ISSN-0039-2502

# Journal of the Association of Lunar & Planetary Observers

Founded in 1947

## *The Strolling Astronomer*

**Volume 48, Number 1, Winter 2006**

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

***Inside. . .***

- ***A new way to classify planets***
- ***Mike Mattei's Little Planetary Observatory***
- ***Solar Report: Carrington Rotations 2025 - 2030***
- ***Using lunar shadows for height determinations***

Ah . . . Crater Clavius at sunrise! See page 37 for details about this superb image.

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

# Journal of the Association of Lunar & Planetary Observers

## The Strolling Astronomer

Volume 48, No. 1, Winter 2006
This issue published in February 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

## Inside the ALPO
# Member, section and activity news

## Association of Lunar & Planetary Observers (ALPO)



## Point of View
# Greetings from the Solar Section !!

*By Kim Hay, acting ALPO Solar Section Coordinator*

As with everyone who has been bitten by the astronomy bug, it hits them at an early age. The wonder and awe-inspiring views of the night skies. Whether they acted on it when young, or let it sit in the back of their minds for years, I was the latter. I loved the dark summer nights on my aunt's farm, the Milky Way and how it touched from horizon to horizon, the arch in the sky, the planets, meteors, and glow of the Moon, the warmth of the Sun — this is where I felt right at home.

I never pursued my touch of the astronomy bug until much later in life, but then I dove in head first! I received my first telescope as a gift, over 20 years ago. It was a Bausch & Lomb 60mm reflector (I still have it) but it worked well — better than the Tasco scopes of the day. With it, I gazed at my first view of Jupiter and its moons — I could even make out the equatorial bands. It was such an awesome view to see and know that this planet is part of our universe.

It was not long before I purchased a used, 4-in. SCT, a Bausch & Lomb scope that came with a Thousand Oaks solar filter, and I was hooked on solar observing. Why have all the fun at night when daytime is awesome, too? That was well over 15 years ago, and I have not stopped or slowed down since. Over the years, star parties that whet your appetite for larger

Continued on page 12.

# Inside the ALPO
# Member, section and activity news

## News of General Interest

### ALPO 2006: Call for Papers!!!

The 2006 conference of the Association of Lunar & Planetary Observers will be held Thursday, Friday, Saturday, July 20, 21 and 22, in Atlanta, Georgia, specifically at the Fernbank Science Center.

Lodging for those arriving from out-of-town has been being arranged at nearby Emory University; attendees may also arrange for their own lodging elsewhere.

The primary purpose of this conference is for the presentation of papers which contain experimental results or current data on solar system astronomy.

This event is open to ALL. At this time the pre-registration fee is expected to be around $30, with the walk-in fee higher. Also, the final registration fees are subject to change as all event costs are ascertained; the Emory University lodging fees are expected to be somewhere near $30 per person.

Papers are sought for all areas of solar system astronomy. Topics of interest include, but are not limited to:

- Recommended observing methods and techniques (elementary and advanced, traditional and new)
- Interesting solar system object
- Computer hardware/software to optimize solar system observing
- Instrumentation used for lunar and planetary imaging, videography, or routine visual work
- Historical observations of particular relevance
- On-going and future opportunities for Pro-Am (professional-amateur) collaboration
- Value of continued systematic, simultaneous lunar and planetary visual observations

Papers must be accompanied by an abstract of no more than 100 words. The abstracts should include

- A description of the topic
- The results or conclusions obtained
- Additional background and other relevant information

Abstracts may also contain reference to supporting figures, tables, and other graphics. The abstract must include:

- Paper title
- Authors' names and affiliations
- Address
- Telephone number
- Fax number
- E-mail address

NO PAPER WILL BE CONSIDERED FOR PRESENTATION OR PUBLICATION THAT HAS BEEN PRESENTED OR PUBLISHED ELSEWHERE.

Two copies of the abstract as described above should be submitted to Ken Poshedly (address info in *ALPO Resources* section of this Journal). Deadline for submission of the abstract is June 15, 2006.

A special ALPO conference lunar & planetary imaging demo session will be held on Saturday morning of the conference. Led by ALPO member Larry Owens, the program will feature the use of the Registax 3.0 for stacking and preliminary processing of webcam-acquired images, along with post-processing techniques to use in your own graphics program (Adobe *PhotoShop*, Corel *PhotoPaint*, etc.).

## 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.

## Inside the ALPO
# Member, section and activity news

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/

Objects covered in the demo will include the Moon (between Last Quarter and New Moon at that time), as well as those planets up for nighttime viewing in mid-late July; this includes Venus, Mars, Jupiter, Neptune, Uranus and Pluto.

A free pdf version of Mr. Owens' presentation will be made available to all who attend this demo; even though tutorials are available online, the presence of other individuals who can assist with questions at the conference is a major advantage to this demo versus working through it on your own.

Registration materials will be available shortly in two ways:

- On the ALPO website
- By a third-class mailing

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

### Dues Change

This is your reminder, folks. Faced with rising postal and production costs for this Journal, the ALPO board of directors voted at its 2005 meeting to adjust the ALPO dues structure accordingly.

### Announcing a New ALPO Solar Handbook

**By Kim Hay, acting coordinator, ALPO Solar Section**

The ALPO Solar Section is pleased and excited to announcethe release of the new ALPO Solar Section Handbook, "The Association of Lunar and Planetary Observers Solar Section - Guidelines for the Observation and Reporting of Solar Phenomena". The task of producing this new guide was undertaken by Jamey Jenkins, assistant coordinator and archivist, and who works with new ALPO solar observers.

This new publication has up-to-date techniques, many pictures, and links to many solar references.

In the past history of the ALPO Solar Section, there has been one publication that has been used by new solar observers to help them learn about the Sun and observe it safely — "The Association of Lunar& Planetary Observer's Solar Section Handbook for the White Light Observation of Solar Phenomena" by Richard Hill, first published in 1983.

Later, this handbook was replaced by "Observe and Understand the Sun", also written by Richard Hill, and available through the Astronomical League.

The new handbook is a 58-megabyte file (over 100 pages ) and is available on CD for a price of $10 USD. The new handbook is an updated version of the original handbook.

If you are interested in purchasing this CD send check or US money order for $10 USD made payable to Jamey Jenkins and send it to him at 308 West First Street, Homer, Illinois 61849.

He can be reached via e-mail at jenkinsjl@yahoo.com

### Change in Responsibilities for the ALPO Lunar Selected Areas Program

Effective immediately, the ALPO Lunar Selected Areas Program will be absorbed into the ALPO Lunar Topographical Studies Program headed by Acting Lunar Coordinator, Mr. Bill Dembowski.

This change is being made at the request of Dr. Julius L. Benton, Jr., who has been in charge of the Section for several decades, but must now focus on managing the significantly increased demands of the ALPO Saturn and Venus Sections as well as his duties as ALPO Executive Director. The ALPO Selected Areas Program also includes the Bright and Banded Craters and Dark Haloed Craters Programs.

As many of you know, Bill has been a dedicated ALPO contributor for many years, and his lunar expertise and experience speaks for itself, and there is no doubt that the Selected Areas Program will remain in good hands. Bill will be issuing an announcement soon as to the future plans he has for the overall programs.

As a result of this change, all observations and images, as well as communications concerning the ALPO Lunar Selected Areas Program, should be directed to: William M. Dembowski, FRAS, 219 Old Bedford Pike, Windber, PA 15963-8905; e-mail to: dembowski@zone-vx.com

The ALPO Lunar SAP Yahoo groups page will be updated shortly to reflect the changes made as a result of this communication.

I wish to thank all of the observers, past and present, who have faithfully contributed observations in the form of drawings and images to the ALPO Selected Areas Program.

# Inside the ALPO
# Member, section and activity news

## 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.

## Yes, We're FINALLY Current

This IS your Winter JALPO!

## ALPO Secretary / Treasurer's Report

**By Matthew L. Will, ALPO Secretary and Treasurer**

From time to time, ALPO members inquire about ALPO membership policies and their current membership status. The Secretary is always happy to assist members and to answer their questions about the ALPO and their memberships.

### Membership Issues

One frequent question that I'm asked by members has to do with membership duration. The length of ALPO Membership is based on the number of issues one purchases of the Journal ALPO and not based on duration of time. So if a person pays for 4 issues of the Journal ALPO, that person will receive 4 issues, no more, no less, regardless of the time interval under which they are produced. At times it may take more than 12 months to produce 4 issues of the Journal, even though the A.L.P.O. tries to maintain a quarterly publishing schedule. Conversely, the Journal is now on an accelerated schedule to make up for lost time. Only two issues were produced last year. So if a member joined or renewed in January of this year and paid for the next 4 issues, (Volume 47, Numbers 3 and 4, and Volume 48, Number 1, and 2), his or her membership would expire with the release of issue Volume 48, Number 2, being released some time in the middle of this year. So the member would still receive the four issues he or she paid for, but the member would not be entitled to an unlimited number of issues over the course of a year. The ALPO would go broke if the latter terms prevailed!

Some members get irritated over receiving repeated renewal notices that are distributed by the Secretary seemingly after the members have paid for their renewal. This happens quite a bit to members that purchase memberships online through the Astronomical League's web site. Unfortunately, it's not possible for the ALPO to have instantaneous communications with the League when purchases of ALPO memberships our made. Copies of receipts for online purchases for ALPO memberships are periodically sent by the League, to the Secretary. The Secretary can only process and update memberships when he receives the receipts from the League. This means that there will be some period of time before an online membership payment is acknowledged and may result in an extra renewal notice being generated and directed to a member, before online purchase receipts are received and a member's membership records can be updated. Also, there are lag times during the printing and mailing of the paper version of the Journal, on the order of weeks. Members will send in late renewals answering previous renewal notices after final renewal notices are inserted into paper Journals, at the printing plant. Some may find the repetitive nature of these notices to be obtrusive. However, the ALPO tries to give its members every opportunity to renew and we would rather send too many renewal notices than not notifying our members enough about their expirations. Please disregard these notices if you have paid. You can get in touch with the Secretary at any time, via email or post, to ask about your membership status or to inform him about your online renewal. The Secretary will send out an acknowledgment and a membership card as soon as possible to confirm your renewal with the ALPO.

### Outreach

Outreach is an issue that the Secretary has worked on for some time now. I'm pleased to report that the ALPO now has several tools that can help promote our organization. The Secretary has used several of these products to familiarize non members with the ALPO, at star parties and other gatherings. Staff and members are likewise welcome to use these materials at similar venues. Below are what the ALPO has to offer in assisting those wanting to make the ALPO's mission, known:

- **Color Trifold Brochure** — The ALPO has produced a color brochure introducing the ALPO to non members and inviting them to join. This brochure is available from the Secretary.

- **Exploring the Solar System With the ALPO** — This wonderful booklet is edited by longtime member and former ALPO coordinator Leonard Abbey. Lenny has compiled written descriptions and explanations of the various observing programs from the section coordinators that manage them. It is viewable online through the ALPO web site and is also available for distribution in hard copy.

## Inside the ALPO
# Member, section and activity news

- **Various Information Sheets** — The ALPO has produced various introductory information sheets encouraging novices to consider participation in our training program for visual observation and informing them of the observational capabilities from the simplest optical aids, to highly advanced instrumentation. These sheets are available from the Secretary.

- **Media Presentation** — The ALPO has recently produced a Powerpoint presentation about the mission, programs, services, and accomplishments of our organization. In addition to colorful and descriptive slides, it's loaded with hidden detailed notes, to assist anyone wanting to do a presentation about the ALPO to a local astronomy club meeting, star party, or similar gathering. This presentation is just another way of getting our word out. It can be downloaded for free from the ALPO web site or obtained on a compact disc from the Secretary for a nominal fee of $5.00. The fee for the CD can be waived if you can report to the Secretary where and when you plan to give your talk about the ALPO.

The ALPO continues to grow and expand in its coverage of the Solar System and in membership numbers. Our membership is now hovering between 550 and 600 members. Nearing half of the current membership joined the ALPO in the last five years, AFTER the Journal became available in electronic format. More than half of our members accept only the digital Journal. With these few facts, one can clearly see that the ALPO is an organization that has kept up with the times, and that the ALPO's mission and programs are still as relevant as they ever were, in today's science of lunar and planetary astronomy.

Listings of ALPO Sponsors, Sustaining Members, and Newest Members are provided later in this section.

### 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.

## Interest Section Reports

### Computing Section

**By Kim Hay, coordinator**

The Computer Section has seen recent activity with new members joining (up to 241) and the newly uploaded WIMP files by Jeff Beish. But Jeff does have this to say about the new WIMP files:

"An error in computer program coding has caused the Central Meridians of three systems of Saturn to subtract 180 degrees suddenly on 2005-09-04 at 02:08 UT. Information pertaining to the physical ephemeris for Saturn is at best difficult to find and since professional researchers use only CM-III, the other two systems have been dropped from their publications. The old problem of finding the correct quadrant during an inverse tangent creeps in here and Saturn took so long to reach the problems point in the equation for computing the central meridians that I neglected to test it after Y2K problems were corrected.

"So, the error went unchecked until Don Parker asked me why the CMs for Saturn in the WIMP program were 'way off.' The CMs can be found by a variety of methods and may be quite accurate, but this is the method I chose back in the early 1980's and since retiring, I am not inclined to change old programs unless they present gross errors. As a former employee of the USNO, I talked with several people who formulated the ephemeris for the planets and they all seemed to say the same thing, 'your programs are just as good as ours – computing the ephemeris is more art that science.'

"To compute the central meridians one must first solve the Right Ascension (A0) and Declination (D0) of the north pole of Saturn at the beginning of the year referred to the mean equinox of the date:

TT = Julian Day - 2452545, then; A0 = 40.66 + 0.0001182 * TT and D0 = 83.69 + 0.0000116 * TT, and DT = Delta time (65 seconds for 2006) is added to correct for the rotation during the light time from Saturn to Earth. NOTE: RAD = PI/180.

The current Right Ascension (RA), Declination (DC) and Distance from Saturn from Earth (DA) is computed from complex equations (not discussed herein) and the erroneous routine used in WIMP was as follows:

```
K0 = (Sin(RAD * D0) * Cos(RAD * (A0 - RA)) - Cos(RAD *
D0) * Tan(RAD * DC))/ Cos(RAD * (A0 - RA))
K0 = Atn(K0) / RAD
If K0 < 0 Then K0 = K0 + 180
```

The new routine is as follows:

## Inside the ALPO
# Member, section and activity news

K1 = Sin(RAD * D0) * Cos(RAD * DC) * Cos(RAD * (A0 - RA)) - Sin(RAD * DC) * Cos(RAD * D0)
K2 = Cos(RAD * DC) * Sin(RAD * (A0 - RA))
K0 = Atn(K1 / K2) / RAD
If K2 < 0 Then K0 = K0 + 180

And used in the following equations:

CMI = 227.2 + 844.2999153 * (TT - DA / 173) - K0 + 0.00977 * DT
Call NORM(CMI)

CMII = 104.82 + 811.9999153 * (TT - DA / 173) - K0 + 0.0094 * DT
Call NORM(CMII)

CMIII = 38.93 + 810.7938177 * (TT - DA / 173) - K0 + 0.00938 * DT
Call NORM(CMIII)

NOTE: The NORM function corrects for angles at or above 360 degrees.

Please check out these files and more at www.yahoo.com and join the ALPOCS group.

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**

In December 2004, I obtained Internet access at home. My e-mail address is: r_b_minton@yahoo.com; and I also have a web site – it's URL is *http://mypeoplepc.com/members/patminton/astrometric_observatory* . My Internet Service Provider is very slow and I cannot send e-mail more than a few lines long per message – the service terminates while typing the message. So I urge all to PLEASE communicate by mail.

Although I had a sizeable article (10 pages) about webcam imagery in the Vol. 47, No. 1, (Winter 2005) issue of the JALPO, I received no comments or questions from ALPO members. This reinforces my opinion that the ALPO has a sizeable contingent of couch potatoes.

On the positive side, my web site has pages on how to build a meteor camera, a Schmidt camera, how to hyper film, and build a simple radiotelescope. I have also posted computer programs, formulas, links, equipment reviews; and many photographs taken with webcams and CCD's. The photos include relevant data to assist the reader in choosing their own imaging system. The computer programs have been downloaded by Ms. Kim Hay to include in the Computing Section archive. She is also interested in radioastronomy, and I mailed her a spare low-noise amplifier to help in that effort.

I imaged comet Machholz C/2004 Q2 with the Meade Deep Sky Imager (DSI) 1-shot color CCD camera, and contributed them to Mr. Ted Stryk of the Comets Section. He is pleased with the timeliness and quality of the observations. I was also a member of the Small Telescope Science Program (STSP) in 2005, an association of amateur and professional astronomers who are supplying the University of Maryland with images of comet Tempel 1. These images will aid NASA, JPL, and others in determining the consequences of hitting this comet with an impactor, the Deep Impact project. I submitted many photographs of Tempel 1, but was unable to observe the impact due to clouds.

My web site also attracted a personal visit by Mr. Richard Schwartz, a man of many talents who is currently manufacturing and selling ribbed mirrors in the range of 6 to 13 inches aperture. He has a kiln to fire his blanks, and can sag the surface to meet the customers desired f/number. For further information email him at: *richas@earthlink.net and visit www.megspace.com/science/sfe*.

I advise readers interested in purchasing a telescope to pay a little extra and get an instrument with enhanced transmission coatings. I evaluated the Meade line of reflectors and found the additional light grasp is cost-effective when translated into an increased equivalent aperture. I am also offering to measure the transmission of filters for ALPO members (with some limitations on filter type and quantity). Both subjects are detailed in papers sent to JALPO Editor & Publisher Ken Poshedly in August 2002 ("Announcing a Free Service to ALPO Members"), and July 2003 ("Low-reflective Coatings are Cost Effective").

I have just finished a 50-page manuscript on nuclear physics (started in mid-2005) which is titled "The Atomic Primer". It

## Inside the ALPO
# Member, section and activity news

has some applicability to astronomy, but I am not soliciting its publication in the JALPO. I will send a free CD-ROM to any ALPO member wishing a copy if they send 3 first-class stamps and tell me what word processor they use. I sent Walter Haas a paper copy a few months ago for his comments, but it was a shorter unfinished version. It covers the basics of atomic physics, includes many equations with solved problems, and has some do-it-yourself projects (using pocket lasers, Geiger counters, scintillation counters, and the like).

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/*

## Observing Section Reports

### Eclipse Section
**By Mike Reynolds, coordinator**

ALPO members and observers are encouraged to submit observations of the 29 March 2006 total solar eclipse for a full report in the Journal, as well as a talk at the Atlanta ALPO meeting in July. Observations submitted can be of several types:

Descriptions of the eclipse phenomena such as:

- diamond ring
- Bailey's Beads
- corona structure
- prominences visible

Descriptions of other eclipse phenomena such as:

- eclipse shadow
- sunrise-sunset horizon colors
- objects visible at totality
- shadow bands

Photographs and images taken during the eclipse; be certain to include data on the image such as lens or telescope, exposure, etc.

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, 604 11th Avenue North, Jacksonville Beach FL 32250; 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**

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

### Comets Section
**By Ted Stryk, acting coordinator**

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

### 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**

I hope many of you are still continuing to observe Mercury. A paper is written up about special observations at 280 degrees west longitude where we might see the darkest feature of unseen surface of Mariner 10 spacecraft. Meanwhile, the MESSENGER spacecraft is still going smoothly, but still a long way off. In Oct. 2006, we will see a first flyby of Venus.

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

# Inside the ALPO
# Member, section and activity news

## Venus Section
**By Julius Benton, coordinator**

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*

## 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**
**acting section coordinator**

The Lunar Topographical Studies Section continues to show high interest in lunar observing among today's amateur astronomers. The Moon has always been a perfect target for beginners, but very often they would lose interest and seek other subjects. Much of their present continuing interest in the Moon can be attributed to digital imaging, especially the introduction of low cost, easy-to-use planetary imagers.

Of the 176 observations received during the past 4 months, 156 (88.6%) were digital images, and many of them were not simply "pretty pictures". Lunar imaging has rapidly proved its value as a tool in such areas as the study of lunar rays, domes, and the determination of lunar heights.

In addition, much work has been done recently in the analysis of surface composition via colorimetric studies. Lunar images from observers with any level of skill and experience are always welcomed and encouraged. Examples of the digital images currently being received can be found in the Lunar Section's monthly newsletter, *The Lunar Observer.*

Now in its 10th year of publication, *The Lunar Observer* can be found at *http://www.zone-vx.com/tlo.pdf* with over a year's worth of back issues archived at *http://www.zone-vx.com/tlo_back.html*

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

### 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 Selected Areas Program: A Request for Observations
**By Julius Benton, coordinator**

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

The past few years have seen an enormous increase in the number of minor planets with reliable rotation periods and amplitudes. Amateur observers in the ALPO Minor Planets Section using differential photometry alone have obtained many of these. However, a number of stubborn cases are emerging which will require special treatment. These are minor planets with possible binary companions, and those with small amplitudes and long periods. Resolving these will require magnitudes reduced to those of standard stars in Landolt and Henden standard star fields. Richard Binzel has published in the *Minor Planet Bulletin* a simplified method of obtaining these with only small reduction in accuracy, and Brian Warner has written software for making the reductions. These are now available in his "Canopus and Connections" (Version 9), and we recommend them to observers.

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*

# Inside the ALPO
# Member, section and activity news

## Galilean Satellite Eclipse Timing Program

**By John Westfall, assistant Jupiter Section 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

## Jupiter Section

**By Richard W. Schmude, Jr., coordinator**

I am right now analyzing the 2004-05 Jupiter data. At the moment, the currents seem to be following the behavior that they had in 2003-04. I measured the brightness and color of Jupiter in early February. Jupiter is near its predicted brightness. Several people have submitted Jupiter images in early 2006. Please continue to send in images. John Rogers pointed out some white-spot activity in the SEB. Please continue to watch this belt for more activity.

Please be sure to send any observations 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*

## Saturn Section

**By Julius Benton, coordinator**

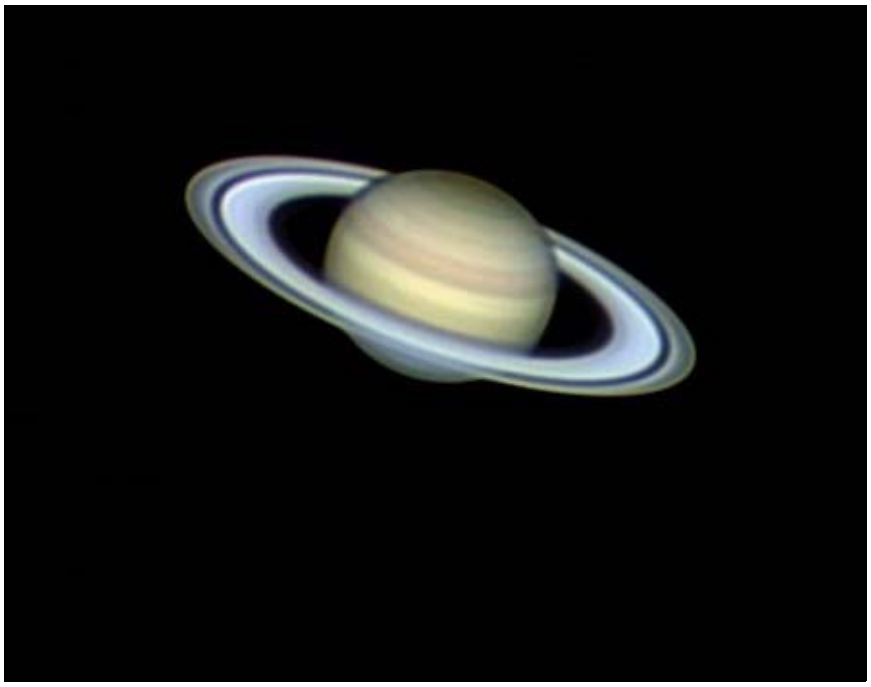
Saturn, situated in the constellation of Cancer and shining at visual magnitude 0.1, reached opposition on 2006 January 27 and is well-placed for viewing throughout the night. The southern hemisphere and south face of the rings remain open to our telescopes, and the rings will reach a maximum inclination to our line of sight of about -20° right after opposition, but will diminish to -16° as the planet reaches opposition to the Sun on 2006 August 7. The globe of Saturn on the date of opposition will be 20".5 across in equatorial diameter and 18".7 in polar diameter, while the major axis of the rings will span 46".4 and the minor axis 15".1.

Observers have already begun submitting visual observations in the form of drawings and visual numerical relative intensity estimates, as well as images captured using CCDs and webcams. As the apparition began, a few observers called attention what appeared to be one or more white spots near the northern edge of the SPR, but these features were apparently short-lived. But, things changed rather dramatically right before opposition.

As a great example of recent Professional-Amateur collaboration, Michael L. Kaiser of NASA's Goddard Space Flight Center in Maryland contacted the ALPO Saturn Section on January 25 to see if any of our observers had by chance reported any unusual atmospheric activity on Saturn on January 23 or 24. The Cassini Radio Astronomy (CRA) team, of which he is a member, had detected a very sudden appearance of Saturn Electrostatic Discharges (SED) around this time. SEDs are actually the radio signatures of lightning flashes, and have been studied by *Cassini* and *Voyager*. Last year, the CRA team successfully correlated some of these SED episodes with a peculiar atmospheric feature detected by the Cassini imaging team (e.g., *http://www.universetoday.com/am/publish/saturn_dragon_storm.html?2522005*).

However, the current series of SED episodes, which in the radio region of the spectrum has been the most intense ever observed, occur when *Cassini* is on the Saturn's backside, so the *Cassini* imaging folks are not observing the cloud tops. The so called "dragon feature" from last year was certainly observable or could be imaged from Earth, so the CRA team suspects whatever storm these current SED events are associated with might be, too. So, so the CRA team has been most interested in any reports of unusual activity on January 23 or 24.

Immediately after being contacted by the Cassini Radio Astronomy (CRA) team, an alert was sent out to ALPO Saturn observers requesting reports of any anomalous phenomena. Our observers did not disappoint. Several individuals responded with images of white spots that were imaged on January 24, just a few days prior to opposition along the northern border of the STeB (South Temperate Belt), protruding into the STrZ (South Tropical Zone), and persisting for several rotations of Saturn.



**Saturn by Jim Fisher.** Taken on 2006 Jan 24 04:06UT in Austin, TX, using a webcam attached to a 25.4 cm (10.0 in) Newtonian. White spot in the STeB protruding into the STrZ is quite obvious. (South at top)

## Inside the ALPO
# Member, section and activity news

An additional white spot was also detected on January 24 that seemed to last for several days, and on February 2, observers reported suspected white ovals in the EZs (Equatorial Zone, Southern half). Needless to say, the CRA team was immensely delighted, remarking that this was exactly the kind of response they were looking for, and that they will be relying on the ALPO Saturn Section for subsequent reports of atmospheric activity. So, Pro-Am cooperation by the ALPO Saturn Section is alive and well again this apparition, and the message here is for ALL Saturn observers to keep imaging and sketching the planet! Some sample images of the recent white spots mentioned above accompany this report.

SPECIAL NOTE FOR IMAGERS: Although virtually everyone normally provides complete supporting data for each observation or image submitted to this forum or to the ALPO Saturn Section, there are a few contributions that lack fundamental information so that we can identify the observer and establish the exact date and time for entry into the database. Therefore, we request that ALL observers provide the following information when submitting images and observational data:

- Date and time (UT).
- Name of the observers and location of the observing site (and observer's mailing and preferred E-Mail address).
- Seeing and transparency estimate.
- Aperture and type of instrument used, magnifications employed, and any filters utilized.
- Description of CCD or webcam, F/ratio, images stacked, exposures, etc.
- CM data (ephemerides are available on the ALPO website).
- Brief descriptive summary of notable features and phenomena.

Imagers are also encouraged to perform visual observations of Saturn on the same night and as close to the same time images were taken. Such visual observations should include comparisons of what was seen visually versus what is apparent on the image, as well as an attempt to perform visual numerical intensity estimates using techniques described in the *ALPO Saturn Handbook* (which has now been superseded by the new book *Saturn and How to Observe It*, available from Springer, Amazon.com, etc.).

As always, the ALPO Saturn Section deeply appreciates the dedication of so many skilled observers who take the time to send us their observations and images, and in particular those who responded in a timely manner to the Pro-Am alert in late January. Some of the results have been truly remarkable, prompting professional astronomers to increasingly 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*

**Saturn by Don Parker**. Taken on 2006 Jan 24 04:14UT in Coral Gables, FL, using a 40.6 cm (16.0 in) Newtonian with a Lumenera 075M Camera and StreamPix Astronomik LRGB filters. White spots in the STeB and SEBZ are visible in the image, as well as several dark features along the N edge of the SEBs and N edge of SSTeB. (South at top)

### Remote Planets Section

**By Richard W. Schmude, Jr., coordinator**

Uranus and Neptune are currently near conjunction but Pluto is visible in the eastern sky before sunrise. I am hoping that people will be able to measure the brightness of Pluto this year. In addition, the moons of Uranus will begin transiting that planet this year. The satellites are large enough to cast dark shadows on Uranus. Let's see who will be the first to image a satellite or a satellite shadow transit Uranus.

In addition to this, a rare event will happen in early July. Essentially two of Uranus' moons will transit each other and this will cause a small (0.2 magnitude) drop in brightness.

More information on this event will be included in the next issue of 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*

## Inside the ALPO
# Member, section and activity news

### Greetings from the Solar Section (continued from page 1)

apertures with the excitement of viewing through others scopes. It's the constant learning and changing of the cosmos that is always rewarding.

We (Kevin Kell , myself and our four cats) have now settled in a small rural dark sky area in Yarker, Ontario Canada. Our observatory, Starlight Cascade Observatory, (on the Worldwide Web at *http://www.starlightcascade.ca* ) has taken us over three years to construct and it still needs work. Trying to create an observatory out of a metal garden shed with a slide-off roof tends to create a few issues, including air holes that even the smallest snowflake or raindrop can find. It's been a learning experience, so Kevin keeps telling me, it's all in good cause for the next observatory, which — if he has his way — will be the size of a

I enjoy my humble pier with my 4-in. SCT, though there is an 8-in. SCT waiting for me somewhere; it has my name on it, it just hasn't called me yet.

Administration work and organization I also enjoy. It's sort of like the counterbalance to the universe which is always in a state of chaos.

I have been the National Secretary for the Royal Astronomical Society of Canada, (RASC, *http://www.rasc.ca*) for the past six years and retired in May 2005. I have also been the archivist for the ALPO Solar Section for close to two years, and enjoy doing this as I get to see the wonderful work that all of the observers do. In addition, I have also been the ALPO Computing Section Coordinator for over two years. Closer to home, I am serving a second year term as the president of the RASC-Kingston Centre, Toronto, (*http://www.rasc.ca/kingston* ) and have held various jobs on that executive over the past 15 years.

Radio astronomy, belonging to the Society of Amateur Radio Astronomers (SARA; *http://www.bambi.net/sara.html* ), the meteor observing with the American Meteor Society (AMS), the North American Meteor Network (NAMN) and the International Meteor Organization (IMO) are also a part of my astronomy regime. Lately, lunar observing has also peaked my interest. I thank Bill Dembowski of the ALPO Lunar Section for his newsletter, *The Lunar Observer*, and all his wonderful help over the last several months. Of course variable stars and planetary work is also a great evening of astronomy.

We have wonderful people working for the ALPO team in all sections. I want to thank the ALPO Board for accepting me as the new Acting General Solar Section Coordinator. I look forward to working with Rik Hill, Jamey Jenkins, Rick Gossett (past Solar Coordinator), Brad Timerson, and Dr. Micheal Williams in this capacity. There is lots of work ahead in the Solar Section, even though we are coming up on the minimum of the Solar Cycle. We currently receive over 80 images for each Carrington Rotation Period, and these images are available to be viewed on the ALPO Solar page (*http://www.lpl.arizona.edu/~rhill/alpo/solar.html* ).

The observers in the ALPO Solar Section are dedicated to the observations of the Sun, either in white light, H-alpha, radiograms (SIDS), magnetograms, filtergrams, or sketching (which is an art in itself).

More reporting on the solar rotation periods, yearly summaries and more communication with the members of the ALPO Solar Section and the entire ALPO team is a goal for the future, and I hope that you are all a part of it. Thank you for letting me use some space of *The Strolling Astronomer* to introduce myself to you, and I hope the days and nights ahead are clear. Happy viewing!!

## *Inside the ALPO*
# *Member, section and activity news*

### Sponsors (those giving $120 or more per membership)

| Sponsor | City | State |
|---|---|---|
| Dr Julius L Benton, Jr | Savannah | GA |
| Henry "Hank" Bulger | Grants | NM |
| Charles L Calia | Ridgefield | CT |
| Kurt Casby | Saint Paul | MN |
| Craig Counterman | Wakefield | MA |
| Thomas Deboisblanc | Westlake Village | CA |
| William Dembowski | Windber | PA |
| Leland A Dolan | Houston | TX |
| Robert E Dunn | Floral Park | NY |
| Barbara G Harris | New Smyrna Beach | FL |
| Roy A Kaelin | Flossmoor | IL |
| John W Mc Anally | Waco | TX |
| Donald C Parker | Coral Gables | FL |
| Berton & Janet Stevens | Las Cruces | NM |
| Roger J Venable | Augusta | GA |
| Gerald Watson | Cary | NC |
| Matthew Will | Springfield | IL |
| Christopher C Will | Springfield | IL |
| Thomas R Williams | Houston | TX |

## *Inside the ALPO*
# *Member, section and activity news*

### Sustaining Members (those giving $60 per membership)

| Sustaining Member | City | State | Country |
|---|---|---|---|
| Raffaello Braga | Milano | | Italy |
| Klaus R Brasch | Highland | CA | |
| Eugene W Cross, Jr | Fremont | CA | |
| Daniel Del Valle | Aguadilla | PR | |
| Anthony J Di Frances | Milwaukee | PR | |
| Mike Dillon | Minneapolis | MN | |
| Howard Eskildsen | Ocala | FL | |
| T Wesley Erickson | Warner Springs | CA | |
| Denis Fell | Edmonton | AB | Canada |
| Richard R Fink | Brick | NJ | |
| Bill Flanagan | Houston | TX | |
| Richard G Fosburg | Palm Desert | TX | |
| Geoff Gaherty | Coldwater | CA | Canada |
| Gordon Garcia | Bartlett | IL | |
| Robert A Garfinkle, Fras | Union City | CA | |
| Robin Gray | Winnemucca | NV | |
| David M Griffee | Indianapolis | IN | |
| Tom Harrison | Ft Worth | TX | |
| Robert H Hays | Worth | IL | |
| Dr John M Hill, Ph D | Tucson | AZ | |
| Mike Hood | Kathleen | GA | |
| David A Hurdis | Narragansett | RI | |
| Vince Laman | Laguna Niguel | CA | |
| James (Jim) S Lamm | Charlotte | NC | |
| Francisco Lao, Jr | Deerfield Township | OH | |
| David J Lehman | Fresno | CA | |
| June C Loertscher | Janesville | WI | |
| Gregory Macievic | Camden | OH | |
| Robert Maxey | Summit | MS | |
| Miami Valley Astronomical Society | Dayton | MS | |
| Dr Arthur K Parizek | Rio Verde | AZ | |
| R Brad Perry | Yorktown | VA | |
| Cecil C Post | Las Cruces | VA | |
| Mike D Reynolds | Jacksonville | FL | |
| Tim Robertson | Simi Valley | CA | |
| Takeshi Sato | Hatsukaichi City | CA | Japan |
| Mark L Schmidt | Racine | WI | |
| Lee M Smojver | Tukwila | WA | |
| Robert Stock | Drexel Hill | PA | |
| Joel Warren | Amarillo | TX | |

## *Inside the ALPO*
# *Member, section and activity news*

## Lifetime Members

The ALPO would like to recognize our lifetime members. These members have been with the ALPO for 40 consecutive years or more and/or have contributed to the ALPO in various capacities, strengthening the ALPO into the organization that it is today. A special thanks goes to John and Elizabeth Westfall for their recent $100 contribution. Thank you all!

| Lifetime Member | City | State | Country |
|---|---|---|---|
| Astronomisches | Heidelberg | | Germany |
| Richard M Baum | Chester | | United Kingdom |
| Phillip W Budine | Binghamton | NY | |
| Winifred S Cameron | Sedona | AZ | |
| Thomas A & Mary Cragg | Coonabarabrann | NSW | Australia |
| Kennth J Delano | Taunton | MA | |
| Daniel Green | Cambridge | MA | |
| Walter H Haas | Las Cruces | NM | |
| Richard & Dolores Hill | Tucson | AZ | |
| Chen Dong Hua | Gulangyu Xiamen | | China |
| Harry D Jamieson | Cheyenne | WY | |
| Michael Mattei | Littleton | MA | |
| Raymond F Missert | Buffalo | NY | |
| Allen C Montague | Greensboro | NC | |
| Michael J Morrow | Ocean View | HI | |
| James Phillips | Charleston | SC | |
| Elmer J Reese | Houston | TX | |
| Antonin Rukl | Praha | | Czech Republic |
| Sky Publishing Corporation | Cambridge | MA | |
| John E Westfall | Antioch | CA | |
| Elizabeth W Westfall | Antioch | CA | |

## *Inside the ALPO*
# *Member, section and activity news*

## Newest Members

The ALPO extends a warm welcome to those who recently became members. Below are persons who joined from November 28, 2004 through February 17, 2006, their home locations, and their interest in lunar and planetary astronomy. The legend of Interest Codes is located after this table. Welcome aboard!

| Member | City | State | Country | Interests |
|---|---|---|---|---|
| Paul Adams | Las Vegas | NV | | |
| Richard Adams | Andover | MA | | |
| Shelby Sue Adkins | Warren | OH | | |
| Leo Aerts | Heist-Op-Den-Berg | | Belgium | |
| Arnold Ashcraft | Perrineville | NJ | | |
| George Bailey | Davenport | IA | | |
| Kevin Baker | Hendersonville | TN | | |
| Reuben Barnhart, Jr | Oregon | IL | | |
| Terrill Bartlett | Canadian | TX | | A |
| Thomas Bash | Jim Thorpe | PA | | |
| Brice Blankenship | Goshen | AL | | |
| Julie Blevins | Ogden | UT | | |
| Thomas Blonigen | Eldorado | WI | | |
| Richard Bosman | Enschede | | Netherlands | |
| Clyde Boyer | Spring Creek | NV | | 356 |
| Truman Boyle | Barnesville | GA | | |
| Henrik Brahtz | Dragoer | | Denmark | |
| Peter Brindle | Leichester | | United Kingdom | |
| Alan G Buck | Douglas | | United Kingdom | 0DP |
| Philip Call | Great Falls | MT | | |
| Irenio Canales | Bangs | TX | | |
| Paulo Casquinha | Qta Do Anjo - Palmela | | Portugal | |
| Edgar Castro | Miami | FL | | 3 |
| Daniel Cervantes | Bloomington | IL | | |
| Mardi¥A K Clark | Tacoma | WA | | 3456 |
| Thomas R Consi | Milwaukee | WI | | 5DR |
| Ron Coolley | Lake Forest | IL | | 023456 |
| Virginia Copus | Torrance | CA | | |
| Jefferson Craft | Tampa | FL | | |
| Rick Craig | Champaign | IL | | |
| David Croll | Sudbury | MA | | |
| John Culter | Naples | FL | | |
| Michael Davis | Livonia | MI | | |
| Frank Dement | Kennewick | WA | | |
| Cheryl Des Ruisseaux | Portland | OR | | |
| Mitchell Diers | Turlock | CA | | |
| Anthony J Di Frances | Milwaukee | WI | | 0356DS |
| David Dockery | Las Cruces | NM | | |
| Kevin H Dooley | Albuquerque | NM | | |
| Laurence Drexler | Harrisburg | NC | | |
| Delcia Marie Duhaylonsod | Waianae | HI | | |
| Timothy M Ellison | Glenndale | AZ | | |
| P_Ricles Enache | Sao Paulo | SP | Brazil | |

## Inside the ALPO
# Member, section and activity news

| Member | City | State | Country | Interests |
|---|---|---|---|---|
| Barbara E Etzkorn | Mokena | IL | | |
| Alan Fevold | Badger | IA | | |
| David Finnell | Hurst | TX | | |
| Bill Flanagan | Houston | TX | | 045678CD |
| Gerald Flaherty | Plymouth | MA | | |
| Bruce M Frank | San Ramon | CA | | 34HM |
| Correen Free | West Chicago | IL | | |
| Marc Eduard Frincu | Resita | RO | Romania | |
| Nora E Gleason | Houston | TX | | |
| George Godwin | Bridgeport | CT | | |
| Hans Goertz | Beek | | Netherlands | |
| Joshua Gonzales | Kal | MI | | |
| John Graves | Nashville | TN | | |
| Peter Gregory | Smallfield | SU | United Kingdom | |
| David M Griffee | Indianapolis | IN | | |
| Bob Haberman | San Francisco | CA | | |
| Don Hall | Tucker | GA | | 356CM |
| Richard Handy | Poway | CA | | |
| Tom Harrison | Ft Worth | TX | | |
| Bruce Housey | Metairie | LA | | |
| George Houston | Houston | TX | | |
| Maggie Hutchison | Plano | TX | | 03 |
| Richard Jankowski | Belmar | NJ | | |
| Douglas Johnson | Marathon | TX | | |
| Clevis And Deborah Jones | Covington | GA | | |
| Steve Katsifos | Raleigh | NC | | |
| Carl Kirby | Mora | NM | | 46D |
| Shawn & Darcey Kirkeby | Bakersfield | CA | | |
| Charles Klausing | Tampa | FL | | |
| David Kolb | Lawrence | KS | | |
| John A Kowalski | Hanoverton | OH | | |
| Cindy Lautenschlaeger | New Orleans | LA | | |
| Lynn Laux | Strongsville | OH | | |
| Tony Licata | Farmington Hills | MI | | |
| Mark Lincke | Craig | CO | | 12356 |
| Kevin Lindsey | Fairfax | VA | | |
| Richard Lionberger | Houston | TX | | |
| June C Loertscher | Janesville | WI | | |
| Clinton Lower, Jr | Belcamp | MD | | |
| Charles W Maupin | Broken Arrow | OK | | |
| Patty H Mayer | Fort Pierce | FL | | 3HT |
| Jim Melka | Chesterfield | MO | | |
| John J Monsees | Surprise | AZ | | |
| James Morgan | Beloit | WI | | |
| Fred Muller | Madison | CT | | 3456 |
| Carter & Shirlee Murphy | Denver | IN | | |
| Hamdy Nasr | Corona | NY | | |
| James Norton | Franklin | NC | | 456ADIMPR |
| Allan Ostrander | Onondaga | MI | | 1458D |
| Ignacio Padilla | Woodland | CA | | |

## *Inside the ALPO*
# *Member, section and activity news*

| Member | City | State | Country | Interests |
|---|---|---|---|---|
| Richard J Patula | Loudon | TN | | |
| James L Peele | Harrisonburg | VA | | |
| Oswaldo Perin | Houston | TX | | |
| Gwen Piper | Williamston | MI | | |
| Richard Prizznick | San Ramon | CA | | |
| D J Reed | El Reno | OK | | |
| John G Reedy | Warren | MI | | |
| Marvin D Rodgers | Fort Worth | TX | | |
| Michael Ross | Gwinn | MI | | |
| Albert Rosten | Las Vegas | NV | | |
| Jc, Jonathan, & Ellie Ryan | Brandon | FL | | |
| Rebecca Saflarski | Elgin | IL | | |
| Lawrence Schafer | Grand Rapids | MI | | |
| Dan Schambach | Lakeside Park | KY | | |
| Keith Schlottman | Tucson | AZ | | |
| Jack Schmidt | Columbia | SC | | |
| Ken Schneller | Louisville | OH | | |
| Kato Shigeru | Saitama | SAITAMA | Japan | |
| Dennis P Skea | Poughkeepsie | NY | | 3P |
| Soci_Te Astronomique De France | Paris | | France | |
| Hyman Solotky | Tucson | AZ | | |
| Nathan D Stewart | Winter Haven | FL | | |
| Pete Thompson | Gainsville | GA | | |
| Richard C Walter | Ft Thomas | KY | | |
| James & Eileen Walz | Park Hills | KY | | |
| Glen Ward | Bridgeport | WV | | 3456 |
| Joel Warren | Amarillo | TX | | |
| John Whitsett | Province | NC | | |
| Robert Wilson | Tucson | AZ | | 38T |
| Hongsun Yoon | Seoul, Se 100-754 | | South Korea | |

## Interest Abbreviations

| | | | |
|---|---|---|---|
| 0 = Sun | 6 = Saturn | D = CCD Imaging | P = Photography |
| 1 = Mercury | 7 = Uranus | E = Eclipses | R = Radio Astronomy |
| 2 = Venus | 8 = Neptune | H = History | S = Astronomical Software |
| 3 = Moon | 9 = Pluto | I = Instruments | T = Tutoring |
| 4 = Mars | A = Asteroids | M = Meteors | |
| 5 = Jupiter | C = Comets | O = Meteorites | |

*ALPO Feature*

# *Index to Volume 44 of the Journal of the Association of Lunar and Planetary Observers*

**By Michael Mattei**

## Publication Data

Issue Number:

1, Winter 2002,.....pp. 1-37
2, Spring 2002,.....pp. 1-45
3, Summer 2002.....pp. 1-36
4, Autumn 2002.....pp. 1-60

Abbreviations:

I. = Issue
IFC = Inside Front Cover
IBC = Inside Back Cover
OFC = Outside Front Cover

## Author Index

## Subject Index

## Feature Story:
# The LPO: The Little Planetary Observatory

**By Michael F. Mattei**
*micmattei@comcast.net*

In January of 2004, when my wife was home during her illness, she encouraged me to continue on with the building of my small observatory. I began to build it in my garage; it was only 4 foot by 4 foot by 6 feet high. I completed the whole structure in the garage, complete with lift-off dome. The dome lifts off to one side of the building. (Fig. 1).


Fig 1

Progress was halted as my wife's illness worsened; she passed away in March of that year. It was not until May that my friend Steve Beckwith mentioned that I needed something to do to take my mind off what had happened, so we began to plan moving the observatory to the backyard.

I have a telephone pole set up out back; we planned to pour some concrete around the pole and then place the observatory on it. After purchasing 900 lbs of concrete, we began to mix and pour. This was hard work because we did it by hand, mixing the concrete in a wheelbarrow one bag at a time. While the concrete was setting up, I began to build a room in a larger building next to the pole. This building was planned to be my first observatory, but it never got finished. It was 16-feet square, so I took one-fourth of the interior and converted it into a control room. The room is completely insulated top, bottom and walls. A small electric heater keeps the room comfortable at 65 degrees F in winter. There is a pipe running underground to the pole. All of the electric cables, video and camera cables run through it. The pole which originally extended 6 feet above the floor, was cut to about 30 inches above the floor.

I had to build a new mount adapter to connect the scope to the pole. (Fig. 2) The dome top is fiberglass, the building is standard building material with 2x4 studs, and the plywood is T111. I found the door in a local dump; it came complete with a nice triangular glass pattern for the top section; I cut it in half and saved the top. (Fig. 3).

The dome is sealed with RTV and painted white; the bottom is also sealed and painted the same color as the house. I placed a rubber gasket around the top frame where the dome closes. This rubber, held in place by staples, is the same as what is in the screen door mesh and provides a gasket seal between the dome and the bottom. I have not had any water enter the building at this seal. The corners are covered with aluminum flashing. The dome sits on two rest-stops to support the overhang weight; I have not placed counterweights on the dome but will do so later.

The telescope is a Meade 10 inch classic SCT f/10 with computer control. I use Project Pluto's Guide 8 to control the scope; this allows me to focus and move the scope to any location in the sky. A low-light video camera on the finder shows where the scope is pointed. Two computers are used; one to control the scope and the other to run the cameras. The cameras are a Starlight Express, a Phillips ToU-

Fig 2

Cam video and low-light security camera for video viewing.


Fig 3

The control room has a door that is insulated in the winter and a screen for summer. I do not look through this scope any more because all observing is done electronically. When I need to do the start-tup synch, I use a stepladder from outside the building to align the scope. It is such a joy to go out and be up and running in under 10 minutes; then at the other end, I can close up shop in less than five minutes.

For a long time I wanted an observatory; the larger one failed, but this one is working out fine for me — it's a real a joy to operate now. The costs were low for me because I already had most of the materials lying around, so I just brought it all together except for the concrete (which was the biggest expense). The closed dome is shown in Fig. 4.


Fig 4

## Feature Story: Solar activity report

# Carrington Rotations 2025-2030 (2005-01-2.05 to 2005-06-14.7)

**By Frincu Marc Edward coordinator,**
**Faculty of Mathematics and Computer Science,**
**West University of Timisoara, Romania**
**E-mail:** *fmarc83@yahoo.com*

## Introduction

The period between Carrington rotation numbers 2025 and 2030 was characterized by low solar activity. This was to be expected since we are near the end of a solar cycle. There were some rotations with some days when R=0 such as rotation 2028 when there were no active regions detected with our instruments. The highest activity peak for our period was rotation 2029, a period dominated by spot 756, an average R=35.8 and a maximum R=46 computed in October 2005.

Our team included three amateur astronomers, mainly from the west of Romania, all dedicated to planetary and deep sky observations, and astrophotography. The number of observations during Carrington rotation numbers 2025- 2028 and early 2029 was relatively low because of weather conditions; overall, there were approximately 12 observations for each rotation. The observations were made almost entirely during 09:00 - 11:00 UT, with cloud coverage of the Sun approximately 0-10% and a visibility of 2-3 or 3-4. Most of the solar regions were observed at solar latitudes greater and above -/+5.0°.

The terms used in this paper are extracted from the ALPO Solar Section, and are the standard terms used when completing the ALPO Solar Section observation forms.

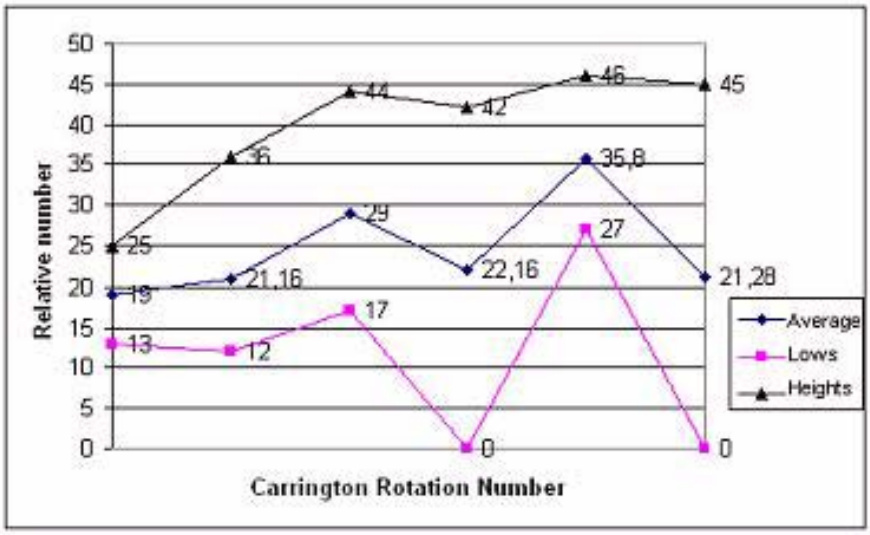



Figure 1. Results for Carrington Rotations 2025- 2030.

## Online Readers

Left-click your mouse on the author's e-mail address in *blue text* to open your own e-mail program with the To: field completed and ready for you to compose your own message. (Internet connection must be ON).

In the References section at the end of this paper, left-click your mouse on the *blue text* to be taken to an Internet site where you can either view or obtain that particular work.

**Table 1: Observers for This Reporting Period**

| Name | Aperture (cm) | Focal Length (cm) | Scope Type* | Location |
|---|---|---|---|---|
| Frincu Marc Edward | 6 | 70 | RE | Timisoara, Romania |
| Juravle Andrei | 18 | 120 | NEWT | |
| Laurentiu Alimpie | 20 | 120 | | |

* RE = Refractor, NEWT = Newtonian Reflector

## Data

Rotation 2025 was characterized by the lowest solar activity in our observations. Only seven active regions observed during this rotation. Most groups were of Class A, with only three of them being a Class H. Some groups were observable for several days, so we were able to study their evolution. One of these groups was of Hax type, and after two days, it devolved in an Axx type just before disappearing from the Sun's surface at latitude of 25° north on Jan 24.

Rotation 2026 was again characterized by a large number of groups of type A or H mostly distributed in the southern hemisphere. The biggest group was detected on Feb 9 around the Sun's equator. It was of type Hkx and had approximately 5° in longitude. No group was seen to survive for several days.

Probably the most dynamic period in our observation, rotation 2027, which was characterized by a continuous drop in the number of spots with each passing day. After starting with R=44 on

**Table 1: Data for Carrington Rotations 2025 thru 2030**

| Minimum & Date | Average | Maximum & Date |
|---|---|---|
| Rotation 2025 | | |
| 13, 01/08 | 19 | 25, 01/22 01/23 |
| Rotation 2026 | | |
| 12, 02/06 | 21.16 | 36, 02/08 |
| Rotation 2027 | | |
| 17, 03/18 | 29 | 44, 03/10 |
| Rotation 2028 | | |
| 0, 03/29 | 22.16 | 42, 04/05 |
| Rotation 2029 | | |
| 27, 05/17 | 35.8 | 46, 05/10 |
| Rotation 2030 | | |
| 0, 2 days (05/21 05/22) | 21,28 | 45, 06/04 |

March 10, it reached R=17 on March 18. The most prominent group appeared on March 16, and had a Cso type. Two groups were seen that day, and they gave the second largest R=31 in this period.

Rotation 2028 was characterized by vast fluctuations in the Sun's activity. Despite the fact that almost all the values for the solar activity number were around two values of 17.5 or 28. There were two occasions when R dropped to 0 on 03/29 and rose up to 42 on 04/05. During this time period, many large groups were observed such as the one on March 25 when a massive Dki group was noticed, and on April 5 when three groups were noticed on the Sun's surface (among them a huge Eki that spread almost 10.5° E-V and 4.8° S-N). Another large group which had an Hkx type was observed on April 16.

Period 2029 was the most interesting period in our observation report. Spot 756 represented it. This was a huge spot, which we typed as a Hkc McIntosh. It was visible from April 24, our first day of observations for this period, until June 5, when bad weather made it impossible for us to observe. During this period, Luarentiu photographed spot 756 using a Canon CCD camera.

The highest activity peak was observed on May 10, when three major groups were seen. Of them, the most interesting had an Eri type with three penumbrae and six umbrae.

Period 2030 was very predictive in the sense that the number of spots increased from 0 on May 21 to 15 spots and umbrae distributed in three groups on June 4, only to decrease again to four spots in two Hhx groups on the last day of the period. We were able to see a clear evolution from a type Cso on June 12 to an Hhx on June 14. This group began with seven spots and umbrae, from which two spots were inside a huge umbra of several degrees in longitude. After only two days, this group transformed into only one spot and one umbra surrounding it.

## Puzzled about Sunspots?

Go to *http://magaxp1.msfc.nasa.gov/outreach/education/spotclass_t.html*

## Conclusions

This report was made during rotations 2025 and 2030, a time when the solar minimum was approaching. Observations during this time were very difficult, especially of bad weather that allowed only a few days of visible Sun. The activity in this period indicates to us that the relative number averages near the value of 24.7 and that the solar activity is somehow stationary. We also noticed that the approaching of the solar

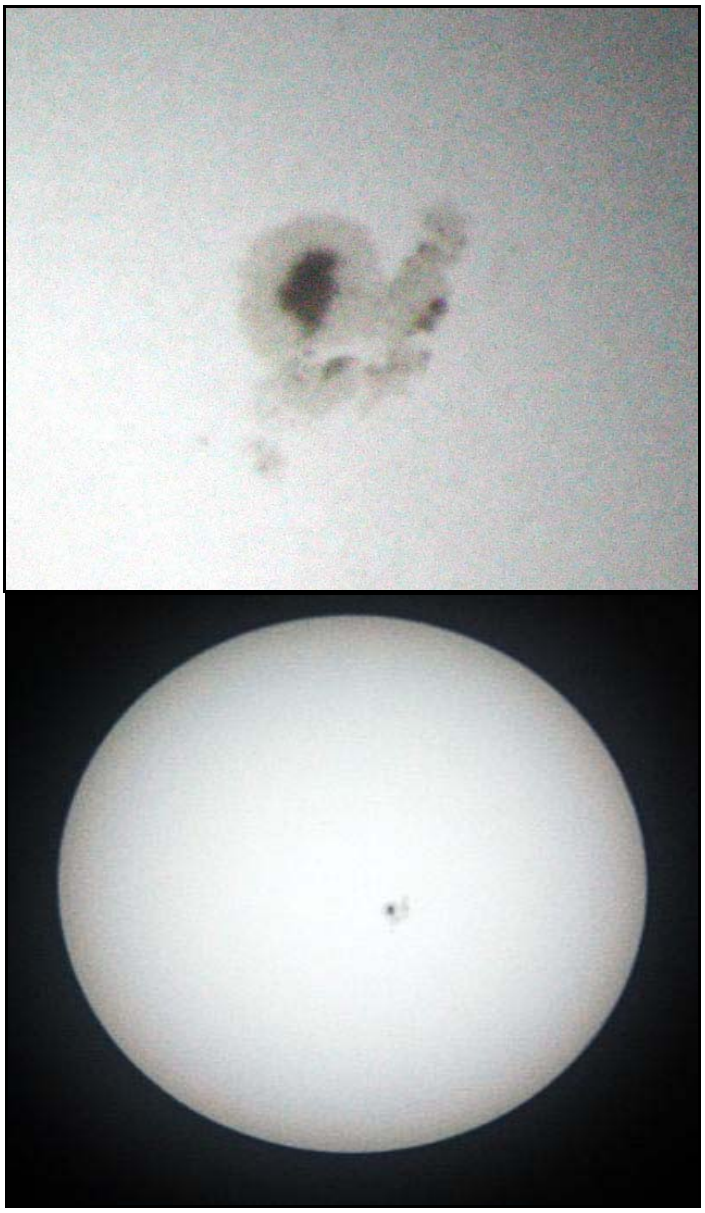


Figure 2. Spot 756. Rotation 2029, 30 April 2005. Images taken by Laurentiu Alimpie with a 200 mm reflector.

minimum does not mean that the Sun has no more surprises left for us. The proof for this was spot 756 which was considered to have a potential risk for radiation bursts. Even if some of us were skeptical about starting a solar report program mainly because it is the end of the current cycle, we were surprised to see and study the Sun's behavior.

## References


Alexescu, Matei & Balaban, Aneta, (1983) *De la Pamant la stele* (*From Earth to Stars*; not available in English), Ion Creanga Publishing House, Bucharest.

Hill, Richard E., "Carrington Rotations 1901-1910 (1995-09-29.81 to 1996-06-28.70)" *Journal of the Association of Lunar and Planetary Observers*, Vol 43, No. 2, pp. 9-15, 2001.

Timerson, Brad. "ALPO Solar Section Ephemeris for 2005". Assn. of Lunar & Planetary Observers website, Solar Section page, <*http://www.lpl.arizona.edu/~rhill/alpo/solstuff/ephems/ephem2005.html*> .


## About the Author . . .


Marc's interest in astronomy began in 1997 as a simple visual observer. Since then, his interests have grown considerably. Besides observing the sky at nights, Marc began working on theoretical papers. And because he always wanted to learn about "near space" he developed a computer software that simulates the workings of the Solar System. His major interest in astromy is the Sun, and depending on time and weather, he observes as often as possible. His equipment includes a 60mm refractor (with mylar solar filter) on an alt-azimuth mount. For photographs, Marc uses a Canon Powershot A70.


Richard Christopher Carrington was born on 26 May 1826 in Chelsea, England. The second son of a wealthy brewer, Carrington was originally expected to pursue a career in the Church. In 1844 he began studies in theology at Trinity College Cambridge, where he graduated in 1848. By then, however, Carrington had found his true vocation in astronomy. In 1849 he joined the Durham University Observatory, but resigned this position in March 1852, using his family fortune to build his own house and observatory at Redhill, Surrey. There, he engaged in both daytime solar and nightime astronomical observations, until the death of his father in 1858 forced him to take over the family business. He was elected to the Royal Astronomical Society in 1851, for which he served as secretary from 1857 to 1862, and to the Royal Society in 1850. In 1865, having fallen into ill health, he sold the family brewery and retired to an isolated spot at Churt, Surrey, where he established a new observatory, but never really resumed serious astronomical work. He died there on 27 November 1875.

Although his work on asteroids and planets while at Durham University Observatory was enough to secure membership in the Royal Astronomical Society, Carrington's first major astronomical undertaking was the compilation, between 1854 and 1857, of his Catalogue of 3735 Circumpolar Stars. Published in 1857, Carrington's Catalogue was highly praised and earned him the Gold Medal of the Royal Astronomical Society in 1859. Carrington is however primarily remembered for his pioneering work on sunspots. Impressed by Heinrich Schwabe's 1843 discovery of the sunspot cycle, and appalled by the lack of systematic sunspots observations, Carrington took it upon himself to pick up the subject where Schwabe had left it. Improving on Schwabe's projection/drawing method, Carrington drew and recorded the positions of sunspots from 1853 to 1861. Although he failed to cover a full sunspot cycle, as originally intended, he nonetheless reaped a rich harvest from his observations, including (1) the discovery of the Sun's differential rotation, (2) the equatorward migration of spots in the course of the cycle (both of these more-or-less simultaneously and independently discovered by Gustav Spörer in Germany), (3) the determination of the Sun's rotation axis with an accuracy hitherto unprecedented, and (4) the first and serendipitous observation of a white light flare.

By the time Carrington published his massive 1863 sunspot tome, entitled Observations of the Spots on the Sun..., he was already recognized worldwide as the British authority on sunspots. He carried out extensive correspondence with sunspot observers across Europe, including Heinrich Schwabe and Rudolf Wolf. When Schwabe was awarded the Royal Astronomical Society's Gold Medal in 1857, Carrington personally delivered the medal to the aging German astronomer, and later persuaded him to donate his extensive collection of sunspot drawings to the Society's Archives.

Despites these successes, in the early 1860's Carrington failed in his bid to secure the directorship of Cambridge Observatory, in succession to his former astronomy teacher James Challis. Bitterly disappointed, Carrington shortly thereafter put an end to his astronomical work at Redhill. Both his health and his marriage degraded from that point on, culminating in November 1875 with the death of his wife from a drug overdose. Ten days later, Carrington himself died, officially of a brain hemorrhage. (Source: *http://www.hao.ucar.edu/Public/education/bios/carrington.html*)

**ALPO Feature:**

# In a Class by Themselves: A Method to Classify Planets

**By: Roy Kaelin, ALPO Member**
rkaelin@luc.edu

## Abstract

Lack of definitive guidelines for the classification of planets has led to occasional minor controversies on the status of certain worlds in the Solar System. As extrasolar worlds are rapidly added to the list of known planetary objects, a systematic classification, unbiased toward cultural or traditional naming schemes, may prove useful for clarifying current controversies and organizing future discoveries.

## 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).

## The Present Situation

Astronomers and astronomy students are already familiar with the present scheme of classifying the planets, one that is readily apparent in any introductory astronomy text, namely, grouping the planets as either terrestrial or Jovian, as inner or outer, small and hard or large and gassy.[1] Terrestrial worlds are clearly those that resemble our Earth, worlds that at a minimum have rocky surfaces. At an apparent opposite extreme are the Jovian planets, worlds that resemble the largest planet, Jupiter, and have dense atmospheres, which constitute no discernible hard surface.

Other objects in the Solar System, such as asteroids and comets, already have established detailed, technical schema by which they are classified.[2, 3] Such schema include size, mass, density, shape, composition, trajectory, and location. But planets do not appear to be categorized with the same zeal as these objects.

**Table 1: Basic Classification of the K Scale**

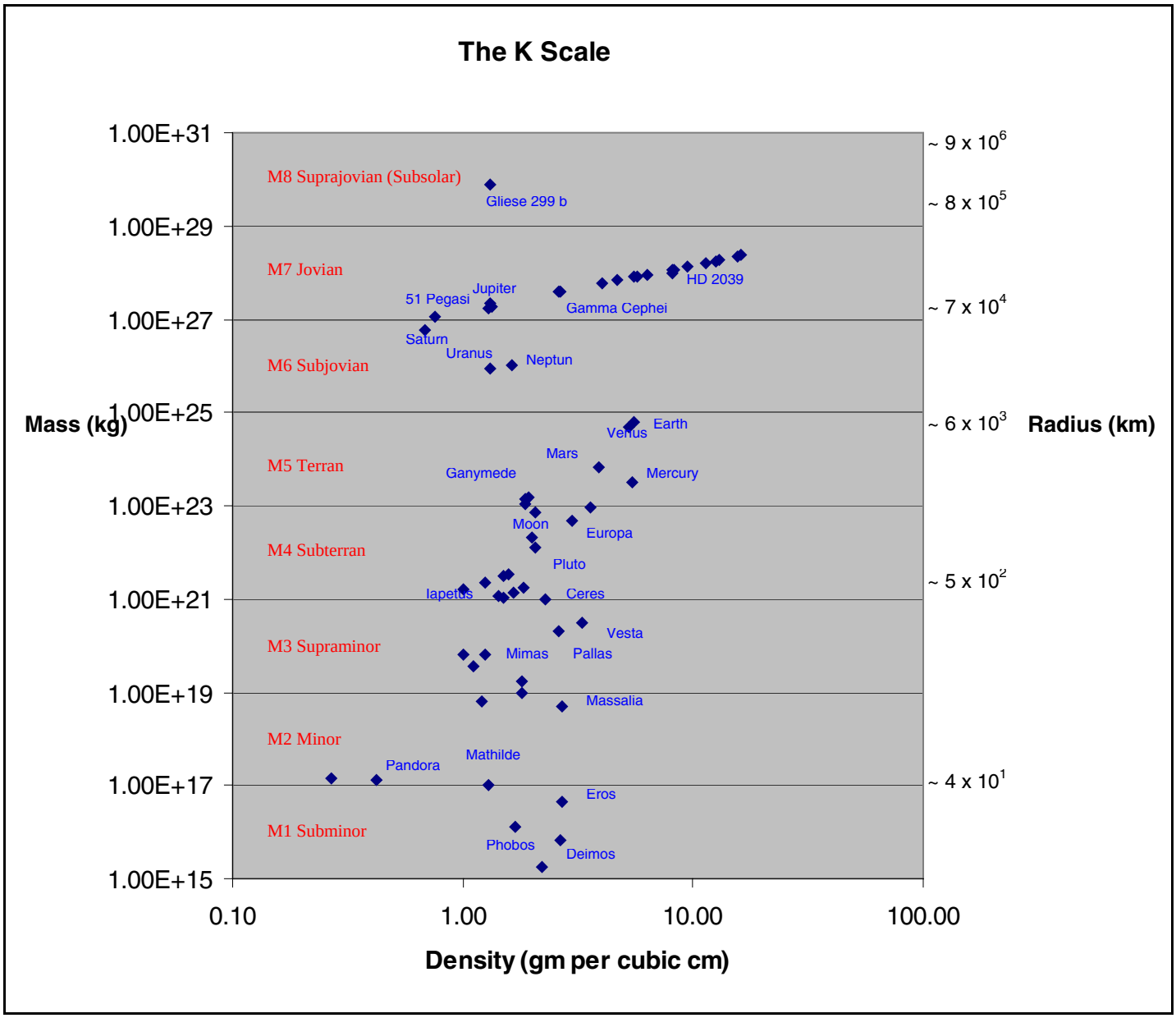
| Name of Class | Mass Range (kg) | Mass Class | Example(s) |
|---|---|---|---|
| Suprajovian (Subsolar) | $1 \times 10^{29}$ to $1 \times 10^{31}$ | M8 | Brown dwarfs, substellar species, stars |
| Jovian | $1 \times 10^{27}$ to $1 \times 10^{29}$ | M7 | Jupiter, many exoplanets |
| Subjovian | $1 \times 10^{25}$ to $1 \times 10^{27}$ | M6 | Saturn, Neptune, Uranus, exoplanets |
| Terran | $1 \times 10^{23}$ to $1 \times 10^{25}$ | M5 | Mercury, Venus, Earth, Mars, Titan |
| Subterran | $1 \times 10^{21}$ to $1 \times 10^{23}$ | M4 | Pluto, Triton, the Moon |
| Supraminor | $1 \times 10^{19}$ to $1 \times 10^{21}$ | M3 | Ceres, Pallas, Vesta, Mimas |
| Minor | $1 \times 10^{17}$ to $1 \times 10^{19}$ | M2 | Prometheus, Pandora |
| Subminor | $1 \times 10^{15}$ to $1 \times 10^{17}$ | M1 | Phobos, Deimos, Eros |

So, too, there is needed a method of classification that allows one to identify unambiguously a certain large, orbiting planetary or planet-like object in the Solar System (or in any other solar system) without regard to its discovery or historical name. Just as well, this system of classification should not abandon or reject any previous cultural manner in which celestial objects are named.

More to the point, planets appear to suffer from a lack of clearly defined boundaries, hence recurring concerns that, as of this writing, the International Astronomical Union does not appear to have clear criteria by which to define a planet.[4] While not a major controversy, a clear-cut system of classification may help astronomers to log a new world as distant objects are discovered or traditional celestial objects are re-evaluated.

## A Proposed Alternative

To help in defining, and in eventually classifying planets, one should not impose such a scheme arbitrarily, that is, based on merely the examples of either being terrestrial or Jovian. These names, aptly descriptive as they are, may prove self-limit-




ing if, for example, a very large new planet, well beyond the orbit of Pluto, is discovered by ground- or space-based observation. It would be scientifically disingenuous, if not downright impractical, to allow a dwarf icy world to retain the status of a planet, while a larger world of differing, or even similar, composition languishes unclassified in the dim purgatory of the Kuiper Belt.

A prospective technique, herein named the K Scale, plots mass (in kilograms) versus density (in grams per cubic centimeter). Any known object of the Solar System may be plotted on the K Scale according to its mass. In addition, all known extrasolar planets (or exoplanets), for which mass and radius are known or inferred and density can then be computed, can be plotted on the K Scale graph as well. The K Scale offers a comprehensive method to classify an orbiting object without regard to its distance from a host star, atmosphere, magnetic field, rotation, or period of revolution. Also, all of these objects' approximate radii accompany the mass scale.

The range of mass, within which an orbiting object is plotted, defines both a size and a designation that is unambiguous. No previous identity of the orbiting object is relinquished, so the method treats all orbiting objects uniformly, categorizing them initially within set ranges of mass and density.

## Basis for Constructing the Classification

Since planets and planet-like objects can have a large range of masses, classifying these objects explicitly by mass requires a logarithmic scale. After we plot a set of standard data [5] of Solar System objects, a fairly distinct relationship becomes evident, namely, that objects of certain masses in the Solar

System tend to cluster in discrete classes. As this pattern may be expected, clustering reveals that each class increases logarithmically from the one preceding it.

Specifically, each class increases 100 times in mass over those objects in the preceding class. This makes for a useful interpretation of the distribution of mass in the Solar System and a possible technique of interpolating the classification of new discoveries of planetary or planet-like objects. Therefore, this classification system is not contrived to force celestial objects into arbitrary categories; rather, the objects' masses suggest the individual classes.

This system of classification of objects by mass largely resembles the stellar magnitude scale.[6] Just as a star's apparent brightness classifies it by its placement on a logarithmic scale, masses of planetary and planet-like objects also increase in magnitude depending on the mass of the object. Each class for planetary objects therefore defines its own range of mass, loosely akin to the range of brightness around a stellar magnitude. So, objects of a certain mass can be assigned to a class by their mass, or, objects in other classes can be compared by their masses.

Each class is assigned a shorthand designation. For example, the least massive objects are placed in the *subminor* class, designated as M1. More massive objects are assigned to their appropriate class, such as M2, the *minor* class, or M3, the *supraminor* class, and so on, up to M8, the *suprajovian* class.

So, objects within the class M2 are 100 times greater in mass than those objects in class M1. Similarly, an object in class M3 is 100 times greater in mass than an object in class M2 and $(100)^2$ or 10,000 times greater than an object in class M1, and so on, through class M8.

While each class represents an increase in mass by a factor of 100, masses within a class or between classes must be compared with decimal values. For example, if an object has an M-value of 6 and another object an M-value of 4.8, a simple subtraction shows the difference in magnitude of their masses; that is, 6 - 4.8 = 1.2. One can then compute that the ratio of their masses is 100 to the exponent 1.2, equaling 251.

Additionally, the y-axis along the right side of the graph shows a corresponding scale of increasing radius as one moves up the graph. This scale is not linear and represents a proportional change.

The resulting system of classification is unofficially dubbed the K Scale since the Solar System data, when initially plotted, branched loosely into the capital letter "K" within the center of the graph. (Data added to the graph, especially of asteroids and of exoplanets, distended the shape of the capital letter so that one would have to stretch the letter "K" to represent additional data.)

## Description of Mass Classes

The **Jovian** worlds lend their name to a series of three classes, describing the most massive worlds, namely, *subjovian*, *jovian*, and *suprajovian* (or *subsolar*). These classes, M6 through M8 inclusive, are defined by large gassy worlds with no discernible hard surface but are largely low-density due to their huge volume.

The largest class of possible world, *suprajovian* (or *subsolar*) M8, bridges the planetary with the stellar. In this mass class, the cen-

**Table 2: Data Used to Construct the K Scale Graph**

| Object | Density | Mass | Object | Density | Mass |
|---|---|---|---|---|---|
| Mercury | 5.43 | 3.30E+23 | Ceres | 2.30 | 1.00E+21 |
| Venus | 5.25 | 4.87E+24 | Pallas | 2.60 | 2.00E+20 |
| Earth | 5.52 | 5.97E+24 | Vesta | 3.30 | 3.00E+20 |
| Mars | 3.93 | 6.42E+23 | Lalande 21185 b | 1.30 | 1.71E+27 |
| Jupiter | 1.33 | 1.90E+27 | Epsilon Eridani b | 1.32 | 2.28E+27 |
| Saturn | 0.69 | 5.68E+26 | 55 Cancri e | 2.62 | 3.80E+27 |
| Uranus | 1.32 | 8.68E+25 | Gamma Cephei b | 2.67 | 3.80E+27 |
| Neptune | 1.64 | 1.03E+26 | 47 Ursa Majoris b | 4.02 | 5.80E+27 |
| Pluto | 2.05 | 1.29E+22 | 51 Pegasi b | 0.76 | 1.10E+27 |
| Moon | 2.05 | 7.35E+22 | 70 Virginis b | 12.50 | 1.79E+28 |
| Phobos | 1.70 | 1.30E+16 | 14 Herculis b | 8.19 | 1.18E+28 |
| Deimos | 2.20 | 1.80E+15 | HD 33636 b | 15.56 | 2.24E+28 |
| Io | 3.57 | 8.93E+22 | HD 111232 b | 13.06 | 1.88E+28 |
| Europa | 2.97 | 4.80E+22 | HD 50554 b | 8.21 | 1.18E+28 |
| Ganymede | 1.94 | 1.48E+23 | HD 92788 b | 6.37 | 9.18E+27 |
| Callisto | 1.86 | 1.08E+23 | HD 40979 b | 5.56 | 8.02E+27 |
| Dione | 1.49 | 1.08E+21 | HD 141937 b | 16.25 | 2.34E+28 |
| Encedalus | 1.00 | 6.50E+19 | HD 169830 c | 4.71 | 6.78E+27 |
| Mimas | 1.12 | 3.70E+19 | HD 106252 b | 11.41 | 1.64E+28 |
| Prometheus | 0.27 | 1.40E+17 | HD 28185 b | 9.38 | 1.35E+28 |
| Pandora | 0.42 | 1.30E+17 | HD 80606 b | 5.71 | 8.22E+27 |
| Rhea | 1.24 | 2.31E+21 | HD 2039 b | 8.12 | 1.00E+28 |
| Titan | 1.88 | 1.35E+23 | Gliese 229 b | 1.32 | 7.60E+29 |
| Iapetus | 1.00 | 1.59E+21 | Psyche | 1.80 | 1.74E+19 |
| Miranda | 1.26 | 6.60E+19 | Massalia | 2.70 | 4.80E+18 |
| Ariel | 1.65 | 1.35E+21 | Eugenia | 1.20 | 6.10E+18 |
| Umbriel | 1.44 | 1.17E+21 | Hermione | 1.80 | 9.40E+18 |
| Titania | 1.59 | 3.52E+21 | Ida | 2.70 | 4.36E+16 |
| Oberon | 1.50 | 3.01E+21 | Mathilde | 1.30 | 1.04E+17 |
| Triton | 2.00 | 2.14E+22 | Eros | 2.67 | 6.72E+15 |
| Charon | 1.83 | 1.77E+21 | | | |

ter of which approaches the mass of the Sun itself, all of the largest brown dwarfs and possible intermediate stellar species that may resemble a range of hot-to-cool red dwarfs are found at its threshold. This class is likely to include mainly the largest brown dwarfs and likely the coolest red dwarfs, mostly of intermediate- to high-density, since the radii of these objects do not usually exceed a certain value. At the upper end of this class, the warmest brown dwarfs approach and may make the transition to T and L substellar spectrum classes.[7] Some cool red dwarfs in this class may even cross over to appear on the traditional M spectrum class on the Hertzsprung-Russell diagram.

The *jovian* class M7 includes Jupiter as its prime example and also hosts a number of recently discovered exoplanets and brown dwarfs in a range of sizes, clustered in masses and radii close to Jupiter. These latter objects have intermediate- to high-density.

The *subjovian* class M6 includes the familiar Jovian planets, Saturn, Uranus, and Neptune, mainly because these planets are closer in mass to one another than to Jupiter. Their placement as *subjovian* planets does not diminish their standing as Jovian worlds since they still share traits with Jupiter. A number of newer exoplanets, close in mass to Neptune, fall into this class and have relatively intermediate densities.

The terrestrial planets traditionally are described as relatively small worlds close to the Sun. A synonym, **terran**, offers the basis to classify planets and moons in two major classes. The classes include and range from low- to high-density worlds with relatively hard surfaces, or, surfaces that are described by distinct features or landforms.

(A *supraterran* class does not appear to exist in nature, as it implies both high mass and high density. The discovery of apparently large, rocky planets,[8] e.g., 55 Cancri-e and Arae-d, could fall under this designation, but such worlds are not 100 times more massive than other terran planets, so they may border the *subjovian* class but do not share traits with classic planets in this class.)

The *terran* class M5 includes and is defined by large, high-density, rocky worlds, which have a distinct surface. Planet Earth is the archetype *terran* world. This class includes the traditional terrestrial planets and several moons. For example, the moons Titan, Ganymede, and possibly Callisto (which seems borderline) are *terran* class worlds and would be planets if they orbited the Sun. Of course they remain moons due to their proximity to their planet hosts.

The *subterran* class M4 includes and is defined by a range of worlds, from fairly large to fairly small, with a range of composition, that is, from rocky to icy (as suggested by their range from low- to intermediate- density), and which have a distinct hard surface. These worlds have terran features, which also implies a world large enough to complement its host in mass.

Both the Moon and Charon complement their hosts sufficiently for popular textbooks and professional papers to consider the Earth-Moon system and the Pluto-Charon system both as double-planet systems.[9, 10] Also, as the large moon attending its host planet may resemble its host partly in composition (as in the Moon) or, as of this writing, wholly so (as appears to be the case with Charon), this distinct classification, namely, that of double-planets for Earth-Moon and Pluto-Charon, may help to settle the nagging contention on the status of Pluto; in addition, classifying worlds of intermediate mass as *subterran* may also serve as a guide for classifying newly discovered worlds on the fringe of the Solar System. This class also includes the Galilean moons Europa and Io.

The **minor** planets lend their name as a basis to classify small worlds, namely, small moons, minor planets, Kuiper belt objects, and space debris, in a series of three classes. These classes include and are defined by a range of densities, compositions, relative shapes, and sizes.

The *supraminor* class M3 includes moons, such as Miranda, Mimas, and Encedalus, and large asteroids, such as Ceres, Vesta, and Pallas. At this time, this class provides a place for certain Kuiper belt objects, such as Quaoar and Sedna, as their masses may become more clearly determined through the application of detailed sky surveys.[11] This class does not replace the traditional notions of large asteroids or moons, but is used here to account for a variety of worlds that resemble one another in mass but have a range of low- to intermediate-density, which suggest varying composition.

The *minor* class M2 refers mainly to the minor planets, the official name for the asteroids. This class includes the bulk of most known asteroids, but also has a few small moons such as Pandora and Prometheus. This class does not replace or detract from the existing schema of asteroid classification already in place. These minor planets have a range from low- to intermediate-density.

The *subminor* class M1 includes small moons such as Phobos and Deimos (which are thought to be captured asteroids),[12] small potato-shaped leftovers (which one might light-heartedly refer to as "tateroids"), and mountain-sized chunks with a range of composition, which are currently being sought and catalogued through sky surveys.[13] To date, these objects appear to be largely low- to intermediate-density. Below this class are found the rocky and icy debris apparently common throughout the solar system.

Note that comets are not included in these mass classes since there are other classification systems[14, 15] for use by astronomers. Though comets could easily be included in either the *subminor* or *minor* classes, depending on the inferred mass of an observed comet's nucleus, no attempt then is made here to impose any further scheme of classification on comet-like bodies.

## Description of the K Scale Graph

Immediately following the text of this article is a plot of the K Scale and its list of data. The name of each mass class is superimposed as specific labels on the y-axis. So, Saturn, a designated *subjovian* planet in class M6, has an approximate M-value of 6.9, as read from the graph. Similarly, Earth, a designated *terran* planet in class M5, has an approximate M-value of 5.9, as read from the graph. The value 6.9 minus 5.9 equals 1, implying that the masses of the two planets are about 100 times apart, that is, Saturn is approximately 100 times more massive than Earth.

Note also that densities for *subjovian* and *jovian* exoplanets and *suprajovian* brown dwarfs are inferred from the object's known mass and its presumed radius. That is, the trend of the K Scale graph suggests an increasing radius at an approximate rate of $10^{1.1}$ (or, about 12.5) times per tilde on the y-axis. This increase in radius is assumed to correspond loosely to the known (or inferred) mass of the object. As indicated by the graph, as mass increases, so should volume, and that relationship may likely hold for planets slightly larger than Jupiter.

However, there appears to be a limit to true planets' radii, that is, before planetary objects cross the threshold to substellar species. Giant planets are believed to rely on Coulomb pressure to maintain their internal structure, whereas substellar species are thought to rely on electron degeneracy pressure.[16] This distinction is intended to explain why substellar species might not have radii much greater than Jupiter. That is, if the mass of an object, thought to be a substellar species, is difficult to compress, then it is presumed to be substellar if it does not respond to usual changes in pressure and temperature; consequently, substellar species may not likely exceed by a significant percentage a typical Jovian radius. It is likely, therefore, that these large bodies, such as exoplanets or substellar species, will cluster in the *jovian* class M7.

According to recognized[17] and recent sources[18] on the transition of exoplanets to substellar species, the working definition (from the International Astronomical Union) for a planet or exoplanet includes those objects with mass greater than Pluto up to an empirically derived limit of 10 Jupiter masses. In addition, objects with masses below the limiting mass for thermonuclear fusion of deuterium, which is a calculated value no more than 13 Jupiter masses,[19] are part of the working definition. Again, in terms of the K Scale, objects in this upper, defined range of mass are likely to cluster in class M7.

Objects larger than Jupiter, namely, substellar objects with true masses above the limiting mass for thermonuclear fusion of deuterium, are defined as "brown dwarfs" (or "sub-brown dwarfs" where appropriate) no matter what their means of formation or their relative location inside or outside a solar system.[20] Such objects are indeed likely to be more massive but not necessarily greater in volume, hence their density would increase greatly, making these worlds appear to cluster in one upper part of the graph, likely crossing the threshold into class M8. Indeed, astronomers have found that brown dwarfs typically have similar radii (i.e., close to Jupiter) and mainly vary in density owing to their different mass.[21]

## Conclusion

A voluntary, workable system of classification is now available for those who wish to add a measure of organization to myriad worlds already known to exist in the Solar System and to the increasing number of possible or likely worlds in orbit around distant stars. Such a system does not rely on classifying planets solely in terms of the mass of the Earth; rather, a planet can be categorized uniquely by a fundamental property of matter, namely, its mass, and, as available or inferred, its density.

Though details about the nature and composition of those worlds organized into each mass class are not specifically addressed at this time, it appears that this classification system may lend itself to a set of aptly descriptive categories of planetary or planet-like objects within each mass class, based on the physical properties of worlds likely to fall into each mass class.

## References


1. Arny T., 2004, *Explorations: An Introduction to Astronomy,* 3rd edition. New York: McGraw Hill.

2. Lemaitre, Anne, 2005, *Dynamics of Populations of Planetary Systems*, DOI: 10.1017/S1743921304008592. Proceedings IAU Colloquium No. 197.

3. Horner, J. et al, 2003, *The populations of comet-like bodies in the Solar System*, Mon. Not. Royal Astron. Soc. 343, pp. 1057-1066

4. A'Hearn, Michael F., 2001, *Pluto: A Planet or a Trans-Neptunian Object?*, Transactions of the IAU, Vol. XXIV B, pp. 1-4.

5. Arny, *op. cit*.

6. Hearnshaw, John B., 1992, *Origins of the Stellar Magnitude Scale*, Sky & Telescope magazine, Vol. 84, p. 494.

7. Kirkpatrick, J. Davy, 2005, *New Spectral Types L and T*, DOI:10.1146/annurev.astro.42.053102.134017. Annual Review of Astronomy and Astrophysics, Vol. 43: 195-245.

8. Burrows, Adam, 2005, *A theoretical look at the direct detection of giant planets outside the Solar System*, pp. 261-268, DOI: 10.1038/nature03244. Nature, No. 433.

9. Arny, *op. cit*.

10. Stern, S. A., 1991, *Pluto-Charon: A Double Planet on the Ragged Edge of the Solar System*, Bulletin of the American Astronomical Society, Vol. 23, p. 962.

11. Barentine, J. C. et al, 2004, *The APO-PSI TNO Survey*, American Astronomical Society Meeting 204, #64.01.

12. Hunten, D. M., 1979, *Capture of Phobos and Deimos by protoatmospheric drag*, Icarus, Vol. 37, pp. 113-123, DOI: *10.1016/0019-1035(79)90119-2*.

13. Harris, Alan W., 2001, In: *Collisional processes in the solar system* (ed. by: Mikhail Ya. Marov and Hans Rickman), Astrophysics and space science library, Vol. 261, *Near-Earth Asteroid Surveys,* pp. 323 – 332, ISBN 0-7923-6946-7.

14. Horner, *op. cit*., pp. 1057-1066.

15. Levison, Harold, 1996, *Completing the Inventory of the Solar System*, Astronomical Society of the Pacific Conference Proceedings, vol. 107, pp. 173-191.

16. Basri, Gibor, 2003, *What Is a Planet?,* Mercury, Vol. 32, No. 6, p. 27.

17. Burrows, Adam. et al, 2001, *The theory of brown dwarfs and extrasolar giant planets*, Rev. Mod. Phys. 73, pp. 719-765, DOI: 10.1103/RevModPhys 73.719.

18. Marcy, Geoffrey and Butler, R. Paul, 2000 (updated 2003), *Position Statement on the Definition of a Planet.* California and Carnegie Planet Search.

19. Marcy, *op. cit*.

20. Marcy, *op. cit*.

21. Marcy, G. and Butler, R. P., 2000, *Planets Orbiting Other Stars,* Publications of the Astronomical Society of the Pacific, 112, pp. 137-140.

*Feature Story: (The Moon)*

# *Taking the Measure of Mons Piton and Surroundings*

**By Alexander Vandenbohede,**
**ALPO member, Brugge, Belgium**
**E-mail:** *avdenboh@yahoo.co.uk*

## Abstract

The length of the shadow cast by a lunar topographic feature can be used to ascertain not only the height of the feature, but also the slope of the surrounding terrain. A graphical method of measuring the surrounding terrain is presented here, using Mons Piton as an example. Local topography can influence height determinations, which is a potential problem for observers. However, analysis such as that presented here takes advantage of this effect to yield further topographic information.

## 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.
- Items labeled "Table" to jump to that particular table.
- Items labeled "Figure" to jump to that particular figure.
- Bracketed numbers in blue text to jump to that particular item in the References section.
- 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

Although it is often thought of as a single, impressive mountain, Mons Piton is actually a small mountain range. Situated in northeastern Mare Imbrium, it is part of a mostly hidden 670-km diameter inner ring structure of the 1,200-km Imbrium impact basin. This inner ring is now mostly buried under the lava flows that filled the basin a few hundred million years after the impact. Mons Piton casts dramatic shadows on the surrounding mare under a low Sun, creating the impression that it is a very high and steep mountain range. In reality it is just a group of gentle hills with the highest peak reaching 2.25 km above the mare. Its height is well known so the height computation is not the purpose of this work. Instead, the height of Mons Piton is used here to study the topography of the mare in the immediate surroundings of the mountain range

As diagrammed in *Figure 1*, when the local altitude of the Sun is degrees, a feature with height of ***H*** kilometers casts a shadow on the surrounding terrain. If this shadow were cast on a flat surface, the length would be ***L*** (km). However, the

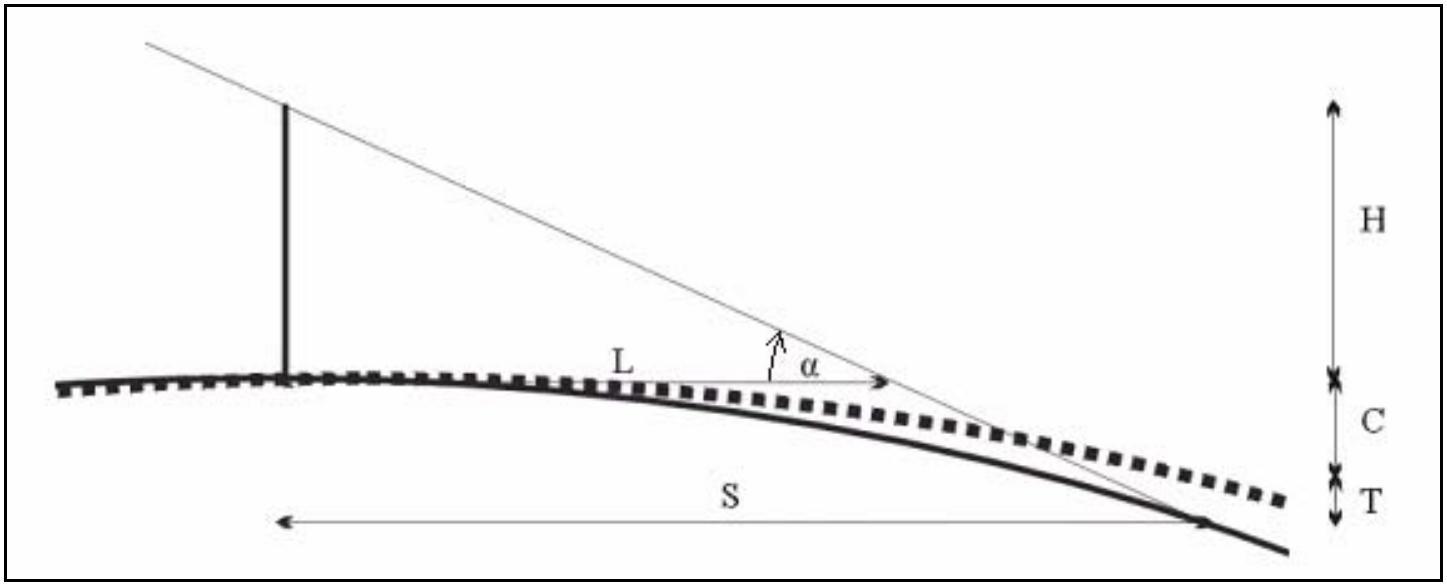



Figure 1. Definition of symbols, see further explanation in text. The dotted line represents the surface of the Moon considered as a sphere,and the solid line is the actual lunar surface, deviating from the sphere because of local topography.

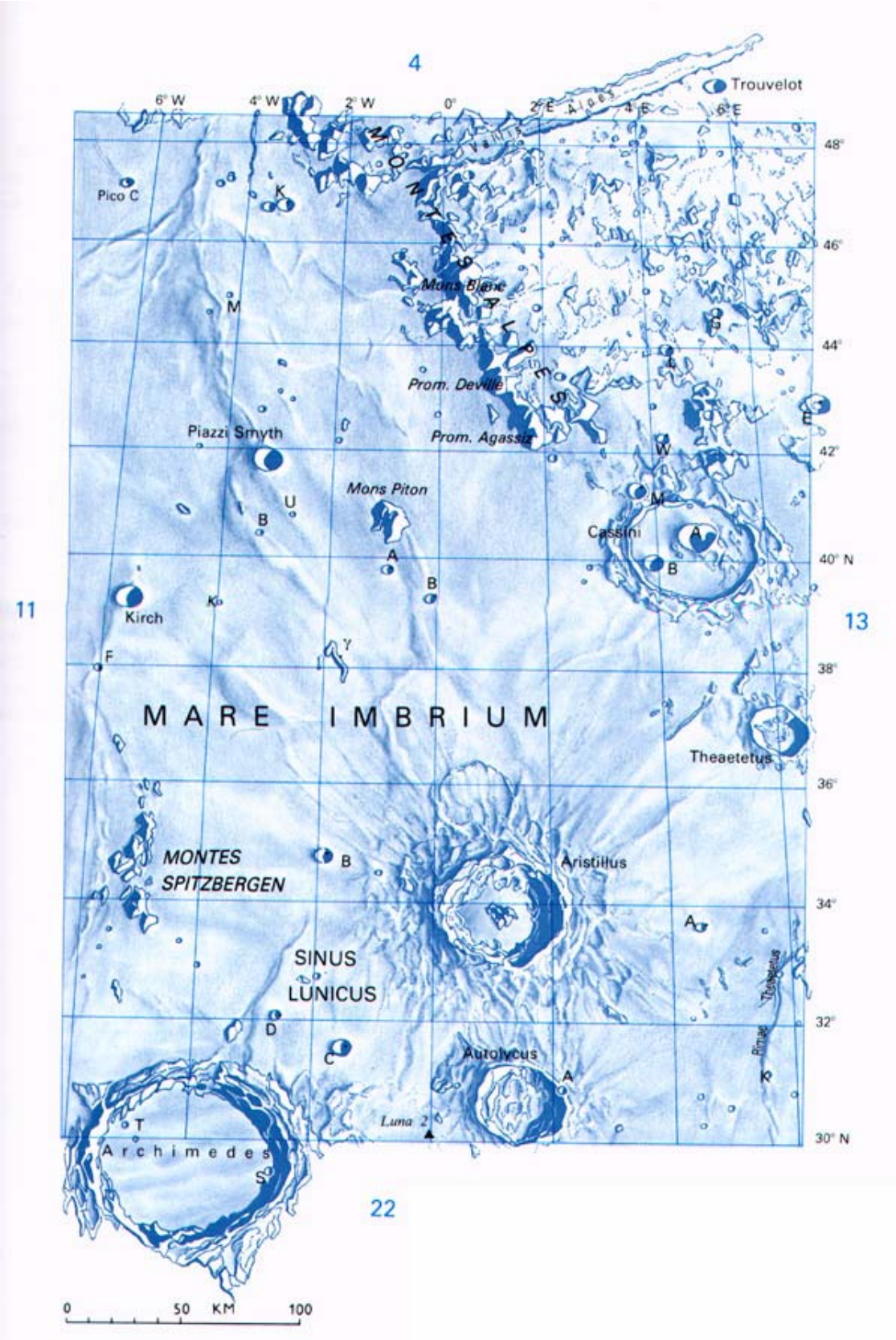



Figure 2. Location of Mons Piton using Map 12 from “Atlas of the Moon” by Antonin Rukl. (Copyright 2004 by Sky Publishing.)

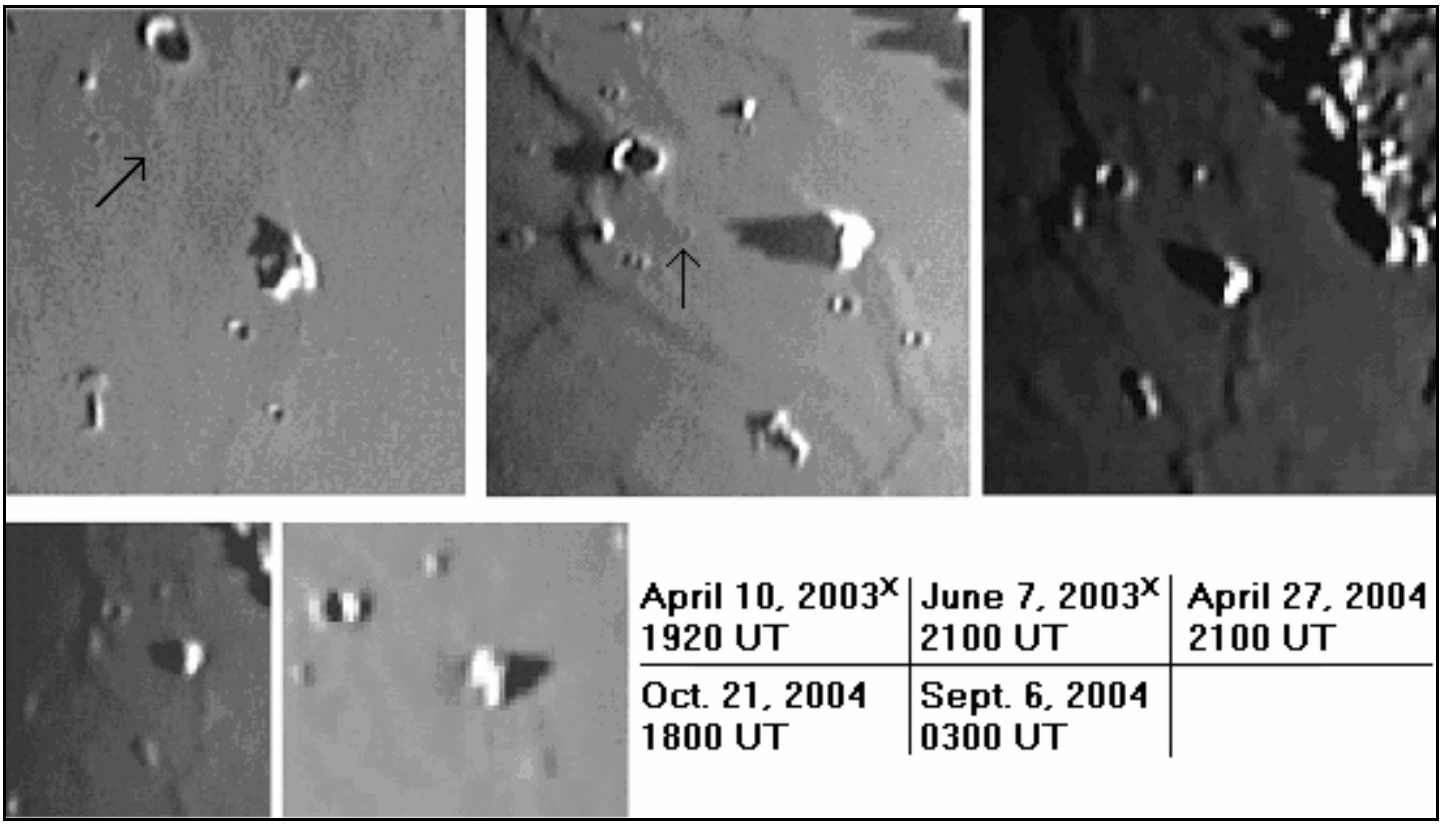



Figure 3. The author's images which were measured to provide data for this article. Images indicated with a superscript "X" were made with the 20-cm, f/15 refractor of the Beisbroek Public Observatory. The other images were made using the author's 20-cm f/6 Newtonian reflector. The small arrow on the images of April 4, 2003, and June 7, 2003 indicates the crater Piazzi Smyth U. The image of April 10, 2003 is included to show detail of Mons Piton, but it was not used in the calculations.

Moon is a sphere with local topography influencing the length of the shadow. In practice, this length is ***S*** (km) as seen from Earth.

Knowing the altitude of the Sun and having a measurement of the shadow length ***S***, the height of the feature ***h*** (km) can be calculated:

$$h = S \tan a \qquad (1)$$

wherein:

$$\sin a = \sin b_s \sin b_p - \cos b_s \cos b_p \sin (colong - L_p) \qquad (2)$$

where:

***$L_p$*** is the longitude of the feature
***$b_p$*** is the latitude of the feature
***colong*** is the Sun's colongitude
***$b_s$*** is the Sun's latitude

This height ***h*** is the height of the feature above the level of the tip of the shadow and it is therefore is influenced by the lunar curvature and local topography, as diagrammed in *Figure 1*:

$$h = H + C + T \qquad (3)$$

***H*** (km) is the actual height of the feature, ***C*** (km) is the correction for lunar curvature, and ***T*** (km) is the height of the relief above (-) or below (+) the expected lunar curvature. ***C*** can be calculated with:

$$C = 1740 - 1740 \cos (\arcsin ({}^{S}/_{1740})) \qquad (4)$$

Thus, if the height of the feature ***H*** is to be determined, the height h is calculated and a correction for the lunar curvature is made. Without further calculations the height **H** can be over or understated by a significant amount due to the local topography. However, if a number of shadow measurements are available, the effect of local topography can be estimated, as will be demonstrated.

In addition to the calculations described above, calculating the effect of the perspective of the observer is an important component of computing a shadow's length. For the sake of clarity, this perspective calculation has been omitted here, though it was included in the data analysis. Details about perspective calculation are in *Baldwin (1963)*.

## Observations

The author made four observations of Mons Piton (location shown in *Figure 2*) that are used in this report (*Figure 3*). One was made with the 20-cm f/15 refractor of the Beisbroek

Public Observatory in Brugge, Belgium, and the other three with the author's 20-cm f/6 Newtonian reflector. Three of these observations show sunrise over Mons Piton, and one shows sunset. In addition, measurement data from three previously published sunrise observations were used (*Fattinnanzi and Lena, 2004*); these data included shadow length, sun altitude, and a calculation of topography. The observation of April 10, 2003 (*Figure 3*) is included because it shows topographical details of the small mountain range, but it was not used in the calculations.

## Results

Although the height of Mons Piton (2.25 km) is known, it was independently calculated from each of the above observations and from each of the data provided by Lena (2004). The results are given in *Figure 4*, wherein the height ***H*** is calculated as (***h*** - ***C***) with the assumption that no local relief is present on the mare floor. In this instance the calculated height is solely dependent on the shadow length.

Using shadow lengths made during sunrise, the height of Mons Piton is calculated too high; while the one sunset observation results in a calculated height that is too low. Not taking into account the observations made with large shadow lengths (more than -35 km) there is a linear correlation between shadow length and height. The equation fitting the data is indicated on the figure.

What does this mean? Actually, the calculated height of the feature (***h*** - ***C***) in *Figure 4* is equal to (***H*** + ***T***) if topography is taken into account. ***H*** is the true height of the mountain and is therefore a constant. The dependence of the mountain's height on shadow length is thus due to failure to take into account the correction ***T*** for topography. We see that the calculated height of the mountain is dependent upon the topography on which the shadow is observed, and to calculate the real height ***H***, a correction for topography should be made. However, this correction is not known.

If Mons Piton is situated on a gently sloping mare surface the error made by neglecting this topography correction becomes smaller with decreasing shadow length. It becomes zero when no shadow can be seen. This is of course impossible to observe but it is derived from the equation in *Figure 4* since:

$$h - C = H + T = -0.0054\,S + 2.2611 \qquad (5)$$

Solving for ***H*** when ***S*** and ***T*** are zero yields the derived height of 2.26 km, essentially equalling the height of 2.25 found in literature. Additionally it can be seen that the topographic correction is 0.0054 S or that the mare is inclined downward 3° (54 m per km) toward the west. About 35 km west of Mons Piton, the slope changes direction and the surface rises to a level as high as the base of the Mons. This is indicated by the strong deviation of the two most westward data points from the relationship given in equation (5).

*Figure 5* graphs the level of the surface for the different data points with respect to the base of Mons Piton, which is at level 0 and distance 0. This graph was made by subtracting each data point of *Figure 4* from the known height of the mountain (i.e., solving equation 3 for ***T***). It shows shadow length ***S*** on the abscissa versus the negative of ***T*** on the ordinate, calculated with a height ***H*** for Mons Piton of 2.25 km. This graph can be interpreted as a cross-section of the topography westward (left) and eastward (right) of the mountain range. Here

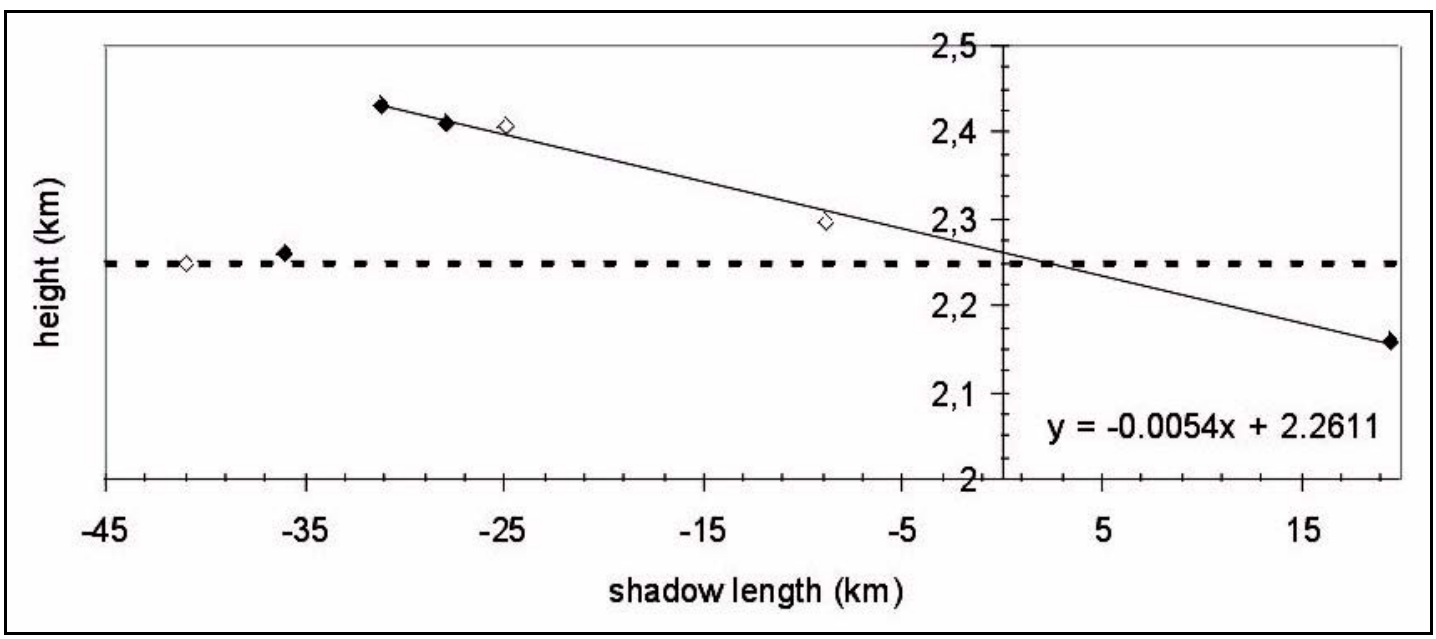



Figure 4. The shadow length (abscissa) versus (h – C), which is the calculated height of Mons Piton (ordinate). Open dots are calculated with the data of *Fattinnanzi & Lena (2004)*. Negative shadow lengths are measured west (during Mons Piton sunrise), while positive shadow lengths are measured east (during sunset). Dotted line is the height of the mountain found in literature (2.25 km).

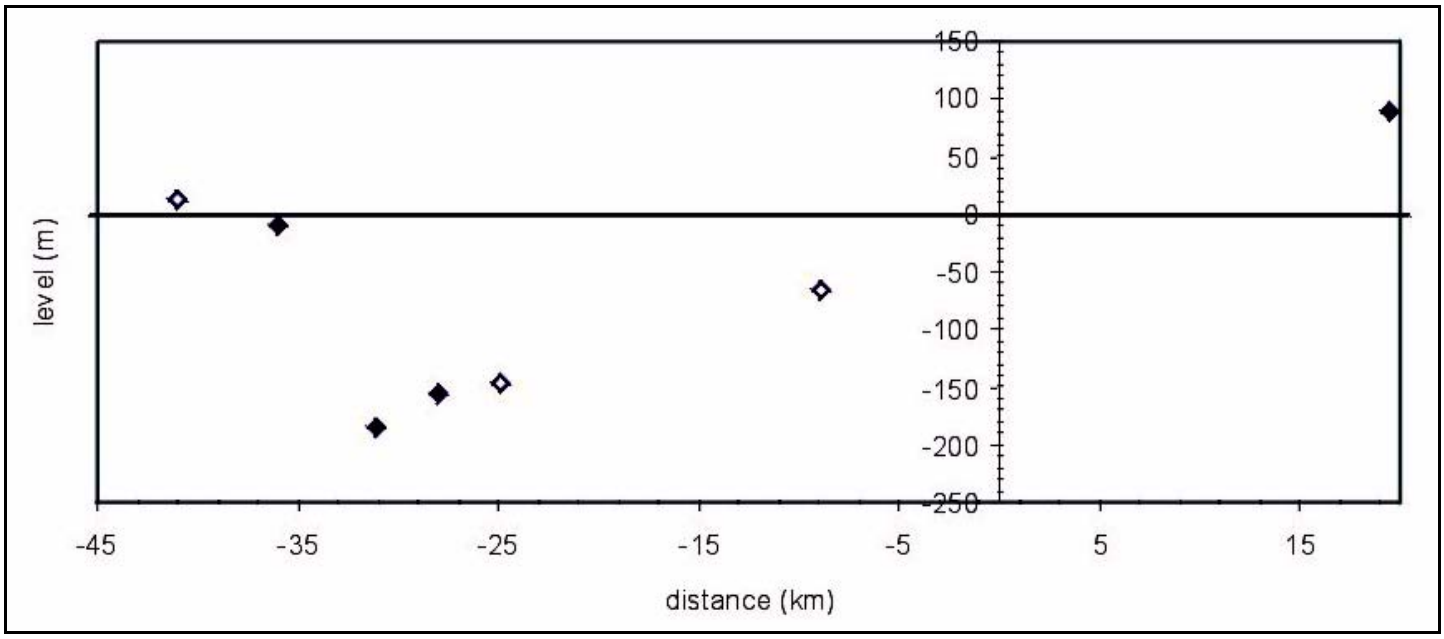



Figure 5. Level of the lunar surface with respect to the base of Mons Piton (level 0) for the different data points of Figure 4. This is S (abscissa) versus the negative of T (ordinate) calculated with a height H of 2.25 km. Open dots are calculated with the data of *Fattinnanzi & Lena (2004)*. Negative shadow lengths are measured west (during Mons Piton sunrise), while positive shadow lengths are measured east (during sunset). The solid line is the zero level.

we see clearly the downward slope of the surface from the Mons westward with a more or less constant value of 54 m per km, to a distance of 35 km where the terrain rises. This rise may be due to crater Piazzi Smyth U, which is about 3 kilometers in diameter. Such a crater should have a height of 175 m according to the relations between crater parameters (*Baldwin, 1963*). Calculations here indicate a height of 220 m which is in the same order of magnitude. In the April 10, 2003, image (*Figure 3*), there is a suggestion of a subtle north-to-south mare ridge a few kilometers east of the crater, and this feature may contribute to the crater's elevation demonstrated by these shadow length measurements.

## Conclusions

Mons Piton sits on a sloping mare surface. The present demonstration of this slope illustrates that a single observation may not yield a reliable height determination because of the interference of local relief. A feature's height will in many cases be computable as a mathematical function of the length of the shadow. If many observations are available, a reliable height can be deduced by extrapolating this mathematical function to the condition of zero shadow. To do this, the relation between the feature's height and shadow length must be known. In the case of Mons Piton, this was approximated by a linear relation and a height of 2.26 kilometers was determined, deviating only 10 meters from the 2.25 kilometers found in literature.

In a second step, knowing the height of the feature, the profile of the surrounding terrain can be calculated by comparing the feature's calculated heights with the known height.

## References

Baldwin, R.B. (1963) *The Measure of the Moon*. The University of Chicago Press.

Fattinnanzi, C. & Lena, R. (2004) "Mons Piton." *Selenology* 23(3): pp 15-17.

### This Month's Cover . . .

Sunrise on Crater Clavius by Richard Jakiel, Douglasville (Atlanta), Georgia, USA. Taken January 9, 2006, 01:40 UT; colongitude 245.6°. Imaged with a Celestron C-11 Schmidt-Cassegrain telescope at f/10 equipped with a Celestron NextImage webcam; final image the result of 1,250 stacked frames using Registax 3.1. North at top; seeing approx. 1 - 5 (scale: 1[worst] - 10 [best]). No other details provided. For more info, e-mail to rjakiel@earthlink.net

### About the Author

Alexander Vandenbohede works as a geologist at Ghent University and has been observing the Moon since the mid-1990s. His main interests are topographical studies, interpretation of colour images and the link between amateur observations and lunar geology. Telescopes used are his own 20 cm f/6 Dobsonian reflector and the 20 cm f/15 refractor of Beisbroek Public Observatory, Belgium.

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

## *Albedo and Supporting Data for Lunar Drawings*

**Lunar Feature Observed :** _____

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

Observer: _____ Observing Station: _____

Mailing Address: _____

street city state zip

Telescope: _____

instrument type aperture (cm.) focal ratio

Magnification(s): _____X _____X _____X Filter(s): F1 _____ F2 _____

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

Transparency: _____ [Faintest star visible to unaided eye]

Date (UT): _____ Time (UT): _____ _____

year month day start end

Colongitude: _____° _____°

start end

## Albedo Data

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

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

**NOTES:**

# ALPO Resources

***People, publications, etc. to help our members***

## For Online Readers

Items in blue text in the ALPO Staff E-mail Directory 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 an e-mail preaddressed to the person you chose, ready for you to compose and send a message. NOTE: Your Internet connection MUST be ON for this feature to work.

## Board of Directors

- Executive Director; Julius L. Benton, Jr., Associates in Astronomy, P.O. Box 30545, Wilmington Island, Savannah, GA 31410305
- 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, 2347 Foxhaven Drive West, Jacksonville FL 32224-2011
- 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 Tarieton 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; Richard J. McKim, Cherry Tree Cottage, 16 Upper Main Street, Upper Benefield, Peterborough PE8 5AN, United Kingdom
- Spanish Language Submissions; Guido E. Santacana, Nuevo Laredo 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

# ALPO Resources

***People, publications, etc. to help our members***

## Observing Sections

### Solar Section

- Acting Coordinator; 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

### 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 31410305

### 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, Illinois College, Jacksonville, IL 62650.
- 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 31410305

### Remote Planets Section

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

### Comets Section

- Acting Coordinator; Ted Stryk, 8211 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

# ALPO Resources

## People, publications, etc. to help our members

### Meteorites Section

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

### Eclipse Section

Coordinator; Michael D. Reynolds, 604 11th Avenue North Jacksonville Beach FL 32250

## 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 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 Schia-

### 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 |
| Westfall, J.E. | johnwestfall@comcast.net |
| Will, M. | will008@attglobal.net |

# ALPO Resources

## People, publications, etc. to help our members

parelli, 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, 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.

- **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 Form*s. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO lunar SAP section. Observers should make copies using high-quality paper.)

- Lunar: *The Lunar Observer*, official newsletter of the ALPO Lunar Section, published monthly. Free at *http://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/venus-frms.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 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) *Jupite*r, the ALPO section newsletter, available onlineonly via the ALPO website; (3) *J-Ne*t, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougal. (4) *Timing the Eclipses of Jupiter’s Galilean Satellites* observing kit and

# ALPO Resources

## People, publications, etc. to help our members

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/sat-frms.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 39):

$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.

$5 each:
Vol. 48(2006), No. 1 (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)

# The Definitive Star Atlas Is Back in Print!

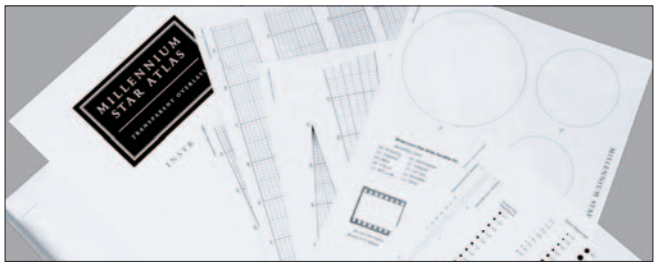

## New, affordable softcover edition!

Hailed as the definitive reference set, the *Millennium Star Atlas* features 1,548 sky charts based on the European Space Agency's landmark *Hipparcos and Tycho Catalogues.*

Detailed, comprehensive, and complete, this three-volume set shows more than one million stars, three times as many as any other atlas in print. More than 10,000 of the nearest stars are labeled with their distances in light-years, as determined by the Hipparcos satellite. The charts also include the locations, orientations, and aspect ratios of 8,000 galaxies. The generous angular scale and the faint limiting magnitude, corresponding to the survey limit of the Hipparcos satellite at around 11th magnitude, makes star-hopping to deep-sky objects a breeze. Handsome slipcase included!

**Millennium Star Atlas, Softcover Edition**
Roger W. Sinnott & Michael A. C. Perryman
**59279 $149.95** ***plus shipping***

Available in early January 2006.




**Millennium Star Atlas Acetate Overlays**
These subdivided coordinate grids, perfectly matched to the scale of the *Millennium Star Atlas,* aid in measuring the positions of charted objects or in plotting new objects. They include a series of star dots for estimating magnitudes, and a set of tick marks for estimating double-star separations.

**MSAOVERS $19.95** ***plus shipping***

SKY & TELESCOPE

**800-253-0245 SkyandTelescope.com/MSA**