committee. That Society's website at <http://tin.er.usgs.gov/meteor/metbull.php> currently records 34,562 official meteorites and 11,890 provisional names.

In some cases, it is possible for many fragments or even whole stones to be found at the site of an already known meteorite. Understandably, meteorite hunting is met with mixed reaction by landowners and meteorite ownership laws vary from country to country. Some meteorite hunters are polite and careful to obtain permission where needed, while others are not. So rather than sending amateurs out into the field, the ALPO Meteorites Section will concentrate on what can be learned from meteorites, resources, suggestions for personal collections, storage, and preservation.

Several topics for future discussion are:

- Can we really collect micrometeorites from drain spouts?
- Is it possible to collect samples from meteor showers?

- How do we know that that meteorite is from the Moon or Mars?
- How are meteorites classified (not all are metal!)?
- How can I start a meteorite collection?
- How can I store, preserve, and/or restore my meteorites?
- Where can I go if I think I have found a new meteorite?

Visit the ALPO Meteorite Section on the World Wide Web at <http://www.alpo-astronomy.org/meteorite/> 

Solar Section

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

A special report by Howard Eskildsen on sunspot activity in Cycle 23 appears later in this issue.

The debate is still on as to whether or not we are still in the twilight of Cycle 23 or in the infancy of Cycle 24. Since our last note in *The Strolling Astronomer*, the Sun has been very inactive on the sunspot side, but has been active in prominences.

On July 18, 2008 (CR2072) the Sunspot number had rolled over to AR1100 when there was a small sunspot and group that lasted a few days, then it was gone.

Currently, we are in Carrington Rotation CR2073, which had been spotless until August 21-22, when a disturbance area showed up, that showed reversed polarity signalling a Cycle 24 sunspot, and played with one reported group with 3 spots, but NOAA had never classified it as a sunspot.

Gema Araurjo from Spain, posted a reply from NOAA on a question she had several years ago on how NOAA classifies a sunspot/group. I contacted Larry Combs of NOAA on August 25, 2008 - which is now NOAA - Space Weather Prediction Center, and the information below is correct.

"Dear Gema,

Thank you for your contact and interest in our service. The NOAA Space Environment



Inside the ALPO Member, section and activity news

Center (SEC) assigns a number to each active solar region.

This is done for two reasons; 1. tracking and location and 2. to keep a history of the region and its activity.

The SEC sunspot data is provided by a dedicated observatory network located around the world through a partnership with the U.S. Air Force solar observatories.*

Solar Regions qualify for assignment of a NOAA number if they meet one or more of the following conditions:

- Contain a conspicuous spot group (Class C or larger)
- Contain a class A or B group confirmed by at least two observers
- Produce a solar flare
- Plage is at least a brightness of 2.5 (on a scale 1-5, 5=flare)
- Plage is bright near the west limb of the sun and is suspected of growing

There are other factors which are considered in assigning region numbers to simple small spot groups, groups which are closely-spaced, and regions near the east limb of the sun."

The observatories used by NOAA include:

- Mount Wilson Observatory, California

Current U.S. Air Force observatories used are:

- Holloman AFB Solar Observatory, New Mexico
- Learmonth Solar Observatory, Australia
- San Vito Air Station Solar Observatory, Italy

According to Larry Combs of NOAA, the spot/disturbance that appeared on August 21/22 did not fulfill the criteria needed for a group classification number, therefore none was given.

There is also the SIDC- Solar Influences Data Analysis Centre [<http://sidc.oma.be/index.php3>] which is the home of International Sunspot Number Tracking. The SIDC

is the solar physics research department of the Royal Observatory of Belgium.

To date, it has the July 2008 results online, but the August 2008 results will not come out until after September 1, so we will have to see if they counted the disturbance as a sunspot and group. Many of the ALPO observers did view and photograph the area.

As we are all actively waiting for the new cycle to begin, and the activity on the sun to start, now is a good time, to get yourself familiarized with observing, and understanding all the elements the Sun has to offer. We would like to see solar observers take their time, and record their data, whether it be sketching, white light, H-alpha (H?) or Calcium (CaK) images. We ask that all times be in UT, date (eg. 2008-08-24) description of your equipment used, and anything of interest during your observation. Images should be 200-250 k in size, we will take bmp, jpg, and gif. If possible, please include the Lo, Bo, Po ephemeris notation, which is located on the <http://www.alpo-astronomy.org/solar> website. Send your images to Kim.Hay@alpo-astronomy.org

We look forward to your observations, so that we can archive and share our results with all solar observers.

For more information on observing the Sun and images, go to <http://www.alpo-astronomy.org> 

Mercury Section

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

October 2008 should be an exciting month for planet Mercury. First, the MESSENGER spacecraft will make its second flyby on Oct. 6th. But unfortunately, Mercury won't be visible to us because it will be at inferior conjunction (between Earth and the Sun). But the spacecraft will provide us with even more new information about the unseen surface of the planet (from the Earth's perspective).

Tying in with this, I have submitted a paper for publication in this Journal about the first MESSENGER flyby and a comparison with Earth-based observations.

Secondly, I plan to attend the Division of Planetary Science (DPS) meeting in Ithaca, NY, Oct. 11 thru Oct. 13, 2008. This is a professional meeting, but of course, amateurs are welcome, too. I will give a postal presentation on Mercury showing the work we ALPO observers have done. Christopher Go of the Philippines will be my sponsor. We have great observations and hopefully, we will convince the professionals in attendance that amateurs are capable of doing some serious work.

Finally, Mercury itself will be favorably placed for morning sky observers soon, with the last two weeks of October being a prime-time window to observe. Again, we will have one famous feature — "Skinakas



Announcing, the ALPO Lapel Pin

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

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

Free for those who hold or purchase ALPO Sponsor level memberships.

Only \$3.50 for those who hold or purchase Sustaining level memberships

Only \$8.50 for all other ALPO members.
Not available to non-ALPO members.

Price includes shipping and handling.

Send orders to: ALPO, PO Box 13456, Springfield, IL 62791-3456. E-mail to: will008@attglobal.net



Inside the ALPO Member, section and activity news

Basin" — facing us. It is still a mystery but hopefully, we will get many good drawings and images showing this feature. The more observations we have, the better ideas we get.

Ed Lomeli and John Boudreau continue to image Mercury, while Carl Roussell continues his drawings. In 2008, they provide the most contributions to the ALPO Mercury Section, and I am hoping others will follow their examples.

Visit the ALPO Mercury Section on the World Wide Web at <http://www.alpo-astronomy.org/mercury>.

Venus Section

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

Venus reached Superior Conjunction on June 9th, 2008, thereby ending the 2007-08 Western (Morning) Apparition. A total of 341 observations, including drawings and digital images, were received. More observations are arriving as observers assemble their reports and submit them.

Venus has already emerged east of the Sun and is now visible low in the Western sky after sunset, marking the beginning of the 2008-09 Eastern (Evening) Apparition. As the observing season progresses, the planet will pass through its waning phases (a gradation from gibbous through crescentic phases), and as of this writing (in early Sept), its gibbous disk is only 11.0 arc seconds across and 91.7% illuminated. Venus reaches Greatest Elongation East on January 14th, theoretical dichotomy (half phase) on January 17th, and greatest brilliancy on February 18, 2009. During the 2008-09 Eastern (Evening) Apparition observers will see the leading hemisphere of Venus at the time of sunset on Earth. The table of Geocentric Phenomena of the 2008-09 Eastern (Evening) Apparition in Universal Time (UT) is presented here for observational planning purposes.

The Venus Express (VEX) mission started systematically monitoring Venus at UV, visible (IL) and IR wavelengths back in late May 2006. As part of an organized Professional-Amateur (Pro-Am) effort, a few ALPO Venus observers submitted high quality digital images of the planet taken in the near-UV and near-IR, as well as other wavelengths through polarizing filters. The observations

should continue to be submitted in JPEG format to the ALPO Venus Section as well as to the VEX website at:

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

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

Key observational endeavors include:

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



A recent drawing of Venus' nearly full disk in a daylight sky on September 1, 2008 at 20:05UT by Carl Roussell of Hamilton, Ontario, Canada, using a 15.2 cm (6.0 in.) refractor employing W47 (violet), W25 (red), and W58 (green) filters to help reveal subtle contrasts and dusky atmospheric markings. Areas of varying brightness are set off by dotted lines on the drawing. S = 4.5, Tr = daylight sky. Apparent diameter of Venus is 11.0", phase (k) 0.919 or 91.9% illuminated, and visual magnitude -3.91. South is at top of image.

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

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

Complete details can be found about all of our observing programs in the ALPO Venus Handbook.

Individuals interested in participating in the programs of the ALPO Venus Section are encouraged to visit the ALPO Venus Section on the World Wide Web at <http://www.alpo-astronomy.org/venus>.

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

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



Inside the ALPO Member, section and activity news

Lunar Section:

Lunar Topographical Studies / Selected Areas Program

Report by William M. Dembowski,
FRAS, program coordinator

bill.dembowski@alpo-astronomy.org

During the second quarter of 2008, the ALPO Lunar Topographical Studies Section (LTSS) received a total of 206 new observations from 26 observers in nine countries and nine states. Emphasis during the period was on the study of Rupes Recta and vicinity. A report on this project was compiled and published in *The Lunar Observer*.

Rik Hill is a regular contributor to LTSS programs who made his first astronomical observation (a transit of Mercury) as a schoolboy in 1957. Rik joined the ALPO in 1975 and has been an active member ever since. In 1983 he helped found the ALPO

Solar Section and later established and maintained the ALPO Website for many years.


Rik lives in Tucson, Arizona, where both he and his wife, Dolores (Coordinator of the ALPO Meteorites Section), are employed by the Lunar & Planetary Laboratory at the University of Arizona. Rik is an accomplished and prolific imager who works with both a 14-inch SCT and a Questar. He has two web pages devoted to his lunar imaging — both of which make excellent research tools for lunar enthusiasts.

Rik Hill's "Jim Loudon Observatory" lunar database and images:

<http://www.lpl.arizona.edu/~rhill/moonobs.html>

<http://www.lpl.arizona.edu/~rhill/questar.html>

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

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

Lunar Domes Survey

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


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



Lunar Transient Phenomena

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

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

- <http://www.alpo-astronomy.org/lunar/ltp.html>
- <http://www.ltpresearch.org/> 



Digital mosaic of Ariadaeus to Triesnecker by Rik Hill taken June 11, 2008, 02:47 UT. Colongitude was 358.8°. Equipment: 35-year-old Celestron C14 SCT with 2x Barlow, SPC900NC Camera, UV/IR blocking filter. Rik says, "All three of my Celestrons are 30-35 years old and of excellent quality." Location: Jim Loudon Observatory, East Tucson, AZ USA, Longitude 110.77554° W, (110° 46' 31.9"), Latitude: 32.18006° N (+32° 10' 48.2"), Height above sea level: 2,875 ft. Transparency was 9 (out of a possible 10, with 10 being best) and seeing was. I recall the evening quite clearly; I was fighting wind and had to block it with a 4x8-ft sheet of plywood propped up. This is a montage of 5 images, each 200 frames from 2,000-frame AVI's taken with the SPC900NC; masks were used to even out the lighting. (<http://www.lpl>).



Inside the ALPO Member, section and activity news

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

Oct. 01	00:00	Moon 5.0° SSW of Mars
Oct. 01	23:00	Moon 4.8° SSW of Venus
Oct. 05	11:00	Moon at Apogee (404,715 km - 251,478 miles)
Oct. 07	08:00	Moon 2.4° S of Jupiter
Oct. 07	09:05	First Quarter
Oct. 10	09:00	Moon 0.81° NW of Neptune
Oct. 12	12:00	Moon 3.5° NNW of Uranus
Oct. 14	20:03	Full Moon
Oct. 17	06:00	Moon at Perigee (363,826 km - 226,071 miles)
Oct. 21	11:56	Last Quarter
Oct. 25	04:00	Moon 4.5° SSW of Saturn
Oct. 27	11:00	Moon 6.5° SSW of Mercury
Oct. 28	23:14	New Moon (Start of Lunation 1062)
Oct. 29	22:00	Moon 4.9° SSW of Mars
Nov. 01	08:00	Moon 2.6° S of Venus
Nov. 02	05:00	Moon at Apogee (405,722 km - 252,104 miles)
Nov. 03	23:00	Moon 1.9° SSE of Jupiter
Nov. 06	04:03	First Quarter
Nov. 06	19:00	Moon 1.0° NNW of Neptune
Nov. 08	21:00	Moon 3.7° NNW of Uranus
Nov. 13	06:18	Full Moon
Nov. 14	10:00	Moon at Perigee (358,972 km - 223,055 miles)
Nov. 19	21:32	Last Quarter
Nov. 21	14:00	Moon 5.0° SSW of Saturn
Nov. 27	16:55	New Moon (Start of Lunation 1063)
Nov. 27	20:00	Moon 3.7° S of Mercury
Nov. 27	22:00	Moon 4.1° S of Mars
Nov. 29	17:00	Moon at Apogee (406,479 km - 252,574 miles)
Dec. 01	16:00	Moon 0.80° N of Venus
Dec. 01	16:00	Moon 1.3° SSE of Jupiter
Dec. 04	02:00	Moon 1.3° NNW of Neptune
Dec. 05	21:25	First Quarter
Dec. 06	06:00	Moon 3.9° NNW of Uranus
Dec. 12	16:38	Full Moon
Dec. 12	22:00	Moon at Perigee (356,567 km - 221,560 miles)
Dec. 18	22:00	Moon 5.4° SSW of Saturn
Dec. 19	10:30	Last Quarter
Dec. 26	18:00	Moon at Apogee (406,600 km - 252,650 miles)
Dec. 26	24:00	Moon 2.7° S of Mars
Dec. 27	12:22	New Moon (Start of Lunation 1064)
Dec. 29	03:00	Moon 0.66° NNW of Mercury
Dec. 29	09:00	Moon 0.63° S of Jupiter
Dec. 31	09:00	Moon 1.5° NNW of Neptune
Dec. 31	18:00	Moon 3.1° NNW of Venus

(Table courtesy of William Dembowski)

Lunar Meteoritic Impact Search

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

To date, the ALPO Lunar Meteoritic Impact Search (LMIS) section has collected observations of some 80 impact candidates over the 8.7 years it has been in operation. Of these, 10 have been confirmed with an eleventh a likely confirmation.

As I was assembling the catalog to publish in the book mentioned below, I came across a pair of observations made during the 2002 August Perseid campaign. Both observations were made at 1:28:03UT on 13 August by Peter Gural and Kevin Wigell. Position information is missing, but the likelihood of two lunar meteoritic impacts occurring at exactly the same time (or within less than a second) at separate locations is quite remote. For now, this event is rendered "tentatively confirmed" and is very likely the first non-Leonid meteor strike to be confirmed as such.

More recently, the February total eclipse was monitored for meteoritic impacts by Mr. George Varros, who recorded two impact candidates at 2:23:47 UT and 3:19:57 UT on 18 February 2008. As of this date, these are unconfirmed, and no other reports have been received. Bad weather across much of the U.S. severely hindered observations.

Four candidate impact events were observed by two regular impact observers: Mr. George Varros and Mr. Robert Spellman. The South delta-Aquarids and the Perseids were the main events during the months leading up to the date of this report. During the June to August timeframe, no reports of impact candidates were received for the South delta-Aquarids campaign. Meteorites were observed striking the Moon during the Perseid meteor shower on 9 April at 1:59:46, 2:18:18, 2:27:04, and 4:06:22 (all times UT). Images of the events can be seen at the following websites:

<http://www.angelfire.com/space2/robertspellman/observationarchive.html>

http://www.lunarimpacts.com/022704_candidate.jpg


<http://www.lunarimpacts.com> has more impact images and videos



Inside the ALPO Member, section and activity news

Work will begin soon on coordinating efforts for the 2009 LCROSS ("Lunar Crater Observation and Sensing Satellite") mission which will feature two man-made impacts at one of the Moon's poles. The purpose of these impacts is to search for water in the permanently shadowed lunar polar regions. Another purpose is to refine our current models of impact dynamics. Interested parties are encouraged to contact me at the e-mail address given at the beginning of this report, or visit the LMIS website, which will have material early this fall.

Work is coming to an end on completion on a book entitled *Lunar Meteoroid Impacts and How to Observe Them*. I plan to submit the material no later than 10 October, and if all goes well, the book should be available by the summer of 2009. This book not only discusses lunar meteoritic impacts, but also includes information about craters and how to observe them. This information includes crater morphology versus size, morphology versus age, and other aspects to look for when observing lunar craters. Craters elsewhere in the solar system are also discussed. More information will be coming in a future edition of this section report and the LMIS web site.

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

Mars Section

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

A report on some preliminary findings appears later in this issue.

The Mars apparition is drawing to a close, and we are overwhelmed by the thousands of high-quality observations that have been made during the 2007-2008 apparition. Now is a good time for aficionados to plan certain equipment upgrades they might want to make before the next apparition. (What do you want for Christmas?) Meanwhile, be watching these pages for reports on the just-completed viewing season. The first is in this issue.

Join us on the Yahoo Mars observers' message list at <http://tech.groups.yahoo.com/group/marsobservers>. There you can

share in discussions of observing Mars and post your images and drawings.

Visit the ALPO Mars Section on the World Wide Web at <http://www.alpo-astronomy.org/mars>. 

Minor Planets Section

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

Minor Planet Bulletin Vol. 35, No. 3, contains lightcurves and rotation period determinations for 108 different asteroids. An increasing number of these result from collaboration between observers at greatly differing longitudes. These permit one observer to cover the part of the lightcurve missed by the other during daylight. We congratulate the many contributing observers, most of them amateurs.

Some of these are the first ever published for the asteroid, including some for which the periods are secure and others with periods still uncertain; some are improvements from earlier determinations; some are at new aspects to aid in spin/shape modeling. Asteroids included are Nos. 26, 34, 74, 143, 168, 256, 272, 294, 332, 408, 419, 443, 547, 557, 667, 789, 793, 892, 1033, 1092, 1099, 1126, 1136, 1240, 1251, 1284, 1292, 1303, 1379, 1411, 1432, 1443, 1464, 1479, 1488, 1607, 1620, 1650, 1664, 1685, 1797, 1810, 1825, 1855, 1900, 2093, 2167, 2173, 2268, 2284, 2345, 2378, 2606, 2709, 2807, 2911, 2912, 2976, 3086, 3236, 3401, 3409, 3415, 3722, 3915, 3971, 4375, 4755, 4771, 4859, 5615, 5783, 5806, 6033, 6296, 6310, 6384, 6411, 6823, 6905, 7267, 7281, 7283, 7560, 7579, 8085, 8828, 9117, 9120, 10826, 11780, 13578, 19309, 22275, 24819, 26471, 26916, 27921, 30220, 34484, 40326, 41223, 143243, 170891, 2007 TF8, 2007 VD12, 2007 XH16, 2008 CN1.

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

In addition, please visit the ALPO Minor Planets Section on the World Wide Web at <http://www.alpo-astronomy.org/minor>.



Jupiter Section

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

Three recent developments on Jupiter include the passage of Oval BA (or the "Little Red Spot") past the Great Red Spot in early July. A second event was the disappearance of a small red spot during the summer. Finally, a rift is developing in the south edge of the NEB. I would like for everyone to continue observing Jupiter and report their findings to his Section.

This coordinator has also been busy with organizing the Jupiter archives. The Jupiter archives extend from 1928 to 2008 and are organized into about 50 to 60 three-ring binders. I have been organizing boxes of old observations into the three ring binders. At some point, I hope to scan (or pay somebody to scan) all of the Jupiter observations into digital format. I have also completed the 2006 Jupiter apparition report and this is in the hands of the editor.


Finally, I would like to remind everyone that John McNally's book, *Jupiter and How to Observe It* is available from Springer. Just go to the Springer website to order this book.

Visit the ALPO Jupiter Section on the World Wide Web at <http://www.alpo-astronomy.org/jupiter>. 

Galilean Satellite Eclipse Timing Program

Report by John Westfall,
assistant section coordinator
johnwestfall@comcast.net

New and potential observers are invited to participate in this worthwhile ALPO observing program.

Contact John Westfall via regular mail at P.O. Box 2447, Antioch, CA 94531-2447 USA; e-mail to address shown above to obtain an observer's kit, which includes Galilean satellite eclipse predictions for the 2007-09 apparition. 



Inside the ALPO Member, section and activity news

Saturn Section

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

Now that the 2007-08 apparition has ended, the ALPO Saturn Section has accumulated 500 reports and images for this closing observing season, although more contributions from observers is expected for several more months as they assemble and organize their data.

Sporadic activity was captured during 2007-08 with digital imagers and also reported by visual observers, especially in the form of small white spots in the STrZ and SEBZ, and details will appear in a full apparition report in a few months. Saturn reached conjunction with the Sun on September 4, 2008, being hidden from view by the Sun. By the third week of September, however, the planet will be visible low in the Eastern morning sky with a ring tilt of only -3.9° . Geocentric phenomena for 2008-09 are presented in the accompanying table for the convenience of observers:

Since the last edge-on orientation of the rings back in 1995, the southern hemisphere and south face of the rings have been inclined toward Earth. That will change once the Sun and Earth pass through the ring plane headed northward in August and September 2009, respectively; therefore, the northern hemisphere and north face of the rings will become increasingly visible for over a decade.

At edgewise presentations, equal portions of the southern and northern hemisphere are visible, separated by the ring plane. Since the ring passages of the Earth and Sun through Saturn's ring plane occur so close to the time of the planet's conjunction with the Sun, observational conditions will be highly unfavorable. Even so, it is a normal practice at times of edgewise orientation of Saturn's rings to try to determine just how close to the theoretical edge-on positions the rings can actually be imaged or seen with a given telescope.

It must be pointed out that that conditions for observing these fascinating edgewise events will be much more favorable for observers in the Earth's Southern Hemisphere. There the two passages occur when the tilt of the ecliptic to the horizon just after sunset, and with Saturn briefly visible, will

be close to its maximum value near their Spring Equinox.

The apparent disappearance of the ring system, which often occurs a number of times during a short interval, can be ascribed to one or more of the geometric circumstances as follows: (a) the Earth may be in the plane of the rings so that only their edge is presented to viewers, and since the rings are quite thin, they may be temporarily lost to even the largest telescopes, (b) the Sun may be in the plane of the rings so that only their edge is illuminated, and (c) the Sun and Earth may be on opposite sides of the ring plane, so what observers see on Earth are regions that are illuminated only by light that is passing through the rings (forward scattering). As mentioned, however, views of the actual edge-on presentation of the rings will be hampered by the close proximity of Saturn to the Sun in 2009.

In 2008-09, when the inclination of the plane of the rings becomes minimal, the best opportunities also occur for observing transits, shadow transits, occultations, and eclipses of those satellites that lie near Saturn's equatorial plane. Small apertures are usually unable to produce optimum views of most phenomena of Saturn's satellites, except perhaps with the case of Titan. Larger telescopes generally make observations of events involving the satellites more worthwhile. It will be interesting to see what imaging with various instruments will reveal, since controversy persists as to whether

shadow transits of any of the satellites other than Titan are visible from Earth with large instruments. Nearly all of the satellites are presumed to be too small to cast umbral shadows onto the globe of the planet Saturn.

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

For 2008-09, in addition to observing and imaging phenomena specific to the edge-on ring presentation, the following are important activities for ALPO Saturn observers:

- Visual numerical relative intensity estimates of belts, zones, and ring components.
- Full-disc drawings of the globe and rings using standard ALPO observing forms.

Geocentric Phenomena for the 2007-2008 Apparition of Saturn in Universal Time (UT)

Conjunction	2008 Sep 04 ^d UT
Opposition	2009 Mar 08 ^d
Sun passes thru the Ring Plane S --> N	2009 Aug 10 ^d
Earth passes thru the Ring Plane S --> N	2009 Sep 04 ^d
Conjunction	2009 Sep 17 ^d
Opposition Data:	
Equatorial Diameter Globe	19.0 arc-seconds
Polar Diameter Globe	17.6 arc-seconds
Major Axis of Rings	44.6 arc-seconds
Minor Axis of Rings	2.2 arc-seconds
Visual Magnitude (m_v)	$-0.5m_v$ (in Leo)
B =	-2.7°



Inside the ALPO Member, section and activity news

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

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

All observers should compare what can be seen visually with what is apparent on their images, without overlooking opportunities to make visual numerical intensity estimates using techniques as described in the author's new book, *Saturn and How to Observe It*, available from Springer, Amazon.com, etc. Although regular imaging of Saturn is extremely important and encouraged, far too many experienced observers have neglected making intensity estimates, which are badly needed for a continuing comparative analysis of belt, zone, and ring component brightness variations over time, so this type of visual work is strongly encouraged before or after imaging the planet.

To continue to support our ongoing Pro-Am efforts in association with the Cassini imaging team, observers should employ classical broadband filters (Johnson UBVRI system) on telescopes with apertures of 31.8 cm (12.5 in. or larger) to image Saturn, including imaging using a 890nm narrow band methane (CH₄) filter. Our data are being used to alert the Cassini team of interesting large-scale targets, and suspected changes in belt and zone reflec-

tivity (i.e., intensity) and color detected by visual methods are also useful. Be sure to include all supporting data such as time and date (UT), instrumentation used, observing conditions and location, etc., since without this fundamental information, observations are essentially useless.

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

Information on ALPO Saturn programs, including observing forms and instructions, can be found on the Saturn pages on the official ALPO Website at <http://www.alpo-astronomy.org/saturn>.

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

Remote Planets Section

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

Annual newsletters of Uranus and Neptune have been distributed either electronically or by postal mail. This newsletter contains finder charts for both planets along with comparison star magnitudes. Please let me know if you would like a copy of this newsletter.

The 2007 apparition report for Uranus and Neptune was completed and is now with the editor of this Journal. Over two dozen people participated in the Remote Planets Section in 2007. Please be sure to send me your images and observations. Both Uranus and Neptune will be well-placed in the evening sky during the fall months.

On a final note, my book titled *Uranus, Neptune and Pluto and How to Observe Them* is available from Springer. Just go to the Springer website at <http://www.springer.com/astronomy/popular+astronomy/book/978-0-387-76601-0> or elsewhere, such as <http://www.amazon.ca/Uranus-Neptune-Pluto-Observe-Them/dp/0387766014>, to order a copy.

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



Two white spots, the leading one located on the CM and the other approaching it, are visible in this digital image of Saturn captured by Jim Melka of St. Louis, Missouri, USA, using a 30.8cm (12.0 in.) Newtonian on April 30, 2008, at 03:18UT. CMI=154.2° CMII=68.5° and CMIII=294.2°. The tilt of the rings is -7.3°. South is at the top in the image. Other observers have been reporting similar features in the STRZ, as well as in the SEBZ.



Inside the ALPO Member, section and activity news

Meet the Member: Howard Eskildsen

By Kim Hay
ALPO Solar Section Coordinator

(Howard submits white light photography images every chance he gets, and is very active and helpful on the ALPO Solar Section e-mail list. Below, in his own words, is a brief introduction of Howard. His article on the ongoing Cycle 23 moving into Cycle 24 appears later in this issue of *The Strolling Astronomer*. Thank you Howard, for bringing your viewpoint of the ongoing solar cycles.)

I learned to love the night sky as a kid growing up under clear dark skies in central Nebraska. I remember the Milky Way being so bright that it looked almost three-dimensional. With a little help from a teacher and a lot of self-study with nearly every astronomy book I could find, I learned the constellations and as much as my middle-school mind could grasp about astronomy. I even ground and polished a 6-inch mirror and used that for a time to observe.

Much of my interest was placed on the back burner as I attended college and later, medical school, and generally worked my butt off to keep on top of my profession. But it (my sky interest) lingered on and 5-6 years ago, I again found time to pursue my lifelong interest in the skies, with special attention to the Sun and the Moon. The 6-inch reflector had mediocre optics, and I contemplated a new scope, so my wife, Fairy (yes, that IS her given name) bought me a Meade ETX-125 for Christmas in 2001. It is a great all-around scope and I use it nearly exclusively for solar photography.

I used it on various sky objects, but discovered the Sun and the Moon and began to concentrate on them, and little by little, learned how to photograph through it as well. In 2003, we moved to Ocala, Florida, where we currently live. There, I discovered very steady skies and had the good fortune of meeting Jose Olivarez giving a local astronomy lecture. He left an open invitation to anyone to join him at his home, which I did several times a month. He had a great knowledge of the Moon and of astronomy in general that he kindly shared until his passing two years ago. He encouraged my efforts in photography and eventually sold me his own Meade 6-inch refractor which has wonderful optics. I currently use it regularly for lunar photography.

In 2003, I learned of the ALPO and joined, not knowing exactly what to expect. I received encouragement and at first, began submitting solar photos, then later submitted lunar photos to the appropriate sections. Since that time, I have observed over 1,050 days and submitted over 1,700 observations to the ALPO Solar Section. I have also submitted several hundred observations to the Lunar Section, and have written reports that have appeared in *Selenology* and in these pages of the JALPO. Several of my photos have been featured on www.SpaceWeather.com, www.Astronomy.com, and Lunar Photo of the Day (<http://lpod.wikispaces.com>).

I continue to practice family medicine, mainly caring for the Medicare age group. Besides astronomy, I am interested in general photography, writing and poetry. My wife and I enjoy travel and enjoy our nearly daily walks that we do for exercise. Florida is a great place to live and we hope to enjoy it for years to come.



ALPO Solar Section observer extraordinaire Howard Eskildsen of Ocala, Florida, with his Meade ETX-125 with Astrosolar Photofilm filter over objective. Says Howard: "I was taking AVI files with Orion StarShoot II for processing of solar images. The computer is in the cardboard box to block glare from the Sun — I call it high tech in a plain brown wrapper. The Meade was a Christmas present from my wife in 2001 and was my first quality telescope. I use it almost exclusively for solar white-light observing and have submitted over 1,700 observations to the ALPO Solar Section. I have photographed with it on more than 1,000 days since I started solar observing regularly in 2003.

Feature Story:

**ALPO Board Meeting Minutes, July 18 and 19, 2008,
Des Moines, Iowa**

**Minutes provided by Matt Will,
ALPO Secretary / Treasurer**

(All photos courtesy of Mike Mattei)

On July 18, 2008, at 3:09 PM CDT (Central Daylight Time), ALPO Executive Director and Board Chairman, Michael D. Reynolds called the ALPO Board to order in the Davenport Room, at the Marriott Hotel in downtown Des Moines, Iowa.

Present were: ALPO Board members, Walter Haas, Don Parker, Michael Reynolds (Chairman), Richard Schmude, John Westfall, and Matthew Will. Board member Sanjay Limaye was absent Friday afternoon but attended the Saturday afternoon session of the Board meeting. Board members Julius Benton and Ken Poshedly could not attend this year's convention and therefore were not present at the Board meeting. Matthew Will was asked to be Julius's proxy on any votes of the Board.

**ISSUE ONE: Approval of the Board
Meeting Minutes of 2007
(Introduced by Matthew Will)**

Board meeting minutes for our 2007 ALPO Board meeting were approved by all the present Board members.

**ISSUE TWO: Location for the ALPO
to Convene in 2009 (Introduced by
Mike Reynolds)**

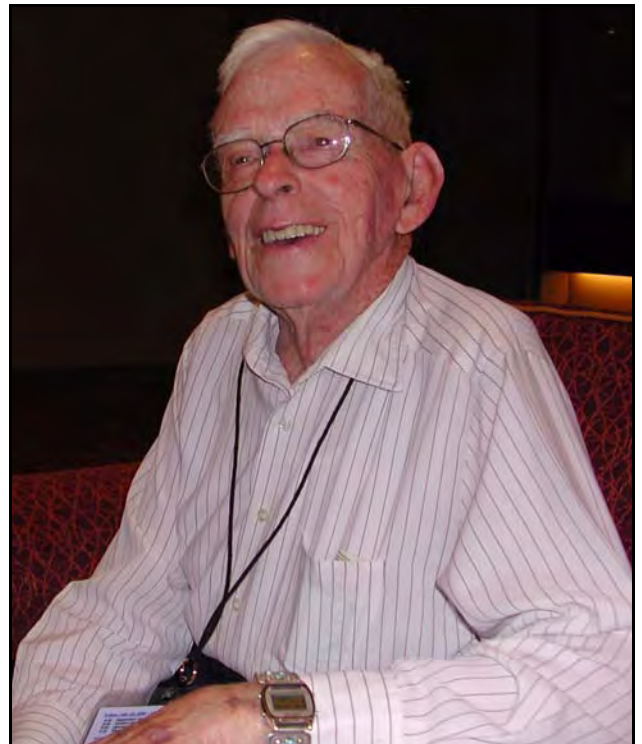
Executive Director, Mike Reynolds introduced two presenters that intend to host future ALCon's (Astronomical League conventions) in 2009 and 2010. The purpose of these presentations from representatives of the host committees was to invite the ALPO as a participating organization in much the same role the ALPO was playing at this ALCon in Des Moines with ALPO paper sessions as a major part of the convention. The first presentation was given by Wayne Green of the Denver Astronomical Society. Along with the Estes Valley Astronomical Society and the

Boulder Astronomical Society, the Denver club tentatively plans to host an ALCon in 2010, in the Denver, Colorado, area. The Astronomical League has not yet selected Denver as a host site for this ALCon, however, no other astronomical societies from other communities have offered to host for that year. Mr. Green said this ALCon would be geared toward having a workshop environment where discussions and activities would concern observing and data collecting techniques. The meeting location would lend itself toward viewable skies with minimal light pollution. The actual host site would be the lodging and conference center in Estes Park, Colorado. This is a resort destination which has both astronomical and nonastronomical attractions. The time frame for this ALCon would be toward the end of July.

Bill Bogardus of the Amateur Observers Society of New York gave a presentation inviting the ALPO to participate in the 2009 ALCon. This ALCon will be held at Hofstra University, in Hempstead, New York, and is scheduled for August 7 and 8. The Astronomical League has already agreed to be hosted here next year. This convention marks the 70th anniversary of the first national gathering of amateur astronomers that eventually led to the formation of the Astronomical League, and New York was the location for that first convention. The 2009 ALCon will have a format similar to the 2008 convention; however, this convention also recognizes that 2009 marks the International Astronomy Year. IAY's purpose is to recognize and publicize the science of astronomy through various astronomical organizations on the 400th anniversary year of the invention of the telescope. So, speakers and papers may be thematic of this observance. A

field trip to the Hayden Planetarium and Rose Center is scheduled on the Aug. 6, prior to the next two full days of the ALCon. On campus, air conditioned dorms are offered for lodging. Parking is free, and Hofstra has such on-campus amenities as a bank, food court and book store. Also, there are plenty of nonastronomical attractions that only New York can provide, so there are opportunities to check out other venues prior to or after the two day ALCon.

The ALPO Board considered these invitations and one other option offered by Mike Reynolds to host the ALPO by itself, in Jacksonville, Florida, at some later year. John Westfall made a motion to accept the invitation from the Amateur Observers Society of New York for ALCon 2009. Don Parker seconded. After discussion, the motion passed with all present Board members voting in the affirmative. The ALPO Board deferred a decision on a



ALPO founder and Director Emeritus Walter H. Haas, still spry, still enjoying things.

meeting site for 2010, at least until the Astronomical League makes a final decision for a meeting site that year.

ISSUE THREE: Membership and Finances (Introduced by Matthew Will)

ALPO Secretary and Treasurer Matthew Will reported to the ALPO Board the ALPO's finances for the preceding year in the annual report submitted to the Board last February. An interim report concern-

ALPO membership dues be increased accordingly:

Sustaining and Sponsor memberships would remain unchanged. The increase would be effective January 1, 2009. John Westfall seconded the motion. After discussion, the motion passed with all present Board members voting in the

Revised ALPO Dues Structure (effective January 1, 2009)

Four issues, paper version; U.S., Canada, Mexico	\$30
Eight issues, paper version; U.S., Canada, Mexico	\$54
Four issues, paper version; all other countries	\$37
Eight issues, paper version; all other countries	\$68
Four issues, digital version; all countries	\$12
Eight issues, digital version; all countries	\$20

members abroad. The ALPO has risen from 57 international members in early 2007 to 84 as of July in 2008.

ISSUE FOUR: Staff Changes (General Board Discussion)

Ken Poshedly made the following motion in writing to the ALPO Board at the Board meeting, Friday afternoon. MOTION: That the ALPO Board of Directors being cognizant of the increased awareness of the planet Mars by NASA by the professional and amateur astronomy communities and our desire to increase outside awareness of our own Mars observing activities and our stature as the most qualified organization which will foster this activity do hereby institute a renewed effort to move the ALPO Mars Section forward and name Roger Venable as its new Coordinator effective immediately. Richard Schmude seconded the motion.



ALPO executive director and Eclipse Section Coordinator Michael D. Reynolds: *The Total Lunar Eclipses of 2007 and 2008*.

ing this year's activities was issued this month. The ALPO has \$4,436.81 in the Springfield account and \$3,022.15 in the Las Cruces account, as of June 30, 2008. The current value of the ALPO Endowment is \$24,351.99 as of June 30, 2008.

While the ALPO is maintaining healthy reserves, current actual cash flow (income versus expenditures) is at "break-even" status despite increases in revenue from advertisements in the Journal. Increases in printing and postage of the Journal, along with other operational cost have led to a reconsideration of the current membership dues structure. To stay ahead of increasing cost, the ALPO Secretary / Treasurer feels that an increase in membership dues is needed to move our finances back to a more stable path. The last such increase in membership dues for the paper Journal was on March 1, 2006 while the dues for the digital Journal last increased on January 1, 2003. Matthew Will made the following motion that the

affirmative.

Currently, the ALPO has 446 members, up from 425 members a year ago at this time. The ALPO has benefitted from online purchasing of memberships since it was reintroduced last year. This has been particularly true for our international members that find it difficult to pay by check using US bank codes abroad. Surcharges for these types of checks are quite steep for our international members. Online payment is quick, easy, and less costly for



ALPO Mars Section Acting Assistant Coordinator Roger Venable: *Formation of the North Polar Cap of Mars*.



Most of this year's ALPO contingent: from left to right (front row, kneeling) Dan Joyce, Bob O'Connell, Jim Fox, Mike Mattei; (back row, standing) Frank Melillo, Richard Schmude, Walter Haas, Don Parker, (lady in yellow, not identified), Joan Post, Cecil Post, Sanjay Limaye, Don Jardine, Phil Plante, Matt Will, (man in white teeshirt not identified).

After discussion, the motion passed with all present Board members voting in the affirmative.

Matthew Will made a motion to move Dan Troiani from his title as Coordinator of the Mars Section to a nonadministrative function as an advisor to the Mars Section. John Westfall seconded the motion. After discussion, the motion passed with all present Board members voting in the affirmative.

Ken Poshedly made another motion in writing to the Board. MOTION: That the ALPO Board of Directors recognize the total lack of activity and interest in the ALPO Instruments Section for many years and hereby announce the removal of this section effective immediately.

Richard Schmude seconded the motion. After discussion, the motion passed with all present Board members voting in the affirmative.

Matthew Will also proposed to expand the office of the Secretary and Treasurer by having an assistant to the Secretary to help in managing these operations. The Secretary plans to put an announcement in a future issue of the Journal for an assistant, listing a brief description of the position. This position would be a volunteer staff position, not a corporate officer, so the appointment would formally be made by the Executive Director as an acting appointment. In a couple of years, if the appointment works out, the Board could vote to make this a permanent volunteer position. This position would be a supporting role with the appointed person performing assignments from the Secretary while gaining an understanding of the overall organization of the Secretary and Treasurer's position. It would be important to have someone that could perform these assignments competently, since the ALPO has certain legal responsibilities that have to be met in order to retain its IRS tax exempt status.

The ALPO Board reviewed acting staff appointments for possible promotion to permanent status. The Board voted to promote the following staff from acting to permanent status.

- Gary Kronk – Coordinator Comets Section
- Kim Hay – Coordinator, Solar Section
- Robert Garfinkle – Book Review Editor (Publications Section)

No new staff positions or sections were provisionally created during this meeting.

Matthew Will noted that the ALPO web site has a lot of erroneous and outdated information including names and addresses of past staff no longer working for the sections. This is particularly true for web pages maintain by staff as well as information on the ALPO main pages. Mike Reynolds said that he would send an



John Westfall: *LCROSS: An Opportunity for Amateurs* presentation.

e-mail to current staff to update their section web pages.

By this point in the meeting it was 5:13 p.m. CDT. A field trip was scheduled for a bus departure of 5:30 p.m. to Ashton Observatory. Not wanting to miss those mouth-watering chicken dinners at the observatory, the Board agreed to adjourn and resume the Board meeting in John Westfall's hotel room at 4 p.m. the next day (Saturday).

On Saturday, July 19, at 4:05 p.m. CDT, ALPO Executive Director and Chairman Michael D. Reynolds called the ALPO Board to order in John Westfall's room, at the Marriott Hotel in downtown Des Moines, Iowa, with Sanjay Limaye, Walter Haas, John Westfall, and Matthew Will present also. Don Parker and Richard Schmude needed to honor prior commitments and were not present.

ISSUE FIVE: Office Space at Yerkes Science Center (Introduced by Matthew Will)

Yerkes Observatory and its surrounding grounds are being relinquish by its current owner and property manager, the University of Chicago. While the land around the observatory for the most part, is being sold to a real estate developer, the actual offices and observatory are being considered for redevelopment as principally, an educational science center. The Yerkes Study Group, composed of educators, scientists and administrators, was formed to examine various options for reconstituting the offices and observatory for educational purposes. The ALPO is aware of the group's existence and its concluding findings on the viability of such an educational science center. With the creation of the science center a virtual certainty, the ALPO would be interested in the possibility of obtaining storage space for its observational and educational collections at Yerkes with possible expansion into operational offices in the future. Many educational organizations are planning to have a presence there, so this poses a unique opportunity for the ALPO to not only have an established a storage/future office site but to coexist with other educational organizations on the same site that share a common interest. Matt Will has volunteered to draft a letter expressing the ALPO's interest in a possible arrangement with Yerkes to the chairman of Yerkes Study Group. The letter will be subject to final review by Mike Reynolds.

ISSUE SIX: ALPO Liability Insurance (Introduced by Matthew Will)

ALPO Secretary / Treasurer Matthew Will will be seeking an expansion of past insurance coverage and will report back to the ALPO Board on our options and cost.

ISSUE SEVEN: Publications (Discussed by the ALPO Board)

John Westfall announced to the ALPO Board his intentions of discontinuing distribution and sales of ALPO monographs in hard copy format. The ALPO monograph series are a collection of publications that are too lengthy or impractical to be published in the Journal but are, nevertheless, of interest to ALPO members. In the past, the monographs could be ordered in hard copy; however, since they can be easily downloaded from the Publication Section's web page in recent years, demand for hard copy monographs has virtually disappeared. Thus, printed copies will no longer be provided in mass quantities. In certain hardship cases where the member cannot download the monographs from the web site, the member will be forwarded to John Westfall where he can provide a hard copy of the monograph for that person.

Don Parker announced earlier to the ALPO Board that *Sky & Telescope* magazine has decided to steer the magazine's editorial direction toward more amateur-related articles. *Sky & Telescope* is interested in publishing ALPO articles related to upcoming solar system events. *Sky & Telescope* must have at least a three-month lead time for submission of such articles. However, a brief one-to-two-paragraph proposal or outline should be initially submitted instead of a full article. If accepted, the contributor will be asked to write the full article. Submissions can be directed to anyone on the editorial staff at *Sky & Telescope* since their new policy is to have all the staff review articles and proposals. Don thinks that this will help put our organization more in the public eye. The ALPO Board encourages our staff to submit articles about upcoming events involving their observing sections.

According to Mike Reynolds, the Astronomical League is interested in helping to release a revised version of the Mars Observers Handbook. Don Parker will be editing the revision while the League will provide the expense of seeing this into production. Similarly, the Astronomical League is interested in sponsoring a Solar System observational handbook. Such a book could be edited by the ALPO with chapters contributed by various ALPO coordinators. Mike Reynolds will

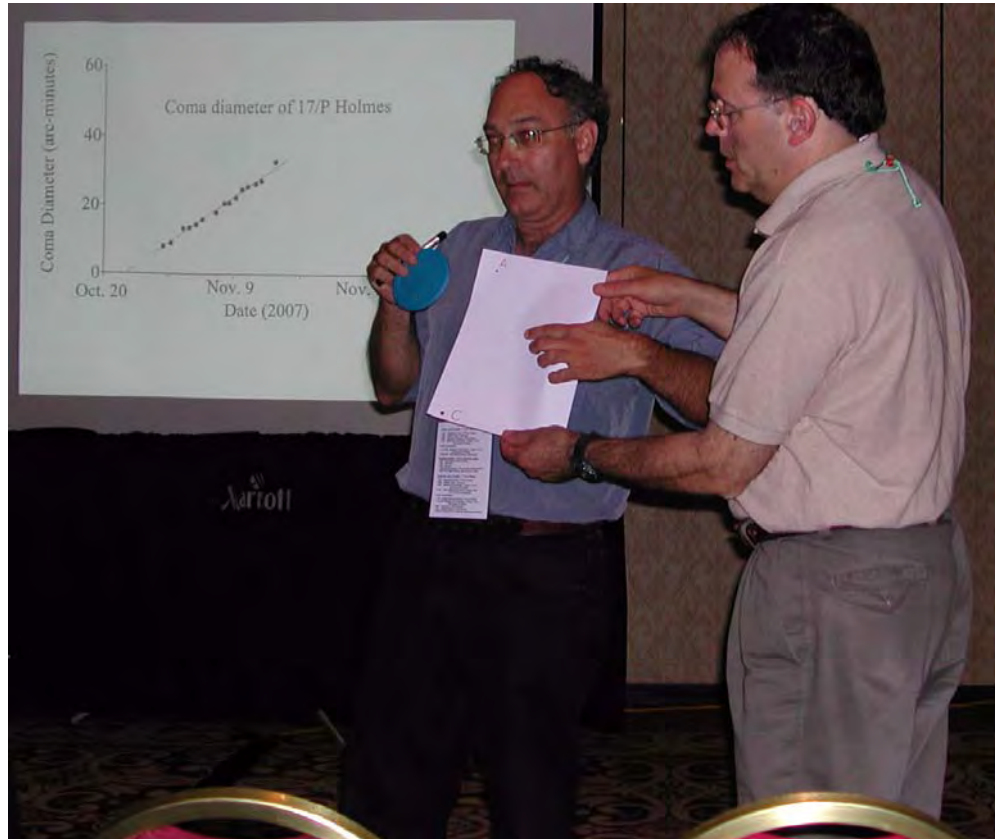
continue to follow up on this proposal from the League.

ISSUE EIGHT: PATS Invitation (Introduced by Mike Reynolds)

PATS, the Pacific Astronomy and Telescope Show, is an international conference/exhibition/convention/workshop for amateur astronomers. RMTC, Inc., the conference organizer, will be bringing dozens of exhibitors, clubs, and presenters together at the convention center in Pasadena, California. The ALPO has been invited to give a talk at this event. Matt Will knows of some ALPO people in southern California that he will contact that can represent the ALPO in that capacity.

ISSUE NINE: ALPO Participation in the International Year of Astronomy 2009 (Introduced by John Westfall)

As mentioned earlier under Issue Two, John Westfall reminded the Board that 2009 has been designated the International Year of Astronomy (by the International Astronomical Union and the United Nations). In recognition of the 400th anniversary of Galileo's first observations of the universe through a telescope, John thought that the ALPO might commemorate this year-long event through activities, publications, or other means of recognition that could also help promote the ALPO.



ALPO Remote Planets Section Coordinator Richard Schmude with assistance from ALPO Mercury Section Coordinator Frank Melillo: *Comet Holmes* presentation



The tried-and-true ALPO table exhibit.

John Westfall mentioned that next year will be the International Year of Astronomy. This is being proclaimed by various astronomical organizations as a celebration of the science of astronomy marking the 400th anniversary year of the creation of the telescope. John thought that the ALPO might commemorate this year-long event through activities, publications, or other means of recognition that could also help promote the ALPO. Mike Reynolds added that rather than the ALPO start something on its own, the ALPO should instead take advantage this opportunity and participate in events organized by others. Mike said that he would contact the Astronomical League to find out what prospective plans they had for organizing such events and what role the ALPO could play.

With no new business to conduct, Matthew Will made a motion to adjourn the Board meeting. John Westfall seconded. The motion passed with all present Board members voting in the affirmative with Board meeting adjourning at 4:59 p.m. on July 19, 2008.

Book Review

The New Atlas of the Moon

Review by Robert A. Garfinkle

ragarf@earthlink.net

The New Atlas of the Moon by Thierry Legault and Serge Brunier; translated from the French by Klaus R. Brasch, 2006, published by Firefly Books, ISBN-10: 1554071739, ISBN-13: 978-1554071739; 128 pages, indexed; price \$55 retail, though \$34.65 at Amazon.com

This outstanding lunar photographic atlas is in a class by itself, and I don't say that lightly. The large format (12-1/2 x 11-1/2 inches) allows for the publication of incredibly clear images of the Moon. Thierry Legault himself took most of the images. While the covers are hard, the book is spiral-bound, which allows the reader to lay the book flat without bending pages at the center of the book or damaging the binding.

The book contains two main sections; the "Moon from Day to Day", and "Lunar Cartography". The first section is divided by lunation day with a large-scale image for most of the days. One thing that I truly like is that for these large-scale images, they supplied a transparent overlay with the feature names on them. Under some of the feature names is the page number where you will find a high-resolution image of the feature and descriptive text about it in the second section.

Not all of the features called out on the lunation pages have high-resolution images in the second section. On the text page, the authors provide an image of the Moon as seen on that lunation day with north up (as viewed through binoculars) and a larger image with south up (as seen through telescopes that invert the image). A small blurry image shows you what the Moon on that day looks like with the unaided eye.

The book contains a clearly written "How to use this atlas" page that shows typical pages from the book. One is an introduction for a lunation day and pages showing the high-resolution images.

A third section, "Lunar Movements", teaches you how the Moon moves around

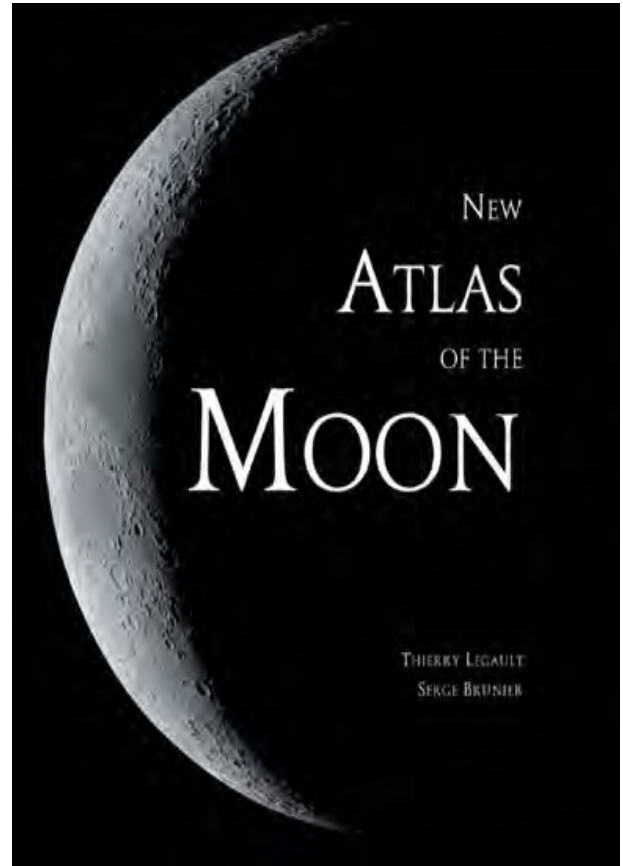
the Earth, covers both lunar and solar eclipses and describes how to observe occultations. The authors give practical tips for observing the Moon, selecting and purchasing the right kind of telescope and photographic equipment helpful for lunar observing.

This section contains minor errors, however, in the way the Sun's rays are presented in the eclipse diagrams. The rays are shown as a cone and inverted cone between the Sun and Moon in the solar eclipse drawing and between the Sun and Earth in the lunar eclipse drawing. The Sun's rays are parallel; it is the shadow cast by a sphere that forms a cone pointing away from the light source. Also, the lunar eclipse scale is way off, because they show a series of moons passing through the Earth's shadow taking up almost a quarter of the Moon's orbit. The novice would have no idea that these drawings are not to scale, because that is not indicated.

The last page of the book contains lunar phase calendars for 2006 through 2011. This is a nice touch, but after 2011, some people will consider the book obsolete. The calendars may become obsolete, but the rest of the book should have a long and useful life.


On each of the daily Moon pages, the authors have included a box with information on a wide range of lunar subjects, such as "The Birth of the Moon", "Aristarchus' Eclipse", "The Earth-Moon System", "Is the Moon Geologically Active?", "Russian Missions to the Moon", and "Lunar Nomenclature". Though most of these boxes give correct information, I do have a problem with the "Lunar Nomenclature" box. The authors failed to mention that the first person to apply names that are still used on a lunar map was Michiel van Langren (Langrenus) in 1644 on his manuscript map. The manuscript map was published the following year.

The authors also state that Giovanni Riccioli introduced the Latin term "mare" for the lunar seas, but again Galileo and Langrenus and others had already used that term for the large dark patches on the lunar surface. The authors go on to mention that Wilhelm



Beer and Johann Mädler published their "Mappa Selenographa", which consisted of more than 100 charts." Their "Mappa Selenographia" actually consisted of only four large quadrant maps of the Moon.

I own a number of lunar atlases (too many according to my wife) and this one is one of the best ever produced for use by a beginning lunar observer. The images are downright spectacular and sharp. There are no out-of-focus images, except those previously mentioned. The large format allowed the authors to use large images, which makes it easier for you to see the finer details than what you could see if the images were smaller.

When using some of the other lunar atlases that I own, I need a magnifying glass to see these finer details. This is not a problem with this work. The text is clear and informative, and the "how-to-use-this-book" is a big asset. I highly recommend this lunar atlas not only for new lunar observers, but for experienced observers as well. 

Feature Story: Bringing the sky to every stargazer The Telescope Grid Project

By Marc Eduard Frîncu,
Member, ALPO;
Member, West University of
Timisoara, Faculty of Mathematics
and Computer Science
E-mail: fmarc83@yahoo.com

Abstract

A large number of amateur astronomers would like to view the skies and planets not visible at a particular moment from their location. Due to modern technologies this can become reality through the creation of a worldwide Telescope Grid of amateur and professional telescopes that can be remotely controlled by any user. This paper presents a simple, low-cost solution to this problem that the author has been working on for the last year. The platform can be used for live-

streaming, presentations, and off-line image requests for planetary or deep sky objects.

Introduction

For centuries, the workhorse of astronomers searching to discover the wonders of the Solar System and beyond has been the telescope. Under various forms, this instrument has helped humans to widen the boundaries of knowledge and science. Amateur astronomers use them for different activities, either for enjoyment or for bringing their own contribution to astronomy by gathering reports on planetary surveys, meteor showers, eclipses, transits, variable star observations, etc. However, due to the fact that the whole sky is not visible from every point on Earth, an observer is limited to viewing only the part of sky visible to him. This prohibits him from exploring and observing regions of space that are inaccessible but would other-

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](mailto:poshedly@bellsouth.net) 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).

wise be of interest. Also, there might be people that cannot afford or do not want to spend long cold nights outside looking at the sky.

Thanks to advances in astronomy, computer science and electronics, we now have the opportunity to create an environment in which every amateur (or professional) astronomer can observe from his own house a region of the sky viewable either from his own region or from the far side of the planet, without leaving the security of his or her own home.

In order to achieve this, I have started a small personal project with the aim of building such an environment. And, after almost an entire year of work, I have come up with a platform that allows through the use of a simple web portal, the connection of several telescopes to a common gateway which can then be controlled remotely by any subscribed user. Interested persons can therefore access regions of the sky without even possessing a telescope. This allows people to wander into space by issuing requests from their own computer terminal and receiving real time answers from distant telescopes.

About the project

The Remote Telescope Control (RTC) is part of the initiative the author has undergone in order to facilitate telescope access to people that cannot afford or own such instruments. It belongs to what the author has called the Telescope Grid Project (TGP), a notion derived from the term "computer grid", where several computers are joined together

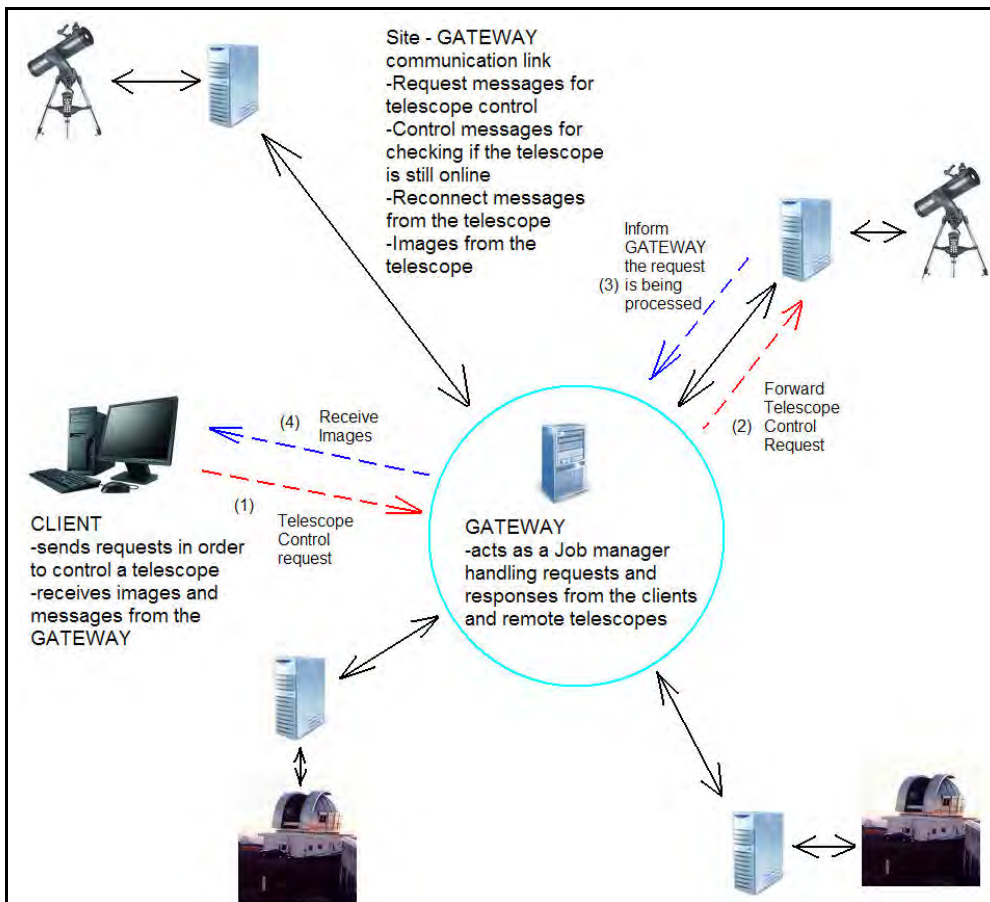



Figure 1. Structure of the proposed Telescope Grid allowing remote control of telescopes from home computers.

[Logout] [Copernicus] [News and events] [Modify account data] [Sitemap] 

Do you want to be a part of the project? Download the application form. Project details

[Compute ephemerides and planetary positions]

View image requests

Add image request

Add request for live observation

View the list of controlled telescopes


Choose an object:

Right Ascension: h m s

Declination: d m s

Send image request

The image updates periodically. There might appear problems due to the server's Internet connection, power lose or bad weather condition:



8:58:15 PM Monday 02/25/08

Displaying the latest image from the Regulus.ro default telescope

Copyright © 1999 - 2008, Marc Eduard Frîncu
Proofreading Ioana Simina Giurginoia

Optimized for: Mozilla FireFox 1.5 (Linux), 2 (Windows) and Internet Explorer 6. Optimal resolution: 1280x1024 and 1024x768.
Other requirements: Acrobat Reader 8 installed on your machine, Java Script activated in the browser.
Tested on Microsoft Windows XP SP2, Linux, Gentoo systems.

Figure 2. Interface for submitting a request for an image of a certain object or equatorial coordinate.

in solving a task. An analogy is obvious if we think of the possibility of having different telescopes connected through a gateway that can be controlled as one single entity or are used independently by users located remotely and which can view the resulted images on their own personal computers. Thus, the concept of Telescope Grid (TG) becomes clear and essential in the premise that we want to allow non telescope holders and remote users to access distant astro-


nomical observation devices and view the results in real time.

Every month, telescope owners and users meet in an online conference to discuss about improvements and problems that have been encountered during the use of the platform.

As the project is in an early stage of development, we are still in the process of trying to get the assistance of observatories and organiza-

tions interested in funding and supporting such an initiative.

There are presently 133 users of which 42 are active. Active users submit requests for live observations and images, while ordinary users assist the advancement of the project by coming up with new ideas and suggestions.

[Logout] [Copernicus] [News and events] [Modify account data] [Sitemap] 

Do you want to be a part of the project? Download the application form. Project details

[Compute ephemerides and planetary positions]

View image requests

Add image request

Add request for live observation

View the list of controlled telescopes


Enter the desired date:

Submit request

Request list

Id	Date	User name	Delete
10	2008-02-22	Laurentiu Alimpie	

The image updates periodically. There might appear problems due to the server's Internet connection, power lose or bad weather condition:



1:48:06 AM Saturday 02/23/08

Displaying the latest image from the Regulus.ro default telescope

Copyright © 1999 - 2008, Marc Eduard Frîncu
Proofreading Ioana Simina Giurginoia

Optimized for: Mozilla FireFox 1.5 (Linux), 2 (Windows) and Internet Explorer 6. Optimal resolution: 1280x1024 and 1024x768.
Other requirements: Acrobat Reader 8 installed on your machine, Java Script activated in the browser.
Tested on Microsoft Windows XP SP2, Linux, Gentoo systems.

Figure 3. Interface for submitting requests for live control.

Table 1: Current Components of the Telescope Grid for Amateur Astronomers

Node	Component Type	Component Name	Description
Timisoara, Romania	Hardware	NexStar 130 NwT	GoTo Telescope mounted on an Alt-Azm Az mount. Focal length 650mm. Aperture 130mm.
		Mintron MTV 12V6	Black and white high sensitive camera capable of working in extreme low light conditions (0.00002 Lux). Total CCD pixels: 795x596.
		Frame-grabber	Converts analog signal coming from the camera to digital signal ready for computer processing.
	Software	Pryme (freeware)	Software for image acquisition and automatic FTP upload to a given server.
		Remote Telescope Control v1.0 (freeware)	Client application that is mandatory for establishing communication between the telescope and the remote user.
		ASCOM Telescope Simulator 4.0.3 (freeware)	Drivers used by the Remote Telescope Control to send requests to the telescope.

Platform description

RTC (Figure 1) can be made up of several telescopes connected to a server which, in turn, is connected to a common gateway. The dotted lines represent an example of a flow execution from the client to a remote telescope and back. The user simply submits a request for a desired date and when that date arrives, he will be able to control a telescope chosen by the server application.

This is accomplished by sending target coordinates (right ascension and declination) to the telescope (Step 1). The Gateway will then forward the request to a chosen telescope (Step 2). After receiving the request, the Gateway initiates a series of message exchanges in order to keep track of the request status (Step 3).

If the telescope fails to complete its task, the request will automatically be redirected to a new one and the telescope will be marked as unavailable until it will inform the Gateway once more of its availability.

If everything goes right, the client will receive a sequence of images transmitted back from the telescope through a highly sensitive camera capable of working in very low light environments (Step 4).

Images captured by the camera will be uploaded to a server and the client's web inter-

face will simply load them on the screen. The client will subsequently see on the monitor a sequence of images transmitted back from the chosen telescope. As a matter of fact, the telescope is not randomly chosen but picked from a list of telescopes available and connected to the server at the moment of the request. Moreover, the telescope list is restricted; only telescopes that can actually view the targeted area of the sky are selected when searching for a possible candidate.

The telescopes linked to form a grid of remotely controllable telescopes can vary from large observatory telescopes to medium-sized amateur telescopes. An imperative requirement is that the telescopes have to be controllable through a computer and, as previously stated, a highly sensitive camera must be attached to it. The camera needs to be sensitive enough (somewhere around 0.0002 Lux luminosity) in order to be able to send back images of faint objects such as nebulae and star clusters without having to stack the images later so as to produce quality results of the targeted object. The objects should thus be visible in real-time on the viewer's monitor. Also, because there are many different vendors manufacturing telescopes all with their own communication protocols, a unitary way of handling them is required. Thankfully this has already been accomplished by the ASCOM initiative (<http://ascom-standards.org/>) that was able to produce a



Figure 4. A Celestron 130mm Newtonian NexStar telescope with a Mintron camera attached and ready for live-streaming.

platform that exposes all the different protocols under the same interface.



Figure 5. A series of raw images taken with the live-streaming method. At upper left and right are snapshots of the Moon, while in the lower section we easily notice M42 (Orion Nebula) at left, and a section of M44 (Beehive star cluster) at right. A UCF filter was used when acquiring the images. Settings for the Mintron camera: Sensitivity:128x, AGC=Max, Zoom=2x. Telescope: Newtonian 130mm, 650mm focal length.

The user interface for requesting an image of a particular region in the sky and for making an appointment for submitting live request is presented in figures 2 and 3. Each client can submit a request for control on a given date as long as that date has not already been taken. The reason we allow only this kind of reservation per day is the presently small number of telescopes available in the TG. The users can also visualize the list of telescopes belonging to the TG and see which of them are available (connected) at that particular moment.

The Current Stage

The platform (Table 1) became operational on March 1, 2008, with a single medium-sized telescope located in Romania (latitude: 45°44'43" N, longitude: 21°12'33" E). The telescope is a 130 mm Newtonian reflector (Celestron's NexStar) equipped with a Mintron MTV 12V6 EX black and white camera (Figure 4). It can be accessed from <http://www.regulus.ro> in the Online Telescope section.

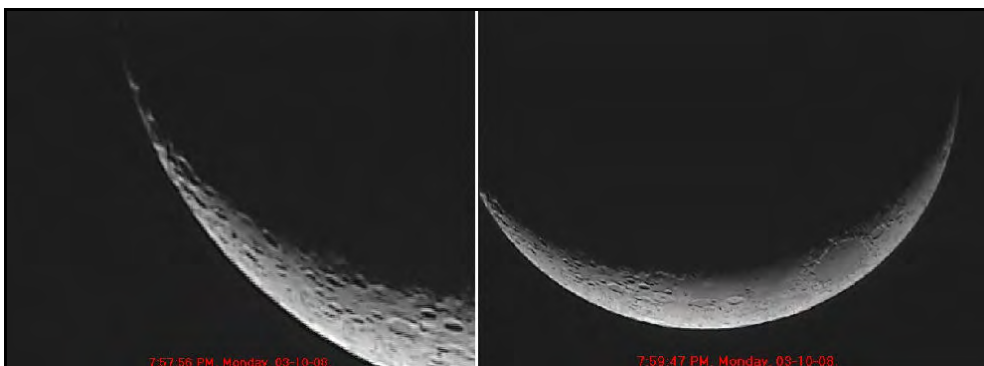


Figure 6. Images of the Moon taken with the live-streaming method. Settings for the Mintron camera: Sensitivity:0, AGC=False, Zoom=0. Telescope: Newtonian 130mm, 650mm focal length.

Currently, the interface is available in three languages (English, French and Romanian). Potential users are required to create a free account in order to access it.

Besides remote control capabilities, the platform allows as well the submission of image requests for various objects and coordinates. These images will be taken by using telescopes connected to the grid but not in real time, their processing being accomplished through various CCD (possibly DSLR) cameras, at a later time.

In figures 5 and 6, we see a series of images sent by a remote telescope and displayed on the interface. The images are not processed and are exact copies of the ones sent in a live-streaming event.

Joining the Telescope Grid Project

Every astronomer who has the possibility and desires to offer his or her telescope for the use of others is welcome. The telescope does not have to stay connected 24/7, but still it would be appreciated if it were online during a decent amount of time so that others might use it if necessary. Also one can choose to offer his or her telescope solely for taking single images of various regions of the sky as requested by users.

In order to join this project, you need to download, then complete and send to the author's e-mail address the form found at <http://www.regulus.ro/telescope/submission-form.doc>.

After your submission form has been processed, you will receive a unique telescope ID and the Remote Telescope Control freeware that will permit your telescope to communicate with the platform. The telescope ID will help the platform identify and communicate with your telescope and cannot be changed. The applicant must also have access to a server where he/she may upload files. All the images he or she obtains will be uploaded to that location – even the live-streaming ones. An application for capturing and automatically uploading of the live images to the server is also required (Pryme - <http://www.hilo.dk/pryme/> should do the job). Instructions in regard to setting up everything are also available on demand.

Future Plans

As the Telescope Grid Project is still in an incipient form, the present directions are testing the platform on varying scenarios and fixing any problems. The Project is also soliciting new participants willing to participate with their own telescopes for even a few hours per week, making it possible for others to experience the heavens as well as participate in the process to improve the platform design at both concept and implementation levels.

Feature Story:

The Quadrantid Multi-Instrument Aircraft Campaign (MAC) or Observing the Quadrantids from 47,000 feet

**By Robin Gray,
ALPO Meteors Section assistant
coordinator**

During the fall of 2007, I received an invitation to participate in the Ursid MAC Project, a joint SETI-NASA effort to observe the peak of the Ursid Meteor Shower from a jet flying north at high altitude with the object of keeping the radiant in view for a prolonged period of time. I felt this was a great opportunity for me personally to learn more about meteor science while helping others to increase our knowledge of this shower.

So one day in mid-December, I left home in northern Nevada to camp out with ALPO Meteors Section Coordinator Bob Lunsford; we planned to meet in the Mojave Desert of Southern California to observe the Geminid meteor shower.

After our three-day session there was concluded I made my way north along the California coast and arrived in Mountain View on December 19, where SETI and the NASA Ames Research Center are located. The next morning the head of the Ursid Multi-Instrument Aircraft Campaign (MAC) Project, Dr. Peter Jenniskens, told me the project had been canceled due to a problem with the jet. He invited me to participate in the upcoming Quadrantid MAC project, which I accepted. I didn't leave Mountain View immediately, though, and spent the next two days touring the

NASA facility there and learning about their research into materials to be used for constructing heat shields for various spacecraft. Afterwards, I made my way back home to Nevada.

On December 31, I left home for Mountain View again, arriving on January 1. The next two days were spent getting the instruments aboard the jet and ready for the flight. While I have done a fair amount of visual meteor observing with little more than a pencil and clipboard, all this activity with sophisticated instruments was completely new to me and I felt like a rank beginner. The small commercial jet, with 14 participants and all their instruments and equipment, soon became very

crowded. A number of types of cameras, including digital, low-light, and video cameras, are used to study meteoroid breakup, magnitude distribution, and for counting Quadrantids and non-Quadrantids. Spectroscopes to study meteoroid breakup and release of volatile materials, plus the UV part of the spectrum, were also set up. Cosmic rays were also studied on this flight. All of these instruments were set up aiming out the windows of the jet.

When this was done, all the windows were shrouded with black cloth to prevent any artificial light from the inside of the plane reflecting off the windows and interfering with observations. Scientists from the United States, the UK, Nether-



Figure 1. The 2008 Quadrantid MAC Team. Robin is kneeling in front row at far left. Photo Credit: NASA Ames Research Center.



Figure 2. Dave Holman (left) and Robin Gray, experienced meteor observers, count Quadrantid meteors by clicking a computer mouse while watching an intensified video feed by one of the cameras aimed out of the windows of the aircraft. Their tally was used to measure the meteor shower's peak in near-real time. Photo Credit: NASA Ames Research Center.

lands, Germany and France participated. The Quadrantid shower is an erratic one, presumably because the meteoroid stream is being influenced by Jupiter, and the object of the study was to find out how erratic the shower really is. To do this the airplane flew on a northeast course from San Jose, CA, to 68 degrees north latitude, which put it over Spence Bay in Nunavut, Canada, and its northernmost point. This flight path kept the Quadrantid radiant at a constant elevation above the horizon and in the dark for the entire eight-hour selected observing period during the flight, something not possible from the ground. At a flight altitude of 47,000 feet, we were above any clouds and enjoyed clear skies the entire time.

The airplane took off from San Jose Airport at 3:47 p.m. PST on January 3. Observations of meteors began at 5:32 p.m. My job was

to count meteors and categorize them into Quadrantids and non-Quadrantids. To do this, I wore a pair of goggles fitted with two small television screens. The goggles were hooked up to an intensified camera aimed out one of the windows of the jet. I used a computer mouse to categorize the meteors into the two separate categories.

This was a very different experience from visually observing meteors out under the night sky. The field of view was much smaller and although stars were visible, it was difficult to know what section of the sky you were looking at. At one time, I saw the head of Hydra, but most of the time, I wasn't sure what I was looking at. Another difference was that even though the rates were above 100 per hour outside, things seemed much slower through the goggles because of the limited field of view. I would estimate that at most, I wit-

nessed 20 meteors per hour of observing. The meteors appeared to travel much more slowly through the goggles than when seen with the naked eye, probably because I was looking down and they were moving away from me.

Cities and the Aurora Borealis were also visible through the goggles. Going north, Edmonton, Alberta was the last sign of civilization. North of Edmonton the ground was dark with no city lights visible after that. The farther north we travelled, the more spectacular the aurora appeared.

I sat in the very back of the airplane, which allowed me a view of all the other activities going on when I was not observing through the goggles. The atmosphere was one of serious, exacting endeavor, kept up for the entire period of the flight.

The flight continued north until about 8:23 pm PST, then turned around and headed back south. We arrived back at San Jose at 1:45 a.m. PST on January 4. I felt tired but we still had to clear the airplane out. Once that was accomplished, I went back to my motel room and rested. The next day, I began the trip home. What should have been a one-day journey took three days because of a huge winter storm that closed the Sierras and highways to the east in Nevada.

So what IS a Quadrantid, anyway?

The name comes from "Quadrans Mulralis", an obsolete constellation.

The Quadrantid meteor shower is one of the year's biggest, in a regular basis producing 80 meteors per hour.



Feature Story: The Sun

Sunspot Activity Low as Cycle 23 Continues

By Howard Eskildsen, member,
ALPO Solar Section
howardeskildsen@msn.com

Sunspots continue to be a rare sight as the diminishing solar cycle 23 lingers longer than expected. With the exception of March 2008, when three spot groups were visible on the Sun at the same time, the sunspot activity over the last year has mainly consisted of sporadic, small, short-lived spots. The average monthly Wolf number (10 times the number of spot groups added to the total number of individual spots) has been 10 or less for the past year, and has been below 20 since January 2006. Preliminary estimates of the average July 2008 Wolf number are 0.5 or less; indeed, sunspots were visible

only two days during the month of July 2008. This contrasts sharply with the cycle 23 maximum when the average Wolf number exceeded 140.

As time drags on, questions have arisen as to whether the continuing low activity is normal or an unusual occurrence. Cycle 23 began in May 1996 and has lasted over 142 months so far, when compared to an average cycle length of 131 months. Even if the solar minimum had occurred in March, 2008, it would still be one of the five longest lasting solar cycles ever recorded and the longest in the past 150 years. While the length of cycle 23 is remarkable, it is still within one standard deviation (14 months) of the mean.

All Readers

Your comments, questions, etc., about this report are appreciated. Please send them to: poshedly@bellsouth.net

Online Features

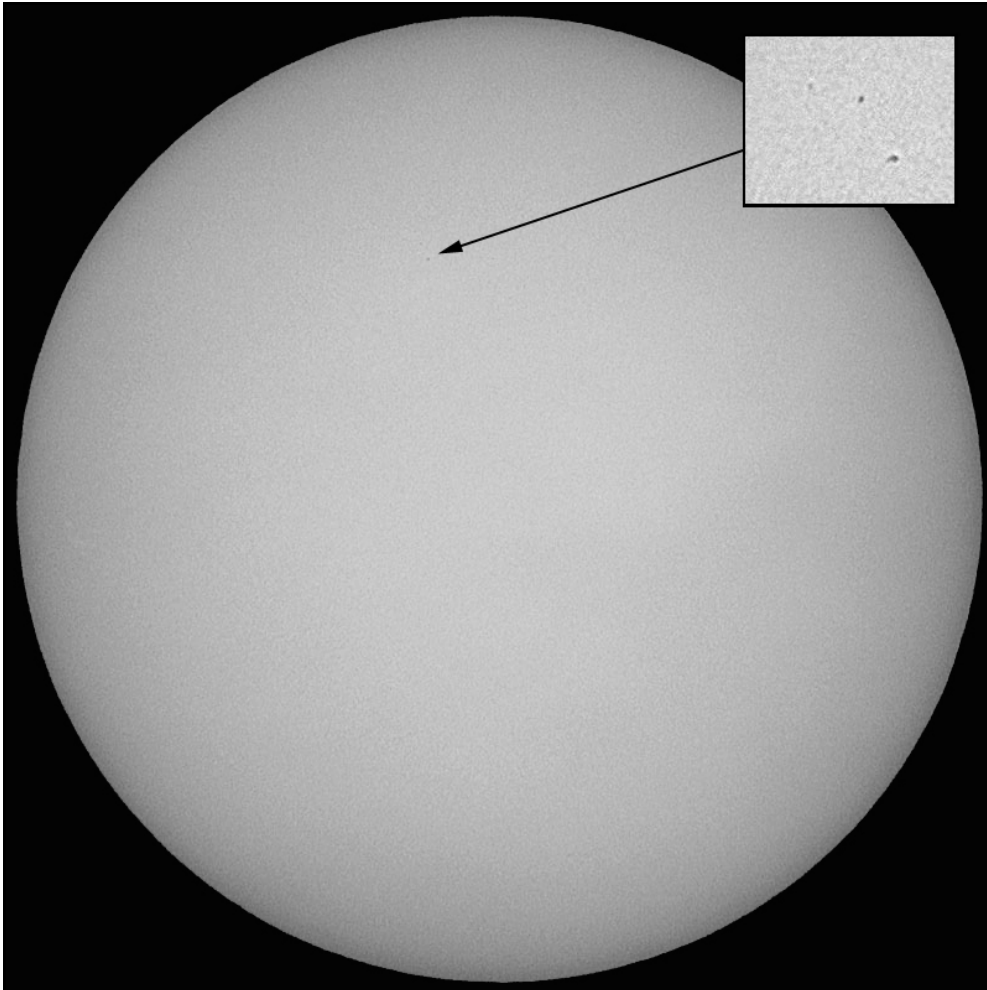
Left-click your mouse on:

- The author's e-mail address in [blue text](mailto:poshedly@bellsouth.net) 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).

As the Sun continues to occasionally conjure cycle 23 spots, hints of the approach of the new cycle have already arisen. The first cycle 24 sunspot, NOAA 10981, appeared on January 4, 2008, distinguished by its high latitude appearance and reversed magnetic polarity compared to cycle 23 spots. Two other cycle 24 spots have occurred since, NOAA 10990 in March and NOAA 10993 in April. In prior cycles, the solar minimum generally occurred 10-20 months after the first appearance of spots of the new cycle; however this is quite variable. For example, the cycle 22/23 minimum actually occurred in the same month as the appearance of the first new cycle spot.

Figure 1. White light solar image by Howard Eskildsen of the sunspot 10981 – the first of cycle 24. Note its high latitude and very small total spot area. Main image photo data: Carrington Rotation Number: 2065, taken 2008 January 05, 16:35 UDT; Altitude: 37°, Seeing: 3", Sky Condition: Cirrus clouds; Wind: Light; Telescope: fork-mounted Meade f/15 ETX125 Mak-Cass with electric drive; FL 1,900 mm; Solar Filter: AstroSolar Photo-film; Photo System: A-focal, MaxView 40, IR Block & Baader Continuum Filters, Nikon Coolpix 4300, 11.1 mm fl; Exposure Time: 1/134 sec.

Inset photo taken same date at 16:40 UT with Orion StarShoot II, no eyepiece nor eyepiece filters.



It is difficult to precisely predict the time of the solar minimum, but the January appearance of the first cycle 24 spot suggests the minimum should occur before mid-2009. In May 2008, the NOAA/NASA/ISES Solar Cycle 24 Prediction Panel reaffirmed its April 2007 prediction of a solar minimum during March 2008 +/- 6 months, further restricting the expected date of the solar minimum.

If the Panel's prediction holds true, the minimum should not be far off, or perhaps it has already occurred. The time of the minimum and official start of cycle 24 is determined by the smoothed monthly

average of sunspot activity over a 12-month period, so the actual date will not be known until at least six months after the fact.

How this will eventually play out remains to be discovered by observers all over the world who log observations of a blank Sun, day after day, in search of signs of the start of the new solar cycle. Superficially, it may sound like somewhat dull or tedious observing, but there is great wonder and fascination in watching the Sun reveal its ways in its own time and own terms.

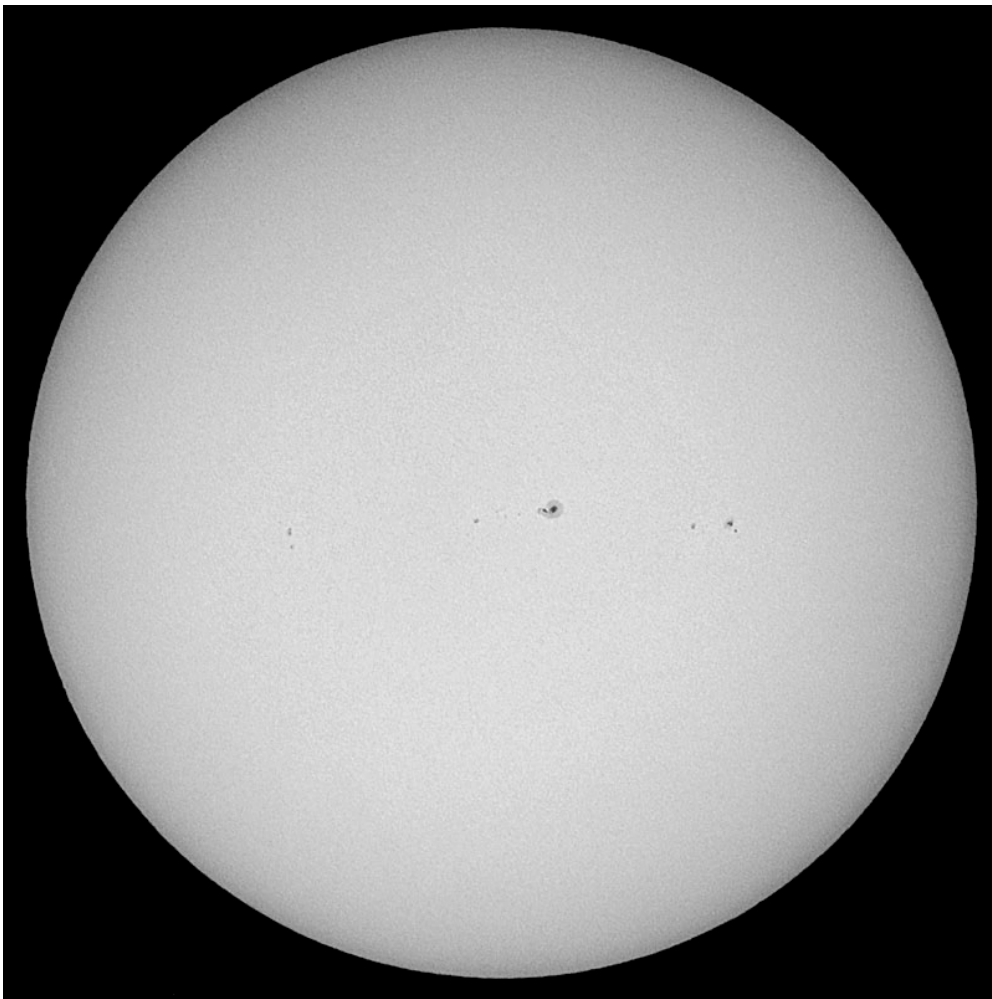


Figure 2. White light solar image by Howard Eskildsen of an unusual surge of three low-latitude cycle 23 sunspots, the most visible on the Sun since June 2007. Sunspot numbers from left to right, 0989, 0988, 0987. Photo data: Carrington Rotation Number: 2068; taken 2008 March 29, 13:20 UDT; Altitude: 25°; Seeing: 2"; Sky Condition: clear; Wind: calm; Telescope: fork-mounted, f/15 Meade ETX125 with electric drive; Aperture: 125mm; FL 1,900 mm; Solar Filter: AstroSolar Photofilm; Photo System: A-focal, MaxView 40, IR Block & Baader Continuum Filters, Nikon Coolpix 4300, 11.1 mm fl; Exposure Time: 1/129 sec.

References:

Janssens, Jan, SOLAEMON, the SOLar Activity and Earth MONitor <http://users.telenet.be/j.janssens/Engwel-come.html>

NOAA Space Environment Center, Cycle 24 Prediction, April 25, 2007, <http://www.swpc.noaa.gov/SolarCycle/SC24/PressRelease.html>

NOAA Space Weather Prediction Center (SWPC), Cycle 24 Prediction Update, July 27, 2008, <http://www.swpc.noaa.gov/SolarCycle/SC24/>

NOAA National Geophysical Data Center (NGDC) Sunspot Numbers <http://www.ngdc.noaa.gov/stp/SOLAR/ftp/sunspotnumber.html>

Wikipedia, http://en.wikipedia.org/wiki/Solar_minimum

Araujo, Gema, Solar Observations, <http://astrosurf.com/obsolar/>

BaseHalpna Solar Database, <http://base-halpa.ift.fr/>

More About Wolf Numbers

In 1849 Rudolph Wolf of Zurich, Switzerland, introduced what he called a "Universal Sunspot Number" that could be used to monitor long term trends of sunspot activity, and is the basis for determining the solar cycle to this day. Now known as the "Wolf number," it is based on the formula: $R = k(10g + s)$. R is the Wolf number, g is the number of spot groups and s is the number of individual spots. This formula more accurately correlates with the total area of sunspots present than does either g or s alone.

The factor k is a coefficient (usually <1) to correct for variability between observers due to different conditions, equipment and technique. Determining k can be problematic. For more information, see AAVSO's web site: <http://www.aavso.org/observing/programs/solar/dances.shtml>. While more modern methods are available to measure the solar activity, the Wolf number (sunspot number) provides an invaluable link to solar activity over the past 300 years and will likely be of value for the foreseeable future.



Feature Story: Mars

First Detections of the North Polar Cap of Mars in 2007: A Continuing Conundrum

By Roger Venable, coordinator,
ALPO Mars Section
rjvmd@hughes.net
Jim Melka, assistant coordinator,
ALPO Mars Section
jtmelka@yahoo.com

Abstract

Although data obtained from spacecraft have proven that the seasonal North Polar Cap forms in northern autumn and winter, Earth-based observations in 2007 were consistent with a delay in the formation of the cap until near the time of northern vernal equinox. Such a delay has been observed in previous apparitions. The nonvisibility of the cap prior to late northern winter may be attributed either to an increase in the cap's reflectivity late in the winter, or to extinction of light reflected from the cap by the long viewing path through the Martian atmosphere. The cap was first

detected at its southern edge only, and the edge may, in fact, be more reflective of light than the rest of the seasonal cap. A better viewing angle in the 2009-2010 apparition may help to elucidate the cause of the cap's nonvisibility in late winter.

When Do the Seasonal Polar Caps Form?

Early in the autumns of both the northern and southern polar regions of Mars, a hood of clouds forms over the respective polar region. This polar hood is usually visible before the pole tips away from the Sun into the long polar night of winter. The surface deposit of CO₂ and H₂O that we call the seasonal polar cap is not visible in either the northern or southern autumn prior to the formation of the obscuring polar hood of clouds. It is not until spring — with the dissipation of the polar hood — that the cap becomes visible. Does the seasonal cap form early in the autumn and remain hidden until spring, or does it form later in the winter?

Towards an answer to this question, atmospheric pressure readings made by the Viking Landers provide an important clue. The Viking Landers measured the atmospheric pressure continuously, for 3.4 Martian years at the Lander 1 site in Chryse, and for 1.9 Martian years at the Lander 2 site in Cydonia (Sheehan, 1996, p.193). The atmospheric pressure was

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](mailto:poshedly@bellsouth.net) 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).

found to vary significantly according to the Martian seasons, in a pattern that is dominated by the deposition and sublimation of the seasonal South Polar Cap (SPC). The seasonal SPC is larger than the seasonal North Polar Cap (NPC) due to the longer, colder, aphelic winter in the south. About 26 percent of the atmosphere condenses to form the seasonal SPC. The pressure data suggest that the seasonal SPC begins to form at a longitude of the Sun (L_S) of about 50°, in the middle of southern autumn, while the seasonal NPC begins to form at L_S of about 260°, in the late northern autumn (Hess, Ryan, et al, 1980.) Insofar as these pressure changes reflect gross condensation of the atmosphere, they may not be sensitive to the earliest, small amounts of conden-

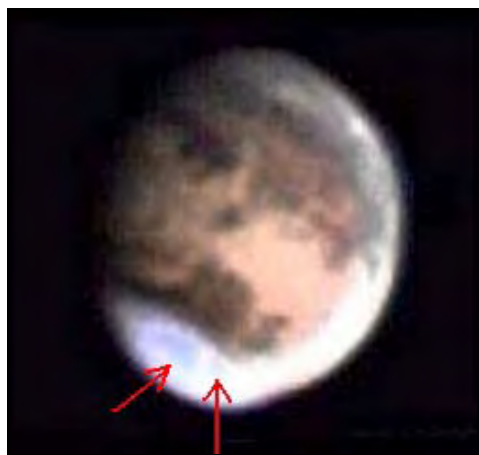


Figure 1. Composite image made by Don Parker on October 25, 1992, at 8:32 UT, using a 400-mm Newtonian telescope, a CCD camera and separate exposures with red, green and blue filters. It is remarkable for the albedo features that are visible through the North Polar Hood, which are arrowed. Here, L_S = 346°, CM = 17°, De = 11°, and Ds = -6°. Apparent diameter = 9.7 arc seconds. For this and all other images in this article, south is up

Table of Images and Drawings Used in This Report
(November 1 thru December 15, 2007)

Total no. of images	582
Total no. of drawings	10
Percent submitted with separate color-component views	55
Number showing albedo features under the NPH	556
Number showing the absence of the seasonal NPC	140
Number showing isolated ice features under the NPH	49
Number showing partially developed seasonal NPC	235
Number of observers	93
Number of countries of origin	20

Some polar cap vocabulary

The “seasonal polar cap” is that part of the cap that reforms each winter and disappears each spring. The “residual polar cap” or “remnant polar cap” is that small, thick part of the cap that never sublimates, but is present throughout the Martian year.

Astronomers have stopped calling the residual polar cap the “permanent polar cap,” because it is not permanent, unlike the polar caps on Earth. This is due to the changing “obliquity” of the planet, which is the tilt of its axis with respect to its orbit. It cycles from 15 degrees to 35 degrees during a period of 120,000 Earth years. Moreover, in perhaps 10 million years it changes chaotically over an even wider range. At higher obliquities, the residual polar caps will disappear completely, leaving only the transitory, seasonal caps.

sation, and thus the seasonal caps might begin to form considerably earlier than the pressure data indicate.

Benson and James obtained further evidence that the seasonal cap is well formed by late winter, by measuring the NPC’s southernmost extent as seen in red images made by the Mars Orbiter Camera aboard Mars Global Surveyor during two Martian years. The Wide Angle Red camera was able to penetrate the late-winter, thinning, North Polar Hood (NPH) and detect the NPC as early as $L_S = 339^\circ$ in one year and $L_S = 341^\circ$ in the other. When first detected, the NPC was seen to be already regressing due to the approach of spring (Benson and James, 2003), suggesting that its formation is not delayed until late in the winter. These late-winter detections of the cap are earlier in the northern winter than the first detections of an outer ring of the cap by Earth-based observers in 2007.

Perhaps the best evidence of the early presence of the polar caps is the thorough characterization of their sizes with respect to L_S that has been made by Titus using the Mars Global Surveyor’s far infrared Thermal Emission Spectrometer (Titus,

2005.) The infrared penetrates the NPH well, and enables the surface temperature to be mapped, thus identifying the seasonal caps as areas that are colder than the soil surface. The graph of the latitude of the edge of the seasonal NPC versus L_S is included in his abstract, and is available online at <http://www.lpi.usra.edu/meetings/lpsc2005/pdf/1993.pdf> as his **Figure 3**. It shows the seasonal NPC to be first detectable at a small, circumpolar size, extending southward to latitude 80° , at $L_S = 187^\circ$ shortly after the northern autumnal equinox; while its greatest extent is to latitude 50° north, occurring at $L_S = 280^\circ$, which is early northern winter.

Other investigators have also detected the caps through the polar hoods in the darkness of the polar winter, using the Thermal Emission Spectrometer. For example, at wavelengths of 6 to 50 micrometers, Hansen found the NPC in the middle of northern winter to cover the surface to a latitude of less than 60° north (Hansen, 2001.) (The absorption by the cap of thermal infrared radiation from the soil enabled him to ascertain certain characteristics of the cap’s dust content, water-ice content and ice grain size.)

From the foregoing, it is clear that the seasonal caps begin to form in the autumn, are broad in the winter, and are already regressing when the hoods thin sufficiently to allow their detection in red light.

Anomalous Observations of the Seasonal Polar Caps in the Past

There are some historical observations that suggested that the seasonal SPC does not form until late winter. The first three of these were described by Martin and James (Martin and James, 1984) and created some controversy. It is natural to extrapolate to the NPC those that relate specifically to the SPC.

Early International Planetary Patrol observations

The International Planetary Patrol was a consortium of eight observatories around the world, coordinated by astronomers at Lowell Observatory beginning in 1969, aiming at 24-hour coverage of the planets. In its first few years of observing Mars, red light images did not penetrate the NPH, and the problem of differentiating the hood from the seasonal NPC was raised. The darkness of the pole in red light (Baum, 1974), which is usually considered to penetrate Martian clouds, was consistent with the idea that the seasonal NPC did not form until late in the winter.

Viking observations

The primary missions of the Viking orbiters in 1977 included imaging the South Polar Region in southern autumn and

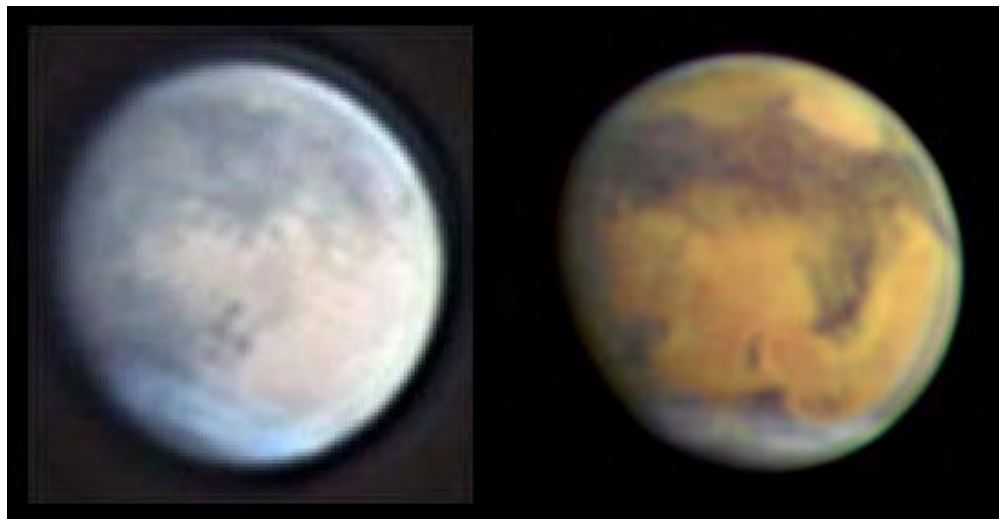


Figure 2. Two images appearing to show albedo features under the North Polar Hood. Left image by Ed Lomeli on November 15, 2007, at 13:36 UT, $L_S = 348^\circ$, $CM = 56^\circ$. Right image about 12 hours later, by David Arditti on November 16, 2007, at 3:42 UT, $L_S = 348^\circ$, $CM = 260^\circ$. Other image data: left, 235-mm Schmidt-Cassegrain telescope at f/40, DMK 21BF04 camera, seeing 6/10, transparency 3/6; right, 280-mm Schmidt-Cassegrain telescope at

winter. These observations indicated that only patchy surface frost was present, extending northward to latitude -40° , until midwinter, at which time a dense hood of clouds developed and obscured the view of the seasonal SPC. The implication is that the continuous, dense cap covering the entire circumpolar surface does not form until late in the southern winter (Briggs, Klassen, et al, 1977.)

International Planetary Patrol observations of 1984

At about $L_S = 152^\circ$, some 28° of LS prior to the southern spring equinox, multiple observers photographed the SPC through the South Polar Hood (SPH), by the use of red filters. Despite the fact that the hood clouds appeared to be transparent to red light, images made before $L_S = 152^\circ$ failed to show the SPC. This was interpreted as a probable sudden transition from hood to surface cap at $L_S =$

152° . In other words, the cap was thought to be absent until late winter (Martin and James, 1984.)

Donald Parker's well-known image

For years, the image by Donald Parker in **Figure 1** was included in Jeff Beish's website in an article on the polar caps. It shows albedo features beneath the NPH. This is important in that, if albedo features can be seen, then the NPC must not be covering them. Although Jeff Beish revised his website this year (2008) so as to omit the image, it was used during this apparition to bolster the notion that in the 2007-2008 apparition, the NPC formed late in the winter.

Observations by Japanese astronomers

For several apparitions in the past, Japanese observers noted that the NPC, when first detected in the northern spring, was smaller than models predicted. For example, in the 1975-1976 apparition, measurements of the NPC size on red-filtered photographs at $L_S = 340^\circ$ to $L_S = 0^\circ$ showed it to never extend south of latitude $+65^\circ$ (Iwasaki, Saito, and Akabane, 1979). This is considerably smaller than the NPC size detected with instruments aboard the Mars Global Surveyor spacecraft at the same L_S . In 1979, Japanese observers found the formation of the NPC to be delayed until just before the vernal equinox.

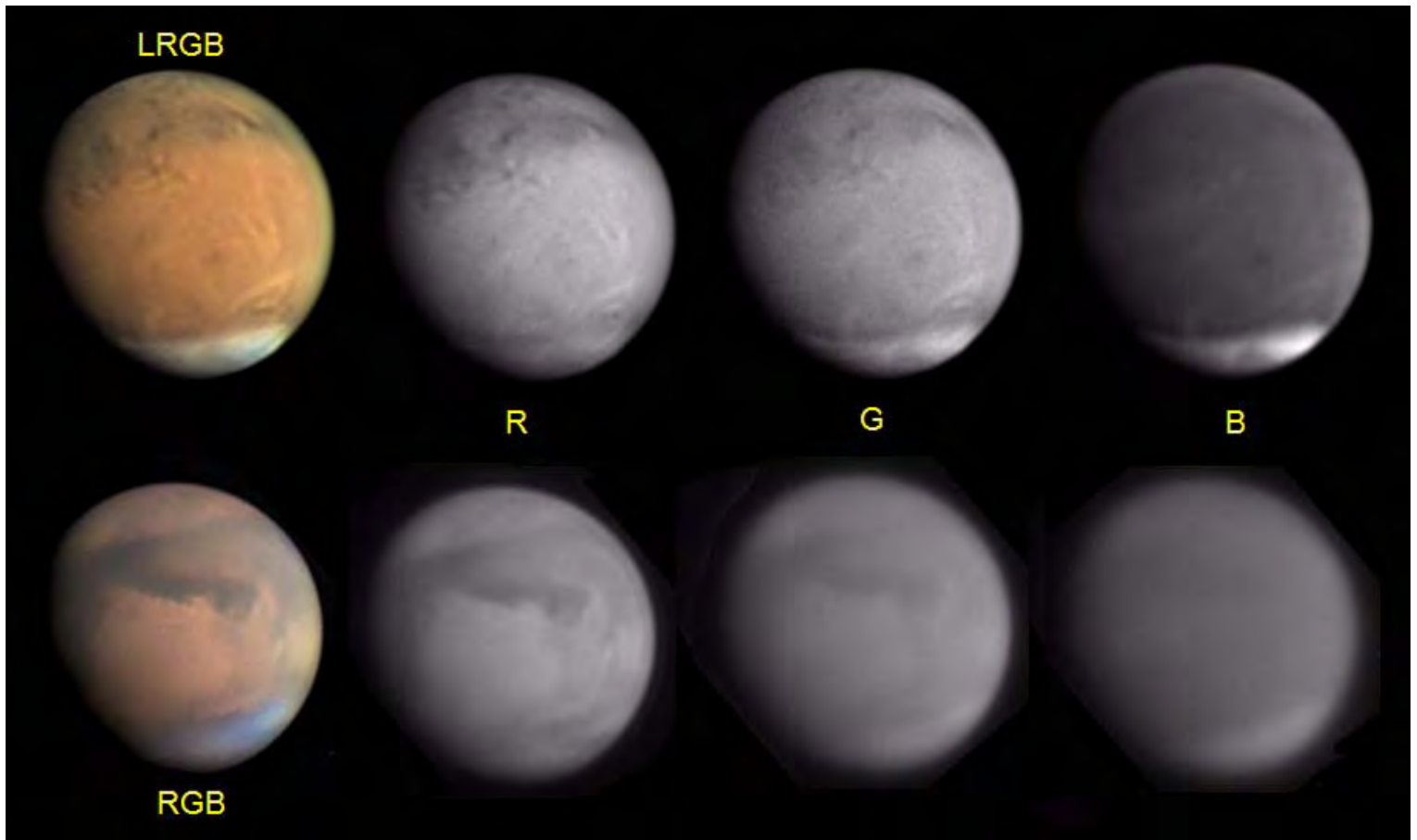


Figure 3. Two image sets that appear to show the absence of the NPC beneath the hood. The cap should be visible in red light, since red generally penetrates Martian clouds. Top set made by Bill Flanagan on November 3, 2007, at 10:20 UT, with $L_S = 341^\circ$ and $CM = 116^\circ$. Bottom set made by Pete Lawrence on November 5, 2007, at 1:39 UT, with $L_S = 342^\circ$ and $CM = 331^\circ$. Other image data: top, 356-mm Schmidt-Cassegrain telescope at f/36, Lumenera LU-075M camera, Astronomik Type II LRGB filters, seeing 5/10 and transparency 5/10; bottom, 356-mm Schmidt-Cassegrain telescope at f/67, SKYnyx 2-0M camera, Astronomik Type II RGB filters, average seeing and transparency.

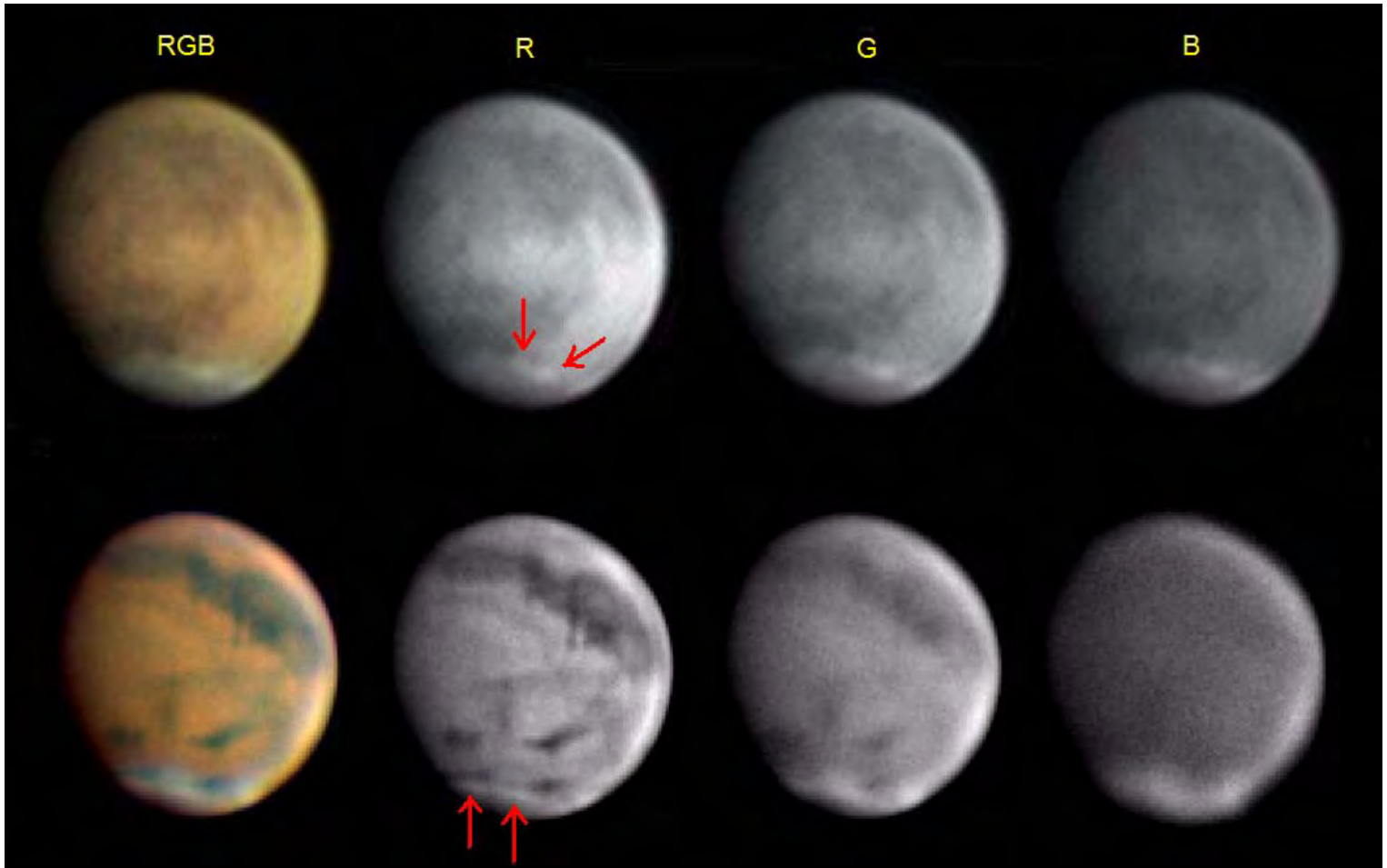


Figure 4. Two image sets showing isolated ice features at the southern edge of the NPC, arrowed in each red image. The brightness of the features in red light is consistent with surface ice. The polar caps, when visible, are usually bright in red, green, and blue. Top image set made by Joel Warren on November 9, 2007, at 8:45 UT, with $L_S = 345^\circ$ and $CM = 38^\circ$. Bottom image set made by Tomio Akutsu about 11 hours after the top image set, on November 9, 2007, at 20:05 UT, with $L_S = 345^\circ$ and $CM = 204^\circ$. Other image details: top, 200-mm Schmidt-Cassegrain telescope at f/20 with DBK 21AF04.AS camera with IR blocked; bottom, 356-mm Schmidt-Cassegrain telescope at f/33, with DMK 21AF04 camera using IDAS LRGB Type 2 filters, and seeing 7/10, transparency 3/5.

Amateur Observations in 2007

Apparition circumstances

The northern vernal equinox occurred on Mars on December 10, 2007, and the period of thinning and dissipation of the NPH spanned the equinox, from approximately the middle of November to late December, 2007. Opposition was on December 24, so that Mars was optimally positioned for observation of this phenomenon. The North Pole was tilted slightly toward Earth, as the declination of Earth in the Martian sky (De) varied from +7.1 on November 1 to +3.1 on December 15. Progressively more of the North Polar Region was visible as it became illu-

minated as Mars progressed through the northern vernal equinox.

About the observations

The images made by many amateurs during this apparition show more detail than most of the best professional images of 30 years ago, now that inexpensive cameras of the “webcam” type are widely used. Moreover, the posting of images on the Internet and the worldwide communication among amateurs have resulted in a remarkable completeness of coverage of the planet. Images used for this report are all posted at various sites on the Internet and were downloaded by the authors, mostly in JPEG format. **Table 1** gives some of the details of the images and drawings. Note that a high percentage of

the submissions included color-component views (made with filters), and that these usually provide the best, most useful information.

Initial absence of the NPC

As the North Polar Region came into view, it quickly became evident that albedo features were visible beneath the hood (**Figure 2**). Remarkably, despite the apparent penetration of the hood by red light, the NPC was not at first visible beneath the hood in early November. **Figure 3** shows two images taken during this period. They appear to show the absence of the seasonal NPC.

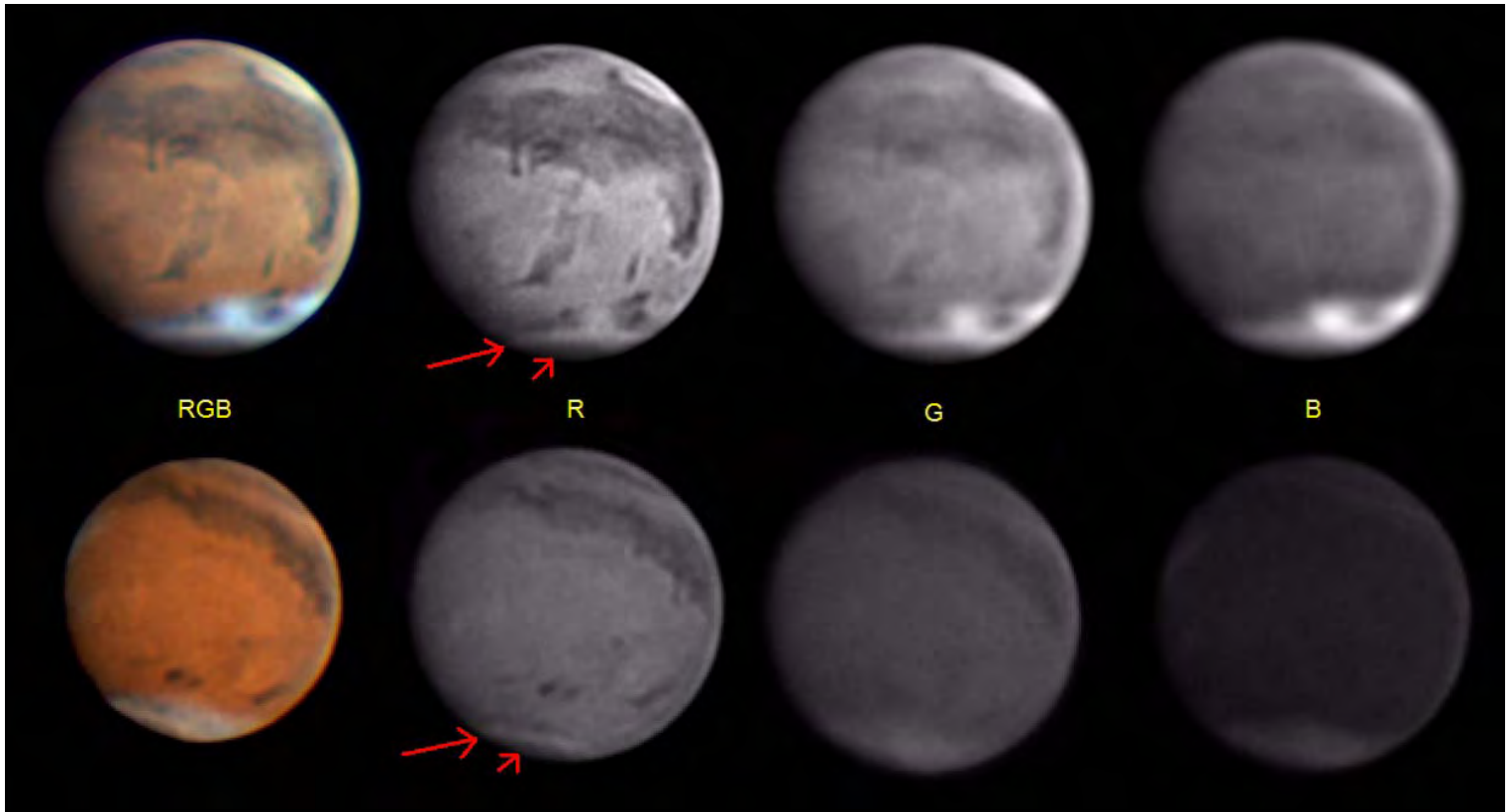


Figure 5. Two images sets that show a narrow “lifesaver” NPC, which is a ring of surface ice around the planet at the southern edge of the forming NPC, as interpreted (see text.) The long arrows designate the lifesaver cap, and the short arrows designate the dark Polar Region to the north of the lifesaver. Top image set made by Paolo Casquinha on November 23, 2007, at 6:21n UT, with $L_S = 352^\circ$ and $CM = 236^\circ$. Bottom image set made by Paul Maxson on December 5, 2007, at 9:40 UT, with $L_S = 358^\circ$ and $CM = 175^\circ$. Other image details: top, 356-mm Schmidt-Cassegrain telescope at f/44, SKYnyx 2.0M camera, Astronomik Type II RGB filters; bottom, 250-mm Dall-Kirkham telescope at f/40.

First hints of the seasonal cap

The seasonal cap did not appear suddenly, but by bits. The first evidences of it in many images were small, isolated bright features, seen in red light. These occurred along the southern edge of the region that was eventually covered by the bright, seasonal cap. They were interpreted as local deposits of the ice that would eventually form the seasonal cap. Seen inconsistently at first, they developed from $L_S = 341^\circ$ to 350° , gradually becoming more extensive. **Figure 4** shows two good examples.

The “lifesaver” cap

The isolated bright spots coalesced into a ring around the planet along the southern edge of what was to be the seasonal cap. There is considerable variability in the time of its first appearance as a ring, but in the authors’ judgment it was at about $L_S = 350^\circ$. The ring was, at first, narrow in its north-south width, and the Polar

Region to its north appeared dark (**Figure 5**). It gradually widened, extending northward (**Figure 6**, upper image set.)

The complete NPC

By $L_S = 6^\circ$ or 7° , the NPC appeared complete, with a bright North Pole (**Figure 6**, lower image set.) Note that it is bright in red, green, and blue light. There is some variability in the images, over several degrees of L_S , concerning when the NPC appears complete.

Thus, in the 2007-2008 apparition, the progression of visibility of the seasonal NPC appeared to be consistent with a delayed – but rapid – formation of the seasonal cap in the late winter over a period of about 25° of longitude of the Sun (i.e., approximately $L_S = 341^\circ$ to 6° .) Remarkably, the southern edge of the NPC appeared to form first, followed by extension of the surface frost northward to the pole.

This sequence in the changing appearance of the NPC was noticed as it occurred by one of us (JM) and independently by Mr. Makoto Adachi, the Mars Section leader of the Association of Lunar & Planetary Observers of Japan, both of whom commented on it contemporaneously in Internet communications.

Discussion: Reconciling the 2007 Observations With What is Known

As discussed in the first part of this article, it is known that the seasonal NPC was well-formed and broad, extending southward to about latitude $+58^\circ$, at $L_S = 341^\circ$ when the first hints of the NPC were visible to Earth-based observers. Therefore, the inability of Earth-based observers to image or visualize the seasonal NPC has to be explained on the basis of the circumstances affecting its visibility.

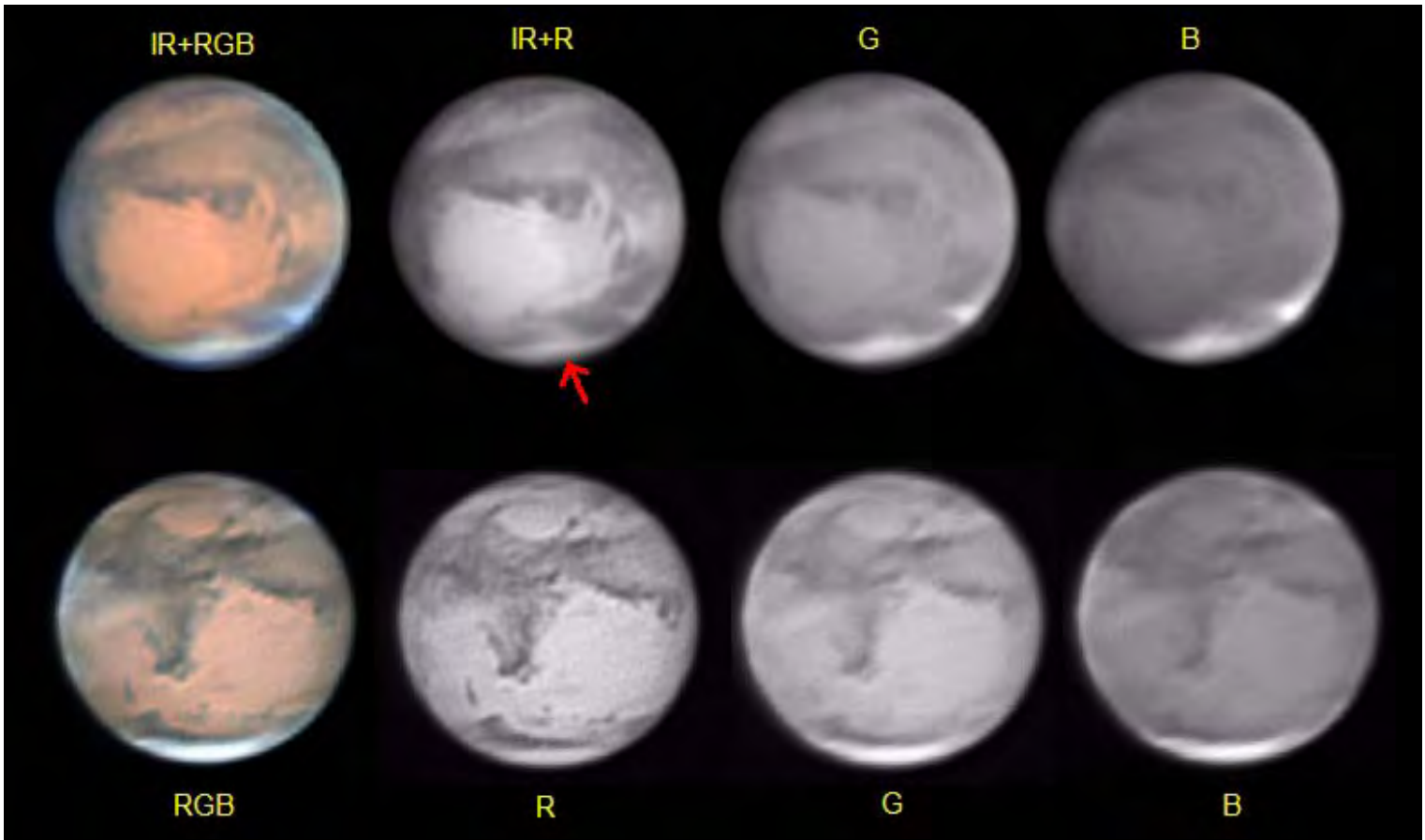


Figure 6. Two sets of images showing the evolution of the NPC with increasing LS. The top image set was made by Jesus Sanchez on December 15, 2007, at 2:37 U.T., with $L_S = 3^\circ$ and $CM = 346^\circ$. It shows the bright ring ("lifesaver") at the edge of the NPC to be wide, with a relatively small area of residual dark albedo, arrowed, near the North Pole. The bottom image set was made by Don Parker on December 23, 2007, at 4:27 UT, with $L_S = 7^\circ$ and $CM = 302^\circ$. Notice that the NPC now appears fully formed, and it is bright right to the northern limb of the planet. It is bright in red, green, and blue light. This is the typical appearance of the NPC when the hood appears to have fully dissipated. Other image details: top, 260-mm telescope, DMK 21AF04.AS camera, RGB filters; bottom, 406-mm Newtonian telescope at f/47, Skynyx 2.0 camera, Astrodon filters, seeing poor, transparency 5.

There are two possibilities regarding the cap's low visibility. First, the cap may be of low reflectivity until late in the winter. Second, the cap may be of normal reflectivity but obscured by the long viewing path through the Martian atmosphere.

A change in reflectivity?

There is a possible, albeit unproven, mechanism to account for an increase in the cap's reflectivity in this time period. It involves snow. If the bulk of the cap that forms in the autumn and winter is clear CO_2 ice, it may be translucent and poorly reflective of light. Much of the seasonal polar caps are thought to be slab CO_2 ice, and the cap albedo is low in middle infrared wavelengths (Titus, Kieffer, et al, 2001). If precipitation of small crystals of either CO_2 or H_2O occurs on top of it late

in the winter, a transition to greater reflectivity would then occur. Clouds of CO_2 ice have been observed in the polar night at both poles, and even in the daytime near the terminator, and the possibility of CO_2 snowfall has been raised (Ivanov, 2002; Zasova, Formisano, et al, 2005). At the present time, the timing and extent of these clouds and possible snowfall have not been well characterized. The notion that CO_2 snow might occur preferentially just prior to the spring equinox is peculiar. However, this possibility should be entertained as a possible explanation of the Earth-based observations of the NPC in 2007.

Obscuration by the NPH?

In ordinary observations of Mars, red light penetrates clouds, so that the surface of

the planet can be seen beneath clouds. Such clouds are composed of water-ice particles. Although it has been proposed that there may be dense clouds composed of CO_2 -ice particles over the poles in the winters (Kieffer, Martin, et al, 1977), it is not clear how admixture of CO_2 -ice clouds with the hood's water-ice clouds would affect the optical density of the NPH as seen from Earth. Measurements of the density of the NPH clouds by spacecraft are difficult to apply to the present problem, due to the widely differing wavelengths, seasons, and viewing angles at which they were made. The point of this discussion is that we do not know what optical density to expect in the NPH in the context of the Earth-based observations of 2007. However, we have mentioned previously the failure of the



Figure 7. The same image as in Figure 1, by Don Parker on October 25, 1992. Here it is marked by the *WinJUPOS* measuring engine with two crosses in the North Polar Region, at the northernmost extent of the dark albedo features that are seen under the NPH. The left cross is at latitude $+57.6^\circ$ while the right one is at latitude $+59.0^\circ$.

red filter on the nadir-pointing Mars Orbiter Camera aboard Mars Global Surveyor to allow the detection of the NPC prior to $L_S = 339^\circ$ (Benson and James, 2003), and also the failure of the nadir-pointing Viking Orbiter camera to detect the SPC through the SPH (Briggs, Klassen, et al, 1977.). These observations suggest that the polar hoods themselves have

significant optical density in the red, unlike other Martian clouds.

Be that as it may, it is obvious that the Earth-based observer's viewing path through the Martian atmosphere to the NPC was very long at the time of the 2007 northern vernal equinox on December 9. The declination of the Earth in the Martian sky was $+4.2^\circ$ on that date. This means that the observing path on the central meridian at 80° north areocentric latitude was 4 Martian atmospheres, while at 70° north it was 2.5 atmospheres. Extinction by such long light paths increases exponentially, so that at 80° north, the extinction was 16 times the extinction at the sub-Earth point, while at 70° north, it was $5^{2/3}$ times the baseline extinction. Such attenuation may explain the inability of Earth-based observers to detect the seasonal NPC beneath the NPH as soon as expected. Moreover, this attenuation is less at the cap edge than it is at more northern latitudes, so that the cap edge would be expected to become visible first upon the seasonal thinning of the NPH. This, of course, is exactly the way it appeared. The declination of the Earth in the Martian sky was becoming more southerly throughout this period, so that the eventual detection of the NPC cannot be attributed to a better viewing angle. It is possible that the thinning of the NPH contributed to its detection.

A bright cap edge?

It is likely that the NPC is of nonuniform brightness, and that this nonuniformity contributes to the phenomena observed this apparition. The peripheral rims of the seasonal caps may be brighter than the central parts of the caps. A study with the infrared spectrometer aboard Mars Express has shown that, at $L_S = 40^\circ$, the southernmost 7° of latitude of the receding, seasonal NPC is water ice, albeit dusty (Giuranna, Hansen, et al, 2007), and water ice is more reflective of visible light than is CO_2 ice. James and Martin stated their expectation that water-ice is entrained into the edges of both caps, from their interpretation of Earth-based observations (James and Martin, 1988). A bright annulus has been observed during the recession of the SPC (James, Briggs, et al, 1979). This may be due to the condensation of water vapor along the periphery of the caps as the caps regress and their entrained water is released (Phillip B. James, personal communication, 2008).

A bright edge of the NPC might have interplayed with another factor, either an increase in reflectivity of the NPC or obscuration by a dense but thinning NPH, to account for the first appearances of the NPC in 2007.

The Prospect of Observing the Late-Winter NPC in the Next Apparition

In the 2009-2010 apparition of Mars, the northern vernal equinox will occur on Octo-

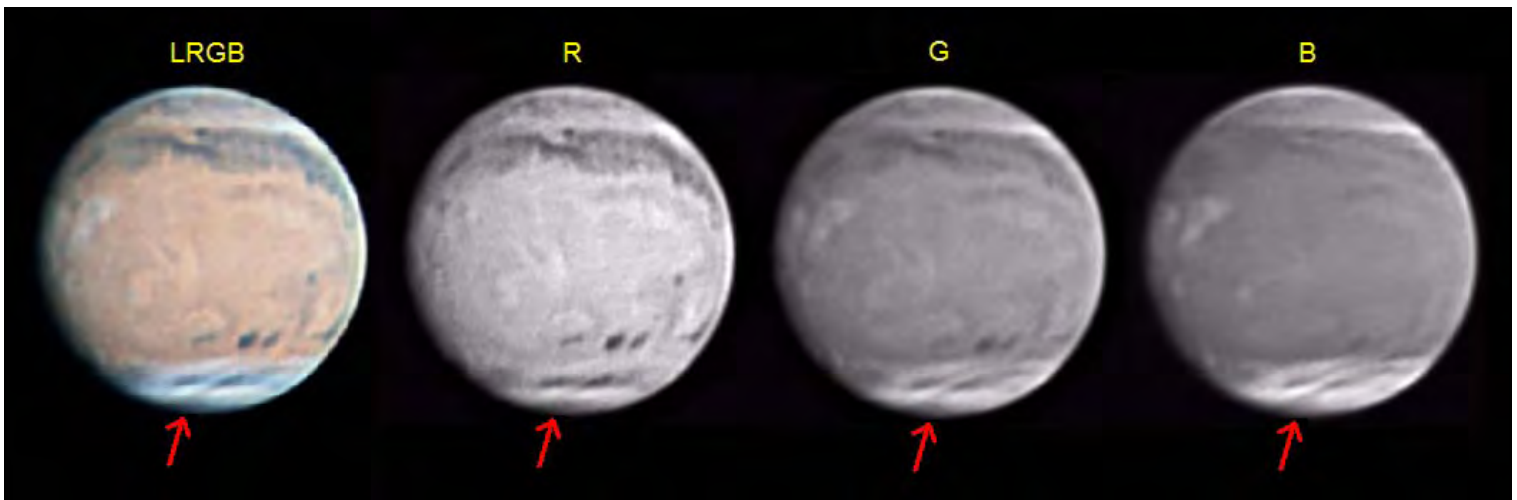


Figure 8. The dark marking in the North Polar Region (arrowed) appears in red and in LRGB to be an albedo feature seen through the NPH. However, it is also prominent in blue light, so that it can better be interpreted as a feature of the NPH itself, not a surface albedo feature. See text. Image made by Don Parker and Paolo Lazzarotti on December 3, 2007, at 7:04 UT, with $L_S = 357^\circ$ and $CM = 157^\circ$. 406-mm Newtonian telescope at $f/47$, Skynyx 2.0 camera, LRGB with Astrodon RGB filters. Seeing $5/10$, transparency 5.

ber 26, 2009, with Mars in the morning sky. At that time, Earth-based observers will have a less attenuated view of the NPC than they did in 2007, as the declination of Earth in the Martian sky will be $+15.9^\circ$. This will result in extinction on the central meridian at latitude $+80^\circ$ by a factor of 4.9 relative to the sub-Earth point, and at latitude $+70^\circ$ by a factor of 3.3. Mars will be near western quadrature, so this will be nearly as low an extinction as is possible at $L_S = 0^\circ$. Thus, we shall have a once-in-a-lifetime opportunity to compare the 2007 observations with those at lower extinction. If the cap appears earlier than it did in 2007, the idea will be supported that extinction by the long viewing path through the Martian atmosphere is a main cause of the nonvisibility of the NPC in late winter. On the other hand, if the cap does not appear earlier than it did in 2007, then the notion will be supported that the reflectivity of the cap increases in late winter.

However, the disc of Mars will be only 7.6 arc seconds in diameter at that time. The excitement of observing it will be balanced by its challenges.

A Few Words of Caution

It is tempting to think that if you see albedo features beneath the polar hood, then the seasonal cap must not yet have formed. This may not be the case. **Figure 7** shows Donald Parker's well-known image of **Figure 1** imported into the WinJUPOS software for measurement of the latitudes and longitudes of features in the image. (For the WinJUPOS software by Grischa Hahn, see <http://www.grischa-hahn.homepage.t-online.de/astro/winjupos/index.htm>.) The crosses at the northern edges of the under-hood albedo features are at latitudes $+57.6^\circ$ and $+59.0^\circ$, leaving plenty of room for the NPC to the north of them.

Furthermore, not all albedo features are albedo features. **Figure 8** shows a dark feature in the LRGB and the red component images that resembles the albedo features under the NPH that are seen in other images such as those in **Figure 2**. However, the feature in **Figure 8** is prominent in the blue image, and with a contrast in blue that is about as great as in red and green. The middle of this feature is so far north that the extinction is about 35 times the baseline extinction at the sub-Earth point. Notice that in the blue image, the Martian atmosphere scatters or absorbs so much of the blue light that the albedo features elsewhere on the disk appear in very low contrast. With the much larger extinction at the latitude of this north polar feature, it is incongruous to think that the blue image is revealing an albedo feature. Rather, it is a feature of the NPH.

The view of the NPC in the lower image set of **Figure 6** is typical. Notice that it appears bright in red, green, and blue light. The brightness in blue light might be considered to be puzzling, since blue light does not penetrate the atmosphere well. The explanation of this brightness in blue is likely that there is a residual NPH, seen as a bright cloud in blue, over much of the NPC as it regresses. Tamppari's group found the hood to be detectable by the Mars Global Surveyor Thermal Emission Spectrometer until $L_S = 75^\circ$, i.e., late northern spring (Tamppari, Smith, et al, 2008). One of us (RV) has proposed that the persistence of the NPH and the difficulty in differentiating it from the NPC have probably been confounders of Earth-based observations of the NPC for many years.

Acknowledgements

The authors are deeply indebted to the 93 highly dedicated and skilled amateur astronomers who made the observations used in this report. We are impressed by their long hours of work on Mars during this apparition. We also express special thanks to the 21 of the 93 who support this work by subscribing to this Journal.

References

- Baum WA (1974). "[Results of current Mars studies at the IAU Planetary Research Center.](#)" In Exploration of the Planetary System; Proceedings of the Symposium, Torun, Poland, September 5-8, 1973. Woszczyk & Iwaniszewska, eds. D. Reidel Publishing Co., Dordrecht. pp241-251.
- Benson JL, James PB (2003). "[Yearly comparisons of the Mars North Polar Cap: 1999, 2001, and 2003 MOC observations.](#)" Lunar & Planetary Institute, Third Mars Polar Science Conf. Abstract no. 8097.
- Briggs GK, Klassen K, Thorpe T, Wellman J (1977). "Martian dynamical phenomena during June-November 1976: Viking Orbiter imaging results." [Journal of Geophysical Research](#) 82(28):4121-4149.
- Giuranna M, Hansen G, Formisano V, Zasova L, Maturilli A, Grassi D, Ignatiev N (2007). "Spatial variation, composition, and thickness of the seasonal North Polar Cap of Mars in mid-spring." [Planetary & Space Science](#) 55(10):1328-1345.
- Hansen GB (2001). "The distribution of water ice and dust in the north seasonal polar cap of Mars." [American Geophysical Union, Fall Meeting 2001](#). Abstract #P12E-09.

Hess SL, Ryan JA, Tillman JE, Henry RM, Leovy CB (1980). "The annual cycle of pressure on Mars at Viking 1 and 2." [Geophysical Research Letters](#) 7:197-200.

Ivanov, AB (2002). "Some aspects of the Martian climate in the Mars Orbiter Laser Altimeter (MOLA) investigation. . . Part II. Polar night clouds. . . ." (PhD thesis, California Institute of Technology.) UMI Company.

Iwasaki K, Saito Y, Akabane T (1979). "Behavior of the Martian polar cap, 1975-1978." [Journal of Geophysical Research](#) 84:8311-8316.

James PB, Briggs G, Barnes J, Spruck A (1979). "Seasonal recession of Mars' South Polar Cap as seen by Viking." [Journal of Geophysical Research](#) 84:2889-2922.

James PB, Martin LJ (1988). "Circumpolar hood and clouds and their relation to the Martian H₂O cycle." In [MECA Workshop on Atmospheric H₂O Observations of Earth and Mars](#). LPI. pp56-57.

Kieffer HH, Martin TZ, Peterfreund AR, Jakosky BM, Miner ED, Palluconi FD (1977). "Thermal and albedo mapping of Mars during the Viking primary mission." [Journal of Geophysical Research](#) 82:4249-4291.

Martin LJ, James PB (1984). "Mars 1984: the transition from polar hood to surface cap." [Bulletin of the American Astronomical Society](#) 16:673.

Sheehan W (1996). "[The Planet Mars. A History of Observation and Discovery.](#)" Univ. of Arizona Press, Tucson.

Tamppari LK, Smith MD, Bass DS, Hale AS (2008). "Water ice clouds and dust in the North Polar Region of Mars using MGS TES data." [Planetary and Space Science](#) 56(2):227-245.

Titus TN (2005). "Mars polar cap edges tracked over three full Mars years." [Lunar & Planetary Science Conference. XXXVI](#), Abstract no. 1993.

Titus TN, Kieffer HH, Mullins KF, Christensen PR (2001).

Zasova LV, Formisano V, Grassi D, Ignatiev NI, Altieri F, Bellucci G, Bibring JP, Giuranna M, Maturilli A (2005). "Structure of the Martian atmosphere in the polar regions: PFS and OMEGA data." [Bulletin of the American Astronomical Society](#) 37:p664.



Feature Story: Galilean Satellite Eclipse Timings The 1997/98 Apparition

By: John E. Westfall,
assistant coordinator,
Jupiter Section, Galilean Satellites
johnwestfall@comcast.net

Abstract

The Galilean Satellite Eclipse Timing Program of the ALPO Jupiter Section received 430 visual timings of eclipses of Io, Europa, Ganymede and Callisto from 36 observers for the 1997/98 Apparition. For each satellite, eclipse visual disappearance and reappearance timings were adjusted for telescope aperture and were then compared with the Jet Propulsion Laboratory's "E-2" Ephemeris. Of the four satellites, only Europa differed significantly in position from the E-2 Ephemeris, being about 29 seconds (390 km) ahead of, or early relative to, its predicted position.

Introduction

The 1997/98 Apparition of Jupiter was the 20th analyzed by the ALPO Jupiter Section's Galilean Satellite Eclipse Timing Program. The satellites timed were Io (1), Europa (2), Ganymede (3) and Callisto (4). Visual observers timed the "first speck" visible when the satellite emerged from Jupiter's shadow (reappearance), or the "last speck" seen when the satellite entered the shadow (disappearance). Reports for previous apparitions are listed under "References" (page 42). [Westfall 1983-84, 1986a, 1986b, 1987, 1988,

1989, 1991, 1992, 1994, 1996, 1998, 1999, 2000 and 2005]

Table 1 lists some important dates for the 1997/98 Jupiter Apparition. All dates and times in this report are in Universal Time (UT). Note that an apparition is the period between successive solar conjunctions, while an observing season is the period of actual observation. Thus the 1997/98 observing season began 29 days after solar conjunction, with Jupiter 23° west of the Sun; it ended 36 days before the next conjunction, at solar elongation 28° east.

At its closest approach to us, Jupiter's distance was 4.049 AU [astronomical units; 1 AU = 149,597,870 km], with an apparent equatorial diameter of 48".64. At opposition in 1997, Jupiter had a visual magnitude of -2.2 and a geocentric declination of -16°.7, so that observers in the Earth's Southern Hemisphere continued to be favored over those in the Northern Hemisphere, although the planet had moved 5°.2 north since its 1996 opposition.

Observations

The 430 timings received for 1997/98 bring our 21-apparition total to 9,425 visual timings, and represent a 25-percent increase from the 1995/97 Apparition. A total of 36 persons made observations and are listed in **Table 2** along with their nationalities, telescope apertures and numbers of timings. The timings themselves are given in **Table 9**, with the

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](mailto:poshedly@bellsouth.net) 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).

observers and their telescope apertures identified by the numbers given in the left-hand column of **Table 2**.

Timings for the 1997/98 Apparition were made by observers in 10 countries in five continents, and the number of observers and timings received from each nation are given in **Table 3**. The geographic spread of our observers is gratifying, but there continue to be longitude gaps in our coverage, including Africa, the Middle East and much of the Pacific Basin. Also, it is disappointing that under one-quarter of the observers were from the United States and that they averaged relatively few timings per observer.

Contributing to this total were 275 timings (64 percent) by 15 New Zealand and Australian observers coordinated by Brian Loader of the Royal Astronomical Society of New Zealand. With Jupiter south of the celestial equator, the Australia-New Zealand observers' contribution remains significant. Thirteen new observers joined the program in 1997/98, although three of the 1995/97 observers did not submit timings for 1997/98. The 1997/98 observers averaged 11.9 timings per observer, down from 13.2 in 1995/97, but above the 21-apparition mean of 8.4 timings per observer per apparition. We need to recognize those observers for the 1997/98 Apparition who had contributed observa-

Table 1: 1997/98 Jupiter Apparition Data.

Conjunction with the Sun	1997 JAN 19, 13h	Jupiter 0°.4 S of Sun
First Eclipse Timing	1997 FEB 17, 19h	Solar Elongation 22°.9 W
Opposition to the Sun	1997 AUG 09, 14h	Declination 16°.7 S
Closest Approach to Earth	1997 AUG 10, 01h	4.049 AU, D(Eq.) 48".64
Last Eclipse Timing	1998 JAN 18, 09h	Solar Elongation 28°.0 E
Conjunction with the Sun	1998 FEB 23, 09h	Jupiter 0°.9 S of Sun
(Meeus 1995; U.S. Naval Observatory 1996 and 1997. Dates and times are UT. AU = astronomical units [1 AU = 149,597,871 km], D(Eq.) = apparent equatorial diameter)		

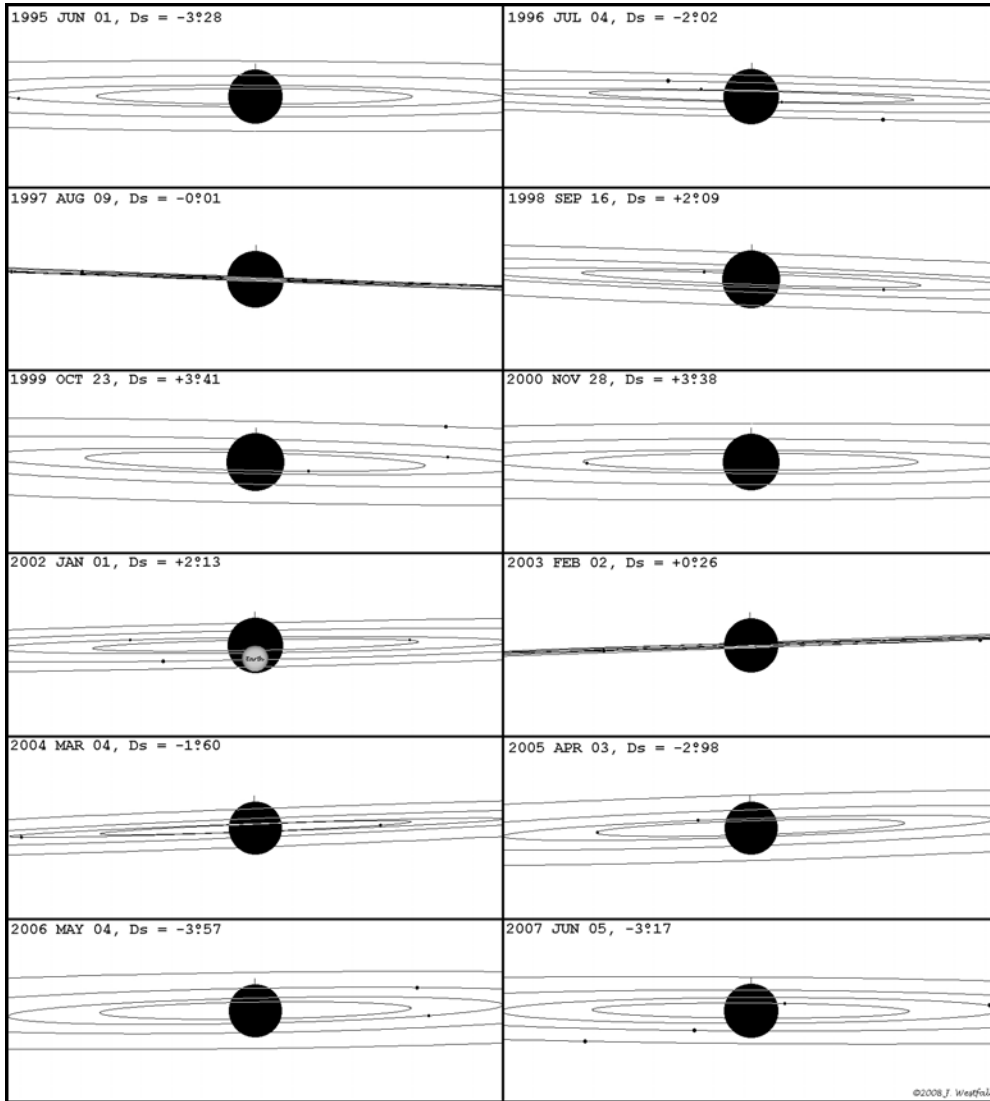


Figure 1. The orbits of the Galilean satellites as seen from the Sun at each geocentric Sun-Jupiter opposition during the course of a Jovian year (12 Earth years). The satellite orbits, in ascending order of distance from Jupiter, are those of Io, Europa, Ganymede and Callisto (celestial north at top). Note the Sun's passages through the satellites' orbital planes in 1997 and 2003 and Callisto's eclipse seasons in 1996-98 and 2002-04. At the opposition of 2002, the Sun saw a transit of the Earth across Jupiter, while at the same time Jupiter witnessed a transit of the Earth across the Sun."

tions for five or more apparitions. **Table 4** gives their names, number of apparitions and number of timings.

Telescope aperture definitely affects timing results. Although most observers used a single telescope, 13 used two or more instruments. The most popular aperture among the 51 different instruments continues to be 20 cm (8 in.), which was also the median aperture. Eleven small telescopes, of 5- to 7-cm (2- to 2.75 in.) aperture, were used. At the other extreme, there were eight fairly large telescopes, of

30 to 65-cm (12 to 25 in.) aperture. The range of apertures continues to be large, showing that almost any size of telescope can be used in our program.

Table 5 gives the number of timings by satellite and type of event. As always, eclipses of the satellites closer to Jupiter are timed more frequently because their orbital periods are less than those of satellites farther from the planet and their eclipses thus more frequent. As with all previous apparitions, there is a bias toward reappearance timings; in this case,

57 percent of the timed events were reappearances.

The outermost Galilean satellite, Callisto, is a special case because, for roughly three years at a time, it passes either north or south of Jupiter's shadow, thus experiencing no eclipse. Between these eclipseless periods, Callisto undergoes approximately three years of eclipses, as shown in **Figure 1**, with partial eclipses at the beginning and end of its "eclipse season." Callisto underwent eclipses throughout the 1997/98 Apparition.

As is usual, the number of timings varied by month, as shown in **Table 6**. The most frequent observing was for the months nearest opposition (1997 AUG 09), when Jupiter was above the horizon for most of the night. As usual, there is a bias toward post-opposition timings, which take place conveniently in the evening sky; in this apparition, they constituted 62 percent of the timings. Nonetheless, it would be helpful if observers made more pre-opposition timings in the future, even though this means observing after midnight.

Naturally, the pattern of the different eclipse phenomena for the different satellites affects the frequency of observations. Eclipse disappearances of Io are visible only before opposition, and its reappearances visible only after. During this apparition, this was true for Europa as well. Disappearances and reappearances for the same eclipses of Ganymede and Callisto could be observed for most of the apparition except near opposition or conjunction.

Reduction

Reduction began by grouping the timings by satellite and by whether they were of a disappearance or a reappearance. The reported times were compared with the predictions of the "E-2" Ephemeris developed by Jay H. Lieske of the Jet Propulsion Laboratory. [Lieske, 1981] The predicted time of each event was then subtracted from the observed time; a positive observed-minus-computed difference meant that an event was "late"; a negative (O-C) difference, that it was "early." We expect disappearances to be late, and reappearances early, in relation to the predicted eclipse time because the latter predicts the time when, as seen from the

Table 2: Participating Observers, Galilean Satellite Eclipse Timings, 1997/98 Apparition

Observer	Observer	Nationality	Telescope Aperture (cm)	Number of Timings
1	Abrahams, W.	Australia	20	1
2	Bacon, I.		25	5
3	Bembrick, C.		25	9
3a			7	26
4	Blanksby, J.		15	45
5	Bock, P.	USA (VA)	12.7	3
6	Busa, S.	Hungary	20	12
7	Buttner, D.	Germany	6	1
8	Chen, D.-H.	P.R. China	20	1
8a			11.4	3
9	Dickie, R.	New Zealand	25	2
9a			20	7
10	Garcia, J.	Portugal	40	18
10a			15.2	1
11	Giovannone, V.	USA (NY)	11.4	3
12	Gonçalves, R.	Portugal	25	2
12a			20	2
12b			15	5
13	Gordon, T.	New Zealand	15	9
14	Haas, W.	USA (NM)	31.75	4
15	Hays, R.	USA (IL)	15	12
16	Kerr, S.	Australia	20	3
16a			5	6
17	Kruijshoop, A.		20	21
18	Larkin, P.		20	45
19	Laskowski, S.	USA (WI)	31.8	7
20	Loader, B.	New Zealand	20	33
21	MacDonald, M.		30	14
21a			25	5
22	MacDougal, C.	USA (FL)	15	4
23	Maluf, W.	Brazil	50	3
23a			15	3
23b			6	2
24	Moller, H.	Australia	20	31
25	Nyári, S.	Hungary	6.3	13
25a			5	1
26	Olesen, J.	Denmark	20	6
27	Parl, M.	Germany	6	11
28	Samolyk, G.	USA (WI)	65	2
28a			32	4
29	Skilton, P.	Australia	15	1
29a			6	2
30	Skilton, R.		15	1
30a			6	1
31	Smith, C.		25	8
32	Sullivan, M.	Canada (BC)	11.43	6
33	Szabó, S.	Hungary	6.3	4
34	Toth, Z.		27	2
34a			20	8
35	Vincze, I.		5	3
36	Westfall, J.	USA (CA)	28	9

center of the satellite's disk, the Sun is bisected by the limb of Jupiter.

When Jupiter's shadow edge bisects a satellite, one might then expect the satellite to be at one-half its uneclipsed brightness. In actuality, regional albedo variations, satellite limb darkening, refraction of sunlight in Jupiter's atmosphere, the curvature of Jupiter's limb, and solar limb darkening misplace the optical (brightness) center of the satellite from the geometric center of its disk. [Mallama et al., 1991; Mallama et al., 2000] These effects do not appear to have biased our results because they are usually not significantly different from either the E-2 Ephemeris or from the results of CCD photometric timings.

The (O-C) differences are given in the right-hand column in **Table 9**. The next step was to correct for aperture with a linear regression model in which the dependent variable (y) was the (O-C) difference in seconds of time and the independent variable (x) was the reciprocal of the telescope aperture in centimeters. The form of the model is:

$$(1) \quad y_{\text{est}} = A + Bx,$$

where A and B are the regression coefficients.

A total of 33 timings, or 8 percent, were not used because they differed from the regression model at the 5-percent significance level (i.e., would occur by chance less than 5 percent of the time) as measured by the standard error (given in **Table 7**). For each satellite and type of event, this 5-percent significance criterion was applied twice in succession. The timings not used for the 1997/98 Apparition are shown by italicized residuals in **Table 9**. It is evident that timings near the beginning and end of the apparition are often unsatisfactory because the event has to be observed in twilight, near the horizon, or both. Another unfortunate situation occurs near opposition, when eclipse events occur near the glare of Jupiter's limb.

Two statistics describe how well Equation (1) fits the observed residuals. One, the standard error (S.E.), is the root-mean-square difference between Equation (1) and each observation. The other statistic,

Table 3: Observers and Timings by Nationality, Galilean Satellite Eclipse Timings, 1997/98 Apparition

Nationality	Number of Observers	Number of Timings	Timings per Observer
Australia	11	205	18.6
Brazil	1	8	8.0
Canada	1	6	6.0
China (P.R.)	1	4	4.0
Denmark	1	6	6.0
Germany	2	12	6.0
Hungary	5	43	8.6
New Zealand	4	70	17.5
Portugal	2	28	14.0
USA	8	48	6.0
Total	36	430	11.9

Table 4: Long-Term Participating Observers, Galilean Satellite Eclipse Timing Program (through 1997/98 Apparition)

Observer	Number of Apparitions	Number of Timings
William Abrahams	12	48
Colin Bembrick	11	170
J.L. Blanksby	10	290
Paul H. Bock	9	46
Chen Dong-Hua	7	124
Ross Dickie	8	106
Joaquim Garcia	9	208
Rui Gonçalves	9	165
Walter Haas	13	78
Robert Hays	11	125
Stephen Kerr	8	183
Alfred Kruijschoop	11	186
Patricia Larkin	8	248
Brian Loader	16	363
Malcolm MacDonald	10	172
Craig MacDougal	12	123
Harry Moller	9	322
Jens Olesen	8	75
Gerry Samolyk	7	28
Peter Skilton	6	78
Charlie Smith	10	195
Michael Sullivan	5	61
Sandor Szabó	6	30
John Westfall	20	361

the coefficient of variation or R^2 , measures what proportion of the variance (squared differences among the residuals) is removed by Equation (1).

1997/98 Results

Results for the 1997/98 Apparition are given in **Table 7**. This table gives results for each of the four satellites in a separate column. Each column is divided into three parts, “Disappearance,” “Reappearance” and “Orbital Residual.” For both disappearances and reappearances, the number of timings made is given first, followed in parentheses by the number finally used in the regression analysis after aberrant timings have been deleted. The next entry is the mean (O-C) difference for the timings that were retained, along with its 1-standard error uncertainty range; in **Table 7** all such uncertainty ranges are preceded by the “±” symbol. The next row contains the coefficient of variation (R^2). If the latter is followed by “(ns)”, then the coefficient is not significantly different from zero and thus there is no significant aperture effect; if by “*”, then the chance of a false aperture effect being due to chance is 5 percent or less; if R^2 is followed by “***”, then the probability of a chance effect is under 1 percent. In the “A(sec)” and “B(sec-cm)” rows, the two regression coefficients are given with their 1-standard error uncertainty ranges. Next is the standard error of estimate for the regression model. Following this are the predicted (O-C) differences for four commonly used telescope apertures.

The last three rows of **Table 7** give the orbital residual, which measures the amount the satellite is “behind” (positive) or “ahead of” (negative) its predicted position, in seconds, kilometers, and degrees of orbital arc, with the standard error and statistical significance of the time residual. In order to find a satel-

lite’s orbital residual it is necessary to have performed a regression analysis on observations of both its eclipse disappearance and reappearance. For this reason, and because a significant number of timings is needed, the orbital residuals listed in **Table 7** should be considered as averages for the entire observing season; they give no information on possible short-term (within-apparition) deviations of a satellite from its predicted position. That such weeks- or months-scale deviations occur is indicated by photometric CCD timings. [Mallama et al., 2000, 2003]

There are eight event types listed in **Table 7**; eclipse disappearances and reappearances for each of the four satellites. As shown by the R^2 values, in six of the eight cases, the aperture-regression model significantly reduced the variance among the timings. Nonetheless, in none of the eight regressions was the majority of the variance among the timings accounted for in our simple residual-aperture model. Naturally, the uncertainties in our timings represent the combined effect of many variables that are not considered in our analysis, such as type of instrument, magnification, optical quality, atmospheric conditions, distance and phase angle of Jupiter, apparent distance of the satellite from Jupiter’s limb, keenness of the observer’s eye, or the use of an occulting bar (an opaque strip placed at the focus of a positive eyepiece to block out Jupiter itself). Clearly, only some of these variables are quantifiable, and for most we have no data at all. Nonetheless, with the large number of timings which have accumulated since 1975, a more complex statistical analysis is possible, which might reduce the amount of uncertainty.

The standard error gives the uncertainty of the timings, which increased with distance from Jupiter as follows (standard errors are given as disappearance:reappearance): 13:14 seconds for Io; 16:25 seconds for Europa; 48:38 seconds for Ganymede and 60:50 seconds for Callisto. This trend of uncertainties increasing with satellite distance from Jupiter is expected as the satellites move more slowly — and Jupiter’s shadow penumbra becomes broader — with increasing distance from the planet.

The values of the B-coefficients indicate the effect of telescope aperture on the

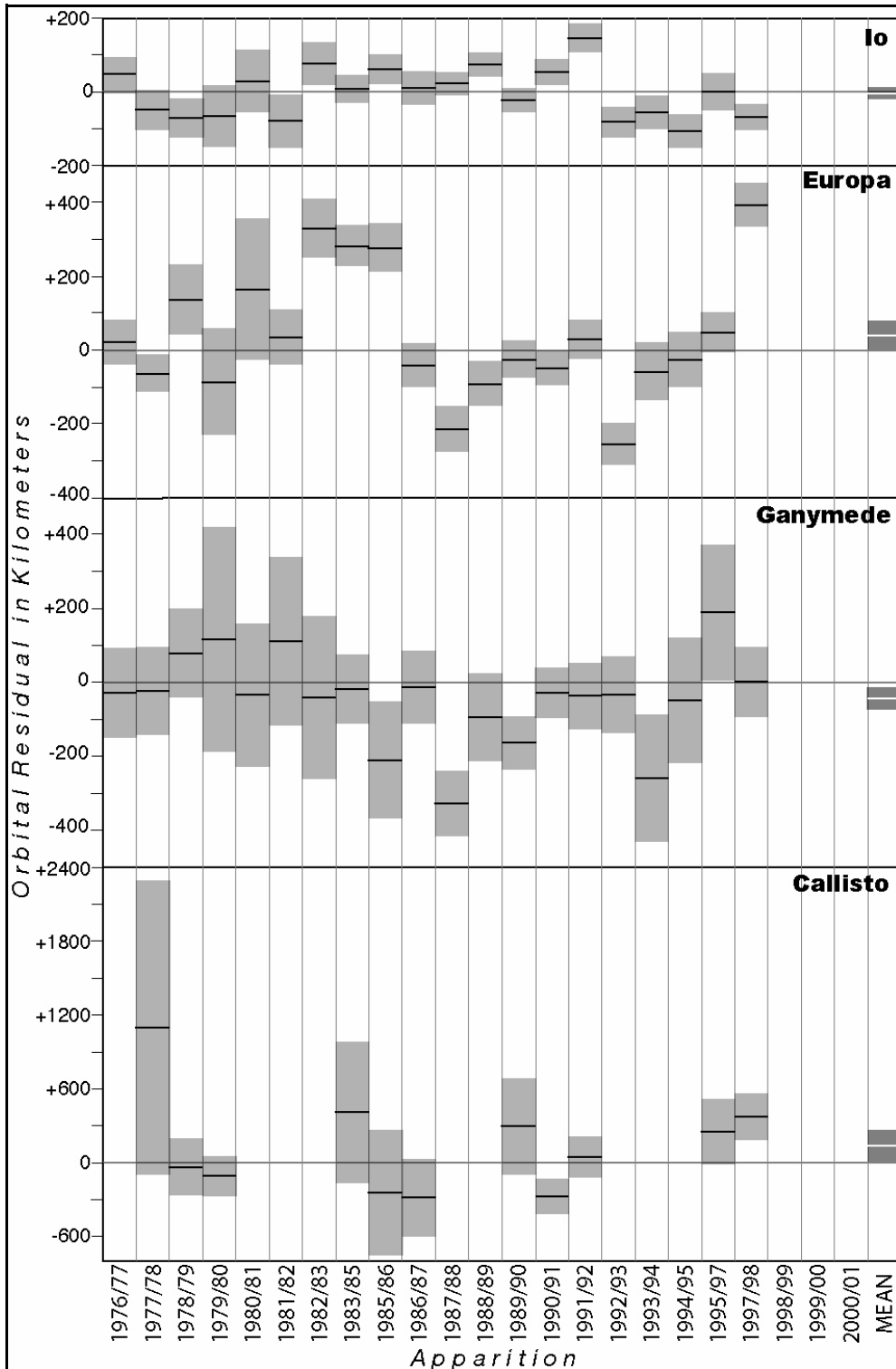


Figure 2. Deviations in kilometers of the Galilean satellites Io, Europa, Ganymede and Callisto from the JPL E-2 Ephemeris for the 1976/77 - 1997/98 Apparitions of Jupiter. The black line in the center of the grey bar for each apparition represents the estimated deviation of each satellite, while the bar itself shows the 1-sigma uncertainty range. The black rectangle on the right margin of the graph shows the 1-sigma range of the 20-apparition mean deviation; none of these four long-term means are significantly different from zero at the 5-percent significance level.

observed time of “first speck” or “last speck.” With the exception of statement (iii) for the eclipse reappearances of Europa and Ganymede, the values follow the expected pattern:

- (i) B is negative for disappearances and positive for reappearances. “Last speck” occurs after, and “first speck” before, the predicted time.
- (ii) The larger the aperture, the later a disappearance, or the earlier a reappearance, is judged to occur.
- (iii) The absolute value of the B-coefficient tends to increase with a satellite's distance from Jupiter; as orbital semimajor axis increases, a satellite's orbital velocity decreases and the width of the penumbral band of Jupiter's shadow increases.

The orbital residuals, expressed in seconds of time, are the simple means of the disappearance and reappearance A-coefficients of each satellite. The four satellites' time residuals have also been converted to degrees of orbital arc and to kilometers. The timing results differed significantly from the E-2 Ephemeris only for Europa, which on average experienced eclipses about 29 seconds later than predicted, equivalent to being “behind” by about 390 km in its orbit.

Comparison with CCD Timings

We encourage suitably-equipped observers to use CCD cameras to time the eclipses of Jupiter's four major satellites and report their results to the program headed by Anthony Mallama. For information about the CCD timing program and how to participate in it, visit its web-site:

<http://www.amsmeteors.org/mallama/galilean/index.html>

Table 8 compares the 1997/98 CCD timings with the visual timings of our program. In comparing the two sets of residuals, it is important to remember that the CCD results are the means of sets of observations of individual eclipse events; consulting the latter may well show trends with apparitions. On the other hand, the visual results merge all the individual timings to give a satellite position generalized over the entire apparition.

Given this caveat, the only statistically significant difference between the CCD and visual timings is for Europa, and that just at the 5-

Table 5: Number of Galilean Satellite Eclipse Timings by Event Type, 1997/98 Apparition

Satellite	(1) Io	(2) Europa	(3) Ganymede	(4) Callisto	Total
Disappearances	78	39	45	22	184
Reappearances	127	50	42	27	246
Total	205	89	87	49	430

percent level, while the numerical signs of both sets of results consistently agree.

Long-Term Results

The apparent changes in satellite position between the 1995/97 and 1997/98 apparitions were found by subtracting the former from the latter, giving:

Io	+3.8 ± 3.5 s
Europa	+25.1 ± 5.7 s
Ganymede	-15.5 ± 18.7 s
Callisto	+15.5 ± 39.2 s

Only the change for Europa is statistically significant, which appeared to have moved behind some 345 kilometers in its orbit since the last previous apparition.

Table 6: Number of Galilean Satellite Eclipse Timings by Month, 1997/98 Apparition

Month	Solar Elongation Range (observing season only)	Number of Timings
1997 FEB	023-032°W	1
MAR	032-056°W	11
APR	056-081°W	17
MAY	081-109°W	21
JUN	109-138°W	43
JUL	138-171°W	54
AUG	171°W-156°E	70
SEP	156-124°E	75
OCT	124-094°E	69
NOV	094-068°E	41
DEC	068-036°E	24
1998 JAN	036-028°E	4
Before Opposition		163 (38%)
After Opposition		267 (62%)

Summarizing the entire history of our program, the orbital residuals for Io, Europa, Ganymede and Callisto for the 20 apparitions from 1976/77 (there were insufficient observations for the 1975/76 Apparition to determine its orbital deviations) through 1997/98 are graphed in **Figure 2**. In the figure, the error bars represent a 1 standard-error range, and a deviation from the ephemeris significant at the 5-percent level would have to equal at least about 2 standard errors.

The diagram hints at cyclical variations for some of the satellites, particularly Europa and Ganymede, perhaps in a 12 Earth-year cycle reflecting Jupiter's orbital period.

Conclusion

We need to continue our program of visual timings which provides continuity with the body of many thousands of similar visual timings that goes back to the 17th century. With our growing database, which includes "meta-data" on the instruments used and the visibility conditions experienced, we have the potential for statistical analysis of the effect of these factors on timing accuracy.

We hope that present participants will continue and new ones will join us. For information on the visual timing program, please contact the writer, whose address is given in the ALPO staff listing in the Journal, ALPO and on the ALPO website. The latter provides observing instructions, an observing report form, and a set of eclipse predictions for each current apparition (all of which can also be provided by mail). The timing report form should be returned at the end of each apparition (not the calendar year). Predictions of Galilean satellite events are also published each year in the *Astronomical Almanac*, the *Observer's Handbook of the Royal Astronomical Society of Canada*, and the *Handbook of the British Astronomical Association*, as well as every month in *Sky & Telescope* magazine.

We thank the many observers who participated in this ALPO project for the 1997/98 Apparition of Jupiter. Remember that your timings become more accurate as you accumulate experience, and also that the more visual timings that are made, the more accurate our results.

References

- Collins, Donald F.; Mallama, Anthony; Nelson, Peter and Park, James (1997). "Precision Time Measurements of Galilean Satellite Eclipses using Small Format CCD's." *Bulletin of the American Astronomical Society*, 29, 819.
- Lieske, Jay B. (1981). "Catalog of Eclipses of Jupiter's Galilean Satellites, 1610-2000." *Astronomy & Astrophysics Supplement Series*, 44, 209-216 (May). [The full catalog is available on microfiche.]
- Mallama, Anthony (1991). "Light Curve Model for the Galilean Satellites During Jovian Eclipse." *Icarus*, 92, 324-331.
- Mallama, Anthony; Caprette, Douglas S.; Nelson, Peter; Park, James; Collins, Donald F. and Vojtisek-Lom, Michal (1994). "Precise Timings of Galilean Satellite Eclipses and Assessment of the E-3 Ephemeris." *Icarus*, 107, 212-214.
- Mallama, Anthony; Collins, Donald F.; Nelson, Peter; Park, James and Krobusek, Bruce A. (2000). "Precise Timings of Galilean Satellite Eclipses and Assessment of the E5 Ephemeris." *Icarus*, 147, 348-352.
- Mallama, Anthony; Krobusek, Bruce A.; Collins, Donald F.; Nelson, Peter and Park, James (2002). "CCD Photometry of Galilean Satellites." *Journal of the Assn of Lunar & Planetary Observers*, 44, (2) 15-21 (Spring).
- Mallama, Anthony; Nelson, Peter; Park, James; Collins, Donald F. and Krobusek, Bruce A. (2003). "Galilean Satellite Eclipse Timing Data", <http://www.amsmeteors.org/mallama/galilean/timings.html>.
- Meeus, Jean (1995). *Astronomical Tables of the Sun, Moon and Planets*. Richmond, VA: Willmann-Bell.
- United States Naval Observatory (1994). *The Astronomical Almanac for the Year 1995*. Washington: U.S. Government Printing Office.
- _____ (1995). *The Astronomical Almanac for the Year 1996*. Washington: U.S. Government Printing Office.
- _____ (1996). *The Astronomical Almanac for the Year 1997*. Washington: U.S. Government Printing Office.
- _____ (2003). *The Astronomical Almanac for the Year 2005*. Washington: U.S. Government Printing Office.
- Westfall, John E. (1983-84). "Galilean Satellite Eclipse Timings: 1975-82 Report." *Journal of the Assn of Lunar & Planetary Observers*, 30, 45-53 (Oct.), 105-115 (Jan.), and 145-154 (Apr.).

Table 7: Galilean Satellite Eclipse Timing Differences from E-2 Ephemeris, 1997/98 Apparition

	Satellite			
	(1) Io	(2) Europa	(3) Ganymede	(4) Callisto
Disappearance				
Number of Timings	78 (72)	39 (35)	45 (43)	22 (21)
Mean Difference (sec)	+86.3 ± 1.5	+115.6 ± 3.0	+210.0 ± 8.0	+295.5 ± 16.7
Regression Coefficients				
R ²	0.0047 (ns)	0.2331**	0.1906**	0.4220**
A (sec)	+87.9 ± 3.1	+130.4 ± 5.4	+245.3 ± 13.5	+385.6 ± 27.5
B (sec-cm)	-25 ± 43	-231 ± 73	-468 ± 151	-1474 ± 396
Standard Error (sec)	± 12.7	± 15.8	± 47.9	± 59.7
Aperture Differences (sec)				
6 cm	+83 ± 5	+92 ± 8	+167 ± 16	+140 ± 44
10 cm	+85 ± 2	+107 ± 4	+198 ± 8	+238 ± 20
20 cm	+87 ± 2	+119 ± 3	+222 ± 8	+312 ± 14
40 cm	+87 ± 2	+125 ± 4	+234 ± 11	+349 ± 19
Reappearance				
Number of Timings	127 (112)	50 (50)	42 (39)	27 (24)
Mean Difference (sec)	-81.7 ± 1.6	-66.2 ± 3.5	-219.0 ± 6.5	-260.5 ± 11.1
Regression Coefficients				
R ²	0.2714**	0.0308 (ns)	0.1789**	0.1932*
A (sec)	-95.8 ± 2.6	-73.3 ± 6.7	-245.1 ± 11.0	-293.0 ± 17.4
B (sec-cm)	+196 ± 31	+104 ± 84	+436 ± 154	+433 ± 189
Standard Error (sec)	± 14.4	± 24.7	± 37.5	± 50.0
Aperture Differences (sec)				
6 cm	-63 ± 3	-56 ± 9	-172 ± 18	-221 ± 20
10 cm	-76 ± 2	-63 ± 4	-201 ± 8	-250 ± 11
20 cm	-86 ± 2	-68 ± 4	-223 ± 6	-271 ± 11
40 cm	-91 ± 3	-71 ± 5	-234 ± 8	-282 ± 14
Orbital Residual				
Seconds	-3.9 ± 2.0 (ns)	+28.6 ± 4.3**	+0.1 ± 8.7 (ns)	+46.3 ± 23.0 (ns)
Orbital Arc (degrees)	-0.009 ± 0.005	+0.034 ± 0.005	+0.000 ± 0.005	+0.012 ± 0.006
Kilometers	-68 ± 35	+393 ± 59	+1 ± 94	+378 ± 188

Table 8: Galilean Satellite CCD Eclipse Timing Results Compared With Visual Results, E-2 Ephemeris (O - C) in Seconds, 1997/98 Apparition

Satellite	CCD Photometry (derived from Mallama et al. 2003)		Visual Results
	Number of Observations	Mean and Standard Error	Mean and Standard Error
Io	11	-2.2 ± 0.9	-3.9 ± 2.0
Europa	8	+17.0 ± 3.3	+28.6 ± 4.3
Ganymede	7	-1.3 ± 3.1	+0.1 ± 8.7
Callisto	4	+23.2 ± 1.3	+46.3 ± 23.0

(1985). "Modest Suggestions for Galilean Satellite Eclipse Photoelectric Photometry." *Journal of the Assn of Lunar & Planetary Observers*, 31, 45-47 (Oct.).

(1986a). "Galilean Satellite Eclipse Timings: 1982/83 Report." *Journal of the Assn of Lunar & Planetary Observers*, 31, 105-119 (Jan.).

(1986b). "Galilean Satellite Eclipse Timings: 1983/85 Report." *Journal of the Assn of Lunar & Planetary Observers*, 31, 198-206 (July) and 249-258 (Nov.).

(1987). "Galilean Satellite Eclipse Timings: 1985/86 Report." *Journal of the Assn of Lunar & Planetary Observers*, 32, 114-128 (Oct.).

(1988). "Galilean Satellite Eclipse Timings: 1986/87 Report." *Journal of the Assn of Lunar & Planetary Observers*, 32, 245-257 (Oct.).

(1989). "Galilean Satellite Eclipse Timings: 1987/88 Report." *Journal of the Assn of Lunar & Planetary Observers*, 33, 157-167 (Oct.).

(1991). "Galilean Satellite Eclipse Timings: The 1988/89 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 35, 14-24 (Mar.).

(1992). "Galilean Satellite Eclipse Timings: The 1989/90 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 36, 63-67 (July).

(1994). "Galilean Satellite Eclipse Timings: The 1990/91 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 37, 154-164 (Apr.).

(1996). "Galilean Satellite Eclipse Timings: The 1991/92 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 39, 16-27 (June).

(1998). "Galilean Satellite Eclipse Timings: The 1992/93 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 40, 14-25 (Jan.).

(1999). "Galilean Satellite Eclipse Timings: The 1993/94 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 41, 24-35 (Jan.).

(2000). "Galilean Satellite Eclipse Timings: The 1994/95 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 42, 74-82 (Jan.).

(2005). "Galilean Satellite Eclipse Timings: The 1995/97 Apparition." *Journal of the Assn of Lunar & Planetary Observers*, 47 (4), 36-49 (Autumn).

The Strolling Astronomer

Table 9. Galilean Satellite Eclipse Timings, 1997/98 Apparition.

UT	LD	Lat	ObN	STB	Dif	UT	LD	Lat	ObN	STB	Dif	UT	LD	Lat	ObN	STB	Dif
Io Disappearances						Io Disappearances – Cntd.						Io Reappearances – Cntd.					
1997						1997						1997					
0217	0.4	-5	18	000	+85	0714	0.5	-1	3a	000	+79	0828	0.4	+0	27	200	-26
0312	0.7	-4	4	100	+54				20	010	+95	0829	0.4	+0	4	210	-59
			17	100	+82	0716	0.5	-1	13	000	+82				3a	010	+22
			18	000	+87	0718	0.5	-1	15	100	+95	0831	0.5	+0	20	000	-96
			31	102	+92	0719	0.4	-1	12b	011	+89				24	010	-70
0319	0.8	-4	24	110	+73				10	211	+110				21	010	-53
0328	0.9	-4	4	110	+63	0721	0.4	-1	13	221	+57	0902	0.5	+0	36	000	-87
			18	010	+78				3a	001	+78	0904	0.5	+1	15	000	-99
			20	000	+88				20	011	+99				19	201	-93
0411	1.0	-4	24	010	+85	0725	0.3	-1	23a	000	+102				28	111	-88
0420	1.1	-3	4	101	+76				32	100	+107	0905	0.6	+1	35	---	-68
			18	100	+78	0727	0.3	-1	10	11-	+80				27	100	-56
			31	021	+83				34a	---	+82	0907	0.6	+1	24	010	-75
0427	1.1	-3	4	110	+81	0728	0.3	-1	24	010	+60	0909	0.6	+1	4	000	-83
			18	010	+90				6	---	+74				18	010	-78
0429	1.1	-3	21	000	+71	0730	0.2	-0	24	011	+58				3a	010	-63
0504	1.1	-3	24	010	+94				3	000	+75	0912	0.7	+1	23	000	-99
0513	1.1	-3	20	000	+92				8	000	+81				34a	---	-83
			24	000	+98	0801	0.2	-0	21	000	+45				25	---	-72
			31	101	+105				13	000	+64				6	---	-66
0520	1.1	-2	31	111	+103				15	001	+88	0916	0.7	+1	17	001	-107
0529	1.1	-2	18	000	+97				18	000	+91				18	001	-104
			20	000	+97	0804	0.1	-0	10	111	+37	0921	0.8	+1	6	---	-85
0605	1.0	-2	3a	000	+88				7	000	+47				34a	---	-81
			20	000	+95	0808	0.0	-0	20	000	+38				29a	000	-68
0607	1.0	-2	20	000	+93				13	000	+57				12	212	-64
			21	000	+93	Io Reappearances									27	---	-42
			36	202	+102	0810	0.0	-0	9a	200	+16	0923	0.8	+1	17	100	-102
0611	1.0	-2	33	---	+83	0813	0.1	-0	25a	---	-55				18	000	-100
			25	---	+92				34a	---	-48				4	000	-92
0614	1.0	-2	18	020	+71	0815	0.1	-0	18	000	-87	0925	0.9	+1	20	000	-102
			21	000	+88				4	101	-76	0927	0.9	+1	15	000	-105
			20	000	+100	0817	0.2	+0	20	200	-75				19	101	-101
0619	0.9	-2	4	102	+37				9a	201	-74	0928	0.9	+1	12a	100	-73
0621	0.9	-2	8a	011	+57				13	001	-59				6	---	-66
			20	010	+95				3a	001	-3				27	102	-5
0626	0.8	-1	25	---	+83				21	001	-1	0930	0.9	+1	4	000	-100
0628	0.8	-1	4	100	+72	0820	0.2	+0	23	000	-81				18	000	-96
			3	000	+92				12b	100	-80				3a	000	-85
			20	000	+95				10	211	-70	1002	1.0	+1	21	020	-77
0630	0.8	-1	4	100	+86				26	010	-26				3a	000	-73
			18	000	+91	0824	0.3	+0	9	010	-87				9a	110	-70
			17	100	+102				13	000	-81	1005	1.0	+1	10	010	-78
0704	0.7	-1	6	---	+93				3a	000	-65	1007	1.0	+2	6	---	-132
			34a	---	+95				21	000	-59	1009	1.0	+2	17	100	-105
			33	---	+96				24	011	-49				1	101	-97
			25	---	+98	0826	0.4	+0	22	121	-83				18	000	-97
0707	0.7	-1	4	100	+84				15	000	-71				4	000	-91
			18	100	+92	0828	0.4	+0	10	000	-86				31	101	-91
			3	000	+94				34a	---	-79				3a	000	-80
			17	000	+104				12b	100	-77	1013	1.0	+2	11	000	-54
0711	0.6	-1	23	000	+82				25	---	-60	1014	1.1	+2	12	101	-103

Table 9. Continued.

UT	LD	Lat	ObN	STB	Dif	UT	LD	Lat	ObN	STB	Dif	UT	LD	Lat	ObN	STB	Dif
Io Reappearances – Cntd.						Europa Disappearances						Europa Reappearances – Cntd.					
1997						1997						1997					
1014	1.1	+2	26	010	-19	0322	1.3	-2	21	000	+62	0905	0.9	+5	27	100	-19
1016	1.1	+2	17	001	-103	0416	1.7	-1	20	110	+103	0909	1.0	+5	24	011	-80
			18	000	-101	0423	1.8	-1	18	010	+94				18	020	-76
			4	001	-95				31	102	+135				3a	000	-74
			3a	000	-87	0430	1.8	-0	31	100	+128				4	020	-51
			24	012	-82	0504	1.8	-0	28a	211	+132	0916	1.2	+5	24	012	-101
1020	1.1	+2	32	000	-94	0507	1.8	-0	24	100	+125	0923	1.4	+6	18	000	-99
			11	000	-83	0515	1.8	+0	33	---	+61				4	200	-82
1023	1.1	+2	4	200	-70	0518	1.8	+0	18	020	+71				17	020	-23
1025	1.1	+2	18	000	-99				21	000	+115	0927	1.5	+6	19	110	-95
			17	000	-98	0525	1.8	+1	3a	000	+107	0930	1.5	+6	26	010	-56
			16	000	-96	0601	1.7	+1	18	020	+93	1004	1.6	+6	3	001	-64
			20	010	-96	0616	1.6	+2	25	---	+121	1007	1.6	+6	10	212	-69
			4	000	-93	0619	1.5	+2	4	101	+123				6	---	-65
			3	000	-85				20	000	+140	1011	1.7	+6	29	010	-98
			21a	210	-65	0623	1.4	+2	10	112	+139				18	000	-97
			30	012	-64	0626	1.3	+2	2	211	+130				4	001	-94
			29a	012	-44				20	000	+131				3a	000	-66
			16a	000	-41	0703	1.2	+2	4	100	+109				21a	011	-50
1027	1.1	+2	36	000	-93				3a	000	+110	1018	1.7	+7	24	012	-93
1030	1.1	+2	25	---	-87				18	000	+112				18	020	-73
			26	010	-80	0710	1.0	+3	6	---	+126				3a	000	-54
1101	1.1	+2	17	001	-108	0714	0.9	+3	13	111	+116	1025	1.8	+7	34a	---	-65
			2	000	-97				20	020	+116				25	---	-62
			4	020	-95	0718	0.8	+3	10	001	+119	1101	1.8	+7	34	---	-86
			3	000	-92				12a	001	+132				27	011	-49
1106	1.1	+2	6	---	-28	0721	0.7	+3	4	012	+113	1112	1.8	+8	4	001	-97
1108	1.1	+2	2	101	-100				18	000	+115				9a	211	-37
			18	000	-94				17	000	+142	1119	1.8	+8	24	010	-90
			4	101	-70	0725	0.5	+3	23a	100	+126				4	120	-82
			3a	100	-33	0728	0.4	+4	20	010	+103				3a	100	-56
1119	1.1	+3	32	220	-72				18	000	+116	1126	1.7	+8	26	111	-48
1120	1.1	+3	23b	000	-93				20	010	+133	1214	1.5	+9	17	100	-110
			5	010	-69	0804	0.2	+4	4	100	+36				18	022	-61
1124	1.1	+3	17	101	-102				3a	000	+79				21a	220	+2
			4	100	-78				18	001	+113	1217	1.4	+9	15	000	-75
			3a	000	-77	0808	0.0	+4	13	000	+69	1221	1.4	+9	24	110	-76
1128	1.1	+3	22	211	-96				20	000	+82	1998					
			5	020	-83				32	200	+127	0115	0.9	+10	4	202	-85
			11	000	-16	Europa -- Reappearances									18	111	-70
1201	1.0	+3	24	120	-63	0812	0.1	+4	10	000	-46	Ganymede -- Disappearances					
1203	1.0	+3	20	101	-95	0815	0.2	+4	18	100	-103	1997					
1205	1.0	+3	14	11-	-77				20	000	-60	0308	1.7	-13	24	110	+235
1210	1.0	+3	17	011	-105				4	101	-50	0413	2.7	-11	31	100	+277
			4	101	-92	0819	0.3	+4	10	211	-29	0519	2.9	-8	21	020	+148
1213	0.9	+3	15	100	-90	0826	0.6	+4	15	000	-83	0526	2.9	-8	4	011	+239
			5	100	-89				22	121	-78				24	012	+255
1226	0.8	+4	21a	000	-64	0902	0.8	+5	4	102	-36				17	100	+277
1998									9a	200	-32	0602	2.8	-7	4	211	+249
0109	0.6	+4	24	212	+6				36	000	-32				18	001	+274
0118	0.5	+4	16a	201	+29	0905	0.9	+5	35	---	-43	0610	2.6	-7	25	---	+239

Table 9. Continued.

UT	LD	Lat	ObN	STB	Dif	UT	LD	Lat	ObN	STB	Dif	UT	LD	Lat	ObN	STB	Dif
Ganymede Disappearances – Cntd.						Ganymede Reappearances – Cntd.						Callisto Disappearances – Cntd.					
1997 0610	2.6	-7	33	---	+239	1997 0624	0.3	-6	18	000	-263	1997 0913	1.2	+6	4	022	+215
			6	---	+256				20	000	-209				21	100	+253
0617	2.4	-6	10	112	+185				4	202	-168				3	001	+289
0624	2.2	-6	22	112	+258				17	211	-163				24	011	+298
			15	000	+263				9a	101	-144				9a	001	+344
0701	2.0	-5	18	000	+241	0813	0.2	-3	18	000	-294				20	000	+356
0715	1.3	-5	3a	000	+190	0820	0.6	-2	26	010	-163	1102	3.2	+12	27	100	+106
			18	000	+308				10	211	-31				34	---	+279
0723	1.0	-4	25	---	+229	0828	1.0	-2	12b	000	-239	1119	3.1	+14	24	011	+190
			6	---	+254				10	000	-229				3a	000	+201
0730	0.6	-4	10	211	+136				34a	---	-228				17	100	+329
			15	200	+238				25	---	-194				18	000	+350
0806	0.2	-3	13	220	+37				27	200	-184				4	000	+362
			32	200	+174	0904	1.4	-1	28	111	-260	1223	1.9	+18	23b	000	-92
0918	0.0	-0	4	002	+97				19	101	-232	Callisto Reappearances					
0925	0.3	+0	18	000	+199				36	000	-220	0415	2.8	-12	24	010	-239
			3a	000	+203	0911	1.7	-1	3a	000	-220	0502	3.2	-10	21	000	-168
			4	100	+214				21	011	-196	0708	0.9	-3	18	010	-262
			17	000	+231	0918	2.0	-0	17	000	-277	0811	0.2	+1	10	000	-117
			20	000	+238				4	001	-247	0827	1.8	+3	25	---	-287
1002	0.5	+1	24	010	+213	0925	2.3	+0	18	000	-234				10	000	-279
1009	0.7	+1	27	111	+130				4	010	-219				12b	100	<-246
1017	0.8	+2	28a	111	+252	1002	2.5	+1	10	000	-246				30a	020	-234
1024	0.9	+2	32	110	+112	1010	2.7	+1	19	102	-251				35	---	~199
			36	100	+201	1017	2.8	+2	14	11-	-270				6	---	-184
1031	0.9	+3	16a	000	+101				19	212	-234				27	200	-164
			16	000	+241				28a	222	-194	0913	3.2	+5	3	001	-321
1107	1.0	+3	3a	000	+134				36	101	-135				24	011	-284
			8a	000	+144	1024	2.9	+2	20	000	-268	0930	4.2	+7	17	000	-366
			24	011	+163	1031	2.9	+3	2	000	-253				18	000	-321
			2	111	+185				16	000	-227				4	000	-304
1129	0.8	+5	14	101	+230				16a	000	-115				3a	000	-263
1213	0.5	+6	16a	011	+81	1122	2.8	+4	15	000	-237	1017	4.9	+9	14	11-	-332
			21a	001	+175	1206	2.6	+5	20	100	-229				19	212	-313
			20	101	+222	1213	2.4	+6	24	012	-202				36	101	-312
1220	0.3	+6	24	110	+193	Callisto Disappearances									28a	222	-248
Ganymede Reappearances						0329	4.1	-14	24	012	+249	1119	5.0	+13	25	---	-187
0406	0.6	-12	20	200	-151	0415	4.7	-12	18	000	+361				27	110	+7
0413	0.7	-11	24	010	-170	0621	4.1	-4	8a	010	+238	1206	4.5	+15	3	100	-268
0428	0.9	-10	10a	110	-123				20	010	+392				18	010	-239
0519	1.0	-9	4	001	-172	0708	2.9	-2	9	210	+296				20	110	-233
0526	0.9	-8	17	000	-259				20	110	+367				16a	000	+28
			4	001	-232				36	100	+410						
0617	0.5	-7	15	200	-247	0725	1.5	-0	23a	100	+321						

Table 9: Key to column headings:

UT = Universal Time, expressed as mmdd; LD = distance of satellite from Jupiter's limb in units of Jupiter's equatorial radius; Lat = latitude of satellite on Jupiter's shadow cone in degrees; ObN = observer number as in Table 2; STB = observing conditions, where S = seeing, T = transparency and B = field brightness, all expressed in terms of 0 = condition not perceptible, 1 = condition perceptible but does not affect accuracy and 2 = condition perceptible and does affect accuracy; and Dif = (observed – calculated) eclipse time in seconds.

ALPO Resources

People, publications, etc., to help our members

Board of Directors

<http://www.alpo-astronomy.org/main/board.html>

- Executive Director; Michael D. Reynolds, associate dean, Math & Science, Florida Community College, 3939 Roosevelt Blvd, E-345, Jacksonville, FL 32205
- Associate Director; Richard W. Schmude, Jr., 109 Tyus St., Barnesville, GA 30204
- Member of the Board; Julius L. Benton, Jr., Associates in Astronomy, P.O. Box 30545, Wilmington Island, Savannah, GA 31410
- Member of the Board; Sanjay Limaye, University of Wisconsin, Space Science and Engineering Center, Atmospheric Oceanic and Space Science Bldg. 1017, 1225 W. Dayton St., Madison, WI 53706
- Member of the Board; Donald C. Parker, 12911 Lerida Street, Coral Gables, FL 33156
- Member of the Board; Ken Poshedly, 1741 Bruckner Ct., Snellville, GA 30078-2784
- Member of the Board; John E. Westfall, P.O. Box 2447, Antioch, CA 94531-2447
- Member of the Board, Secretary/Treasurer; Matthew Will, P.O. Box 13456, Springfield, IL 62791-3456
- Founder/Director Emeritus; Walter H. Haas, 2225 Thomas Drive, Las Cruces, NM 88001

Publications Staff

<http://www.alpo-astronomy.org>

Publisher & Editor-in-Chief

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

Science / Peer Reviewers

- Klaus R. Brasch; 10915 Sage Rd, Flagstaff, AZ, 86004
- Richard Jakiel; 5186 Big A Rd, Douglasville, GA 30135-5356
- Richard K. Ulrich, Professor, Dept. of Chemical Engineering, 3202 Bell Engineering Center, University of Arkansas, Fayetteville, AR 72701
- Roger J. Venable, MD, P.O. Box 117, Chester, GA 31012

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

Book Review Editor

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

Translators

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

Graphics

- John Sanford, P.O. Box 1000, Springville, CA 93265-1000

Interest Sections

Computing Section

<http://www.alpo-astronomy.org/computing>

- Coordinator; Kim Hay, 76 Colebrook Rd, RR #1, Yarker, ON, K0K 3N0 Canada

Historical Section

<http://www.alpo-astronomy.org/main/hist.html>

- Coordinator; Richard Baum, 25 Whitchurch Rd., Chester, CH3 5QA, United Kingdom
- Assistant Coordinator; Thomas A. Dobbins, 1937 Hillcrest Dr, Coshocton, OH 43812-2733

Lunar & Planetary Training Section

<http://www.alpo-astronomy.org/training>

- Coordinator; Timothy J. Robertson, 2010 Hillgate Way #L, Simi Valley, CA 93065

Website

<http://www.alpo-astronomy.org/>

- Acting Webmaster; Larry Owens, 4225 Park Brooke Trace, Alpharetta, GA 30022
- Assistant Webmaster; Jonathan D. Slaton, P. O. Box 496, Mansfield, MO. 65704

Youth Section

<http://www.cometman.net/youth>

Coordinator; Timothy J. Robertson, 2010 Hillgate Way #L, Simi Valley, CA 93065

Observing Sections

Solar Section

<http://www.alpo-astronomy.org/solar>

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

Mercury Section

<http://www.alpo-astronomy.org/Mercury>

- Coordinator; Frank J. Melillo, 14 Glen-Hollow Dr., E-#16, Holtsville, NY 11742

Venus Section

<http://www.alpo-astronomy.org/venus>

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

Mercury/Venus Transit Section

<http://www.alpo-astronomy.org/transit>

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

Lunar Section

Lunar Topographical Studies Program

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

Smart-Impact Webpage

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

The Lunar Observer

<http://www.zone-vx.com/tlo.pdf>

Lunar Selected Areas Program

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

ALPO Resources

People, publications, etc., to help our members

Banded Craters Program

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

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

Lunar Meteoritic Impacts Program

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

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

Lunar Domes Program

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

Mars Section

<http://www.alpo-astronomy.org/Mars>

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

- Acting Assistant Coordinator; Jim Melka, 14176 Trailtop Dr., Chesterfield, MO 63017

Minor Planets Section

<http://www.alpo-astronomy.org/minor>

- Coordinator; Frederick Pilcher, 2277 Brightstar Ave, Las Cruces, NM 88011.
- Assistant Coordinator; Lawrence S. Garrett, 206 River Road, Fairfax, VT 05454
- Scientific Advisor; Steve Larson, Lunar & Planetary Lab, University of Arizona, Tucson, AZ 85721

Jupiter Section

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

- Coordinator (Section); Richard W. Schmude Jr., 109 Tyus St., Barnesville, GA 30204
- Assistant Coordinator (Section); Ed Grafton, 15411 Greenleaf Lane, Houston, TX 77062
- Assistant Coordinator & Scientific Advisor; Sanjay Limaye, University of Wisconsin, Space Science and Engineering Center, Atmospheric Oceanic and Space Science Bldg. 1017, 1225 W. Dayton St., Madison, WI 53706
- Assistant Coordinator, Transit Timings; John McAnally, 2124 Wooded Acres, Waco, TX 76710
- Assistant Coordinator, Newsletter; Craig MacDougall, 821 Settlers Road, Tampa, FL 33613
- Assistant Coordinator, Eclipses of Galilean Satellites; John E. Westfall, P.O. Box 2447, Antioch, CA 94531-2447
- Scientific Advisor; Prof. A. Sanchez-Lavega, Dpto. Fisica Aplicada I, E.T.S. Ingenieros, Alda. Urquijo s/n, 48013, Bilbao, Spain wupsalaa@bic00.bi.ehu.es

Saturn Section

<http://www.alpo-astronomy.org/saturn>

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

Remote Planets Section

<http://www.alpo-astronomy.org/remote>

- Coordinator; Richard W. Schmude, Jr., 109 Tyus St., Barnesville, GA 30204

Comets Section

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

- Coordinator; Gary Kronk, 132 Jessica Dr, St. Jacob, IL 62281-1246

Meteors Section

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

- Coordinator; Robert D. Lunsford, 1828 Cobblecreek St., Chula Vista, CA 91913-3917
- Assistant Coordinator; Robin Gray, P.O. Box 547, Winnemucca, NV 89446

Meteorites Section

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

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

Eclipse Section

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

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

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 Astronomer*. All except Monograph No. 3 are available by regular mail or online as a pdf.

Order hard copy monographs (including Monograph No. 3) from *The Strolling Astronomer* Science Editor, P.O. Box 2447, Antioch, CA 94531-2447 USA. Hardcopy prices include postage and are stated below. Checks should be in U.S. funds, payable to "ALPO".

You may download all at no charge EXCEPT Monograph No. 3 (available only in hard copy format).

- **Monograph No. 1.** *Proceedings of the 43rd Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, August 4-7,*

ALPO Resources

People, publications, etc., to help our members

1993.77 pages. Hard copy \$12 for the United States, Canada, and Mexico; \$16 elsewhere.

- **Monograph No. 2.** *Proceedings of the 44th Convention of the Association of Lunar and Planetary Observers. Greenville, South Carolina, June 15-18, 1994.* 52 pages. Hard copy \$7.50 for the United States, Canada, and Mexico; \$11 elsewhere.
- **Monograph No. 3.** *H.P. Wilkins 300-inch Moon Map.* 3rd Edition (1951), reduced to 50 inches diameter; 25 sections, 4 special charts; also 14 selected

areas at 219 inches to the lunar diameter. Price: \$28 for the United States, Canada, and Mexico; \$40 elsewhere.

- **Monograph No. 4.** *Proceedings of the 45th Convention of the Association of Lunar and Planetary Observers. Wichita, Kansas, August 1-5, 1995.* 127 pages. Hard copy \$17 for the United States, Canada, and Mexico; \$26 elsewhere.
- **Monograph No. 5.** *Astronomical and Physical Observations of the Axis of Rotation and the Topography of the Planet Mars. First Memoir; 1877-1878.*

By Giovanni Virginio Schiaparelli, translated by William Sheehan. 59 pages. Hard copy \$10 for the United States, Canada, and Mexico; \$15 elsewhere.

- **Monograph No. 6.** *Proceedings of the 47th Convention of the Association of Lunar and Planetary Observers, Tucson, Arizona, October 19-21, 1996.* 20 pages. Hard copy \$3 for the United States, Canada, and Mexico; \$4 elsewhere.
- **Monograph No. 7.** *Proceedings of the 48th Convention of the Association of Lunar and Planetary Observers. Las*

ALPO Staff E-mail Directory

Benton, J.L. jlbaina@msn.com
Brasch, K.R. m_brasch@earthlink.net
Baum, R. richardbaum@julianbaum.co.uk
Cook, A. tony.cook@alpo-astronomy.org
Cudnik, B. cudnik@sbcglobal.net
Darling, D.O. DOD121252@aol.com
Dembowski, W. dembowski@zone-vx.com
Dobbins, Tom r&d@organitech.com
Garfinkle, R.A. ragarf@earthlink.net
Garrett, L.S. atticaowl@yahoo.com
Gossett, R. rick2d2@sbcglobal.net
Grafton, E. ed@egrafton.com
Gray, R. sevenvalleysent@yahoo.com
Haas, W.H. haasw@zianet.com
Hay, K. kim@starlightcascade.ca
Hill, D. dhill@lpl.arizona.edu
Hines, D. cmptervel@hotmail.com
Huddleston, M.W. kc5lei@sbcglobal.net
Jakiel, R. rjakiel@earthlink.net
Jenkins, J. jenkinsjl@yahoo.com
Joyce, D. djoyce@triton.edu
Kronk, G. kronk@cometography.com
Lamm, J.S. jlspacerox@aol.com
Larson, S. slarson@lpl.arizona.edu
Limaye, S. sanjayl@ssec.wisc.edu

Lunsford, R.D. lunro.imo.usa@cox.net
MacDougal, C. macdouc@verizon.net
McAnally, J. CPAJohnM@aol.com
Melillo, F. frankj12@aol.com
Melka, J. jtmelka@yahoo.com
Owens, Larry larry.owens@alpo-astronomy.org
Parker, D.C. park3232@bellsouth.net
Pilcher, F. pilcher@ic.edu
Poshedly, K. ken.poshedly@alpo-astronomy.org
Reynolds, M. director@alpo-astronomy.org
Robertson, T.J. cometman@cometman.net
Sanchez-Lavega, A. wupsalaa@bic00.bi.ehu.es
Sanford, J. starhome@springvillewireless.com
Santacana, G.E. lauffitte@prtc.net
Schmude, R.W. schmude@gdn.edu
Scotti, J.V. jscotti@lpl.arizona.edu
Slaton, J.D. jd@justfurfur.org
Timerson, B. btimerson@rochester.rr.com
Troiani, D.M. dtroiani@triton.edu
Ulrich, R.K. rulrich@uark.edu
Venable, R.J. rjvmd@hughes.net
Wessling, R.J. pinetop@aol.com
Westfall, J.E. johnwestfall@comcast.net
Will, M. will008@attglobal.net

Online Readers

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

ALPO Resources

People, publications, etc., to help our members

Cruces, New Mexico, June 25-29, 1997.76 pages. Hard copy \$12 for the United States, Canada, and Mexico; \$16 elsewhere.

- **Monograph No. 8.** *Proceedings of the 49th Convention of the Association of Lunar and Planetary Observers.* Atlanta, Georgia, July 9-11, 1998.122 pages. Hard copy \$17 for the United States, Canada, and Mexico; \$26 elsewhere.
- **Monograph Number 9.** *Does Anything Ever Happen on the Moon?* By Walter H. Haas. Reprint of 1942 article. 54 pages. Hard copy \$6 for the United States, Canada, and Mexico; \$8 elsewhere.
- **Monograph Number 10.** *Observing and Understanding Uranus, Neptune and Pluto.* By Richard W. Schmude, Jr. 31 pages. Hard copy \$4 for the United States, Canada, and Mexico; \$5 elsewhere.

ALPO Observing Section Publications

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

- **Solar:** Totally revised *Guidelines for the Observation and Reporting of Solar Phenomena*, \$10 USD; includes CD with 100 page-manual in pdf with up-to-date techniques, images, and links to many solar references. Produced by ALPO Solar Section Assistant Coordinator and Archivist Jamey Jenkins, this publication replaces *Observe and Understand the Sun* and its predecessor, *The Association of Lunar & Planetary Observer's Solar Section Handbook for the White Light Observation of Solar Phenomena*, both by the ALPO's own Rik Hill. To order, send check or US money order made payable to Jamey Jenkins, 308 West First Street, Homer, Illinois 61849; e-mail to jenkinsjl@yahoo.com
- **Lunar & Planetary Training Section:** *The Novice Observers Handbook* \$15. An introductory text to the training program. Includes directions for recording

lunar and planetary observations, useful exercises for determining observational parameters, and observing forms. Available as pdf file via e-mail or send check or money order payable to Timothy J. Robertson, 2010 Hillgate Way #L, Simi Valley, CA 93065; e-mail cometman@cometman.net.

- **Lunar (Dembowski):** (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://www.zone-vx.com/alpo-topo.html>, or \$10 for a packet of forms by regular mail. Specify *Lunar Forms*. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO lunar SAP section. Observers should make copies using high-quality paper.
- **Lunar:** *The Lunar Observer*, official newsletter of the ALPO Lunar Section, published monthly. Free at <http://www.zone-vx.com/tlo.pdf> or 70 cents per copy hard copy; send SASE with payment (check or money order) to: William Dembowski, Elton Moonshine Observatory, 219 Old Bedford Pike, Windber, PA 15963
- **Lunar (Jamieson):** *Lunar Observer's Tool Kit*, price \$50, is a computer program designed to aid lunar observers at all levels to plan, make, and record their observations. This popular program was first written in 1985 for the Commodore 64 and ported to DOS around 1990. Those familiar with the old DOS version will find most of the same tools in this new Windows version, plus many new ones. A complete list of these tools includes Dome Table View and Maintenance, Dome Observation Scheduling, Archiving Your Dome Observations, Lunar Feature Table View and Maintenance, Schedule General Lunar Observations, Lunar Heights and Depths, Solar Altitude and Azimuth, Lunar Ephemeris, Lunar Longitude and Latitude to Xi and Eta, Lunar Xi and Eta to Longitude and Latitude, Lunar Atlas

Referencing, JALPO and Selenology Bibliography, Minimum System Requirements, Lunar and Planetary Links, and Lunar Observer's ToolKit Help and Library. Some of the program's options include predicting when a lunar feature will be illuminated in a certain way, what features from a collection of features will be under a given range of illumination, physical ephemeris information, mountain height computation, coordinate conversion, and browsing of the software's included database of over 6,000 lunar features. Contact harry@persoftware.com

- **Venus (Benton):** (1) *ALPO Venus Observing Kit*, \$17.50; includes introductory description of ALPO Venus observing programs for beginners, a full set of observing forms, and a copy of *The Venus Handbook*. (2) *Observing Forms*, free at <http://www.alpo-astronomy.org/venus>, or \$10 for a packet of forms by regular mail (specify *Venus Forms*). To order either numbers (1) or (2), send a check or money order payable to "Julius L. Benton, Jr." All foreign orders should include \$5 additional for postage and handling; p/h included in price for domestic orders. Shipment will be made in two to three weeks under normal circumstances. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Venus section. Observers should make copies using high-quality paper.
- **Mars:** (1) *ALPO Mars Observers Handbook*, send check or money order for \$15 per book (postage and handling included) to Astronomical League Sales, 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

ALPO Resources

People, publications, etc., to help our members

League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail leaguesales@astroleague.org.

(2) *Jupiter*, the ALPO section newsletter, available online only via the ALPO website at <http://mysite.verizon.net/mac-douc/alpo/jovenews.htm>; (3) *J-Net*, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougall. (4) *Timing the Eclipses of Jupiter's Galilean Satellites* free at <http://www.alpo-astronomy.org/jupiter/Galilean-str.pdf>, report form online at <http://www.alpo-astronomy.org/jupiter/Galilean-Form.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):** (1) *ALPO Saturn Observing Kit*, \$20; includes introductory description of Saturn observing programs for beginners, and a full set of observing forms, and a copy of *The Saturn Handbook*. Newly released book *Saturn and How to Observe It* (by J. Benton) replaced to *The Saturn Handbook* in early 2006. (2) *Saturn Observing Forms*, free at <http://www.alpo-astronomy.org/saturn>, or \$10 by regular mail. Specify *Saturn Forms*. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Saturn Section.

- **Meteors:** (1) *The ALPO Guide to Watching Meteors* (pamphlet). \$4 per copy (includes postage & handling); send check or money order to Astronomical League Sales, 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> or \$24 per year via regular mail in the U.S., Mexico and Canada, \$34 per year elsewhere (air mail only). Send check or money order payable to "Minor Planet Bulletin" to Derald D. Nye, 10385 East Observatory Dr., Corona de Tucson, AZ 85641-2309.

Other ALPO Publications

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

- **An Introductory Bibliography for Solar System Observers. No charge.** Four-page list of books and magazines about Solar System objects and how to observe them. The current edition was updated in October 1998. Send self-addressed stamped envelope with request to current ALPO Membership Secretary (Matt Will).
- **ALPO Membership Directory.** Provided only to ALPO board and staff members. Contact current ALPO membership secretary/treasurer (Matt Will).
- **Back issues of The Strolling Astronomer (JALPO).** Download JALPO43-1 thru present issue in pdf from the ALPO website at <http://www.alpo-astronomy.org/djalpo> (no charge; most recent issues are password-protected, contact ALPO membership secretary Matt Will for password info).

Many of the hard copy back issues listed below are almost out of stock, and it is impossible to guarantee that they will remain available. Issues will be sold on a first-come, first-served basis. Back issues are \$4 each, and \$5 for the current issue. We can arrange discounts on orders of more than \$30. Order directly from and make payment to "Walter H. Haas" (see address under "Board of Directors,"):

\$4 each:

Vol. 7 (1953), No.10
Vol. 8 (1954), Nos. 7-8
Vol. 11 (1957), Nos. 11-12
Vol. 21 (1968-69), Nos. 3-4 and 7-8
Vol. 23 (1971-72), Nos. 7-8 and 9-10
Vol. 25 (1974-76), Nos. 1-2, 3-4, and 11-12
Vol. 26 (1976-77), Nos. 3-4 and 11-12

Vol. 27 (1977-79), Nos. 3-4 and 7-8
Vol. 31 (1985-86), Nos. 9-10
Vol. 32 (1987-88), Nos. 11-12
Vol. 33 (1989), Nos. 7-9
Vol. 34 (1990), No. 2
Vol. 37 (1993-94), No. 1
Vol. 38 (1994-96), Nos. 1 and 3
Vol. 39 (1996-97), No. 1
Vol. 42 (2000-01), Nos. 1, 3 and 4
Vol. 43 (2001-02), Nos. 1, 2, 3 and 4
Vol. 44 (2002), Nos. 2 and 4
Vol. 45 (2003), Nos. 1, 2 and 3 (no issue 4)
Vol. 46 (2004), Nos. 1, 2, 3 and 4
Vol. 47 (2005), Nos. 2, 3 and 4
Vol. 48 (2006), Nos. 1, 2, 3 and 4
Vol. 49 (2007), Nos. 1, 2 and 4
Vol. 50 (2008), Nos. 1, 2 and 3

\$5 each:

Vol. 50 (2008), No. 4 (current issue)



THE ASSOCIATION OF LUNAR & PLANETARY OBSERVERS (ALPO)

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

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

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

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

Subscription rates and terms are listed below (effective January 1, 2009).

We heartily invite you to join the ALPO and look forward to hearing from you.

- \$US120 – Sponsoring Member level, 4 issues of the digital and paper Journal, all countries
- \$US60 – Sustaining Member level, 4 issues of the digital and paper Journal, all countries
- \$US54 – 8 issues of the paper Journal only, US, Mexico and Canada
- \$US30 – 4 issues of the paper Journal only, US, Mexico and Canada
- \$US68 – 8 issues of the paper Journal only, all other countries
- \$US37 – 4 issues of the paper Journal only, all other countries
- \$US20 – 8 issues of the digital Journal only, all countries, e-mail address required
- \$US12 – 4 issues of the digital Journal only, all countries, e-mail address required

For your convenience, you may join online via the via the Internet or by completing the form at the bottom of this page.

To join or renew online, go to the ALPO membership web page hosted by *Telescopes by Galileo* at <http://www.galileospace.com/ALPO/>. Afterwards, e-mail the ALPO membership secretary at will008@attglobal.net with your name, address, the type of membership and amount paid.

If using the form below, please make payment by check or money order, payable (through a U.S. bank and encoded with U.S. standard banking numbers) to "ALPO". There is a 20-percent surcharge on all memberships obtained through subscription agencies or which require an invoice. Send to: ALPO Membership Secretary, P.O. Box 13456, Springfield, Illinois 62791-3456 USA.

Please Print:

Name _____

Street Address _____

City, State, ZIP _____

E-mail Address _____

Phone Number _____

Please share your observing interests with the ALPO by entering the appropriate codes on the blank line below.

Interest _____

Interest Abbreviations

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



Galileo®

PARTS & ACCESSORIES



FREE
Galileo® Storage Case
with any purchase!



Tri-Pods



Yoke Mounts



EQ Mounts



Telescope Cases



EQ Mounts



Secondary / Spider



Multiple Ocular Housing



Focus Housings



Counterweight/Rods



Color Filter Wheel



Primary/Secondary Mirrors



Counterweights/Rods



Motor Drives



Ocular Lens Assembly



Reflector Cradles



Metal Focus Tubes



Equatorial Mounts
Flex Cables



Counterweight Rods



Motor Drive w/Remote



Observation Chairs

FOR ALPO SPECIAL PRICING EMAIL CUSTOMERSERVICE@GALILEOSPLACE.COM
OR CALL 1-800-548-3537 MON - FRI 9AM TO 5PM EST
MIAMI, FL, USA
INVENTORY SUBJECT TO AVAILABILITY
WWW.GALILEOSPLACE.COM



SKY
& TELESCOPE

12 Months of Astronomy Wonders

2009

SKYWATCH

SPECIAL INTERNATIONAL YEAR OF ASTRONOMY EDITION

127 Top Targets *for Telescopes & Binoculars*

Watch
Saturn's Rings
Disappear!

HOW TO SEE
Planets, Stars & Beyond

Tour Our Moon's
Battered Landscape

