ISSN-0039-2502

Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 48, Number 2, Spring 2006

Now in Portable Document Format (PDF) for Macintosh and PC-Compatible Computers

Founded in 1947

Inside. . .

- ***ALPO conference 2006 web site now online!***
- ***Scientific Interests in the Planet Mercury***
- ***Index to Volume 45 of "The Strolling Astronomer"***
- ***Apparition reports on Saturn and the Remote Planets***
- ***A report on a lunar dome near crater Hyginus***

Jupiter . . .from southern California, USA, by ALPO member John Sanford. See table of contents page for details.

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

ADVANCED TELESCOPE SYSTEMS
APOGEE INSTRUMENTS ❖ ASTRO-PHYSICS
BOGEN ❖ BORG ❖ BUSHNELL ❖ CANON
CELESTRON ❖ CORONADO ❖ CYANOGEN
DISCOVERY DOBS ❖ FLI ❖ FUJINON ❖ JMI
KENDRICK ❖ LEICA ❖ LOSMANDY ❖ LUMICON
MEADE ❖ NIKON ❖ OGS ❖ OPTEC
PARALLAX ❖ PENTAX ❖ QUESTAR
RC OPTICAL SYSTEMS ❖ SBIG ❖ SIRIUS OPTICS
SOFTWARE BISQUE ❖ STELLARVUE
SWAROVSKI ❖ TAKAHASHI ❖ TEC
TELEGIZMOS ❖ TELE VUE
UNIVERSAL ASTRONOMICS ❖ VIXEN
WIDE SKY OPTICS ❖ WILLIAM OPTICS ❖ ZEISS

The Anacortes Difference

We are thoroughly committed to providing the astronomical and birding community not only with the world's best products, but the finest service as well. Whether you're just starting out with your hobby or you've had decades of experience, call us or visit us online for competitive pricing and professional service that you can rely on again and again.

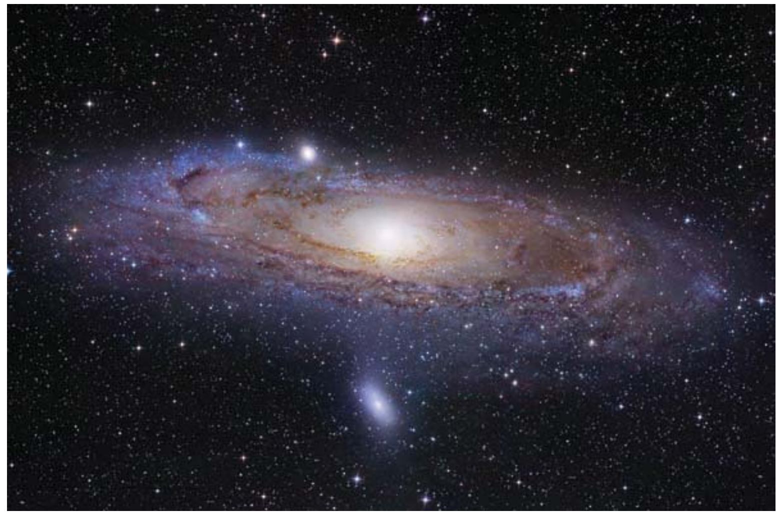


PHOTO BY ROB GENDLER, CUSTOMER OF SBIG AND ANACORTES TELESCOPE & WILD BIRD

True SBIG appreciation requires ownership.
Successful astro-imagers know that for quality, reliability, innovation and simply astonishing images, there's no substitute for SBIG cameras. If you're a long-time SBIG imager and you're ready to move up to a bigger chip or a faster camera, order yours today from the world's largest seller of SBIG gear. Between SBIG's excellent products and our long expertise with them, we'll put the right equipment in your hands for years of picture-perfect satisfaction.

TeleVue Nagler Type 5
A "must own" eyepiece

Tele Vue 60 Imaging System
Ultra compact imaging platform

Tele Vue NP-127
Flawless Nagler Petzval design

Telescopes by Tele Vue
Superb optics and craftsmanship

Tele Vue Dioptrx
Astigmatism Correction Without Eyeglasses

Tele Vue FocusMate Driver
Easy, vibration-free focusing

TeleVue TV-76
Tack sharp, wide-field views

Tele Vue Eyepieces
Great selection, exemplary quality

Tele Vue Fine Focuser
Precision focusing at its best

TeleVue Nagler Type 6
Incredibly sharp, wide-field views

TeleVue TV-102
"... optical near-perfection."

TeleVue's new Panoptics
Very sharp, wide-field views

SECURE ONLINE ORDERING 24 HOURS A DAY
www.BuyTelescopes.com
Tel: (800) 850-2001 (360) 588-9000 Fax: (360) 588-9100

FREE EQUIPMENT CLASSIFIEDS
AstroMart.com
Brought to you by Anacortes Telescope

Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 48, No. 2, Spring 2006
This issue published in June 2006 for distribution in both portable document format (pdf) and also hardcopy format.

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

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

For membership or general information about the ALPO, contact:

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

E-mail to: will008@attglobal.net

Visit the ALPO online at:
http://www.lpl.arizona.edu/alpo

In This Issue:

Inside the ALPO

ALPO Feature Stories

ALPO Resources

Our Advertisers

This month's cover . . .

Jupiter by ALPO Journal graphics person John Sanford taken June 1, 2006, 06:11 UT, from near Springville, CA. (south central California, USA). South at top; note the Great Red Spot in the upper left part of the image. Equipment: 15 cm (6 in.), f/9 Astrophysics refractor with 2.5x TeleVue Telemate Barlow and Celestron Nextimage Planetary Imaging Camera (modified webcam). Observing conditions: Seeing 7/10 (ALPO), Transparency 8/10. Jupiter CM: 131.4 (Sys II). Says John, "The image was captured in a 580 frame .avi clip, then improved with Registax Version 3.0 using the best 480 frames. This was unusually good seeing for this inland site." Contact John at *starhome@springvillewireless.com*

Inside the ALPO
Member, section and activity news

Association of Lunar & Planetary Observers (ALPO)

Board of Directors

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

Publications

Publisher & Editor-in-Chief, Ken Poshedly

Primary Observing Section & Interest Section Staff

(See full listing in *ALPO Resources* at end of issue)
Lunar& Planetary Training Program: 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:
Selected Areas Program; Julius L. Benton, Jr.
Lunar Transient Phenomena; Anthony Cook
Lunar Meteoritic Impact Search; Brian Cudnik
Lunar Topographical Studies; William Dembowski
Lunar Dome Survey; Marvin W. Huddleston
Mars Section: Daniel M. Troiani
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: Ted Stryk
Meteors Section: Robert D. Lunsford
Meteorites Section: Dolores Hill
Computing Section: Kim Hay
Youth Section: Timothy J. Robertson
Historical Section: Richard Baum
Instruments Section: R.B. Minton
Eclipse Section: Michael D. Reynolds
Webmaster: Rik Hill

Point of View

Come to the Aid of . . . your ALPO!!!

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

"Now is the time for all good men to come to the aid of their party."

An ubiquitous statement that almost everyone who took typing courses way-back-when had to learn.

Why? Because, it is said, it's got a pretty good sampling of our alphabet, so the more you type it, the better you get with it.

Likewise with you and our organization. The more active you become with and use the services of the ALPO, the better you get as an ALPO member AND as an observer of our solar system.

With this year's conference in Atlanta almost here, you can "come to the aid" of your ALPO.

Our organization started off with humble beginnings almost 60 years ago as a means for serious students of solar system astronomy to exchange reports, drawings, whatever.

And this year's conference is the perfect venue for today's exchange of those same reports and drawings, as well as photographs, ccd images, webcam images, photometry data, etc.

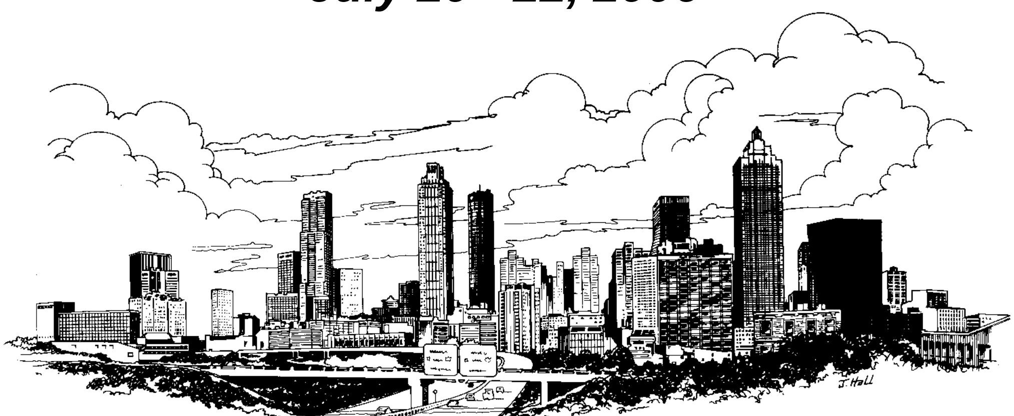
Whether they be simply a few sheets of paper, a few graphs or a slick PowerPoint presentation with high-resolution images — YOUR reports of what YOU have observed can inspire others to follow in your footsteps and realize that it is our collective database of reports and the like that make the ALPO so valued and important.

Come to the aid of your party. Your ALPO.

ALPO 2006

Atlanta, Georgia

July 20 - 22, 2006



Join your ALPO colleagues for a weekend of planetary science and Southern Hospitality in Atlanta:

- *Paper and business sessions at the prestigious Fernbank Science Center*
- *Special planetary imaging demo*
- *Awards banquet Saturday night*
- *Economical, top-rated overnight accommodations at nearby Emory University*

The Fernbank Science Center, site of ALPO 2006

Look for your ALPO 2006 registration packet in your mailbox this spring.
For more information now, contact:
Ken Poshedly, 1741 Bruckner Court, Snellville, GA 30078
E-mail: poshedly@bellsouth.net

Inside the ALPO
Member, section and activity news

News of General Interest

ALPO 2006 Web Site Now Online!!!

With the Association of Lunar & Planetary Observers 2006 conference fast-approaching, please note that a special Conference 2006 web site is now available with the latest news about the event, as well as registration materials, door prize listings, etc.

Access to the "Conference 2006" web site is via the main ALPO web site home page at *http://www.lpl.arizona.edu/alpo*.

The conference will be held Thursday, Friday, Saturday, July 20, 21 and 22, at the Fernbank Science Center in Atlanta, Georgia. Lodging for out-of-towners has been arranged at nearby Emory University (though attendees may also arrange for their own lodging elsewhere). The event is open to ALL.

Besides the standard presentation of papers of interest to students of solar system astronomy, a special ALPO conference lunar & planetary image processing demo workshop wll be held on Saturday morning of the conference.

Led by ALPO member Larry Owens, this session will walk attendees through the use of the *Registax 3.0* software package in image stacking and preliminary processing of webcam-acquired images, along with post-processing techniques to use with your own graphics program (Adobe *PhotoShop*, Corel *PhotoPaint*, etc.).

Samples of Mr. Owens' work can be found on the World Wide Web at *http://www.atlantaastronomy.org/CEWMA/larry_owens_images.html*

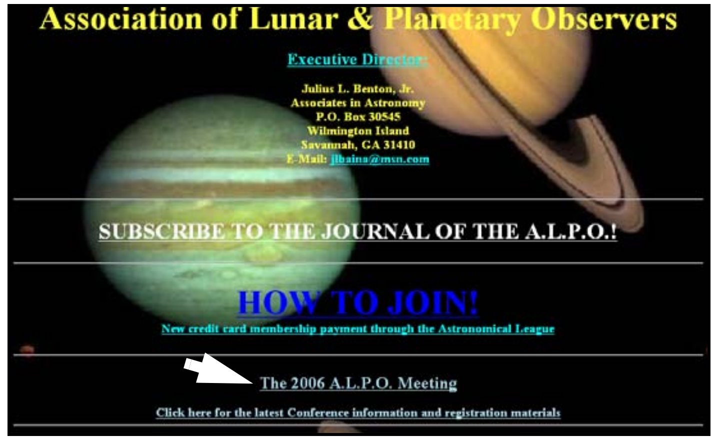
The *Registax* program itself is free and available at *http://registax.astronomy.net/*

A free pdf version of Mr. Owens' presentation will be available to all who attend this demo.

Besides online availability as mentioned above, registration materials were sent by regular mail in early May.

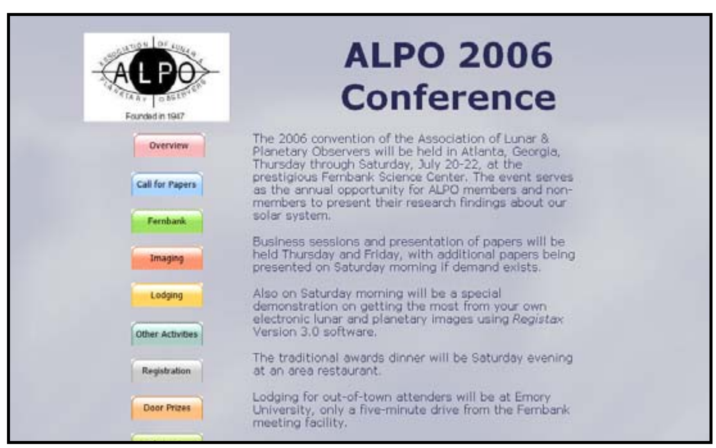
For more information, e-mail to *poshedly@bellsouth.net*

At the ALPO web site home page . . .



left-click on the ALPO Meeting link, then . . .

. . . at the Publications & Conference News page, left-click on the "Conference" button.



Inside the ALPO
Member, section and activity news

Professional-Amateur Observing Campaign: The Venus Express Mission

By Julius Benton

Amateur astronomers and ground based observations have contributed very useful information for studies of Venus' atmosphere.

The Russian astronomer Mikhail Vasilyevich Lomonosov (1711-65) first suggested the existence of atmosphere on Venus (1761); French astronomers Boyer and Guerin first determined the rapid, "4-day" circulation of the Venus atmosphere, and most recently, Christophe Pellier succeeded in imaging the night side of Venus (emission from the hot surface) using a 1-micron infrared filter with a 30 cm telescope.

Now amateurs equipped with CCD cameras and filters can still contribute to the study of Venus. Continued UV and polarized light images of Venus are still likely to prove useful for monitoring the Venus atmosphere and its circulation.

The European Space Agency probe *Venus Express* began systematically monitoring Venus at ultraviolet, visible and infrared wavelengths starting late May 2006. Initially approved for a nominal duration of one Venus day, it is likely that the mission may get extended longer. We invite high quality digital images of Venus from amateur astronomers taken at ultraviolet wavelengths and at other wavelengths through polarizing filters. The observations should ideally be submitted in FITS format, but should also be contributed in JPEG format as well, to Julius Benton, the ALPO Venus Coordinator.

Submitted images will be archived for analysis and comparison with the results on the atmospheric circulation from the *Venus Express* mission. Please visit *http://www.venus.wisc.edu* for updates on the *Venus Express* as the mission progresses

An excellent source for information about imaging Venus has been provided by Richard McKim of the BAA and can be accessed through the following URL:

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

Questions regarding the effort may be addressed to planets@ssec.wisc.edu and the ALPO Venus Section at jlbaina@msn.com.

We look forward to a successful "Pro-Am" cooperation in this mission, and we welcome observers throughout the world to participate.

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.

ALPO Journal staff vacancy

The position of French language translator for manuscripts submitted for publication in the ALPO Journal is open – should any French language papers be submitted.

Richard McKim (United Kingdom) has left the position (but NOT his ALPO membership) due to the lack of papers requiring his expetise.

Those interested in filling this position should contact Ken Poshedly, e-maiol to *poshedly@bellsouth.net*.

Announcing a New ALPO Solar Handbook

By Kim Hay, acting coordinator, ALPO Solar Section

As stated in the Winter issue of this Journal, the ALPO Solar Section announcesthe release of its totally revised handbook, *The Association of Lunar and Planetary Observers Solar Section - Guidelines for the Observation and Reporting of Solar Phenomena*, produced by Jamey Jenkins, assistant coordina-

Inside the ALPO
Member, section and activity news

tor and archivist, and who works with new ALPO solar observers.

This new handbook includes up-to-date techniques, many images and links to many solar references.

The new handbook is provided as a 58-megabyte file (over 100 pages) in pdf on CD for $10 USD.

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*

Our Advertisers

Folks!! We give a hearty welcome to two new advertisers in the Journal of the Assn. of Lunar & Planetary Observers. *Anacortes Telescope & Wild Bird* of Anacortes, Washington, and *Scope City* — names that many of our readers are familiar with.

We also thank *Sky Publishing* for its continued support and *Accurate Graphics* for its consistently top-notch handling of this Journal.

We urge our readers to contact our advertisers as you make plans to either add to your book or magazine collection, purchase scopes or equipment or even seek professional printing services.

ALPO Resources Updates

With new phone numbers, etc., in place, don't forget to refer to the *ALPO Resources* at the back of each Journal before you correspond with any of the ALPO staff or board members. Changes have been made.

ALPO Membership Online

The ALPO now accepts membership payment by credit card via a special arrangement with the Astronomical League. However, in order to renew by this method you MUST have Internet access. See the inside back cover of this Journal for details.

ALPO Interest Section Reports

Computing Section

By Kim Hay, coordinator

We are always looking for what you the members of ALPO would like from the ALPOCS and how we can serve you better. If you have any comments or suggestions contact Kim Hay, at *kimhay@kingston.net*

Visit the ALPO Computing Section on the World Wide Web at: http://www.lpl.arizona.edu/~rhill/alpo/computer.html

Lunar & Planetary Training Program

By Tim Robertson, coordinator

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

Instruments Section

By R.B. Minton, coordinator

(We'll have another of R.B.'s reports in your next JALPO.)

Visit the ALPO Instruments Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/inst.html and *http://mypeoplepc.com/members/patminton/astrometric_observatory/*

ALPO Observing Section Reports

Eclipse Section

By Mike Reynolds, coordinator

Reports on poor weather are also welcome; it is useful to know where observations were hampered due to conditions.

Please submit your reports either via the Internet or regular mail to: Mike Reynolds, Ph.D., ALPO Eclipse Section Coordinator, Florida Community College, Associate Dean, Math & Science, 3939 Roosevelt Blvd, E-345, Jacksonville, FL 32205; e-mail to *astrogator90@comcast.net*

Visit the ALPO Eclipse Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/eclipse.html*

Meteors Section

By Robert Lunsford, coordinator

(Bob's 2005 Meteors Section report will appear in your next JALPO.)
Visit the ALPO Meteors Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/meteor.html

Inside the ALPO
Member, section and activity news

Comets Section

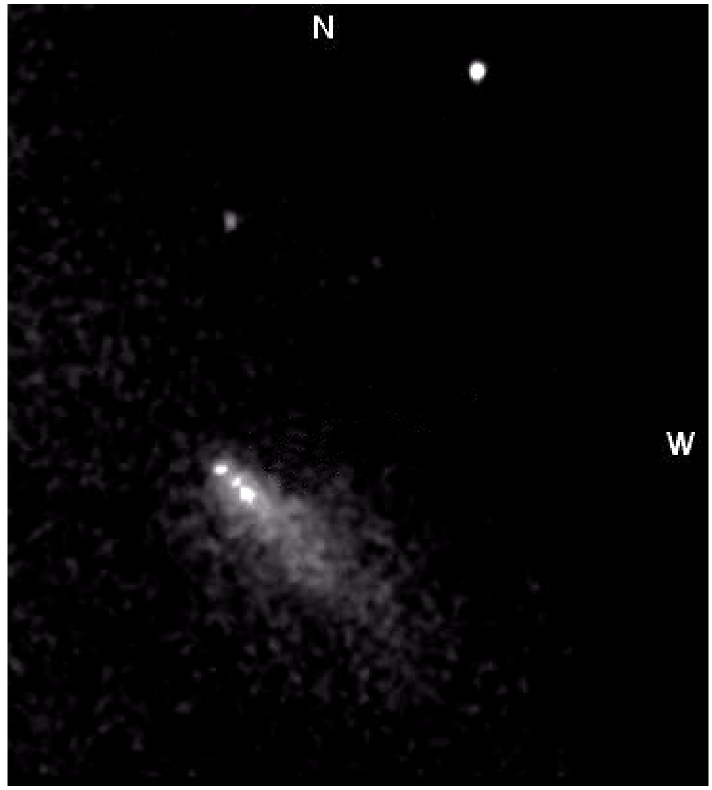
By Ted Stryk, acting coordinator

The ALPO Comets section is currently focused on observing the close approach of the fragmented 73P/Schwassmann-Wachmann 3. The comet is approaching its perihelion date of June 7, 2006, and will pass 0.0735 AU from Earth on May 13, being only slightly farther than its 1930 pass, during which it was discovered.

It has formed a "string of pearls", somewhat reminiscent of Shoemaker-Levy 9. During the 1995 pass, the fragmentation was first observed, and the brightest fragments were detected in the very unfavorable 2001 apparition. Currently, 19 fragments are being tracked, but it appears that even these fragments are breaking up (see image of Fragment B by Frank J. Melillo). All observations are helpful in tracking the breakup of this comet.

The ALPO Comets Section recent observations page has been updated. Images from ALPO contributors can be seen by going to *http://pages.preferred.com/~tedstryk/*

Visit the ALPO Comets Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/meteor.html



Comet Schwassmann-Wachmann 3, fragment B, as imaged by Frank J. Mellilo, Holtsville, NY, on April 20, 2006, 5:35 UT. equipment details: 8-inch Celestron Scmidt-Cassegrain telescope equipped with a Starlight Xpress MX-5 CCD camera; four 15 second exposures taken at f/6.3.

Solar Section

By Kim Hay, acting coordinator

Recently submitted observations may be viewed on the Web at *http://www.lpl.arizona.edu/~rhill/alpo/solstuff/recobs.html* Join the ALPO Solar Section e-mail list by visiting the Solar group at *http://groups.yahoo.com/group/Solar-ALPO/*

Submit all observations to rick2d2@sbcglobal.net Visit the ALPO Solar Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/solar.html

Mercury Section

By Frank J. Melillo, coordinator

Visit the ALPO Mercury Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/merc.html

Venus Section

By Julius Benton, coordinator

Circumstances of the current 2006 Western (Morning) Apparition of Venus are as follows:

Geocentric Phenomena in Universal Time (UT)

Inferior Conjunction
. . . . 2006, January 14^d UT (angular diameter = 62")
Greatest Brilliancy
. . . . .February 18^d (m_v = -4.6)
Greatest Elongation West
. . . . March 25^d (Venus is 47º West of the Sun)
Predicted Dichotomy
. . . . March 26.21^d (Venus is exactly at half phase)
Superior Conjunction
. . . . October 27^d (angular diameter = 9.7")

Venus is now proceeding through its waxing phases and slowly diminishing in angular diameter from about 62" across in January to just a little less than 10" at Superior Conjunction in October (a progression from crescent through gibbous phases). We are viewing Venus' trailing hemisphere and the dawn side of the planet at the time of terrestrial sunrise.

Inside the ALPO
Member, section and activity news

Observers have already started imaging and submitting drawings of the planet, but observational response has been sluggish due to the necessity to rise before sunrise to view and image Venus. Many more CCD and webcam images, especially in UV and IR wavelengths, are encouraged, as well as carefully executed drawings, made at roughly the same time and on the same date (simultaneous observations) to improve confidence in results.

Observational Highlights

- 12 CCD and webcam images of Venus have been submitted so far
- 60 drawings and intensity estimates of dusky features suspected on Venus have been sent in
- Very few images have shown any features in Venus so far due to crescentic phases
- No instances of dark hemisphere phenomena (e.g., Ashen Light) have been reported
- Pro-Am collaboration in association with the Venus Express Mission is being planned
- Incidence of simultaneous observations of Venus is increasing

Key Observational Pursuits:

- 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 CCD and webcam imaging of Venus at visual, UV, and IR wavelengths
- Special efforts to accomplish simultaneous observations

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

Complete details can be found about all of our observing programs in the ALPO Venus Handbook. Individuals interested in participating in the programs of the ALPO Venus Section are cordially invited to visit the ALPO Venus Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/venus.html*

Crescent of Venus taken by David Arditti of Middlesex, UK, on 2006 February 08 at 07:41 UT (IR image at 685nm) and 07:55UT (UV image at 320-390nm) using a Mono ToUcam webcam attached to a 25.4 cm (10.0 in.) Dall-Kirkham telescope at f/22. Altitude 16-17°. Images scaled to 80%.

Lunar Section:

Lunar Meteoritic Impact Search

By Brian Cudnik, coordinator

Visit the ALPO Lunar Meteoritic Impact Search site on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/lunimpacts*

Lunar Topographical Studies / Selected Areas Program

By William M. Dembowski, FRAS section coordinator

The European Space Agency's SMART-1 spacecraft is rapidly approaching the completion of its successful mission of lunar exploration. It has been decided that, in lieu of allowing the craft to impact the Moon on its far side, the orbit of SMART-1 will be altered in such a way as to cause it to strike the Moon's visible hemisphere.

The ESA has welcomed the participation of the ALPO in observing and recording this momentous event. Through the ALPO Lunar Section's online newsletter, the Lunar Topographical Studies Section is encouraging all amateur observers to participate in this effort by first familiarizing themselves, both visually and photographically, with the impact area (when announced). Then, when the event occurs, the maximum amount of meaningful data can be gathered. All individ-

Inside the ALPO
Member, section and activity news

ual observers will, of course, be recognized and given full credit for their participation in this project.

The following is an excerpt from a recent communication from the ESA SMART-1 team:

"Because of gravitational perturbations by the Earth and the Sun, the SMART-1 orbit will irremediably intersect the lunar surface, having exhausted its main Xe fuel. If we would leave the spacecraft on natural course, it would impact on the far side of the Moon on 17 August 2006. We plan to extend the mission at low altitude, and also allow an impact on the near side, in a dark part near the terminator, under good observations conditions from Earth telescopes and public. From 26 June, we plan to perform for a week a series of new manoeuvers using the hydrazine attitude thrusters to impulse an extra push of some 12 m/s. Only after this is completed successfully, shall we have a better estimate of the date of impact, now calculated to occur on 3 September 2:00 UT with 7 hour uncertainty." (Dr. Bernard H. Foing, chief scientist, ESA Research and Scientific Support Dept.)

Further details will be published as they are received, both in *The Lunar Observer* (found at *http://www.zone-vx.com/tlo.pdf)* and on the newly created ALPO Lunar Topographical Studies Smart-Impact WebPage at *http://www.zone-vx.com/alpo-smartimpact.html*

Visit the ALPO Lunar Topographical Studies Section on the World Wide Web at *http://www.zone-vx.com/alpo_topo.htm*

Visit the ALPO Lunar Selected Areas Program on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/selarea.html*

Lunar Dome Survey
Marvin Huddleston, FRAS, coordinator

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

Lunar Transient Phenomena
By Dr Anthony Cook, coordinator

Visit the ALPO Lunar Transient Phenomena program on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/ltp.html and http://www.ltpresearch.org/*

Mars Section
By Dan Troiani, coordinator &
Daniel P. Joyce, assistant coordinator

Visit the ALPO Mars Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/mars.html*

Minor Planets Section
By Frederick Pilcher, coordinator

We remind all users and inquirers that the *Minor Planet Bulletin* is a refereed publication. It is now 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.lpl.arizona.edu/~rhill/alpo/minplan.html*

Jupiter Section
By Richard W. Schmude, Jr., coordinator

I am hoping that people will watch Ganymede and Europe as they transit Jupiter. I am especially interested if these moons are brighter (or darker) than the belts and zones of Jupiter when they cross the CM (central meridian) of Jupiter's disc. (The central meridian is an imaginary line running from the north to the south poles of Jupiter.) Selected CM transit times for these two moons are listed below:

Ganymede Transit Times	Europa Transit Times
June 15 (22:30)	July 2 (13:04)
June 23 (02:04)	July 6 (2:17)
June 30 (05:41)	July 9 (15:31)
July 7 (09:23)	July 13 (03:49)
July 14 (13:09)	July 16 (18:03)
July 21 (16:59)	July 20 (07:20)
July 28 (20:53)	July 23 (20:36)
August 5 (00:52)	July 27 (09:54)
August 12 (04:55)	July 30 (23:13)
August 19 (09:01)	August 3 (12:31)
August 26 (13:11)	August 7 (01:50)

Please watch for these satellite transits and send any data that you have to the ALPO Jupiter Section, c/o Dr. Richard Schmude, Jr. (e-mail to: *schmude@gdn.edu*)

Visit the ALPO Jupiter Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/jup.html*

Inside the ALPO
Member, section and activity news

Galilean Satellite Eclipse Timing Program
By John Westfall, Jupiter Section assistant coordinator

The writer will be happy to supply prospective observers with an observing kit which includes an observation reporting form; you can contact him via e-mail at *johnwestfall@comcast.net*; or write to him at ALPO, P.O. Box 2447, Antioch, CA 94531-2447 USA

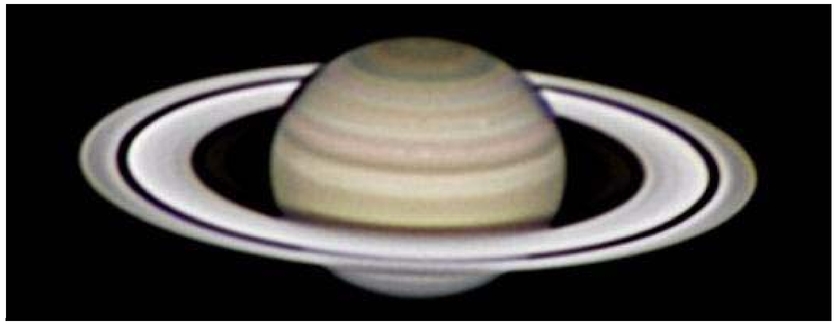


Image 1: Excellent view of STrZ and SEBZ white spots can be seen in this image taken by Don Parker of Coral Gables, FL on 2006 January 24 at 03:59UT using a 40.6 cm (16.0 in) Newtonian with a Lumenera 075M Camera and StreamPix Astronomik LRGB filters. South is at the top in the image.

Saturn Section
By Julius Benton, coordinator

Circumstances of the current 2005-06 apparition of Saturn are as follows:

Geocentric Phenomena in Universal Time (UT):

Conjunction	2005 July 23d UT
Opposition	2006 January 27^d
Conjunction	2006 August 07^d

Opposition Data for January 27^d:

Equatorial Diameter (Globe)	20.4”
Polar Diameter (Globe)	18.6”
Major Axis of Rings	46.3”
Minor Axis of Rings	18.2”
Visual Magnitude	$-0.2m_v$ (in Cancer)
B =	-18.9^o

Saturn reached opposition on January 27th and remains well situated for viewing most of the night. The southern hemisphere and south face of the rings are open to our vantage point from Earth, with the rings inclined about -20° to our line of sight. As Saturn approaches conjunction with the Sun on August 7th, the ring tilt will diminish to -16°.

Observational Highlights

- 330 CCD and webcam images of Saturn have been submitted
- Over 100 drawings and intensity estimates of Saturn have arrived
- White spots have been imaged in the EZs, STrZ, SEBZ, and SPR
- STrZ and SEBZ white spots became elongated and rather diffuse since early February
- The EZs and SPR small white features have been less obvious and rather short-lived

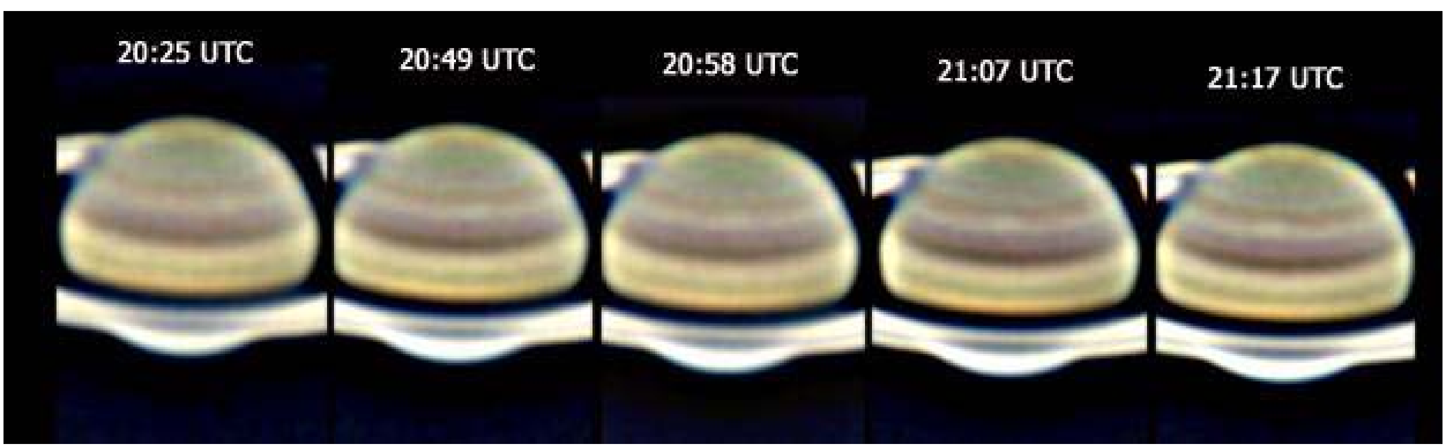


Image 2: Look at this superb sequence of images taken by Ralf Vandebergh of The Netherlands on 2006 March 15 from 20:25UT to 21:17UT showing an elongated STrZ white spot using a 25.4 cm (10.0 in) Newtonian and ToUcam webcam. South is at the top of the image.

Inside the ALPO
Member, section and activity news

- Several tiny, transient dark features have been imaged in the SEB
- Pro-Am collaboration in association with the Cassini Mission is continuing
- Incidence of simultaneous observations of Saturn is steadily increasing

Imagers are urged to perform visual observations of Saturn on the same night and as close to the same time images were taken. All observers should make comparisons of what is seen visually vs. what is apparent on the image, 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.).

The ALPO Saturn Section deeply appreciates the work of so many dedicated observers who take the time to send us observations and images. Our efforts have prompted more and more professional astronomers to seek input from amateur observers and imagers worldwide, and discoveries by amateur astronomers keep increasing every year.

Information on ALPO Saturn programs, including observing forms and instructions, can be found on the Saturn page on the official ALPO Website at http://www.lpl.arizona.edu/~rhill/alpo/sat.html

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

Remote Planets Section

By Richard W. Schmude, Jr., coordinator

The 2004 Remote Planets Apparition Report appears in this issue of *The Strolling Astronomer*. I have already started working on the 2005 Remote Planets Report and I hope to have it finished by early June. If you made observations of any planet beyond Saturn, then please send me your observations as soon as possible.

Uranus and Neptune became visible beginning in early May in the eastern sky just before sunrise. I am hoping that people will image Uranus and look for the coming shadow transits. Those with large telescopes (12 inch aperture or larger) and have good atmospheric seeing condition are asked to please make drawings of Uranus and submit them. Dark equatorial belts may become more prominent this year than in previous years.

Pluto is well-placed in the eastern sky after about 3 a.m. I am hoping that people with CCD cameras will be able to make brightness measurements of this planet.

More information appears in the *Remote Planets Review*. You can request a copy via e-mail to Schmude@gdn.edu.

Remote planets observers are urged to submit their own brightness measurements of Uranus, Neptune and Pluto to the ALPO Remote Planets Section, c/o Dr. Richard Schmude, Jr. (e-mail to: schmude@gdn.edu).

Visit the ALPO Remote Planets Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/remplan.html

In Remembrance of Denise Nye

May 24, 1946 – March 13, 2006

When I think of Denise Nye, I see a twinkle in her eye and hear a giggle as she spotted a funny sign along the road, as she told of plans for her and Derald's next eclipse adventure, and as she regaled us with the unexpected glitches and interesting people they had met on their most recent trip to another remote island. One could always keep up with their adventures because she always sent postcards and e-mails to her friends. Denise had a wonderful curiosity to discover what was in the world, especially in hard-to-get-to parts of the world. She was the perfect travel and astronomy partner to Derald Nye, long-time ALPO member, as they sought out total and annular eclipses, transits, and occultations around the globe. Denise was recognized as an equal astronomy partner with Derald when the International Astronomy Union (IAU) named asteroid number 3685 DERDENYE for both of them. Derald and Denise visited all the continents and over 90 countries and island groups, and Denise had traveled to 28 total and annular eclipses. They were about to depart to view her 29th eclipse in Libya when she succumbed to a sudden massive heart attack.

Even more important than the places Denise visited were the friends that she made in these places, developing a world-wide web of friends. These strong ties were evident at her Celebration of Life held in Tucson on May 7 with friends gathered from Australia, Great Britain, the Netherlands and Canada, as well as from all over the United States.

I spent time with Denise regularly at ALPO meetings, and with less regularity on eclipse trips, their visits to California, and by email conversations trying to coordinate trips so that we could meet. Denise exuded so much interest, curiosity, and energy that with her passing I feel as if I have lost a friend with whom I would have coffee or tea every few weeks.

Elizabeth Westfall

Feature Story: Index

Volume 45 of the "Strolling Astronomer"

By Michael Mattei

Publication Data

Author Index

Subject Index

ALPO Feature: Mercury

Scientific Interests in the Planet Mercury

By: Frank J Melillo, coordinator,
ALPO Mercury Section
FrankJ12@aol.com

Abstract

Mercury offers many challenges for successful observation and imaging. However, since only about half of the planet has been mapped by spacecraft, there are still significant contributions that Earth-bound observers can make. I am hoping here to encourage more observers to study Mercury and to report their findings.

Online Features

If you're reading this as a pdf file, please note that items in blue text are links to e-mail addresses, tables, figures and websites for more information. Left-click your mouse on:

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

Introduction

As the ALPO Mercury Section coordinator, I hope that many of you will give some serious thought to adding Mercury to your list of observing targets. We all realize the difficulties of making these observations at low angles through our murky atmosphere and near the Sun. Mariner 10 observed Mercury at close range during the three flybys in 1974-75, but imaged the same part of the planet each time, between longitudes 10° and 190°, leaving the rest unobserved. Therefore, we have high-resolution images of only about one-half of the surface.

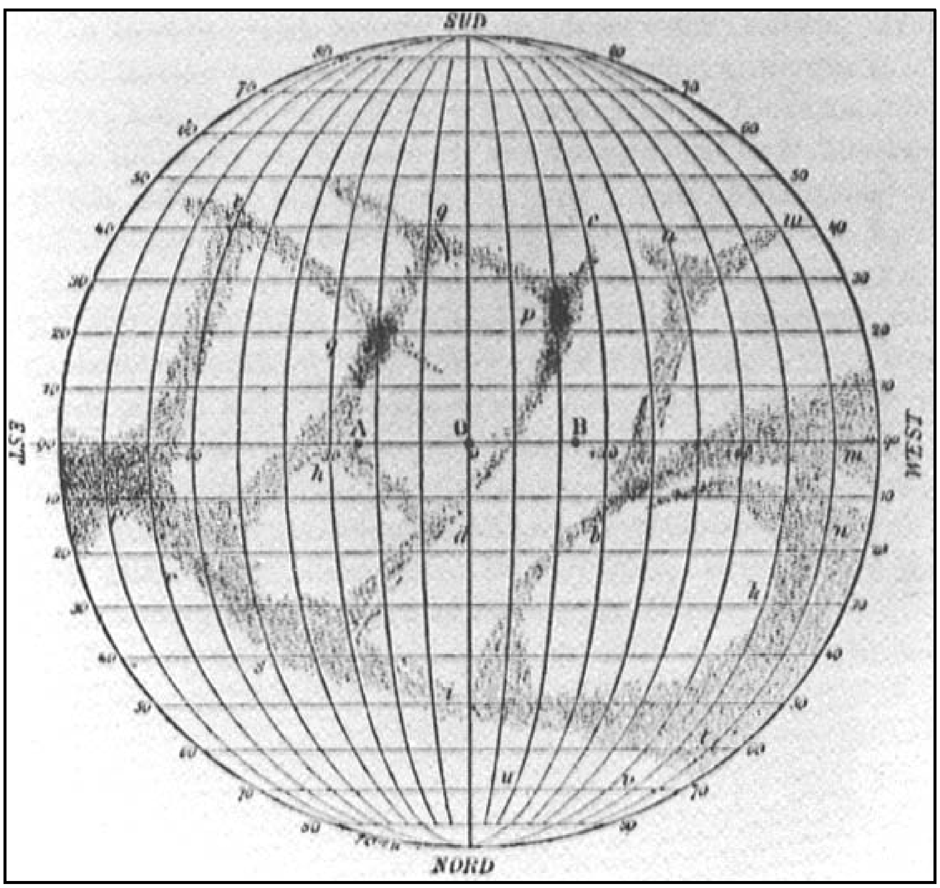


Figure 1. Mercury as mapped by Giovanni Schiaparelli.

After Mars, Mercury is the only other planet on which to observe a solid surface. The drawings of Mercury by many observers such as Giovanni Schiaparelli, Percival Lowell, William Denning, Eugene Antoniadi and Clark R. Chapman indicated that the surface of Mercury could be seen from Earth. Surprisingly, William Herschel did not see anything on Mercury. However, reports of surface features were given in the late 19th century by Schiaparelli from Milan, Italy, who reportedly saw light and dark patches on the disk which, to him, resembled Mars. Lowell observed Mercury with his own 24-inch refractor and reported dark "canal-like" features.

Denning in England was perhaps one of the most dedicated observers who was trying to establish the rotation period. He observed Mercury many times and recorded a few dark and bright markings for two consecutive nights and was convinced that he saw a slight shift of features on the disk. Schiaparelli and Antoniadi concluded that the planet rotated in the same period as it revolved around the Sun. Good try, but it was way off from the actual period of about 59 days.

Antoniadi and Chapman saw what they believed were permanent details and each constructed a map of his own. In addition,

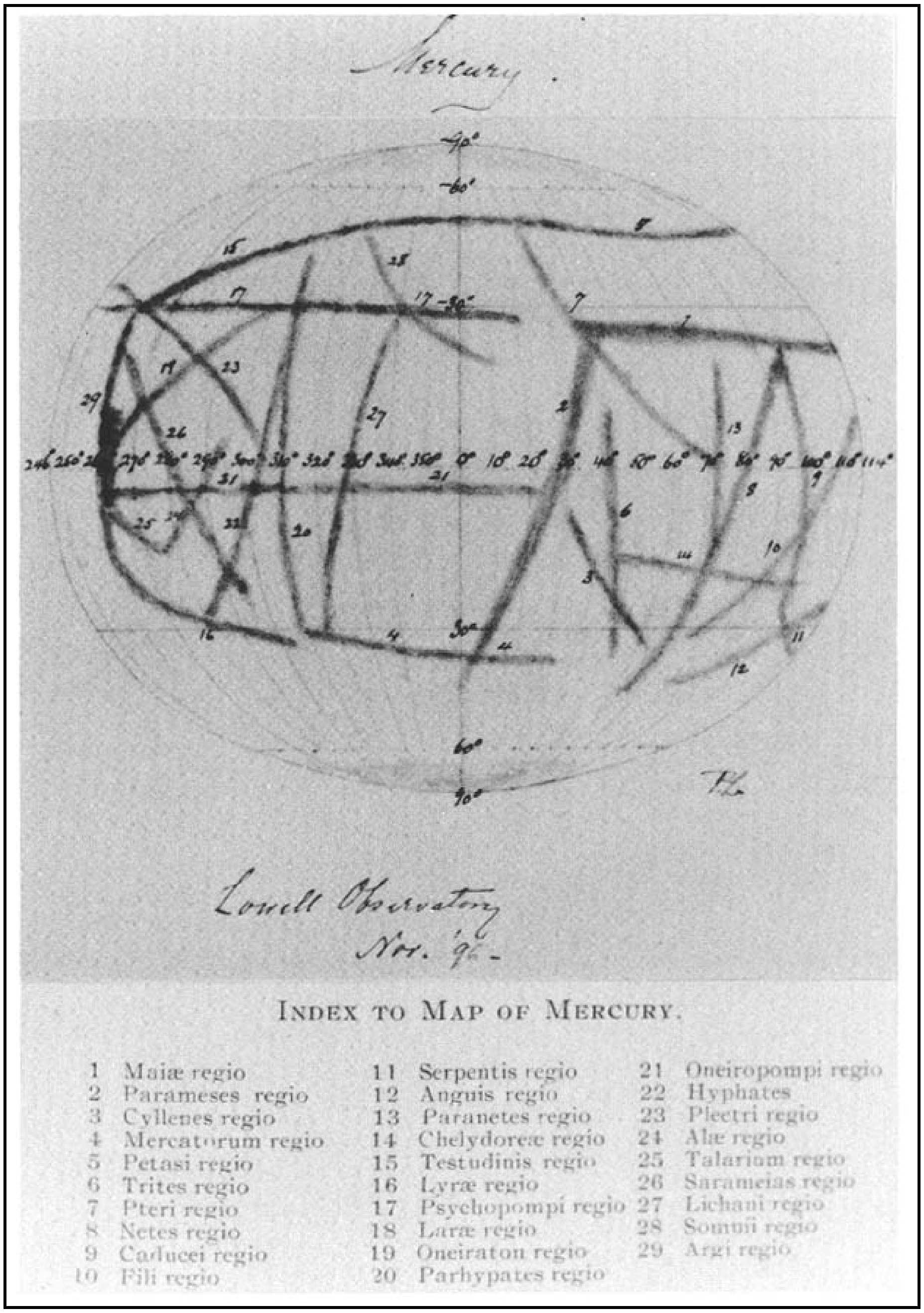


Figure 2. Mercury as mapped by Percival Lowell.

several other observers have sketched and reached some agreement on surface features, especially with Antoniadi's map. Chapman was the last one to construct a map before Mariner 10 arrived, but his map didn't agree with the others. In 1974, Mariner 10 showed that all maps made from Earth exhibited absolutely no correlation with any features that it imaged at high resolution. What went wrong and why?

Analyzing Previous Observations

For the past 350 years, we have watched from Earth the changing dark markings and features on the surface of Mars. Many believed that these are some form of seasonal vegetation and, as a result, the views from Mariner 4 in 1965 were much anticipated. Unfortunately, images from the Mariner series and, later, Viking, showed that the light and dark areas were due to seasonal changes in the distribution of surface dust, not vegetation.

Resolution and contrast are the two factors that most influence the raw information that we have available for interpretation. When we observe Mercury from Earth, we are observing it at low resolution because of the large distances involved. At higher resolution from a nearby spacecraft, the albedo markings are difficult to discern. The finer surface detail begins to show up and to distract the other important features that can be seen through the telescope. The Mariner 10 photographs showed no markings which clearly related to any drawings and maps made from Earth observations. Most planetary scientists sided with the images from the spacecraft and disagreed with the sketches. But this is not to say that low-resolution work is not important, especially when the next spacecraft visit may be many years away.

In some ways, Mercury and Mars have similar appearances as seen from Earth. At times, both can be seen about 5 to 7 arc seconds in apparent diameter with a hint of surface detail. Walter H. Haas, founder and director emeritus of our own Assn. of Lunar & Planetary Observers, notes: "Many years ago, I used to compare Mercury and Mars when they were near each other in the evening sky. I thought the Mercurean dark detail similar in aspect to the large maria on Mars."

The visual conditions have to be just right to see albedo markings but, unfortunately, we don't have the luxury to observe Mercury high in the dark sky the same way we can with Mars. About six months before and after opposition, Mars displays a gibbous disk and is similar in apparent size to Mercury. Albedo markings can be easily seen on Mars under even average seeing conditions. The major difference between observing these two planets is that Mercury is closer to the Sun and, therefore, closer to the horizon.

But under the right conditions and at the right times, observation of Mercury can be successful. [Several astronomers have made spectroscopic observations of Mercury recently, looking for atmospheric gases and trying to ascertain the chemical composition of the surface.] In addition, radar observations show that water ice may exist inside craters near the polar regions, hidden in the shadows since the formation of the solar system. An observation from Boston University using short exposures on videotape resulted in some remarkably sharp images of Mercury. They combined all the best individual snapshots and co-added them into one image. After processing, they have detected new albedo features in regions that were not observed by the Mariner 10 spacecraft.

Let's review Mercury's physical conditions: It is the second smallest of the nine planets in our solar system with a diameter of

3,100 miles. Mercury goes around the Sun in 88 Earth days and it rotates in about 59 days, that is, PRECISELY two-thirds of its orbital period. It never gets any closer to Earth than 55 million miles, even at an inferior conjunction. Mercury displays a disk ranging from 5 arc seconds to 12 arc seconds in apparent diameter and it always stays within 28° of the Sun. Does this sound like a challenging planet to observe?

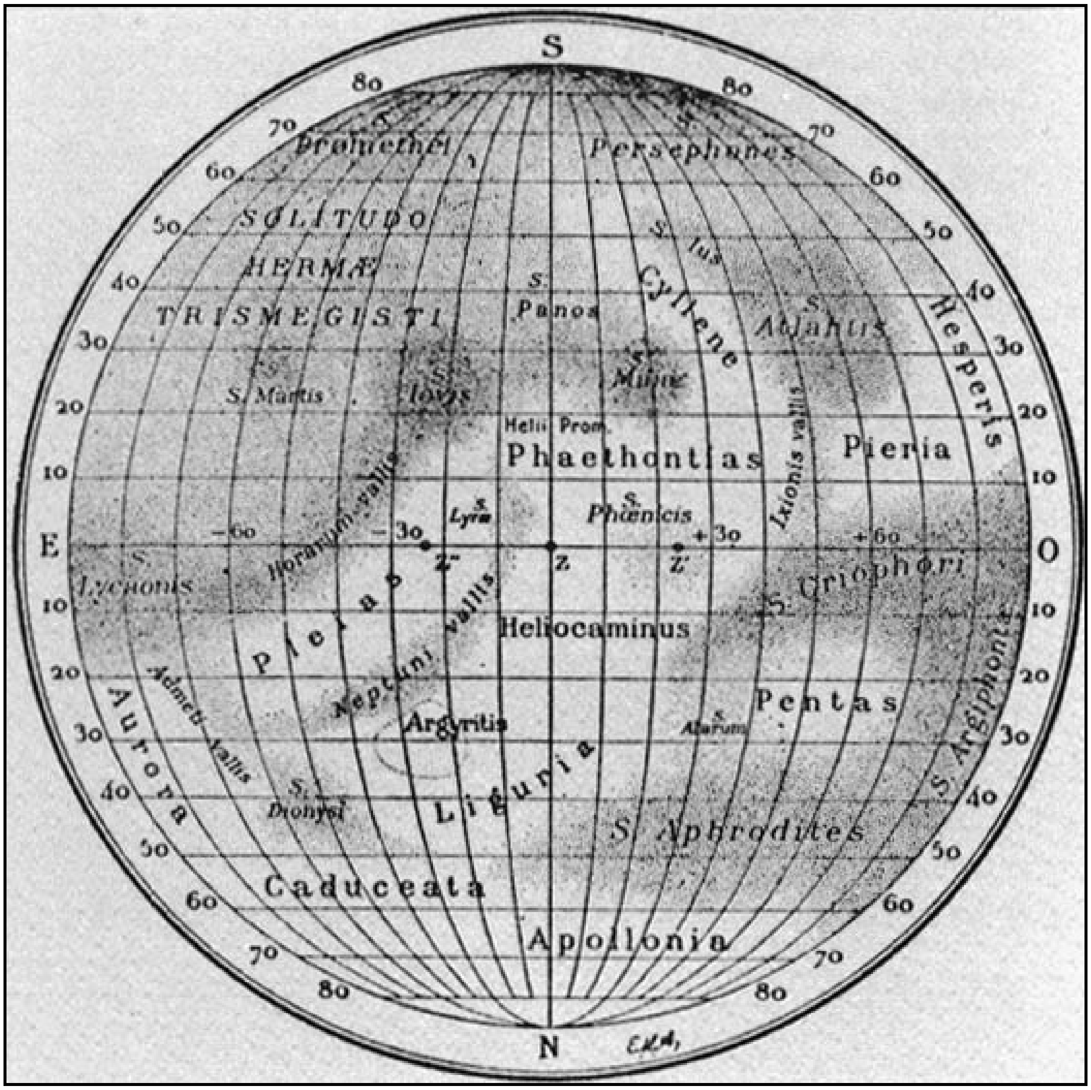


Figure 3. Mercury as mapped by Eugene Antoniadi.

Making Scientific Observations

It is exciting to sketch or image an unmapped surface. A plan well in advance is necessary to make these observations more meaningful and may lead to a discovery in regions that Mariner 10 didn't see. But it's a tricky planet to view since it is visible only three or four times a year and, even then, is not favorably placed. Mercury is the only planet that has not been observed by the Hubble Space Telescope, simply because it lies too close to the Sun in the sky. Therefore, without any space probe for the last 30 years, we have to depend entirely on ground-based observations. Very few professionals have devoted their time to Mercury but, recently, interests have been reconsidered and a "Mercury Watch Program" was created in which I am participating. Amateur astronomers are well-equipped these days, and you don't need a large telescope. All you need to have is willpower, plenty of advanced planning, and of course, clear weather. I am pretty sure that if you seriously observe Mercury, it will show you some surprises!

Let us start with a pair of binoculars. With just a hand-held set, Mercury will show its true colors when compared with other planets in the same field. For example, Jupiter appears to us as a creamy yellow color, Venus looks silver-white, Saturn appears yellow with a slight hint of orange and Mars looks red with a mixture of yellow. Mercury will be yellowish also, but with a mixture of pink and rose shadings.   Is this coloration due to atmospheric conditions or the actual chemical composition on the surface? You be the judge. But also be aware of the effects of atmospheric dispersion low in the sky, making images blue on top and red at the bottom.

Also, a pair of binoculars is a great help to spot Mercury when it is much higher in the evening sky but not visible to the naked eye.

Telescopically, at a first glance, Mercury appears like a smaller version of our own Moon. It swings from gibbous to crescent or back in a few weeks. Compare these rapid changes to Venus, which take months. Most experts prefer to observe Mercury during the daylight hours. *This is possible only if you are very cautious when observing it near the Sun and I don't recommend this to beginners*. But experienced observers might take advantage of Mercury when it is higher in the sky before sunset to minimize air turbulence.However, Walter Haas offers his own experience as an observer of Mercury some years ago: "I was a fairly active observer of Mercury for many years, beginning in 1936, often with 10 to 18 inches of aperture. With equatorial mounts, it was often easy to find Mercury a little before sunset. However, it was then faint with resulting poor contrasts of tone. As the sky darkened, the view improved, with the best view and the strongest contrasts coming in a short interval maybe about 10 minutes after sunset. (Varying with phase and aperture?) Then the disc detail grew worse as glare and lower altitude had their effect."

My own best advice is to observe Mercury during morning twilight and then to follow it with an equatorial mount well into the daylight hours after sunrise. The main drawback of this method is that the contrast may be low since the bright blue sky will wash out much of what can be seen on the disk, even though the atmospheric conditions are favorable. If this happens, you can try a Wratten #25 red filter to darken the background or experiment

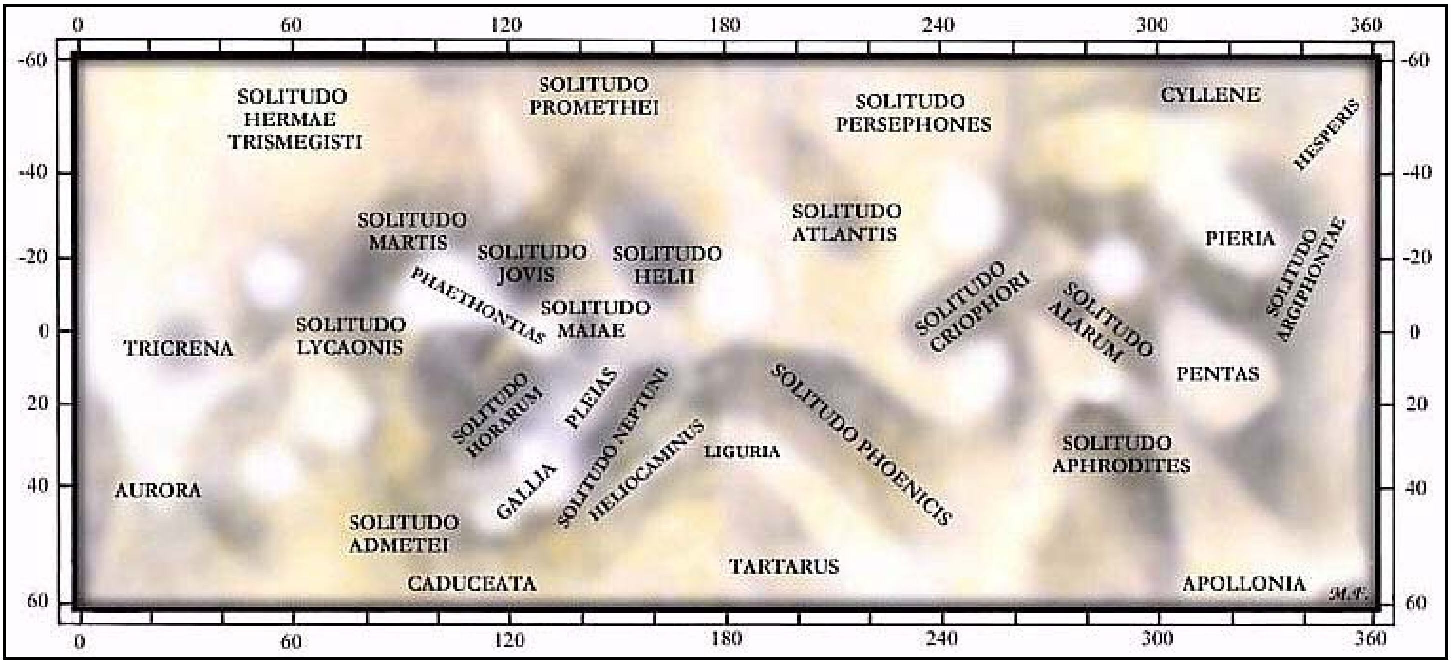


Figure 4. Mercury as mapped by Mario Frassati, based on 54 visual observations between 1997 and 2001. Equipment: 203 mm (8 in.), f/10 Schmidt-Cassegrain, 250x - 400x magnifications used.

with any other filters that you might have on hand. Then report what worked best for you.

Discerning any albedo markings on the disk can be very tricky. Gibbous and half-phase is the best time to search for them since the planet then exposes much of its surface and it is near its brightest. Mariner 10 photographed only the regions between 10° and 190° longitude so, if you see markings in other areas, you might want to speculate as to what kind of features they are. Many drawings and even photographs disagree with each other but, at times, there may be some similarities. When you have perfect seeing conditions, even for a few seconds, Mercury might be loaded with dark and white spots and mare-like features. The appearance of the features and spots should shift slightly the next day due to the rotation. If the same features persist, the detail you are seeing could be real. So far, the observations by Boston University have succeeded at longitude 280° to 330°. Hopefully, other ground-based observers can become involved and fill in the gaps.

Conclusions

With today's advanced technology, I believe this is the best time to pursue mapping the unknown areas of Mercury. Any of you who are seriously observing Mercury should be familiar with the "Mercury Watch Program." Professional astronomers, and now amateurs as well, are sharing their interests and their latest results. Of course, ALPO is now participating in this program as well. NASA, in cooperation with Europe and Japan, launched a space probe to Mercury named "Messenger" in August 2004. This probe will orbit Mercury and will image the entire surface at high resolution by 2009. Our goal is to make the best albedo map of Mercury possible and later to compare it with the Messenger images. In fact, ALPO has already joined the "Mercury Watch" program and will hopefully be able to participate in the excitement along with the professionals.

The ALPO Mercury section relies on reports from you, the observers. While some observers assume that there is nothing to be seen, or are frustrated by the seeing conditions, such is not always the case. Buildings, houses and trees, as well as our atmosphere, are the enemies when it comes to observing this body. But, if we learn the secrets of observing this tiny planet, we can be successful in this challenging and rewarding experience. I hope some of you will join the list of great astronomers who have recorded faint but real details. If you plan well enough, Mercury will show its secrets to you!

References

Arnal, O.C. (1996), "The Challenge of observing Mercury: Frustrations and Rewards", *Journal of the Assn of Lunar & Planetary Observers*, Vol. 39 No. 2 pp. 49-55.

Capen C., Dobbins, T. and Parker, D., (1988) "*Introduction to Observing and Photographing the Solar System*" Richmond, VA, Willmann-Bell, pg 31.

Davies, M., Dwornik, S., Gault, D., and Strom, R., (1978), "*Atlas of Mercury*" NASA.

Dobbins, T. and Sheehan, W., "Mesmerized by Mercury" *Sky & Telescope* magazine, June 2000, Vol. 99 No. 6, pp 109-114.

Price, F. W. (1994), "*The Planet Observer's Handbook*". Cambridge University Press, England, pp 73-98.

Schaaf, F (1991) "*Seeing the Solar System*". New York, John Wiley & Sons, Inc., pg 149.

Schmude, R. W. (1990), "Observations of Mercury in 1988 - 1989", *Journal of the Assn of Lunar & Planetary Observers*, Vol. 34, No. 3, pp 101-103.

Feature Story: Moon
Observations of a Dome Near Crater Hyginus

By Raffaello Lena and Eric Douglass,
The Geologic Lunar Research Group (GLR)
gibbidomine@libero.it

This paper was prepared and submitted by the GLR Group, an organization independent of the ALPO, which also studies lunar domes and other features. This paper has gone through the ALPO peer review process.

Online Features

If you're reading this as a pdf file, please note that items in blue text are links to e-mail addresses, tables, figures and websites for more information. Left-click your mouse on:

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

Introduction

Hyginus is an interesting crater located at 6.30° E and 7.80° N, in Sinus Medii. Rima Hyginus is one of the unique lunar formations, for the presence of small pit craters visible in the rille (Wood). Recently, Hyginus was monitored by the GLR Group. In addition, a dome has been observed in this area and it is described here. That dome, located at Xi +0.162 and Eta +0.143 (longitude 9.44° E latitude 8. 22° N), doesn't appear in the ALPO Lunar Dome list. It seems to require very specific lighting conditions to be visible.

Observations

For all the images reported in this paper, north is at the top and west (IAU) at the left. The solar altitude (H) and colongitude (C), as seen from the dome, were calculated using the *Lunar Observer's Tool Kit* software by Harry Jamieson.

The *Consolidated Lunar Atlas* (frame D13) shows the presence of a dome around Hyginus Z. That image (Figure 1) was taken September 6, 1966 at 11:10 UT (C 157.55°, H 3.18°).

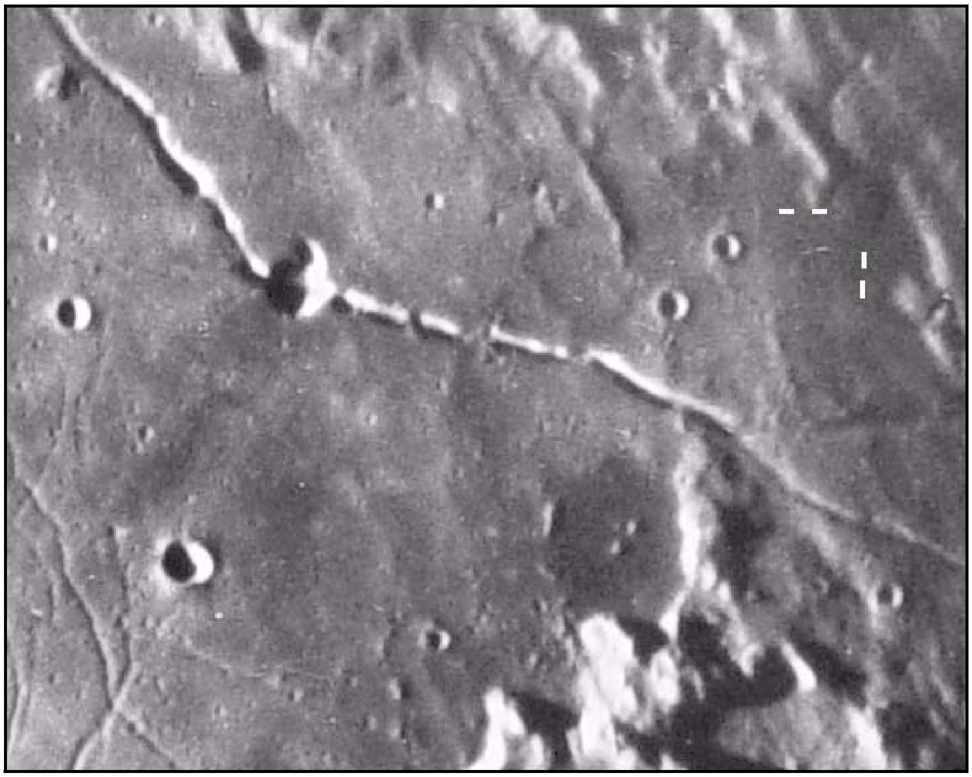


Figure 1: White hatch-marks indicate Hygiunus dome. Source: Consolidated Lunar Atlas, Kuiper et. al., digital edition. Douglass; D13.

Table 1: General Data About Hyginus Dome

Position Lunar Orthographic Coordinates		Longitude (°)	Latitude (°)	Diameter (km)
Xi	Eta			
+0.162	+0.143	9.44	8.22	10 x 12

Paolo Baldoni of the GLR Group, did another observation of the Hyginus region. This observation (Figure 2) was carried out on August 7, 2004 at 1:55 UT using a 260mm f/5 Newtonian (C 164.05°, H 6.65°). As depicted in the Baldoni image, the dome is clearly visible.

Another image (Figure 3), was taken by L. Comolli using a 318 mm f/20 Trischiefspiegler telescope. The

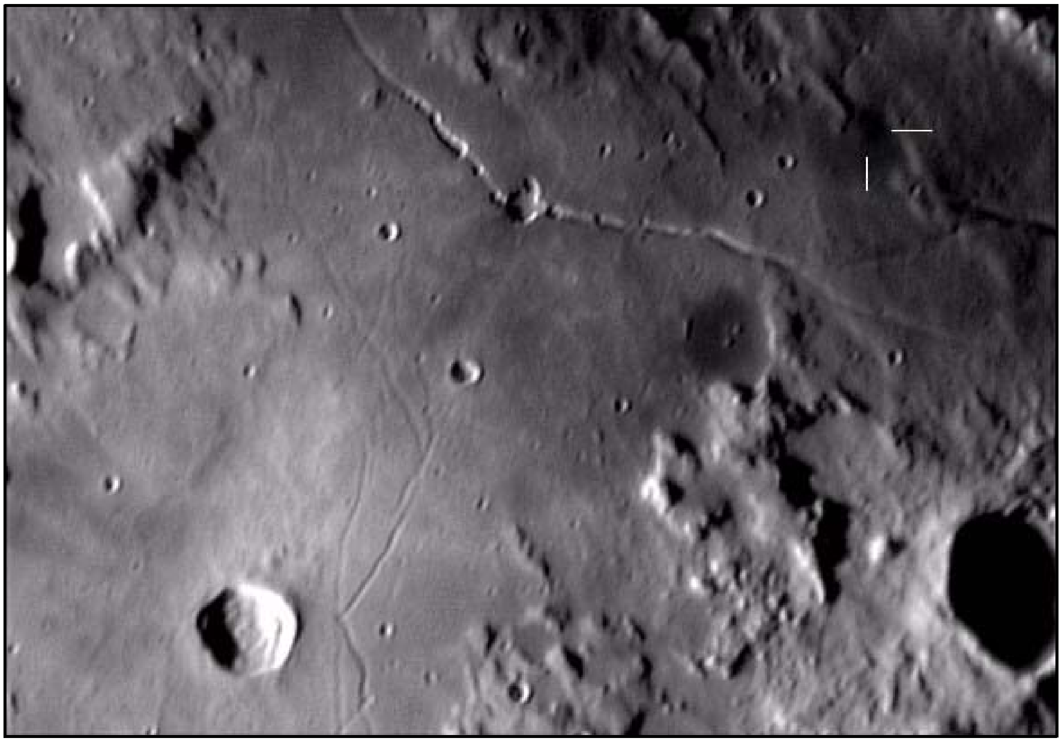


Figure 2: Paolo Baldoni, observation carried out on August, 7, 2004 at 1:55 UT. Note white hatch-marks.

dome than can be detected by traditional Earth-based imaging, including the presence of a craterlet on its summit. We measured the dome by enlarging the images, counting the number of pixels in the object of interest, and then converting this number to kilometers by using the known kilometers-per-pixel value (see Table 1). The fact that there have been only three previously reported observations of this dome strongly suggests that this may be a very difficult object to observe, requiring specific lighting and good seeing conditions in order to clearly define the features. Using the available CCD, images this dome may be classified according to the Westfall classification scheme as DW/2a/6f/7j (Westfall, 1964).

image showing the dome was made on the same night as Baldoni's image, but only five minutes later, at 02:00 UT.

Another image of the dome (Figure 4) submitted to the GLR Group by Bruno Daversin (Ludiver Observatory Normandy, France) shows this dome during an observation on September 17, 2003 at 03:27 UT (C 163.62°, H 7.06°). The image was obtained using a 600 mm f/16 Cassegrain telescope. Figure 4 reveals much finer detail in the

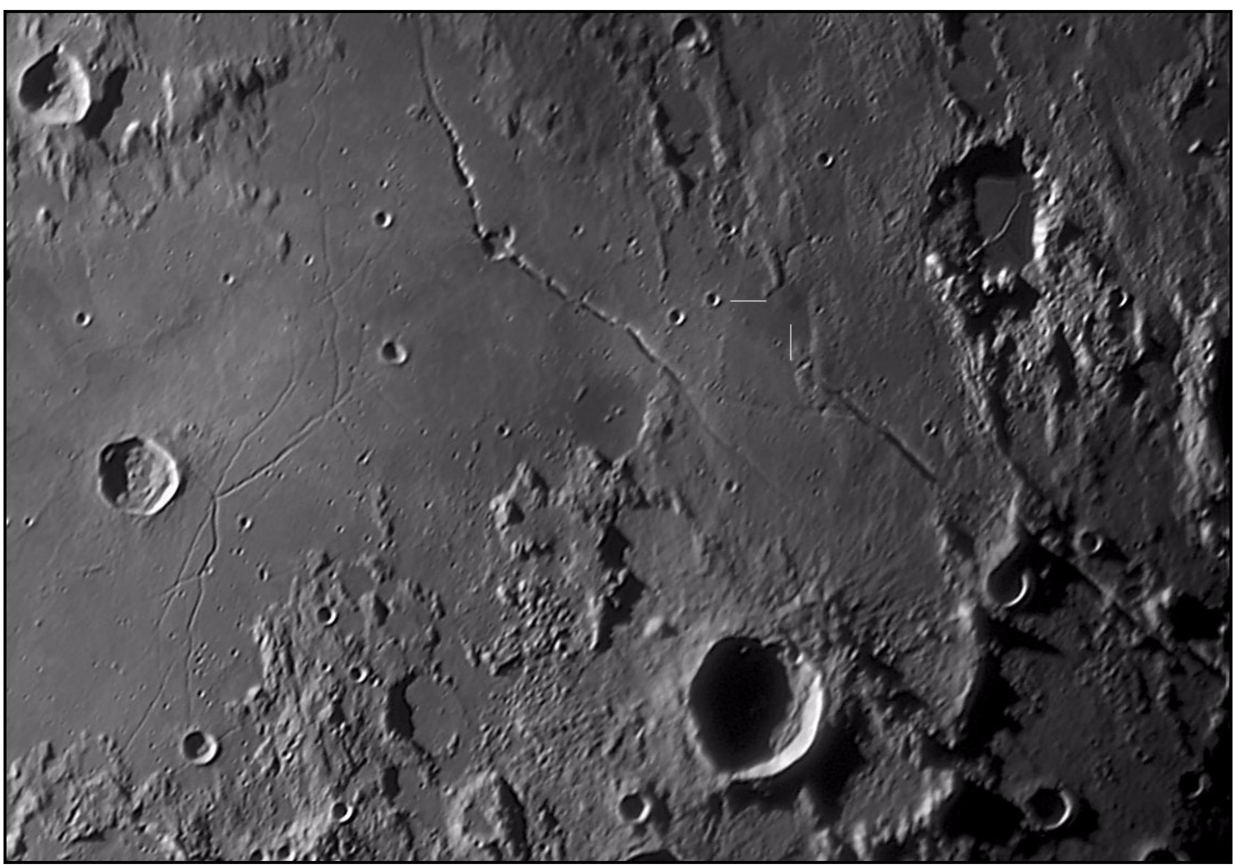


Figure 3: Lorenzo Comolli observation carried out on August, 7, 2004 at 02:00 UT. Note white hatch mark at center-right of image.

Geology of the Hyginus Region

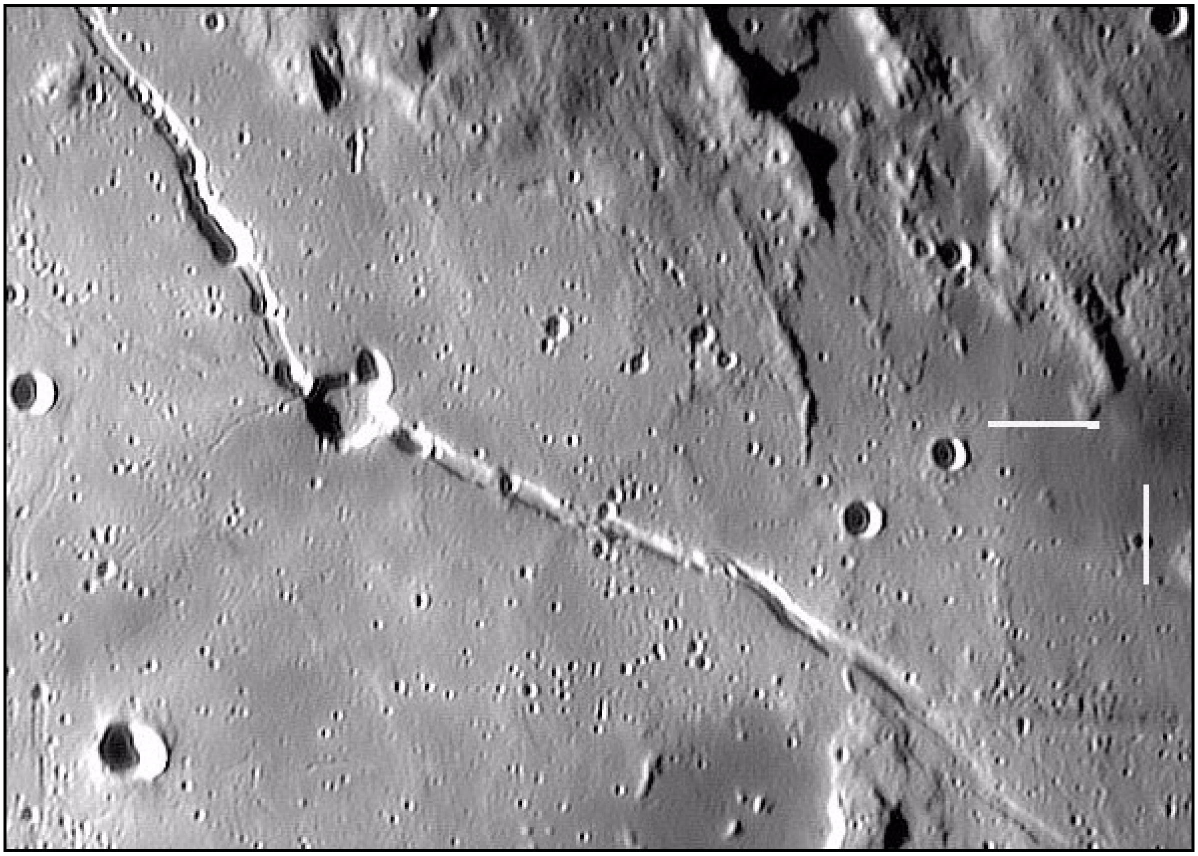


Figure 4: Bruno Daversin (Ludiver Observatory Normandy, France) observation carried out on September 17, 2003 at 03:27 UT. Note white hatch-marks at center-right.

The region around crater Hyginus is full of geologically interesting formations. Here we will briefly discuss these formations because they are important in understanding the history and formation of the dome discussed in this paper.

Southeast Region of Mare Vaporum

Mare Vaporum (Figure 5) is a volcanic province and is covered with lava that flowed from surface vents. Like all flow-based lavas on the Moon, this magma is low in silicates, giving it a very low viscosity (thin and runny). Thus, the lava was able to flow for long distances, with relatively low flow fronts. However, the spectral appearance of the southeast region of Mare Vaporum is quite different from the remainder of the mare (Figure 6, 7; labelled “P”).

In Earth-based telescopes, this section has a low albedo (is dark in appearance). Such dark sections generally represent areas of fire fountaining, and are called “dark mantling materials” (Wilhelms, p. 89). Fire fountaining occurs when rising magma begins the process of degassing. Here, gasses dissolved in the magma when it was under great pressure begin to come out of the solution (a process called “exsolution”). This happens as the magma nears the lunar surface; and as the gasses come out of solution, they may erupt explosively, fragment the surrounding magma, and throwing small magma droplets high above the lunar surface. Above the surface, these droplets cool as volcanic glass and then fall around the vent. In large provinces of dark mantling materials, the fire fountaining likely occurred repeatedly, and may represent the serial deplugging of volcanic vents by the pressure surges of exsolution (Mursky, p. 174). The southeast region of this mare is one such “large” dark mantling province, covering approximately 10,000 square kilometers of area (Gaddis).

Hyginus Rille

This rille (Figure 5) has two arms that assume a graben-like appearance (Heiken, et. al., p. 111), with steep-sided walls and a flat floor. This kind of feature is formed by extensional forces acting on the lunar crust. Given that Hyginus Rille occurs in a volcanic province, the extensional stress is most likely volcanic in nature. Here a rising magma stressed the surface (extension by up-bowing) until the upper layers of the crust failed, resulting in surface fractures.

Further, it is of note that the arms of Hyginus Rille are straight. This suggests that the magma rose as a dike, dissecting along fracture lines in the subsurface rock — fractures that were created by the Imbrium impact. The rille created, then followed, the geography of the rising dike. If this is the geologic history of Hyginus Rille, then the craterlets within the rille may represent collapse pits due to loss of structural support upon magma withdrawal (see Wilhelms, p. 88), or places where exsolving gasses (gasses that come out of lava as it approaches the surface) explosively blew the surface rock off the floor of the graben (cf. Head and Wilson). While it is tempting to consider that these craterlets represent the top of an unroofed lava tube, this is unlikely for several reasons:

- Unroofed lava tubes tend to develop linear elongations due to lack of support along the axis of the tube.

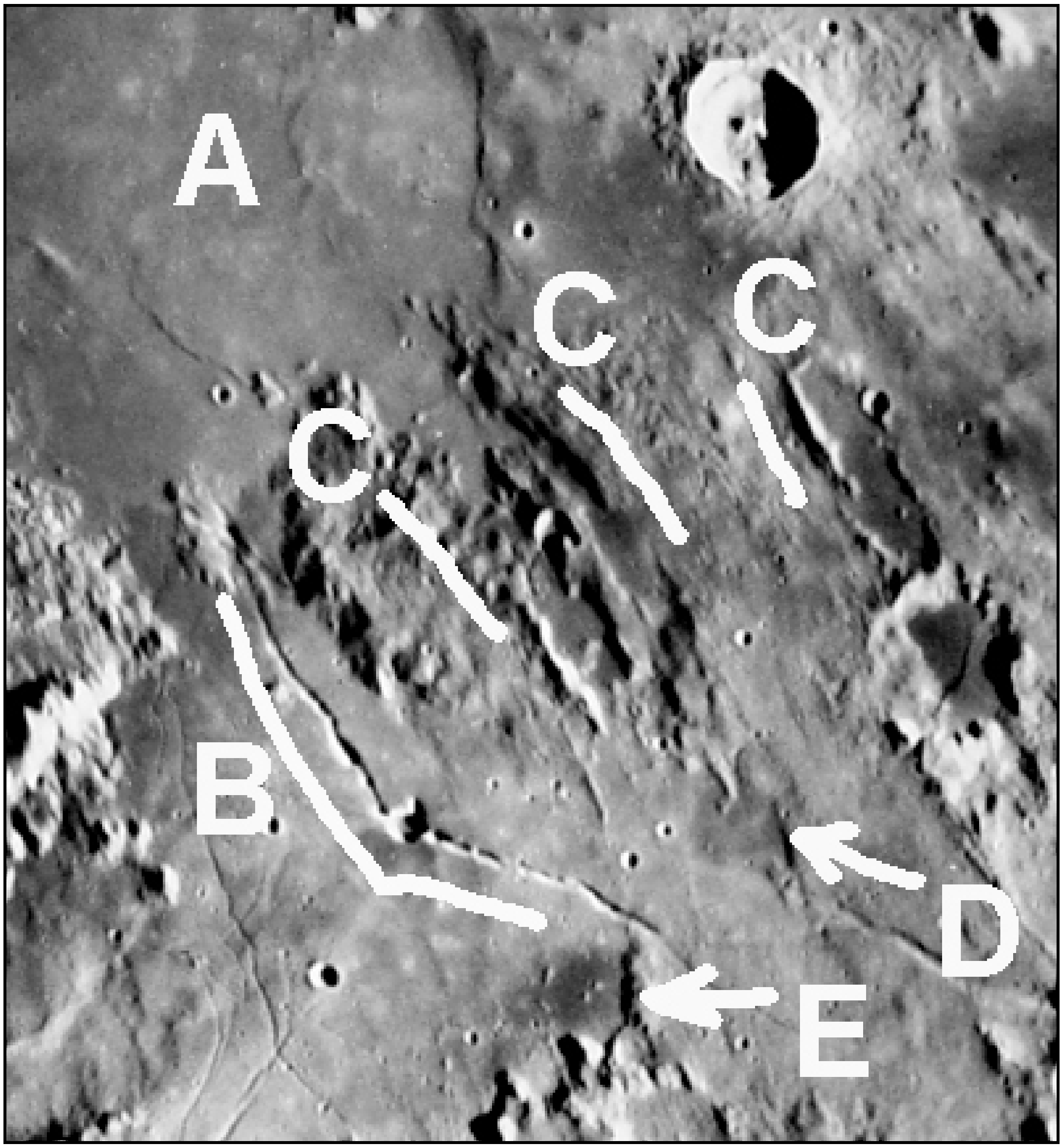


Figure 5: Consolidated Lunar Atlas, Kuiper et. al., digital edition. Douglass; D12. NOTE A: Mare Vaporum; B: Rima Hyginus; C: Rough, Lineated Materials; D: Dome and Region; E: Hyginus S Region.

- Lava tubes tend to be more sinuous in their course (consider Hadley Rille).

Rough, Lineated, Hummocky Materials

These terms refer to those mountainous regions that appear to be linearly placed from north-west to south-east (figures 6 and 7). These materials represent the ejecta from the Imbrium Impact. Ejecta was thrown from this basin in a radial trajectory, arching above the lunar surface, and striking this surface under the influence of the lunar gravity (see Melosh, p. 92 for details). This gave the ejecta the appearance of being radial to the basin itself. This ejecta goes by the name of the Fra Mauro formation, and most of it has been covered over by later lava flows — only the highest parts remain.

Geology and Geologic History of the Dome Region

Domes may be formed in a variety of different ways. However, when the dome has a summit pit crater, as is found here (Figure 4), it most likely formed by a buildup of effusive flows that erupted from the central vent. In the early stages of lunar volcanism, effusive domes didn't form, as the lavas were hot and of very low viscosity (thin and runny). However, in its later stages, the temperature of the magma was slightly cooler, increasing the viscosity so that they accumulated around the vent instead of flowing off as relatively flat sheets. This constructional phase was aided by a decreasing supply of magma to the vent, allowing the magma to more effectively cool once extruded (Cattermole, p. 228). The present dome has such a summit pit, and so probably represents an effusively constructed dome.

If the origin of this dome is found in effusive volcanism, then the dark areas surrounding the dome (figures 5 and 6; labelled "D") are likely a set of volcanic flows, either from the dome itself or from nearby vents. An alternative is that these patches represents pyroclastic beds, as is found further to the northeast (see above discussion). However, Gaddis (Lunar Pyroclastic Volcanism Database), using the multispectral Clementine imagery, didn't identify this region or the similar region surrounding Hyginus S (figures 5 and 7; labelled "E") as such.

Examination of these "dark patches" using the Clementine imagery reveals what appears to be several dark halo craters (Figure 8). While the Moon has several types of dark halo craters, the ones in this region likely formed by an impact into a particular kind of lava field. An example of this type of dark halo crater from near Copernicus is reproduced in Figure 9. The geologic history of this type of dark halo crater is as follows:

1. A dark, volcanic layer forms on the lunar surface.

2. A nearby impact covers the lava layer with a thin veneer of light ejecta.

3. A later impact occurs in the lava bed, piercing the thin, lighter veneer and entering into the dark, lava layer.

4. The ejecta from this impact spreads the dark, lava materials on the lunar surface.

Using the above discussion, we can now piece together the geologic history of this region:

1. Imbrium impact occurred 3.85 billion year ago, creating fractures in the rock layers of this region and spreading ejecta throughout this region.

2. At the same time, radioactive decay of elements in the mantle produced sufficient heat to cause melting of the surrounding rock.

3. The magma ascended along the fractures produced by the Imbrium shock wave as dikes (note that a variety of factors cause volcanism to be associated with basins, of which fracturing is but one; see Mursky, p. 162).

4. These magmas acted differently in different contexts, with some forming relatively flat effusive flows (much of Mare Vaporum), some forming pyroclastic events (the southeast section of Mare Vaporum), some remaining subsurface but stressing the surface until it produced grabens (Hyginus Rille), and some forming domes with associated effusive flows (the present dome and its region).

5. Later impacts in this region spread a light covering of ejecta over the present dome and region.

6. Yet later impacts pierced the light veneer of ejecta and excavated the darker lava products beneath, so producing dark halo craters.

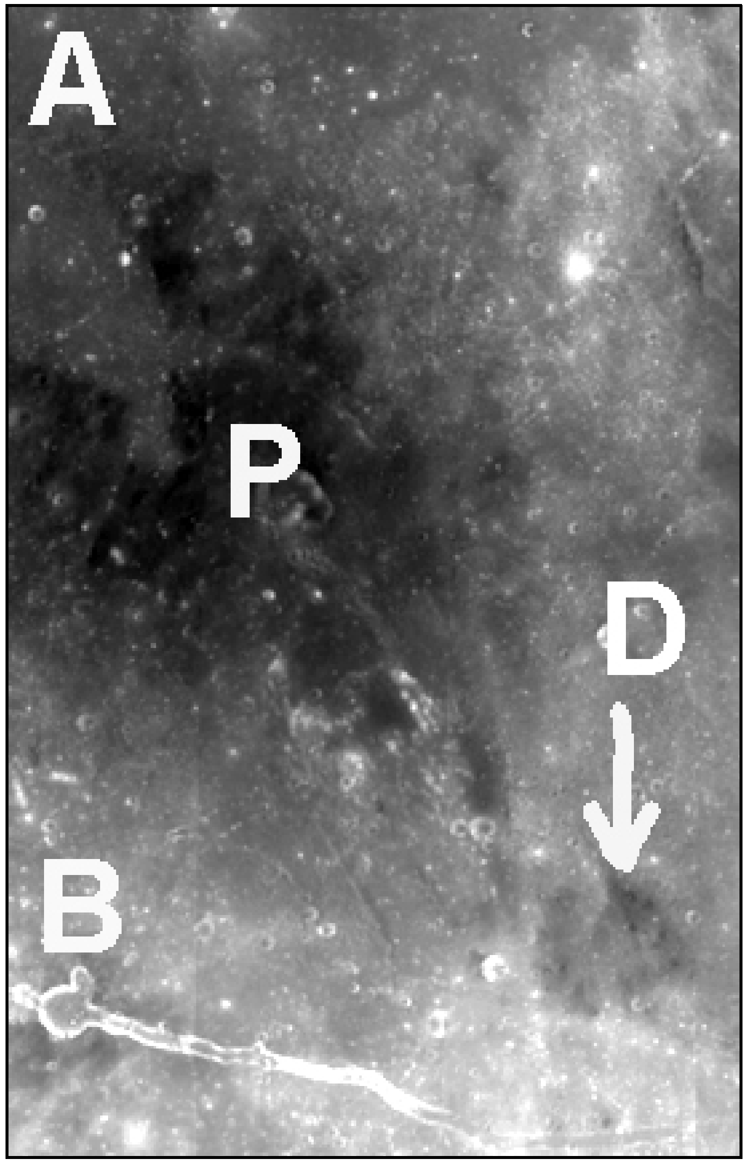


Figure 6:Clementine, DIM, UVVIS 750-nm Basemap; USGS. NOTE A: Mare Vaporum; B: Rima Hyginus; D: Dome and Region; P: Pyroclastic Materials.

Conclusion

The study of the lunar domes requires extreme patience and good seeing.

In this paper, we report a study and classification of a dome near crater Hyginus at Xi +0.162, Eta +0.143 (longitude 9.44° E, latitude 8. 22° N). This report also demonstrates that the study and classification of these volcanic structures on the Moon is far from complete.

References:

Cattermole, P. *Planetary Volcanism*, 2nd ed. Chichester: John Wiley and Sons Ltd., 1996.

Gaddis, L. "Lunar Pyroclastic Volcanism Database." July, 2002: *http://wwwflag.wr.usgs.gov/USGSFlag/Space/LunPyro/lunpyroWebDb.html*.

Head, J. and Wilson, L. "*Lunar Linear Rilles as Surface Manifestations of Dikes: Predictions and Observations*." Lunar and Planetary Science Conference XXVII (1996): Abstract 96. Planetary Science Institute, Houston.

Heiken, G., Vaniman, D., and French, B. *Lunar Sourcebook*. Cambridge: Cambridge University Press, 1991

Melosh, H. *Impact Cratering* (Oxford Monographs on Geology and Geophysics, #11). New York: Oxford University Press, 1989.

Mursky, G. *Introduction to Planetary Volcanism*. Upper Saddle River: Prentice Hall; 1996.

Westfall, J.(1964). "A Generic Classification of Lunar Domes." *Journal of the Assn of Lunar & Planetary Observers* 18 (1,2): pp 15-20.

Wilhelms, D. *Geologic History of the Moon*. USGS Professional Paper 1348. Washington: GPO, 1987.

Wilhelms, D. *Geologic Map of the Mare Vaporum Quadrangle of the Moon*. Washington: United States Geologic Survey, 1968.

Wood, C. "Say Hi to Hyginus". February 25, 2004 Lunar Photo of the Day: *thttp://www.lpod.org/LPOD-2004-02-25.htm*

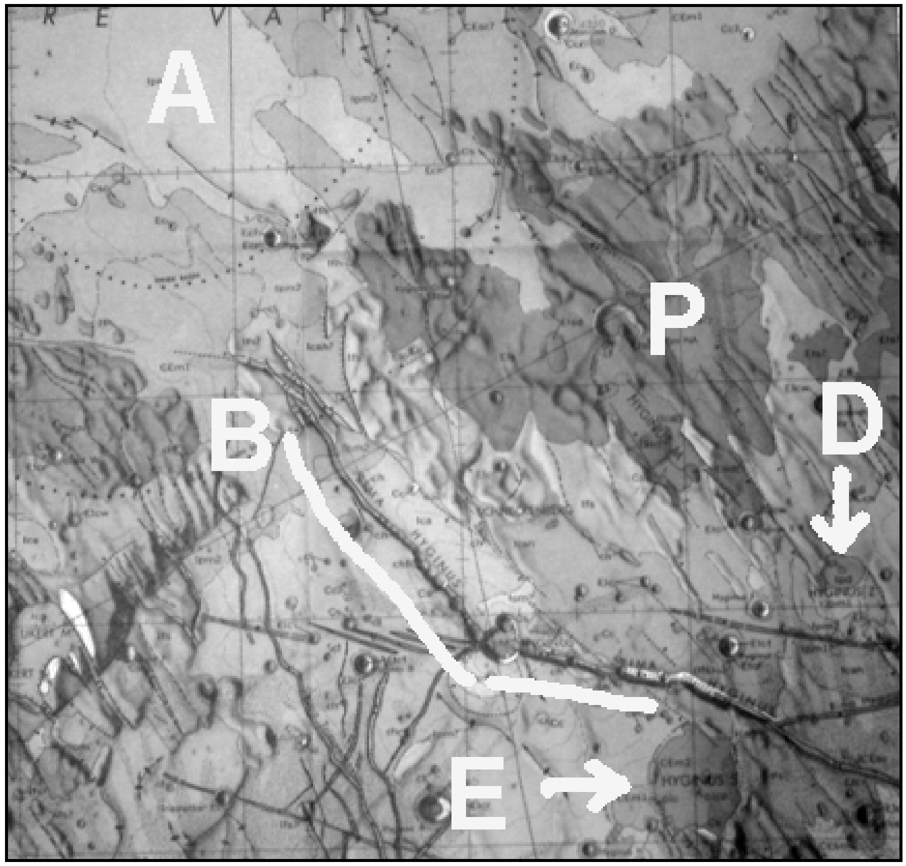


Figure 7:Wilhelms, D. Geologic Map of the Mare Vaporum Quadrangle of the Moon. NOTE A: Mare Vaporum; B: Rima Hyginus; D: Dome and Region; E: Hyginus S Region; P: Pyroclastic Materials.

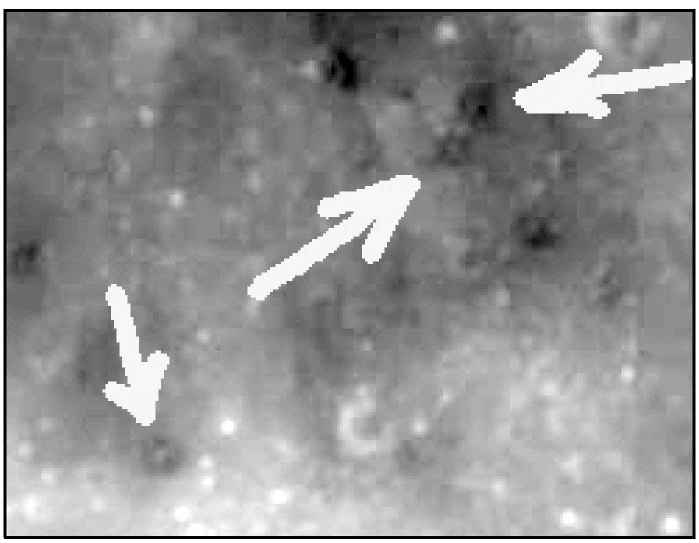


Figure 8:Clementine, DIM, UVVIS 750-nm Basemap; USGS.

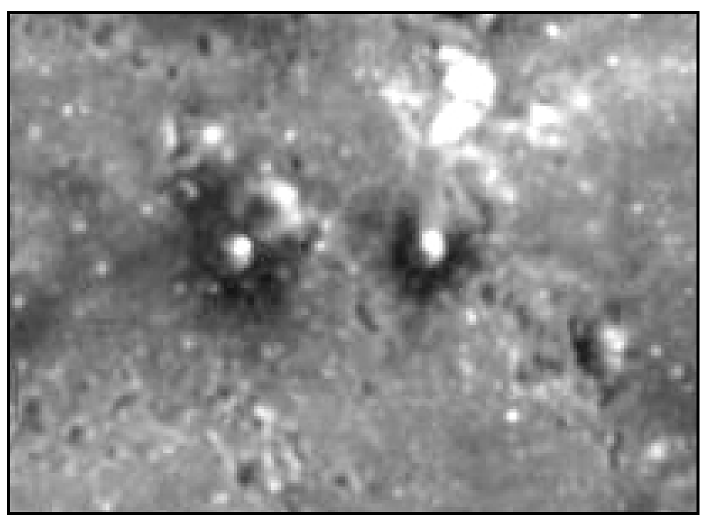


Figure 9:Clementine, DIM, UVVIS 750-nm Basemap; USGS.

Feature Story: Saturn
Observations During the 2002-2003 Apparition

By Julius L. Benton, Jr.,
Coordinator, ALPO Saturn Section
jlbaina@msn.com

Abstract

A superb variety of 218 visual, photographic, webcam and CCD observations of Saturn were contributed to the ALPO Saturn Section during the 2002-2003 Apparition by 33 individuals residing in the United Kingdom, France, Germany, Singapore, China, Italy, Puerto Rico, Canada and the United States. The observations covered the period from 2002 August 12 through 2003 May 08, and the instruments used to record these data ranged in aperture from 10.2 cm (4.0 in) up to 40.6 cm (16.0 in). Saturn observers reported occasional dusky festoons and other short-lived dark spots in the mid-temperate latitude belts and zones of Saturn's Southern Hemisphere during the observing season, as well as several diffuse, small transient white spots or ovals near the South Tropical Zone (STrZ), South Polar Region (SPR), and southern Equatorial Zone (EZs). A few recurring central meridian (CM) transit timings were reported for these features, but their short longevity hampered derivation of reliable rotation rates. The inclination of the ring system to Earth, B, reached a maximum value of –27°.013 on 2003 April 09, and as would be expected, observers were afforded optimum views of Saturn's Southern Hemisphere and the South face of the Rings during the 2002-2003 Apparition. A synopsis of visual observations and images of Saturn made throughout 2002-2003 are discussed, including the results of continuing efforts to image the bicolored aspect and azimuthal brightness asymmetries of the Rings. Accompanying the report are references, drawings, photographs, webcam and CCD images, graphs, and tables.

Online Features

If you're reading this as a pdf file, please note that items in blue text are links to e-mail addresses, tables, figures and websites for more information. Left-click your mouse on:

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

Introduction

This report is based on an analysis of 218 visual observations, photographs, and CCD and webcam images that were submitted to the ALPO Saturn Section by 33 observers from 2002 August 02 through 2003 May 08, which represents the 2002-2003 "observing season" of Saturn. [As opposed to the apparition, or entire period between successive solar conjunctions, which was 2002 June 09 – 2003 June 24. Ed.] Carefully selected samples of drawings and images accompany this report, and it is important to note that all times and dates mentioned in our discussion are in Universal Time (UT).

Table 1 provides geocentric data in Universal Time (UT) for the 2002-2003 Apparition of Saturn. During the observing season, the numerical value of **B**, or the saturnicentric latitude of the Earth referred to the ring plane (- when south), ranged between the extremes of -26°.332 (2002 October 17) and -27°.013 (2003 April 09). The value of **B**', the saturnicentric latitude of the Sun, ranged between -26°.749 (2002 October 27) and -26°.520 (2003 May 08).

Table 2 lists the 33 individuals who provided a total of 218 observations to the ALPO Saturn Section for the

Table 1: Geocentric Phenomena in Universal Time (UT) for Saturn During the 2002-2003 Apparition

Conjunction		2002	Jun	09^d	11^h UT
Opposition			Dec	17^d	17^h
Conjunction		2003	Jun	24^d	14^h
Opposition Data					
Visual Magnitude		–0.50			
Constellation		Taurus			
Declination		+22°.055			
B		–26°.590			
B'		–26°.733			
Globe	Equatorial Diameter	20".64			
	Polar Diameter	19".02			
Rings	Major Axis	46".84			
	Minor Axis	20.96″			

Table 1: 2002-2003 Apparition of Saturn: Contributing Observers

	Observer	Location	# Observations	Instrumentation*
1.	Avellone, John	Alexandria, VA	1	15.2-cm (6.0-in) NEW
2.	Benton, Julius L.	Wilmington Island, GA	21	12.7-cm (5.0-in) MAK
3.	Boyar, Daniel	Boynton Beach, FL	1	10.5-cm (4.1-in) REF
4.	Carbognani, Albino	Parma, Italy	1	25.4-cm (10.0-in) NEW
5.	Crandall, Ed	Winston-Salem, NC	2	25.4-cm (10.0-in) NEW
6.	Cudnik, Brian	Houston, TX	4 4	25.4-cm (10.0-in) NEW 31.8-cm (12.5-in) NEW
7.	Dal Prete, Ivano	Verona, Italy	2	20.3-cm (8.0-in) NEW
8.	Del Valle, Daniel	San Juan, Puerto Rico	18	20.3-cm (8.0-in) SCT
9.	Dekarske, Donald H.	Colorado Springs, CO	1	25.4-cm (10.0-in) NEW
10.	Frassati, Mario	Crescentino, Italy	2 1	20.3-cm (8.0-in) SCT 31.8-cm (12.5-in) NEW
11.	Grafton, Ed	Houston, TX	12	35.6-cm (14.0-in) SCT
12.	Haas, Walter H.	Las Cruces, NM	6 11	20.3-cm (8.0-in) NEW 31.8-cm (12.5-in) NEW
13.	Hatton, Jason P.	Mill Valley, CA	26	23.5-cm (9.25-in) SCT
14.	Hernandez, Carlos	Miami, FL	2	23.0-cm (9.0-in) MAK
15.	Karakas, Mike	Winnipeg, MN, Canada	14	20.3-cm (8.0-in) NEW
16.	Kiss, Gabor	Erkner, Germany	1	25.4-cm (10.0-in) CASS
17.	Leong, Tan Wei	Singapore	1	25.4-cm (10.0-in) DALL
18.	McAnally, John	Waco, TX	1	20.3-cm (8.0-in) SCT
19.	Melillo, Frank J.	Holtsville, NY	2	20.3-cm (8.0-in) SCT
20.	Moore, David M.	Phoenix, AZ	1 1	25.4-cm (10.0-in) NEW 35.6-cm (14.0-in) CASS
21.	Ng, Eric	Hong Kong, China	3	25.4-cm (10.0-in) NEW
22.	Neitzel, Michael C.	Coquitlam, BC, Canada	1	28.0-cm (11.0-in) SCT
23.	Niechoy, Detlev	Göttingen, Germany	3 22	10.2-cm (4.0-in) REF 20.3-cm (8.0-in) SCT
24.	Parker, Donald C.	Coral Gables, FL	1 4	25.4-cm (10.0-in) NEW 40.6-cm (16.0-in) NEW
25.	Peach, Damian	Norfolk, UK	23	28.0-cm (11.0-in) SCT
26.	Pellier, Christophe	Bruz, France	1	17.8-cm (7.0-in) MAK
27.	Plante, Phil	Braceville, OH	1 2	15.2-cm (6.0-in) REF 20.3-cm (8.0-in) SCT
28.	Robbins, Sol	Fair Lawn, NJ	5	15.2-cm (6.0-in) REF
29.	Schmude, Richard W.	Barnesville, GA	4	10.2-cm (4.0-in) REF
30.	Sherrod, Clay	Little Rock, AR	8	30.8-cm (12.0-in) SCT
31.	Vladrich, Christian	Paris, France	1	20.3-cm (8.0-in) SCT
32.	Williamson, Thomas E.	Albuquerque, NM	2	20.3-cm (8.0-in) NEW
33.	Yu, Gu	Morgantown, WV	1	23.5-cm (9.25-in) SCT
	TOTAL OBSERVATIONS		**218**	
	TOTAL OBSERVERS		**33**	

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

The author expresses his sincere gratitude to all of the observers mentioned in Table 2 who sent their data, images, descriptive reports, and drawings to the ALPO Saturn Section during 2002-2003. Observers everywhere who want to get more involved in systematic studies of Saturn using visual methods (drawings and intensity estimates), regular photography, or more sophisticated techniques employing CCDs, video cameras, and webcams, are cordially invited to join us in upcoming apparitions as we continue our international comprehensive scrutiny of the planet. Readers should note that the ALPO Saturn Section considers all methods of recording observations mentioned above as vital to the success of our programs, regardless of whether one's preference might be sketching Saturn at the eyepiece or simply writing descriptive reports, making visual numerical relative intensity estimates, or doing film photography, CCD and webcam imaging, and videography. Novice observers are also encouraged to contribute their work, and the ALPO Saturn Section will always be pleased to provide assistance in getting started.

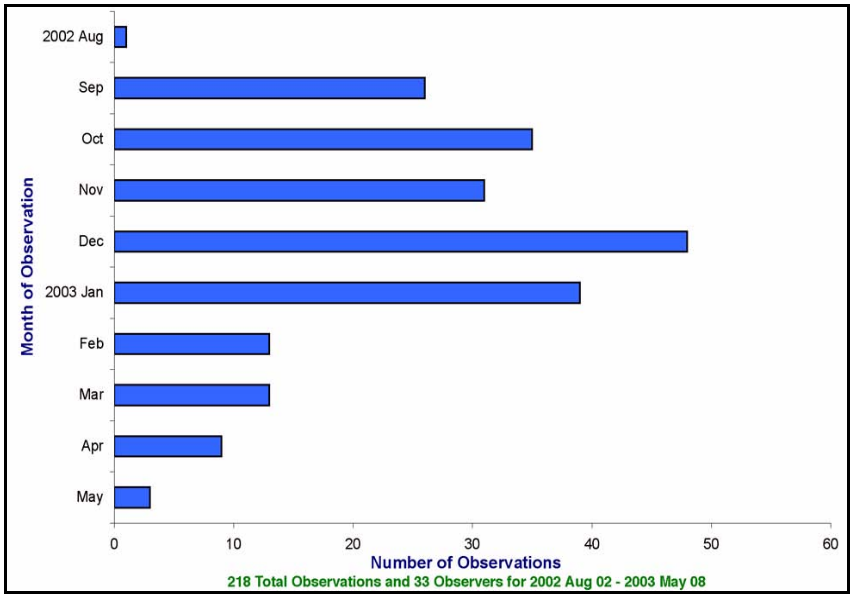


Figure 1. Distribution of observations by month, 2002-20903 Apparition of Saturn

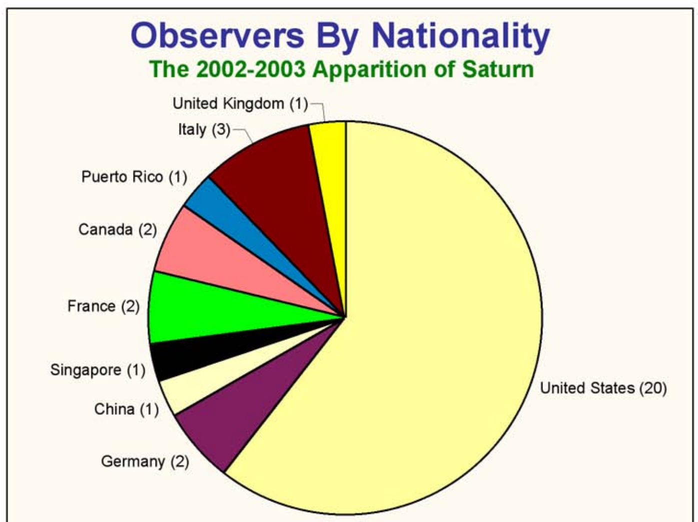
2002-2003 Apparition, along with their observing sites, numbers of observations, and telescope types and apertures.

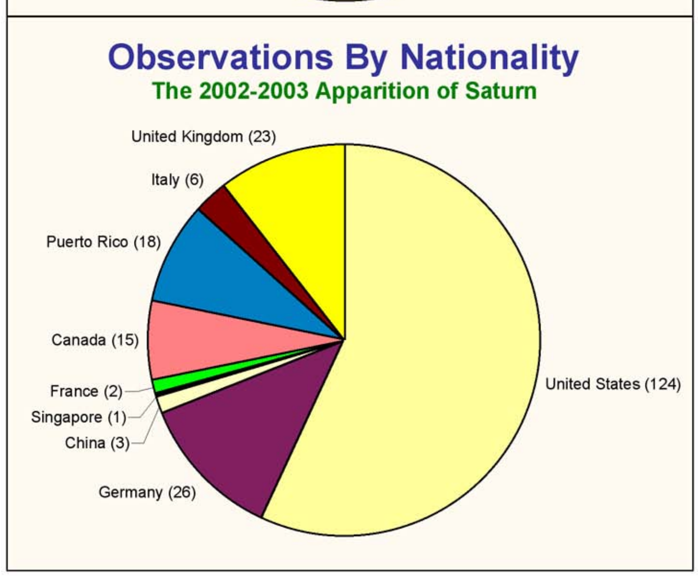
Figure 1 is a histogram that depicts the distribution of observations by month during the 2002-2003 observing season. As in many previous apparitions, observers tended to view Saturn during the months inclusive of and on either side of the date of opposition. To facilitate more comprehensive coverage throughout any given apparition, observers are urged to begin watching Saturn as soon as it appears in the eastern sky before sunrise, right after conjunction, and persevere until it again approaches the domain of the Sun a little over a year later, at the next conjunction. Of the submitted observations, 49.5 percent were made before opposition, 0.5 percent on the precise date of opposition (2002 December 17), and 50.0 percent thereafter.

Figure 2 and Figure 3 show the ALPO Saturn Section observer base (total of 33) for 2002-2003 and the international distribution of the 218 observations that were contributed. During the apparition, the United States accounted for slightly less than two-thirds (60.6 percent) of participating observers and a little more than half (56.9 percent) of the submitted observations. With 39.4 percent of ALPO Saturn observers residing in the United Kingdom, France, Germany, Singapore, China, Canada, Italy, and Puerto Rico, whose total contributions accounted for 43.1 percent of all the observations, it is apparent that international cooperation in our programs remained strong during the 2002-2003 observing season.

Figure 4 illustrates the number of observations in 2002-2003 by instrument type. Notice that during 2002-2003, only about one-third (34.9 percent) of the 218 total observations were made with telescopes of classical design (refractors, Cassegrains and Newtonians), strikingly different from most of the Saturn apparitions in the past. Such instruments, assuming high-quality optics and proper collimation, traditionally deliver high-resolution images with good contrast, and they have historically been the telescopes of choice for detailed visual investigations of the Moon and planets. Yet, since more and more observers are now regularly imaging Saturn, the shift to a greater reliance on Schmidt-Cassegrains or Maksutov-Cassegrains may be because these instruments have readily available adapters in the marketplace for a wide variety of CCD, video, web, and digital cameras.

Telescopes with apertures >15.2 cm (6.0 in.) accounted for 86.7 percent of the observations submitted during the 2002-2003 Apparition. Readers are reminded, however, that smaller apertures of





Figures 2 and 3. Distribution of observers (top) and observations (bottom) by nation of residence, 2002-2003 Apparition of Saturn.

Table 3: Visual Numerical Relative Intensity Estimates and Colors for the 2002-2003 Apparition of Saturn

Globe/Ring Feature	Number of Estimates	2002-2003 Mean Intensity and Standard Error	Intensity Change Since 2001-2002	Mean Derived Color
Zones:				
SPC	3	4.50 ± 0.61	–0.53	Light Grey
SPR	51	4.00 ± 0.12	–0.78	Dark Yellowish-Grey
SSTeZ	1	6.80 ---------	–0.20	Pale Yellowish-White
STeZ	37	6.21 ± 0.07	+0.44	Yellowish-White
STrZ	24	6.35 ± 0.10	–0.47	Yellowish-White
EZs	57	7.52 ± 0.13	–0.18	Bright Yellowish-White
Globe S of Rings	15	4.93 ± 0.02	–0.04	Dull Yellowish-Grey
Belts:				
SPB	9	3.76 ± 0.15	–0.07	Dark Grey
STeB	3	4.93 ± 0.28	–0.47	Light Greyish-Brown
SEB (whole)	41	4.47 ± 0.08	+0.34	Greyish-Brown
SEBs	10	3.68 ± 0.10	+0.22	Dark Grey
SEBn	16	3.05 ± 0.08	+0.09	Very Dark Grey
EB	9	4.02 ± 0.15	–0.50	Dark Grey
Rings:				
A (entire)	57	6.18 ± 0.07	–0.52	Yellowish-White
Ring A (outer half)	1	6.80 --------	0.00	Pale Yellowish-White
Ring A (inner half)	1	6.60 --------	+0.02	Pale Yellowish-White
A5	14	3.54 ± 0.24	+1.38	Dark Grey
A0 or B10	51	0.64 ± 0.10	–0.14	Greyish-Black
B (outer 1/3)	57	8.00 ± 0.00 STANDARD	0.00	Brilliant White
B (inner 2/3)	33	7.06 ± 0.07	–0.16	Bright Yellowish-White
B1	4	3.73 ± 0.10	+0.10	Dark Grey
B2	1	3.00 ---------	–1.00	Dark Grey
C (Ansae)	33	0.75 ± 0.10	–0.85	Greyish-Black
Crape Band	53	2.57 ± 0.08	+0.51	Very Dark Grey
Sh G or R	34	0.34 ± 0.05	+0.02	Dark Greyish-Black
TWS	8	8.79 ± 0.14	+0.82	Brilliant White

Notes:
For nomenclature see text and Figure 5. A letter with a digit (e.g. A0 or B10) refers to a location in the ring specified in terms of units of tenths of the distance from the inner edge to the outer edge. Visual numerical relative intensity estimates (visual surface photometry) are based upon the ALPO Intensity Scale, where 0.0 denotes complete black (shadow) and 10.0 refers to the most brilliant condition (very brightest Solar System objects). The adopted scale for Saturn uses a reference standard of 8.0 for the outer third of Ring B, which appears to remain stable in intensity for most ring inclinations. All other features on the Globe or in the Rings are compared systematically using this scale, described in the Saturn Handbook, which is issued by the ALPO Saturn Section. The "Intensity Change Since 2000-2001" is in the same sense of the 2001-2002 value subtracted from the 2002-2003 value, "+" denoting an increase in brightness and "–" indicating a decrease (darkening). When the apparent change is less than about 3 times the standard error, it is probably not statistically significant.

good quality in the range of 7.5 cm (3.0 in) to 12.8 cm (5.0 in) are still quite useful for studying the planet Saturn.

The author expresses his sincere gratitude to all of the observers mentioned in Table 2 who sent their data, images, descriptive reports, and drawings to the ALPO Saturn Section during 2002-2003. Observers everywhere who want to get more involved in systematic studies of Saturn using visual methods (drawings and intensity estimates), regular photography, or more sophisticated techniques employing CCDs, video cameras, and webcams, are cordially invited to join us in upcoming apparitions as we continue our international comprehensive scrutiny of the planet. Readers should note that the ALPO Saturn Section considers all methods of recording observations mentioned above as vital to the success of our programs, regardless of whether one's preference might be sketching Saturn at the eyepiece or simply writing descriptive reports, making visual numerical relative intensity estimates, or doing film photography, CCD and webcam imaging, and videography. Novice observers are also encouraged to contribute their work, and the ALPO Saturn Section will always be pleased to provide assistance in getting started.

Table 4: Saturnian Belt Latitudes in the 2002-2003 Apparition

Saturnian Belt	Number of Estimates	Eccentric (Mean)	Form of Latitude: Planetocentric	Planetographic
N edge SPB	17	–86.57 0.34 (–0.59)	–86.16 0.38 (–0.65)	–86.94 0.31 (–0.53)
N edge SEB	17	–30.37 0.19 (–0.95)	–27.62 0.18 (–0.90)	–33.27 0.20 (–1.00)
S edge SEB	17	–34.00 0.24 (–0.08)	–31.06 0.23 (–0.08)	–37.06 0.25 (–0.08)
Center EB	8	–10.76 0.76 (–1.22)	–09.64 0.68 (–1.10)	–12.01 0.84 (–1.35)

Notes:
For nomenclature see Figure 4. Latitudes are calculated using the appropriate geocentric tilt, **B**, for each date of observation, with the standard error also shown. Planetocentric latitude is the angle between the equator and the feature as seen from the center of the planet. Planetographic latitude is the angle between the surface normal and the equatorial plane. Eccentric, or "Mean," latitude is the arc-tangent of the geometric mean of the tangents of the other two latitudes. The change shown in parentheses is the result of subtracting the 2001-2002 latitude value from the 2002-2003 latitude value.

The Globe of Saturn

All 218 observations submitted to the ALPO Saturn Section during 2002-2003 by the 33 observers listed in Table 2 were used in preparation of this brief summary. Except when the identity of an individual is considered pertinent to the discussion, names have been omitted for the sake of brevity, however contributors are always mentioned in selected illustrations accompanying this report. Drawings, webcam and CCD images, tables and graphs are included with this summary so that readers can refer to them as they study the text. Readers should be aware that features on the globe of Saturn are described in south-to-north order and can be identified by looking at the nomenclature diagram shown in Figure 4. If no reference is made to a global feature in our south-to-north discussion, the area was not reported by observers during the 2002-2003 Apparition.

subtle, but nonetheless recognizable, variations that may possibly be occurring seasonally on Saturn.

Observational data imply that some of the intensity variations noted in saturnian belts and zones (see Table 3) may be only a consequence of the continually varying inclination of the planet's rotational axis relative to the Earth and Sun. Using photoelectric photometry observers have also documented small oscillations of roughly 0.10 visual magnitude for Saturn in several observing seasons in the last 8 to 10 years. There is no question, however, that transient and long-enduring atmospheric features occurring in Saturn's belts and zones also contribute to apparent brightness fluctuations. Regular photoelectric photometry of Saturn, in conjunction with carefully-

It has been routine in preparing apparition reports for the ALPO Saturn Section to compare data for global atmospheric features between observing seasons. This practice continues with this report to assist the reader in understanding the importance of extremely

Table 5: Visual Observations of the Bicolored Aspect of Saturn's Rings During the 2002-2003 Apparition

Observer	UT Date and Time	Telescope Type and Aperture	Filter					
			X	S	Tr	Blue	IL	Red
Haas	2002 Oct 05 11:05-12:00	NEW 20.3 cm (8.0 in)	203	4.5	4.5	E	=	=
Haas	2002 Oct 11 11:45-12:41	NEW 31.8 cm (12.5 in)	321	3.0	4.5	E	=	E
del Valle	2002 Dec 06 01:31-01:39	SCT 20.3 cm (8.0 in)	339	6.0	4.0	=	W	W
del Valle	2003 Jan 04 00:00	SCT 20.3 cm (8.0 in)	339	7.0	4.0	E	=	=
del Valle	2003 Jan 11 23:29	SCT 20.3 cm (8.0 in)	339	6.5	3.0	=	W	W
Haas	2003 Jan 19 04:41-05:32	NEW 31.8 cm (12.5 in)	321	2.0	3.5	E	=	W
del Valle	2003 Jan 29 00:04-00:29	SCT 20.3 cm (8.0 in)	339	5.5	5.0	=	=	W
del Valle	2003 Mar 03 00:02-00:12	SCT 20.3 cm (8.0 in)	339	5.5	3.0	W	W	W
Haas	2003 Apr 21 03:55-04:05	NEW 20.3 cm (8.0 in)	203	3.5	4.0	W	=	=
Haas	2003 Apr 28 02:18-02:52	NEW 20.3 cm (8.0 in)	203	3.5	3.5	W	=	=

Notes:
Telescope types are as in Table 2. **X** is the magnification, **S** is the Seeing in the 0-10 ALPO Scale (0 = worst to 10 = perfect), and **Tr** is the transparency (the limiting visual magnitude in the vicinity of Saturn). Under "Filter," **Blue** refers to the W47 or W80A filters, **IL** to integrated light (no filter), and **Red** to the W25 or W23A filters. **E** means the East Ansa was brighter than the W, **W** that the West Ansa was the brighter, and **=** means that the two Ansae were equally bright. East and West directions are as noted in the text.

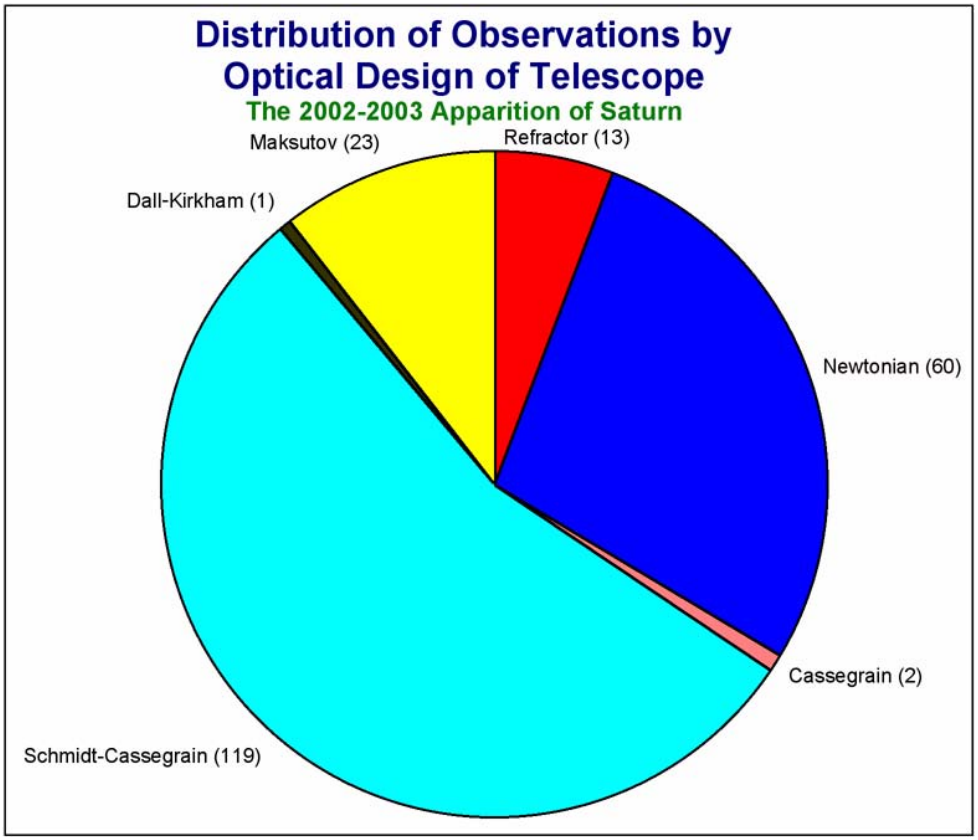


Figure 4. Distribution of observations by instrument type, 2002-2003 Apparition of Saturn.

executed visual numerical relative intensity estimates, remains a very important undertaking for observers.

The intensity scale employed by Saturn observers is the ALPO Standard Numerical Relative Intensity Scale, where 0.0 denotes a total black condition (e.g., shadows) and 10.0 represents maximum brightness of a feature or phenomenon (e.g., an unusually bright EZ or exceptionally brilliant white spot). This numerical scale is normalized by setting the outer third of Ring B at a "standard" intensity of 8.0. The arithmetic sign of an intensity change is found by subtracting a feature's 2001-2002 intensity from its 2002-2003 value. Suspected changes of ± 0.10 mean intensity points are usually considered insignificant. Furthermore, reported intensity fluctuations are probably not noteworthy unless they are more than about three times the standard error.

Observers have continued to use the convenient visual method introduced by Haas over 40 years ago to make estimates of Saturnian global latitudes during the 2002-2003 Apparition. This technique requires the observer to estimate the fraction of the polar semidiameter of Saturn's globe subtended on the central meridian (CM) between the limb and the feature whose latitude is desired. Data resulting from this exercise compare reasonably well with latitudes measured from drawings, images, or determined with a baffler micrometer. Quantitative reductions of latitudes of Saturn's global features during 2002-2003 appear in Table 4. While one is cautioned not to place undue confidence in data generated by only a couple of individuals, experienced observers have been using this visual technique for many years with reliable results. So, more observers are urged to routinely use this procedure, even if a bifilar micrometer is available, since comparison of latitude data generated by more than one method is important. As a control on the accuracy of the visual method, observers should include in their estimates the positions on the CM of the projected ring edges and the shadow of the Rings. The actual latitudes can then be computed from the known values of **B** and **B'** and the dimensions of the Rings, although this test cannot be applied when **B** and **B'** are near their maximum attained numerical values. In describing each feature on Saturn's Globe, gleanings from latitude data are incorporated into the text where appropriate. A detailed description of Haas' visual technique can be found in the Saturn Handbook available from the author in printed or pdf ("portable document format").

Southern Regions of the Globe. During the 2002-2003 Apparition, the maximum value of **B** was -27°.013, very near the maximum inclination the Rings can have for observers on Earth. Thus, optimum views of Saturn's Southern Hemisphere were possible during the 2002-2003 observing season, while most of the Northern Hemisphere of the globe was obscured by the Rings as they crossed in front of the planet. From the observational data submitted for 2002-2003, the Southern Hemisphere of Saturn displayed nearly the same mean numerical relative intensity as in 2001-2002. Beginning in late September of 2002 through early 2003 January, several observers (Grafton, Peach, Yu and Parker) imaged comparatively short-lived STrZ white spots that we will discuss in the appropriate section below. During the same time span, several observers also suspected white-spot activity of low contrast in the EZs near the SEBn, but confirming reports were lacking. These bright STrZ and EZs features, probably triggered by convection of NH4 (ammonia) in Saturn's atmosphere, seemed to dissipate over the span of a week or so, and it has also been conjectured that the structure of the zonal wind profile in these regions contributes to the emergence and behavior of such short-term white spots. A couple of transient dark spots were also reported in mid-temperate regions, as well as in the SEB, during 2002 October, while throughout the apparition there was a considerable number of reports of dusky festoons associated with the SEBn, projecting into the EZs. Most of these darker features had insufficient longevity for recovery after a few rotations of the planet.

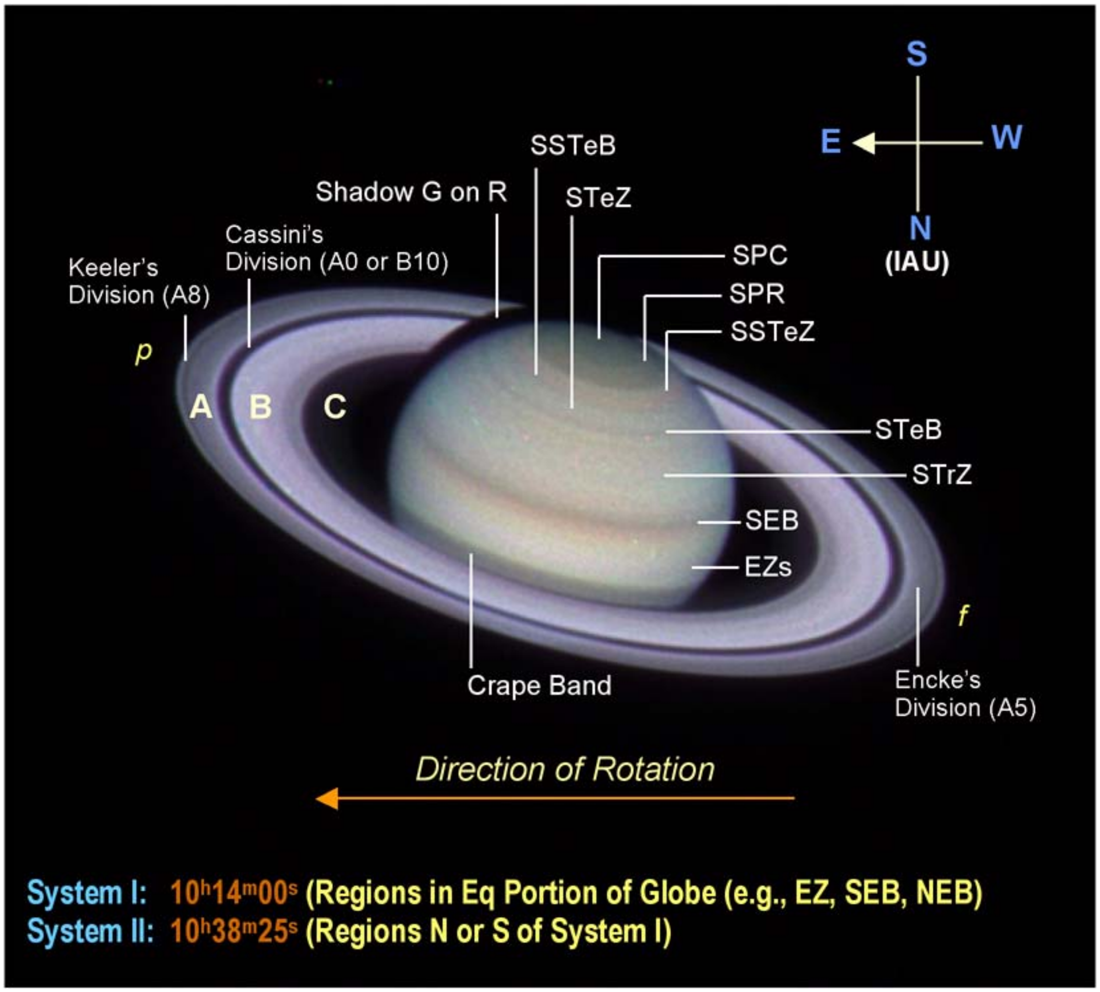


Figure 5. General nomenclature of Globe and Ring features of Saturn, where: B = Belt, C = Cap, E = Equatorial, f = following, G =- Globe, p = preceding, P = Polar, R = Region or Ring, S or s = South, Te = Temperate, Tr = Tropical and Z = Zone. A, B and C are Ring designations.

It should be pointed out that Saturn reached perihelion on 2003 July 26, which occurs every 29.5 terrestrial years (one Saturnian year), and some investigators have suggested that a slight increase in atmospheric activity may be a response to the planet's seasonal insolation cycle, although measurements in the past imply a slow thermal response to solar heating at Saturn's distance from the Sun of 9.03 AU at perihelion [about 5.7 percent closer than its mean distance. Ed.]. Nevertheless, observers are encouraged to keep Saturn's Southern Hemisphere under close surveillance in coming apparitions following the planet's perihelion passage, since a lag in the planet's atmospheric thermal response may possibly mimic the one we experience on Earth, where the warmest days do not occur on the first day of summer, but several weeks later.

South Polar Region (SPR). The dark yellowish-grey SPR remained fairly consistent in intensity throughout the 2002-2003 Apparition, and the SPR maintained essentially the same mean intensity since 2001-2002 (the SPR was darker by only -0.78 mean intensity points). Sherrod imaged what vaguely appeared to be a small white spot at the northern edge of the SPR on 2002 October 31 at 18:42 UT using a 30.8-cm (12.0-in) SCT; but other than this feature, reported activity in the SPR was lacking. A handful of observers detected a light grey South Polar Cap (SPC) that was slightly brighter than the surrounding SPR, and it was thought by most visual observers to appear slightly darker than in the immediately preceding apparition (a mean intensity difference of -0.53 since 2001-2002 is not statistically significant, however). Some of the best images submitted during the 2002-2003 Apparition usually confirmed the foregoing visual impressions, but precisely at the South Pole of Saturn, CCD and webcam images showed a region that was darker than the immediate environs of the SPR. The dark greyish South Polar Belt (SPB) encircling the SPR, running completely across Saturn's Globe from limb to limb, was detected sporadically during the 2002-2003 observing season, but it was readily apparent in most of the better CCD images of the planet. When detected visually, observers described the SPB as somewhat diffuse and of about the same mean intensity in 2002-2003 as opposed to 2001-2002 (with a negligible mean intensity change of -0.07).

South South Temperate Zone (SSTeZ). The SSTeZ was reported only once by visual observers throughout the 2002-2003 Apparition. The SSTeZ exhibited a pale yellowish-white hue, and if the single report of this zone is of any significance, it ranked second only to the EZs in overall intensity. Most contributed images of Saturn showed the linear SSTeZ, but this zone displayed no discrete atmospheric phenomena during 2002-2003. Compared with the 2001-2002 observing period, the SSTeZ for the most part exhibited the same mean intensity in 2002-2003, but since only one intensity estimate was provided by a single visual observer in the last two apparitions, little confidence can be placed in such a limited observational sample.

South South Temperate Belt (SSTeB). Visual observers did not report the SSTeB during the 2002-2003 Apparition, but most good CCD images showed this feature extending across the Globe of Saturn from limb to limb.

General Comment for Figures 6-27. These drawings and electronic images are all oriented with saturnian south toward the top and the preceding direction to the left, approximating the orientation in an inverting telescope used in the Northern Hemisphere when Saturn is near the meridian, assuming an unreversed view (i.e., no eyepiece diagonal). If not otherwise stated, Seeing (S) is given in, or has been converted to, the standard ALPO Scale, ranging from 0.0 for the worst possible condition to 10.0 for perfect, while Transparency (Tr) is the limiting stellar magnitude in the vicinity of Saturn For CM and other information, consult The Saturn Handbook, available from the Saturn Coordinator.

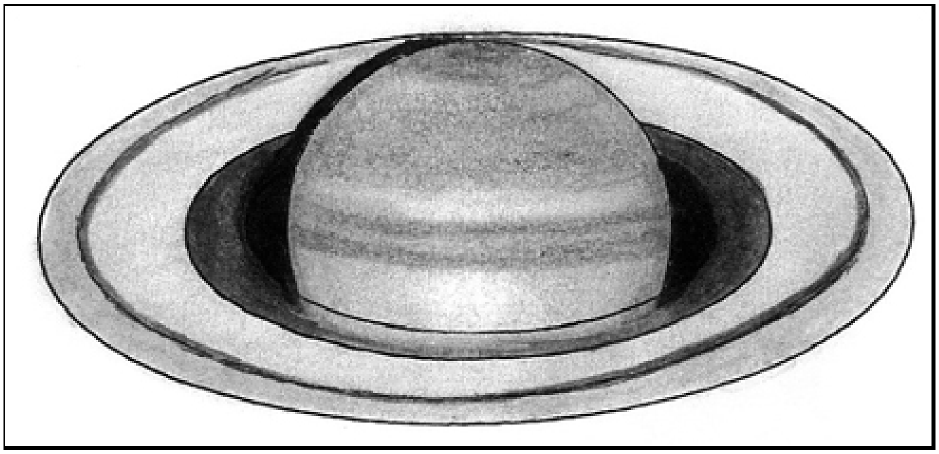


Figure 6. 2002 Sep 01 09:44 UT. Phil Plante. 15.2-cm (6.0-in) REF, Drawing, 123X, IL. S = 5.5, Tr = 3.6. CM I = 071°.6, CM II = 174°.3, CM III = 013°.3. B = -26°.4, B´ = -26°.6. Globe = 17".84 X 16".44, Rings = 40".48 X 18".06. Whitish area in EZs near CM.

Figure 7. 2002 Sep 29 11:28 UT. Ed Grafton. 35.6-cm (14.0-in) SCT, CCD Image, IL + IR rejection filter. S = 8.0, Tr = 7.0. CM I = 013°.8, CM II = 289°.7, CM III = 094°.8. B = -26°.2, B´ = -26°.6. Globe = 18".76 X 17".28, Rings = 42".57 X 18".90. Small STrZ white spot.

South Temperate Belt (STeB). The light grayish-brown STeB was seldom reported by visual observers during the 2002-2003 Apparition, but it was readily apparent in higher-resolution images contributed during the observing season. When visual observers saw this belt, it was devoid of activity as it extended uninterrupted across Saturn's Globe. Based on mean intensity data, the STeB showed a slight diminution in brightness of -0.47 since 2001-2002.

South Tropical Zone (STrZ). Visual observers saw the yellowish-white STrZ periodically during the 2002-2003 Apparition, and as derived from contributed intensity estimates, the STrZ was darker by a negligible value of -0.47 since 2001-2002. The STrZ was third in order of brightness behind the EZs and SSTeZ, although the mean intensity values for STrZ and slightly duller STeZ were not strikingly dissimilar (with a difference of only +0.14 in favor of the STrZ). Although CCD and webcam images mostly corroborated visual impressions of this feature during the observing season, small ephemeral white spots that were rarely suspected visually were imaged during the apparition from 2002 September through 2003 March. The first CCD images of a small STrZ white spot (at approximate saturnigraphic latitude -42°) were taken on 2002 September 29 from 10:40 to 11:28 UT by Grafton using a 35.6-cm (14.0-in) SCT. Grafton also imaged the same feature on 2002 October 7 from 10:14 to 11:26 UT, and subsequent reduction of CM transit timings yielded a rotation period for the white spot of approximately 10h 36.9m. On 2002 October 8 at 08:36 UT, Parker imaged a STrZ spot near the CM using a CCD camera and a 40.6-cm (16.0-in) NEW, while on 2002 November 20 between 05:05 and 05:17 UT, Yu imaged a possible new short-lived white spot in the STrZ using a Philips ToUcam and a 23.5-cm (9.25-in) SCT. Yet another extremely small white spot was evident on a CCD image submitted by Peach on 2002 November 22 at 02:35 UT using a 28.0-cm (11.0-in) SCT, and a month later, on 2002 December 18 from 23:43 to 23:59 UT, Peach imaged an additional tiny STrZ white spot using the same telescope. Prof. Agustin Sanchez-Lavega of the *International Outer Planets Watch* (IOPW) kindly submitted a Hubble Space Telescope (HST) image of Saturn taken on 2002 December 16 at 05:30 UT at a wavelength of 814

South Temperate Zone (STeZ). The yellowish-white STeZ was seen repeatedly by visual observers in 2002-2003 and was quite obvious in most CCD and webcam images of Saturn, When compared with 2001-2002, the STeZ was virtually unchanged in overall conspicuousness (with a mean intensity change of +0.44). In terms of estimated brightness, the STeZ ranked fourth behind the EZs, the SSTeZ and STrZ during the 2002-2003 Apparition, and it retained its uniformity in texture since 2001-2002. No discrete phenomena in the STeZ were reported by visual observers or captured on images submitted during 2002-2003.

Figure 8. 2002 Oct 07 11:28 UT. Ed Grafton. 35.6-cm (14.0-in) SCT, CCD Image, IL + IR rejection filter. S = 8.5, Tr = 6.0. CM I = 274°.1, CM II = 292°.1, CM III = 087°.5. B = -26°.2, B´ = -26°.6. Globe = 19".04 X 17".54, Rings = 43".21 X 19".17. Small STrZ white spot.

Figure 9. 2002 Oct 08 08:36 UT. Donald C. Parker. 40.6-cm (16.0-in) NEW, CCD Image, IL + RGB filter. S = 7.0, Tr = 5.0. CM I = 312°.2, CM II = 301°.2, CM III = 095°.6. B = -26°.2, B´ = -26°.6. Globe = 19".07 X 17".57, Rings = 43".28 X 19".20. Small STrZ white spot.

nm that shows the same STrZ white spot that was imaged by Peach on December 18th. On 2002 December 22 between 05:32 and 06:31 UT, Grafton imaged still another new STrZ white spot, which was somewhat larger and of higher contrast than previously discovered spots in these latitudes. Apparently the same white spot that had been captured by the HST on 2002 December 16th and imaged by Peach on December 18th was recovered again by Grafton on December 29th from 05:08 to 05:42 UT with a 35.6-cm (14.0-in) SCT, then subsequently captured by Parker on 2003 January 7 with his 40.6-cm (16.0-in) NEW between 02:09 and 02:22 UT. While most of the other small white spots associated with the STrZ may have persisted for only a few hours to several days, this one appears to have lasted nearly a month. From early 2003 January until nearly the end of March, submitted images did not show any white spots, but on 2003 March 25 at 19:16 UT, Kiss imaged a fairly obvious small white spot in the STrZ using a 25.4-cm (10.0-in) Cassegrain. Carbognani imaged a similar feature on 2003 March 29 at 20:29 UT also using a 25.4-cm (10.0-in) Newtonian and a Philips ToUcam.

South Equatorial Belt (SEB). The wide, greyish-brown belt SEB was seen often by visual observers throughout the 2002-2003 Apparition, sometimes subdivided into SEBn and SEBs components, with an indistinct intervening SEBZ in good seeing (where **n** refers to the North Component and **s** to the South Component). This interpretation was confirmed by those who submitted CCD and webcam images to the ALPO Saturn Section during the observing season. Taken as a whole, the SEB may have been lighter during 2002-2003 than in the immediately preceding apparition, but once again, a difference of only +0.34 mean intensity points between two observing seasons is considered trivial. When the SEBn and SEBs components were visible, their mean intensity in 2002-2003 was largely unchanged since 2001-2002, and despite a few sightings of the dull yellowish-grey South Equatorial Belt Zone (SEBZ), no one provided intensity estimates for this zone. Peach imaged what appeared to be a small whitish oval in the SEBZ at 02:49 UT on 2002 November 12 using a 28.0-cm (11.0-in) SCT, confirmed by Grafton when he imaged Saturn two days later on 2002 November 14 at 08:19 UT with a 35.6-cm (14.0-in) SCT, but after November 14, the SEBZ spot was not reported again by observers. As a single belt, the SEB ranked third behind the SPB and EB as being the duskiest belt on Saturn's Globe during the 2002-2003 Apparition, yet the very dark grey SEBn (mean intensity of 3.05) and dark grey SEBs (mean intensity 3.68) were the darkest of all belts reported in the planet's Southern Hemisphere. Based on the 2002-2003 intensity data, the SEBn was darker by a mean value of -0.63 than the SEBs, and the best CCD and webcam images corroborated Saturn observers' visual impressions of these two belt components.

From late 2002 September throughout the rest of the 2002-2003 Apparition, observers sighted several ill-defined dark notches, as well as diffuse dark spots, along the northern border of the SEB. Dusky festoons were occasionally sighted protruding from the northern edge of the SEBn into the EZs and nearly connecting with the faint EB. None of these features appeared to persist long enough for recurring CM transit timings.

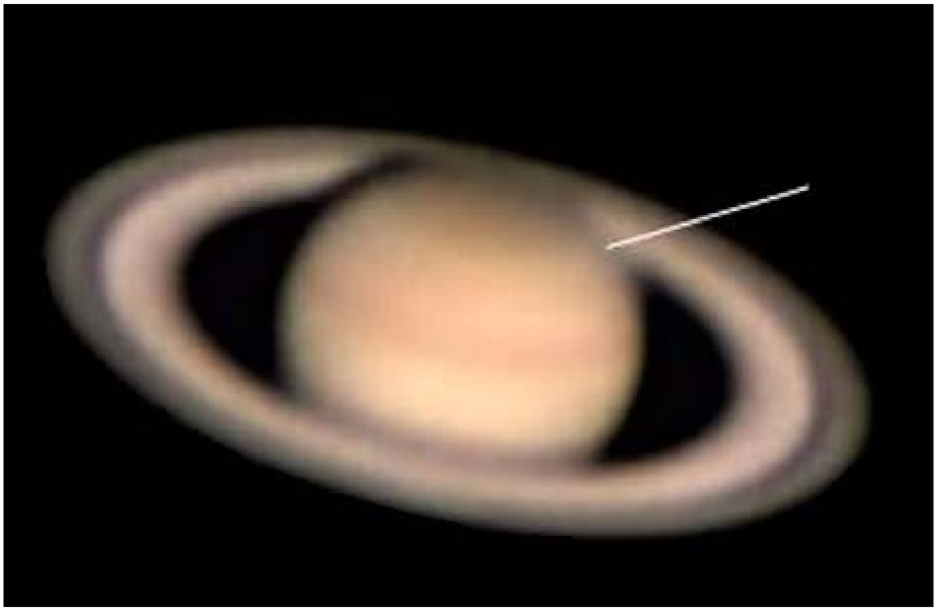


Figure 10. 2002 Oct 31 18:42 UT. Clay Sherrod. 30.8-cm (12.0-in) SCT, Digicam Image, IL. S = 4.0, Tr = 3.5. CM I = 288°.5, CM II = 241°.0, CM III = 007°.1. B = -26°.2, B´ = -26°.6. Globe = 19".84 X 18".28, Rings = 45".03 X 19".99. White line points to small white area near northern edge of SPR.

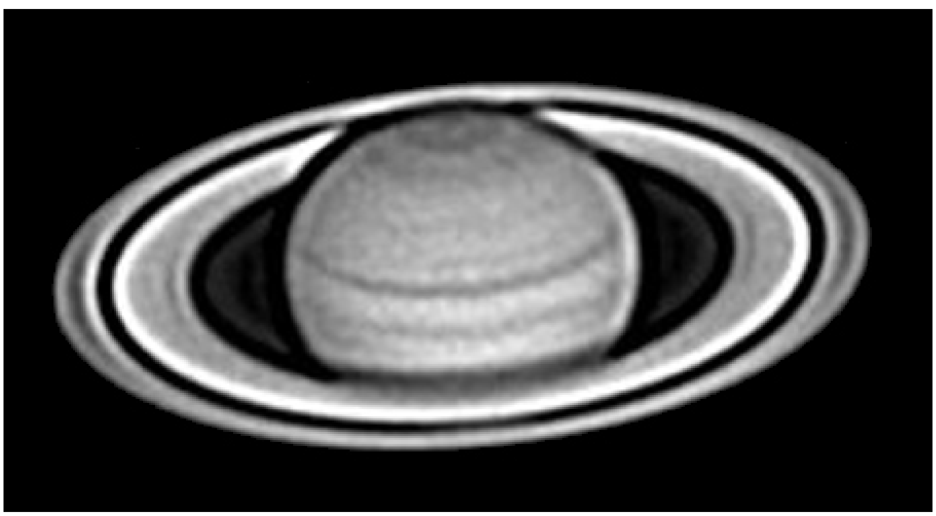


Figure 11. 2002 Nov 12 02:49 UT. Damian Peach. 28.0-cm (11.0-in) SCT, CCD Image. IL + IR rejection filter. S = good (undefined scale). CM I = 142°.6, CM II = 088°.8, CM III = 201°.2. B = -26°.3, B´ = -26°.6. Globe = 20".16 X 18".58, Rings = 45".75 X 20".34. Small white area in SEBZ.

Equatorial Zone (EZ). The southern half of the bright yellowish-white Equatorial Zone (EZs) was the area of the EZ visible between where the Rings cross the Globe of Saturn and the SEBn in 2002-2003 (the EZn was not readily apparent during the apparition). The mean intensity of the EZs in 2002-2003 was basically unchanged since the 2001-2002 Apparition and undisputedly the brightest zone on Saturn's Globe according to visual reports, CCD and webcam images. Using a 15.2-cm (6.0-in) Newtonian in mediocre seeing on September 01 at 09:24-09:44 UT, Plante drew what he suspected to be a diffuse brightening of the EZs near the CM of Saturn, but there were no other observations of this bright area to support Plante's impressions. For most of the 2002-2003 Apparition, there were only a few scattered, unconfirmed reports of white spots in the EZs. During good seeing at various times during the 2002-2003 Apparition, visual observers described a narrow, continuous light greyish Equatorial Band (EB) extending across Saturn's Globe. This feature was very obvious in the better CCD images of Saturn, and mean intensity data in 2002-2003 suggested that the EB was perhaps a bit darker than in 2001-2002 by -0.50 mean intensity points.

Northern Portions of the Globe. With Saturn tipped as much as -27°.0 to our line of sight in 2002-2003, virtually none of the planet's Northern Hemisphere could be seen to advantage. Studies of Saturn's Northern Hemisphere will have to resume in subsequent apparitions when geometric circumstances for viewing these regions are more favorable.

Shadow of the Globe on the Rings (Sh G on R). The Sh G on R was visible to observers as a geometrically regular dark greyish-black feature on either side of opposition during 2002-2003. Suspected departures from a true black (0.0) intensity were due to poor seeing conditions or extraneous light. Most CCD images showed this feature as completely black.

Shadow of the Rings on the Globe (Sh R on G). This shadow in 2002-2003 was described as a dark greyish-black feature south of the Rings where they passed across Saturn's Globe. Any reported variations from an intrinsic black (0.0) condition were due to the same reasons cited above for the Sh G on R.

Saturn's Ring System

The next few paragraphs of this report pertain to visual studies of Saturn's ring system, including our traditional comparative analysis of mean intensity data between apparitions, although impressions gleaned from CCD, digital camera, and webcam images of the Rings are also included. Observations of the southern face of the Rings were almost optimal during 2002-2003 as the inclination of the Rings (**B**) toward observers on Earth increased to as much as –27°.0.

Ring A. The yellowish-white Ring A, considered as a whole, was slightly dimmer by -0.52 mean intensity points in 2002-2003 than in 2001-2002. On only one occasion during the apparition, Ring A was described by visual observers as being

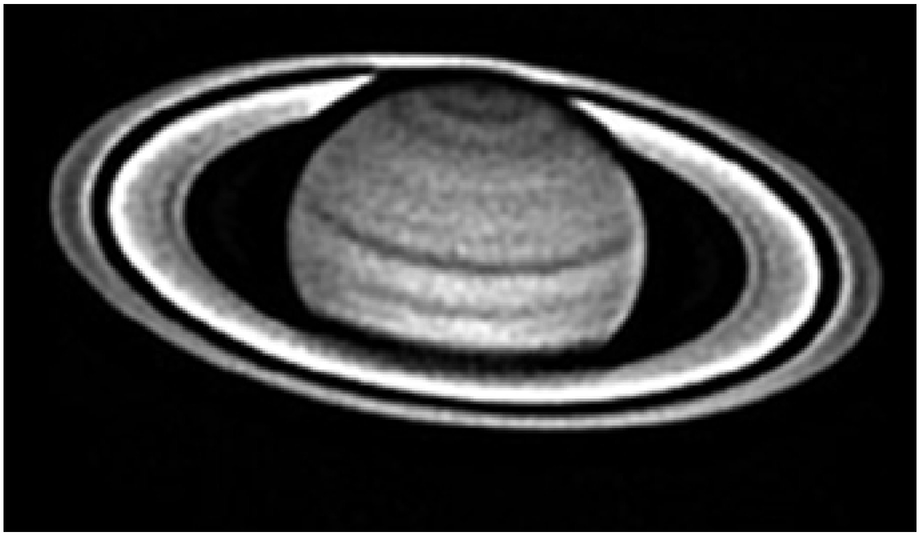


Figure 12. 2002 Nov 14 08:19 UT. Ed Grafton. 35.6-cm (14.0-in) SCT, CCD Image, IL + IR rejection filter. S = 8.0, Tr = 6.0. CM I = 224°.9, CM II = 099°.1, CM III = 208°.9. B = -26°.3, B´ = -26°.6. Globe = 20".22 X 18".63, Rings = 45".88 X 20".40. Small white spot in SEBZ.

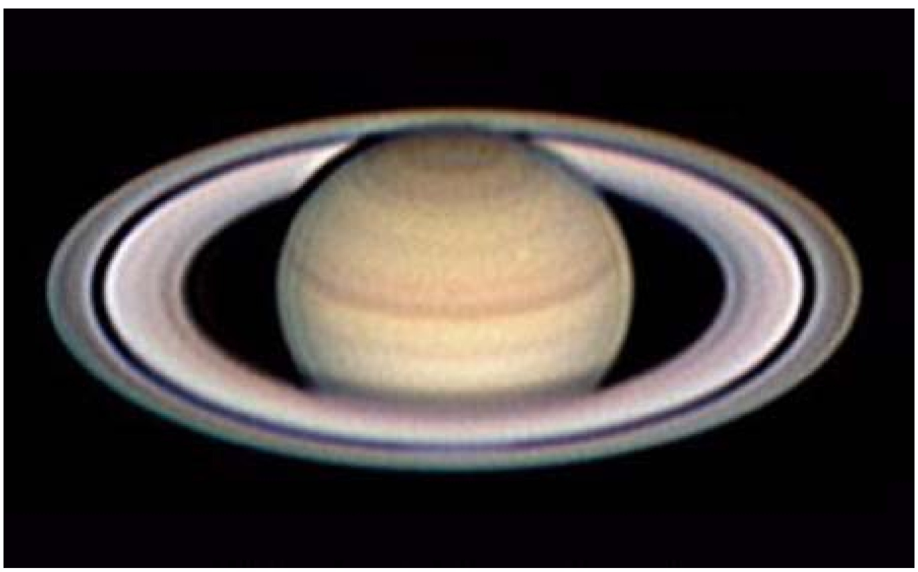


Figure 13. 2002 Nov 20 05:08 UT. Gu Yu. 23.5-cm (9.25-in) SCT, Philips ToUcam Image, IL + IR rejection filter. S = 7.5, Tr = 6.0. CM I = 139°.4, CM II = 184°.0, CM III = 286°.7. B = -26°.3, B´ = -26°.6. Globe = 20".34 X 18".74, Rings = 46".18 X 20".56. Short-lived white spot in STrZ.

separated into pale yellowish-white outer and inner halves, with the outer half of Ring A marginally brighter than the inner half. Most CCD and webcam images of Saturn taken during the 2002-2003 Apparition depicted inner and outer halves of Ring A that were basically equal in brightness, although there were a few images that corroborated the impression of visual observers. The dark greyish Encke's Division (A5) was seen fairly frequently at the ring Ansae by visual observers and imaged almost routinely as a "complex" halfway out in Ring A. Some processed webcam and CCD images showed Keeler's Division (A8), but no visual observers estimated its intensity. No other intensity minima in Ring A were reported in 2002-20032 either visually or with CCD and webcam imagers.

Ring B. The outer third of Ring B remains our standard of reference for the ALPO Saturn Visual Numerical Relative Intensity Scale, with an assigned value of 8.0. To visual observers during 2002-2003, the outer third of Ring B was brilliant white, stable in intensity, and consistently the brightest feature on Saturn's Globe or in the ring system, with the possible exception of the spurious Terby White Spot (TWS). The inner two-thirds of Ring B in 2002-2003, which was described as bright yellowish-white in hue and uniform in intensity, portrayed virtually the same mean intensity since 2001-2002. Images from CCD imagers, webcams, and digital cameras were usually in accord with the visual results during the apparition.

As in the immediately preceding apparition, a few people continued to report dusky spoke-like features near the Ansae in Ring B. For instance, Robbins made a very fine drawing in good seeing of several radial dusky features in the inner half of Ring B on 2003 February 05 from 03:00–03:25 UT using a 15.2-cm (6.0-in) refractor at 375x, and Niechoy also vaguely suspected similar Ring B spokes off and on during the 2002-2003 Apparition. No CCD or webcam images contributed to the ALPO Saturn Section showed radial spoke features at the Ansae in Ring B, but observers are urged to attempt to image these elusive ring features when they are suspected visually. Moreover, establishing their presence by simultaneous visual observations, with concurrent imaging, is extremely important.

Visual observers also suspected dark-grey intensity minima at B1 and B2 during 2002-2003, and these features were also noticeable in the best processed CCD images of Saturn as well as in some drawings. Also imaged (but not reported visually) were intensity minima at B5 and B8 positions in Ring B.

Cassini's Division (A0 or B10). Cassini's Division (A0 or B10) was regularly detected visually as a grayish-black gap at both Ansae during 2002-20032, while in good seeing with moderate apertures this feature could be traced around the circumference of the Saturn ring system. A black Cassini's Division was usually quite apparent on CCD and webcam images received during 2002-2003, and in some of the better digital images, the Northern Hemisphere of Saturn's could be perceived through Cassini's Division. It should be pointed out that any other divergence from a completely black intensity for Cassini's Division is simply a result of such factors as poor

Figure 14. 2002 Nov 22 02:35 UT. Damian Peach. 28.0-cm (11.0-in) SCT, CCD Image. IL + IR rejection filter. S = good (undefined scale). CM I = 298°.5, CM II = 282°.0, CM III = 022°.4. B = -26°.3, B´ = -26°.6. Globe = 20".38 X 18".78, Rings = 46".26 X 20".60. Small white spot in STrZ.

Figure 15. 2002 Nov 26 02:21 UT. Chris Pellier. 17.8-cm (7.0-in) MAK, Philips ToUcam Image, IL + IR rejection filter. S = 8.0, Tr = 5.0. CM I = 067°.9, CM II = 282°.5, CM III = 018°.1. B = -26°.3, B´ = -26°.6. Globe = 20".46 X 18".85, Rings = 46".42 X 20".68.

seeing, scattered light, and inadequate aperture. Also, the visibility of major ring divisions and other intensity minima was improved in 2002-2003 because the Rings were near their maximum possible inclination to our line of sight, attaining -27.0° during the apparition. Likewise, as a consequence of the improved tilt of the Rings toward Earth, the mean intensity of Cassini's Division was reportedly slightly darker to visual observers in 2002-2003 when compared with the view in 2001-2002.

Ring C. Visual observers saw the grayish-black Ring C at the Ansae regularly during 2002-2003, and it was also considered a bit darker in overall intensity when compared with 2001-2002 data (having a mean intensity difference of -0.85). Where Ring C crossed Saturn's globe (the "Crepe Band"), it appeared very dark gray in color and uniform in intensity, perhaps not quite as dark in 2002-2003 as in 2001-2002. Webcam and CCD images showed Ring C encircling the Globe of Saturn, confirming visual impressions of this ring component during 2002-2003. When **B** and **B'** are both negative, and **B > B'**, the shadow of the Rings on the Globe is cast to their south; such circumstances occurred from 2003 January 09 through May 08 (the last submitted observation). The Crape Band is then also located south of the projected Rings A and B. If **B < B'**, the shadow is north of the projected Rings, which occurred during the 2002-2003 Apparition until 2003 January 08. When the shadows of rings A and B, and the Ring C projection are superimposed, it is exceedingly troublesome to distinguish them from each other in ordinary apertures and seeing conditions, and the shadow of Ring C is an added complication.

Terby White Spot (TWS). The TWS is a frequently perceived perceived brightening of the Rings immediately adjacent to the Sh G on R. On several dates during 2002-2003, visual observers saw a brilliant TWS (intensity of 8.79), but this feature is nothing more than a false contrast effect and not a real feature of Saturn's Rings. It is still meaningful, however, to try to determine what correlation might occur between the visual numerical relative intensity of the TWS and the varying tilt of the Rings, including its brightness and visibility in variable-density polarizers, color filters, photographs, and CCD or webcam images. A few processed CCD and webcam images submitted during 2002-2003 also showed the Terby White Spot.

Bicolored Aspect of the Rings and Azimuthal Brightness Asymmetries. The bicolored aspect of the Rings refers to an observed difference in color between the East and West Ansae (IAU system) when systematically compared by alternating blue filters (W47 [Wratten 47], W38, or W80A) and red filters (W25 or W23A).

The circumstances of visual observations are listed in Table 5 when a bicolored aspect of the ring Ansae was thought to be present during 2002-2003. Readers should be aware that the directions in Table 5 refer to Saturnian, or IAU, directions, where West is to the right in a normally-inverted telescope image (with the observer located in the northern hemisphere of the Earth) which has South at the top.

Figure 16. 2002 Dec 16 16:11 UT. Eric Ng. 25.4-cm (10.0-in) NEW, Philips ToU-cam Image, IL + IR rejection filter. S = 5.0, Tr = 6.0. CM I = 162°.7, CM II = 072°.7, CM III = 143°.5. B = -26°.5, B´ = -26°.6. Globe = 20".64 X 19".02, Rings = 46".84 X 20".96.

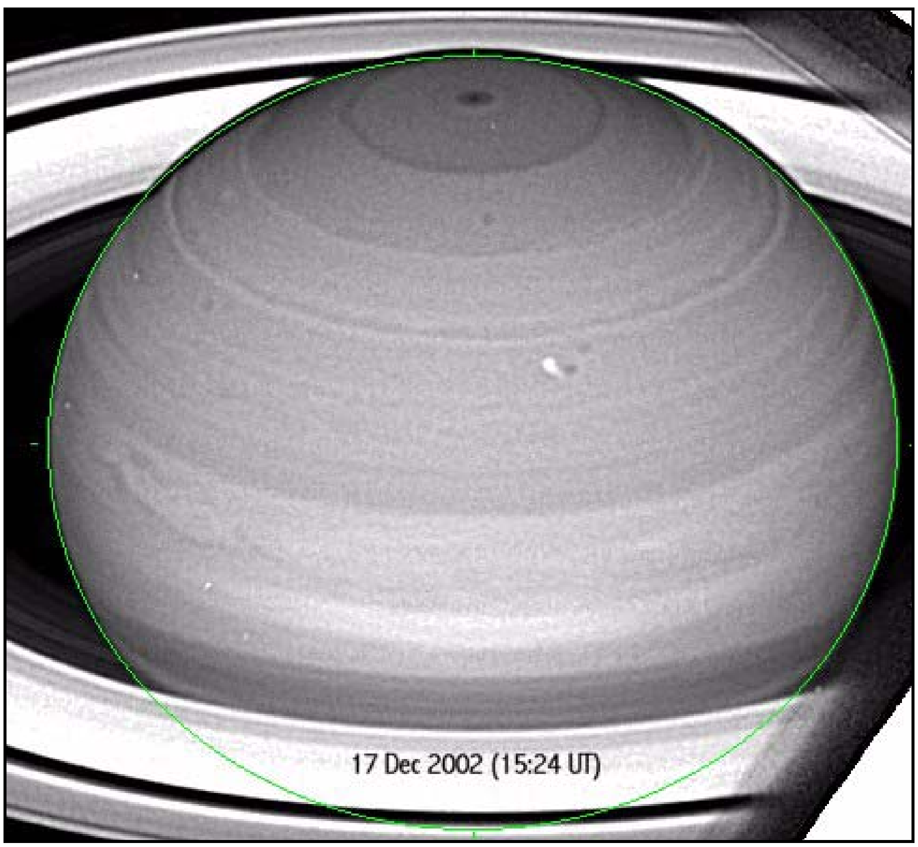


Figure 17. 2002 Dec 17 15:24 UT. HST Image, courtesy of Agustin Sanchez, taken at 814 nm, showing series of small dark spots at high latitude and white spot captured by Peach on Dec 18 and Grafton on Dec 29th. CM I = 259°.5, CM II = 138°.3, CM III = 207°.9. B = -26°.5, B´ = -26°.6. Globe = 20".64 X 19".02, Rings = 46".84 X 20".96.

In the last several apparitions (including 2002-2003), observers have been systematically trying to capture the bicolored aspect of the Rings using CCD, video, webcam, and digital cameras, although results so far have been inconclusive. During the 2002-2003 observing season, there were no images submitted in which this phenomenon was unambiguously apparent. Yet, as such efforts become more commonplace, the greater will be the probability of success. Likewise, Saturn observers are encouraged to see if they can image subtle azimuthal brightness variations in Ring A that may be reported from time to time by visual observers, particularly those that are independent of similar effects noted on Saturn's globe (which one would expect to occur if atmospheric dispersion was at fault). Professional astronomers are well-acquainted with Earth-based observations of such azimuthal asymmetries (confirmed by Voyager), which apparently arise when light is scattered by denser-than-average particle agglomerations orbiting in Ring A, and thus such images by ALPO Saturn observers are highly sought after. Therefore, observers are strongly encouraged to continue imaging Saturn to try to capture azimuthal brightness differences, as well as the bicolored aspect of the Rings, in coming apparitions.

The Satellites of Saturn

Observers in 2002-2003 did not submit systematic visual estimates of the magnitudes of Saturn's satellites employing suggested methods described in *The Saturn Handbook*, and photoelectric photometry and systematic visual magnitude estimates of Saturn's satellites are strongly encouraged for future apparitions. In addition, dating back to the 1999-2000 Apparition, we have been trying to motivate observers to attempt spectroscopy of Titan as part of a newly-introduced professional-amateur cooperative project. Even though Titan has been occasionally studied by the Hubble Space Telescope (HST) and extremely large Earth-based instruments, the opportunity still exists for systematic observations by amateurs with suitable instrumentation.

Currently being probed as part of the Cassini-Huygens mission, Titan is an extremely dynamic satellite exhibiting transient as well as long-term variations. From wavelengths of 300 nm to 600 nm, Titan's color is dominated by a reddish methane haze in its atmosphere, while longward of 600 nm, deeper methane absorption bands appear in its spectrum.

Figure 18. 2002 Dec 18 23:43 UT. Damian Peach. 28.0-cm (11.0-in) SCT, CCD Image. IL + IR rejection filter. S = good (undefined scale). CM I = 316°.5, CM II = 151°.8, CM III = 219°.8. B = -26°.5, B´ = -26°.6. Globe = 20".64 X 19".02, Rings = 46".84 X 20".97. White spot in STrZ (same as imaged by HST on Dec 17th).

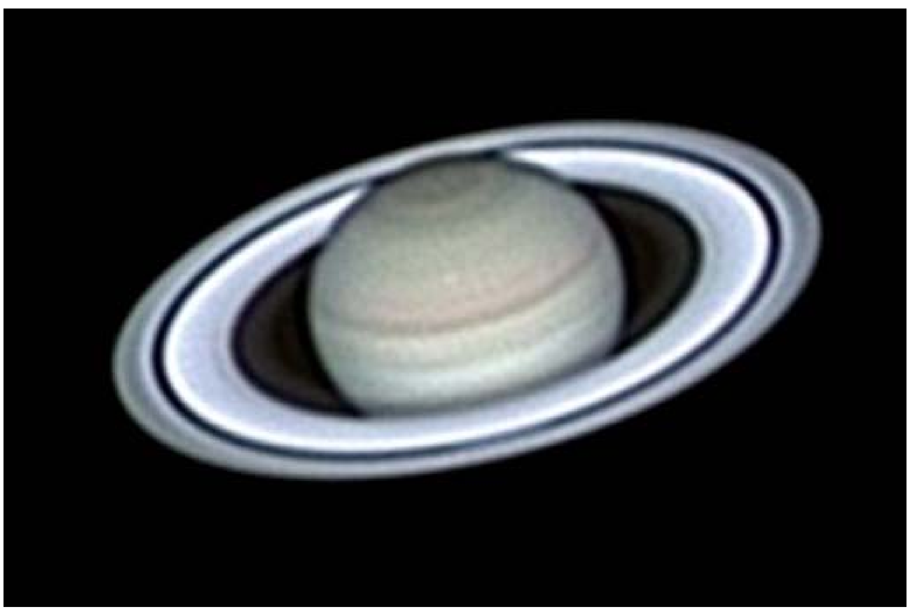


Figure 19. 2002 Dec 18 23:59 UT. Damian Peach. 28.0-cm (11.0-in) SCT, CCD Image. IL + IR rejection filter. S = good (undefined scale). CM I = 325°.9, CM II = 160°.8, CM III = 228°.8. B = -26°.5, B´ = -26°.6. Globe = 20".64 X 19".02, Rings = 46".84 X 20".97. White spot in STrZ (same as imaged by HST on Dec 17).

Between these methane bands are "windows" to Titan's lower atmosphere and surface, and daily monitoring in these "windows" with photometers or spectrophotometers is worthwhile for cloud and surface studies. Also, long-term investigations of other areas from one apparition to the next can help shed light on Titan's seasonal variations. Suitably-equipped observers are therefore encouraged to participate in this interesting and valuable project. Details on this endeavor can be found on the Saturn page of the ALPO website at http://www.lpl.arizona.edu/alpo/.

Simultaneous Observations

Simultaneous observations, or studies of Saturn by individuals working independently of one another at the same time and on the same date, afford good opportunities for verification of ill-defined or controversial Saturnian phenomena. The ALPO Saturn Section has organized a simultaneous observing team so that several individuals in reasonable proximity of one another can maximize the chances of viewing Saturn at the same time using similar equipment and methods. Joint efforts like this significantly reinforce the level of confidence in the data submitted for each apparition. Several simultaneous, or near-simultaneous, observations of Saturn were submitted during 2002-2003, but as in the 2001-2002 Apparition, such observations were essentially fortuitous. More experienced observers usually participate in this endeavor, but newcomers to observing Saturn are heartily welcome to get involved. Readers are urged to inquire about how to join the simultaneous observing team in future observing seasons.

Conclusions

It may be concluded that Saturn's atmosphere showed marginal discrete activity during the 2002-2003 Apparition, particularly with respect to a series of small, visually inconspicuous white spots that were repeatedly imaged in the STrZ. In addition, there were a few sightings of bright areas in or near the SPR, SEBZ , and EZs by visual observers, some of which were captured with CCD imagers and webcams. Poorly-defined, transient dusky spots or festoons in the SEB were also seen, none of which reappeared following several rotations of the planet to facilitate a series of well-timed CM transits. Aside from frequent visual observations and CCD images of Cassini's (A0 or B10) and Encke's (A5) Divisions, several observers imaged Keeler's Gap (A8). Visual observers spotted, and CCD imagers recorded, other intensity minima in Ring B. Several visual observers suspected and made drawings of dusky ring spokes that were possibly evident in Ring B during 2002-2003, and two visual observers reported the curious bicolored aspect of the Rings.

The author extends his most sincere thanks to all of the observers mentioned in this report who submitted visual drawings, and CCD, digital camera, and webcam images, as well as descriptive reports, during the 2002-2003 Apparition. Systematic observational work in support of our programs

Figure 20. 2002 Dec 22 05:56 UT. Ed Grafton. 35.6-cm (14.0-in) SCT, CCD Image, IL + IR rejection filter. S = 8.0, Tr = 6.0. CM I = 188°.4, CM II = 278°.4, CM III = 342°.5. B = -26°.5, B´ = -26°.6. Globe = 20".63 X 19".01, Rings = 46".82 X 20".98. Another small white spot in STrZ.

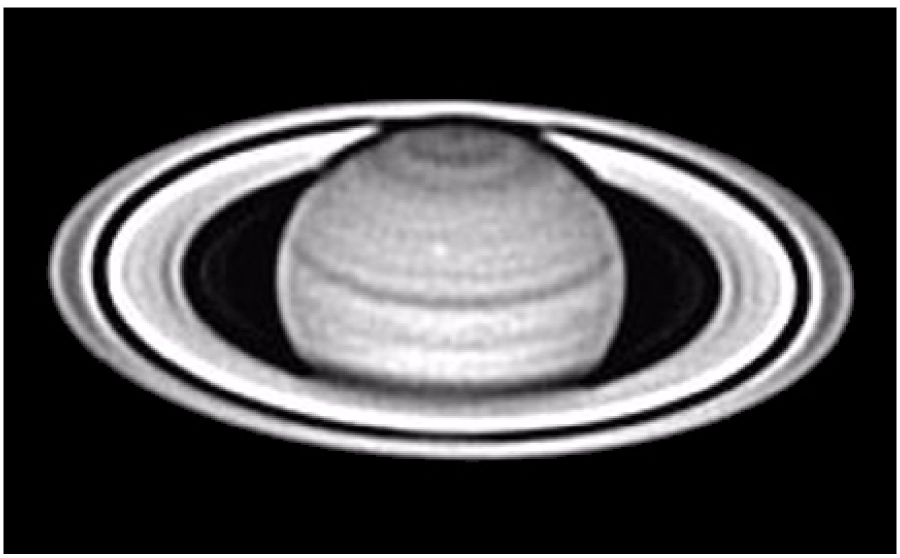


Figure 21. 2002 Dec 29 05:08 UT. Ed Grafton. 35.6-cm (14.0-in) SCT, CCD Image, IL + IR rejection filter. S = 8.0, Tr = 6.0. CM I = 310°.9, CM II = 175°.9, CM III = 231°.5. B = -26°.5, B´ = -26°.6. Globe = 20".59 X 18".97, Rings = 46".71 X 20".96. White spot in STrZ (same as imaged by HST on Dec 17 and Peach on Dec 18).

helps amateur and professional astronomers alike to obtain a better understanding of Saturn and its always intriguing ring system, and observers everywhere are invited to join us in our studies of Saturn in the coming year.

Readers should and will not want to forget that there is a continuing opportunity for participation in the **Amateur-Professional Cassini Observing Patrol**, because Cassini's arrival at Saturn (orbit insertion) occurred on 2004 July 01, followed by the Titan Probe Entry and Orbiter flyby on 2004 November 27. What will be most useful to the professional community will be digital images of Saturn at wavelengths ranging from 400 nm – 1000 nm, in good seeing using webcams, CCDs, digital cameras, and videocams; this effort has already begun, starting in 2004 April when Cassini began observing Saturn at close range. The use of classical broadband filters (e.g., Johnson system: B, V, R and I) has been recommended, and for telescopes with large apertures (e.g., 30.0 cm and greater), imaging through a 890-nm narrow-band methane filter will also be extremely worthwhile.

The Cassini Team is hoping that ALPO Saturn observers will carefully and systematically patrol the planet every clear night to search for individual features, recording their motions and morphology, to serve as input to Cassini's imaging system, thereby indicating to Cassini scientists where interesting large-scale targets exist. Suspected changes in belt and zone reflectivity (i.e., intensity) and color will be also useful, so visual observers can also play a very useful role by making careful visual numerical relative intensity estimates. The Cassini team also would like to combine ALPO Saturn Section images with data from the Hubble Space Telescope and from professional ground-based observatories (a number of proposals have been submitted).

The ALPO Saturn Section Coordinator is always eager to offer guidance for new, as well as advanced, observers. A very meaningful resource for learning how to observe and record data on Saturn is our ALPO Training Program, and we urge participation in this valuable educational experience. Also, detailed descriptions of methods and techniques for observing Saturn are contained in *The Saturn Handbook*, available from the author as a printed manual or as a pdf file.

References

Alexander, A.F. O'D. 1962. *The Planet Saturn*. London: Faber and Faber.

Benton, J.L., Jr. 1996. *Visual Observations of the Planet Saturn: Theory and Methods (The Saturn Handbook)*. Savannah, GA: Review Publishing Company. (8th Revised Edition; now available also in *.pdf format).

----------------------. 1999a. “The 1995-96 Apparition of Saturn and Edgewise Presentation of the Rings: Visual and Other Observations,” *Journal of the Assn of Lunar & Planetary Observers*, 41, 1: 1-23.

----------------------. 1999b. “Observations of Saturn During the 1996-97 Apparition,” *Journal of the Assn of Lunar & Planetary Observers*, 42, 1: 1-12.

Figure 22. 2003 Jan 07 02:09 UT. Donald C. Parker. 40.6-cm (16.0-in) NEW, CCD Image, IL + RGB filters. S = 7.0, Tr = 5.5. CM I = 245°.2, CM II = 183°.5, CM III = 228°.4. B = -26°.6, B´ = -26°.6. Globe = 20".47 X 18".87, Rings = 46".46 X 20".88. Small STrZ white spot (same spot imaged by Grafton on 2002 Dec 29).

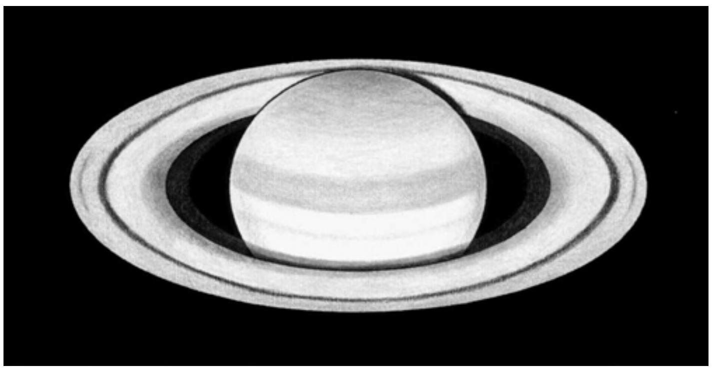


Figure 23. 2003 Jan 14 21:00 UT. Mario Frassati. 20.3-cm (8.0-in) SCT, Drawing, IL, 400X. S = 5.0 (interpolated). CM I = 338°.7, CM II = 025°.6, CM III = 061°.1. B = -26°.6, B´ = -26°.6. Globe = 20".33 X 18".74, Rings = 46".13 X 20".77.

Figure 24. 2003 Feb 05 03:25 UT. Sol Robbins. 15.2-cm (6.0-in) REF, Drawing, IL, 375X, variable-density polarizer. S = 8.0, Tr = 5. CM I = 294°.8, CM II = 014°.7, CM III = 024°.6. B = -26°.7, B´ = -26°.6. Globe = 19".76 X 18".21, Rings = 44".83 X 20".25. Note dusky spokes within Ring B at Ansae, as well as notches and undulations along SEBn.

----------------------. 2000. "Observations of Saturn During the 1997-98 Apparition," *Journal of the Assn of Lunar & Planetary Observers*, 42, 3: 106-117.

----------------------. 2001. "Observations of Saturn During the 1998-99 Apparition," *Journal of the Assn of Lunar & Planetary Observers,* 43, 4: 31-43.

----------------------. 2002. "Observations of Saturn During the 1999-2000 Apparition," *Journal of the Assn of Lunar & Planetary Observers*, 44, 1: 15-27.

----------------------. 2003. "ALPO Observations of Saturn During the 2000-2001 Apparition," *Journal of the Assn of Lunar & Planetary Observers*, 45, 1: 64-76.

----------------------. 2004. "ALPO Observations of Saturn During the 2001-2002 Apparition," *Journal of the Assn of Lunar & Planetary Observers*, 46, 1: 24-39.

Gehrels, T. and Matthews, M.S. 1984. *Saturn*. Tucson: University of Arizona Press.

Kozyrev, N.A. 1974. "East-West Asymmetry of Saturn's Ring," *Astrophysics and Space Science*, 27, 1: 111-116.

Lukkari, J. and Piironen, J.O. 1981. "The East-West Asymmetry of Saturn's Rings: New measurements?" *The Moon and Planets*, 25, 133-136.

Morrison, D. 1982. *Voyages to Saturn* (NASA SP-451). Washington: U.S. Government Printing Office.

Smith, B. A., et al. 1981. "*Encounter with Saturn: Voyager 1 Imaging Science Results*," *Science*, 212, 163-191.

Spilker, Linda J., Editor. 1997. *Passage to A Ringed World: The Cassini-Huygens Mission to Saturn and Titan* (NASA SP-533). Washington: U.S. Government Printing Office, 1997.

United States Naval Observatory. *The Astronomical Almanac*. Washington: U.S. Government Printing Office. (Annual Publication; the 2002 and 2003 editions, which were published in 2001 and 2002, respectively, were used for this report).

Figure 25. 2003 Mar 25 19:16 UT. Gabor Kiss. 25.4-cm (10.0-in) CASS, Philips ToUcam Image, IL + IR rejection filter. S = 7.0 (interpolated). CM I = 334°.3, CM II = 282°.6, CM III = 233°.9. B = -26°.9, B´ = -26°.5. Globe = 18".11 X 16".70, Rings = 41".08 X 18".66. White spot in STrZ.

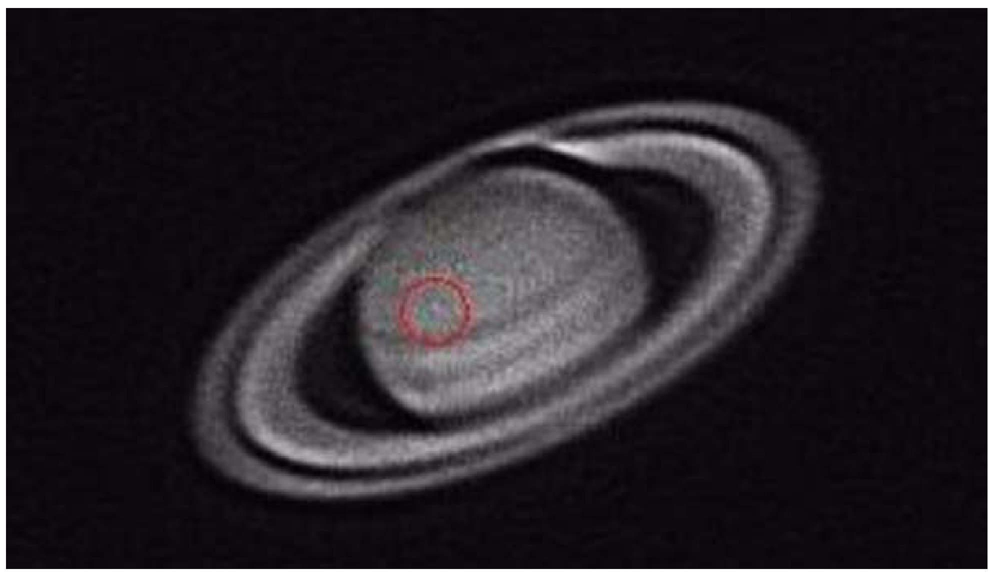


Figure 26. 2003 Mar 29 20:29 UT. Albino Carbognani. 25.4-cm (10.0-in) NEW, Philips ToUcam Image, IL + IR rejection filter. S = 7.0 (interpolated). CM I = 153°.7, CM II = 331°.2, CM III = 277°.6. B = -26°.9, B´ = -26°.5. Globe = 17".97 X 16".57, Rings = 40".79 X 18".52. White spot in StrZ (circled).

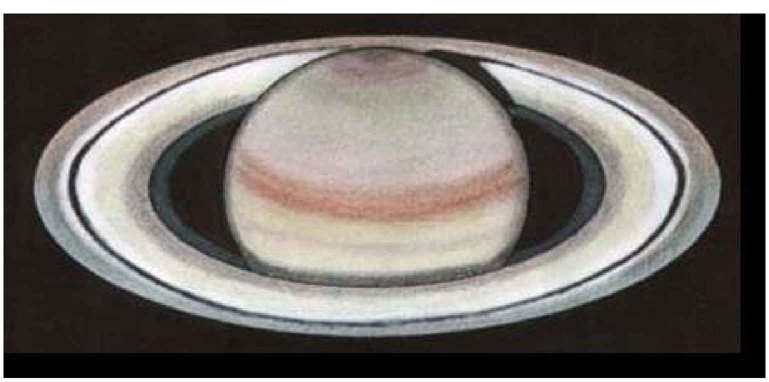


Figure 27. 2003 Mar 10 18:37 UT. Ivano Dal Prete. 20.3-cm (8.0-in) NEW, Drawing, IL, 360X. S = 7.0 (interpolated). CM I = 248°.9, CM II = 322°.6, CM III = 291°.9. B = -26°.8, B´ = -26°.6. Globe = 18".60 X 17".16, Rings =

Feature Story: Uranus, Neptune & Pluto

Observations During the 2004 Apparitions

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

Abstract

The selected 2004 normalized magnitudes of Uranus are: B(1,0) = -6.62 ± 0.02, V(1,0) = -7.11 ± 0.01 and R(1,0) = -6.68 ± 0.06, while the corresponding values for Neptune are: B(1,0) = -6.58 ± 0.02 and V(1,0) = -6.99 ± 0.02. The mean V(1,0) value for Pluto is -0.94 ± 0.10. A bright spot in Uranus' southern hemisphere was imaged by Pellier in red and near-infrared light.

Online Features

If you're reading this as a pdf file, please note that items in blue text are links to e-mail addresses, tables, figures and websites for more information. Left-click your mouse on:

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

Introduction

Several important remote planets studies were carried out in the past year. As an example, Rages and co-workers (2004, 548) reported that between 1994 and 2002, Uranus underwent two changes as seen in infrared light: (1) the south polar region, south of 75°S, became dimmer and (2) all areas at about 70°S became brighter. Rages and co-workers reported that in 2002, Uranus had a bright band at 70°S in near-infrared images. Hammel and co-workers (2005a, 284) imaged a bright cloud in Uranus' southern hemisphere in the K´ filter. The K´ filter is most sensitive to light with a wavelength of 2.12 micrometers and on Uranus only clouds at high altitudes will appear bright at this wavelength. Hammel and co-workers (2005b, 534) imaged over 30 bright clouds on Uranus in infrared light (wavelengths = 1.2 – 2.1 micrometers). From these images, this group was able to compute wind speeds at several latitudes on Uranus. One cloud was found to be moving at 488 miles per hour. Hicks and Buratti (2004, 210) reported photoelectric magnitudes of Triton in the Johnson U, B, V, R and I filters between May 1998 and July 2000. Their measurements are consistent with color indices of B-V = +0.75, V-R = +0.39 and V-I = +0.77 for Triton. Finally, Sromovsky (2005, 254) carried out a thorough study of scattered light from Neptune. This individual reported that high-altitude haze on Neptune reduces the amount of blue light that that planet reflects. This in turn can influence Neptune's B-filter magnitude.

This report will summarize work done by amateur astronomers. Table 1 lists the characteristics of the 2004 Apparitions of Uranus, Neptune and Pluto, while Table 2 lists the people who made observations of these planets in 2004 and early 2005.

Photoelectric Photometry

Fox and the writer used SSP-3 solid-state photometers along with filters that were transformed to the Johnson B, V and R system. More information about the equipment can be found elsewhere (Optec, 1997; Schmude, 2002). Fox reported transformation coefficients of +0.131 and -0.053 magnitude for the B and V filters respectively.

West used an SBIG ST-9E camera along with a 0.2-meter Schmidt-Cassegrain telescope and a filter that was transformed to the Johnson V system to make his magnitude measurements of Pluto. West assumed that the B-V value of Pluto was +0.80 magnitude when he made his color corrections.

Table 1: Characteristics of the Remote Planets During Their 2004 Apparitions

	Uranus	Neptune	Pluto
First conjunction date	Feb. 22, 2004	Feb. 2, 2004	Dec. 12, 2003
Opposition date	Aug. 27, 2004	Aug. 6, 2004	June 11, 2004
Angular diameter (opposition)	3.7 arc-sec.	2.4 arc-sec.	0.1 arc-sec.
Right Ascension (opposition)	22h 28m	21h 06m	17h 23m
Declination (opposition)	10.5°S	16.7°S	14.2°S
Sub-Earth latitude (opposition)	13°S	29°S	33°S
Second conjunction date	Feb. 25, 2005	Feb. 3, 2005	Dec. 13, 2004

Data are from the Astronomical Almanacs 2002-2004.

Table 3 summarizes the comparison and check stars used for magnitude measurements of Uranus and Neptune (Hirshfeld et al., 1991; Iriarte et al., 1965). According to Sinnott and Perryman (1997) none of the stars in Table 3 are variables.

Magnitude measurements of Uranus, Neptune and Pluto are listed in Table 4. All measurements were corrected for color transformation; furthermore the Uranus and Neptune measurements were corrected

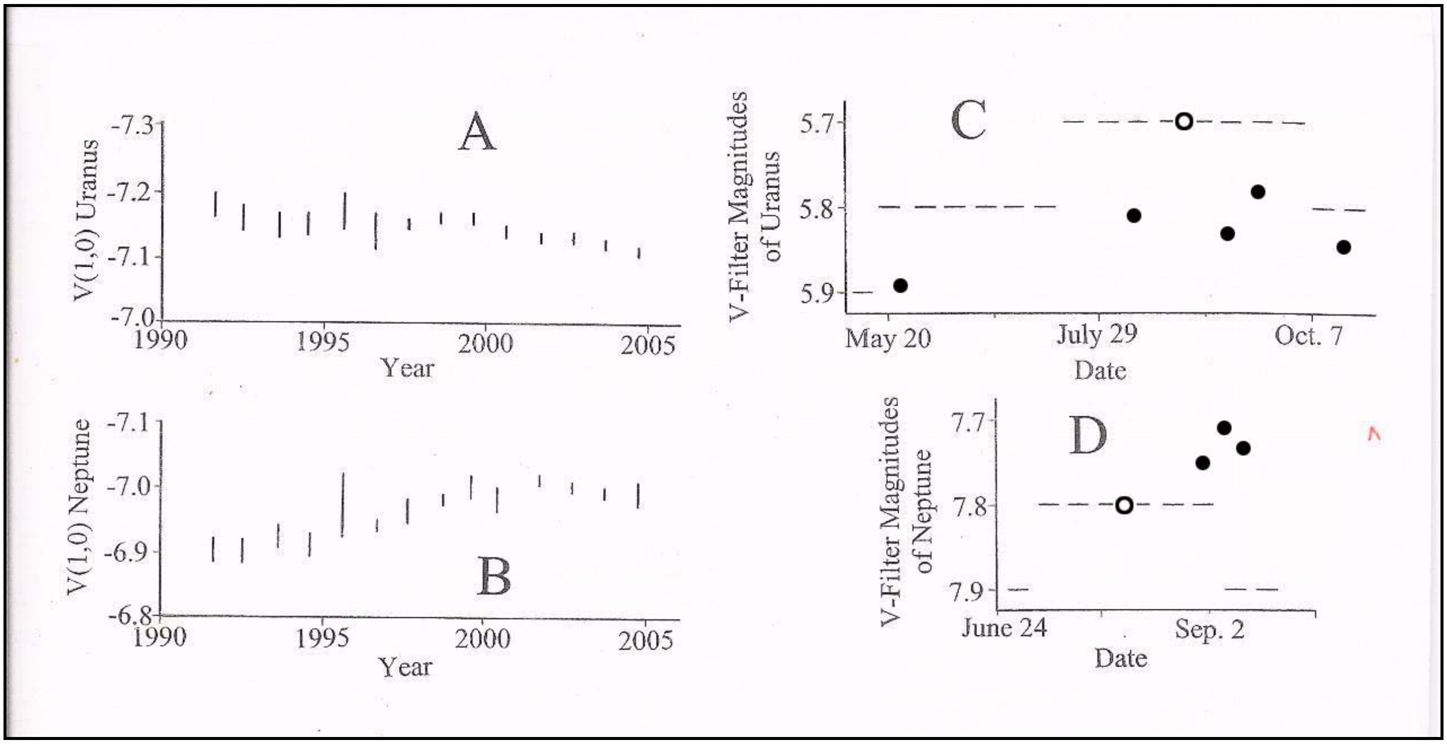


Figure 1. A, B: Plots of the normalized V-filter magnitudes of Uranus and Neptune from 1991 to 2004; the lengths of the lines represent the uncertainties and the middle of the line is the magnitude measurement. C, D: shows the measured V-filter magnitudes of Uranus and Neptune (filled circles) along with predicted magnitudes from the Royal Astronomical Society of Canada *Observer's Handbook* (lines) and the British Astronomical Society's *Handbook* (open circle) on the opposition date for each planet

for differential atmospheric extinction. The mean measured magnitude for the Uranus check star Gamma-Capricorni was B = +4.00 ± 0.02, V = +3.67 ± 0.03 and R = +3.38 ± 0.01. The B and V magnitudes are close to the literature values, but the R magnitude is 0.06 magnitudes brighter than the accepted value of +3.44 (Iriarte et al., 1965). Due to this discrepancy, a 0.06-magnitude uncertainty is selected for the R-magnitude of Uranus. The measured magnitudes for Eta-Capricorni (the Neptune check star) were B = +5.00 and V = +4.84, which are close to the literature values (Iriarte et al., 1965).

Table 5 lists values of the normalized magnitudes of Uranus, Neptune and Pluto. The normalized magnitude is the magnitude that a planet would have if it was 1.0 astronomical unit from both the Earth and the Sun and at a solar phase angle of 0°. Any change in the normalized magnitude is due to factors other than the changing phase angle as well as the changing planet-Sun and Planet-Earth distances. Figures 1A and 1B show the normalized magnitudes of Uranus and Neptune in the V-filter over the 1991-2004 time period. During this time, Uranus dimmed at a mean rate of +0.0038 magnitude/year while Neptune brightened at a mean rate of +0.0083 magnitude/year; the estimated uncertainty of both rates is ±25 percent.

Between 1993 and 2004, Uranus dimmed by +0.006 mag./year and +0.026 mag./year in the blue and red filters, respectively. These values are similar to those reported by Schmude (2004).

Figures 1C and 1D show the measured magnitudes of Uranus and Neptune in 2004 along with predicted magnitudes in the

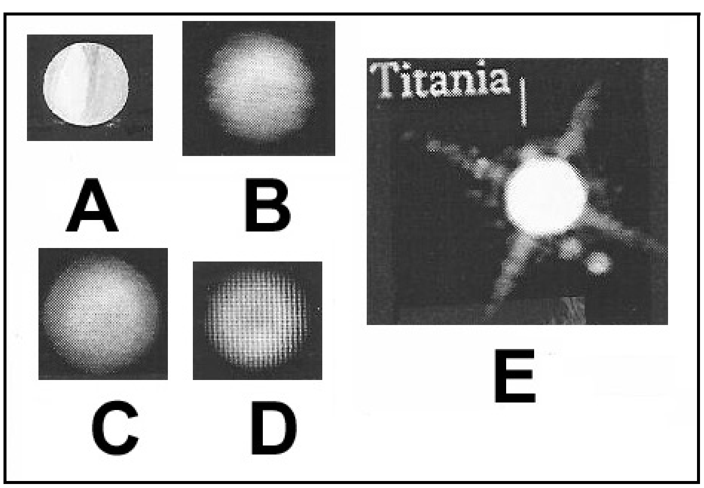


Figure 2. Drawings and images of Uranus; in all cases, the south limb is at the top and the preceding limb is at the left. A: Sep. 12, 2004, 5:20 UT by Plante (0.41-m Cassegrain telescope at 411X; B: June 28, 2004, 2:54 UT by Pellier (red + infrared filters, 0.36-m Schmidt-Cass. telescope with an ATK-1HS camera); C: June 28, 2004, 3:17 UT by Pellier (infrared filter, 0.36-m Schmidt-Cass. Telescope with an ATK-1HS camera); D: July 14, 2004, 4:19 UT by Grafton (red + green + blue images, 0.36-m Schmidt-Cass. Telescope with an ST5 CCD camera); E: Aug. 23, 2004, 0:36 UT by Vandebergh (0.25-m Newtonian telescope with an ATK-2C CCD camera).

Table 2: Contributors to the Remote Planets 2004 Apparition Report

Name & Location	Telescope[a]	Type of Observation[b]	Name & Location	Telescope[a]	Type of Observation[b]
Abbott, Patrick; AB Canada	10x50 Bin	VP	Heffner, Robert; Nagoya Japan	0.25-m SC	I
Amato, Michael; CT USA	0.25-m RL & 0.43-m RL	DN	Hernandez, Carlos; FL USA	0.23-m MC	D
Bell, Charles; MS USA	0.30-m SC	I	Lazzarotti, Paolo; Italy	0.25-m RL	I
Boisclair, Norman; NY USA	0.51-m RL	D, DN	Melillo, Frank; NY USA	0.20-m SC	I, PP
Bosman, Richard; Holland	0.28-m SC	I	Niechoy, Detlev; Germany	0.20-m SC	D
Campbell, Peter; TX USA	0.15-m RL	I	Parker, Don; FL USA	0.25-m DK	I
Candusio; Bert; Victoria Australia	0.21-m RL	I	Pellier, Christophe; France	0.18-m RL & 0.36-m SC	I
Chavez, Rolando; GA USA	0.20-m & 0.36-m SC	I	Plante, Phil; OH USA	0.08-m RR & 0.41-m C	D, DN, VP
Cudnik, Brian; TX USA	several	D, DN, VP	Roussell, Carl; ON Canada	0.15-m RR & 0.05-m RR	D, DN, VP
Fox, James; MN USA	0.25-m SC	PP	Schmude, Richard; GA USA	0.09-m M & 11x80 Bin	VP, PP
Gorenstein, Ian; NJ USA	0.28-m SC	I	Tatum, Randy; VA USA	0.25-m RL	I
Grafton, Ed; TX USA	0.36-m SC	I, PP	Vandebergh, Ralf; Holland	0.25-m RL	DN, I
Gray, Robin; NV USA	0.15-m RR & 11x80 Bin	D, DN, VP	West, Doug; KS USA	0.20-m SC	PP

a) Telescopes: Bin = Binoculars, C = Cassegrain, DK = Dall-Kirkham, M = Maksutov, MC = Maksutov-Cassegrain, RL = reflector, RR = refractor, SC = Schmidt-Cassegrain
b) Type of observation: D = drawing, DN = descriptive notes, I = images,
PP = photoelectric photometry, VP = visual photometry

2004 Observer's Handbook of the Royal Astronomical Society of Canada (Gupta, 2003) and The Handbook of the British Astronomical Association: 2004. The measured magnitudes of Uranus in 2004 are about 0.1 magnitudes fainter than the predicted values. This difference is due to the dimming of that planet over the last 1-2 decades. The measured magnitudes of Neptune in 2004 are almost 0.1 magnitudes brighter than the predicted values. This discrepancy is due to the five-year brightening of Neptune between 1994 and 1999.

The mean normalized magnitudes of Pluto for 2001, 2002, 2003 and 2004 were: -0.93, -0.98, -1.05 (excluding the -1.80 value on Mar. 21.485, 2003, which is probably an outlier) and -0.94, respectively. The equally weighted magnitude of Pluto is -0.98 which is close to the literature value of -1.0 (Astronomical Almanac, 2004, E4).

Visual Magnitude Estimates

Abbott, Cudnik, Gray, Plante, Roussell and the writer made 68 visual magnitude estimates of Uranus and 16 visual estimates of Neptune during 2004 and early 2005. The mean normalized magnitudes based on these estimates are: $V_{vis}(1,0) = -7.2 \pm 0.01$ (Uranus) and $V_{vis}(1,0) = -7.1 \pm 0.04$ (Neptune). The stated uncertainties include only random errors.

Table 3: Comparison and Check Stars Used in Photoelectric Magnitude Measurements Of Uranus and Neptune in 2004

Star Name	Right Ascension	Declination	Magnitude[c]		
			B-filter	V-filter	R-filter
Theta-Cap. [a]	21h 06.3m	17.21°S	4.06	4.07	4.06
Eta-Cap. [b]	21h 04.4m	19.86°S	5.02	4.84	4.68
Sigma-Aqr. [a]	22h 30.9m	10.64°S	4.76	4.82	---
Iota-Aqr. [a]	22h 06.7m	13.84°S	4.18	4.25	4.29
Gamma-Cap[a]	21h 40.4m	16.64°S	3.99	3.67	3.44

a) Right ascension and declination are from the Astronomical Almanac for the year 2005.
b) Right ascension and declination are from Hirshfeld et al. (1991).
c) Magnitudes are from Iriarte et al. (1965).

Disc Appearance: Uranus, Neptune and Pluto

Bell, Bosman, Campbell, Candusio, Chavez, Gorenstein, Grafton, Heffner, Lazzarotti, Melillo, Parker, Pellier, Tatum and Vandebergh all imaged either Uranus, Neptune or Pluto. Most of the images did not show any details other than limb darkening.

Table 4: Photoelectric Magnitude Measurements of Uranus, Neptune and Pluto In 2004

Date – Universal Time	Planet	Observer	Filter	Magnitude +	X(1,0) -	Comparison Star
May 24.356	Uranus	Schmude	V	5.89	7.13	Sigma-Aqr.
May 24.372	"	"	V	5.89	7.13	"
Aug. 09.161	"	"	V	5.81	7.10	"
Sep. 10.215	"	"	V	5.83	7.09	"
Sep. 20.083	"	"	V	5.78	7.14	"
Oct. 17.013	"	"	V	5.82	7.13	"
Oct. 17.038	"	"	V	5.89	7.06	"
Oct. 17.050	"	"	V	5.84	7.11	"
Oct. 17.067	"	"	V	5.83	7.12	"
Oct. 17.097	"	"	V	5.85	7.10	"
Oct. 17.121	"	"	B	6.30	6.65	"
Oct. 17.142	"	"	B	6.38	6.58	"
Oct. 17.160	"	"	B	6.35	6.60	"
Oct. 17.181	"	"	B	6.30	6.65	"
Oct. 17.203	"	"	B	6.34	6.61	"
Nov. 06.021	"	"	R	6.36	6.62	Iota-Aqr.
Nov. 06.048	"	"	R	6.28	6.71	"
Nov. 06.071	"	"	R	6.28	6.70	"
Nov. 06.099	"	"	R	6.30	6.68	"
Aug. 31.209	Neptune	Fox	B	8.14	6.57	Theta-Cap.
Aug. 31.209	"	"	V	7.75	6.97	"
Sep. 08.195	"	"	B	8.10	6.62	"
Sep. 08.195	"	"	V	7.71	7.01	"
Sep. 13.182	"	"	B	8.17	6.55	"
Sep. 13.182	"	"	V	7.73	6.99	"
Mar. 19.463	Pluto	West	V	13.87	1.08	SAO 160563 (V=8.82) & GSC 5670:562 (V=10.14)
May 20.417	Pluto	"	V	14.05	0.80	GSC 5670:484 (V=10.53) & GSC 5670:256 (V=10.57)

Pellier's June 28 and July 6 images in red and near-infrared light (wavelength = 0.60 to 0.80 micrometers) show a bright south polar region; see Figures 2B and 2C. The B and V images by this same individual on July 6 do not show a bright South Polar Region on Uranus, which shows that the South Polar Region may only be bright in red and near-infrared light. Grafton's July 16 image (in visible light) shows a bright north limb on Uranus; see Figure 2D. Melillo's Oct. 4 red filter (W25) images of Uranus show hints of dark belts. It must be remembered that the last two times (early 1920s and mid 1960s) when the Earth was near the Uranian equatorial plane, people saw dark belts on Uranus (Alexander, 1965, 235; Shartle, 1968, 199; Cross, 1969, 153).

Pellier made blue, green, red and infrared images of Pluto on June 15; he stacked 150 of each of these images, and each of the green, red and infrared images had 7-second exposure times while each blue image had a 10-second exposure time. Pellier found that after the images were stacked, Pluto was brighter in the blue image than in the infrared image. Pellier admits that he may not have the correct color balance; however the results are interesting and further investigation is needed.

Several people made visual observations of Uranus and Neptune. The most common feature reported for Uranus was limb darkening. A few people observed other irregularities including bright limb spots, dark belts and dark limb spots; see Figure 2A. Hernandez reported seeing a bright south polar region on June 24, 2004. Cudnik suspected a bright spot on Neptune with a

Table 5: Normalized Magnitudes for Uranus, Neptune and Pluto In 2004

Planet	B(1,0)	V(1,0)	R(1,0)
Uranus	-6.62 ± 0.02	-7.11 ± 0.01	-6.68 ± 0.06
Neptune	-6.58 ± 0.02	-6.99 ± 0.02	-----
Pluto	-----	-0.94 ± 0.10	-----

0.36-m Schmidt-Cassegrain telescope under good seeing conditions on Oct. 17.

The selected colors are green with blue and yellow hues for Uranus and blue with a green hue for Neptune; these colors are based on visual estimates by several observers.

Satellites

Vandebergh imaged three of Uranus' moons; see Figure 2E. Grafton used an unfiltered ST5C CCD camera along with a 0.36-m Schmidt-Cassegrain telescope to measure the magnitude differences among the four brightest moons of Uranus. The results are summarized in Table 6. The magnitude differences for Oberon and Ariel are similar to those measured by Grafton and Melillo in 2002 (Schmude, 2004, 55). Melillo used an unfiltered Starlight Xpress MX-5 camera, a 0.20-m Schmidt-Cassegrain telescope and a few comparison stars to measure magnitudes of +13.60 and +13.25 for Titania and Triton respectively. Both of these magnitudes are slightly brighter than the respective V-filter magnitudes.

Table 6: Relative Magnitude Measurements of the Satellites of Uranus in Comparison to Titania (2004)

Date, Time (UT)	Oberon-Titania magnitude	Ariel-Titania magnitude	Umbriel-Titania magnitude
July 14, 04:19	0.195	---	0.798
July 14, 04:23	0.172	---	0.812
July 16, 09:05	0.178	0.264	---
July 16, 09:11	0.186	0.255	---
July 22, 08:48	0.062	0.200	0.888
July 23, 08:46	0.204	0.333	1.024
July 31, 07:54	0.224	---	0.862
Aug. 09, 07:19	0.151	0.415	---
Aug. 09, 07:46	0.134	0.424	---
Mean	0.17 ± 0.02	0.32 ± 0.03	0.88 ± 0.04

In all cases, the magnitudes are based on unfiltered CCD-camera images made by Ed Grafton

Conclusions

My conclusions regarding the Remote Planets in 2004 are:

1. The V-filter magnitude of Uranus continued its dimming trend whereas Neptune's V-filter magnitude has remained nearly constant over the last five years.
2. The R-filter magnitude of Uranus is much dimmer than it was in the early 1990s.
3. Pluto's normalized V-filter magnitude over the last four years is close to the literature value.
4. Pellier imaged a bright South Polar Region on Uranus at red and near-infrared wavelengths.

References

Alexander, A. F. O'D (1965) *The Planet Uranus: A History of Observation, Theory and Discovery*. New York: American Elsevier Publishing Company, Inc.

British Astronomical Association, Computing Section (2003) *The Handbook of the British Astronomical Association 2004*. London: The British Astronomical Association.

Cross, E. W. Jr. (1969) "Some Visual Observations of Markings on Uranus." *Journal of the Association of Lunar & Planetary Observers*, Vol. 21, No. 9-10 (July), pp. 152-153.

Gupta, R., ed. (2003) *Observer's Handbook 2004*. Toronto: The University of Toronto Press.

Hammel, H. B.; de Pater, I.; Gibbard, S. G.; Lockwood, G. W. and Rages, K. (2005a) "*New cloud activity on Uranus in 2004: First detection of a southern feature at 2.2 mm*." *Icarus*, 175, pp. 284-288.

Hammel, H. B.; de Pater, I.; Gibbard, S.; Lockwood, G. W. and Rages, K. (2005b) "*Uranus in 2003: Zonal winds, banded structure and discrete features*." *Icarus*, 175, pp. 534-545.

Hicks, M. D. and Buratti, B. J. (2004) "*The spectral variability of Triton from 1997-2000*." *Icarus*, 171, pp. 210-218.

Hirshfeld, A., Sinnott, R. W. and Ochsenbein, F. (1991) *Sky Catalog 2000.0* Vol. 1, second edition. Cambridge, MA: Sky Publishing Corporation.

Iriarte, B.; Johnson, H. L.; Mitchell, R. I. and Wisniewski, W. K. (1965). "*Five-Color Photometry of Bright Stars*." *Sky & Telescope*, Vol. 30 (July) pp. 21-31.

Optec Inc. (1997) *Model SSP-3 Solid-State Stellar Photometer Technical Manual for Theory of Operation and Operating Procedures* (Revision three). Lowell MI: Optec, Inc.

Rages, K. A.; Hammel, H. B. and Friedson, A. J. (2004) "*Evidence for temporal change at Uranus' south pole*." *Icarus*, 172, pp. 548-554.

Schmude, R. W. Jr. (2002) "Photometric and Polarimetric Observations of Mars in 2000-2002." *Journal of the Royal Astronomical Society Canada*, Vol. 96, pp. 105-110.

________ (2004) "The Uranus, Neptune and Pluto Apparitions in 2002." *Journal of the Association of Lunar & Planetary Observers*, Vol. 46, No. 4 (Autumn), pp. 47-55.

Shartle, S. M. (1968) "The Ellipticity of Uranus." *Journal of the Association of Lunar & Planetary Observers*, Vol. 20, No. 11-12 (March), pp. 197-200.

Sinnott, R. W. and Perryman, M. A. C. (1997) *Millennium Star Atlas*. Cambridge MA: Sky Publishing Corp.

Sromovsky, L. A. (2005) "Accurate and approximate calculations of Raman scattering in the atmosphere of Neptune." *Icarus*, 173, pp. 254-283.

United States Naval Observatory (2002-2004). *Astronomical Almanac for the Year 2003-2005*. Washington: US Govt. Printing Office. Published annually; the 2003-2005 editions were used, each published in the previous year.

ALPO Resources

People, publications, etc., to help our members

Board of Directors

- Executive Director; Julius L. Benton, Jr., Associates in Astronomy, P.O. Box 30545, Wilmington Island, Savannah, GA 31410
- Associate Director; 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; Michael D. Reynolds, associate dean, Math & Science, Florida Community College, 3939 Roosevelt Blvd, E-345, Jacksonville, FL 32205
- Member of the Board; Richard W. Schmude, Jr., 109 Tyus St., Barnesville, GA 30204
- 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
- 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
- Founder/Director Emeritus; Walter H. Haas, 2225 Thomas Drive, Las Cruces, NM 88001

Publications Staff

Publisher & Editor-in-Chief

Ken Poshedly. Send ALL papers, submissions, etc., to 1741 Bruckner Ct., Snellville, GA 30078-2784; e-mail poshedly@bellsouth.net

General Editors

- Editor (General Materials); Robert A. Garfinkle, F.R.A.S., 32924 Monrovia St., Union City, CA 94587-5433
- Editor (General Materials); Roger J. Venable, MD, 3405 Woodstone Pl., Augusta, GA 30909-1844

Science Editors

- Dr. Klaus R. Brasch, Executive Director, Office of Technology Transfer & Professor of Biology, California State University, San Bernardino, 5500 University Parkway, San Bernardino, CA 92407
- Editor; Dr. Richard K. Ulrich, Professor, Dept. of Chemical Engineering, 3202 Bell Engineering Center, University of Arkansas, Fayetteville, AR 72701
- John E. Westfall, P.O. Box 2447, Antioch, CA 94531-2447

Book Review Editor

Jose Olivarez, 4705 SE 14th St., Ocala, FL 34471

Staff Writers

- Eric Douglass, 10326 Tarleton Dr., Mechanicsville, VA 23116-5835
- James S. Lamm, 9341 Whispering Wind Dr., Charlotte, NC 28277
- Richard J. Wessling, 5429 Overlook Dr., Milford, OH 45150-9651

Translators (Acting)

- French Language Submissions; (open)
- 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

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

Historical Section

- Coordinator; Richard Baum, 25 Whitchurch Rd., Chester, CH3 5QA, United Kingdom
- Assistant Coordinator; Thomas A. Dobbins, 305 Northern Spy Circle, Howard, OH 43028

Instruments Section

- Coordinator; R.B. Minton, 568 N. 1st St., Raton, NM 87740
- Assistant Coordinator; Richard J. Wessling, 5429 Overlook Dr., Milford, OH 45150-9651

Lunar and Planetary Training Program

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

Website

- Webmaster; Richard Hill, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721
- Assistant Webmaster; Jonathan D. Slaton, P. O. Box 496, Mansfield, MO. 65704

Youth Section

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

Observing Sections

Solar Section

- Acting Coordinator (including all submissions, photo, sketches, filtergrams) Ms. Kim Hay, 76 Colebrook Rd, RR #1,Yarker, ON, K0K 3N0 Canada
- Assistant Coordinator; Brad Timerson (use e-mail for correspondence, see Internet directory)
- 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

ALPO Resources

People, publications, etc., to help our members

Mercury Section

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

Venus Section

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

Mercury/Venus Transit Section

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

Lunar Section

- Coordinator, Lunar Meteoritic Impacts Search; Brian Cudnik, 11851 Leaf Oak Drive, Houston, TX 77065
- Coordinator, Lunar Transient Phenomena; Anthony Cook, School of Computer Science and Information Technology, University of Nottingham, Jubilee Campus, Wollaton Rd., Nottingham NG8 1BB, United Kingdom
- Assistant Coordinator, Lunar Transient Phenomena; David O. Darling, 416 West Wilson St., Sun Prairie, WI 53590-2114
- Coordinator, Lunar Dome Survey; Marvin W. Huddleston, 2621 Spiceberry Lane, Mesquite, TX 75149
- Coordinator, Lunar Topographical Studies / Lunar Selected Areas Program; William Dembowski, 219 Old Bedford Pike, Windber, PA 15963

Mars Section

- 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

Minor Planets Section

- Coordinator; Frederick Pilcher, 4438 Organ Mesa Loop, Las Cruces, NM 88011.
- Assistant Coordinator; Lawrence S. Garrett, 206 River Road, Fairfax, VT 05454
- Assistant Coordinator; Richard Kowalski, 7630 Conrad Street, Zephyrhills, FL 33544-2729
- Scientific Advisor; Steve Larson, Lunar & Planetary Lab, University of Arizona, Tuscon, AZ 85721

Jupiter Section

- 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 (Section); Damian Peach, 466 Vardon Rd., Stevenage, Herts. SG1 5BJ United Kingdom
- Acting Assistant Coordinator (Section); Dr. P. Clay Sherrod, Arkansas Sky Observatory, Conway Offices, 794 Drake Drive, Conway, AR 72034
- Assistant Coordinator & Scientific Advisor; Sanjay Limaye, University of Wisconsin, Space Science and Engineering Center, Atmospheric Oceanic and Space Science Bldg. 1017, 1225 W. Dayton St., Madison, WI 53706
- Assistant Coordinator, Transit Timings; John McAnally, 2124 Wooded Acres, Waco, TX 76710
- Assistant Coordinator, Newsletter; Craig MacDougal, 821 Settlers Road, Tampa, FL 33613
- Assistant Coordinator, Galilean Satellites; John E. Westfall, P.O. Box 2447, Antioch, CA 94531-2447
- Scientific Advisor; Prof. A. Sanchez-Lavega, Dpto. Fisica Aplicada I, E.T.S. Ingenieros, Alda. Urquijo s/n, 48013, Bilbao, Spain wupsalaa@bicc00.bi.ehu.es

Saturn Section

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

Remote Planets Section

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

Comets Section

- Acting Coordinator; Ted Stryk, 6211 Tangle Grove Lane, Powell, TN 37849
- Assistant Coordinator; Gary Kronk, 132 Jessica Dr, St. Jacob, IL 62281-1246

Meteors Section

- Coordinator; Robert D. Lunsford, 161 Vance Street, Chula Vista, CA 91910
- Assistant Coordinator; Robin Gray, P.O. Box 547, Winnemuca, NV 89446

Meteorites Section

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

Eclipse Section

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

ALPO Publications:

The Monograph Series

ALPO monographs are publications that we believe will appeal to our members, but which are too lengthy for publication in *The Strolling Astronomer*. They should be ordered from *The Strolling*

ALPO Resources

People, publications, etc., to help our members

Astronomer science editor (P.O. Box 2447, Antioch, CA 94531-2447 U.S.A.) for the prices indicated, which include postage. Checks should be in U.S. funds, payable to "ALPO".

- **Monograph Number 1.** *Proceedings of the 43rd Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, August 4-7, 1993.77* pages. Price: $12 for the United States, Canada, and Mexico; $16 elsewhere.
- **Monograph Number 2**. *Proceedings of the 44th Convention of the Association of Lunar and Planetary Observers. Greenville, South Carolina, June 15-18, 1994.52* pages. Price: *$7.50* for the United States, Canada, and Mexico; $11 elsewhere.
- **Monograph Number 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 Number 4.** *Proceedings of the 45th Convention of the Association of Lunar and Planetary Observers. Wichita, Kansas, August 1-5, 1995.127* pages. Price: $17 for the United States, Canada, and Mexico; $26 elsewhere.
- **Monograph Number *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. Price: $10 for the United States, Canada, and Mexico; $15 elsewhere.
- **Monograph Number *6.*** *Proceedings of the 47th Convention of the Association of Lunar and Planetary Observers, Tucson,*

ALPO Staff E-mail Directory

Benton, J.L.	jlbaina@msn.com
Brasch, K.R.	kbrasch@csusb.edu
Baum, R.	richardbaum@julianbaum.co.uk
Cook, A.	acc@cs.nott.ac.uk
Cudnik, B.	cudnik@sbcglobal.net
Darling, D.O.	DOD121252@aol.com
Dembowski, W.	dembowski@zone-vx.com
Dobbins, Tom	r&d@organictech.com
Douglass, E.	ejdftd@mindspring.com
Garfinkle, R.A.	ragarf@earthlink.net
Garrett, L.S.	LSGasteroid@msn.com
Gossett, R.	rick2d2@sbcglobal.net
Grafton, E.	egrafton@ghg.net
Gray, R.	sevenvalleysent@yahoo.com
Haas, W.H.	haasw@zianet.com
Hay, K.	kimhay@kingston.net
Hill, D.	dhill@lpl.arizona.edu
Hill, R.	rhill@lpl.arizona.edu
Hines, D.	cmpterdevil@hotmail.com
Huddleston, M.W.	kc5lei@sbcglobal.net
Jenkins, J.	jenkinsjl@yahoo.com
Joyce, D.	djoyce@triton.edu
Kowalski, R.	RAK@bitnik.com
Kronk, G	kronk@amsmeteors.org
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@prodigy.net
McAnally, J.	CPAJohnM@aol.com
McKim, R.J.	rmckim5374@aol.com
Melillo, F.	frankj12@aol.com
Minton, R.B.	r_b_minton@yahoo.com
Olivarez, J.	olivarezhsd@earthlink.net
Parker, D.C.	park3232@bellsouth.net
Peach, D.	dpeach_78@yahoo.co.uk
Pilcher, F.	pilcher@hilltop.ic.edu
Poshedly, K.	poshedly@bellsouth.net
Reynolds, M.	Astrogator90@comcast.net
Robertson, T.J.	cometman@cometman.net
Sanchez-Lavega, A.	wupsalaa@bicc00.bi.ehu.es
Sanford, J.	starhome@springvillewireless.com
Santacana, G.E.	laffitte@prtc.net
Schmude, R.W.	schmude@gdn.edu
Sherrod, C.	drclay@arksky.org
Slaton, J.D.	jd@justfurfun.org
Stryk, T.	tedstryk@preferred.com
Timerson, B.	btimerson@rochester.rr.com
Troiani, D.M.	dtroiani@triton.edu
Ulrich, R.K.	rulrich@uark.edu
Venable, R.J.	rjvmd@knology.net
Wessling, R.J.	pinesop@aol.com

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 and your own e-mail program will open 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

Arizona, October 19-21, 1996.20 pages. Price $3 for the United States, Canada, and Mexico; $4 elsewhere.

- **Monograph Number 7.** *Proceedings of the 48th Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, June 25-29, 1997.76* pages. Price: $12 for the United States, Canada, and Mexico; $16 elsewhere.
- **Monograph Number 8**. *Proceedings of the 49th Convention of the Association of Lunar and Planetary Observers. Atlanta, Georgia, July 9-11,1998.122* pages. Price: $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. Price: $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. Price: $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 Cordinator and Arhivist Jamey Jenkins, this publication replaces *Observe and Understand the Sun* and its predecessor, *The Association of Lunar& Planetary Observer's Solar Section Handbook for the White Light Observation of Solar Phenomena*, both by the ALPO's own Rik Hill. To order, send check or US money order made payable to Jamey Jenkins, 308 West First Street, Homer, Illinois 61849; e-mail to jenkinsjl@yahoo.com

- **Lunar and Planetary Training Program:** *The Novice Observers Handbook* $15. An introductory text to the training program. Includes directions for recording lunar and planetary observations, useful exercises for determining observational parameters, and observing forms. Send check or money order payable to Timothy J. Robertson, 2010 Hillgate Way #L, Simi Valley, CA 93065.

- **Lunar (Benton):** (1) *The ALPO Lunar Section's Selected Areas Program (*$17.50). Includes full set of observing forms for the assigned or chosen lunar area or feature, along with a copy of the *Lunar Selected Areas Program Manual.* (2) *Observing Forms,* free at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/selarea.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 harryjam@hotmail.com or 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.lpl.arizona.edu/~rhill/alpo/venustuff/venusfrms.html* or $10 for a packet of forms by regular mail (specify *Venus Forms).* To order either numbers (1) or (2), send a check or money order payable to "Julius L. Benton, Jr." All foreign orders should include $5 additional for postage and handling; p/h included in price for domestic orders. Shipment will be made in two to three weeks under normal circumstances. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Venus section. Observers should make copies using high-quality paper.

- **Mars:** *(1) ALPO Mars Observers Handbook,* send check or money order for $15 per book (postage and handling included) to Astronomical League Sales, c/o Marion M. Bachtell, P.O. Box 572, West Burlington, IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. *(2) Observing Forms;* send SASE to obtain one form for you to copy; otherwise send $3.60 to obtain 25 copies (send and

ALPO Resources

People, publications, etc., to help our members

make checks payable to “Deborah Hines").

- **Jupiter:** *(1) Jupiter Observer’s Handbook*, $15 from the Astronomical League Sales, c/o Marion M. Bachtell, P.O. Box 572, West Burlington, IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. (2) *Jupiter*, the ALPO section newsletter, available onlineonly via the ALPO website; (3) *J-Net*, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougal. (4) *Timing the Eclipses of Jupiter’s Galilean Satellites* observing kit and report form; send SASE to John Westfall. (5) *Jupiter Observer’s Startup Kit*, $3 from the Richard Schmude, Jupiter Section coordinator.

- **Saturn (Benton):** (1) *ALPO Saturn Observing Kit*, $20; includes introductory description of Saturn observing programs for beginners, a full set of observing forms, and a copy of *The Saturn Handbook*. Newly released book *Saturn and How to Observe It* (by J. Benton) replaces to *The Saturn Handbook* in early 2006. (2) *Saturn Observing Forms*, free at *http://www.lpl.arizona.edu/~rhill/alpo/satstuff/satfrms.html* or $10 by regular mail. Specify *Saturn Forms.* NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Saturn section.

- **Meteors:** (1) *The ALPO Guide to Watching Meteors* (pamphlet). $4 per copy (includes postage & handling); send check or money order to Astronomical League Sales, c/o Marion M. Bachtell, P.O. Box 572, West Burlington, IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. (2) *The ALPO Meteors Section Newsletter*, free (except postage), published quarterly (March, June, September, and December). Send check or money order for first class postage to cover desired number of issues to Robert D. Lunsford, 1828 Cobblecreek St., Chula Vista, CA 91913-3917.

- **Minor Planets (Derald D. Nye):** *The Minor Planet Bulletin*. Published quarterly; free at *http://www.minorplanetobserver.com/mpb/default.htm* or $14 per year via regular mail in the U.S., Mexico and Canada, $19 per year elsewhere (air mail only). Send check or money order payable to “Minor Planet Bulletin” to Derald D. Nye, 10385 East Observatory Dr., Corona de Tucson, AZ 8564I-2309.

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 witrh 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)***. Many of the 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. The price is $4 for each back issue; the current issue, the last one published, is $5. We are always glad to be able to furnish old issues to interested persons and 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,” on page 46):

- $4 each:

Vol. 7(1953), Nos. 3 and 10
Vol. 8(1954), Nos. 7-8
Vol. 11(1957), Nos. 11-12
Vol. 16(1962-63), Nos. 1-2, 3-4, 5-6, 7-8, 9-10, and 11-12.
Vol. 17(1963-64), Nos. 1-2, 3-4, 5-6, 7-8, 9-10, and 11-12.
Vol. 18(1964-65), Nos. 1-2, 3-4, 5-6, 7-8, 9-10, and 11-12.
Vol. 19(1965-66), Nos. 1-2, 3-4, 5-6, 7-8, 9-10, and 11-12.
Vol. 21(1968-69), Nos. 3-4 and 7-8
Vol. 23(1971-72), Nos. 7-8 and 9-10
Vol. 24(1972-74), Nos. 7-8
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) Nos. 2 and 4
Vol. 37(1993-94) No. 1
Vol. 38(1994-96) Nos. 1 and 3
Vol. 39(1996-97) Nos. 1, 3 and 4
Vol. 40(1998) No. 2
Vol. 41(1999) No. 4
Vol. 42(2000-01) Nos. 1, 2, 3 and 4
Vol. 43(2001-02) Nos. 1, 2, 3 and 4
Vol. 44(2002) . Nos. 1, 2, 3, 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. 1, 2, 3 and 4.
Vol. 48(2006), No. 1

$5 each:
Vol. 48(2006), No. 2 (current issue)

THE ASSOCIATION
OF LUNAR & PLANETARY OBSERVERS (ALPO)

The Association of Lunar and 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. Out web site is hosted by the Lunar and Planetary Laboratory of the University of Arizona which you are encouraged to visit at http://www.lpl.arizona.edu/alpo/. 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 the Journal. The ALPO offers a printed version of the Journal that is mailed out quarterly. An identical digital (portable document file, or pdf) version is available over the internet at reduced cost.

Subscription rates and terms are listed below (effective March 1, 2006).

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

$US120 – Sponsor 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
$US50 – 8 issues of the paper Journal only, USA, Mexico and Canada
$US28 – 4 issues of the paper Journal only, USA, Mexico and Canada
$US64 – 8 issues of the paper Journal only, all other countries
$US35 – 4 issues of the paper Journal only, all other countries
$US19 – 8 issues of the digital Journal only, all countries, e-mail address required
$US11 – 4 issues of the digital Journal only, all countries, e-mail address required

For your convenience, you may join online via the World Wide Web (includes small service fee), or by completing the form below.

To join online, go to the Astronomical League web page that has the ordering information and entry page at: *http://www.ec-securehost.com/AstronomicalLeagueSales/ALPO_Membership.html* Afterwards, e-mail the ALPO membership secretary at *will008@attglobal.net* with your name, address, and 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 U.S.A.

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)