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Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 46, Number 3, Summer 2004

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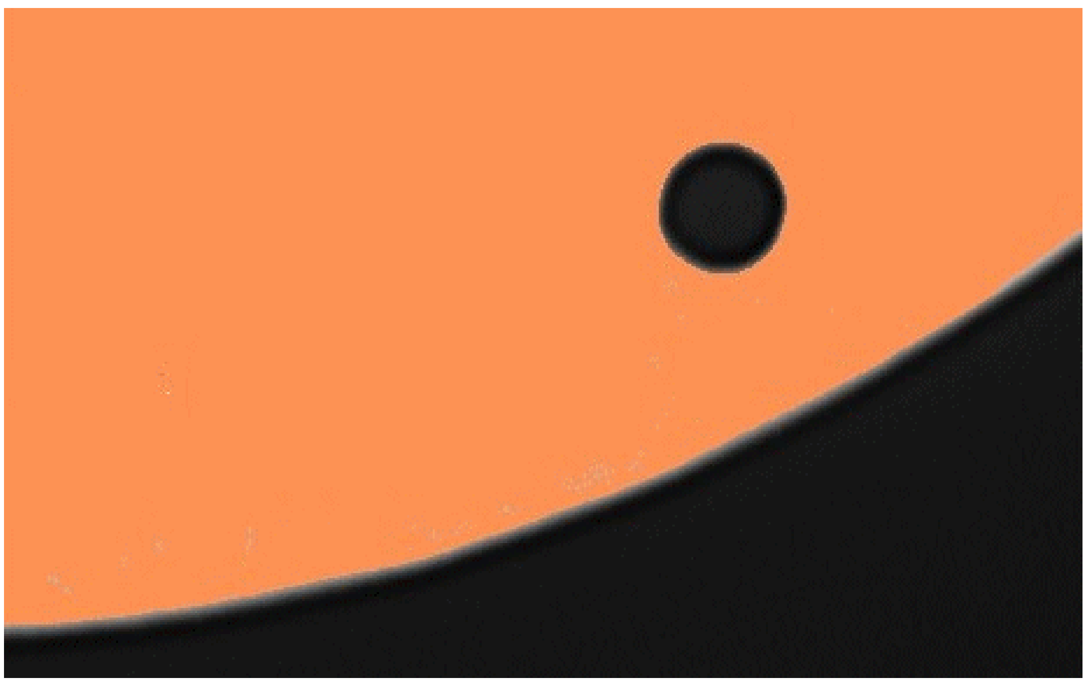
Inside. . .

* The Perseids are coming! The Perseids are coming! And guess what — almost NO Moon this time!

* Some early personal reports on the Venus transit

* A report on the 1996 Jupiter apparition

* A writeup on the Moon's Maestlin Region



This Issue's Cover: A great shot of the Venus transit by Mercury Section Coordinator Frank Melillo from Holtsville, NY, USA. Taken June 8, 10:40 UT (6:40 a.m. local time) using a Celestron 8-inch Schmidt-Cassegrain at f/10 equipped with a Starlight Xpress MX5 CCD camera; exposure 0.5 second; some clouds present. For an animation of this image, go to http://hometown.aol.com/frankj12/specialtransitpage1.html

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

Journal of the Association of Lunar & Planetary Observers,
The Strolling Astronomer

Volume 46, No. 3, Summer 2004
This issue published in July 2004 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

Features

ALPO Resources

Inside the ALPO
Member, section and activity news

Association of Lunar and Planetary Observers (ALPO)

Board of Directors

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Publications

Editor & Publisher, Ken Poshedly

Primary Observing Coordinators, Other Staff

(See full listing in *ALPO Resources* at end of issue)
Lunar& Planetary Training Program: Coordinator; Timothy J. Robertson
Solar Section: Acting Coordinator, Rick Gossett
Mercury Section: Coordinator; Frank Melillo
Venus Section: Coordinator; Julius L. Benton, Jr.
Mercury/Venus Transit Section: Coordinator; John E. Westfall
Lunar Section:
Coordinator; *Selected Areas Program;* Julius L. Benton, Jr.
Coordinator; *Lunar Meteoritic Impact Search;* Brian Cudnik
Coordinator; *Lunar Transient Phenomena;* Anthony Cook
Mars Section: Coordinator, *all observations, U.S. correspondence;* Daniel M. Troiani
Minor Planets Section: Coordinator; Frederick Pilcher
Jupiter Section: Coordinator; Richard W. Schmude, Jr.
Saturn Section: Coordinator; Julius L. Benton, Jr.
Remote Planets Section: Coordinator; Richard W. Schmude, Jr.
Comets Section: Coordinator; Open
Meteors Section: Coordinator; Robert D. Lunsford
Meteorites Section: Coordinator; Dolores Hill
Computing Section: Coordinator; Kim Hay
Youth Section: Coordinator; Timothy J. Robertson
Historical Section: Coordinator; Richard Baum
Instruments Section: Coordinator; R.B. Minton
Eclipse Section: Coordinator; Michael D. Reynolds
Webmaster: Coordinator; Richard Hill

Point of View
It's Nice to be Noticed – Again

By Ken Poshedly, editor, *The Strolling Astronomer*

Well, once more a celestial event has put astronomy and astronom*ers* back in the public eye.

While it's too bad it takes a rare event to make it happen, it IS nice to be sought out by the great unwashed for answers to questions we (the knowing) can handle easily.

This time, it was the transit of Venus on June 8. And what makes it perhaps even more special is that no one alive today saw the last one, which occurred in 1882.

So once more, co-workers and friends who may think our hobby or avocation is "odd" sought us out asking if we ourselves saw the event, why doesn't it happen more often, why couldn't it be seen without a telescope, etc.

The mainstream media helped by mentioning it and even seeking out groups that planned organized observing activities. (We in metro Atlanta, Georgia, were pretty much clouded out; so some folks travelled from here south to Florida and north to other points and got great views.)

So once again, for a few fleeting days, we were the celebrities of the office, the school or the workplace. And, yes, it DID feel good to take the "mystery" out of one of Mother Nature's occasional treats.

But like I said earlier, it's too bad that it takes a once-every-so-often event like this to get people to look up and appreciate or at least inquire about the heavens.

By the way, you can probably expect another round of questions in early August – with little interference from the Moon, this year's Perseids should be much more noticeable. And so it goes.

Inside the ALPO
Member, section and activity news *(continued)*

ALPO Founder Walter Haas Injured in Fall

Walter Haas, age 86 and founder of this organization, is currently recovering from a broken hip suffered from a fall while in London on June 14. The announcement was made to ALPO officers by his daughter, Mary Haas Alba (dmvalba@zianet.com)

When he will return to the United States is uncertain, but it is certain that he will not be at the upcoming ALCON event.

Walter can be contacted via David Oosterman (e-mail: Davidoosterman@hotmail.com, telephone 011 44 207-701-1408).

In Memoriam: Janet Mattei

Janet A. Mattei, director of the American Association of Variable Star Observers (http://www.aavso.org) for 30 years, and wife of longtime ALPO member Michael Mattei, passed away on March 22, 2004.

An online profile about Janet by David Levy can be found on the Sky & Telescope website at http://skyandtelescope.com/news/article_1224_1.asp

All of us in the ALPO extend our sincere condolences to Michael and his family at this time.

ALPO's L. Garrett: Asteroid Discoverer

By Lawrence Garrett, assistant coordinator, ALPO Minor Planets Section

I am pleased to announce my first success in the minor planet public survey program, FMO Project Spacewatch, http://fmo.lpl.arizona.edu/FMO_home/index.cfm .

On June 17, at 2:05 a.m., I was able to review just 4 images online; the third of this series contained a new Fast Moving Object (FMO). This was the 316th image I had reviewed since joining Spacewatch in April of the year. On first review, due to both fast motion, (11.9 degree per day) and faintness (about magnitude 19.5), this object was given little change of recovery.

However, Spacewatch did report this find to the Minor Planet Center, who then placed this on the Near Earth Object Confirmation Page (NEOCP) as SW40E3, for others to attempt.

On June 19, 17h30 UT, MPEC-2004 M25 announced this object as 2004 MO1, earning me my first designation.

This object is quite small at H 23.3, or roughly 200 feet in diameter. Because it was observed for just a 2 day arc, it is now lost, which is normal for this type of near-Earth object of the Amor class. From its current orbital elements, this object will return to near-Earth space in 2023, to be rediscovered, and hopefully linked to this passage. This linkage would result in a permanent number.

While the discoverer of this object, I may lose the rights to suggest a name for this object to a future astronomer. But hopefully, because this was found under the Spacewatch program, I might retain the naming rights, and will suggest the first names of my parents, "joanstanley".

With this find, and the suggestion to the Spacewatch program this an image alarm upgrade to their system (to wake reviewers to available images in the night), earned me the first "imager reviewer on the month award" at the Yahoo.Com Spacewatchfmo Group.

Report from the ALPO Membership Secretary/Treasurer

by Matthew L. Will

Please see the listing of our newest members, etc. at the end of this section.

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 (continued)

Interest Section Reports

Computing Section

By Kim Hay, coordinator

June 1 – Earlier in 2004, the Computing Section took a bit of a hiatus with the leaving of Mike McClure. In the interim, Lenny Abbey had kindly looked after the ALPOCS listserv to keep things going until a new coordinator was found.

This position was posted and inquiring minds wanted to know. The next moment, Richard Schmude, ALPO executive director appointed me as ALPO Computing Section Coordinator.

I will not go into to much detail of what I do, but I am currently Acting Asst. Coordinator - Rotation Reports & General Correspondence for the ALPO Solar Section, and belong to several other Astronomy groups, such as the American Assn. of Variable Star Observers (AAVSO), the Royal Astronomical Society of Canada (RASC), the International Meteor Organization (IMO), NAMN, the American Meteor Society (AMS), and the Society of Radio Astronomers (SARA).

Each section is not run by one person, but is put together by a team — a team of volunteers who believe in what they are doing and want to share its knowledge with others. We need to rebuild the ALPO Computing Section, and I ask you, our members, that if you are interested in writing programs, databases or anything "computing", to please come and join our section.

If you have ideas on what you would like to see this section do or have included, please let us know. You can contact me at kimhay@kingston.net privately, or post to the ALPOCS list.

Our Yahoo Groups listserv discussion group (ALPOCS) was established in 1999 and now has 146 members. If you wish to subscribe, please send a message to alpocs-subscribe@yahoogroups.com.

Though traffic on the listserv is down right now, I am sure everyone will get re-acquainted and that over the next few months, it will become active again. With all the astronomical wonders that are happening now, we can produce some programs to enrich our observing techniques and help bring astronomy to everyone.

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

ALPO Lunar & Planetary Training Program

By Tim Robertson, coordinator

June 9 – The ALPO Training Program would like to congratulate Carl Roussell for his successful completion of the Basic Level of the Training Program in only eight months. He is now perfecting his observing skills as he advances through the Novice Level to finally obtain Observer Status. Great job Carl!

The ALPO Training Program currently has 8 active students at various stages of training. And in the past 12 months, we have had orders for over 120 copies of the Novice Observers Handbook.

The ALPO Training Program is a two-step program, and there is no time requirement for completing the steps. But I have seen that those students that are motivated usually complete the steps in a short amount of time. The motivation comes from the desire to improve their observing skills and contribute to the pages of *The Strolling Astronomer,* the Journal of the ALPO.

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

The course of instruction for the Training Program is two-tiered. The first tier is known as the "Basic Level"

Inside the ALPO
Member, section and activity news *(continued)*

and includes reading the ALPO's Novice Observers Handbook and mastering the fundamentals of observing. These fundamentals include performing simple calculations and understanding observing techniques. When the student has successfully demonstrated these skills, he or she can advance to the "Novice Level" for further training where one can specialize in one or more areas of study. This includes obtaining and reading handbooks for specific lunar and planetary subjects. The novice then continues to learn and refine upon observing techniques specific to his or her area of study and is assigned to a tutor to monitor the novice's progress in the Novice Level of the program. When the novice has mastered this final phase of the program, that person can then be certified to Observer Status for that particular field.

For more information on the ALPO Lunar & Planetary Training Program, contact Tim Robertson at 2010 Hillgate Way #L, Simi Valley CA, 93065; e-mail to cometman@cometman.net

The Federation of Galaxy Explorers: The Future in Space

One cannot gaze upon the glory of the heavens without wondering. Why did it unfold this way? Is there life out there? What other mysteries wait to be discovered? The study of the cosmos imparts to its students a sense of timelessness that leads one to ask the question of who will take up the challenge of exploring and developing our presence in space after me? That question has been answered, and they are the Federation of Galaxy Explorers.

The Federation of Galaxy Explorers is a 501(c)3 organization dedicated to educating and inspiring youth in space related science and engineering. The vision of the Federation of Galaxy Explorers organization is to expand the frontiers of science and technology to explore and develop space. The mission is to educate, guide, and prepare the next generation to accept the challenge of expanding humankind's presence in space.

Background

In the Federation of Galaxy Explorers organization children attend monthly meetings and periodic field trips. Adult volunteers teach Federation of Galaxy Explorers with easy to understand and fun-to-do educational material. The materials use exercises, projects, and field trips to provide a hands-on understanding of space and earth science, and principles of engineering, rocketry and space citizenship (the role of government, the power of citizens in a democracy, the promise of space expressed in art, writing, history, and business).

Galaxy Explorers are organized into Sectors and then local "Mission Teams". These teams meet from September to June, 10 meetings per year. Some schools have implemented Federation of Galaxy Explorers as an enrichment program after school. Mission Team members wear uniform shirts and are rewarded for participation and achievements with ribbons, patches, medals, and certificates. Awards are an integral part of the program providing children self-esteem through achievement and recognition.

Federation of Galaxy Explorers fills a void in America's educational system by engaging, educating, and motivating children outside the classroom. Federal, State, local agencies, private institutions, and corporations dedicate some resources towards educating children in space related science and engineering. However, curriculum requirements dictate that numerous subjects be taught during primary, middle, and high schools. Little time remains for space subjects, leaving students with no support to pursue those interests. Galaxy Explorers provides an external support network to compensate for this shortfall.

History

In 2002, Galaxy Explorers pilot programs began at 13 schools in Colorado, Maryland, Washington, D.C., and Virginia, where we conducted a summer space camp for 150 children. In 2003 we hosted 500 children in five summer camps and the expanded to after school-evening program to 600(+) members. Our current expansion effort includes pilot programs in Texas, California, and Pennsylvania. In 2004, we will host seven summer camps. The program is wildly popular and is expanding faster then we can keep up with it. The Federation of Galaxy Explorers expects to have a program of several hundred thousand children in the coming years.

Our strategic plan is on track to expand the program to additional states in 2003/4. The Federation of Gal-

Inside the ALPO
Member, section and activity news *(continued)*

axy Explorers expects to have a program of several hundred thousand children in the coming years. To accomplish a nationwide expansion, Galaxy Explorers has established collaborative working relationships with the numerous non-profits, businesses, and government agencies. In addition, the effort is strongly supported by Congressional Members and staff.

Benefits

The Galaxy Explorers program provides great benefits for the nation:

- Educate America - The Federation of Galaxy Explorers will prepare America's children for employment in the 21st century.
- Galvanize America's support for space - Over time, Federation kids will grow to create a long term citizen activist force in society; shaping the nation's space policy, and furthering the science and engineering required to create a space faring civilization.
- Economical - The concept of Federation of Galaxy Explorers is an extremely inexpensive means of educating the next generation by drawing on the volunteer spirit of America. The program provides a critical support infrastructure to motivate and educate children outside of the classroom. This infrastructure is particularly important given America's lack of classroom resources, science and math teachers, and modern day peer pressure.

Astronomers Wanted

Last year, ALPO and FOGE joined youth education efforts. The Director of Youth Programs, Mr. Tim Robertson, we appointed to the FOGE Advisory Board to ensure an outstanding working relationship. Since that time, over 1000 children have been trained on astronomy and 300 in the basics of planetary observation. The Federation of Galaxy Explorers offers the means to bring children into the field on amateur (and professional) astronomy.

We need ALPO members to help all over the nation – in time, the world. We need people to rewrite lesson plans, start and run Mission Teams, and to assist with management issues and administration. We need astronomers who are willing to impart their knowledge to the next generation; and in so doing, change the future of humanity. The Federation has an outstanding leadership team that includes congressmen, Service Members, former astronauts, business professionals, astronomers, artists, and more. Join the Federation – ALPO alliance today. We need you. Please take a few moments to learn more about the organization and sign up at http://www.foge.org, contact Tim Robertson, cometman@cometman.net. or call toll free 1 877 761-1266.

Observing Section Reports

Eclipse Section

By Mike Reynolds, coordinator

June 15 – The ALPO Eclipse Section has received a number of observations from observers for both 2003 and 2004 eclipses. Possibly the most interesting observations are those from last year's total solar eclipse seen from Antarctica!

A full report and article for the Journal will be prepared after AstroCon 2004 (the Section Coordinator is the AstroCon 2004 Convention co-chair, thus spending all his free time preparing for the Convention!). A second article will cover upcoming eclipses, including 2005's unusual hybrid solar eclipse.

For those interested in obtaining a copy of *Observe Eclipses*, the handbook being used by the ALPO Eclipse Section, please mail $17 (USD) to: Mike D. Reynolds, Ph.D., ALPO Eclipse Section Coordinator, 2347 Foxhaven Drive West, Jacksonville FL 32224-2011

Make checks payable to "Dr. Mike Reynolds". The handbook covers general eclipse information, observing techniques and many observational examples for both lunar and solar eclipses.

Please note that my e-mail address has changed; drmike@astrospace.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

June 3 – Meteor season kicks into high gear this summer with the arrival of the Perseid meteor shower. This year could be much better than average as the Perseid shower peaks on the morning of August 12 with little lunar interference. There is also a possibility of a short outburst from the Perseids this year as the

Inside the ALPO
Member, section and activity news *(continued)*

Earth closely approaches the debris left behind by Comet 109P/Swift-Tuttle during its 1862 journey through the inner solar system.

While the ALPO Meteors Section is not mounting an expedition to view the Perseids, we recommend that everyone try to view this display. The Meteors Section will have an expedition in California to view the Orionids in October, when cooler weather will make camping much more pleasant. We hope some members will join Robin Gray and I to pick up some tips on meteor watching and to enjoy the show. The exact dates will be announced in a future issue.

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

Solar Section

By Rick Gossett, acting coordinator

June 10 – As of this writing during Carrington Rotation 2017, we are continuing to receive observations in most wavelengths. Rik Hill is posting images at http://www.lpl.arizona.edu/~rhill/alpo/solstuff/recobs.html.

He has also published the latest rotation report at http://www.lpl.arizona.edu/~rhill/alpo/solstuff/RR/RR1997.html .

The observers have started preparations for the new observer's handbook. The project is being supervised by Jamey Jenkins. Our section's best observers will be participating in their specific area of expertise.

The methods of collecting and archiving data have gone through some changes this year. Images received are now copied and stored in multiple locations within 24 hours. This virtually eliminates the possibility of loss of data, and also makes observations readily accessible to anyone who requests them.

The numbers of observations received are starting to increase. The Solar Section will accept observations from both members and non-members alike, as long as the basic required information is included. Observations can be submitted at 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

June 14 – Erwin V D Velden of Brisbane, Australia, made some very interesting observations in January 2004. He imaged Mercury several times during the morning apparition (which was quite favorable in the southern hemisphere) and assembled those images to create an animation. This is quite remarkable because Mr. Velen may have captured some details as Mercury rotated. The features were easily seen and more eye-catching during the animation. When Mercury rotated during the animation play, the conspicuous crater Kuiper was possibly visible along the eastern limb. There was a bright spot exactly where it should be, according to the CM longitude

Again, possibly captured Kuiper crater in January 2003, which will be reviewed in the upcoming 2003 Mercury Apparition report. Kuiper Crater has a high surface brightness. But be AWARE! You are seeing the crater ejecta rays, not the crater itself. At certain angles, it may appear very bright and have enough contrast to be seen from Earth.

More studies are needed to confirm this.

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

Venus Section

By Julius Benton, coordinator

May 31 – As of this writing, the 2003-2004 Eastern (Evening) apparition of Venus is drawing to a close. Venus reached Greatest Elongation East on 2004 March 29 (46°), then passed greatest brilliancy on 2004 May 2 (visual magnitude -4.5), and at the time of this writing was approaching Inferior Conjunction, which occurs on 2004 June 8. Inferior Conjunction of Venus is especially noteworthy this year because the planet will transit the Sun on June 8th, and all observers with suitable equipment are encouraged to watch the event, record their observations, and send them to the ALPO (see recent articles in this Journal dealing with the transit of Venus). Venus will re-emerge from the solar glare in late June 2004, and will be a morning object in the eastern sky before sunrise. Sample observations and images from the 2003-2004 Eastern (Evening) Apparition appear on the Venus page of the ALPO website.

Preliminary results from the 2003-2004 Eastern (Evening) Apparition of Venus suggest limited activity

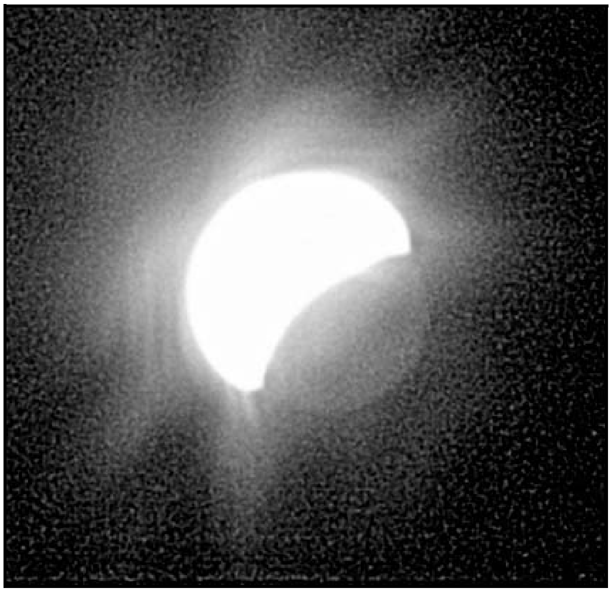

Image of Venus in near-infrared (1,000 nm) by Christophe Pellier in France using a 35.6 cm (14.0 in) SCT. See Venus Section report text.

in the atmosphere of the planet from the standpoint of visual observations. It is quite difficult, however, in any analysis to differentiate between what constitutes real atmospheric phenomena and what is merely illusory on Venus at visual wavelengths. Of substantial interest during 2003-2004 are images of Venus in near-infrared (1,000 nm) by Christophe Pellier in France using a 35.6 cm (14.0 in) SCT which clearly show the dark hemisphere of Venus (see accompanying images)! More will appear on Pellier's images in a forthcoming issue of this Journal.

Over 100 ultraviolet CCD images of Venus were submitted during 2003-2004 that reveal considerable atmospheric detail. Comparison of images made at roughly the same time and on the same date (simultaneous observations) show similar cloud patterns in the UV, and in a few cases, there is good correspondence with drawings made on the same date using W47 (violet) filters. A greater level of confidence in our results improves as observers make an effort to do simultaneous observations, and the ALPO Venus Section is stressing combined visual observations and CCD imaging for comparative analysis of resultant data. There is also a definite need for more ultraviolet imaging of Venus simultaneously with visual observations; for example, some observers apparently have a slight visual sensitivity in the near UV range, whereby they report radial dusky features that are so readily apparent on UV photographs and images.

ALPO studies of the Ashen Light, which peaked during the Pioneer Venus Orbiter Project, are still continuing every apparition. Constant monitoring of the planet for the presence of this phenomenon by a large number of observers (ideally participating in a simultaneous observing program) remains important as a means of improving our chances of capturing confirmed dark hemisphere events. Imaging with CCDs and webcams to attempt to capture the faint glow on the dark hemisphere at crescentic phases is an important endeavor that must continue.

It is the ultimate goal of the ALPO Venus Section to attempt to assemble a completely homogeneous mass of accurate, reliable observational data collected over many apparitions, permitting an exhaustive statistical analysis. It is hoped that we might derive enough from painstaking observations and analysis to help provide some answers to questions that continue to perplex us about Venus.

Observations of the atmosphere of Venus are organized into the following routine programs:

- Visual observation and categorization of atmospheric details in dark, twilight, and daylight skies.
- Drawings of atmospheric phenomena.
- Observation of cusps, cusp-caps, and cusp-bands, including defining the morphology and degree of extension of cusps.
- Observation of dark hemisphere phenomena, including monitoring visibility of the Ashen Light.
- Observation of terminator geometry (monitoring any irregularities).
- Studies of Schröter's phase phenomenon.
- Visual photometry and colorimetry of atmospheric features and phenomena.
- Routine photography (including UV photography), CCD imaging, photoelectric photometry, and videography of Venus.

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

June 2 — In order to increase the effectiveness of the Lunar Meteoritic Impact Search (LMIS) section, a number of changes have been made to improve the focus and efficiency of operation. A number of ambitious ideas have been put forth since the formation of the LMIS in January 2000, some of which have been attempted but with only limited success. The modified approach is rather simple, drawing upon several principles of methodology to include the "3-C" approach to lunar meteor observing — confirm, count, and characterize. Rather than attempt to do a number of things in the study of lunar meteoritic phenomena, we have decided to be more focused and do one thing very well. The whole of the section will consist of these three steps to catalog lunar meteor events. More ambitious work will come as results allow.

With the extensive, dedicated efforts of Dr. Anthony Cook, the ALPO LTP coordinator, and others in the "Earthshine Watch", it is determined at this time that the monthly watch will not be pursued any further in an organized sense. We just don't have the resources to do such an ambitious project at this time in the history of the Section, and as the very-much appreciated efforts of Dr. Cook have shown, the yield is extremely low. We have attempted four times to secure supplemental funding from NASA and the National Science Foundation (NSF), but without success. This funding would have provided the resources and motivation to equip a team of amateurs for a concerted effort for monthly earthshine studies for meteor impacts. Without this source, we currently do not have the key numbers of personnel, coupled with the lack of availability of detection software to relieve the burden of hours of review of videotapes generated by the program. The ALPO LMIS Section will, however, continue to post prime dates for any one who wishes to observe during the "Earthshine period" and, as always, any and all observations, video and visual, are very welcome.

Since the monthly campaign is no longer in force, we are focusing on annual shower dates when the Earth-Moon geometry is favorable with the following (recommended) parameters for lunar meteor observing. Observations will commence when the following three parameters exceed 10: Local elevation 10 degrees or greater, Earth-based ZHR 10 or more, and the Percent of Impacts on unlit near side 10 or greater. Typically this amounts to about a half dozen or so opportunities per year, which is the right amount considering the time it takes to observe, record and review the recording.

Also, we encourage observers: when in doubt-report it anyway! As a result, we will likely be building up a catalog of cosmic ray hits and retinal flashes, but there could very well be faint impact flashes mixed in there as well. If an observer's confidence is at least 10%, (another 10-parameter…), we encourage them to report it anyway, along with a note of the low confidence for the record. For visual observers, it is recommended that they follow a 10-3 rule — for every 10 minutes staring through the eyepiece, rest 3 minutes, so that they are in optimal condition to monitor for impact flashes for an extended period.

These principle changes will be incorporated into the LMIS website over the coming months, to include its mission statement and report forms. Also, look for updated observing guides and star catalogues to aid in data collection. The observing manual, "An Observer's Guide to Lunar Meteoritic Phenomena" will reflect this methodology in its pages, with a chapter devoted to more ambitious future considerations for the section. This manual is expected to be published late in the current calendar year.

Lunar Domes

Marvin W. Huddleston, coordinator

Persons interested in the revived survey are invited to join the Yahoo discussion group on Lunar Domes located at http://groups.yahoo.com/group/lunar-dome/

Visit the ALPO Lunar Dome Survey Section on the World Wide Web at http://www.lunar-dome.com

Lunar Selected Areas

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

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

Mars Section

By Dan Troiani, coordinator
Daniel P. Joyce, assistant coordinator
With assistance from Richard Schmude, Jr., Deborah Hines, Donald C. Parker and Jeffery D. Beish

June 10 – Richard Schmude, Jr. measured the brightness of Mars on May 24, 2004 to be close to the predicted brightness. This result is consistent with there being little or no dust in the Martian atmosphere.

Mars is currently very low in the evening sky, so there is a chance that you can still see something.

The ALPO Mars Section is finishing up the 2003 Mars report and we are hoping to submit it to the editor in July. Almost 200 people sent in observations of Mars during the 2003 apparition. The 2003 apparition report will include maps of Mars, the north polar cap/hood and the south polar cap. There will be an extensive discussion on the photometry and the recent dust storms.

Most of the Section leadership will be attending the AstroCon gathering in Berkeley in July. There will be profuse gratitude expressed for those who sent in the wonderful observations we received for the (still-ongoing!) apparition. We are deeply indebted.

Because Mars is now heading toward solar conjunction, this will be the last call for observations. Soon, Mars' apparent diameter will not even exceed that of Uranus. It was a memorable display this time, and we reaped a rich harvest.

(Addenda from Dan Troiani) Triple anniversary for your Mars Section Coordinator this summer:

- June – 25 years as a member of the ALPO (June 1978)
- July – 16 years on the staff of the Mars Section (assistant coordinator in July, 1988)
- August – 12 years as the head coordinator of the ALPO Mars Section (August, 1992)

The 2003 apparition map of Mars is almost done. This is the eighth Mars map that Troiani completed for the past eight Mars oppositions starting with the 1988 apparition. The first two were hand-drawn maps and the rest were done on a computer using Adobe *Photoshop*. Since 1992, these maps have appeared in the *The Strolling Astronomer*, *Sky & Telescope* magazine, *Astronomy* magazine and *Mercury* magazine.

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

June 10 – The *Minor Planet Bulletin* Volume 31, No. 2, 2004 April-June, contains lightcurves and associated rotation periods and amplitudes for minor planets 110, 174, 196, 228, 342, 354, 365, 373, 575, 776, 804, 899, 1084, 1171, 1248, 1306, 1309, 1351, 1388, 1474, 1501, 1544, 1589, 1645, 1790, 1825, 2074, 2097, 2525, 2778, 3674, 5076, 5892, and 6386. Planets 110 and 196 have very complex lightcurves. Brian D. Warner has published his very fine book, based on his vast personal experience, "A Practical Guide to Lightcurve Photometry and Analysis," by Bdw Publishing, 2003, ISBN 0-9743849-0-9, 266 pages, $30, which may be purchased through http://www.MinorPlanetObserver.com .

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

Jupiter Section

By Richard W. Schmude, Jr., coordinator

June 4 – Jupiter will remain visible in the evening sky through August. Please be sure to observe Jupiter this summer. Oval BA is expected to pass the GRS in late July and we will need images and drawing of these two features. Oval BA will probably stretch out as it passes the GRS; this is what it did the last time it passed the GRS.

Another feature that people need to watch is the North Temperate Belt. This belt has been weak for over a year and I am expecting it to become darker soon. Please report any changes to the Jupiter coordinator.

There is a chance that we will be working with a professional astronomer in 2005. More information about this will be posted on the Jupiter e-mail group. If you are not a member of this e-mail group then contact Craig MacDougal (assistant Jupiter coordinator); his e-mail address is listed in the "ALPO Resources" section of this Journal.

I am planning to begin working on the 2003-04 Jupiter report in the summer and will submit it to the JALPO this autumn. Please be sure to send in your Jupiter observations quickly.

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

April 11 – Saturn's southern hemisphere and south ring face have been conveniently open for our inspection in recent apparitions. During the current 2003-2004 apparition, Saturn's rings have been inclined -25°, just shy of their maximum tilt of -27° to our line of sight, which occurred during the 2002-2003 apparition. The rings will now gradually to "close up," with Saturn diminishing gradually in brightness, as the next edgewise orientation in 2009 approaches.

With respect to recent apparitions of Saturn, all reports for the 2002-2003 apparition have been received, logged into the ALPO Saturn Section database, and are now undergoing detailed analysis. Observer response during 2002-2003 was excellent, with a considerable number of superb CCD, videographic, and webcam images of Saturn received, along with routine drawings and descriptive reports. The apparition report for the 2002-2003 will appear soon in this Journal.

The current well-observed 2003-2004 apparition will draw to a close as Saturn reaches conjunction with the Sun on 2004 July 08. Even though our analysis has not yet begun for the 2003-2004 observing season, Saturn's atmosphere has shown some interesting activity over the last eight months. Over 100 images have been submitted so far, and most have been made with webcams. Samples of drawings and images appear on the Saturn page of the ALPO website.

All ALPO Saturn observers will not want to forget that there is a great opportunity this apparition for participation in the *Amateur-Professional Cassini Observing Patrol*, because Cassini's arrival at Saturn (orbit insertion) occurs on July 1, 2004, followed by the Titan Probe Entry and Orbiter flyby on November 27, 2004. What will be most useful to the professional community will be digital images of Saturn at wavelengths ranging from 400 nm - 1 micron in good seeing using webcams, CCDs, digital cameras, and videocams. This effort began in April 2004 to coincide when Cassini starts observing Saturn at close range. Use of classical broadband filters (e.g., Johnson system: B, V, R and I) have been recommended, and for telescopes with large apertures (e.g., 30.0 cm. and greater), imaging through a 890-nm narrow band methane filter will also be extremely worthwhile.

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

The ALPO Saturn Section is always eager to enlist new observers, and anyone interested in our programs should contact the ALPO Saturn Section Coordinator on how to get started.

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

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

Remote Planets Section

By Richard W. Schmude, Jr., coordinator

June 4 – The planets Uranus and Neptune can be easily seen in the early morning sky during July. Uranus is continuing to rise higher and higher each year. This year, it is at a declination of around -10 degrees. Dr. Schmude measured the brightness of Uranus on May 24, 2004; Uranus was about as bright as it was last year.

Pluto will reach opposition in June. Hopefully, people will be able to do some CCD photometry of Pluto. Brightness measurements can tell us what is happening on Pluto.

At the moment, Dr. Schmude is finishing up the 2003 apparition report of Uranus, Neptune and Pluto. He is planning to send this report to Ken this summer. A total of 25 different people sent in observations of these three planets in 2003.

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

ALPO Membership Online

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

ALPO Interest Codes

The following codes are used to indicate member interests in the table of newest members later in this section.

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

Sponsors, Sustaining Members, and Newest Members

By Matthew L. Will, A.L.P.O. Membership Secretary/Treasurer

The ALPO wishes to thank the following members listed below for voluntarily paying higher dues. The extra income helps in maintaining the quality of the *Journal* while helping to keep the overall cost of the *Journal* in check. Thank you!

As of June 12, 2004: SPONSORS - Members giving $100 or more per membership:

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ROGER J VENABLE	AUGUSTA	GA	
ELIZABETH W WESTFALL	ANTIOCH	CA	

NEWEST MEMBERS...

The ALPO would like to wish a warm welcome to those who recently became members. Below are persons that have become new members from September 2, 2003, through June 12, 2004: where they are from and their interest in lunar and planetary astronomy. The legend for the interest codes are located at the bottom page 10.

MEMBER	CITY	STATE	COUNTRY	INTERESTS
MARVIN O ALVAREZ	MIAMI	FL		
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LAURA BERNIER	VICTORVILLE	CA		
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DAVID BEARDSLEY	ZEPHYRHILLS	FL		
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THOMAS DEBOISBLANC	THOUSAND OAKS	CA		23R
MARK S DEPREST	ANN ARBOR	MI		
MARIE & MELISSA DI GIACOMO	CHICAGO	IL		
VINCENT DOVYDAITIS	LAS CRUCES	NM		
WES EDENS	GLENDALE	AZ		
JAMES FISHER	ROUND ROCK	TX		
CHARLES FLOYD	PHENIX CITY	AL		3456ACDPS
RICHARD G FOSBURG	PALM DESERT	CA		
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ROD GALLANT	CHARLOTTETOWN	PE	CANADA	
CHRIS GILLIES	MAREEBA	Q	AUSTRALIA	
MICHAEL L GRYGIEL	RICHLAND	WA		04569
JOSE GUINOVART	BRUSSELS	EV	BELGIUM	
PATRICIA HAINES	NORTHUMBERLAND	PA		
HARRY HARKER	COLUMBIANA	OH		
STEVE E HAUGEN	ST PETERSBURG	FL		0123456789 ACDEHIMOPS

MEMBER	CITY	STATE	COUNTRY	INTERESTS
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WESLEY HIGGINS	TECUMSEH	OK		
BRIAN HINES	MARTINSBURG	WV		
THOMAS M HOPKINS	VICTORVILLE	CA		
RICHARD F HOWARD	AUBURN	NY		3
KEN HUBAL	NORTH ROYALTON	OH		456I
GARY HUDSON	LAKE ORION	MI		
MISSY JACKSON	OLIVER SPRINGS	TN		
KEITH JANECO	BOARDMAN	OH		
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JUAN LUIS MARTINEZ	AGUAS BUENAS	PR		
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JOHN MC VEY	BOISE	ID		
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DR MICHAEL T MC EWEN	EDMOND	OK		
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MEMBER	CITY	STATE	COUNTRY	INTERESTS
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ENRIQUE RIVERA	BOLINGBROOK	IL		3456ACP
ENZA RIZZOTTO	BRENTWOOD	NY		356
PAUL J ROEDER	PROVINCE	TX		
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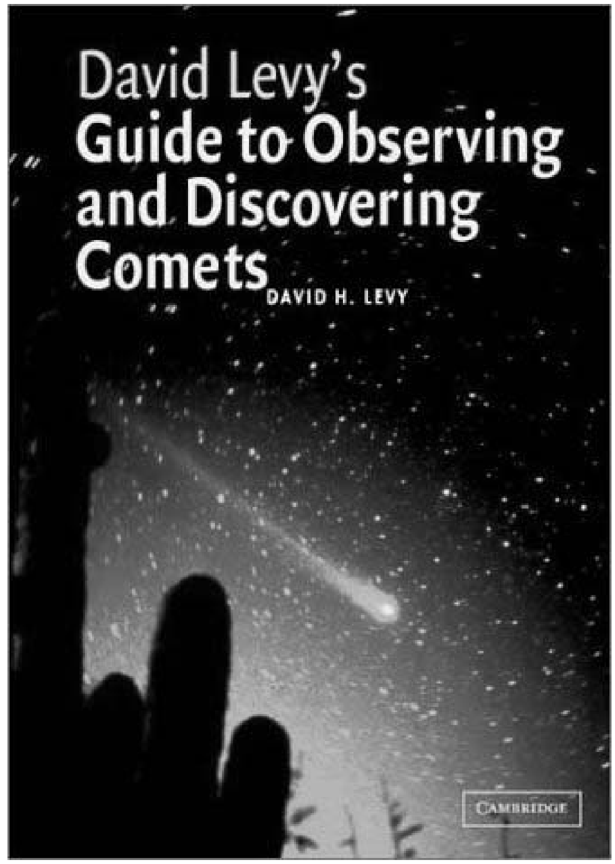
ALPO Book Review — David Levy's Guide to Observing and Discovering Comets

Published by Cambridge University Press, 40 West 20th Street, New York, New York 10011-4211. 2003. 188 pages. Paperback. Price: $17
ISBN number 0 521 52051 7

Reviewed by Gary Kronk, former ALPO Comets Section coordinator
E-mail to kronk@amsmeteors.org

I have been observing and researching comets for a long time. They fascinate me in two ways. First, I love studying their changing appearance as they move across the sky. Second, I am very interested in the history of comets. From corresponding with David Levy on and off for nearly 20 years, as well as reading many of his books, I know that he appreciates comets the same way I do. Subsequently, it was with great anticipation that I looked forward to reading this book. The topic of "observing and discovering comets" is quite broad, but with an advertised length of only 188 pages, I expected the book would probably be directed more towards the beginner.

The book is composed of 19 chapters, which are themselves grouped into five parts. The first part, "Why observe comets?", gives a very nice history, which begins with the ancient Greek and Roman empires and ends with the theory of comets bringing important necessities of life to our planet — all in 13 pages. Along the way, Levy mentions the superstitions of how people thought comets influenced the outcome of some historical events, and the important work of Edmund Halley. Although this section may seem inadequate in discussing cometary history, it does hit the important highlights that would capture the attention of someone just beginning his or her trek into studying comets.



"Discovering comets" comprises the bulk of the book and is divided into 9 chapters. It very adequately covers the history of comet discovery, by looking at successful comet hunters like Charles Messier, Jean Louis Pons, Edward Emerson Barnard and many others. The section looks at what drove these individuals and even the techniques many of them used to successfully discover comets. The section also discusses the history of visual, photographic and CCD discovery techniques. It even has a chapter dedicated to finding comets on images obtained by the Solar & Heliospheric Observatory (SOHO).

"Discovering comets" also happens to include my favorite and least favorite chapters of the book. Chapter 6 is my favorite section. This is where Levy discusses his own comet discovery experiences. Levy has some great personal stories, and many of these involve his comet discoveries. This chapter contains many stories I had heard before, as well as many new stories. For instance, while following Comet Austin in May of 1990 at Catalina Observatory with astronomer Steve Larson, observers realized that this comet was not going to perform as hoped. Larson told Levy to stay home the next night and "find us a bright comet." The following morning, Levy was conducting a routine comet-hunting session and found a faint comet in Pegasus. A few months later that comet reached naked-eye visibility!

I thought the weakest chapter of the entire book was chapter 8, which discusses searching for comets with CCD cameras. For some reason, Levy gives a little more information than is necessary on the use of a CCD camera, including technical terms that he defines but fails to indicate their real purpose. Unfortunately, by touching on the more technical aspects of whether to use a camera that attaches to a serial port or a SCSI port, he misses the newer class of cameras that uses USB.

"A new way of looking at comets" is the title of Part III. It contains only two chapters, but appears a little out of place. The first chapter is a good discussion of comet Shoemaker-Levy 9 and is no doubt the reason this part of the book gets the title it has; however, the second chapter looks at the future of comet hunting and probably would have been better placed at the end of Part II.

Part IV, "How to observe comets", is another excellent section. Its five chapters instruct the reader how to estimate comet magnitudes, measure the diameter of a coma, and estimate the length of a tail. Also included are instructions on how to draw comets and photograph comets. It even includes details on measuring the positions of comets.

"Closing notes" is the title of Part V. It contains a single chapter entitled "My passion for comets." It is a classic piece of Levy writing, which paints a picture of what probably goes through the mind of this comet hunter as he gets up early in the morning and comet hunts until dawn.

I enjoyed this book very much, but my strong familiarity with comets from my own writing caused some errors to really stand out. On page 13, Levy gives the designation of one of his comets as "1998e", where it should have been "1988e". On pages 31, 91, and 157, Levy gives the discovery circumstances of periodic comet Encke. In each instance, he incorrectly gives the date of Caroline Herschel's discovery as "October 20, 1805" when it should have been November 7, 1795. The 1805 date was that of Pons' discovery, which is mentioned on those pages as well.

The only other notable problem in this book occurs on page 19. Levy states, "the effect of 'planetary perturbations' … has been variable on different comets. For some, the effect would turn out to be negligible. For others, like Halley, the effects would be considerable and easily measurable." He never says why the effects are different for each comet and, for a book that appears aimed at beginners, this omission will probably inspire some bizarre celestial conspiracy theory. Interestingly, on the same page, Levy uses his now-famous phrase, "Comets are like cats: they both have tails, and they both do precisely what they want to do," to describe the orbital motion of a comet, which appears very inappropriate.

Overall, this book is very good and really is not just for beginners. If you are just starting to observe comets and want a good primer, this book will certainly be a good start. On the other hand, even the experienced comet observer should enjoy this book. It is well illustrated with both drawings and photographs, and includes some great stories that are certainly worth the price of the book.

Meteors —

Viewing the 2004 Perseid Meteor Shower

By Robert Lunsford, ALPO Meteors Section coordinator
E-mail to lunro.imo.usa@cox.net

Overview

After being obscured by a Full Moon last year, the Perseids may be seen in all their glory this August. This year, the Moon will be a waning crescent, rising on average some two hours before the start of morning twilight. The ten-percent illumination will not cause any problems as long as one keeps the Moon out of the field of view. The peak night will fall on August 12, but the opportunity exists to view members of the Perseid shower during the last half of July and throughout most of August.

The Perseid Meteor Shower is produced by the debris of comet 109P/Swift-Tuttle, which last passed through our neighborhood back in 1992. Starting near July 15, the Earth begins to encounter the debris field created by this comet during its numerous passages through the inner solar system. The edge of the debris field is sparse and rates seldom exceed one shower member per hour. Also during this time, the Earth occupies a different part of its orbit so we will see these meteors radiating from Cassiopeia instead of Perseus. With each passing night we approach a little closer to the core of the debris field and the corresponding hourly rates will slowly rise. With the Earth's shifting position, the radiant will also move approximately one degree eastward each night.

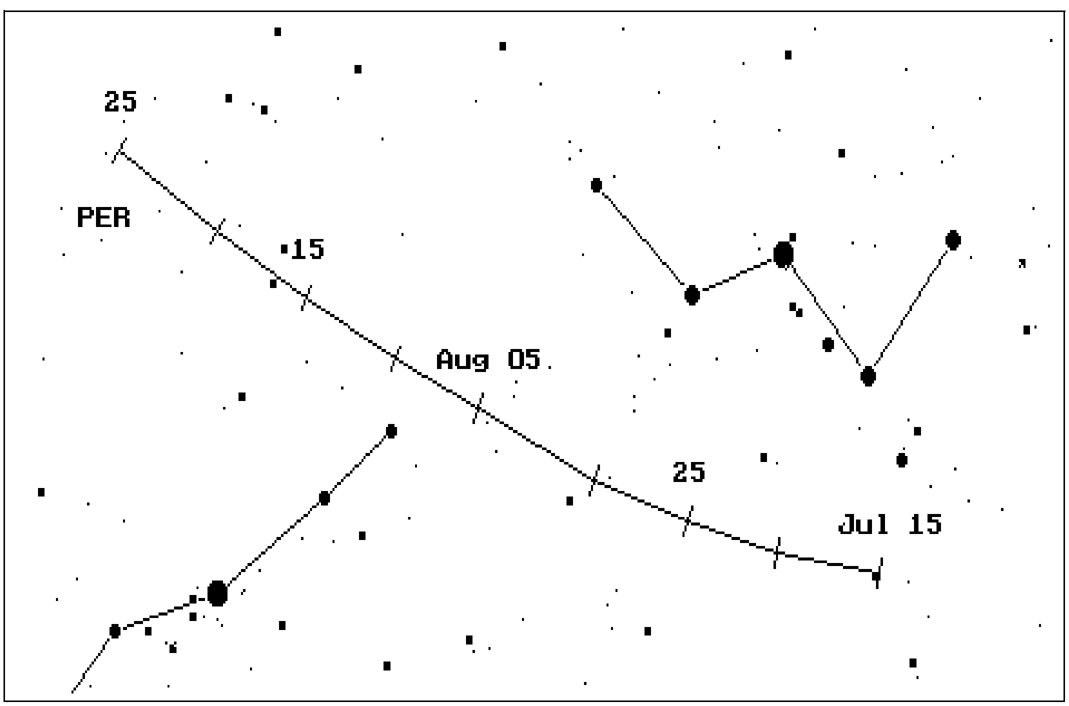


Figure 1: The Perseid meteor shower is active from mid July through most of August. The radiant drifts from the border of Cassiopeia and Andromeda through Perseus, finally ending in Camelopardalis. (Chart courtesy of the International Meteor Organization)

The Moon will interfere with viewing near the end of July, as it approaches its full phase. The full Moon is in the sky all night long on July 31. After that, the Moon will rise approximately 45 minutes later each night, creating more opportunity to view activity. Rates will kick into high gear as the Moon passes its Last Quarter phase on August 7. At this time, the moonlight will be much less intense, and fainter meteors can then be easily seen. Hourly rates for the Perseids are likely to be near 10 at this time. As we approach the night of maximum activity, rates will increase significantly as the Earth approaches the core of the Perseid debris field. To help the situation even more, the moonlight will become less and less of a factor with each passing night.

By August 10, rates up to 20 Perseids per hour may be seen. The closest approach to the center of the debris field is soon at hand. This inner portion of the debris field contains much more material than the outer edges. This material is far from uniform though; it was created by numerous passages of the comet through the inner solar system, therefore, there are filaments of debris within the core that correspond with each passage of comet 109P/Swift-Tuttle. These filaments are normally quite thin and the Earth takes just 15 minutes or so to pass through each one. We normally miss passing directly through these filaments each year. This year though, the possibility exists that the Earth may encounter the filament created by 109P/Swift-Tuttle in 1862. The time of this passage is predicted to occur near 20:54

Table 1: Perseid Radiant Elevations for Selected Latitudes

Radiant Altitude for 60N		Radiant Altitude for 40N		Radiant Altitude for 20N		Radiant Altitude for 0	
Local Daylight Time	Radiant Altitude in Degrees	Local Daylight Time	Radiant Altitude in Degrees	Local Daylight Time	Radiant Altitude in Degrees	Local Daylight Time	Radiant Altitude in Degrees
21:00	32	21:00	13	21:00	-5	21:00	-17
22:00	34	22:00	18	22:00	0	22:00	-10
23:00	39	23:00	23	23:00	6	23:00	-1
00:00	44	00:00	30	00:00	14	00:00	6
01:00	49	01:00	37	01:00	21	01:00	13
02:00	55	02:00	44	02:00	29	02:00	20
03:00	62	03:00	52	03:00	37	03:00	26
04:00	69	04:00	59	04:00	43	04:00	29

Universal Time* on August 11. This timing is favorable for the Eastern Hemisphere — especially the western Pacific area and Asia, where the radiant will lie high in the sky at this time. While the actual activity levels are unknown, they should be greater than the average of 50 Perseids per hour normally seen at this time.

The Earth will pass though the center of the debris field near 11:00 Universal Time* on August 12. This time favors the western portions of North America and the eastern Pacific regions, as the radiant will be high in a dark sky from these locations. During the last hour before the start of morning twilight, rates should approach one per minute, depending on your viewing conditions. There should also be numerous persistent trains on the brighter Perseids and an occasional fireball (meteor brighter than magnitude -3). Rates on the following morning will be lower, perhaps reaching to 30 per hour. As August progresses, Perseid meteors will continue to appear, but rates will continue to drop until they reach an average zenith hourly rate of one per hour on August 25. The radiant will have moved from Perseus into the obscure constellation of Camelopardalis before activity ceases in September.

Viewing Guidelines

To view Perseid meteors, one needs to simply view the sky during the dates above. To increase your chances, it is suggested that you view after midnight, when the constellation of Perseus lies high in the sky. There are also several other key strategies one can employ to undertake a successful watch. Of course the most obvious is to watch for as long as possible. The odds of seeing activity soon after beginning the night's watch is remote – especially if your eyes have not adapted to the dark conditions. One also needs to be comfortable while viewing. Standing is not an option, as you soon begin to tire as your neck becomes painful. Find a comfortable chair that will allow you to view at least half way up into the sky. Bright lights nearby will reduce the number of meteors visible. It is best to view toward the darkest direction.

There are several ways one can record the Perseid activity. The simplest is to count the number of Perseid meteors seen during a specific time. How can you tell if it is a Perseid meteor or not? Perseid meteors will all appear to come from the radiant no matter where they appear in the sky. If it was a true Perseid, then a line traced backwards will always intersect the radiant. One needs to know the location of the radiant and where that particular area of the sky lies at the time they are viewing.

For example, let's say it's the evening of August 11. As the chart in Figure 1 indicates, the Perseid radiant lies just above (north of) the star at the end of the line (Eta Persei). This position in the sky at sunset will lie nearly due north for everyone, no matter your location. The key is your latitude. For observers at 30 degrees north latitude and southward, the radiant will lie below the northern horizon at sunset. From 40 degrees north latitude, it will lie approximately 10 degrees above the horizon; and at 50 degrees north latitude, it will lie 20 degrees above the northern horizon.

As the night progresses, this area of the sky will rise higher into the northeastern sky. The radiant will culminate near 0600 local daylight time, which is unfortunately after sunrise for most of us. Therefore the earlier one observes, the lower the radiant elevation will be. The table above provides the radiant elevations for a few selected latitudes.

What is most notable from the tables is that it is not worthwhile to attempt to view Perseid meteors from 20 degrees north latitude and southwards before midnight. At the equator, the radiant does not even rise until after 23:00 (11 p.m.). One can also conclude that the Perseids are not visible below 30 degrees south latitude as the radiant does not rise at all during the night this far south. For the observer at 40 degrees north latitude, some Perseid activity will be visible during the early evening hours, but the radiant does not achieve sufficient altitude (30 degrees) until midnight.

The key hours for viewing Perseid activity will be the last few hours before morning twilight. This is true for everyone no matter the location. Not everyone can watch during the morning hours, so in that case, I would suggest viewing as late as possible in the evening.

Now that you know where the meteors are coming from and what time to view them, where in the sky should you look? The prime target would be to look halfway up

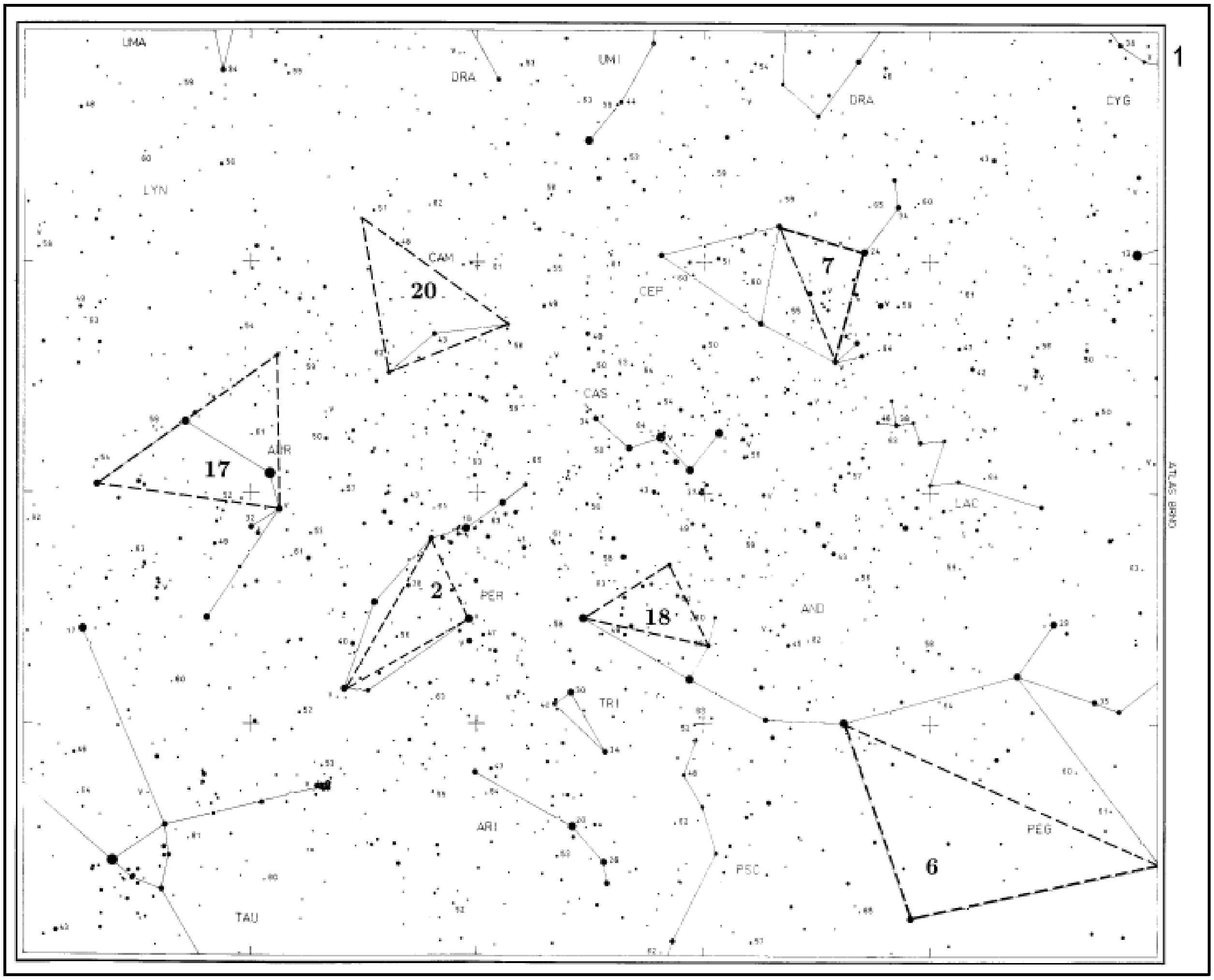


Figure 2: A representation of the star count areas plotted on Atlas Brno that is suitable for use during the Perseid shower. (Courtesy the International Meteor Organization).

into the north, northeastern or eastern portion of the sky. If lights ruin the view in this direction, then switch to either northwest or southeast. The last resort would be facing west to south. It is important, though, to look at least halfway up in the sky so that none of your vision is wasted on the ground. While most of the meteor activity will be seen in that strip of sky between 0 and 45 degrees altitude, absolutely no activity will be seen if your view is blocked by the ground, trees, hills or mountains. Adjust your view if necessary so that the bottom of your field of view just touches the top of the ground, trees, hills or mountains.

Table 2: Corresponding Limiting Magnitudes for Each Star Count Area in Figure 2

AREA2		AREA 6		AREA 7		AREA 17		AREA 18		AREA 20	
#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.
1	2.11	1	2.06	1	2.47	1	0.08	1	2.17	1	4.03
2	2.88	2	2.49	2	3.23	2	1.90	2	3.87	2	4.31
3	3.02	3	2.84	3	4.07	3	2.65	3	4.10	3	4.62
4	3.78	4	4.66	4	4.23	4	3.03	4	4.26	4	4.77
5	4.95	5	5.08	5	4.79	5	3.73	5	4.83	5	5.14
6	5.15	6	5.49	6	5.12	6	3.97	6	4.87	6	5.44
7	5.55	7	5.56	7	5.17	7	4.33	7	4.96	7	5.47
8	5.60	8	5.80	8	5.26	8	4.52	8	5.01	8	5.62

Besides hourly counts of the Perseids, there are several more aspects of each meteor that can be recorded. One can record the shower association of each meteor (Perseid, Sporadic, etc.), time of each meteor, the brightness (magnitude), color, length, velocity and altitude of each meteor. The most important parameters are the shower association and brightness in whole or half magnitudes.

To yield a useful report, one must at least include the block of time one observes or the time of each meteor and the shower association of each meteor. It is also important to state the observing conditions during your watch. This is usually accomplished by listing any cloud cover in percent within your field of view and the faintest star visible within this same field of view. Many star atlases list stellar magnitudes in increments of one-half magnitudes. Estimating the limiting magnitude in your field of view to the nearest half magnitude is fine for the novice observer. More experienced observers are encouraged to use the star count areas published by the International Meteor Organization (IMO). In Figure 2 is a representation of the star count areas plotted on *Atlas Brno* that is suitable for use during the Perseid shower. (Courtesy the IMO).

Each area should take no more than one minute to count. Do not attempt to artificially increase your estimated limiting magnitude by spending too much time counting stars. Using averted vision is acceptable during star counts, as a majority of your field of view is scanned using averted vision. More often than not, a meteor will occur when counting these areas. It is best to stop recording and record your meteor and then restart the count. Also, when counting stars in a star-count area, do not forget to include the stars which mark the corners of the area

Table 2 (continued) : Corresponding Limiting Magnitudes for Each Star Count Area in Figure 2

AREA 2		AREA 6		AREA 7		AREA 17		AREA 18		AREA 20	
#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.
9	5.79	9	6.13	9	5.29	9	5.21	9	5.04	9	5.63
10	5.80	10	6.14	10	5.36	10	5.46	10	5.64	10	6.00
11	5.98	11	6.17	11	5.42	11	5.64	11	5.67	11	6.04
12	6.01	12	6.25	12	5.73	12	5.91	12	5.94	12	6.17
13	6.07	13	6.25	13	5.95	13	5.99	13	5.98	13	6.17
14	6.40	14	6.26	14	5.96	14	6.09	14	6.13	14	6.20
15	6.41	15	6.29	15	6.00	15	6.11	15	6.13	15	6.21
16	6.45	16	6.44	16	6.14	16	6.23	16	6.39	16	6.24
17	6.50	17	6.47	17	6.19	17	6.30	17	6.42	17	6.25
18	6.51	18	6.50	18	6.23	18	6.30	18	6.52	18	6.35
19	6.54	19	6.50	19	6.44	19	6.41	19	6.55	19	6.36
20	6.60	20	6.57	20	6.47	20	6.44	20	6.58	20	6.38
21	6.61	21	6.59	21	6.48	21	6.47	21	6.60	21	6.43
22	6.66	22	6.59	22	6.63	22	6.48	22	6.64	22	6.49
23	6.72	23	6.60	23	6.69	23	6.51	23	6.65	23	6.61
24	6.72	24	6.60	24	6.70	24	6.54	24	6.68	24	6.62
25	6.75	25	6.67	25	6.71	25	6.56	25	6.68	25	6.63
26	6.78	26	6.68	26	6.72	26	6.57	26	6.77	26	6.64
27	6.85	27	6.68	27	6.84	27	6.58	27	6.77	27	6.64
28	6.89	28	6.69	28	6.88	28	6.58	28	6.84	28	6.66
29	6.90	29	6.72	29	6.92	29	6.59	29	6.90	29	6.69
30	7.02	30	6.73	30	6.93	30	6.60	30	6.95	30	6.71
31	7.03	31	6.74	31	6.94	31	6.63	31	7.07	31	6.74
32	7.03	32	6.82	32	6.97	32	6.66	32	7.14	32	6.81
33	7.05	33	6.87	33	7.01	33	6.69	33	7.19	33	6.82
34	7.15	34	6.89	34	7.04	34	6.75	34	7.21	34	6.85
35	7.15	35	6.89	35	7.06	35	6.77	35	7.23	35	6.86
36	7.16	36	7.07	36	7.08	36	6.80	36	7.23	36	6.88
37	7.18	37	7.07	37	7.16	37	6.81	37	7.25	37	6.89
38	7.22	38	7.10	38	7.18	38	6.82	38	7.26	38	6.89
39	7.23	39	7.11	39	7.23	39	6.84	39	7.26	39	6.92

Table 2 (continued): Corresponding Limiting Magnitudes for Each Star Count Area in Figure 2

AREA2		AREA 6		AREA 7		AREA 17		AREA 18		AREA 20	
#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.	#	Lim. Mag.
40	7.24	40	7.12	40	7.24	40	6.86	40	7.27	40	6.95
41	7.24	41	7.12	41	7.25	41	6.86	41	7.27	41	6.97
42	7.25	42	7.14	42	7.25	42	6.89	42	7.30	42	6.98
43	7.26	43	7.15	43	7.27	43	6.93	43	7.33	43	6.99
44	7.27	44	7.19	44	7.29	44	6.95	44	7.43	44	7.01
45	7.28	45	7.24	45	7.30	45	6.95	45	7.44	45	7.03
46	7.30	46	7.27	46	7.32	46	6.98	46	7.46	46	7.05
47	7.31	47	7.33	47	7.35	47	6.98	47	7.47	47	7.08
48	7.31	48	7.37	48	7.39	48	7.01	48	7.48	48	7.12
49	7.33	49	7.43	49	7.43	49	7.16	49	7.50	49	7.12
50	7.33	50	7.44	50	7.44	50	7.19			50	7.14
51	7.35	51	7.45	51	7.46	51	7.20			51	7.17
52	7.35	52	7.45	52	7.49	52	7.21			52	7.27
53	7.36	53	7.45			53	7.24			53	7.28
54	7.42	54	7.49			54	7.24			54	7.30
55	7.45	55	7.49			60	7.27			56	7.32
56	7.48	56	7.50			61	7.31			57	7.37
57	7.49					67	7.37			59	7.40
58	7.50					68	7.40			61	7.43
59	7.50					71	7.46			64	7.45

Activity during the Perseids is usually too great to record anything beyond the time, shower association and magnitude of each meteor. At other times, it is interesting to also record the color, length, velocity and altitude of each meteor. The simplest method to record data is writing your notes on a piece of paper. While you write, though, your eyes are off the sky and you may miss some activity. Experienced observers overcome this problem by recording their data verbally on a small cassette tape recorder. When the observing session is complete the tape is rewound and the data are transcribed on to paper.

It is also suggested that one observes at the darkest site possible, away from city lights. The darker the sky, the more stars will be visible. The more stars visible, the more meteor activity will be seen. During any shower, there are many more faint meteors produced than bright ones. The darker your skies, the more of these faint meteors become visible. One can easily double the number of meteors seen by moving from skies with a limiting magnitude of +5.0 to one with a limiting magnitude of +6.5. Wherever you view from, make sure it is safe and secure. Avoid observing alone in desolate spots as company usually discourages intruders and helps keep one alert.

While viewing the Perseids you may notice that other areas of the sky appear to produce activity. There are other minor radiants active during this time of the year. (Some observers have also suspected that an unlisted radiant lies in Cetus during the Perseids.) Observers are encouraged to also report the activity of these other radiants along with all the Perseids. Finally, while your session may be entertaining to you, it does not help extend our knowledge of these showers unless you share your data with others. Only when data from all over the world are compared does a true view of the activity curve become a reality.

Photographing the Perseids

You can try to create permanent memories of the Perseid shower by photographing the sky on the morning of maximum activity. This will give you the best chance of catching a falling star on film. It is all a game of chance, as you have to guess where a meteor may occur.

There are two strategies when attempting to photograph meteors. One strategy is to use a wide field lens in order to capture as much sky as possible. The downfall to this method is that wide field lenses tend to be slower (higher f-stop) and thus can only capture the brightest meteors. During the Perseids though, there tends to be many shower members in the negative magnitude class, so bright meteors are available.

The second method employs a smaller field of view with a faster lens. This method tends to capture more meteors, but they are usually faint on the photograph. My personal favorite method is to use a 28mm (wide-field) lens combined with fast film, which somewhat compensates for the slower lens. I usually use a film with an ISO speed of 1,000 to 1,600. You can only use this film when photographing in a site in a dark rural area, as it will quickly fog in the presence of city lights. From rural sites I can leave the shutter open as long as 20 minutes without any problems. Table 3 lists the approximate length of time one may leave the shutter open before fogging begins:

As you can tell, one cannot use a simple point-and-shoot camera for catching meteors. The shutter must be able to stay open for at least five minutes to be of use. Most new digital cameras are limited to 60 seconds and also have trouble with "hot" pixels during extended exposures in warm weather. Expensive digital SLR's (single lens reflex) usually have extended exposure times but one would also need a continuous source of power or an ample supply of batteries. Power is also a problem with electronic SLR's.

The camera of choice is the old mechanical SLR. A simple cable release on these cameras can keep the shutter open as long as one wishes without the need of batteries. These are usually supplied with a reasonably fast 50mm lens. Using a film of at least ISO 400 would be a good combination with this lens.

Figure 3: Perseid Bollide in the eastern portion of Cetus taken August 11, 1981, 3:11 PDT (11:11 UT) from a site in Alpine, California, USA. The actual fireball (magnitude -13) was visible from Andromeda down through Cetus and left a 13-minute persistent train. Excellent transparency with a limiting magnitude of +6.5 near the center of my field of view (Andromeda). The seeing conditions were not noted. Equipment details: 28mm f/1.8 SLR; exposure time, 9 minutes; film, stale ASA 200. This was the first frame taken, as I had just moved the camera to Cetus after noticing many Perseids occurring in the area. (Photo by Robert Lunsford)

A camera attached to a study tripod will create pictures of the stars trailing through the photograph. If you are lucky, a meteor may appear in the picture crossing these trails. Some photographers prefer that the camera follow the sky and keep the stars as pinpoints. This can be achieved by using a clock driven mount, which can range from small tabletop units to those large mounts used to guide telescopes. Some people attach their cameras directly to the telescope tube and let the mount guide both the telescope and the camera. Unfortunately, it is of little use to photograph directly though the telescope, as the field of view is much too small and the odds of capturing a meteor extremely remote.

Where should one aim in order to capture the most activity? Most of the meteor activity occurs in the lower half of the sky. Unfortunately haze, hills and lights necessitate that we aim the camera higher in the sky. It is best to aim the camera toward the darkest direction about halfway up in the sky. Just make sure no terrestrial objects are visible in the lower portion of the field of view, especially if your camera is driven. Those with a 50mm lens can aim directly at the radiant and hope to capture some of the short, bright meteors that occur in this area. Those with wider lenses should center their cameras at least 45 degrees away from the radiant. At this distance, the Perseid meteors are much longer than those seen near the radiant.

If you happen to see an area of the sky in which much meteor activity is occurring, go ahead and move your camera. This is how I caught a –13 magnitude Perseid fireball in 1981. Finally, the more exposures you take, the better your odds of capturing a meteor. If the visual rate reaches 60 an hour, then you should be able to capture 2-3 meteors on a 36 exposure roll of film. You will never know until you try!

Contribute Your Data

The ALPO Meteors Section accepts and publishes data on a constant basis. To contribute your data please submit your observations to the section coordinator, Robert Lunsford, 161 Vance Street, Chula Vista, CA 91910-4828

Table 3: Open Shutter Durations

Film Speed (ISO)	Limiting Mag. = 5.0	Limiting Mag. = 6.0	Limiting Mag. = 7.0
400	5 minutes	15 minutes	30 minutes
1000	3 minutes	10 minutes	20 minutes
1600	2 minutes	5 minutes	10 minutes

* McBeath, Alastair (2003). "2004 Meteor Shower Calendar". *IMO* info (2-03), pp. 8-9

(NOTE: A shorter version of this article also appears in the American Meteor Society publication, *Meteor Trails*.)

Mercury/Venus Transit Section: —

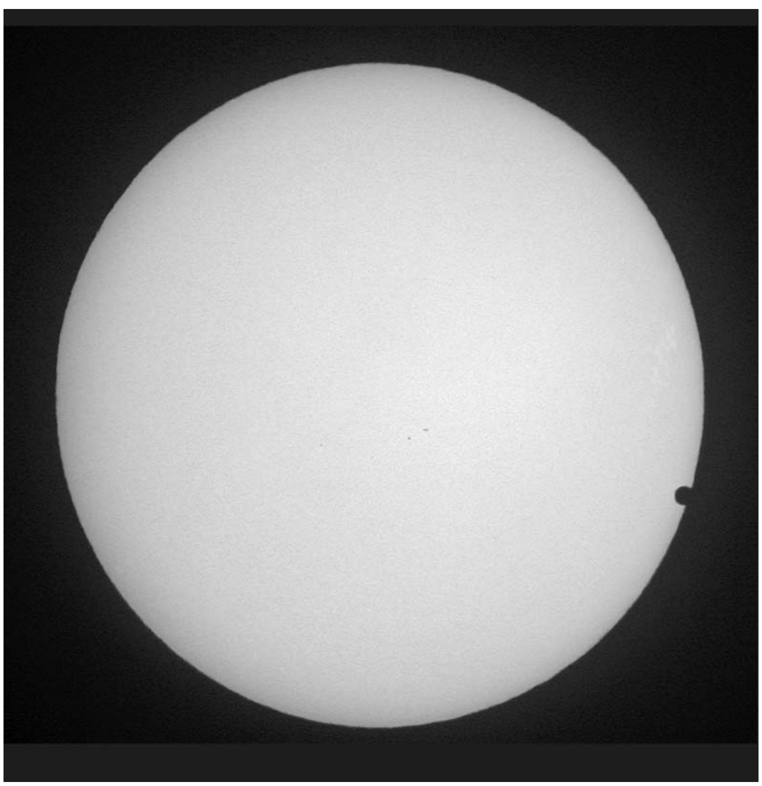
The Late, Great Transit of Venus

By John Westfall, coordinator

On the morning of June 8, 2004, not a living soul had seen a transit of Venus; by that evening, conservatively, several hundred million had. As of this moment (June 18), the ALPO Mercury/Venus Transit Section has received accounts of this event from about 25 observers. Reports are still arriving in the form of limb contact timings, written descriptions, drawings, and images. Several images show the “ring of light" around Venus when crossing the Sun's limb, a phenomenon before now shown only in drawings or described in written notes.

If you watched the transit, whether with a telescope, binoculars, or filter-protected naked eye, please forward your observation to us — ALPO Mercury/Venus Transit Section, P.O. Box 2447, Antioch, CA 94531-2447, USA. (Email: johnwestfall@comcast.net). Along with the observation itself, we need backup information on your telescope (type, aperture, magnification or, if an image, effective focal length), atmospheric seeing and transparency conditions, and longitude and latitude to 0°.01.

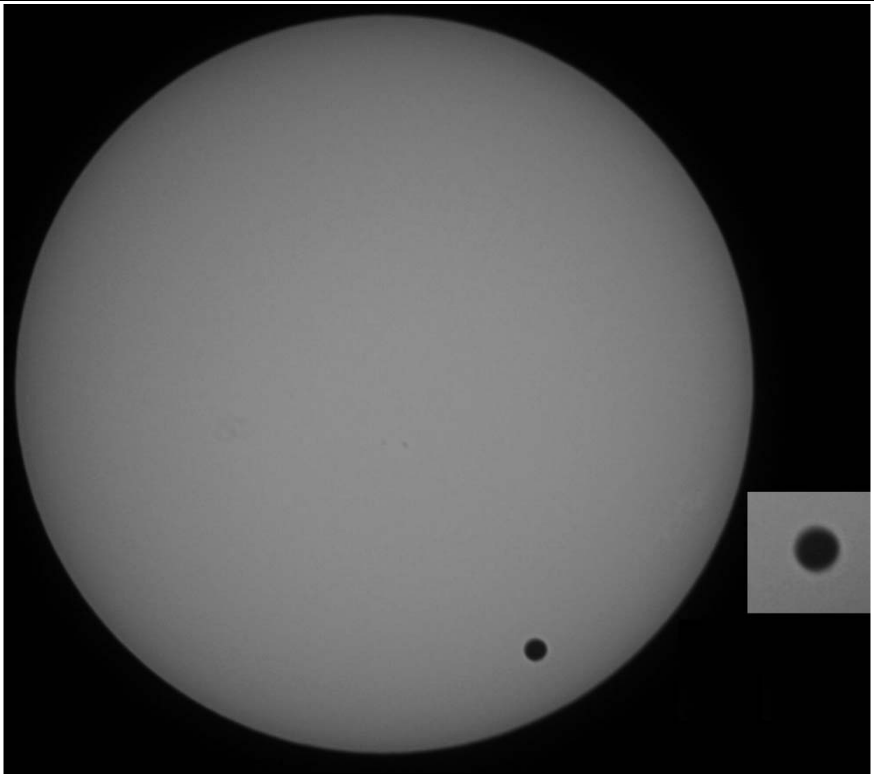
Our preliminary report on this rare event is to be given at the coming AstroCon 2004 convention (Berkeley, California, July 21-24, 2004); a more complete account will be published in the *Strolling Astronomer* in the near future.



Antonín Rükl (Prague, Czech Republic) — After reading your recent ALPO-Member-Discussion, devoted to Venus transit, I would like to share with you our excitement on this wonderful phenomenon. Fortunately, we had completely blue skies here in Prague through the transit, only a few cumulus clouds appear during the last hour and the 3rd and 4th contact. What a rare and breathtaking view!

Attached please find a few souvenirs/ pictures taken with my ETX 90 (the generous gift from members of the Atlanta Astronomy Club), Nikon Coolpix 995 and Baade filter. Of course, any extras (like black drop or the bright atmosphere ring) were not captured with this equipment, but as seen in your list and elsewhere on Internet, many observers reported the ring, also clearly seen visually through larger apertures.

(My wife) Sonja watched the beginnings of the transit with me and then she left for a treatment at the dentist(!), taking the special sun-glasses in her pocketbok. After the treatment she demonstrated the event to the doctor and other staff, and returning back, she stopped several times in the town and looked at the Sun - attracting passers-by, of course. Tens of people saw the black Venus thanks to Sonja, so as an astronomer, I am proud to have a so well-educated wife.



Keith Shank (Stockholm, Sweden) — From a collage of the Venus transit images on my website at http://kasism.home.comcast.net

Note that the timing could be off a few seconds.

Details: June 8, 2004, 10:13:08 UT; 127 mm @f/10. Latitude: N 59.16.20 Longitude: E 18.18.15. Equipment: Celestron C5 Schmidt-Cassegrain, Canon Digital Rebel camera with Thousand Oaks solar filter.

David O. Darling (Sun Prarie, Wisconsin, USA) — Photograph taken 11:06 UT using 5-inch RFT refractor with Sony Digital Camera DSC-P71.

The Moon — The Maestlin Region: Geology and Geologic History

By: Eric Douglass and Robert A. Garfinkle, F.R.A.S. (© 2004 Eric Douglass and Robert A. Garfinkle) Used here with permission.)
E-mail to ejdftd@mindspring.com and ragarf@earthlink.net
Peer review by Roger Venable
E-mail to rjvmd@knology.net

Introduction

The Maestlin Region (Figure 1) is a locally elevated crater-marked surface situated to the southeast of the cone crater Maestlin (latitude 04°.9 north; longitude 40°.6 west). The crater is about 7 kilometers (4.3 miles) in diameter and about 1,650 meters (5,413 feet) deep from the rim crests to the floor of the crater. This crater is named for the German mathematics and astronomy professor Michael Maestlin (1550–1631).

The region is defined by its relative elevation, which can be seen in the optical images, and its comparatively greater age than the surrounding terrain. The region is composed of two major units, these being a younger mare surface and a set of older mountains.

The area appears to be where at least six major non-overlapping impacts occurred. To the west is the ghost crater Maestlin R (latitude 03°.5 north; longitude 41°.5 west) [60.8 km (37.7 miles) in diameter] and to the east is the larger [95.5 km (59.3 miles) diameter] ghost crater Encke T (latitude 03°.3 north; longitude 38°.0 west). The other unnamed ghost impact craters can be detected by the curvature of the mountains that form the edges of the elevated region.

After the major impacting era ended in this area, the lower elevations were flooded by successive lava flows. The region is notable for its variety of interesting rilles and other surface features. We will examine the various structures that occur in this area, and construct a geologic history of the region.

Age

An examination of the Lunar Orbiter imagery, included here as figures 2 and 3, reveals that the elevated Maestlin Region has a significantly larger number of impact craters than the surrounding mare surfaces. In both of these images, the Maestlin Region has considerably more impact scars, especially as bright rayed-craters. This suggests that the Maestlin Region is older than the mare surfaces surrounding it,

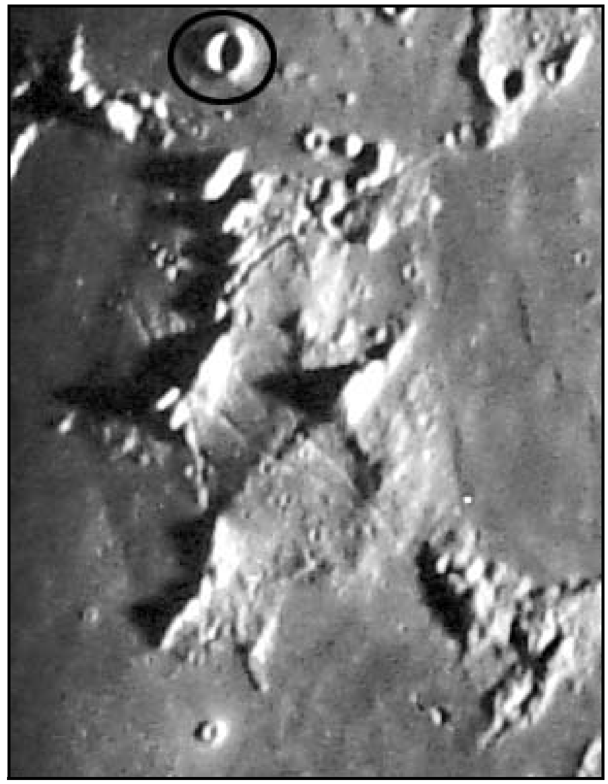


Figure 1: The Maestlin Region, located southeast of its namesake crater (circled). Source: Kuiper, G., et al. (1967): *Consolidated Lunar Atlas*. Tucson, Arizona: Lunar and Planetary Laboratory, University of Arizona. Digital Version, ed. Douglass, E., and O'Dell, M.S. (2003). Houston: Lunar and Planetary Institute. Map D22.

and so these mare surfaces set the minimum age for dating purposes.

Since the surrounding mare surfaces are from the Imbrian (probably Upper Imbrian) and Eratosthenian periods (Wilhelms and McCauley, 1971), the Maestlin Region is at least this old (3 billion years ago). The area is also overlain with ejecta materials from the crater Kepler, as this impact is much younger.

The mare surface of the Maestlin Region contains no scars from the impact event that created the Imbrian Basin to the north, while the mountains of this region do contain such scars that tend to be radial to the Imbrian Basin. This indicates that the mare regions are younger than both the mountains and the Imbrian Basin, and places an upper limit on the age of the mare surfaces in this region — they must be younger than the Imbrian Basin impact (3.85 billion years ago). It appears that the Maestlin Region is

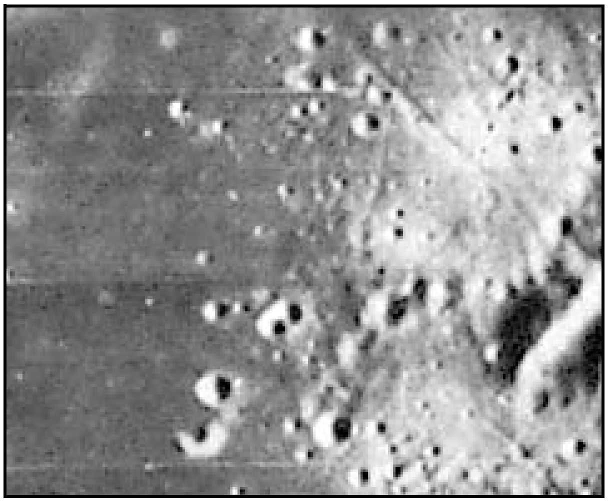


Figure 2: Western portion of Maestlin Region at right with surrounding mare surface at left. Note larger number of impact craters in Maestlin Region. Source: Bowker and Hughes, (1971): *Lunar Orbiter Photographic Atlas of the Moon*. NASA. p.178.

from the Imbrian age (3.85–3.0 billion years ago), and likely from the older part of this period (Lower Imbrian).

When compared to the surrounding mare surfaces, the Maestlin Region is not only locally uplifted, but also older. This, along with lower FeO concentrations

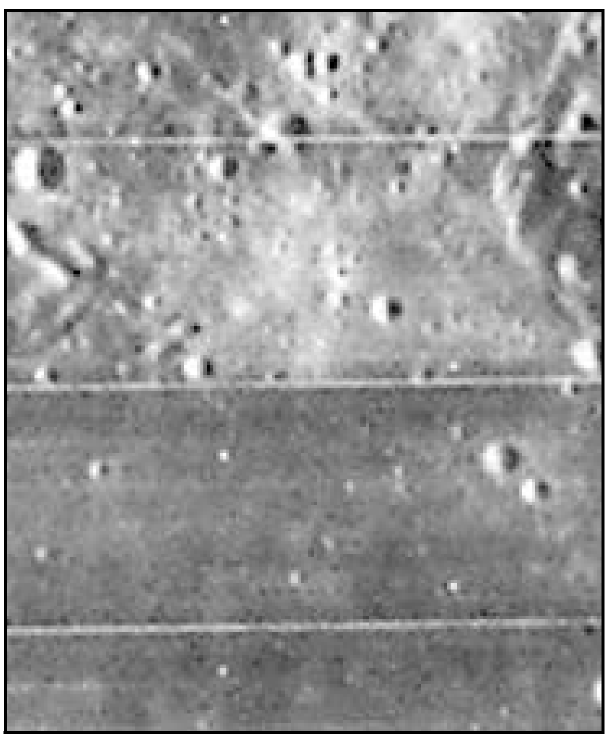


Figure 3: Southern portion of Maestlin Region at top with surrounding mare surface below. Again, note larger number of impact craters in Maestlin Region. Bowker and Hughes, (1971): *Lunar Orbiter Photographic Atlas of the Moon*. NASA. p182.

(Jolliff *et al.*, 2001), suggests that the Maestlin Region is a distinct geologic unit, and not a simple uplift of the surrounding mare surface.

Local Geology

The Maestlin Region has a variety of interesting geologic forms, virtually all of which can be observed through earth-based telescopes. Each of these will be discussed as follows:

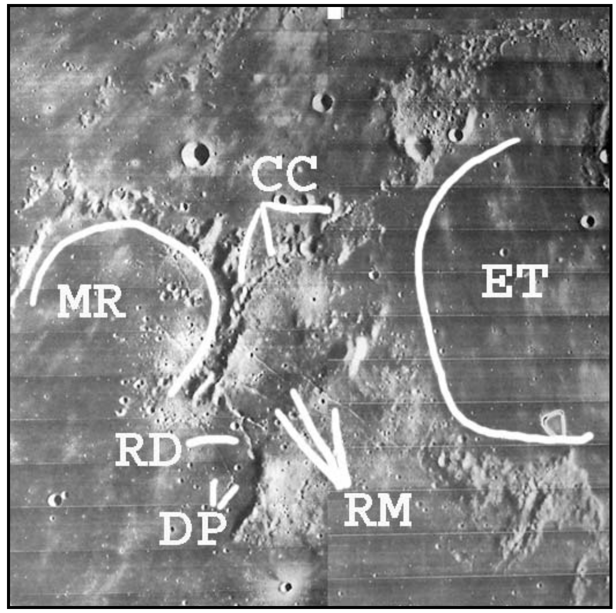


Figure 4: Composite photo from pp. 178 and 182 *Lunar Orbiter Photographic Atlas of the Moon*. NASA.

(a) Crater Chain (marked as "CC" in Figure 4; for details, see figures 6 and 7): This catena cuts through the Maestlin Region heading northeast from the eastern rim of the crater Maestlin R. The sizes of the craters in the chain diminish in diameter as the chain stretches for about 150 km (93.2 miles) northeastward toward the crater Encke C. In Lunar Orbiter imagery, this feature is clearly composed of a series of craterlets. While such strings have a variety of possible origins (such as a series of volcanic drainage pits or impacts of a tidally disrupted comet or meteoroid), the mechanism that best fits the present context is a string of secondary impacts. Secondary impacts form when blocks of ejecta from a distant crater impacts on the lunar surface, producing a set of craterlets. Craterlets formed in this way tend to be irregular in shape (Wichman and Wood, 1994), often have a missing back wall where the headwall of the next crater intrudes, and have a herringbone ejecta pattern. Examples of these features can be seen in the cratering field about crater Copernicus (Figure 5). Most of these

Figure 5: Cratering field details near Copernicus. Source: Upper image: Ibid. p193. Lower image: Masursky, Colton, and El-Baz (1978): *Apollo Over the Moon*. Washington: United States Government Printing Office. p 130.

features are visible in the Lunar Orbiter imagery of the Maestlin crater chain (Figure 6, especially the region above "A"; also see Figure 7), though the herringbone pattern in the ejecta has been lost due to micrometeorite erosion.

The age boundary of the chain is established by the degradation and volcanic filling of parts of the chain. The northern reach of the chain ends abruptly, north of the Maestlin Region. However, examination of the termination reveals that the final visible craterlet is filled with mare lava (Figure 6). Since this is an Imbrian age lava flow (Wilhelms and McCauley, 1971), the chain must be at least as old as this. The oldest age is suggested by the general state of degradation of the craterlets in this chain. (For characteristics of degraded craters, refer to Wilhelms (1987), p. 134.)

Examination of the craterlets suggests that it is from the Eratosthenian or possibly the latest part of the Imbrian period. Thus, the suggested age for this crater chain is from the latest part of the Imbrian period (around 3.0 billion years ago).

(b) Rimae Maestlin (marked as "RM" in Figure 4; for details, see Figure 7): A variety of straight rilles runs through the Maestlin Region. All rilles identified in the Lunar Obiter photos are found fully within the Maestlin Region, and do not extend onto the surrounding mare surfaces. Within this region, the rilles appear on both low-lying regions and in massif regions, and a few extend from one to another.

With rare exceptions, all rilles trend in a northwest to southeast direction. In form, the rilles are generally straight and appear to be grabens, suggesting that these rilles are the result of extensional forces in the region. As this is a volcanic province, with later volcanism occurring both within the region and in surrounding regions, it is likely that these grabens represent the surface expression of extensional forces created by the accumulation of lava beneath the Maestlin Region.

Some of the grabens cross onto the low-lying regions where dark patches occur. In certain of these features, the grabens lose their distinctiveness (Figure 7, labeled "A"), suggesting later resurfacing with obliteration of the graben. How-

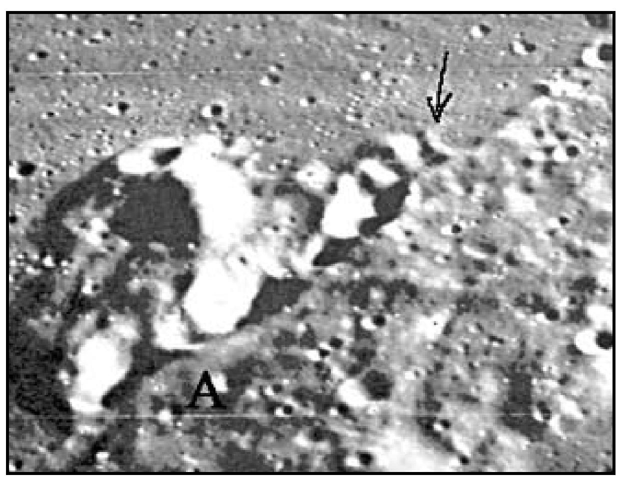


Figure 6: Maestlin Region crater chain details. Source: Lowman, P. (1969): *Lunar Panorama: A Photographic Guide to the Geology of the Moon*. Zurich: Weltflugbild Reinhold A. Muller. p 44.

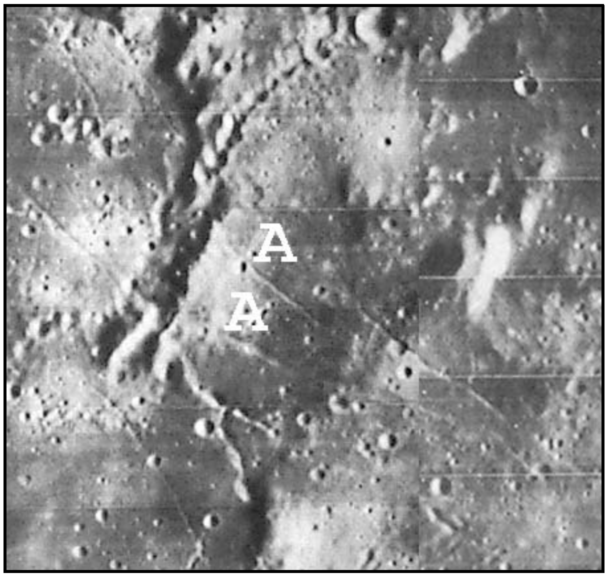


Figure 7: Maestlin Region rimae and depressions. Source: : Bowker and Hughes, (1971): *Lunar Orbiter Photographic Atlas of the Moon*. NASA. pp.178 and 182.

ever, other grabens cross these dark patches without losing their distinctiveness, suggesting that they formed after the resurfacing event. Therefore, these grabens must have formed over a wide time frame as volcanism was occurring within the Maestlin province.

(c) Rima with Depressions (marked as "RD" in Figure 4; for detail, see Figure 7): This rille is different from the rima noted above in that it does not appear to be a straight graben. Rather, this rille has curved segments and at several places appears to broaden into oblong, flat-floored depressions with little internal structure. A number of similar features are found elsewhere on the lunar surface (Figure 8). Such features generally occur in volcanic provinces, and are likely related to collapse in association with volcanic processes.

(d) Dark Patches (marked as "DP" in Figure 4; for detail, see Figure 7): The Maestlin Region contains a number of smooth dark patches. Inspection of these reveals a relative paucity of impact scars in the dark areas, suggesting that they are younger than the Maestlin Regions in which they are embedded. These probably represent the youngest lava flows on the Maestlin Region, arising from a later pulse of volcanism. While such dark patches often represent pyroclastic activity, the Clementine data does not suggest this (Gaddis). Thus, these patches likely

Figure 8: Miscellaneous Maestlin Region features. Source: (left image) Wilhelms (1987): *Geologic History of the Moon*. USGS Professional Paper 1348. Washington: United States Government Printing Office. p 87; right images: Masursky, Colton, and El-Baz (1978): *Apollo Over the Moon*. Washington: United States Government Printing Office, pp. 99, 214.

represent the last flows of effusive volcanism in this province.

(e) Mountain Ranges (marked as “MR” and “ET” in Figure 4): A number of mountain ranges occur throughout the Maestlin Region. In the western region, the arc of a mountain range reveals a roughly circular pattern, with the south wall missing (called “Maestlin R”). It is clear that these are the highest points (rim crests) of a flooded crater, with the south wall being below the level of the lava flooding. The mountains to the east of the region undoubtedly stem from the same origin, and so represent the most elevated parts of flooded crater rims (called “Encke T”).

All the mountain ranges show lineations in a direction trending from north-northeast to south-southwest. These lineations are similar in form to the linear markings in the crater walls of Ptolemaeus and its surrounding region, and indeed, all of these lineations are radial to the Imbrian Basin. Here ejecta from the Imbrian impact struck existing structures at high velocity, damaging them in a radial fashion with respect to the impact site. Just these lineations reveal that these structures are pre-Imbrian in timescale (greater than 3.85 billion years of lunar age). This entire elevated region was also built-up by the layering of these ejecta materials, ejecta from the ghost craters and mare flooding. Secondary impacts from this crater formation era have also left their marks on this area.

Geologic History

Using a combination of crater dating techniques and stratigraphic relationships (how objects overlap each other), we can construct a geologic history for the Maestlin Region.

The oldest features are the mountain peaks, which are pre-Imbrian in timescale. These represent the highest points of ancient crater rims. At a later time, the Imbrian impact formed the Imbrian Basin (3.85 billion years ago), scattering ejecta that scarred the walls of these massifs and covered the entire region with a thick ejecta blanket. At a later time, lava flows inundated this region, including the flows that formed the Maestlin Region. Given the high crater density on the Maestlin flows, these must represent an early pulse of volcanism — one that is considerably older than the present surface flows that surround the region.

After this initial pulse of volcanism, later pulses occurred. Some of these accumulated under the Maestlin Region, causing a tensional stress in the overlying materials. These stresses were released through the formation of a series of “grabens”. Some of these pulses also reached the surface, producing the “dark patches” that occur throughout this region. Some of these also reached the lunar surface surrounding the Maestlin Region, producing the current mare surfaces that abut its raised sides.

While these volcanic processes were operating, impact processes were also occurring. The most prominent example is the string of ejecta that produced the “crater chain” that crosses the Maestlin Region. Inasmuch as Imbrian surface flows covered this string where it entered the surrounding mare surface, this feature must have formed in the last part of the Imbrian period. After volcanism ceased in the Maestlin Region, the region was subjected to a slowly decreasing rain of micrometeorites which have eroded the existing features.

The Maestlin Region forms a fascinating hunting ground for observers who take the time to examine the more unusual features on the lunar surface. Its rilles form a group of wonderful “‘high power” objects, as do the dark patches of its later volcanism. For all observers who enjoy the unusual objects, good hunting!

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ALPO Feature:
Jupiter –The 1995 - 1997 Apparition

By Richard Schmude, Jr., coordinator, ALPO Jupiter Section
E-mail to Schmude@gdn.edu

Peer review by John Westfall
E-mail to johnwestfall@comcast.net

Abstract

The drift rates of 21 features are summarized in this report. The drift rates were computed from longitudes measured from images of Jupiter taken in visible light. The drift rates for the South South Temperate Belt are similar to rates in apparitions before the comet impact in 1994 indicating no long-term changes as a result of that event. A methane-band image taken at 889 nm on 1996 July 2 indicates that the South Temperate Belt ovals BC and DE extended to high altitudes.

Introduction

The most significant event that took place during this apparition was the exploration of Jupiter by the Galileo probe. One probe entered Jupiter's atmosphere in December 1995 while the other probe orbited Jupiter (Hanlon, 2001). In addition to Galileo, important studies made by the Hubble Space Telescope and Earth-based observers were also being carried out; *see*, for example, García-Melendo *et al*. (2000). Rogers and Foulkes (2001) summarize observations made by members of the British Astronomical Association in 1996. Budine (1996, 188) gave a preliminary report based on observations made by members of the Association of Lunar & Planetary Observers (ALPO). Rummler (1998, 176) summarizes his observations of Jupiter. This paper is a thorough summary of Jupiter observations made largely by members of the ALPO.

The characteristics of Jupiter during the 1995-97 Apparition are listed in Table 1, while the participating observers and their locations are summarized in Table 2. Figure 1 shows a drawing of Jupiter along with the nomenclature for that planet; a more detailed summary of Jovian nomenclature can be found elsewhere (Rogers, 1990, 88). Belt and zone abbreviations are also given in Figure 1. The north and south edges of the belts and zones are designated by a lower-case n or s after the feature name. As an example, the north edge of the South Equatorial Belt is called the SEBn; this is not to be confused with the north component of the SEB (Schmude, 2002, 22). In addition, the Great Red Spot is abbrevi-

Table 1: Characteristics of the 1996 Apparition of Jupiter

First Conjunction with the Sun	1995 Dec. 18 UT
Opposition Date	1996 July 4 UT
Second Conjunction with the Sun	1997 Jan. 19 UT
Apparent Equatorial Diameter (opposition)	47.0 arc-seconds
Visual Stellar Magnitude (opposition)	-2.7
Planetographic declination of the Sun (opposition)	2.0ºS
Planetographic declination of the Earth (opposition)	2.0ºS
Geocentric Declination of Jupiter (opposition)	22.9ºS

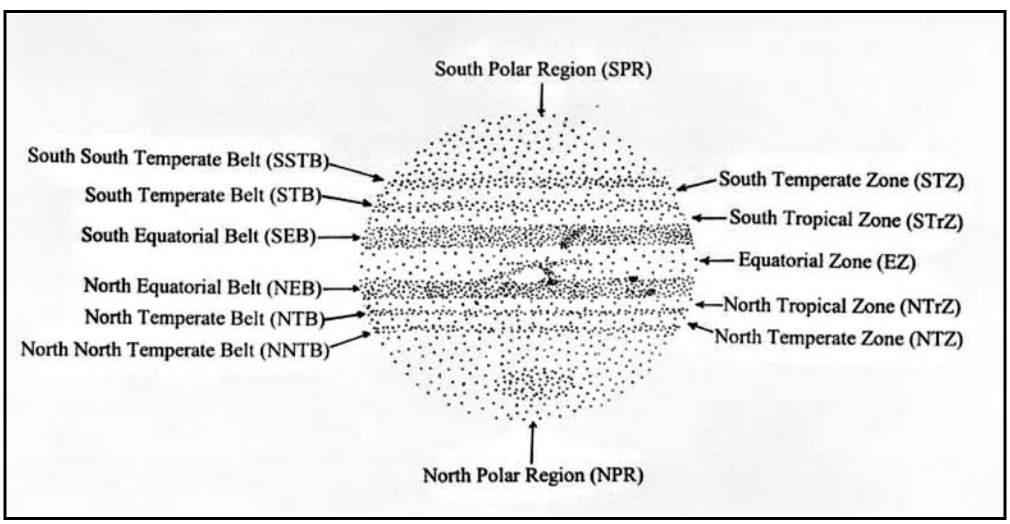

Figure 1: Drawing of Jupiter made by R. Schmude on 1996 Sep. 23 with a 0.51-m (20-in) reflector at 380X; the seeing was 4 on the ALPO scale (0 = worst, 10 = perfect seeing). Jovian nomenclature and abbreviations are shown in this drawing.

Table 2: Contributors to This Report

Contributor	Location	Instrument **	Type of Data***
Benninghoven, C.	Burlington, IA USA	0.30m RR	SS, TT
		0.20m RL	
Bosselaers, M.	Belgium	0.26m RL	TT
		0.41m RL	
Budine, P.	Walton, NY USA	0.15m RR	R, SS, TT
Cannaerts, P.	*	0.25m SC	TT
Cuppens, W.	*	0.20m RR	TT
		0.20m SC	
Goertz, H.	*	0.10m RR	TT
Haas, W.	Las Cruces, NM USA	0.32m RL	DN, TT
Hays, R.	Worth, IL USA	0.15m RL	TT
Hernandez, C.	Miami, FL USA		DN
Lehman, D.	Fresno, CA USA	0.25m RL	SS,TT
Louderback, D	South Bend, WA USA	0.20m RL	TT
MacDougal, C.	Tampa, FL USA	0.15m RL	TT
McAnally, J.	Waco, TX USA	0.11m RL	SS, TT
		0.20m SC	
Melillo, F.	Holtsville, NY USA	0.20m SC	P
Moerman, D.	*	0.13m RR	TT
Olivarez, J.	Wichita, KS USA	0.25m RL	SS, TT
		0.32m RL	
Parker, D.	Coral Gables, FL USA	0.41m RL	CCD
Plante, P.	Poland, OH USA	several	SS, TT
Ramon, J.	*	0.10m RR	TT
Robinson, R.	Morgantown, WV USA	0.25m RL	TT
Rummler, J.	Oscar, LA USA	0.20m RL	D, DN
Schmude, R.	Barnesville, GA USA	0.51m RL	D, PP, TT
Teichert, G.	Hattstatt, France	0.28m SC	TT
Thijs, B.	*	0.11m RL	TT
		0.20m RR	
Vargas, B.	****Bolivia	0.20m RL	TT
Whitby, S.	Hopewell, VA	0.15m RL	TT
*Data for this observer included in a report by Bosselaers.			
**Instrument type: RL = reflector, RR = refractor, SC = Schmidt-Cassegrain			
***Type of observations: CCD = CCD image, D = disc drawing, DN = descriptive notes, PP = photoelectric photometry, R = report, SS = strip sketch, TT = transit times			
****According to Rogers (2001)			

ated "GRS." Figures 2 and 3 show the usual appearance of Jupiter during 1996.

"West" will refer to increasing longitude. There are three longitude systems for Jupiter, and all three are used in this report. System I includes the equatorial zone, System II includes most of the remaining areas of Jupiter while System III refers to the rotation of the magnetic field of the planet. The longitude is designated by the Greek letter lambda, λ, followed by a Roman numeral indicating the system used. As an example, $\lambda_{III} = 125°$ refers to a System III longitude of 125°.

The planetographic (sometimes called "zenographic" and defined as the angle between the local surface normal and Jupiter's equator) latitudes of several features were measured from CCD (charged-coupled device) images made by Parker and the results are summarized in Table 3. The method outlined in Peek (1981, 49) was used in determining latitudes. The planetographic latitudes of the Earth were taken from the *Astronomical Almanac* (1995). All latitudes in this report are planetographic.

Latitudes for most of the belts are in excellent agreement with those measured by Rogers and Foulkes (2001, 69). The NNTB in Table 3 corresponds to the southern component of the NNTB (Rogers, 1995, 89).

Most of the belt latitudes are consistent with historical values (Peek, 1981, 67; Rogers, 1995, 86-87). The comet impact in July 1994 appears to have not disrupted the latitudes of the SSTBn and SSTBs, but it may have affected the measurements of the SSSTB. The SSSTB latitudes in both Table 3 and in Rogers and Foulkes, 2001 (69) are 2-3° farther

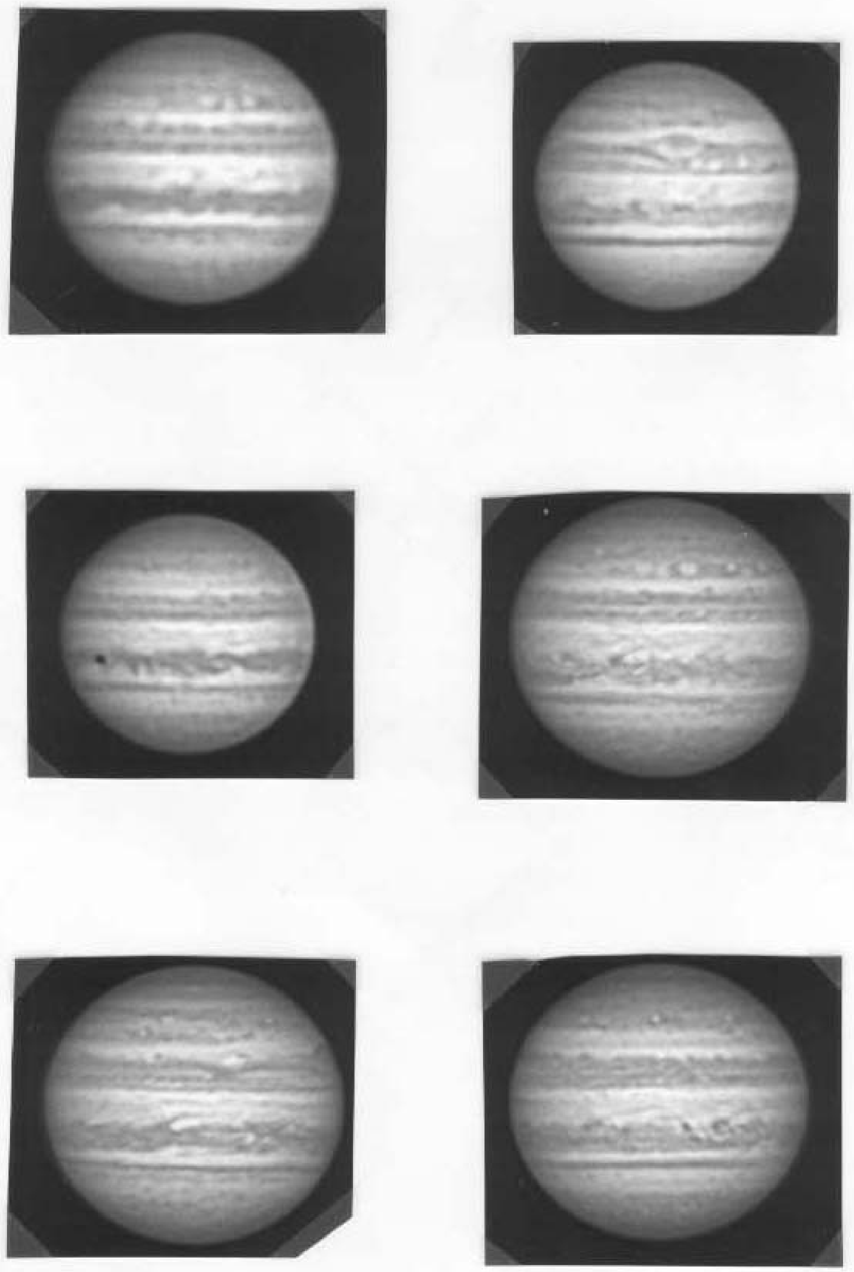

Figure 2: Six images of Jupiter made by Donald Parker with a 0.41-m (16-in) reflector. Top left image: 1996 Apr. 6 at 9:06 UT with λ_I = 293º, λ_{II} = 246º and $\lambda_{II\ I}$= 124º; top right: Apr. 14 at 10:16 UT with λ_I = 159º, λ_{II} = 050º and λ_{III} = 291º; middle left: Apr. 27, at 9:44 UT with: λ_I = 033º, λ_{II} = 185º and λ_{III} = 069º; middle right: June 25 at 4:30 UT with λ_I = 164º, λ_{II} = 228º and λ_{III} = 127º; bottom left image: June 28 at 5:18 UT with λ_I = 308º, λ_{II} = 348º and λ_{III} = 248º; and bottom right: June 29 at 5:45 UT with: λ_I = 122º, λ_{II} = 154º and λ_{III} = 055º.

south than are historical values (Rogers, 1995, 86-87).

The relative brightness of the belts and zones were estimated from images of Jupiter taken by Donald Parker between April and July 1996. The order of the belts from darkest to lightest was: NTB>NEB>s. comp. SEB>n comp. SEB>SPR>NPR>GRS, while the order of the zones from brightest to darkest was: EZs>NTrZ>STrZ>NTZ>EZn>STZ. The ordering of the belt intensities is similar to that during the 1992 and 1993 apparitions (Schmude, 2002; 2003a), but the relative brightness of the zones is different.

The author measured the shapes and sizes of several white ovals on Jupiter and the results are summarized in Table 4. The dimensions were measured from CCD images using the same procedure described by Schmude (2002, 26). Each of the dimensions in Table 4 is a mean of several measurements. Ovals BC, DE and FA were well observed in both the 1993 and 1996 Apparitions. All three ovals were smaller in 1996 than in 1993. Based on the 1993 and 1996 results, the areas of these three ovals shrunk at an mean annual rate of 5%, which is larger than the annual shrinkage rate, about 3.3%, of the lengths of those ovals between 1953 and 1993 (Schmude, 2003a; Rogers, 1995, 225).

The mean area and aspect (corrected north-south length divided by east-west length) of the SSTB ovals in 1996 was 15 million km^2 (5.8 million mi^2) and 0.93, which is similar to the corresponding values in 1992 (16 million km^2 and 0.88) and 1993 (21 million km^2 and 0.88) (Schmude, 2002; 2003a). The mean area and aspect of the SSTB ovals measured by Morales-Juberias *et al.* (2002, 81) is 12.3 million km^2 and 0.78.

The area and aspect of the "long-lived" STrZ oval (C3 in Table 4) is in agreement with measurements made by Morales-Juberias *et al.* (2002, 81).

Table 3: Planetographic Latitudes of Belts on Jupiter During the 1996 Apparition
(The north and south edges of the belts are designated by a lower-case "n" or "s"; for example, the northern edge of the north equatorial belt is called "NEBn". A lower-case "c" means, "center".)

Belt	Planetographic Latitude	Estimated Error
NNNTBn	45.3ºN	1º
NNNTBs	41.5ºN	1º
NNTBn	36.4ºN	1º
NNTBs	32.6ºN	1º
NTBn	29.1ºN	0.5º
NTBs	24.4ºN	0.5º
NEBn	19.0ºNa	1º
NEBs	6.4ºNa	1º
EBc	2.6ºS	1º
SEBn	8.0ºS	0.5º
SEBs	23.3ºS	1º
STBn	28.6ºSb	2º
STBs	35.2ºSb	2º
SSTBn	35.4ºSc	2º
SSTBs	41.5ºSc	2º
SSSTBn	45.4ºSd	1º
SSSTBs	49.0ºSd	1º
SSSSTBn	53.3ºS	1º
SSSSTBs	57.3ºS	1º
SPH (n edge)	62.9ºS	0.5º
GRS	21.5ºS	0.5º

[a]Average of latitudes measured in April and June
[b]For system II longitudes of between 220º and 365º
[c]For system II longitudes of between 100º and 190º
[d]For system II longitudes of between 110º and 402º

Region I: Great Red Spot

Figure 4 shows the development of the GRS between February and September 1996. The GRS had an orange color between 1996 Feb. 26 and Jul. 4. The southern portion was usually darker than the northern portion. This is probably due to the white ovals that were west of the GRS, which were broken up by the GRS (Simon-Miller *et al.*, 2002, 251). Several of the GRS drawings in Figure 4 show at least one of these white ovals approaching the GRS. Budine, Benninghoven, Lehman and Rummler all saw at least one of these bright spots. Unfortunately these spots change shape quickly and so an almost daily monitoring of these spots is needed to establish a drift rate.

High-resolution images of the GRS showed a dark orange spot within the GRS. A similar feature was imaged during the 1991-92 Apparition (Schmude, 2002, 32; Rogers and Foulkes, 1994, 170).

Figure 5 shows the longitude of the GRS with respect to time. The mean drift rate of this feature was 0°.4/30 days (System II longitude), which corresponds to a rotation rate of $9^h\ 55^m\ 41^s$. The mean System II longitude of the GRS on opposition day was 058°.5±0°.8.

Region II: South Polar Region to the South Tropical Zone

The SPR had a dark band with a northern boundary located at 62°.9 S. Parker imaged two white spots near latitudes of 50º S and 60º S. The white spot at 60º S was distinct on 1996 June 28 and was just north of the dark south polar cap; it became less distinct on July 3. This spot had an area of 10±4 million km^2 on June 28. A second white oval was visible on June 29 and again on July 4. This feature had an area of about 11±4 million km^2 on July 4. The approximate drift rates and rotation rates of these spots are summarized in Table 5, and longitudes for these two features are plotted in Figure 5.

At least seven white ovals were present in the SSTB. There were sufficient data to compute the drift rates for five of these ovals B1-B5 and the results are summarized in Figure 5 and Table 5. The 1996 drift rates for the SSTB white ovals were similar to those in 1992 and 1993 (Schmude, 2002, 31; 2003a, 56; Rogers and Foulkes, 1994, 172); this suggests that the comet collision in July 1994 had little long-term effect on the drift rate of the SSTB ovals.

There were at least six white ovals in the STB. Figure 4 shows the development of ovals BC, DE and an oval between these two (C1). Ovals BC and DE were bright in methane-band light (wavelength = 889 nm where 1 nm = 1.0×10^{-9} m), which is evidence that these two extended to high altitudes in 1996. Oval C1 however was not bright in the methane band, and so C1 did not extend to the high altitudes that ovals BC and DE did. The mean drift rate of the five STB ovals was –12°.8/30 days (System II), which is close to the 1992 and 1993 values. The longitudes of the STB ovals are plotted in Figure 5 and the rotation rates are summarized in Table 5.

The long-lived STrZ oval (C3) was imaged several times in 1996. The longitudes of this feature are plotted in Figure 5 and the drift rate and other data are listed in Table 5. The drift rate is similar to what it was in 1992 (Schmude, 2002, 31).

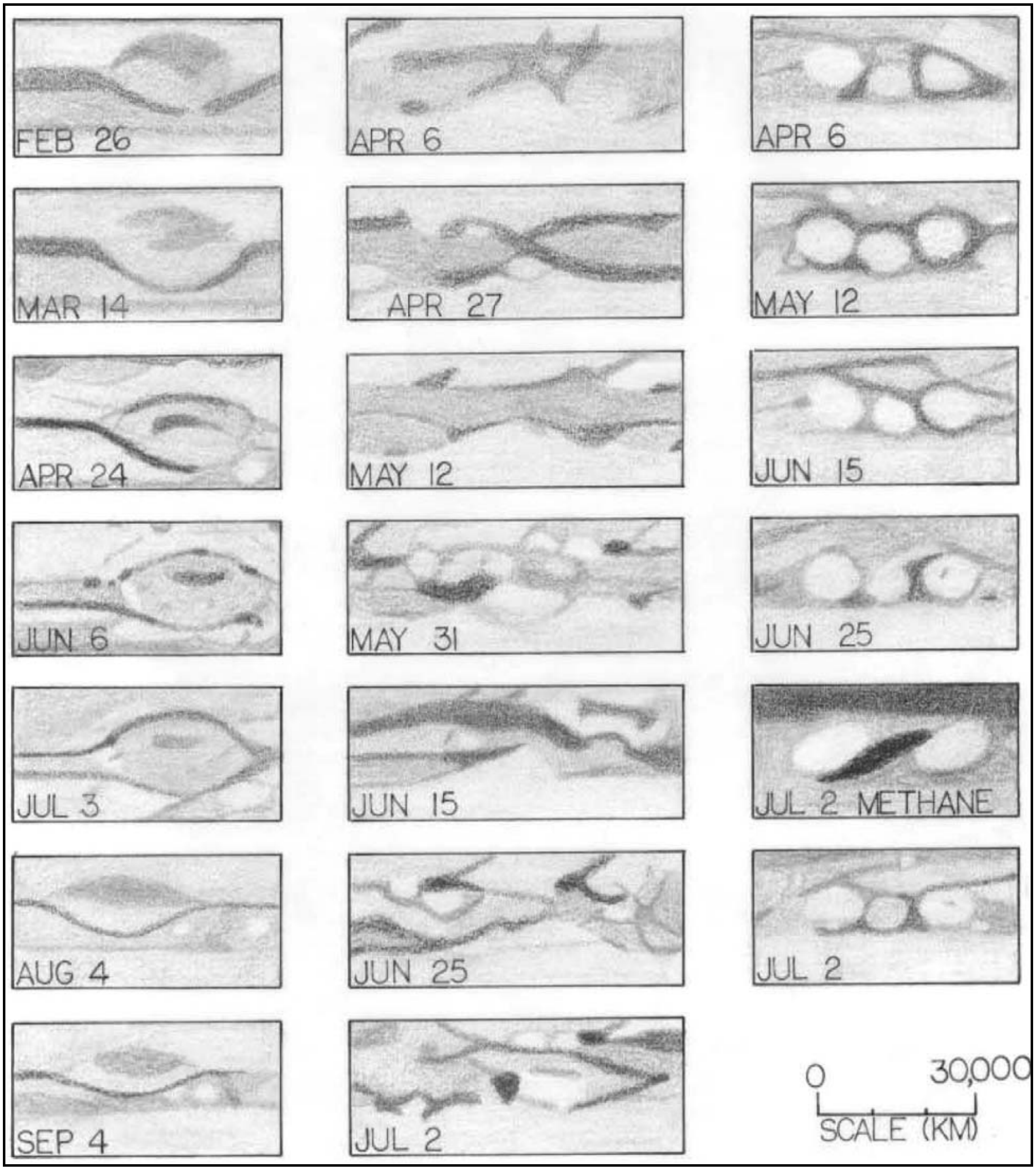

Figure 3: A series of drawings of the GRS (left), huge bay in the NEBn (center) and ovals BC and DE (right); all drawings are based on Parker's CCD images except the GRS drawings on Aug. 4 and Sep. 4 which are based on Benninghoven's drawings

Region III: The South Equatorial Belt

The appearance of the SEB during June at different System II longitudes was:

- 070°-100°: White spots (plumes) dominate the center of the belt.
- 100°-160°: Wide spotted belt; lacks a SEZ (south equatorial zone)
- 190°-360°: Dark north and south components surround the SEZ.

- 360°-010°: Dark south component merges with the dark north component just north of C3.

- 010°-040°: Same as for 190-360°.

Unfortunately, there were not enough data to plot any drift rates inside of the SEB during 1996.

Region IV: Equatorial Zone

Three festoons at System I longitudes of 100°, 125° and 150° were followed during June and July; additional features were not studied due to a lack of data. The mean drift rate for these three features was –4°.1/30 days (System I longitudes) which corresponds to a rotation period of $9^h\ 50^m\ 24^s$; this rate is consistent with the historical values Peek (1981, 107), (Rogers, 1995, 144). Longitudes for these features are plotted in Figure 6 and listed in Table 6.

The southern third of the EZ was usually the brightest zone on the planet. An equatorial band (EB) was often visible. During June, the EB was strong at λ_I = 170°-220° and 290°-330°, but was weak at λ_I = 030° and 110°.

Table 4: Dimensions of White Ovals During the 1996 Apparition of Jupiter

(The aspect is the north-south dimension corrected for foreshortening, divided by the east-west dimension. All areas were computed by assuming an elliptical shape for each feature. Uncertainties for the East-West and North-South dimensions are a few hundred km.)

Feature	Dimension		Aspect	Area (10^6 km^2)
	East-West	North-South		
Oval BC	8500	6300	0.74	42±2
Oval DE	9000	6400	0.72	45±3
Oval FA	7700	5400	0.71	33±3
B1	4100	4500	0.90	15±2
B2	4100	4200	0.99	14±2
B3	4100	4400	0.90	14±1
B4	4500	4500	1.00	16±1
B6a	5000	4200	0.86	17±1
B7a	4600	4200	0.91	15±1
C1	5700	6100	0.94	27±2
C2	4900	3900	0.81	15±2
C3	7700	5000	0.70	30±3
I1	9100	7800	0.86	56±3

[a] These are SSTB ovals located at system II longitudes of 330° (B6) and 112° (B7) on July 4, 1996.

Region V: North Equatorial Belt

Vincent and co-workers (2000, 190) report that the NEB widened at visible wavelengths in mid-1996. As a result of this report, the author measured the latitudes of the NEBn and NEBs at eight different System II longitudes in April and June 1996. The mean latitudes of the NEBs were 6°.5±0°.3 N (April) and 6°.4±0°.3 N (June) while the corresponding latitudes for the NEBn were 18°.1±0°.3 N (April) and 19°.7±0°.3 N (June). The NEB grew 1°.7±0°.5 wider between April and June and almost all of the expansion took place at the NEBn.

A huge bay in the NEBn (at λ_{II} = 210°) was imaged from 1996 April through early July. The development of this bay is illustrated in Figure 4 (center). This bay was distinct in April through mid-June but became less distinct in early July.

Region VI: North Tropical Zone to the North Polar Region

Two features F1 and I1 were tracked long enough to establish drift rates. A small bump was present along the southern edge of the NTB, which had a drift rate of –58°.1/30 days (System I); this is consistent with the north temperate current C. García-Melendo and co-workers (2000, 517) report that several features, visible in Hubble Space Telescope images, moved at a rate consistent with the North Temperate Current C during 1996.

Feature I1 was a large and distinct light brown oval on June 15. The System II drift rate of I1 was –1°.4/30 days, which corresponds to a rotation rate of 9^h 55^m 39^s.

Satellites

Mallama (2000, 102; 2002, 17) summarizes a few of his 1996 Galilean satellite eclipse timings made with photoelectric equipment.

Methane-Band Image

Methane-band images are recorded at a wavelength of 889 nanometers (nm; 1.0 x 10^{-9} meters), which is a wavelength of light that methane (CH_4) absorbs. Methane-band images are useful because they show the relative altitudes of Jovian cloud features. A cloud that appears bright in a methane-band image indicates that methane absorption is low above that

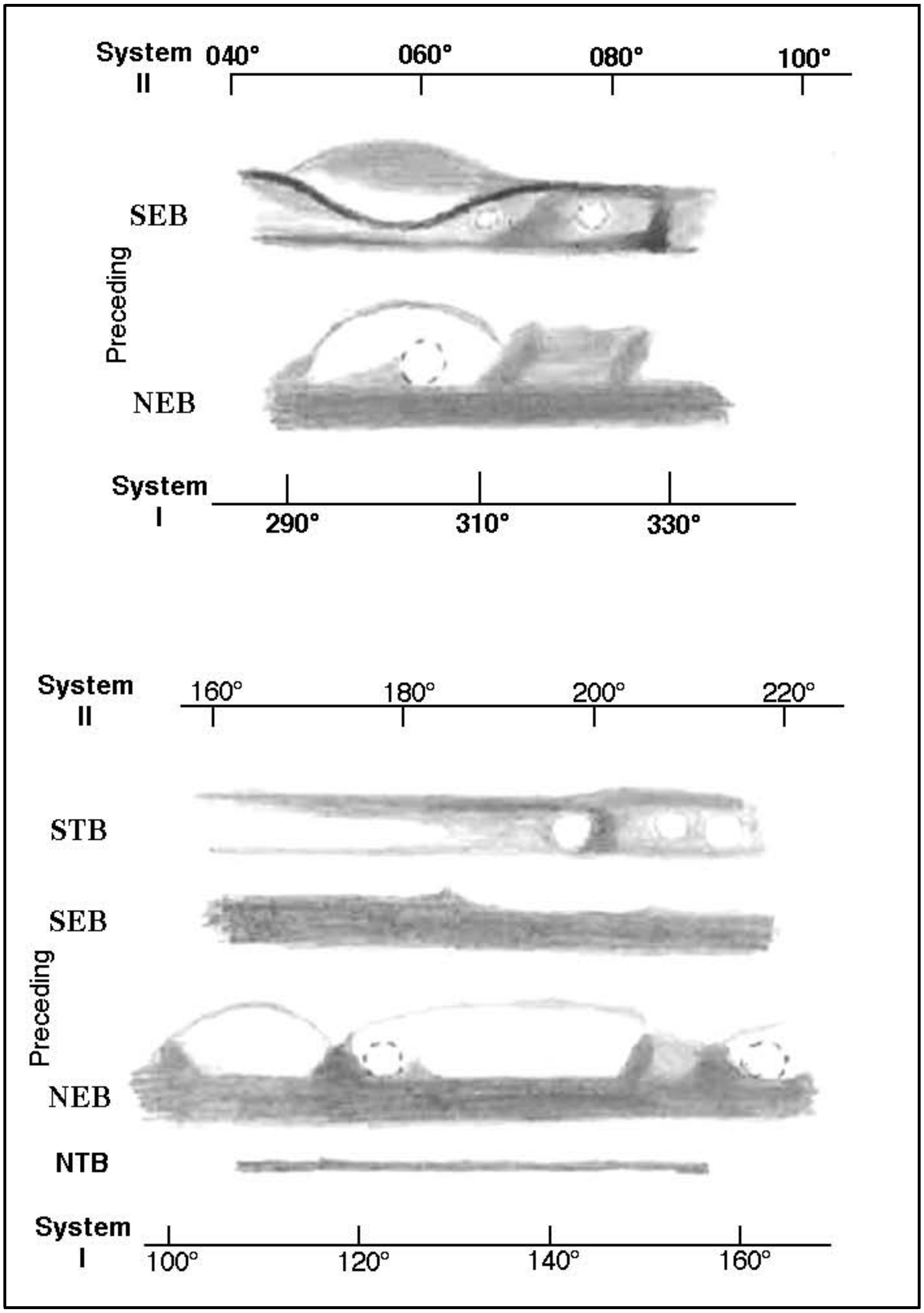

Figure 4: System I and System II longitudes for various features on Jupiter during 1996.

cloud and so it has a high altitude. One methane-band image of Jupiter was taken on 1996 July 2 and based on this image, the order of brightness of the belts, zones and other Jovian features starting with the brightest are: SPR>EZn>Oval BA>Oval DE>EZs>NPR>NTrZ>STrZ > NTZ> NTB>EB>n. comp. SEB>NEB>s. comp. SEB. A large festoon near the central meridian (λ_I = 205°) was light gray in the image. Values for the polar flattening of Jupiter were measured for the methane-band image and for visible-light images. The trend in the polar flattening was similar to that measured in 2001-02 (Schmude, 2003b).

Wind Speeds

All Jovian wind speeds are computed with respect to System III longitude. The method outlined in Schmude, (2002, 30) was used in computing all wind speeds; uncertainties in wind speeds were computed using the method explained by Schmude (2003b). The resulting speeds are summarized in Table 7. Most of the results are consistent with historical values (Rogers, 1995), and with more recent Hubble Space Telescope results (García-Melendo and Sánchez-Lavega, 2001, 324-326).

Photoelectric Photometry

Schmude carried out a series of photoelectric magnitude measurements of Jupiter on Sep. 27, 1996. His comparison star was lambda-Sagittarius, using B and V-filter magnitudes of +3.86 and +2.82 (Iriarte *et al.*, 1965, 30). The author used the method outlined in Hall and Genet (1988, 196-200) to correct for both atmospheric extinction and transformation. The resulting magnitudes are summarized in Table 8.

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Table 5: Drift Rates of Features on Jupiter During the 1996 Apparition

Feature	Number of Points	Time Interval (1996)	Planetographic Latitude	Drift Rate (degrees/ 30 day) (System II)	Rotation Rate
South South South South South Temperate Current					
A1	2	June 28-July 3	60ºS	-42	9h 54.7m
South South South South Temperatue Current					
A2	2	June 29-July 4	50ºS	10	9h 55.9m
South South Temperate Current					
B1	7	May 12-July 2	41.6ºS	-31.0	9h 54m 58s
B2	8	May 12-July 4	41.7ºS	-29.5	9h 55m 00s
B3	4	June 6-July 3	41.6ºS	-29.9	9h 55m 00s
B4	5	June 6-July 3	41.6ºS	-27.6	9h 55m 03s
B5	5	June 6-July 3	40.3ºS	-24.4	9h 55m 07s
Mean			**41.4ºS**	**-28.5**	**9h 55m 02s**
South Temperate Current					
Oval BC	7	Apr. 27-July 2	32.9ºS	-12.9	9h 55m 23s
Oval DE	6	May 12-July 2	32.7ºS	-13.3	9h 55m 23s
Oval FA	8	Apr. 11-July 2	32.0ºS	-12.7	9h 55m 23s
C1	6	May 12-July 2	31.7ºS	-14.3	9h 55m 21s
C2	4	June 15-July 2	33.5ºS	-10.6	9h 55m 26s
Mean			**32.6ºS**	**-12.8**	**9h 55m 23s**
South Tropical Zone					
GRS	24	Feb. 26-Nov. 18	21.5ºS	0.4	9h 55m 41s
South Tropical Zone					
C3	8	June 6-July 15	22.6ºS	5.3	9h 55m 48s
C4	4	June 15-July 2	23.7ºS	1.1	9h 55m 42s
Mean			**23.2ºS**	**3.2**	**9h 55m 45s**
North Equatorial Belt large bay					
N6	8	Apr. 27-July 2	19.0ºN	-2.0	9h 55m 38s
North North North North Temperate belt					
I1	5	May 31-July 2	52.8ºN	-1.4	9h 55m 39s

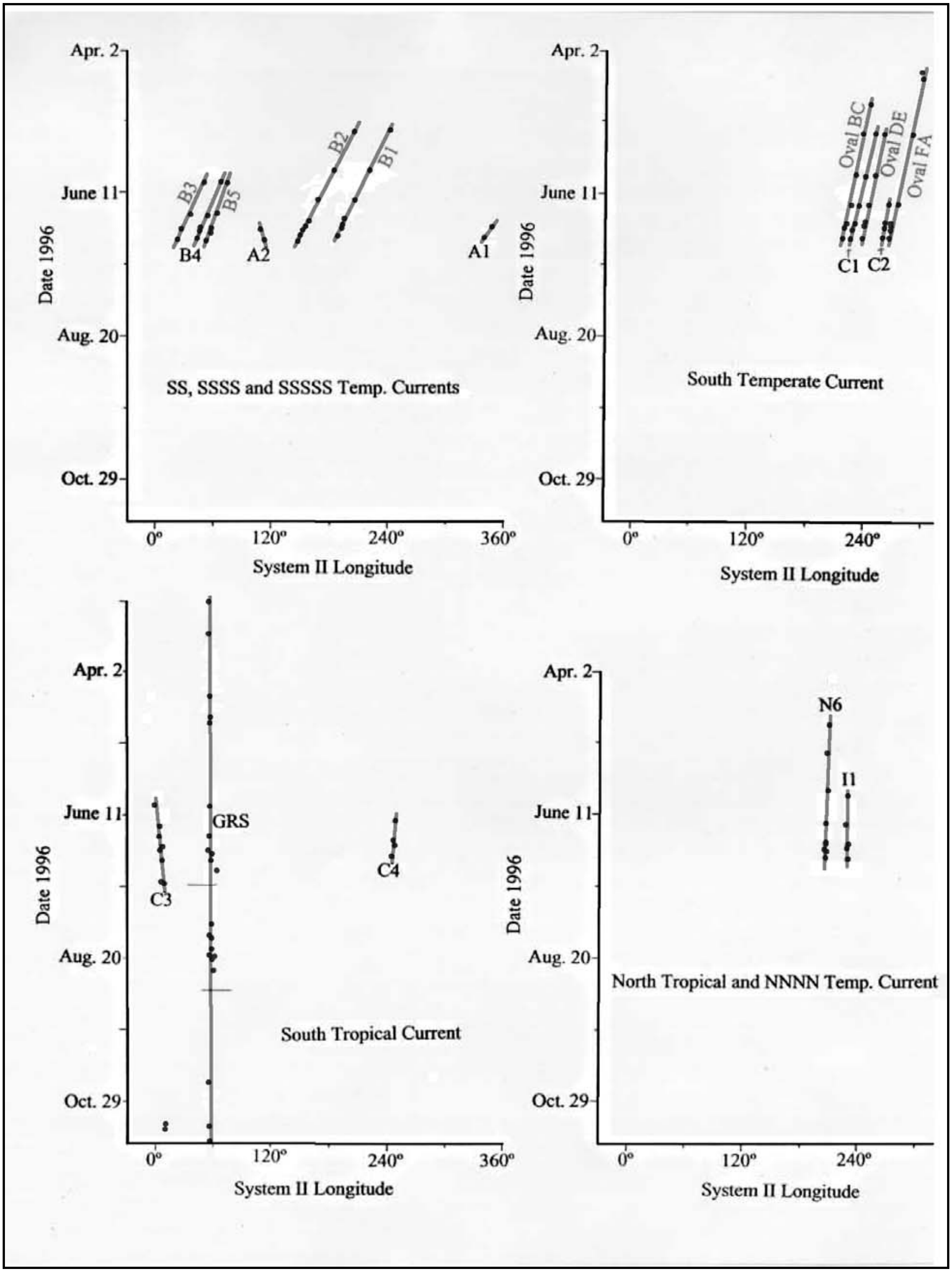

Figure 5: Drift rates and System II longitudes for various features on Jupiter during 1996.

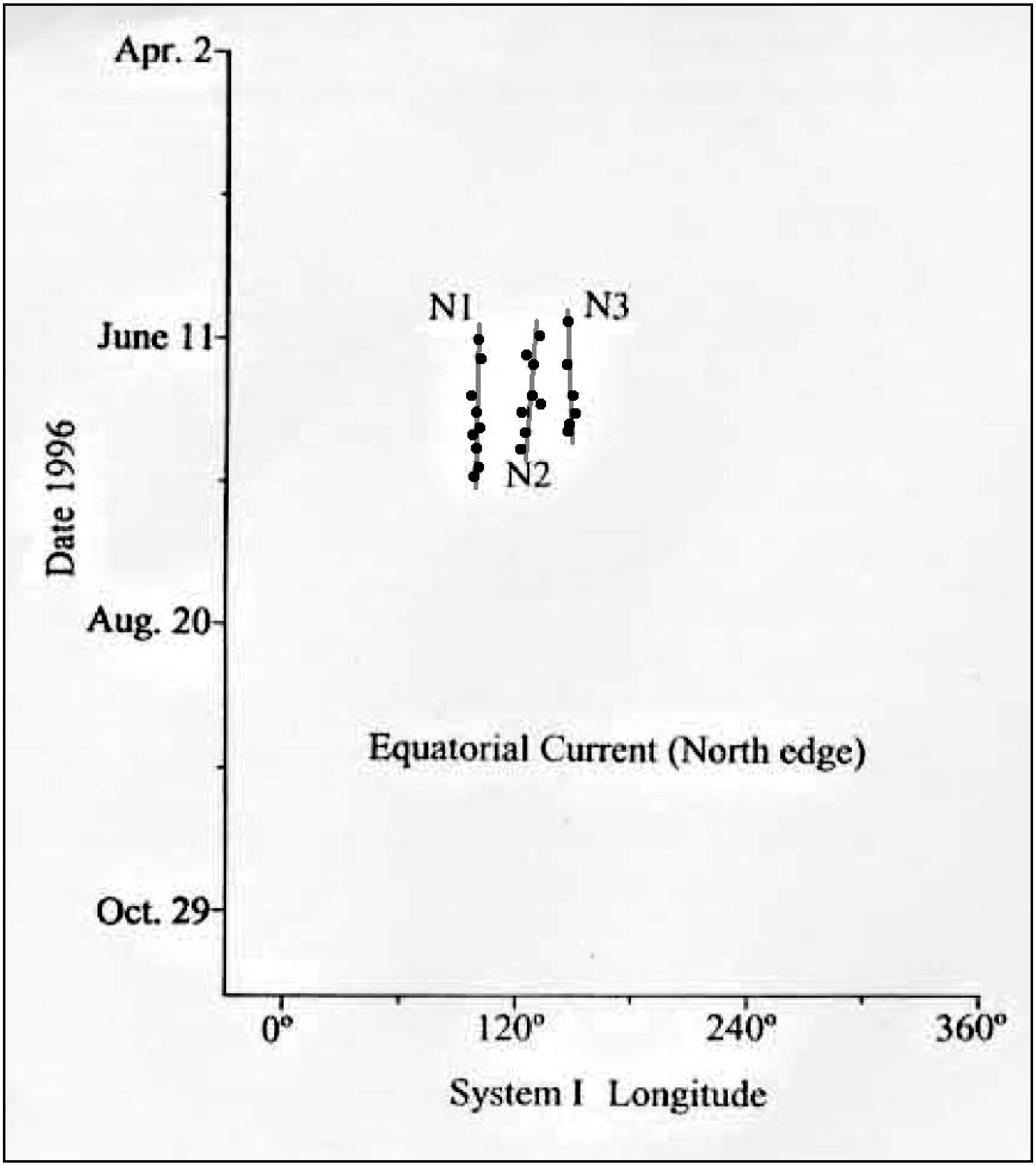

Figure 6: Drift rates and System I longitudes for various features on Jupiter during 1996.

Table 6: Drift Rates of Features Following the Equatorial Current on Jupiter During the 1996 Apparition

Feature	Number of Points	Time Interval (1996)	Planetographic Latitude	Drift Rate (degrees/30 day) (System I)	Rotation Rate
North Equatorial Belt (south edge)					
N1	10	June 11-July 15	6.1ºN	-2.7	9h 50m 26s
N2	8	June 11-July 8	6.1ºN	-7.0	9h 50m 21s
N3	6	June 6-July 4	6.1ºN	-2.6	9h 50m 26s
Mean				-4.1	9h 50m 24s
North Equatorial Belt (south edge)					
F1a	3	June 15-July 3	25.3ºN	-58.1	9h 49m 12s
a F1 System I longitudes: June 15.3 (98º), June 29.2 (69.7ºand July 3.3 (64.2º)					

Table 7: Average Drift Rates, Rotation Periods and Wind Speeds for Several Currents on Jupiter; 1996 Apparition

Current	Features	Sys. I	Sys. II	Sys.III	Roation Period	Wind Speed (meter/sec.) System III
SSSSS Temp. Curr.	A1	186.9	-42	-34	9h 54.7m	-8.6±4a
SSSS Temp. Curr.	A2	238.9	10	18	9h 55.9m	5.8 ±4a
SS Temp. Curr.	B1-B5	200.4	-28.5	-20.5	9h 55m02s	-7.6±0.4
S Temp. Curr.	Ovals BC,FA					
	DE,C1,C2	216.1	-12.8	-4.8	9h 55m23s	-2.0±0.3
S Trop. Curr.	GRS	229.3	0.4	8.4	9h 55m41s	3.8±0.3
S Trop. Curr.	C3,C4	232.1	3.2	11.2	9h 55m45s	5.0±0.7
Equatorial Curr.	N1-N3	-4.1	-233.0	-225.0	9h 50m24s	-107.6±0.6
N. Temp. Curr. C	F1	-58.1	-287.0	-279.0	9h 49m12s	-122.7±2a
N Trop. Curr.	N6	226.9	-2.0	6.0	9h 55m38s	2.7±1a
NNNN Temp. Curr.	I1	227.5	-1.4	6.6	9h 55m39s	2.0±1a
a Estimated Uncertainty						

Table 8: Photoelectric Magnitude Measurements of Jupiter, Sep. 27, 1996

Date (UT)	Filter	Magnitude	Air Mass	
			Jupiter	λ-Sagittarius
Sep. 27.051	B	-1.23	2.27	2.78
Sep. 27.053	V	-2.17	2.29	2.84
Sep. 27.072	B	-1.22	2.54	2.94
Sep. 27.073	V	-2.10	2.57	3.02
Sep. 27.076	B	-1.22	2.63	3.59
Sep. 27.078	V	-2.16	2.67	3.70

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Observing Alert: Eclipses of Jupiter's Satellites

By John Westfall, assistant coordinator, ALPO Jupiter Section

As it does every 13 months, Jupiter is now sinking lower into the western sky after sunset. Soon it will no longer be observable, until it ends the 2003-2004 Apparition with its conjunction with the Sun on September 22, 2004, and then enters the morning sky.

During this apparition, all the Galilean satellites – Io, Europa, Ganymede, and Callisto – undergo eclipses by Jupiter's shadow, although the current series of eclipses of Ganymede ends in September.

Since 1975, the ALPO has been collecting and analyzing visual timings of the beginnings and endings of these satellite eclipses. When the apparition ends, we ask continuing observers to send in their apparitional reports. Potential observers should note that one can make Galilean satellite eclipse timings to the necessary 1-second precision using a telescope no larger than 5-cm aperture, and referring to a time source such as short-wave time signals, a GPS receiver, or even an "atomic" clock or watch.

For more information on taking part in this long-term program, please contact: ALPO Galilean Satellite Program, P.O. Box 2447, Antioch, CA 94531-2447, USA. (Email: johnwestfall@comcast.net).

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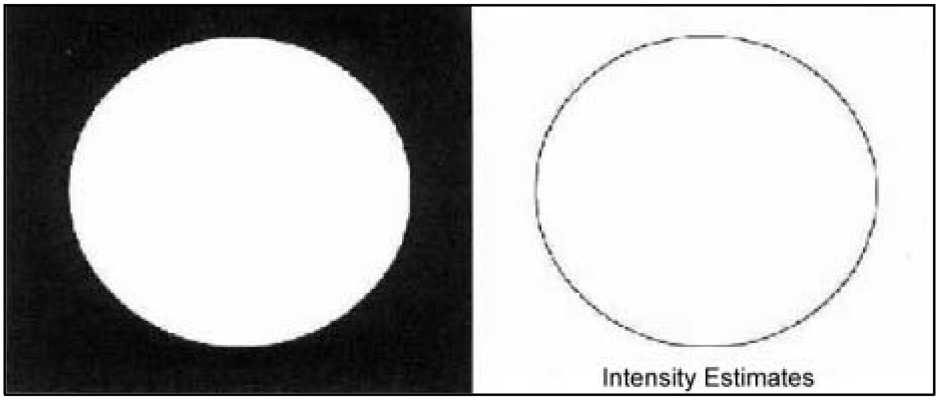

Date (UT): ______________________________________

Time (UT): ______________________________________

CM I _____ CM II ____ CM III _______

Begin (UT): _____________ End (UT) ____________

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

Magnification: _______x ________x ________x

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Address: ______________________________________

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Publications Staff

Publisher

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

General Editors

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

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

Staff Writers

- Eric Douglass, 10326 Tarieton Dr., Mechanicsville, VA 23116-5835
- (Acting) James S. Lamm, 9341 Whispering Wind Dr., Charlotte, NC 28277
- (Acting) 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

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- Assistant Coordinator; Thomas A. Dobbins, 305 Northern Spy Circle, Howard, OH 43028

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- 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, 2445 Seiler Rd., Alton, IL 62002

Youth Section

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

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- Assistant Coordinator, Brad Timerson (use e-mail for correspondence, see Internet directory)
- Acting Assistant Coordinator & Archivist; Jamey Jenkins, 308 West First Street, Homer, Illinois 61849
- Acting Assistant Coordinator & Archivist; Mrs. Kim Hay, 76 Colebrook Rd., RR #1, Yarker, ON K0K 3N0, Canada
- 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

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- Assistant Coordinator; *Lunar Transient Phenomena*; David O. Darling, 416 West Wilson St., Sun Prairie, WI 53590-2114
- Acting Coordinator; *Lunar Topographical Studies*; Marvin W. Huddleston, 2621 Spiceberry Lane, Mesquite, TX 75149

Mars Section

- Coordinator (general correspondence, dust storm reports, Intl. Mars Patrol alert notices, ALPO Mars Observing kit); Daniel M. Troiani, P.O. Box 1134 Melrose Park, IL 60161-1134
- Assistant Coordinator (pre-apparition reports); Jeff D. Beish, 842 Virginia Ave., Lake Placid, FL 33852
- Assistant Coordinator & Archivist; 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
- Acting Assistant Coordinator (Photometry and Polarimetry); Richard W. Schmude, Jr., 109 Tyus St., Barnesville, GA 30204

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- 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; Richard W. Schmude Jr., 109 Tyus St., Barnesville, GA 30204
- 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
- Acting Assistant Coordinator; Ed Grafton, 15411 Greenleaf Lane, Houston, TX 77062
- Acting Assistant Coordinator; Damian Peach, 466 Vardon Rd., Stevenage, Herts. SG1 5BJ United Kingdom
- Acting Assistant Coordinator; Dr. P. Clay Sherrod, Arkansas Sky Observatory, Conway Offices, 794 Drake Drive, Conway, AR 72034
- Scientific Advisor; Prof. A. Sanchez-Lavega, Dpto. Fisica Aplicada I, E.T.S. Ingenieros, Alda. Urquijo s/n, 48013, Bilbao, Spain

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Coordinator; Julius L. Benton, Jr., Associates in Astronomy, 305 Surrey Road, Savannah, GA 31410

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ALPO Resources (continued)

ALPO Staff E-mail Directory

Beish, J.D. .... dustymars@tnni.net
Benton, J.L. (routine e-mail+observations & images)
.... jlbaina@msn.com
Benton, J.L. (alternate e-mail+observations&images)
....jbenton55@comcast.net
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
Dobbins, Tom ....kmdobbins@coshocton.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@comcast.net
Jenkins, J. .... jenkinsjl@yahoo.com
Joyce, D. .... djoyce@triton.cc.il.us
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
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. .... drmike@astrospace.net
Robertson, T.J...............................cometman@cometman.net
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
Timerson, B. .... btimerson@snows.net
Troiani, D.M.................................. dantroiani@earthlink.net
Ulrich, R.K. .... rulrich@uark.edu
Venable, R.J... rjvmd@knology.net
Wessling, R.J. ....pinesop@aol.com
Westfall, E.W.................................. ewestfall5@comcast.net
Westfall, J.E.................................. johnwestfall@comcast.net
Will, M. ....will008@attglobal.net

Meteorites Section

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

Eclipse Section

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- **Monograph Number *5.*** *Astronomical and Physical Observations of the Axis of Rotation and the Topography of the Planet Mars. First Memoir; 1877-1878.* By Giovanni Virginio Schiaparelli, translated by William Sheehan. 59 pages. Price: $10 for the United States, Canada, and Mexico; $15 elsewhere.
- **Monograph Number *6.*** *Proceedings of the 47th Convention of the Association of Lunar and Planetary Observers, Tucson, 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 Plane-*

ALPO Resources (continued)

tary 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 (Robertson):** *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. To order, send check or money order payable to "Timothy J. Robertson."
- **Lunar (Benton):** (1) *The ALPO Lunar Section's Selected Areas Program (*$17.50). Includes a full set of observing forms for the assigned or chosen lunar area or feature, together with a copy of the *Lunar Selected Areas Program Manual.* (2) *Observing Forms Packet,* $10. Includes observing forms to replace those provided in the observing kit described above. Specify *Lunar Form*s. (See note for Venus.)
- **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 h.jamieson@bresnan.net.
- **Venus (Benton):** (1) *The 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 Packet,* $10. Includes observing forms to replace those provided in the observing kit described above. 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, Saturn, or lunar SAP sections. Observers should make copies using high-quality paper.
- **Mars (Troiani):** (1) *Martian Chronicle;* published approximately monthly during each apparition; send 8 to 10 SASE's; (2) *Observing Forms;* send SASE to obtain one form for you to copy; otherwise send $3.60 to obtain 25 copies (make checks payable to "Dan Troiani").
- **Mars:** *ALPO Mars Observers Handbook,* send check or money order for $10 per book (postage and handling included) to Astronomical League Book Service, c/o Paul Castle, 2535 45th St., Rock Island, IL 61201.
- **Jupiter:** (1) *Jupiter Observer's Startup Ki*t, $3 from the Jupiter Section Coordinator. (2) *Jupite*r, ALPO section newsletter, available online via the ALPO website or via snail-mail; send SASE to the Jupiter Section Coordinator; (3) To join the ALPO Jupiter Section e-mail network, *J-Ne*t, send an e-mail message to the Jupiter Section Coordinator. (4) *Timing the Eclipses of Jupiter's Galilean Satellites* observing kit and report form; send SASE to John Westfall.
- **Saturn (Benton):** (1) The *ALPO Saturn Observing Ki*t, $20; includes introductory description of Saturn observing programs for beginners, a full set of observing forms, and a copy of *The Saturn Handboo*k. (2) *Saturn Observing Forms Packe*t, $10; includes observing forms to replace those provided in the observing kit described above. Specify *Saturn Forms.* To order, see note for *Venus Forms*.
- **Meteors:** (1) Pamphlet, *The ALPO Guide to Watching Meteors,* send check or money order for $4 per book (postage and handling included) to Astronomical League Book Service, c/o Paul Castle, 2535 45th St., Rock Island, IL 61201. (2) *The ALPO Meteors Section Newslette*r, 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, 161 Vance St., Chula Vista, CA 91910.

ALPO Resources (continued)

- **Minor Planets (Derald D. Nye):** *The Minor Planets Bulleti*n, published quarterly $14 per year in the U.S., Mexico and Canada, $19 per year elsewhere (air mail only). Send check or money order payable to “Minor Planets Bulletin” to 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.*** **Free** for a stamped, self-addressed envelope. A 4-page list of books and magazines about Solar System bodies and how to observe them. The current edition was updated in October, 1998. Order from: ALPO Membership Secretary.
- *ALPO* ***Membership Directory.*** $5 in North America; $6 elsewhere. Latest updated list of members on 3.5-in. MS-DOS diskette; either DBASE or ASCII format. Make payment to "ALPO" Also available via e-mail as portable document format (pdf) file to requester's e-mail address. Provided at the discretion of the Membership Secretary. Order from Matthew Will, ALPO membership secretary/treasurer.
- **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 44):

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THE ASSOCIATION OF LUNAR AND 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 email 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 (Acrobat Reader) version is available over the internet at reduced cost. Subscription rates and terms are listed below.

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