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Journal of the Association of Lunar & Planetary Observers

Founded in 1947

The Strolling Astronomer

Volume 49, Number 2, Spring 2007
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Inside. . .

- ***A home brewed collimation tool for Schmidt-Cassegrain scopes***
- ***A status report on the current Mars apparition***
- ***A report on the 2003-2004 Saturn apparition***
- ***Sunspot observations during Carrington solar rotation 2031-2036***
- ***Book Review: The Planets***

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

Comet McNaught (C/2006 P1) as imaged by its discoverer Robert H. McNaught on January 24, 2007, 10:39 UT, at Dubbo, New South Wales, Australia. Equipment: Canon 5D SLR using a 50mm, f/2.8, lens; 360-sec.total exp., ISO 400. Medium combine of three 120-sec. exposures.

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Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 49, No. 2, Spring 2007
This issue published in March 2007 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.

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

Founded in 1947

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Astronomy Roundup 2007

CALGARY, ALBERTA, CANADA
JUNE 28 TO JULY 3

A joint meeting of the Royal Astronomical Society of Canada, the Association of Lunar and Planetary Observers and the American Association of Variable Star Observers.

Speakers

Ray Villard *"Hubble Space Telescope's Legacy"*
Dr. Eric Donovan *"Using the Aurora to Study Space"*
Dr. Michael Wilson *"Medicine Wheels in the Landscape and the Skyscape"*
Dr. Tracey Delaney *"Using Stellar Archaeology to Unlock the Mysteries of the Supernovae"*
Dr. Jaymie Matthews *"One Little Telescope, So Many Stars"*

Three half-days of paper sessions and many social events as well!

Optional Workshops

Fireball Investigation: Alan Hildebrand, Martin Beech
Light Pollution Abatement: Anna Brassard, Kevin Leitch, Bob King
Imaging: Don Parker, *Capturing and Processing Planetary Images*; and Alan Dyer, *Digital SLR Astrophotography*
Introduction to Scientific Observing: Dr. Arne Henden, Dr. Richard Schmude, Dr. Sanjay Limaye, Gary Billings, Kim Hay

Optional Tours

Rothney Astrophysical Observatory
University of Calgary's Meteorite Lab
Cretaceous/Tertiary Boundary and Tyrrell Museum Badlands
Looking for Mars in the Canadian Rockies

http://calgary.rasc.ca/ar2007/

Go to the Astronomy Roundup website to register and for more information on meeting events and accommodations.

Register before April 30 for the early bird fee of $100 Canadian.

On-line registration ends June 12.

Reminder Call for Papers

We invite you to submit a proposal for a paper or a poster to be presented during Astronomy Roundup 2007. Please submit your proposal via email (AR2007@shaw.ca) by March 31.

You will be notified by April 30 if your paper has been accepted as an oral paper or a poster.

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Member, section and activity news

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Point of View

"Lunar Photo of the Day" — Gorgeous!

By Ken Poshedly, editor & publisher, The Strolling Astronomer

OK, it's the morning after a great night of observing. Saturn is pretty much an all-nighter. Jupiter and Pluto (yeah, you remember Pluto, don't ya'?), rise together just before 2 a.m. Neptune and Mars are really tight as they rise together just before 5 a.m., Mercury just before 6 a.m., followed shortly afterwards by Uranus, and then . . . old Sol himself only a little bit later.

So you kinda-sorta want to start the day off with a little astro "kick", but what to do?

Well, as a lunar & planetary person, may I highly recommend "Lunar Photo of the Day" at *http://www.lpod.org*

Day after day, Dr. Chuck Wood, regular columnist for *Sky & Telescope* magazine, and author of *The Modern Moon: My Personal View*, posts yet another stunning lunar view. Sometimes it's a close-up of a nearside feature, sometimes it's something on the lunar far side (taken by the Clementine lunar orbiter).

And not content to just post image after image for the shock-and-awe effect, Chuck includes a truly detailed and interesting and inspiring write-up about the feature in the image, including some pretty interesting geologic explanations.

And sometimes, even Chuck is taken aback by just how popular his website is. This from one day in March when he posted a world map with indications of where viewers of his site over the previous 20 days were located: "Wow! I am impressed that since March 2, there have been 57,187 visits to LPOD from all across the globe. This works out to about 2,860 visits/day. This is remarkable because the average for Jan and Feb 2007 was 1,591/day and the average for all of last year was 1,214/day.

"I wonder why the sudden surge - are there more web crawlers indexing LPOD or are there really that many more people interested in the Moon? I welcome all lunar observers everywhere, especially the lonely outposts in Iceland, Azores, Reunion, Nigeria, Tanzania, Iraq, Iran, Vietnam, Korea, Male and all the other small red dot places in between. And also the Americas, Europe and the rest of the world!

"We are a global network of Moon watchers - and probably Moon lovers!"

I couldn't have said it better.

Inside the ALPO
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News of General Interest

Gary Kronk Tapped to Lead ALPO Comets Section

Gary W. Kronk, former acting coordinator and prior to that, assistant coordinator, has been named to once again head the ALPO Comets Section.

His interest in comets began in earnest with Comet Kohoutek of 1973/1974. “Not only was my observation of it on November 30, 1973, my first sighting of a comet, but the early predictions of this comet's potential greatness sparked something inside of me that took me to libraries in search of information on comets.”

Gary’s work on comet research has been published in various periodicals, including *Astronomy, Icarus, Mercury*, the *Meteor News*, the *Journal of the International Meteor Organization* (IMO), and numerous club newsletters as well as our own *Journal of the Association of Lunar & Planetary Observers* (ALPO).

As of mid-2004, Gary had made over 1,800 observations of 130 comets.

His current book project is called *Cometography* (Cambridge University Press) and it will span six volumes and nearly 3,000 pages, giving descriptions of every comet recorded by mankind from ancient times up through 1999.

Gary holds a Bachelor of Science degree in Journalism from Southern Illinois University at Edwardsville (IL) and is a programmer analyst at Washington University in St. Louis, MO.

Astronomy Roundup 2007 – Register Now!

Registration is now open for Astronomy Roundup2007 in Calgary, Alberta, June 28 to July 3. The early bird registration price of $100 Can. is in effect until April 30.

The Calgary Centre is hosting the 2007 General Assembly of the Royal Astronomical Society of Canada in conjunction with the American Association of Variable Star Observers (96th Spring Meeting) and the Association of Lunar & Planetary Observers (60th anniversary). The meeting will be held on the campus of the University of Calgary in Calgary, Alberta, Canada.

Talks will include:

- Ray Villard - Hubble Space Telescope's Legacy
- Dr. Eric Donovan - Using the Aurora to Study Space
- Dr. Michael Wilson - Medicine Wheels in the Landscape and the Skyscape: Sacred Sites of Plains First Nations
- Dr. Tracey Delaney - Peering into the Explosion, Using Stellar Archaeology to Unlock the Mysteries of the Supernovae
- Dr. Jaymie Matthews - One little telescope, so many stars

Optional workshops include:

- Fireball Investigation (Alan Hildebrand, Martin Beech)
- Light Pollution Abatement (Anna Brassard, Brassard Associates, expert in urban planning and 'Crime Prevention Through Environmental Design' (CPTED) training; Kevin Leitch, Calgary By-Law Services and Bob King, Chair, Light Pollution Abatement Committee, RASC, Calgary Centre)
- Imaging (Don Parker, Capturing and Processing Planetary Images; and Alan Dyer, Digital SLR Astrophotography)
- Introduction to Scientific Observing (Dr. Arne Henden, Dr. Richard Schmude, Dr. Sanjay Limaye, Gary Billings, Kim Hay)

Optional Tours include:

- University of Calgary's Rothney Astrophysical Observatory
- University of Calgary's Meteorite Lab
- Cretaceous/Tertiary Boundary and Tyrrell Museum Badlands
- Looking for Mars in the Canadian Rockies

Reminder Call for Papers

Events also include paper and poster sessions. If you would like to present a paper or poster during the Astronomy Roundup 2007, please submit your abstract to AR2007@shaw.ca by March 31.

Passports Required for Some

Also, attendees flying into Calgary who are U.S. citizens will need to carry a U.S.

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.

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passport in order to enter Canada and also to return to the U.S.

According to the U.S. State Department, this currently only applies to U.S. citizens *flying* into Canada. Those U.S. citizens traveling by land won't need to carry a U.S. passport until January of 2008. However, there are no guarantees that the U.S. State Department will not invoke this requirement for land travelers sooner in 2007.

It is advisable to obtain a U.S. passport regardless of how one enters Canada to insure that entrance into Canada and back to the U.S. goes smoothly. Normally, application for a U.S. passport takes about six weeks.

More information about applying for or updating a U.S. passport can be found on the world wide web at *http://www.travel.state.gov* More reason to plan ahead early for this convention!

For more information on Astronomy Roundup 2007 and to register, go to: *http://calgary.rasc.ca/ar2007/*

Hope to see you in Calgary!

-- *Astronomy Roundup 2007 Organizing Committee*

Free Online ALPO Journals

Certain older online (pdf) issues of the *Journal of the Assn of Lunar & Planetary Observers* are now available without password protection.

Included are JALPO43-1 (Winter 2001) through JALPO48-1 (Winter 2006). Issues released within the previous 12 months remain password-protected and are available only to those whose ALPO memberships specifically include the online Journal as a club benefit.

These issues can be accessed at *http://www.justfurfun.org/djalpo*

Also, Astrophysics Data System, a service provided by the Smithsonian Astrophysical Observatory, is currently scanning our entire catalog of archival ALPO Journals to make them available for online viewing and printing as well.

We will publish details about that project as it progresses.

ALPO Resources Updates

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

ALPO Membership Update

The Astronomical League's online payment service is still down, which means that membership payments via credit card are still not available.

We will resume accepting membership payment via credit card once the AL online service is running once more.

See the ALPO membership application form near the back of this issue of your Journal for dues and other details.

Letters & Correspondence

The following letter is in response to an article in JALPO49-1 (Winter 2007). Readers of the paper version of this Journal should note that the Slipher and Di Sciullo images shown here are reproduced perhaps more faithfully to the originals in the pdf version of this Journal.

I take issue with Roger Venable's contention in the previous issue of the journal ("*The Perception of Asymmetrical Brightness of Saturn's Rings as a Result of Eye Position*" JALPO, Vol. 49, No. 1, Winter 2007, pp. 50–58) that "it is inappropriate to continue to report the bicolored aspect [of Saturn's rings] as though it were a real planetary feature." Venable's hypothesis is that vignetting in optical systems may account for some reports of this phenomenon, but it certainly fails to explain instances in which the bicolored aspect has appeared in photographs and CCD images.

I have previously cited a set of Saturn photographs taken on November 12, 1943 in rapid succession through red, yellow, and blue filters by Earl C. Slipher with the 24-inch Clark refractor at Lowell Observatory to be convincing evidence that the bicolored aspect is real. I was quite taken aback when I read Venable's statement that these photographs are "disqualified" because "the asymmetry of brightness involves the disc of the planet as well as the rings." Slipher's photographs are beautifully reproduced as Plate LVI on page 123 of *A Photographic Study of the Brighter Planets* (Washington, National Geographical Society, 1964). I have provided scans of the red- and blue-light photographs from this text so that readers who cannot readily access this classic tome can examine Slipher's photographs and make their own appraisal. My eye cannot detect any hint of the brightness asymmetry on the disc of the planet alleged by Venable in the red light photograph, in which Ring A is strikingly brighter in the following ansa. In the blue light photograph, Ring A is brighter in the opposite, preceding ansa. Admittedly, the following limb of Saturn's globe is indeed darker in the blue light image, but such limb darkening in short wavelengths is to be expected in any photograph taken 33 days prior to the date of opposition (and is, in fact, present in other photographs in Slipher's book without being accompanied by any brightness or color anomaly in the rings). It is noteworthy that the dozens of other Saturn images that appear in Slipher's book fail to record ring anomalies, so some systemic error in the optical system of the 24-inch Clark refractor and the Barlow lens that Slipher employed to enlarge the image scale can hardly be responsible.

I find it even more curious that Venable failed to make reference to the splendid CCD images taken by Maurizio Di Sciullo

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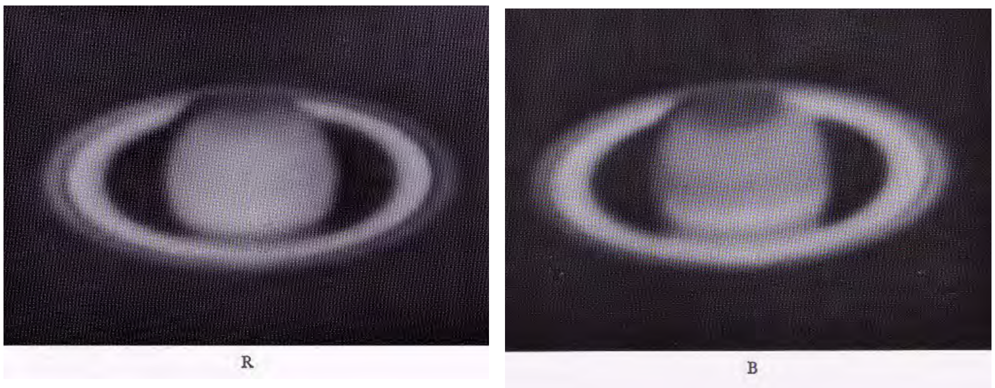

Scans of red-light and blue-light photographs taken by Earl C. Slipher which appear in *A Photographic Study of the Brighter Planets* and are cited here by Mr. Dobbins.

on January 20, 2002 through cyan, magenta, and yellow filters that dramatically captured the bicolored aspect of Ring A, despite the fact that Di Sciullo's images were prominently featured in two of the references that Venable cited. In my opinion, these images are the most compelling evidence to date that the bicolored aspect cannot simply be dismissed as an illusion. The color anomaly is clearly confined to Ring A, with no accompanying anomaly present on the adjacent Ring B (let alone the globe of the planet). Once again, it is noteworthy that Di Sciullo has repeatedly failed to record any color anomaly in the rings using the same instrument and projection optics on other nights. [I have attached jpeg-format versions of Di Sciullo's images in the hope that readers can access them online, given the inability of the print version of the journal to reproduce these color images. In the first image, which mimics the visual appearance of the planet, the color anomaly is rather subtle. In the second image, color saturation has simply been increased.]

Venable cautions that coma due to poor collimation in a Newtonian reflector "can cause a peculiar appearance that has been mistaken for brightness asymmetry." However, any spurious brightness asymmetry arising in this fashion has no color component and cannot account for the apparent reversal in the brightness of the ansae in different regions of the spectrum.

Venable's argument that "many experienced observers of Saturn say they have never seen it [the bicolored aspect], and reports of seeing it have been from only a few observers," only leads me to conclude that the phenomenon is rare, not necessarily that it is unreal. (The same thing could be said of the transient "spokes" in the rings, which were long dismissed as illusions because they are implausible from the standpoint of a simple Newtonian gravitational model of ring particle behavior.) For example, the accomplished Austrian planetary observer Martin Stangl has seen the bicolored aspect on only one occasion, although for years, he made it a point to attempt to detect it using filters as part of his observing routine. Stangl recounted that in an effort to determine if an illusion was involved: "I tried moving Saturn in the field, rotating the eyepiece, and alternating between my right and left eyes," all to no avail.

In the conclusion of his article, Venable wrote: "The burden of proof is on those who consider it to be a planetary feature to show that it still merits reporting." I for one do believe that the bicolored aspect continues to merit reporting whenever it is observed or imaged. While Venable's vignetting mechanism may account for some visual observations, in my book, it by no means explains away the Slipher and Di Sciullo images, or even visual observations like Stangl's. And while I am skeptical of the reality of Lunar Transient Phenomena or the ashen light of Venus, I would never dare to suggest that they do not merit further reporting. Such censorship would be contrary to the essence of the scientific method. It is the anomalies in the observational record that have often constituted the seeds of future discoveries.

Thomas Dobbins

****

Author Roger Venable responds:

In searching for images that show a bicolored aspect of Saturn's rings, Thomas Dobbins has made an attempt to convert this historically visual phenomenon into one with more objectivity. This is a worthwhile pursuit, and the images that he presents here are impressive. When the photographs by Slipher were reproduced in my issue of *Sky & Telescope* magazine, they were printed so as to show asymmetry in the globe as well as in Ring A. Consequently, I classified the images as "disqualified."

Saturn as imaged by Maurizio Di Sciullo and cited here by Mr. Dobbins. "Normal" image is to left, with enhanced image (for color saturation) appears at right. Both images submitted to this publication in jpeg format.

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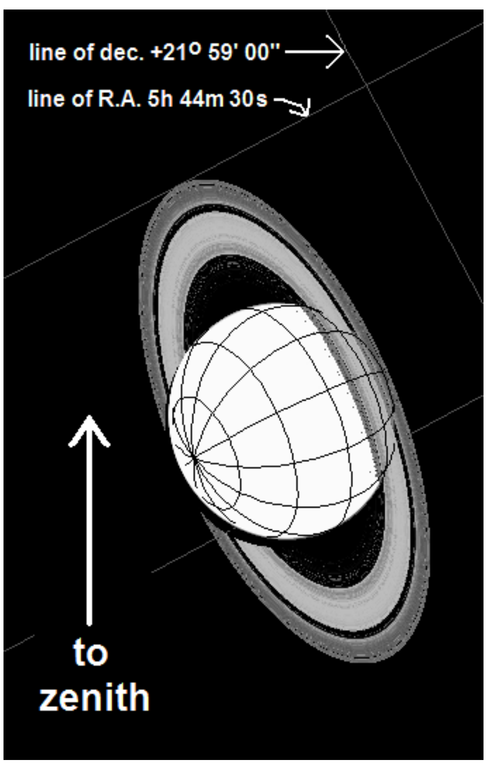
Dobbins now presents reproductions of Slipher's images that show no asymmetry in the globe. However, I have Slipher's book, and in my copy, the globe is definitely involved in the asymmetry as I stated in the article, and I thus disagree with Dobbins in his assertions about these images. I'll discuss the images further, below. It is more important to emphasize that by focusing on these few images Dobbins is ignoring the big picture. The fact that he has found so few images depicting color asymmetries is strong confirmation that it is not a planetologic phenomenon. If this commonly visualized effect originates in the rings, images of it should be common! On the other hand, if it originates in the human eye, images that show it will be the result of occasional quirks in imaging procedures, they will be rare, and they may not be fully explainable when they occur. I agree with him that its presence in these few images is not due to *systematic* procedural error in imaging. It is due to unnoticed *random* procedural error.



Computer-generated image by Roger Venable which duplicates orientation of Saturn as seen at 13:00 UT on November 12, 1943, from Lowell Observatory.

A good example of such unnoticed error is that which caused the color variation in the image by Maurizio Di Sciullo that Dobbins presents here. In his drive to optimize his planetary telescope, Di Sciullo made his 10-inch Newtonian with a focal ratio of 8, and a diagonal with only 12.5% obstruction (measured diametrally.) This design vignettes most of the focal plane, except for a small unvignetted zone at the center. Any Newtonian with a vignetting diagonal is especially prone to false color in images, and Di Sciullo's telescope is extreme (see "*Pitfalls In Imaging The Bicolored Aspect*," *JALPO* Vol. 49, No. 1 pg 51). The false color arises from differences in vignetting due to differences in the image-plane positions among the three color-component images. I described this imaging pitfall in the article, and I am glad to have so clear an illustration of it. The fact that Di Sciullo's images generally do not show such a color asymmetry testifies to his skill in imaging.

The problem with vignetting in some Newtonians is similar but not identical to the problem with collimation error. Dobbins tries to refute the idea that poor collimation can cause a color asymmetry by his statement that collimation effects are color-neutral. He could not have known of the two times that I have guided imagers in correcting the collimation of their instruments, based on a comatic appearance of Saturn's rings that each mistook for a bicolored aspect, in black and white images taken with colored filters. The asymmetrical appearance of coma will cause a color anomaly if there are sufficient differences in the planet's image-plane positions among the several color-component images. Vignetting and collimation effects are both color-neutral, but they produce brightness asymmetries, and these cause false color due to the manner in which astronomers build color images.

Regarding Slipher's November 12, 1943, photographs, readers should know that he included them in his book as illustrations of the *globe's* varied appearance in different colors, and not that of the rings. In fact, in his discussion of these very images he stated, "Tricolor negatives over a period of thirty years have indicated that the rings [i.e., in contrast to the globe] shine essentially by white light, which is consonant with spectrographic results" (page 122.) Thus he preemptively dismissed any attempt to ascribe to a planetologic effect the obvious color asymmetry of Ring A in these images. This is mystifying unless you suppose that he considered the cause of this ring asymmetry to be so obvious as to merit no further comment.

I enclose an illustration, made by using *Guide 8.0* software by Project Pluto, showing Saturn's orientation in the sky at 13:00 UT on November 12, 1943, as seen from Lowell Observatory. In comparing it to the photographs that Dobbins displays, you can see that the chromatic dispersion by Earth's atmosphere explains the color anomaly, with red smeared toward the bottom and blue smeared toward the top. This is mundane, but Slipher did not use these images to display the rings, but rather the globe.

I encourage observers to continue to image the rings. However, an assertion of extraordinary nature demands extraordinary evidence in its support. Please pay careful attention to the confounding factors that I mentioned in the "Pitfalls" box that accompanies my article. Images that may show a color anomaly in the rings are best submitted in raw form, that is, with no processing whatsoever.

The bicolored aspect of Saturn's rings is fundamentally a visual phenomenon. In a typical apparition, the ALPO Saturn coordinator receives a number of reports of its visual detection, but no images that display it. Almost all of those few images that have purported to display it over the years have been satisfactorily refuted. Because many experienced observers have never seen it, Dobbins concludes that the bicolored aspect is rare, and that this accounts for the lack of images that show it. The effect is not rare. In the most recently reported apparition (2002-2003,) Haas detected it in 5 of his 17 visual observa-

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tions and Del Valle saw it in 5 of 18 observations. These detection rates are similar to those during other apparitions. Images of it are very rare, because it is a visual phenomenon.

In my perusal of apparition reports, I am impressed by how much more readily evident it is to some observers than to others. In 2002-2003, no observers other than Haas and Del Valle reported detecting it (see Benton JL (2006). "*Saturn: Observations During the 2002-2003 Apparition*." *JALPO,* Vol. 48, No. 2: pp. 24-40.) Perhaps this observer-dependency has persuaded some persons that it is rare. It seems natural to think that if you can't see it, it must be rare, rather than observer-dependent.

I presented evidence that it is caused by the Stiles-Crawford effect, and the evidence is compelling:

- The experiment showed that the Stiles-Crawford effect does produce a perception of asymmetry in the brightness of the rings.

- The study demonstrated that vignetting can occur without the experienced observer's awareness of it, confirming that his eye can wander from the optical axis without his awareness of it, so as to possibly reveal the Stiles-Crawford effect.

- The Stiles-Crawford effect produces a brightness asymmetry involving the whole ansa, which conforms to Haas's description of the bicolored aspect. This is in contrast to the azimuthal brightness asymmetry and the asymmetries evident in the images that Dobbins promulgates, which look different from Haas's description.

- The visibility of the Stiles-Crawford effect, like that of the bicolored aspect, is known to vary markedly from person to person, and this was confirmed in the study. Thus, a third of the subjects could not perceive the Stiles-Crawford effect in the observation of Saturn's rings, which is consistent with the observer-dependent nature of the bicolored aspect.

- The Stiles-Crawford effect is known to be most readily seen in violet light, intermediately evident in red light, and least visible in green light – a color relationship identical to that of the bicolored aspect.

- The Stiles-Crawford effect is visual, and so explains the lack of images that show a bicolored aspect.

The reason that visual perceptions of a bicolored aspect should no longer be reported is that the phenomenon is indistinguishable from the Stiles-Crawford effect, which is now known to cause such a perception.

Lest this be unclear, let me make an analogy. We know that airplanes cause us to see lights that cross the sky at night. If you see a light crossing the sky at night that is indistinguishable from an airplane, but you think that it is an alien spacecraft, why report it as an alien? And why should he who compiles reports of aliens include your observation in his report to the public? There is no indication that it is anything other than an airplane. If you see a bicolored aspect, you have no indication that it is anything other than the Stiles-Crawford effect.

Dobbins cites a single observation by Martin Stangl as evidence that I am not correct. However, like other highly skilled observers who have seen the bicolored aspect, when Stangl saw it, he did not check to see whether he might be seeing the Stiles-Crawford effect. Rather than consider Stangl's observations to be a refutation of my data, one should consider my data to be an explanation of Stangl's observations.

Furthermore, even if an image is found that appears to show a color asymmetry in the rings, the data that I obtained regarding the visual bicolored aspect are not refuted. To refute it, one would need to show what I did wrong in the experimental procedure. It is unfair to ask me to identify every imaging procedural quirk that explains every image that is alleged to reveal a color asymmetry in the rings. Instead, show what I did wrong in my experimental procedure, if you think that I obtained misleading data concerning the Stiles-Crawford effect as it relates to the visual perception of a bicolored aspect of Saturn's rings!

The reference list inadvertently omitted the article by Bartlett, which is: Bartlett J (1945). "*A Strange Saturnian Illusion*." *Sky & Telescope* magazine, (April):16-17.

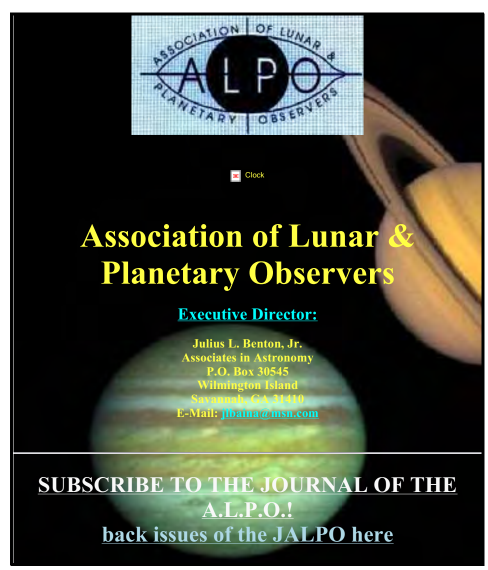
Roger Venable

ALPO Interest Section Reports

Web Services

Rik Hill, coordinator / manager

The ALPO homepages have grown steadily at about 10% per year. Some ALPO observing sections make more use of this than others, but it is interesting to note that those sections making the most use of the pages with regular updates and postings of observations are the sections showing the most growth in numbers of observers.



Inside the ALPO
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Several sections have posted manuals and instructions for observing. New inquiries coming to the ALPO web manager are referred to these section web pages and to the section coordinators themselves. Similarly, several sections also post regular newsletters to keep observers informed and also to direct observations and observational campaigns. This is excellent use of the resources.

Most postings can be made quickly, in a day or so, but some requiring modifications and handling of data and posting by the web manager, are delayed for a week or so.

Our World Astronomy Club Link on the front page is perhaps the largest such collection of amateur club and society web pages on the Internet. It is vital that any errors, additions or changes in URLs be reported to the ALPO web manager since with such a large collection, it is necessary to rely on feedback to maintain the list.

Ten years ago, when our website was only two-years-old, our web space was 20-30 megabytes on the Lunar & Planetary Lab (Univ. of Arizona) system. Today, we are at approximately 310 Mb — a clear indication of greater use of our web services by ALPO coordinators. System administrators at LPL have indicated that this is negligible and foresee no problem with our future needs. We are very appreciative of the generosity of LPL in granting us this space and maintenance.

Visit the ALPO home page on the World Wide Web at http://www.lpl.arizona.edu/alpo

Computing Section

Kim Hay, coordinator

The ALPO Computer Section (ALPOCS) is a very low key group, answering computer questions that may come up, mainly on coding issues these days. In the day when computers were new and questions were many, this group was quite busy, but now, with more commercially available programs, and the tremendous explosion of resources on the internet, we seem to be less busy.

However, our email group has 248 members, generally new members who are new to the hobby and looking for help in astronomy, planetary and celestial mechanics.

Jeff Beish has uploaded in January updates to the WIMP files.

In order to access these new files, visit http://www.yahoo.com you can go to the group's area and look for ALPOCS. If not already a member of this Yahoo email list, you will have to sign into Yahoo to create an identity, then you can go the files area and download. Take a look around, post a message, see what there is.

Join the group, ask questions, and if you have an astronomical program that you would like to share, please upload it.

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

Lunar & Planetary Training Program

Tim Robertson, coordinator

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

Instruments Section

R.B. Minton, coordinator

Two ALPO board members (and one non-member) have expressed interest in my offer to measure the transmission of filters for ALPO members free of charge. The details of this offer are outlined in a one-page tutorial yet to be published. Three filters were measured for a gentleman (Bernard M.) who had contacted Julius Benton for further information. Bernard is an experienced stage lighting engineer who needed some samples measured to determine their colorimetric transmissions. These are thin gelatin filters with a surface quality equal to Kodak Wratten filters, but at a much lower cost. Interested readers may write me for further information. Bernard was extremely pleased with my results — my measures of one known filter agreed exactly with information he already had on hand. I, too, was pleased, and consider this as a "peer review" of my instrument and offer.

Two ALPO members have responded to my solicitation for information about their observatories. One was published in a recent issue by e-mailing material directly to Ken Poshedly. The other member sent photographs, but no description or other information; and it is yet to be submitted for publication. Please send me or Ken a description and photos about your observatory if you would like to share your experiences with others. Any size observatory greatly increases the ease of one's observing, and observing is the crux of enjoying amateur astronomy. I urge all amateurs to consider building an observatory if they are forced to move their instruments from indoors to outdoors.

Another useful aid to observing are the new non-contact optical thermometers. The price for these has recently dropped from the $50 to $100 range (available at Sears), to the $10 to $40 range (available at Harbor Freight Tools). These thermometers measure infrared (IR) in the wide band from 6 to 16 microns where most surrounding objects emit their maximum thermal energy. Most models measure from -20° C to 250° C to a resolution of one-tenth or two-tenths of a degree. The less expensive models have a field of view around 57° C, and the more expensive near 7° C. I use a $10 model to measure the temperature of my CCD. They also detect clouds; giving a cloud bottom reading usually around freezing (at my location), or an underflow indication for a clear night sky (no energy!). Their uses are almost limitless. Happy observing!

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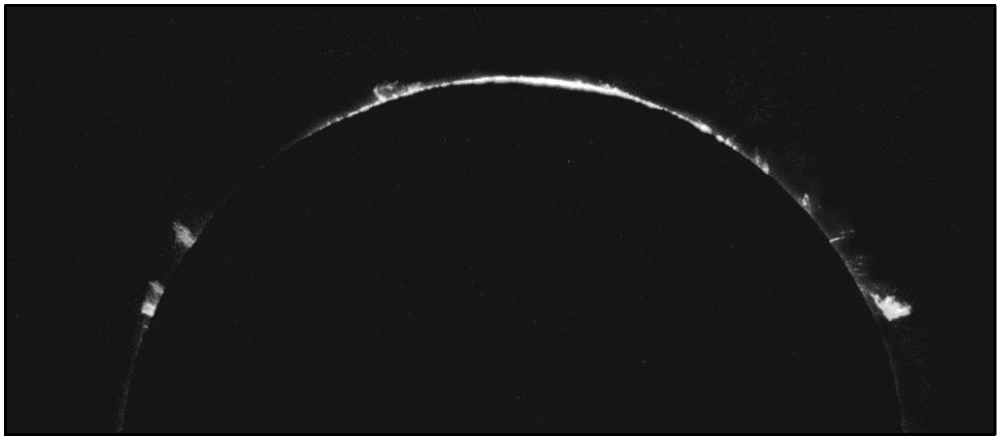
Visit the ALPO Instruments Section on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/inst.html* and *http://mypeoplepc.com/members/patminton/astrometric_observatory/*



The 21 June 2001 Total Solar Eclipse. Madagascar. *(Photograph by Vic Winter.)*

ALPO Observing Section Reports

Eclipse Section

Mike Reynolds, coordinator

Over the years, people have expressed their delight over an interest in extraordinary total solar eclipse imaging. The superb images seem to be a combination of lots of skill and experience, and sometimes a little luck. And it seems that a few individual names were always associated with the incredible photos — both ALPO and non-ALPO members.

Vic Winter was one of those total solar eclipse chasers whose images won renown, especially amongst fellow eclipse chasers. His images have graced many magazines, and a number of this coordinator's talks at ALPO meetings. He seemed to have an ability to know what and how to shoot. This ability was one that he had applied professionally, as a photographer for the Kansas City Star. His general astrophotography skills were also superb.

Vic passed away January 28 at the age of 53, leaving his wife Jen, daughter Shadow, and stepdaughters Aerica and Libby. His "always ready for the next eclipse" enthusiasm and exquisite photography will be missed by all who knew him, or had the opportunity to view the results of his photographic abilities. In addition Vic was very active in astronomy outreach, including the Southern Skies Star Party. He recently became the co-owner of DayStar Filters; his passion as a solar observer.

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

Comets Section

Gary Kronk, acting coordinator

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

Meteors Section

Robert Lunsford, coordinator

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

Solar Section

Kim Hay, coordinator

It has been an extremely interesting series of Carrington Rotation (CR) periods since the last submission in August 2006. Currently, we are in CR2053, and since CR2048 up to CR2052, we have had several large active groups on the Sun.

We are in the Solar Minimum part of the Cycle 23, with expectations that we are starting to turn the corner on the upswing of the Sun becoming active again. Sunspot Cycle 24, which is expected to peak in 2010-2011, is predicted to be a major solar cycle (*http://science.nasa.gov/headlines/y2006/21dec_cycle24.htm*) .

In November, we were treated to a spectacular view of group AR10923 (CR2049), which produced several flares, then rotated around again to produce AR10930 in December (CR2050), as shown in Figure 1 by ALPO member and moderator of the ALPO Solar e-mail list Rick Gossett (Michigan, USA). Figure 2 in white light by Howard Eskildsen (Florida, USA) shows group AR0910 and Figure 3

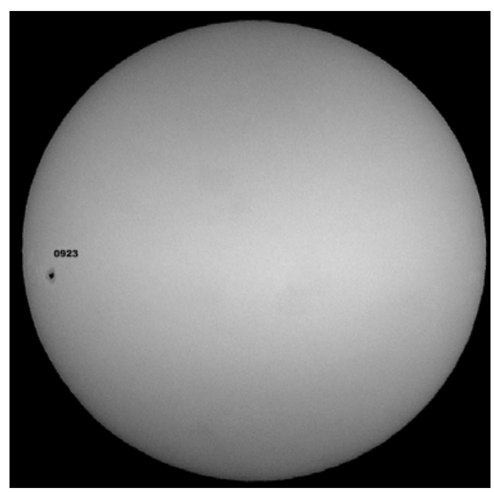


Figure 1. Carrington Rotation 2049, on 11 Nov 2006 16:24 UT, showing group AR10923. 50x afocal image by Rick Gossett, Roseville, MI, USA (*rick2d2@sbcglobal.net*). Scope 20 cm (8 in.) SCT at f/10. North at top, west at right.

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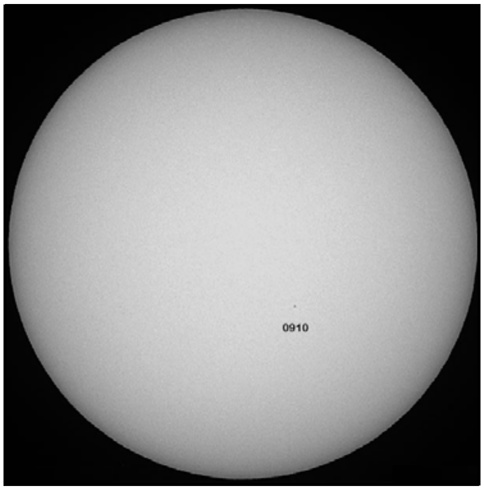

Figure 2. Carrington Rotation 2047, on 23 Sept 2006 12:32 UT, showing group AR10910. Afocal image by Howard Eskildsen, Ocala, FL USA (*howard-eskildsen@msn.com*). Sky, clear; altitude, 14°; wind, calm; seeing, 3". Equatorially-mounted Meade 6-in., f/8 refractor with electric drive; 152 mm aperture, Baader Visual Solar Film, FL=1,200 mm, Nikon Coolpix 4300 digital camera w/16.3 mm MaxView eyepiece, W15 yellow and IR block filters. Exposure time 1/260 sec. North at top, west at right.

by Gema Araujo (Spain) shows a flare of AR10930.

The sunspot AR10930 created several X class flares in the month of December. On December 5, 2006 this new solar region rotated onto the eastern solar limb producing a X9.0 solar flare *http://www.msnbc.msn.com/id/16059571/*). This also resulted in Middle Latitude Auroral alerts as far south as Oregon to Idaho, northern Nebraska to Illinois, Indiana to Ohio to Delaware. In Europe, it was from northern France to Central Germany to Poland and Central USSR.

By the middle of December, this group AR10930 was a naked eye observation, using, of course, the proper solar filters and/or welder's glass #13.

The Sun's period of rotation at the surface varies from approximately 25 days at the equator to 36 days at the poles. In the convective zone, it appears to have a rotation period of 27 days.

Carrington Rotation	Date of Rotation Period	No. of Observers	No. of Submissions	Sunspot Numbers That Appeared Per Rotation
CR2048	Sept 22-Oct 18, 2006	9	119	AR10910-AR10916 with the end of the rotation with no spots visible
CR2049	Oct 19- Nov 14, 2006	10	153	AR10916-AR10924-AR10923 showed up on November 9, 2006. This spot produced many flares. It then rotated around the sun and came back as AR10930.
CR2050	Nov 15-Dec 12, 2006	8	143	AR10923-AR10930- AR10930 showed up on December 6, 2006. 28 day rotation, falling in the normal rotation period
CR2051	Dec 13 2006- Jan 8 2007	7	105	AR10930-AR10938- AR10933 also produced flares
CR2052	Jan 9- Feb 4, 2007	8	97	AR10938-AR10941 – AR10940 & AR10941 were naked eye sunspots

All submissions of observations are available for viewing at *http://www.lpl.arizona.edu/~rhill/alpo/solar.html* , then select the most Recent ALPOSS Observations. These observations include drawings of sunspot groups with added H-alpha phenomena. Included are photographic images of White Light, H-alpha, prominences and some animations, as well as drawings of the Sun.

If you wish to contribute to the ALPO Solar Section by sending in images or drawings, please send them electronically to *kim@starlightcascade.ca* . Note that all digital images should be 200k-300k in size and in jpeg format. If you are unsure on how to go about submitting, or how to start, drop me a line.

Or join the Solar Section e-mail group, where you can also learn how to observe safely with proper filtering, and how to take images. Go to *http://groups.yahoo.com/group/Solar-ALPO/* sign in to join.There are currently 276 members signed up to the list. We are looking forward to seeing your drawings or images of our Sun.

Here is a short bibliography of solar observing materials:

- Submissions by solar observers Gema Araujo, Howard Eskildsen, Rick Gossett
- ALPOSS Solar List Solar — *http://groups.yahoo.com/group/Solar-ALPO/*
- Solar Flare Dec 5, 2006 — *http://www.msnbc.msn.com/id/16059571/*
- AR10930 on Spaceweather — *http://www.spaceweather.com/archive/dec212006*
- Big Bear Solar Observatory — *http://www.bbso.njit.edu/*
- Science at NASA — *http://science.nasa.gov/headlines/y2006/21dec_cycle24.htm*
- Mees Solar Observatory — *http://www.solar.ifa.hawaii.edu/ARMaps/archive.html*

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The ALPO Solar Section reminds all of its totally revised handbook, *The Association of Lunar & Planetary Observers Solar Section - Guidelines for the Observation and Reporting of Solar Phenomena*, produced by Jamey Jenkins, assistant coordinator and archivist, and who works with new ALPO solar observers. This new

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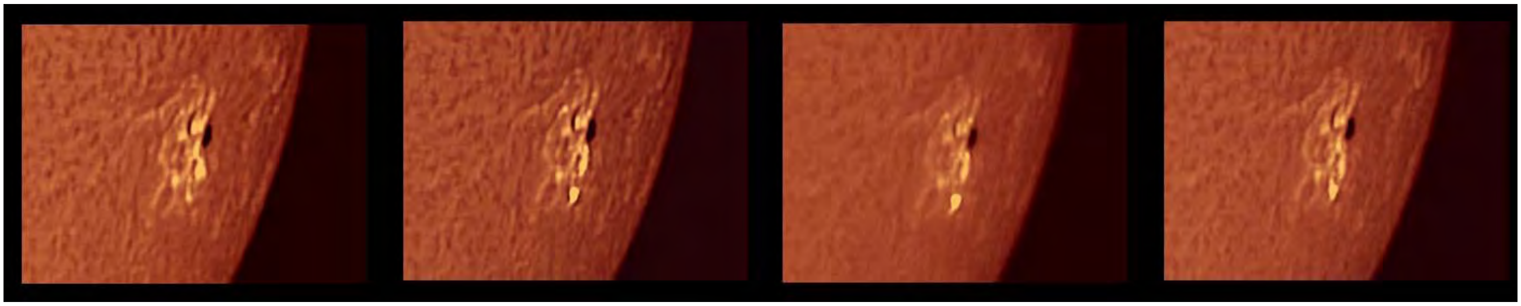

Figure 3. Carrington Rotation 2050, 06 Dec 2006, showing flare (C4.8) of AR10930. From left to right, 12:52 UT. 12:56 UT, 12:58 UT and 13:03 UT. Image by Gema Araujo, USA (*http://astrosurf.com/obsolar*). Coronado PST 40 mm, f/10, 2x Barlow, No. 25 IR filter, and ToUcam Pro PC video camera.

handbook includes up-to-date techniques, many images and links to many solar references. The new handbook is provided as a 58-megabyte file (over 100 pages) in pdf on CD for $10 USD.

To order, send check or US money order made payable to Jamey Jenkins, 308 West First Street, Homer, Illinois 61849; e-mail to *jenkinsjl@yahoo.com.*

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

Mercury Section

Frank J. Melillo, coordinator

In early February 2007, Mercury had a fine appearance with nearby Venus in the Western evening sky. Both planets were eye-catching about 30 minutes after sunset and were shining beautifully. Mercury was about -0.5 mag. while Venus was about -3.9 mag. In fact, Mercury was considerably closer to us over entire apparition with Venus at the far side of the Sun.

Both Ed Lomeli and a new observer, Andrew Allen, have done an excellent job of imaging Mercury during the favorable morning appearance in November and December 2006. Their images are perhaps the best I have ever seen. There is strong evidence that the crater ejecta rays were captured clearly; these rays are similar to those also found on the lunar surface. Of course, we can't see the craters on Mercury, but we can see the effects of those craters as white spots. They have high contrast, especially when the Sun is very high as seen from Mercury's surface.

Usually, the ejecta rays are more easily seen when Mercury is in its gibbous phase as viewed from Earth. The late ALPO Mercury section observer Erwin V D Velden had imaged the white spots a few years ago, but they were less convincing at that time. Now, however, his images are more valuable; unfortunately, he did not live long enough to see this. Tim Wilson did an outstanding job of overlaying grid lines on the disk to identify the features' coordinates. This is first class amateur work on Mercury!

ALPO Lunar Topographic Section Coordinator William Dembowski says, "Having several independent observers, each taking a sequence of images, is a real "double whammy". There is no doubt in my mind that we are not looking at artifacts or illusions; the evidence is just too strong. Overlaying the images on "mercuryindex4" with a grid also shows that the bright features correspond nicely with known rayed craters."

I have contacted Mercury experts Dr. Clark Chapman, Dr. Johan Warell and Dr. Ann Sprague and they said that the white spots provide convincing evidence of the crater ejecta rays. I won't say much here, but a paper should be written up for JALPO and also to present this at the meeting of the Division of Planetary Sciences (DPS) suggested by Dr. Ann Sprague.

GET OUT AND OBSERVE MERCURY!!

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

Venus Section

Julius Benton, coordinator

Venus now appears as a brilliant object in the evening sky after sunset, progressing through its waning phases (a gradation from gibbous through crescentic phases). As of this writing in mid-February, the gibbous disc of Venus is about 13 arc-seconds across, slowly increasing in angular diameter as it heads toward Inferior Conjunction on August 18, 2007, when it will be about 60 arc-seconds in angular diameter. Observers are viewing the leading hemisphere (dusk side) of Venus at the time of sunset on Earth. Observers are always encouraged to try to view Venus as close to the same time and date as possible (simultaneous observations) to improve confidence in results and reduce subjectivity.

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

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Geocentric Phenomena of the 2006-07 Eastern (Evening) Apparition of Venus in Universal Time (UT)

Superior Conjunction	2006	October 27^d UT (angular diameter = 9.7 arc-seconds)
Predicted Dichotomy	2007	June 8.65^d (exactly at half-phase predicted)
Greatest Elongation East		June 9^d (Venus will be 45º east of the Sun)
Greatest Brilliancy		July 12^d (m_v = – 4.6)
Inferior Conjunction		August 18^d (angular diameter = 60 arc-seconds)

as other wavelengths through polarizing filters. The observations should continue to be contributed in JPEG format to the ALPO Venus Section Coordinator as well as to the VEX website at: *http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=38833&fbodylongid=1856*.

Routine observations of Venus are needed throughout the period that VEX is observing the planet, which continues in 2007 and a few years henceforth, as well as after completion of the mission. Since Venus has a high surface brightness, it is potentially observable anytime it is far enough from the Sun to be seen without threat of eye damage.

Observational Highlights

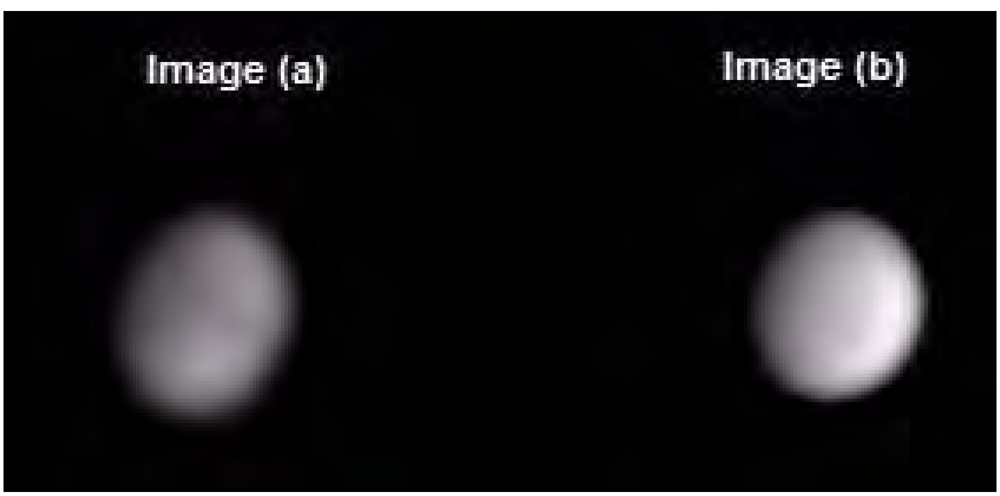
- 250 digital images of Venus have been submitted.
- 60 drawings and intensity estimates of dusky features suspected on Venus have been received.
- Numerous UV images have shown dusky banded and amorphous atmospheric features
- Pro-Am collaboration in association with the Venus Express (VEX) mission continues.
- Incidence of simultaneous observations of Venus is increasing.

Key Observational Pursuits

- Visual observations and drawings in dark, twilight, and daylight skies to look for atmospheric phenomena including dusky shadings and features associated with the cusps of Venus
- Visual photometry and colorimetry of atmospheric features and phenomena
- Monitoring the dark hemisphere for Ashen Light
- Observation of terminator geometry (monitoring any irregularities)
- Studies of Schröter's phase phenomenon near date of predicted dichotomy
- Routine CCD and webcam imaging of Venus at visual, UV, and IR wavelengths
- Special efforts to accomplish simultaneous observations
- Contribution of observation data and images to the Venus Express mission is encouraged

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

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



Digital images of Venus by David Arditti of Edgware, Middlesex, UK, using a 28.0 cm (11.0 in) SCT on January 21, 2007. The diameter of the disc is 10 arc-seconds and gibbous phase of k = 0.94 (94% illuminated). Image (a) was made using an ultraviolet 320-390nm UV filter at 14:24UT, while image (b) was made using an infrared 685nm filter at 14:40UT. Note the obvious dusky atmospheric features on Venus in the UV image. South is at the top of the image.

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Lunar Section:
Lunar Topographical Studies / Selected Areas Program

William M. Dembowski, FRAS section coordinator
Dembowski@zone-vx.com

After an unusually slow third quarter, activity in the ALPO Lunar Topographical Studies Section (ALPO-LTSS) increased nicely in the fourth quarter of 2006 with 158 new images of the lunar surface being received from 14 observers in seven countries and five states of the United States.

The ALPO-LTSS continued to promote the various observing projects within the Selected Areas Program via this section's newsletter, *The Lunar Observer*. Although some interest has been shown, it is yet unclear how viable these programs will be. Web pages for two of the programs have been established and interested members are encouraged to visit them:

Selected Areas Program:
http://www.zone-vx.com/alpo-sap.html

Banded Craters Program:
http://www.zone-vx.com/alpo-bcp.html

Among those expressing an interest in Banded Craters observing program is Howard Eskildsen of Ocala, Florida, who is one of the more dedicated observers of the ALPO-LTSS. Howard is a physician with a life-long interest in astronomy.

His involvement in the ALPO began in 2003 with a Meade ETX-125 Maksutov-Cassegrain telescope and a solar filter. He soon expanded his observing to include the Moon and now uses a Meade 6 inch f/8 refractor with both a Nikon Coolpix 4300 CCD camera and Celestron NextImage camera. A well-rounded individual, Howard enjoys geology, writes both prose and poetry, and plays an Australian didgeridoo.

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

- ALPO Lunar Topographical Studies Section *http://www.zone-vx.com/alpo_topo.htm*
- ALPO Lunar Selected Areas Program *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/selarea.html*
- ALPO Lunar Topographical Studies Smart-Impact WebPage *http://www.zone-vx.com/alpo-smartimpact.html*
- *The Lunar Observer* *http://www.zone-vx.com/tlo.pdf*

Lunar Dome Survey

Marvin Huddleston, FRAS, coordinator

Participants are encouraged to contact Harry D. Jamieson, e-mail *harry@persoftware.com* in order to obtain a copy of the Lunar Observers Tool Kit, (Windows edition).

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

Lunar Transient Phenomena

Dr Anthony Cook, coordinator

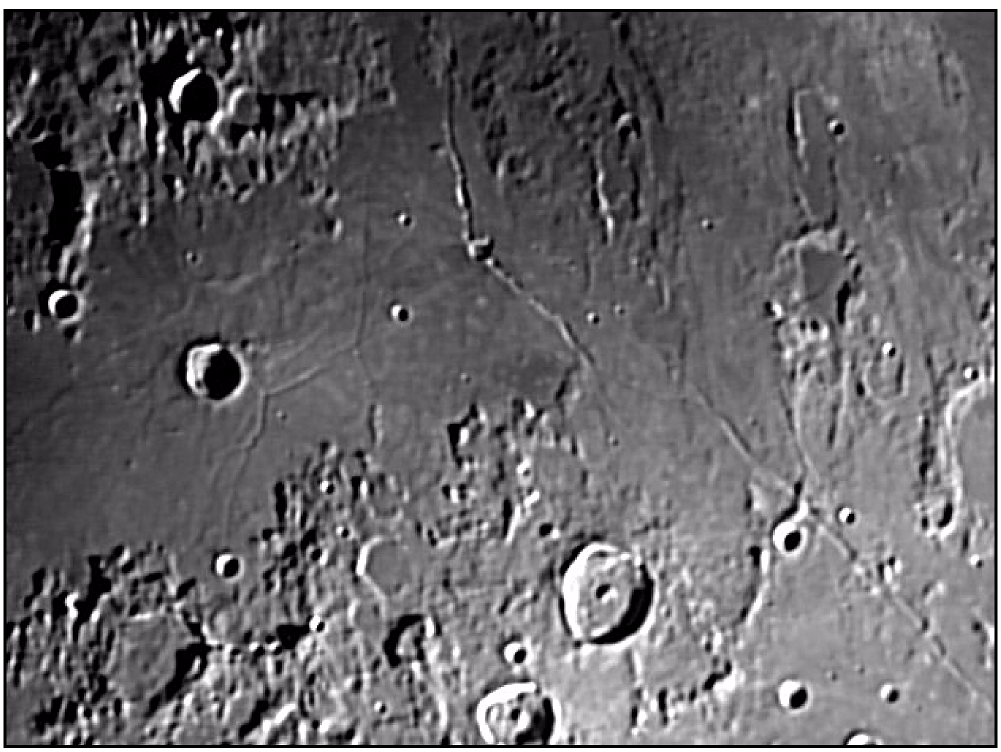
Visit the ALPO Lunar Transient Phenomena program on the World Wide Web at *http://www.lpl.arizona.edu/~rhill/alpo/lunarstuff/ltp.html and http://www.ltpresearch.org/*

Lunar Meteoritic Impact Search

Brian Cudnik, coordinator

The ALPO LMIS section was rather quiet during the four-month period leading up to this report (November 1 thru February 26). However, there were three campaigns organized to observe the Moon during three annual meteor showers, and the monthly campaign continues.

Observations were requested for the Leonids, Geminids, and Ursids. The Moon was a waning pre-dawn Crescent with the western (dark) limb facing into the Leonid meteoroid stream. For the Geminids, the Moon was a waning Crescent, just past Last



Hyginus and Triesnecker Rilles imaged by Howard Eskildsen of Ocala, Florida, USA, December 28, 2006 - 00:59 UT; lunar colongitude: 5.6°; seeing: 8/10, transparency: 6/6; Meade 6 inch, f/8, refractor, 2x Barlow - IR blocking filter, Celestron NextImage CCD camera. (See also maps 33 and 34, *Atlas of the Moon* by Antonín Rükl.)

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Lunar Calendar for the Second Quarter of 2007(All times are UT)

Apr. 02	17:15	Full Moon
Apr. 03	09:00	Moon at Apogee (406,326 km - 252,479 miles)
Apr. 08	08:00	Moon 5.9 Degrees S of Jupiter
Apr. 10	18:04	Last Quarter
Apr. 13	01:00	Moon 1.9 Degrees SSE of Neptune
Apr. 14	01:00	Moon 0.49 Degrees NW of Mars
Apr. 16	06:00	Moon 4.3 Degrees NNW of Mercury
Apr. 17	06:00	Moon at Perigee (357,137 km - 221,915 miles)
Apr. 17	11:36	New Moon (Start of Lunation 1043)
Apr. 20	07:00	Moon 3.3 Degrees N of Venus
Apr. 24	06:35	First Quarter
Apr. 25	10:00	Moon 1.0 Degrees NNE of Saturn
Apr. 30	11:00	Moon at Apogee (406,208 km - 252,406 miles)
May 02	10:10	Full Moon
May 05	11:00	Moon 5.8 Degrees S of Jupiter
May 10	04:27	Last Quarter
May 10	09:00	Moon 1.6 Degrees SSE of Neptune
May 12	06:00	Moon 1.1 Degrees NW of Uranus
May 12	23:00	Moon 2.7 Degrees NNW of Mars
May 15	15:00	Moon at Perigee (359,392 km - 223,316 miles)
May 16	19:28	New Moon (Start of Lunation 1044)
May 17	24:00	Moon 3.0 Degrees N of Mercury
May 22	20:00	Moon 0.77 Degrees NE of Saturn
May 23	21:02	First Quarter
May 27	22:00	Moon at Apogee (405,456 km - 251,939 miles)
June 01	01:04	Full Moon
June 01	11:00	Moon 5.7 Degrees S of Jupiter
June 06	16:00	Moon 1.4 Degrees SSE of Neptune
June 08	11:43	Last Quarter
June 08	14:00	Moon 1.5 Degrees NNW of Uranus
June 10	18:00	Moon 4.7 Degrees NNW of Mars
June 12	17:00	Moon at Perigee (363,777 km - 226,041 miles)
June 15	03:14	New Moon (Start of Lunation 1045)
June 16	10:00	Moon 5.6 Degrees N of Mercury
June 18	16:00	Moon 0.58 Degrees NE of Venus
June 19	08:00	Moon 0.43 Degrees NNW of Saturn
June 22	13:14	First Quarter
June 24	15:00	Moon at Apogee (404,538 km - 251,368 miles)
June 28	12:00	Moon 5.7 Degrees S of Jupiter
June 30	13:49	Full Moon

Quarter with much of the earthlit portion exposed to incoming Geminid meteoroids. The Moon was a few days past New, a thin evening crescent for the Ursids. As of February 26, four Leonid impact candidates and 10 Geminid candidates — most of these tentatively confirmed with two separate telescopes in close proximity to each other — have been reported, all by the NASA-MSFC Meteoroid Environmental Office. The Leonid candidates ranged from magnitude 8.2 to 9.4 (two of which have yet to be determined), and the Geminid candidates ranged in magnitude from magnitude 7.5 to 10.0 (four events have yet to be determined). No candidates from the Ursid stream have been reported.

The ALPO LMIS has also begun to coordinate general monthly observations during time blocks when the Moon is 10% to 50% illuminated, both evening and morning. So far, no candidates have been reported with the exception of nine sporadics by the NASA team from November and December.

The observing manual *An Observer's Guide to Lunar Meteor Phenomena* has been completed, and this section coordinator is currently seeking a publisher. The goal for publication is by the end of 2007. This coordinator will also be presenting a paper at the 38th Lunar and Planetary Science Conference in Houston, Texas, providing a status report of lunar meteoritic studies to the professional planetary geology community and advertising the observing manual.

Plans for the coming year for the Section include continued two-tier monitoring of the Moon during selected annual showers, during the two total lunar eclipses (3 March and 28 August) and on a regular monthly basis. The LunarScan program may be released to the amateur community by mid-year, which will greatly improve our ability to observe and capture true meteoroid impacts on a more frequent basis.

Information on impact-related events can be found at *http://www.i2i.pvamu.edu/physics/lunimpacts.htm*

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

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Mars Section

Dan Troiani, coordinator & Daniel P. Joyce, assistant coordinator

A report on the current (2007 - 2008) apparition of Mars appears later in this issue of *The Strolling Astronomer.*

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

Minor Planets Section

Frederick Pilcher, coordinator

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

In addition, please visit the ALPO Minor Planets Section on the World Wide Web at http://www.lpl.arizona.edu/~rhill/alpo/minplan.html

Jupiter Section

Richard W. Schmude, Jr., coordinator
schmude@gdn.edu

The New Horizons probe (on its way to Pluto) imaged Jupiter well into March. For this reason, people are requested to image Jupiter as often as possible. There is a chance that professional astronomers will need our data.

The Great Red spot has changed a little and part of the SEB has become weaker. I am hoping that some people will also record the exact times when Jupiter's bright satellites disappear or reappear in that planet's shadows. This information is used to refine the orbits of these moons. All satellite times need to be sent to John Westfall.

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

Galilean Satellite Eclipse Timing Program

John Westfall, Jupiter Section assistant coordinator

New and potential observers are invited to participate in this worthwhile observing program. Contact John Westfall via regular mail at P.O. Box 2447, Antioch, CA 94531-2447 USA; e-mail to johnwestfall@comcast.net to obtain an observer's kit, which includes Galilean satellite eclipse predictions for 2007.

Note that this is one of our least technology-intensive programs – it involves visual timing of the beginning and end of the eclipses by Jupiter of its major satellites, using telescopes of 2.25-in. (60-mm) aperture on up. (There is, admittedly, a minor need for electronics, in that you need a time source accurate to one second, such as an "atomic" watch or clock or a GPS receiver.)

Saturn Section

Julius Benton, coordinator

The 2006-07 observing season continues with 185 digital images and drawings submitted by observers at the time of this report in mid-February. Saturn reached opposition on 2007 February 10, and now appears in the eastern sky right after sunset and is visible nearly all night. The southern hemisphere and south face of the rings are visible from Earth, but portions of the northern hemisphere of Saturn can be glimpsed now that the tilt of the rings to our line of sight is about -14°.

Observational Highlights for the 2006-07 Apparition (as of mid-February):

- 185 digital images of Saturn have been submitted
- 40 drawings and intensity estimates of Saturn have arrived
- A few highly elusive white mottlings have been suspected in the EZs and possibly imaged in the SEBZ
- Several tiny, transient dark features were imaged in the SEBZ, emanating from the N edge of the SEBs
- Pro-Am collaboration in association with the Cassini Mission is continuing in 2006-07
- Incidence of simultaneous observations of Saturn steadily increased this observing season

Activities of the ALPO Saturn Section this apparition

- Visual numerical relative intensity estimates of belts, zones, and ring components

Digital image of Saturn by Christopher Go of the Philippines on February 10, 2007 at 15:49UT using a 28.0 cm (11.0 in) SCT. The so-called "opposition effect", where the rings of Saturn appear to brighten during a very short interval on either side of true opposition, is presumably apparent here. Seeing = 8.0, Transparency = 5.0. CMI = 13.4º, CMII = 244.8º, and CM III = 286.0º. South is at the top in the image.

Inside the ALPO
Member, section and activity news

Geocentric Phenomena for the 2006-2007 Apparition of Saturn in Universal Time (UT)	
Conjunction	2006 Aug 07^d UT
Opposition	2007 Feb 10^d
Conjunction	2007 Aug 21^d
Opposition Data:	
Equatorial Diameter Globe	20.2 arc-seconds
Polar Diameter Globe	18.0 arc-seconds
Major Axis of Rings	45.8 arc-seconds
Minor Axis of Rings	11.0 arc-seconds
Visual Magnitude (m_v)	–0.0m_v (in Leo)
B =	–13.8°

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

Observers are encouraged to perform digital imaging of Saturn at the same time that others are imaging or visually watching Saturn (i.e., simultaneous observations). All observers should compare what can be seen visually with what is apparent on their images, without overlooking opportunities to make visual numerical intensity estimates using techniques as described in the author's new book, "Saturn and How to Observe It", available from Springer, Amazon.com, etc.

The Saturn Pro-Am effort that began back on 2004 Apr 01, when Cassini started observing the planet at close range, is still underway, and observers are encouraged to participate in this effort during the 2006-07 apparition and beyond. Employing classical broadband filters (Johnson UBVRI system) on telescopes with suggested apertures of at least 31.8 cm (12.5 in.), Saturn should be imaged as often as possible, as well as through a 890nm narrow band methane (CH4) filter. Observers should make note of any features, their motions and morphology, and report such observations promptly. Resulting data serve as input to the Cassini imaging system, thereby suggesting where interesting (large-scale) targets exist. Suspected changes in belt and zone reflectivity (i.e., intensity) and color will be also useful, so visual observers can play a vital role by making careful visual numerical relative intensity estimates in Integrated Light (no filter) and with color filters of known transmission.

The Cassini team will combine ALPO images with data from the Hubble Space Telescope and from other professional ground-based observatories. Observations should be immediately dispatched to the ALPO Saturn Section throughout 2007 and 2008 for immediate dispatch to the Cassini team. Be sure to include all supporting data such as time and date (UT), instrumentation used, observing conditions and location, etc., since without such fundamental information, observations are essentially useless.

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

Information on ALPO Saturn programs, including observing forms and instructions, can be found on the Saturn pages on the official ALPO Website at *http://www.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

Richard W. Schmude, Jr., coordinator
schmude@gdn.edu

Pluto is fairly well placed in the early morning sky. I am hoping that people will be able to use their CCD cameras to record brightness data of this dwarf planet.

Later this year, Uranus will reach equinox, offering the opportunity to view satellite transits and mutual events. More information will be enclosed in the annual newsletter that I will send out in May or June of this year.

Please be sure to send in all remote planet observations to this coordinator, Richard Schmude, Jr., as soon as possible. I will begin preparing the remote planets apparition report in May or June of this year.

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

Errata

- JALPO 49-2, page 2. The full page advertisement for *Astronomy Roundup 2007* erroneously states that the upcoming event will also be the 60th Annual Meeting of the ALPO. Instead, it is the 60th anniversary of the founding of the ALPO.
- JALPO 49-2, page 30. The correct year for the drawing in Figure 13 is 1952.
- JALPO 49-2, page 30. The feature in Figure 14 is Guericke and not Gassendi as stated in the caption.

Product Review:
A Homebrew SCT Collimation Tool

By Bill Black, ALPO member
All photos by the author.

I recently installed a Meade 12-inch LX200GPS Schmidt-Cassegrain telescope (SCT) in my Grayson, Georgia, observatory. (Editor's Note: Grayson is an eastern suburb of Atlanta, Georgia.) The instrument is polar-mounted on a tall steel pier, making it comfortable to use without a diagonal. After numerous nights of trying to observe Jupiter with different Televue eyepieces, I discovered that the scope was out of collimation. Confronted by the necessity for a collimation, I replaced the Meade set screws with more manageable screws from a company named "Bob's Knobs."

I currently have three very informative books on SCTs authored by Covington, Mollise and Suiter (see *References*), but after a lot of reading about collimation problems and their cures, I felt more comfortable with the procedure outlined in the Meade manual. I soon found that the procedure is understandable and definitive, but can only be easily done on small SCTs. I can produce a clean, defocused star image that shows the secondary mirror is not centered, but I cannot reach the collimation screws to make adjustments while looking into the eyepiece, nor do I have any clues as to which screws to adjust.

Since the procedure in the Meade manual is the one I decided to follow, let me briefly list out the details:

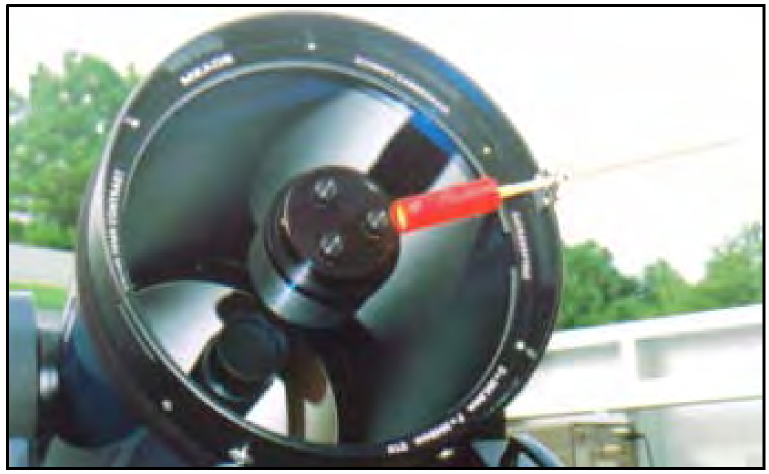

Figure 2. Position of the Homebrew Collimation Tool to indicate which collimation screw to adjust.

1. The only adjustments possible on the LX200GPS models are from the three screws located at the edge of the outer surface of the secondary mirror housing.

2. While looking at the defocused star image, notice which direction the darker shadow is offset in the ring of light, or notice which part of the ring is the thinnest. Place your index finger in front of the telescope so that it touches one of the collimation screws. You will see the shadow of your finger in the ring of light. Move your finger around the edge of the black plastic secondary mirror support until you see the shadow of the finger crossing the thinnest part of the ring of light. At this time, look at the front of the telescope where your finger is aiming. It will either be pointing at a set screw, or it will be between two set screws aiming at the set screw on the far side of the black plastic secondary mirror support. This is the set screw you will adjust.

Figure 1. The Homebrew SCT Collimation Tool by Bill Black.

3. Using the Autostar II controller's arrow keys at the slowest slew speed, move the defocused star image to the edge of the eyepiece field of view in the same direction in which the darker shadow is offset in the ring of light.

4. Turn the screw that you found with the pointing exercise while looking in the eyepiece. You will notice that the star image will move across the field. If the defocused star image flies out of the eyepiece while you are turning the set screw, then you are turning the screw in the wrong direction. Turn the set screw in the opposite direction and bring the image back to the center of the field.

It soon became obvious to me that I was going to have to use something mechanical rather than my index finger for this procedure. This is where the idea of the collimation tool shown in Figure 1 was born. The tool is a one-foot length of small wood dowel glued to a discarded permanent marker tube. The tube is covered with thick felt in case it accidentally contacts the corrector plate. The dowel is slipped into the two holes in the handle of the paper clip, which can be pinched to attach to the rim of the telescope. The clip is positioned on the dowel so as to position the felt tube just outside of the secondary mirror holder on the corrector plate. The tube is intended to simulate using my index finger, and the clip enables the tool to be held in place once it has been positioned over the area of maximum deformity of the defocused star image.

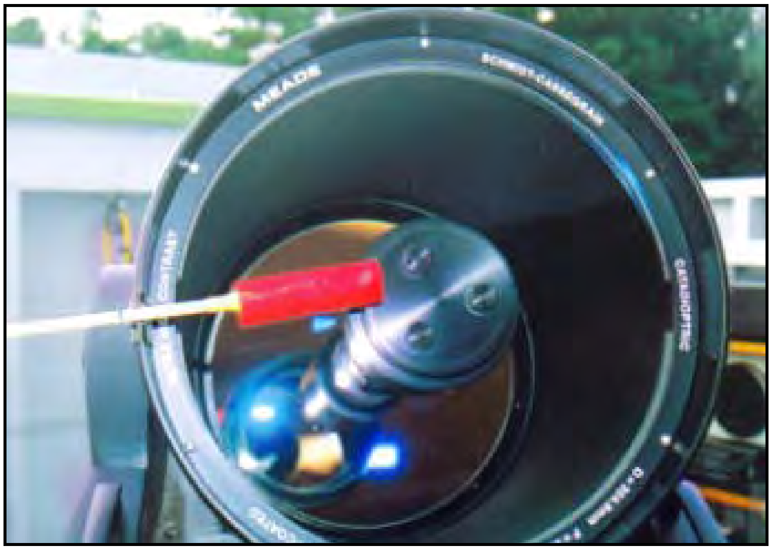

Figure 3. Possible position of the Homebrew Collimation Tool between two set screws to indicate that it is the opposite single screw that is to be adjusted.

There is nothing uniquely critical about the collimation tool I devised — I found these parts in an old desk drawer. A larger piece of wood dowel glued to a very small C-clamp would provide the same function. I would, however, wrap felt padding around the end that will be over the corrector plate.

I spent several nights fumbling with the trial-and-error approach to collimating my big SCT with totally negative results. But the very first time I used this collimation tool while carefully followed the Meade instructions, I produced a relatively perfect collimation. Three nights later I refined the alignment using a 12mm Radian eyepiece and now the defocused image looks perfectly concentric.

If you derive any benefit from collimating with this gizmo or come up with a better model, I'd like very much to hear from you.

For more information: Bill Black, 1168 Pinehurst Rd., Grayson, GA 30017-1731; e-mail to k4bsn@bellsouth.net

References

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Mollise, Rod. *Choosing and Using a Schmidt-Cassegrain Telescope, A Guide to Commercial SCT's and Maksutov's*. Springer (Spring Science+Business media), 2001.

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Scope Buggy! A Successful Afterthought

Polar mounting the Meade 12-inch LX200GPS freed up the giant Meade tripod and the homebrewed, equatorially mounted 6-inch, f/12 D&G refractor previously mounted in my observatory.

I missed not having access to the refractor – it is not an apochromatic (APO) refractor, but it is an excellent scope for general and public observing. So I got it back into my repetoire of instruments by mobilizing it with a "ScopeBuggy", a really great vehicle for moving and storing a large telescope.

Details can be obtained at http://www.scopebuggy.com.

I added a heavy 2-ft x 2 ft plywood platform to hold the car battery, a 400-watt DC/AC power inverter, a clock drive and a dew zapper. The 10-inch tires make the setup a cinch to move and park, and once set into a predesignated location, I can activate the scope in a couple of minutes.

(Text and image by Bill Black)

Book Review:
The Planets

By Dava Sobel, research and development for the Atlanta Journal-Constitution newspaper website, *http://www.ajc.com*

The Planets by Dava Sobel. Hardcover: 288 pages, publisher, Viking Adult (October 11, 2005) , English,
ISBN-10: 0670034460,
ISBN-13: 978-0670034468

When Dava Sobel discovered a friend had ingested a quantum of Moon dust, a furtive gift from a Moon rock analyst, the author was furious. “She had eaten it all without leaving a crumb for me,” Sobel laments.

Sobel's prose doesn't need the extra luminescence the moon dust might have provided. The writing in “The Planets” is as bright as the sun and its thinking as star-studded as the cosmos.

In two earlier books, both best-sellers, Sobel looked to the past for material. Her “Longitude” told the story of John Harrison, who found a way to chart the sea, while “Galileo's Daughter” followed the besieged genius who charted the sky. In “The Planets,” Sobel contemplates the future, realizing that the present sense of our surroundings, “like Ptolemy's map, captures only the present moment's self-awareness.”

We are, it seems, Columbus still dreaming of the Indies.

Though she notes that some astronomers no longer consider Pluto a planet and that 120 exoplanets have already been identified, Sobel structures her book along the nine known celestial bodies of our grade-school years: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto (mnemonically, “My very educated mother just served us nine pies”). The chapters, including one on the Moon, explore the planets' places in mythology, literature, music, astrology, astronomy and space ventures.

Poetry and science, fact and the fantastic, become strangely evocative. The Moon, Sobel writes, “changes shape by the hour, waxing and waning and whining for attention.” A Voyager spacecraft heading for the outer boundaries of the solar system, she notes, carries a specially engineered golden record with music by Bach, Beethoven, Louis Armstrong and Chuck Berry.

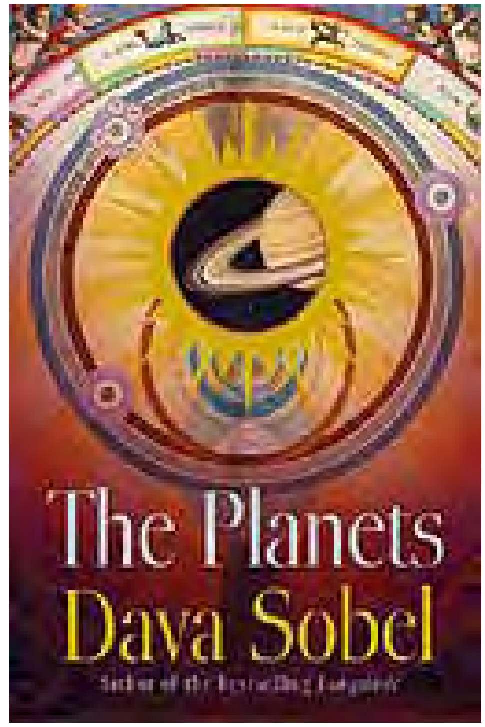
Consideration of the universe is the closest we may come to the sublime in the 21st century. Writes Sobel: “All the while the planets were forming, projectiles flew through the young Solar System like avenging angels. Worlds collided. Icy bodies struck the Earth to disgorge a few oceans' worth of water.”

And she writes of the possible future with an unabashed blend of Bible and science: Eventually the Sun “will smolder as an ember, and shed a fading light on the charred cinder [Earth] where God once walked among men. This dim future, however, lies so far ahead as to allow the descendants of Adam and Noah ample time to find a new home.”

With such a rich style of her own, it's a shame Sobel chose to write the Mars chapter in the first-person voice of a rock and that she adopted an epistolary method in the discussion of Uranus, disrupting the elegance of her own narrative flow. And some might wish she had considered film references to the planets as she mused on culture.

But why quibble with writing that will make your mind leap like a rocket off a launch pad? Anyone who has ever tried to identify Venus in the night sky, or yearned skyward as a NASA craft roars into space, will identify with Sobel.

She wonders what prompted her lasting preoccupation with the Moon dust eaten by her friend. Could it have been, Sobel muses, that it represented “the shining essence of all that is unobtainable?”



That essence of unobtainability, in a nutshell, is our quest — in outer and inner spaces. Sobel's book speaks to both.

(Reprinted with permission of the reviewer.)

The Planets by Dava Sobel is available at the following websites:

http://www.amazon.com/Planets-Dava-Sobel/dp/0670034460

http://www.powells.com/biblio/0670034460

http://search.barnesandnoble.com/booksearch/results.asp?WRD=The+Planets&z=y&cds2Pid=9481

Feature Story: Solar Activity Report

Carrington Rotations 2031-2035 (2005-06-14.8 to 2005-10-29)

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

Introduction

This report covers the Carrington rotations 2031 through 2035. It is a detailed report covering the solar activity on each rotation and a final report on the entire period. For each rotation, I have compiled a short summary; a graphic showing the activity on each day when I observed the Sun is located after the text of this paper. The observations took place in the city of Timisoara Romania, located at coordinates 45°45'35" N, 21°13'48" E. The Sun was observed with a 60mm refractor using a 9mm Plossl eyepiece and a 3x magnification Barlow lens. The observations were made almost entirely during the period between 12:00 and 14:00 U.T. To identify the spots I used the McIntosh Classification system as described in the ALPO article written by Richard Hill. The article can be found at *http://www.lpl.arizona.edu/~rhill/alpo/solstuff/wlf.html* .

Data

Rotation 2031 was characterized by a drastic change in the number of spots starting with July 1, 2005, when the number of spots increased from 0 to 21, grouped in five active regions. The relative number for this day was 71.

This was a surprise mostly because until that time, the number of spots decreased from an average of 27 during the period June 19 - 28 to 0 in the following period of time. Although I suspected this to be an isolated incident, the number of spots continued to increase, reaching a number of 31 spots in six regions on July 6, 2005.

Although this major increase in the activity of the Sun was quite unexpected, it did not change the overall result. Following the report for rotations 2025 through 2030, I reached the conclusion that the average relative number is somewhere near 24.73. Also, as I calculated the average number for Carrington Rotation 2031, I obtained 27.38, which was not out of the scale. The most massive spot during this period was the largest spot in active region AR783 (as marked at http://www.spaceweather.com), which was first observed on July 1. (See http://sgd.ngdc.noaa.gov/sgd/jsp/solarindex.jsp for more information about active regions)

At this date, AR783 was of type Edi but it evolved during the following days to Fkc. This remained unchanged until July 7. The last date I observed this spot was July 8.

Another massive spot observed during this period was in AR786 seen from July 4 until July 8. It evolved from a type Dhi in the first day to a type Eki later.

All Readers

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

Online Features

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

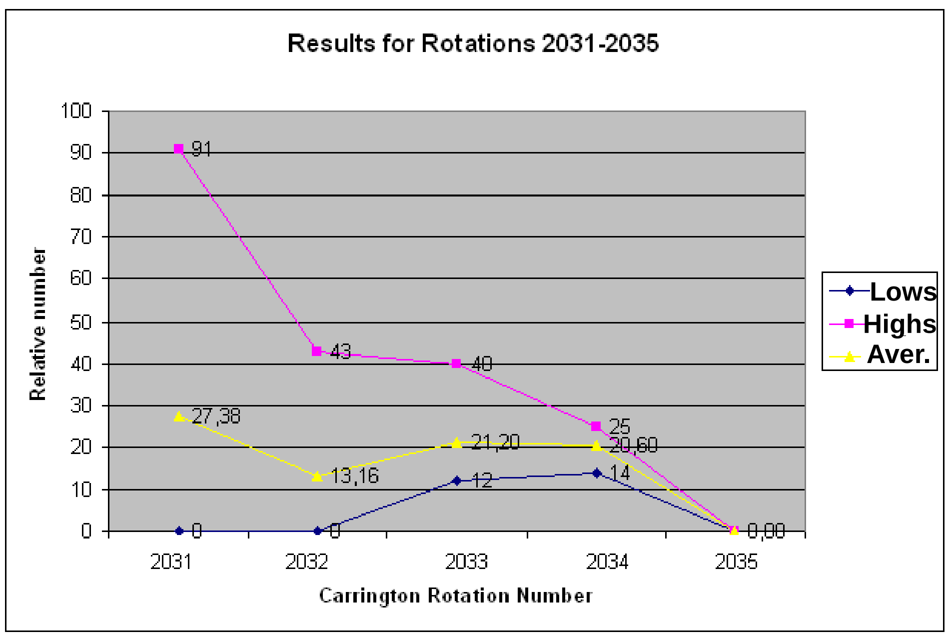


Table 1: Observers for This Reporting Period

Name	Aperture (cm)	Focal Length (cm)	Scope Type*	Location
Frincu Marc Edward	6	70	RE	Timisoara, Romania
* RE = Refractor,				

Table 2: Data for Carrington Rotations 2031 thru 2035

Minimum & Date	Average	Maximum & Date
Rotation 2031		
0, 6 days	27.38	91, 07/05
Rotation 2032		
0, 5 days	13.63	43, 08/01
Rotation 2033		
12, 09/03	21.2	40, 08/20
Rotation 2034		
14, 09/28	20.6	25, 09/26
Rotation 2035		
0, 10/03 & 10/20	0	0, 10/03 & 10/20

As expected, ***Rotation 2032*** was also characterized by a drastic change in the number of spots. After a period with no activity, the number increased to an almost constant 13 (July 25), then 27 (Aug 1) and reached its peak on Aug 1 (R=43). At the peak, I observed three active regions, among them group AR792 which was spotted on Aug 1. I cataloged it as being a Cho. Despite this large group and the increase of spots, this period was still one of the calmest of all the reported periods.

Rotation 2033 was unfortunately not very good for solar observations, mainly because of cloudy weather. However I still managed to get some clear skies and to observe the Sun. From my observations, I concluded that this period was not very active and I only once managed to see more than one spot per observing session. The only time I observed two spots was in my first observation for this period on August 20 when I noticed a type Axx group and a large Dho group that later evolved into a Bho.

Rotation 2034 was extremely interesting in that it had one of the biggest sunspot groups in the last few rotations. This was AR798, first observed on September 10. I cataloged it as a Ekc spot with a total number of 11 spots. The last observation of this spot was made in September 17, when my colleague, Laurentiu Alimpie imaged it. We numbered a total of approximately 56 spots in it, but because we were only numbering the spots as seen directly through a telescope, we didn't consider this number in our official rotation report.

Starting with this rotation, the days with clear skies were few here at my observation site in Timisoara Romania. Due to this unfortunate weather, my observations are not complete enough and lack the last rotations of the year 2005 entirely (rotations 2036, 2037, and 2038 corresponding to the months of November and December). Rotation 2035 was relatively inactive and had no important events marking it. I managed to observe the Sun twice and found it clear of any spots.

Image 1. AR798 as seen September 17, 2005. Imaged with a Canon PowerShot A70 Digital Camera at 3x Optical Zoom through a 203mm reflector with a 25mm Plossl Eyepiece and 2x Barlow lens.

Conclusions

As a general conclusion, I would like to state that the average relative number (R_average=20.58) for the rotations in this report (except 2035) is not very different from the one obtained in my previous report (R_average=24.73).

I could even conclude that the fact it is smaller than the previous one is a result of the approaching solar minimum.

Puzzled about Sunspots?

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

References

Active Region numbers: http://sgd.ngdc.noaa.gov/sgd/jsp/solarindex.jsp

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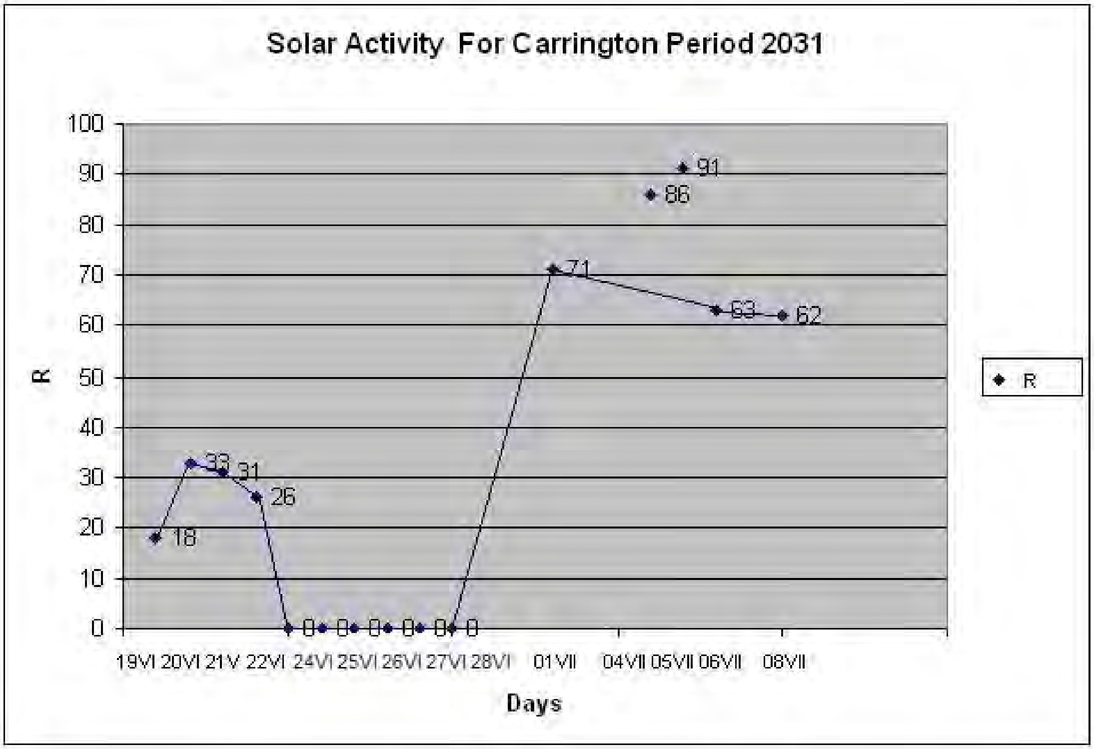
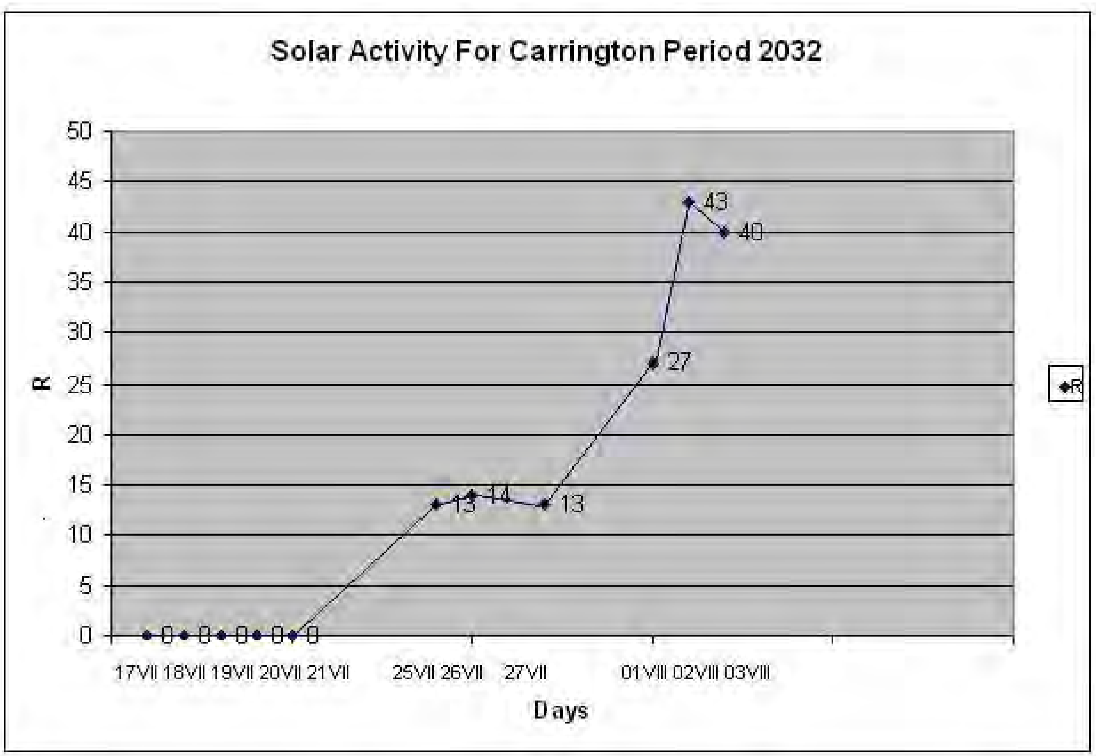
Vasile, Ureche, 1982, The Universe-Astronomy (Original title -ro: Universul-astronomie), Dacia Cluj Napoca or electronic format (Romanian only) at http://www.astroclubul.org/sarm/carti/Universul-Vol1/


Solar Activity For Carrington Period 2031
R
Days
19VI 20VI 21V 22VI 24VI 25VI 26VI 27VI 28VI 01VII 04VII 05VII 06VII 08VII
18 33 31 26 0 0 0 0 0 0 71 86 91 63 62
R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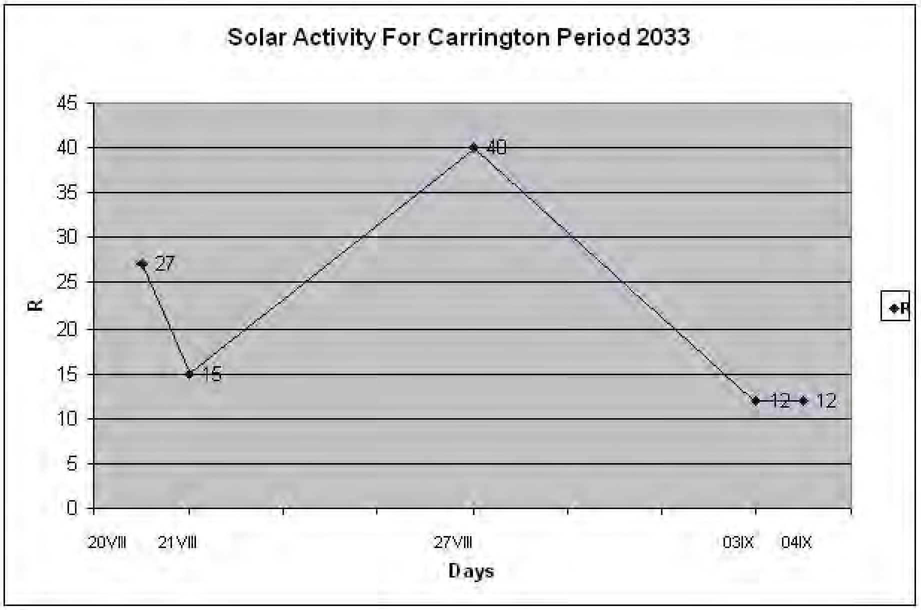
R
Days
17VII 18VII 19VII 20VII 21VII 25VII 26VII 27VII 01VIII 02VIII 03VIII
0 0 0 0 0 13 14 13 27 43 40
R


Solar Activity For Carrington Period 2033
R
Days
20VIII
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12
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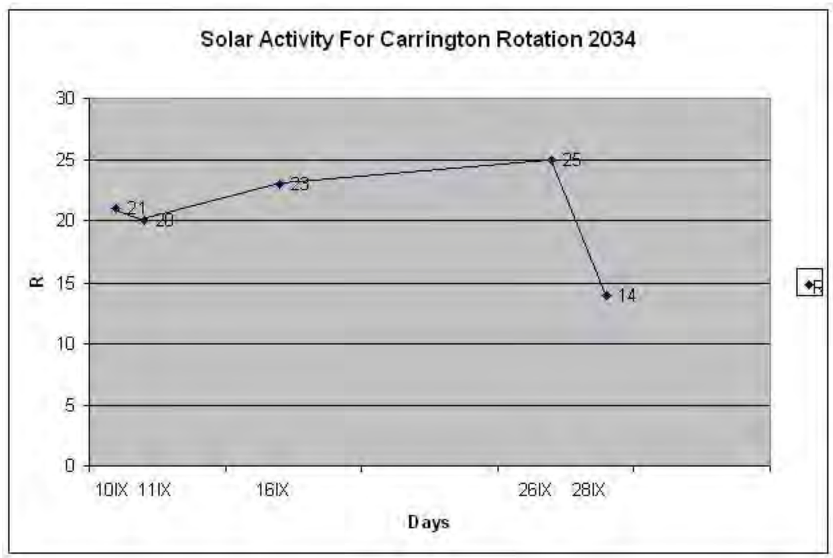
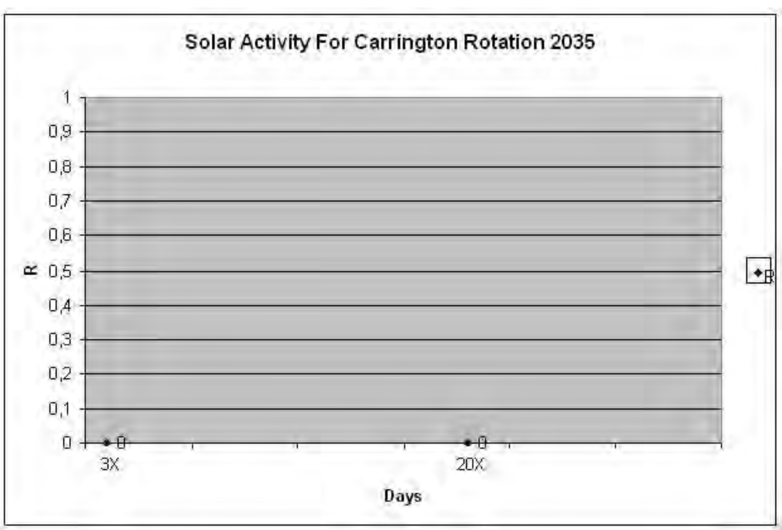

Solar Activity For Carrington Rotation 2034
R
Days
10IX
11IX
16IX
26IX
28IX
21
20
23
25
14
R


Solar Activity For Carrington Rotation 2035
R
Days
3X
20X
0
0
R

A.L.P.O. Solar Section

OBSERVER____

ADDRESS____

DATE/TIME____UT

SEEING____________ CLOUDS____________ WIND____________

APERTURE__________mm FOCAL LENGTH__________mm TYPE______

EYEPIECE_______mm FILTRATION___________________________

OBSERVATION: ***DIRECT*** OR ***PROJECTED***? (CIRCLE ONE)

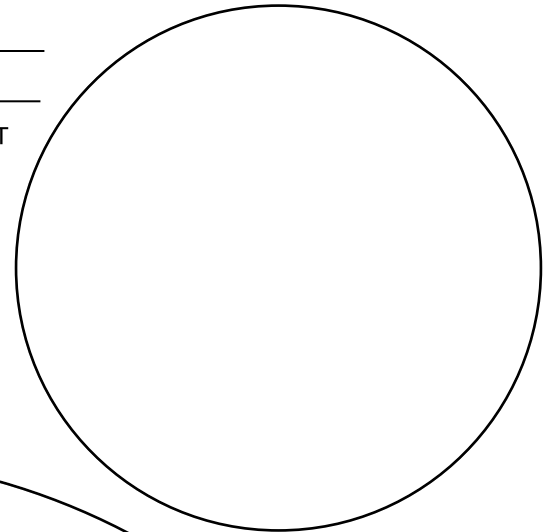
ROTATION______________

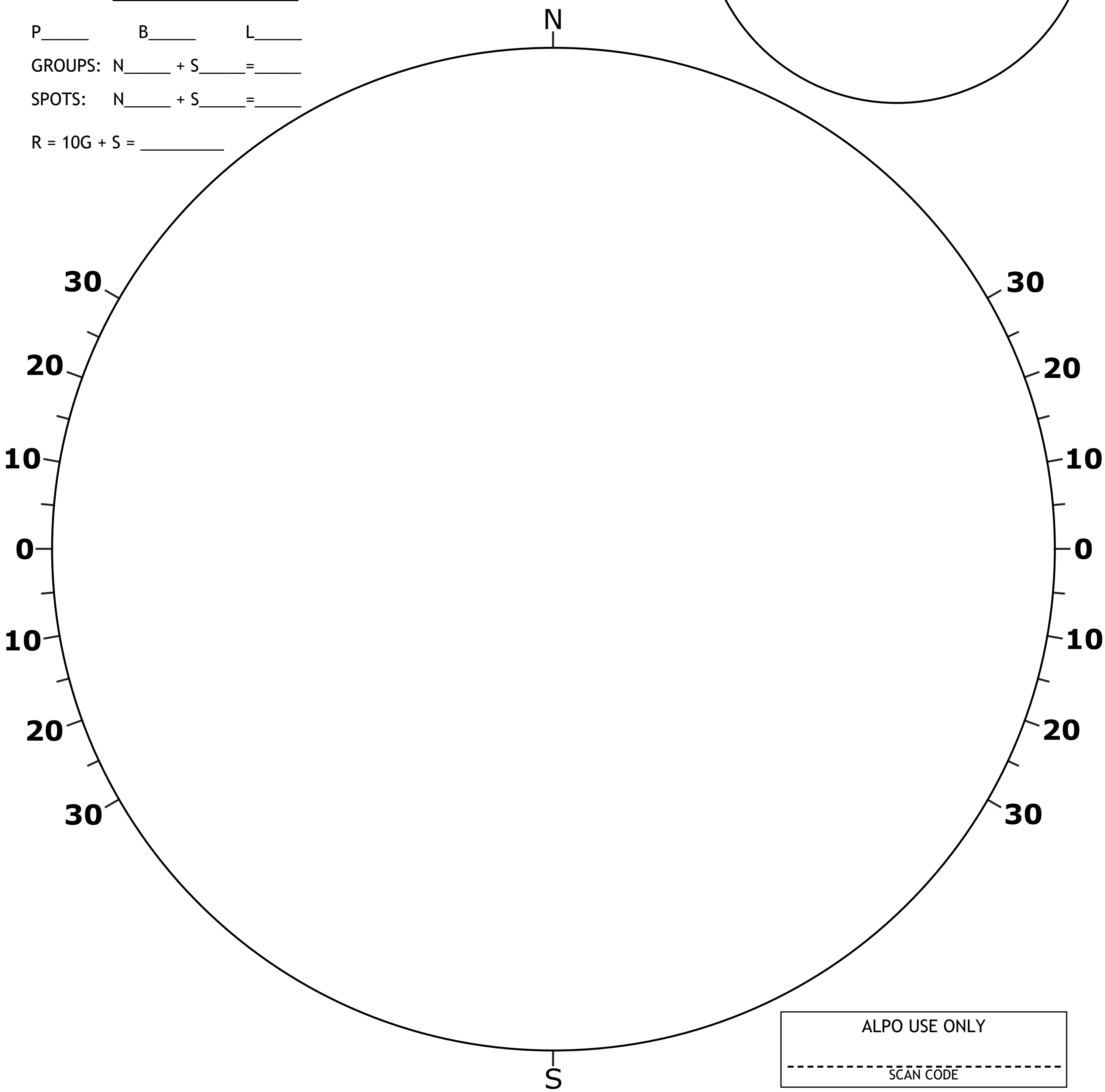
P_____ B_____ L_____

GROUPS: N_____ + S_____=_____

SPOTS: N_____ + S_____=_____

R = 10G + S = _________





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Feature Story:

The 2007 - 2008 Apparition of Mars
A Pre-Apparition Report

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Abstract

This article describes the 2007-2008 apparition of Mars with regard to the planet's anticipated sky motions, telescopic appearance, seasons, and possible special events such as dust storms and bright flashes.

Introduction

Mars appears more Earth-like to us than any other planet because we can observe its surface, its clouds and hazes, and its brilliant white polar caps. We can watch as its seasons change and the polar caps shrink. The Martian weather is revealed not only by the clouds, but by the dust storms that occasionally obscure part or all of the surface. Some Martian albedo features even shift position slightly, over long periods. These aspects, together with the possibility of life, have made Mars one of the most studied planets in our solar system.

The Mars Section of the Assn of Lunar & Planetary Observers coordinates the International Mars Patrol (IMP). This is an informal group of some 820 observers in 64 countries that has contributed more than 43,000 observations in the last 40 years. You are invited to be a part of it by submitting your Mars images, drawings, descriptions, and measurements to Dan Troiani at P.O. Box 1134, Melrose Park, IL 60161, e-mail *dtroiani@trition.edu*.

A helpful, blank observing form can be downloaded at *http://www.lpl.arizona.edu/~rhill/alpo/marstuff/marsfrm2.jpg* . The IMP functions in cooperation with the International Mars-Watch, the Terrestrial Planets Section of the British Astronomical Assn, and the Mars Section of the Oriental Astronomical Assn.

With a CCD camera or video camera, an amateur may produce useful images of Mars during an entire apparition. During the past several apparitions, observers began to take images when Mars was as close as 32° to the Sun. It is time to begin observing Mars now! This early in the apparition, Mars rises before dawn in the morning sky and sets during daylight. Information for observing Mars during a typical apparition is presented in an article titled, "Observing Mars," found at *http://www.tnni.net/~dustymars/General_Info_Mars.htm* .

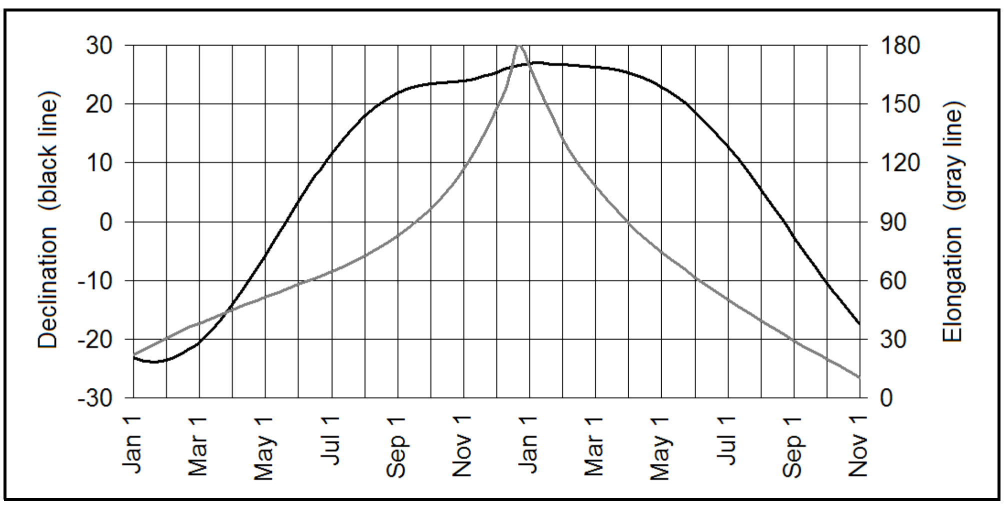

Figure 1. The declination and the solar elongation of Mars from January 1, 2007, to November 1, 2008. The dates are along the abscissa. The declination axis key is along the ordinate on the left, and the declination curve is drawn in black. The elongation axis key is along the ordinate on the right, and the elongation curve is drawn in gray. Opposition occurs where the elongation curve peaks at 180 degrees. Elongations are in the morning sky before opposition and in the evening sky after opposition.

Motion of Mars in Our Sky

After conjunction on October 26, 2006, the declination of Mars decreased to -23.9° in mid-January 2007, and then began to climb northward. The planet will

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- The author's e-mail address in blue text to contact the author of this article.
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Observing Scales

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

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

Scale of Transparency Conditions:
- Magnitude of the faintest star observable near Mars in the sky when allowing for daylight and twilight

IAU directions are used in all instances.

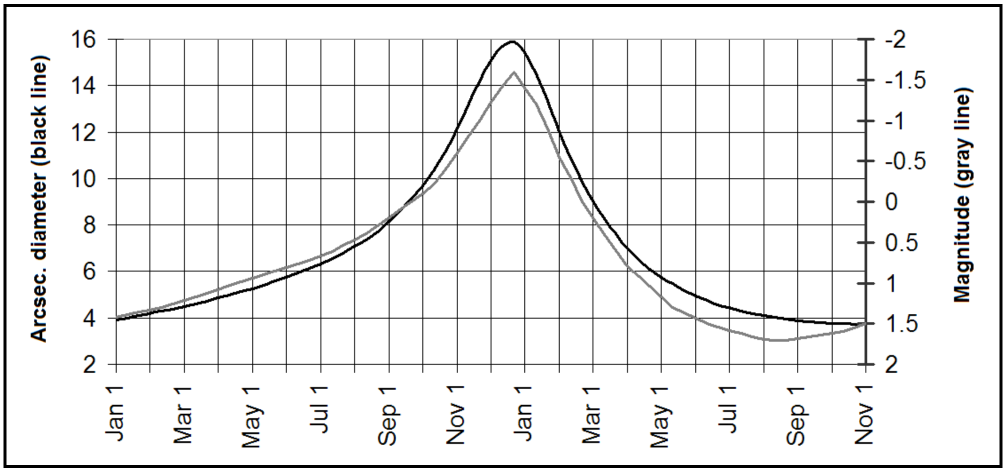


Figure 2. The apparent angular diameter of Mars from January 1, 2007, to November 1, 2008, is plotted as a black line with the ordinate key on the left of the chart. The apparent visual magnitude for the same period is plotted as a gray line with the ordinate key on the right of the chart. The two lines are similar but they do not parallel each other precisely, due to effects such as the change in Mars' distance from the Sun in its eccentric orbit and the change in its phase defect.

cross the celestial equator on May 21 in the constellation Pisces, and will continue to increase in declination through the time of opposition on December 24, when it will be at +26.7°. Thereafter, the planet will remain north of +20° declination for about five months, and will not slip south of the celestial equator until it approaches the sunset glare late in 2008. Thus, Mars will be high in the sky of northern observers during the best months of the apparition (*Figure 1*). In contrast, during the last three apparitions, Mars favored southern observers, staying at southerly declinations during the best observing months.

Retrograde motion will begin on November 16, 2007, and end on January 31, 2008. During this time, the Red Planet will appear to move backward among the stars (toward the western sky), from the constellation Gemini into Taurus, due to the perspective effect as Earth overtakes it in orbit. The nightly change in Mars' solar elongation is greater when Mars is closer to Earth, so it is greatest around opposition. This is shown in *Figure 1* as the steep slope of the elongation curve around opposition.

Fourteen months after conjunction, the right ascensions of Mars and the Sun will differ by 180° so that Mars is on the opposite side of the Earth from the Sun. This is called "opposition". The time will be 19:41 UT on December 24, 2007. Mars will remain visible for 11 months after opposition and then become lost in the glare of the Sun as it approaches conjunction on December 05, 2008. The synodic cycle takes 774 Earth days to complete this time. There is variation from apparition to apparition in the duration of the cycle, due to the eccentricity of Mars' orbit.

Size and Orientation of the Planet

Figure 2 shows the apparent size and brightness of Mars during this apparition. Mars began 2007 with an apparent diameter of only 3.9 arc-seconds. Typically, surface and atmospheric features can be discerned visually when it is 6 arc-seconds or greater. This occurs on June 14, 2007, and lasts until April 24, 2008, a period of ten and one-half months. This is shorter than the 2005 apparition, when Mars was larger than 6 arc-seconds for eleven and one-half months.

By the time of morning quadrature (solar elongation of 90 degrees) on September 18, 2007, the planet will be gloriously orange at magnitude 0 in the morning sky between the horns of Taurus. Its apparent diameter will be 8.96 arc-seconds. At quadrature, the phase is at its smallest — 86 percent illuminated this time — and the planet appears the most "gibbous." The quadrature after opposition will be on March 30, 2008, in the evening sky in Gemini. Its brightness then will be only magnitude 0.7, as it will have receded from both the Earth and the Sun due to its orbital eccentricity. This geometry will cause its angular diameter to be only 7.07 arc-seconds and its phase to be 90% illuminated.

Closest approach to Earth will occur at 00:18 UT on December 19, 2007 with an apparent disk diameter of 15.9 arc-seconds and a distance of 0.59 astronomical units. The apparent disk diameter will be less than two-thirds of that in the closest perihelic apparitions. For example, Mars appeared more than 25 arc-seconds diameter in August, 2003. Closest approach between Earth and Mars is not necessarily coincident with the time of opposition but varies by as much as two weeks, due mainly to the eccentricity of Mars' orbit. Mars' peak brightness during this apparition will be magnitude -1.6, compared to -2.8 in 2003. Peak brightness and closeness to Earth do not coincide precisely, due to factors such as orbital eccentricity and phase defect (*Figure 2)*. For Northern observers, the smaller apparent size of the planet in this aphelic apparition will be compensated by the higher-declination path through the sky.

Figure 3 illustrates the changing orientation and size of Mars, with information regarding Martian seasons. A detailed tabulation of the Martian apparent size, distance and brightness, apparent tilt, and seasons can be obtained at: *http://www.tnni.net/~dustymars/eph07_08.html* . *Figure 4* is a relatively realistic depiction of the expected telescopic appearance of the planet at opposition.

The North and South Polar Regions

Astronomers will have views of each polar region during this apparition. In January 2007, the Martian south polar region (SPR) began to tilt toward the Earth, and in early February 2007, southern spring began on Mars. Thus, we will be looking at the southern hemisphere for much of 2007. The south polar hood will dissipate in February, and by March, the planet will appear large enough to allow measurements of the south polar cap (SPC.) The SPC will gradually shrink through the

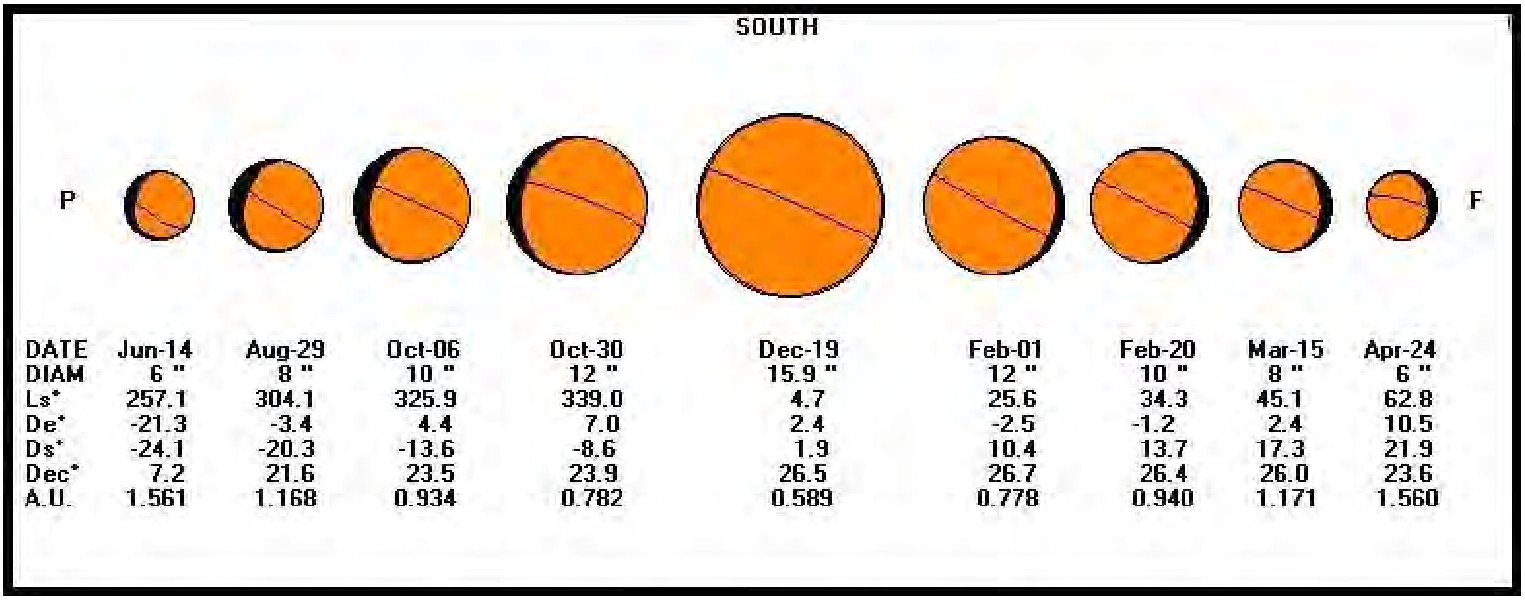


Figure 3. As Earth approaches it, Mars will grow from a small apparent disk of 6" on June 14, 2007, to a maximum diameter of nearly 16" on December 19, 2007, and then shrink as we move away. June 2007 through April 2008 are the prime observing months, as the planet is greater than 6" in apparent diameter. Notice the varying tilt of the planet during this time. South is up. **De** is the declination of the Earth in the Martian sky, and is indicative of the apparent tilt of Mars that we see. **Ds** is the declination of the Sun in the Martian sky, and is related to the Martian seasons. **Ls** is the longitude of the Sun in the areocentric seasonal system, where Ls = 0 at the point in Mars' orbit where the Sun crosses the Martian celestial equator in the northerly direction. This is the beginning of Martian northern spring, analogous to the first point of Aries with respect to Earth's seasons. **Dec** is the declination of Mars in our sky, and **A.U.** is the distance between Mars and Earth measured in units of the mean Earth-Sun distance.

Martian southern spring and early summer, and will be small by September, 2007. That will be the middle of the Martian southern summer, and it will be the end of the south pole's tilt toward Earth, so that measurements of the SPC may be interrupted after September.

As the SPC turns away from us, the entire north polar hood will not immediately appear, because much of it will be hidden in the dark of the northern winter beyond the terminator of the gibbous planet. From mid-September until the end of 2007, the north polar region will be tilted slightly toward Earth, and the north polar hood will gradually come out of shadow as northern spring approaches. Northern spring will begin in early December 2007, and the north polar hood should dissipate around that time. Watch for its dissipation, so as to commence measurements of the NPC's size. We think that the rate of recession of the NPC in early 2008 may be related to the presence of clouds at lower latitudes, and to study this possibility we need your observations.

From mid-August 2007, until early April 2008, the north or south tilt of the planet with respect to our line of sight will change back and forth but never exceed 7.3° either way. It will start this period with the south pole tilted slightly toward Earth, but then the north pole will tilt slightly toward us in October, November, and December. The south pole again will tilt slightly toward us during January and February, and then the north pole will tilt slightly toward us in March and April. Observation of the polar caps under these circumstances will be challenging even though these will be the months that the planet appears largest. It may help to know that the SPC, when small, is not centered perfectly on the pole, but is slightly displaced toward the 45-degree meridian of longitude (the longitude of Argyre), so that it will be more readily seen when that meridian is centered on the disc.

As northern spring progresses in early 2008, the SPC will slip into the darkness beyond the terminator of the gibbous planet, escaping from our scrutiny. The rest of the apparition will consist of northern spring and summer with the NPC tilted toward Earth and progressively decreasing in size. The south polar hood may become visible at the southern limb in the last half of 2008.

For more detailed information on the south polar cap go to either *http://www.tnni.net/~dustymars/SPR.htm*

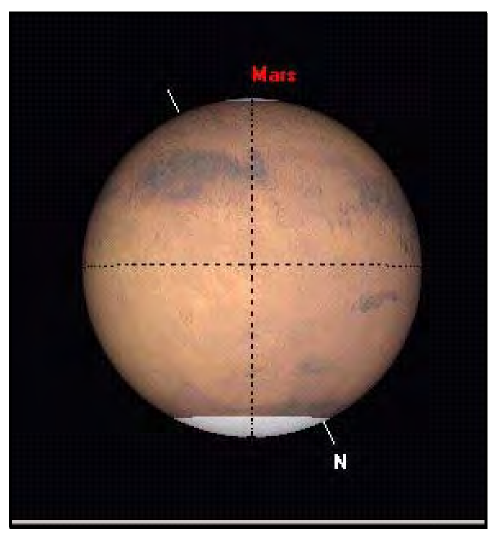


Figure 4. A simulated view of the appearance of Mars during opposition at 19:41 UT on December 24, 2007. Martian south is up, and celestial north is to the bottom right. The south pole is tipped away from us by 1.4 degrees, and the small south polar cap can be glimpsed. The north polar hood still obscures the north polar cap, since northern spring begins only 15 days before opposition.

or the north polar cap click: *http://www.tnni.net/~dustymars/NPR.htm* .

Special Events

Dust storms can occur at any time of the Martian year and cannot be predicted. However, they are most frequent when Mars is closest to the Sun – during southern hemisphere spring and summer (early February 2007, through November 2007). The dustiest season is likely to be from the third week in May through the first week in July 2007, which is late southern spring. Perhaps the most important area to watch for the development of dust storms is the northwest part of Hellas, but the Serpentis-Noachis region and the Solis Lacus region may also spawn dust storms. If massive, planet-encircling storms occur, they usually start in the first half of southern summer (early July 2007, through mid-September 2007,) and they may last for months. If the Red Planet behaves as it did in 2001 and 2003, then 2007 may be a time when Mars is very dusty indeed! For more detailed information on Martian dust storms click to the URL: *http://www.tnni.net/~dustymars/2003_DUST.htm* .

The detection of "flashes" on Mars is one of the most exciting types of observations amateurs have made in recent years. We think that flashes are likely to be visible when the areocentric declination of the Earth is equal to that of the Sun. There will be two such periods during this apparition. The difference between the declinations of Earth and Sun will be less than 1.0° from May 28 through June 6, 2007, and again from December 18 through December 22, 2007. The latter of these periods encompasses the time of closest approach, so it will be especially interesting.

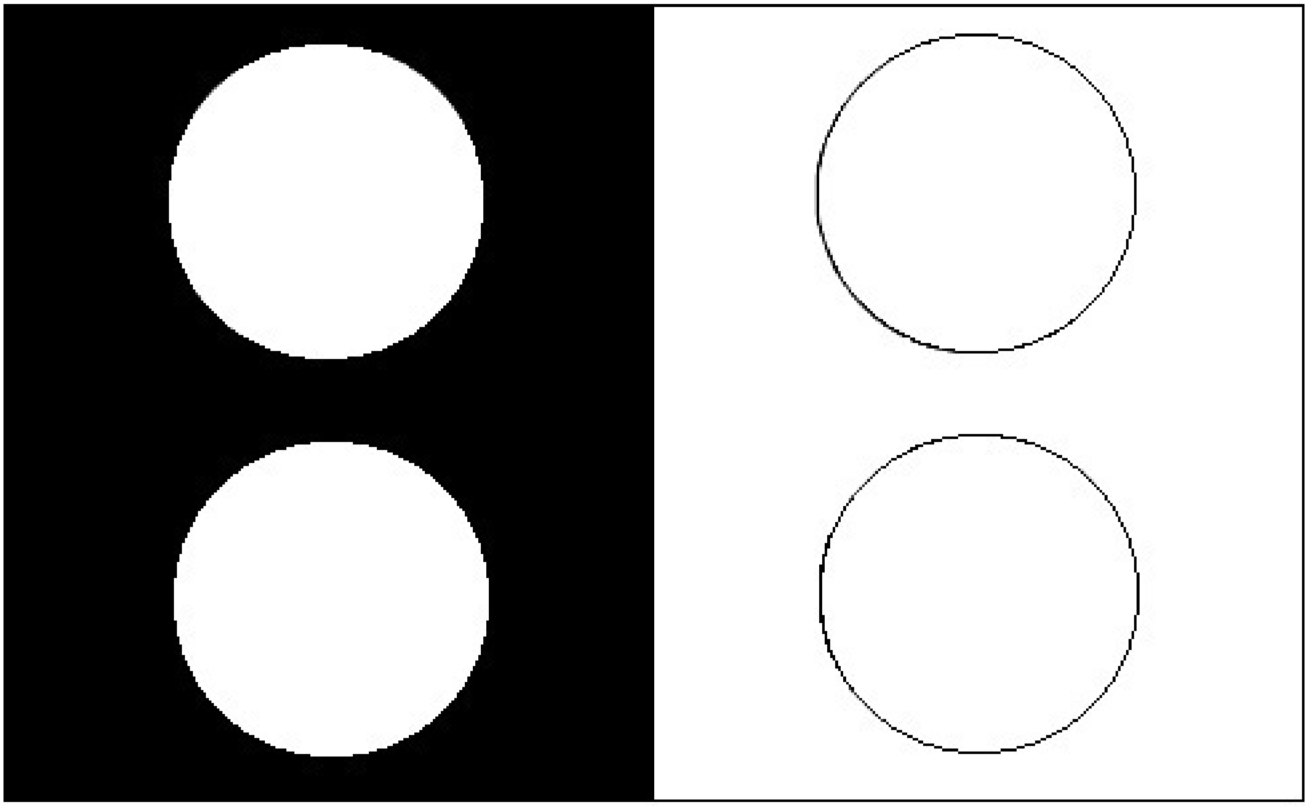
Table 1: Calendar of Events — Mars, 2007-2008 (see legend at end of table)

Date	Physical Data	Remarks
2006 Oct 23	Ls 125°	Conjunction. Mars is behind the Sun ~2.5939 AU.
2007 Feb 08	Ls 180° De -9.5° Ds -0.1° RA 19:11 Dec -23.1° A.Dia 4.3''	Equinox: Beginning of Northern Autumn/Southern Spring. SPR emerging from darkness of Winter. Does SPH or frost cover Hellas? SPH thinning and forms "Life Saver Effect." Hellas should begin to clear and darken. SPC at maximum diameter, subtending ~ 60.5°. Is the North Polar Hood present? Are W-clouds present?
2007 Jun 03	Ls 250.2° De -22.9° Ds -23.2° RA 00:53 Dec 4.1° A.Dia 5.8"	Mars at Perihelion. Late southern spring. SPC in rapid retreat (SPC width ~24.8° ±2.4°.) Novus Mons smaller. Dust clouds expected over Serpentis-Hellaspontus (Ls 250° - 270). Syrtis Major narrow. Orographic clouds (W-clouds) possible. Frost in bright deserts? Elysium and Arsia Mons bright? Note: Several "planet-encircling dust storms have been reported during this season.
2007 Jun 14	Ls 257.1° De -21.3 ° Ds -24.1° RA 01:23 Dec 7.2° A.Dia 6"	Apparition begins for observers using 4-inch to 8-inch apertures telescopes and up. Begin low-resolution CCD imaging. Views of surface details not well defined. Novus Mons reduced to a few bright patches and soon disappears. Windy season on Mars begins, dust clouds present? Watch for initial dust clouds in south. White patches in bright areas? Hellas bright spots? Numerous bright patches. SPC width ~20.8° ±1.1°.
2007 Jul 05	Ls 270° De -17.1° Ds -24.8° RA 02:21 Dec 12.6° A.Dia 6.4"	Solstice: Northern Winter/Southern Summer. W-clouds present? NPH extends 50° N? Decreased number of White clouds. Atmosphere clearing of blue clouds? White areas in deserts? Dust clouds in south until 270° Ls? Watch for planetary system cloud bands. SPC width ~17.5° ±1.3°.
2007 Aug 29	Ls 304.1° De -03.4° Ds -20.3° RA 04:49 Dec 21.6° A. Dia 8"	White areas? Orographic clouds over the Tharsis volcanoes. W-Cloud? SPC very small, difficult to see: SPC width ~9.7° ±0.2°.
2007 Oct 06	Ls 325.9° De 4.4° Ds -13.6° RA 06:13 Dec 23.5° A.Dia 10"	Wave or frontal cloud activity from NPR? Bright spots in Hellas? Hellas ice-fog activity? SPC W ~9.8° ±0.5°.
2007 Oct 30	Ls 339.0° De 7.0° Ds -8.6° RA 06:46 Dec 23.9° A.Dia 12"	NPC large hood present. W-Cloud? Orographic cloud over Arsia Mons? Topographic cloud over Libya? Topographic cloud over Edom?

Table 1: Calendar of Events — Mars, 2007-2008 (see legend at end of table)

2007-Nov-16	Ls 348° De 7.0° Ds -5.0° RA 06:54 Dec 24.5° A.Dia 13.7”	Retrogression Begins. Mars begins retrogression, or retrograde motion against the background stars nearly 390 days after conjunction, and now when it appears to move backward (toward celestial west) during the period around opposition.
2007 Dec 10	Ls 0.0° De 4.2° Ds 0.0° RA 06:36 Dec 26.0° A.Dia 15.7”	Equinox: Northern Spring/Southern Autumn. NPH may be breaking up, and NPC if exposed should have a width of about 55° areographic latitude.
2007 Dec 18	Ls 0.4° De 2.6° Ds 1.7° RA 06:23 Dec 26.5° A.Dia 15.9”	Mars at Closest Approach. High-resolution CCD imaging and photography.
2007 Dec 24	Ls 7.1° De 1.4° Ds 3.0° RA 06:13 Dec 26.7° A.Dia 15.8”	Mars at Opposition. NPH breaking up, NPC should be exposed. Hellas and Argyre bright?
2008-Jan-31	Ls 25.2° De -2.5° Ds 10.3° RA 05:33 Dec 26.7° A.Dia 12.2”	Retrogression Ends. Mars resumes eastward motion against the background stars.
2008 Feb 01	Ls 25.6° De -2.5° Ds 10.4° RA 05:33 Dec 26.7° A.Dia 12’	NPC nearly static or entering erratic retreat. Polar clouds present? Limb clouds and hazes should start to increase. NPC width still ~55°.
2008 Feb 20	Ls 34.3° De -1.2° Ds 13.7° RA 05:43 Dec 26.4° A.Dia 10”	Limb clouds and hazes should increase. Few clouds. Limb arcs increasing in frequency or intensity? Arctic hazes and clouds?
2008 Mar 15	Ls 45.1° De 2.4° Ds 17.3° RA 06:16 Dec 26.0° A.Dia 8”	Few clouds. Limb arcs increasing in frequency or intensity? Arctic hazes and clouds? NPC width ~50°.
2008 Apr 24	Ls 62.8° De 10.5° Ds 21.9° RA 07:35 Dec 23.6° A.Dia 6”	Watch for “Aphelic Chill” in NPR – (usually between 60° and 70° Ls) with possible halt in thawing of NPC. Views of surface details well defined. Rima Tenuis may appear (140° and 320° areographic meridians). Cloud activity in north increasing? NPC width ~44°.
Ls is areocentric longitude of the Sun using northern vernal equinox as Ls = 0. De is areocentric declination of Earth, also known as the declination of the sub-Earth point. Ds is areocentric declination of the Sun, also known as the declination of the sub-solar point. RA is the right ascension of Mars in our sky. Dec is the declination of Mars in our sky. A.Dia is the apparent diameter of Mars.		

A.L.P.O. Mars Section Observation



Top: Time (UT):________________ CM:__________ ° W Filter:______________ (W / S)

Bottom: Time (UT):________________ CM:__________ ° W Filter:______________ (W / S)

Date (UT):________________

Time (UT):__________ - __________

CM: __________ ° W - __________ ° W

D_E:__________ ° - L_S:__________ °

Dia. ("):__________ k (phase): __________

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

Magnification:______ x ______ x ______ x

Filters:________________ (W / S)

Seeing (0-10):______ Antoniadi (I-V):______

Transparency (1-6):______ (Clear / Haze / Int. Clouds)

Blue (Violet) Clearing (0-3):______

Observer:________________

Address:________________

Observing Station:________________

E-mail (optional):________________

Notes

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Feature Story:

ALPO Observations of Saturn During the 2003 - 2004 Apparition

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

This paper includes a gallery of Saturn images submitted by a number of observers.

Abstract

A very fine collection of 360 visual observations and images of Saturn were submitted to the ALPO Saturn Section during the 2003-04 apparition by 44 observers located in the United States, Germany, China, Japan, France, Canada, Puerto Rico, Italy, United Kingdom, Spain, The Netherlands, Switzerland, and Mexico. Observational coverage spanned the period from 2003 July 31 to 2004 June 01, and apertures from 12.7 cm (5.0 in.) up to 50.8 cm (20.0 in.) instruments were used to gather these data. Saturn observers reported sporadic dusky festoons and short-lived dark spots in the South Equatorial Belt (SEB) and mid-temperate latitude belts of Saturn's Southern Hemisphere during the observing season, as well as several persistent white spots or ovals in the Southern Equatorial Zone (SEZ), South Equatorial Belt Zone (SEBZ), South Tropical Zone (STrZ), and South Temperate Zone (STeZ). A few recurring central meridian (CM) transit timings were reported for these features. The inclination of the ring system to Earth, **B**, reached a maximum value of -26°.29 on 2004 March 16 and, as would be expected, observers were able to view and image significant portions of Saturn's southern hemisphere and the south face of the rings throughout the 2003-04 apparition. During 2003 November several observers imaged the occultation of an 8th magnitude star behind the globe and rings of Saturn. A summary of visual observations and images of Saturn made in 2003-04 is discussed, including the results of continuing efforts to image the bicolored aspect and azimuthal brightness asymmetries of the rings. Accompanying the report are references, drawings, digital images, graphs, and tables.

Introduction

This report is derived from an analysis of 360 visual observations and digital images that were contributed to the to the ALPO Saturn Section by 44 observers from 2003 July 31 through 2004 June 01, which defines the 2003-04 "observing season" or apparition of Saturn. Carefully-selected drawings and images that integrate with topics discussed in the text accompany this report. All times and dates mentioned in this summary are in Universal Time (UT).

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Online Features

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

Observing Scales

Standard ALPO Scale of Intensity:
- 0.0 = Completely black
- 10.0 = Very brightest features
- Intermediate values are assigned along the scale to account for observed intensity of features
- Ring B has been adopted (for most apparitions when Ring B can be seen) as the standard on the numerical sequence. The outer third is the brightest part of Ring B, and it has a stable intensity of 8.0 in integrated light (no filter). All other features on the globe and in the rings are estimated using this standard of reference.

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

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

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

Table 1: Geocentric Phenomena in Universal Time (UT) for Saturn During the 2003-2004 Apparition

Conjunction		2003	Jun	24^d	14^h UT
Opposition			Dec	31^d	21^h
Conjunction		2004	July	08^d	17^h
Opposition Data					
Visual Magnitude		–0.50			
Constellation		Gemini			
B		–25°.55			
B'		–25°.63			
Globe	Equatorial Diameter	20".64			
	Polar Diameter	19".00			
Rings	Major Axis	46".85			
	Minor Axis	20.20"			

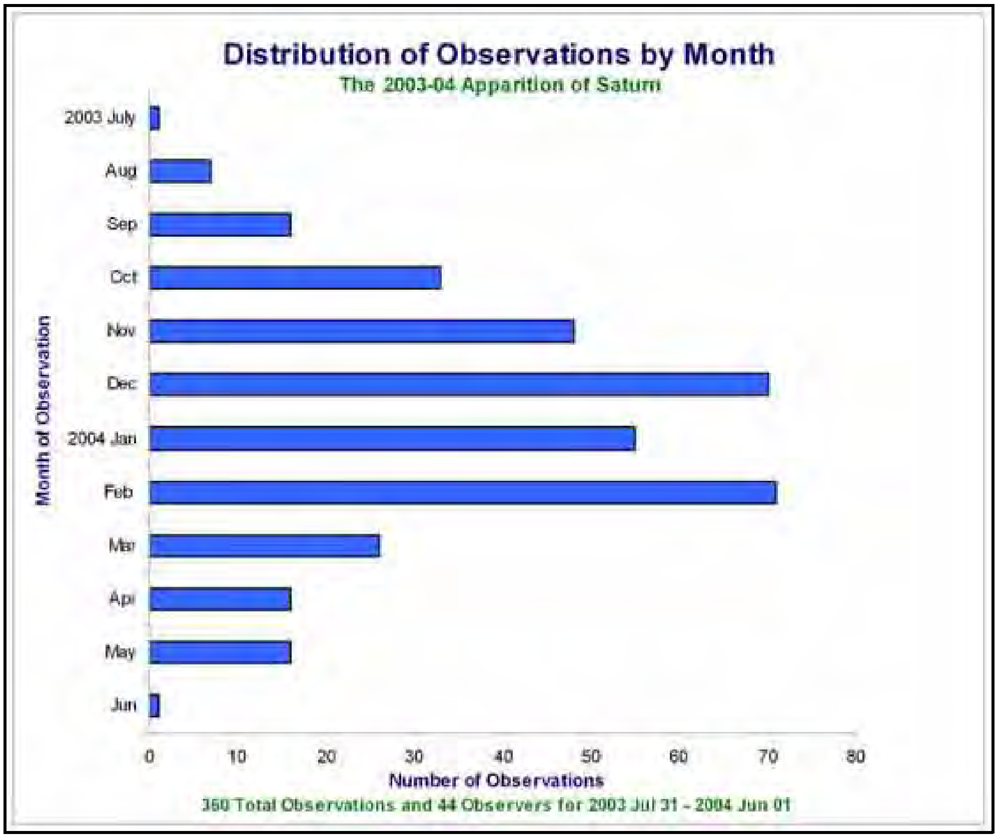

Figure 1.

Table 1 gives geocentric data in Universal Time (UT) for the 2003-04 apparition of Saturn. During the observing season, the numerical value of **B**, or the Saturnicentric latitude of the Earth referred to the ring plane (+ when north), ranged between the extremes of -24°.81 (2003 October 24) and -26°.29 (2004 March 16). The value of **B'**, the Saturnicentric latitude of the Sun, ranged within the limits of -26°.28 (2003 July 31) and -24°.71 (2004 June 01).

Table 2 lists the 44 individuals who provided a total of 360 observations to the ALPO Saturn Section for the 2003-04 apparition, along with their observing sites, number of observations, and telescope type and aperture.

Figure 1 is a histogram that shows the distribution of observations by month during the 2003-04 observing season. As in many previous apparitions, observers tend to view Saturn during the months inclusive of and on either side of the date of opposition. To facilitate more comprehensive coverage throughout any given apparition, observers are urged to begin watching Saturn as soon as it appears in the eastern sky before sunrise right after conjunction, and persevere until it again approaches the domain of the Sun a little over a year later, at the next conjunction. Of the submitted observations, 47.5% were made before opposition, 1.1% on the precise date of opposition (2003 December 31), and 51.4% thereafter.

Figure 2 and Figure 3 show the ALPO Saturn Section observer base (total of 44) for 2003-04 and the international distribution of the 360 observations that were contributed. During the apparition, the United States accounted for slightly more than half of both the participating observers (52.3%) and submitted observations (54.7%). With 47.7% of ALPO Saturn observers residing in Germany, China, Japan, France, Canada, Puerto Rico, Italy, United Kingdom, Spain, The Netherlands, Switzerland, and Mexico, whose total contributions represented 45.3% of all the observations, it is very pleasing that international cooperation in our programs remained strong during the 2003-04 observing season.

Figure 4 illustrates the number of observations in 2003-04 by instrument type. As in the immediately preceding apparition, in 2003-04 a little more than a third (39.7%) of the 360 total observations were made with telescopes of classical design (refractors and Newtonians), in contrast with most Saturn apparitions prior to 2002. Classical designs with quality optics and proper collimation traditionally deliver high-resolution, optimal contrast images, and they have historically been the telescopes of choice for detailed visual investigations of the Moon and planets. But, with the onslaught of so many observers now routinely doing digital imaging of Saturn, a shift has occurred toward a greater reliance on Schmidt-Cassegrains or Maksutov-Cassegrains, possibly because these catadioptrics have so many adapters that are readily-available in the marketplace for all sorts of video, web, and digital cameras, plus when properly collimated (assuming good optics to start with), these often conveniently portable instruments can produce some very decent images.

Telescopes with apertures of 15.2 cm (6.0 in.) or larger accounted for 84.4% of the observations submitted during the 2003-04 apparition. Readers are reminded, however, that smaller telescopes of excellent quality in the range of 7.5 cm (3.0 in.) to 12.7 cm (5.0 in.) are still quite useful for viewing and recording observations of the planet Saturn.

The Globe of Saturn

All 360 observations submitted to the ALPO Saturn Section during 2003-04 by the 44 observers listed in *Table 2* were used in preparation of this summary. Except when the identity of an individual is considered particularly relevant to the discussion, names have been omitted in the interest of conciseness, however contributors are always mentioned in connection with selected illustrations accompanying this report. Drawings and digital images, tables, and graphs are included with this synopsis so that readers may refer to them as they study the text. In our discussion, features on the globe of Saturn are described in south-to-north order and can be identified by looking at the nomenclature diagram shown in *Figure 5*. If no reference is made to a global feature in our south-to-north discussion,

Table 2: 2003-04 Apparition of Saturn: Contributing Observers

	Observer	Location	No. of Observations	Telescopes Used
1.	Acquarone, Fabioi	Genova, Italy	1	23.5 cm (9.25 in.) SCT
2.	Amato, Michael A.	West Haven, CT	1	15.2 cm (6.0 in.) NEW
3.	Bates, Donald R.	Houston, TX	1	25.4 cm (10.0 in.) NEW
4.	Benton, Julius L.	Wilmington Island, GA	45	12.7 cm (5.0 in.) MAK
5.	Bildy, Les	Sarasota, FL	2	28.0 cm (11.0 in.) SCT
6.	Boisclair, Norman J.	S. Glens Falls, NY	6	50.8 cm (20.0 in.) NEW
7.	Budine, Phillip W.	Binghamton, NY	1	12.7 cm (5.0 in.) REF
8.	Calia, C. Laird	Ridgefield, CT	3	12.7 cm (5.0 in.) MAK
			7	12.7 cm (5.0 in.) REF
			18	20.3 cm (8.0 in.) SCT
9.	Crandall, Ed	Winston-Salem, NC	5	25.4 cm (10.0 in.) NEW
10.	Chavez, Rolando	Powder Springs, GA	2	20.3 cm (8.0 in.) SCT
			1	31.8 cm (12.5 in.) NEW
11.	Cudnik, Brian	Houston, TX	1	20.3 cm (8.0 in.) SCT
			9	25.4 cm (10.0 in.) NEW
			2	31.8 cm (12.5 in.) NEW
			3	35.6 cm (14.0 in.) SCT
12.	Dal Prete, Ivano	Verona, Italy	2	20.3 cm (8.0 in.) NEW
13.	del Valle, Daniel	San Juan, Puerto Rico	7	20.3 cm (8.0 in.) SCT
14.	Fattinnanzi, Cristian	Macerata, Italy	5	25.4 cm (10.0 in.) NEW
15.	Girardin, Eric	Onex, Switzerland	1	15.2 cm (6.0 in.) REF
16.	Grafton, Ed	Houston, TX	12	35.6 cm (14.0 in.) SCT
17.	Haas, Walter H.	Las Cruces, NM	12	20.3 cm (8.0 in.) NEW
			8	31.8 cm (12.5 in.) NEW
18.	Hatton, Jason P.	Mill Valley, CA	24	23.5 cm (9.25 in.) SCT
			1	25.4 cm (10.0 in.) SCT
19.	Hernandez, Carlos	Miami, FL	2	22.9 cm (9.0 in.) MAK
20.	Ikemura, Toshihiko	Osaka, Japan	5	30.5 cm (12.0 in.) NEW
21.	Karakas, Mike	Winnipeg, MAN, Canada	1	20.3 cm (8.0 in.) NEW
22.	King, R.	Derby, UK	1	25.4 cm (10.0 in.) NEW
23.	Lazzarotti, Paolo	Massa, Italy	5	25.4 cm (10.0 in.) NEW
24.	Maxson, Paul	Phoenix, AZ	2	20.3 cm (8.0 in.) SCT
25.	Melillo, Frank J.	Holtsville, NY	6	20.3 cm (8.0 in.) SCT
26.	Mobberley, Martin	Suffolk, UK	10	30.5 cm (12.0 in.) SCT
27.	Ng, Eric	Hong Kong, China	12	31.8 cm (12.5 in.) NEW
28.	Niechoy, Detlev	Göttingen, Germany	13	20.3 cm (8.0 in.) SCT
29.	Owens, Larry	Alpharetta, GA	1	35.6 cm (14.0 in.) SCT
30.	Parker, Donald C.	Coral Gables, FL	1	25.4 cm (10.0 in.) DALL
			1	40.6 cm (16.0 in.) NEW
31.	Peach, Damian	Norfolk, UK	45	28.0 cm (11.0 in.) SCT
32.	Pellier, Christophe	Bruz, France	5	18.0 cm (7.1 in.) NEW
			10	35.6 cm (14.0 in.) SCT
			1	40.0 cm (15.7 in.) NEW
33.	Plante, Phil	Braceville, OH	1	15.2 cm (6.0 in.) NEW
			3	20.3 cm (8.0 in.) SCT
34.	Puglia, Giorgio	Palermo, Italy	1	40.6 cm (16.0 in.) NEW
35.	Robbins, Sol	Fair Lawn, NJ	4	15.2 cm (6.0 in.) REF
			5	24.4 cm (9.6 in.) NEW
36.	Roel, Eric	Valle de Bravo, Mexico	2	25.4 cm (10.0 in.) MAK
37.	Roussell, Carl	Hamilton, Ontario, Canada	17	15.2 cm (6.0 in.) NEW
38.	Sanchez, Jesus	Cordoba, Spain	1	23.5 cm (9.25 in.) NEW
			5	25.4 cm (10.0 in.) NEW
			10	28.0 cm (11.0 in.) SCT
39.	Sherrod, Clay	Little Rock, AR	1	40.6 cm (16.0 in.) SCT
40.	Vandebergh, Ralf	Maastricht, Netherlands	1	18.0 cm (7.1 in.) NEW
41.	Venable, Roger	Wrens, GA	1	40.1 cm (15.8 in.) NEW

Table 2: 2003-04 Apparition of Saturn: Contributing Observers

42.	Vladrich, Christian	Paris, France	1	20.3 cm (8.0 in) MAK
43.	Williamson, Thomas E.	Albuquerque, NM	5	20.3 cm (8.0 in) NEW
44.	Zannelli, Carmelo	Palermo, Italy	1	40.6 cm (16.0 in.) NEW
	TOTAL OBSERVATIONS		360	
	TOTAL OBSERVERS		44	

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

the area was not reported by observers during the 2003-04 apparition.

It has been customary in preparing Saturn apparition reports to compare data for global atmospheric features between observing seasons. This practice is maintained with this report to help readers appreciate the importance of extremely subtle, yet nonetheless recognizable, variations that may be happening seasonally or otherwise on Saturn.

Observational data suggest that some of the intensity fluctuations suspected in Saturnian belts and zones (see *Table 3*) may be only a consequence of the continually varying inclination of the planet's rotational axis relative to the Earth and Sun. Using photoelectric photometry observers have also documented small oscillations of something like ± 0.10 in the visual magnitude of Saturn in several observing seasons in the last decade. There is no question, however, that transient and long-enduring atmospheric features occurring in Saturn's belts and zones also factor into apparent brightness fluctuations. Regular photoelectric photometry of Saturn, in conjunction with carefully-executed visual numerical relative intensity estimates, is encouraged.

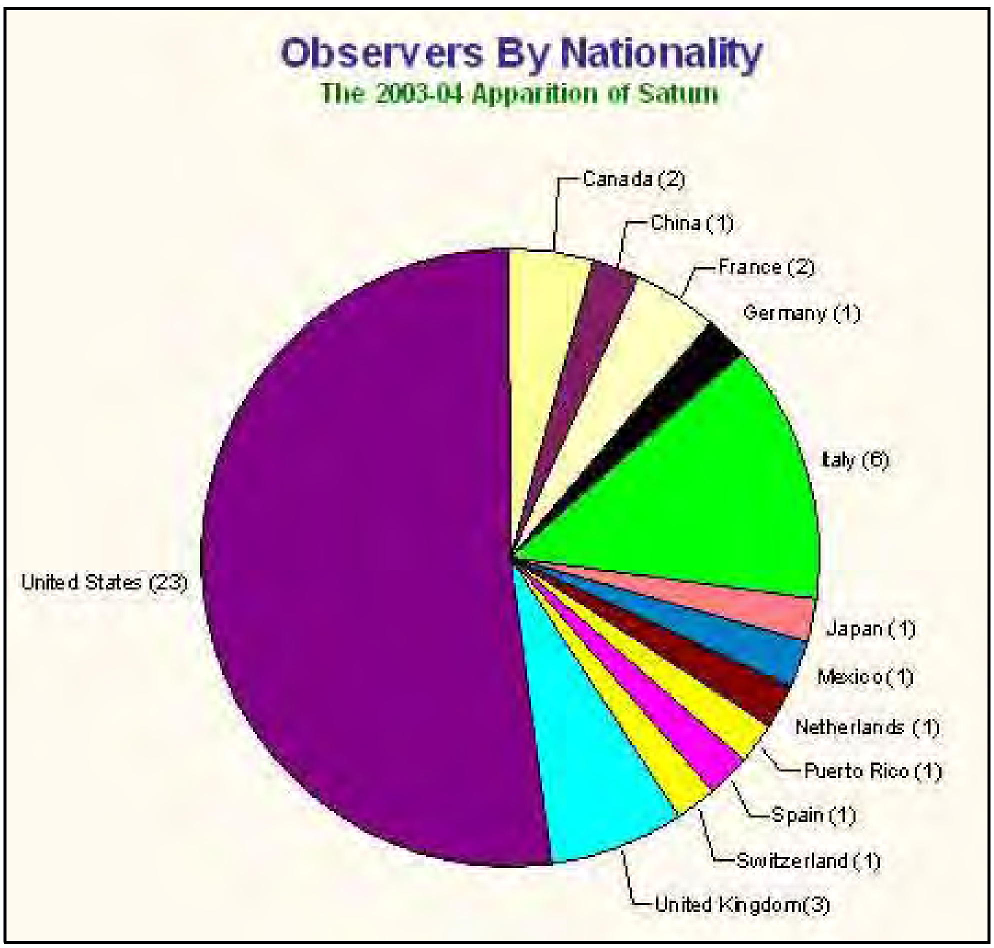

Figure 2.

The intensity scale regularly used by Saturn observers is the ALPO Standard Numerical Relative Intensity Scale, where 0.0 denotes a total black condition (e.g., shadows) and 10.0 represents maximum brightness of a feature or phenomenon (e.g., an unusually bright EZ or exceptionally brilliant white spot). This numerical scale is normalized by setting the outer third of Ring B at a "standard" intensity of 8.0. The arithmetic sign of an intensity change is found by subtracting a feature's 2002-03 intensity from its 2003-04 value. Suspected variances of ± 0.10 mean intensity points are usually considered insignificant, and furthermore, reported changes in intensity are probably not truly noteworthy unless they are more than about three times the standard error.

Several observers continued using in 2003-04 the convenient visual technique formulated by Haas nearly 50 years ago to make estimates of Saturnian global latitudes. By this method, observers simply estimate the fraction of the polar semidiameter of Saturn's globe subtended on the central meridian (CM) between the limb and the feature whose latitude is desired, and the resulting data compare reasonably well with latitudes measured from drawings, images, or determined with a bi-filar micrometer. Quantitative reduction of visually estimated latitudes of Saturn's global features during the 2003-04 apparition appear in *Table 4*. While readers are cautioned not to place undue confidence in data generated by only a very few individuals, experienced observers have been employing this visual technique for many years with very reliable results. So, use of this procedure on a regular basis, even if a bi-filar micrometer is available, is encouraged, because comparison of latitude data generated by different methods is valuable. As a control on the accuracy of the visual method,

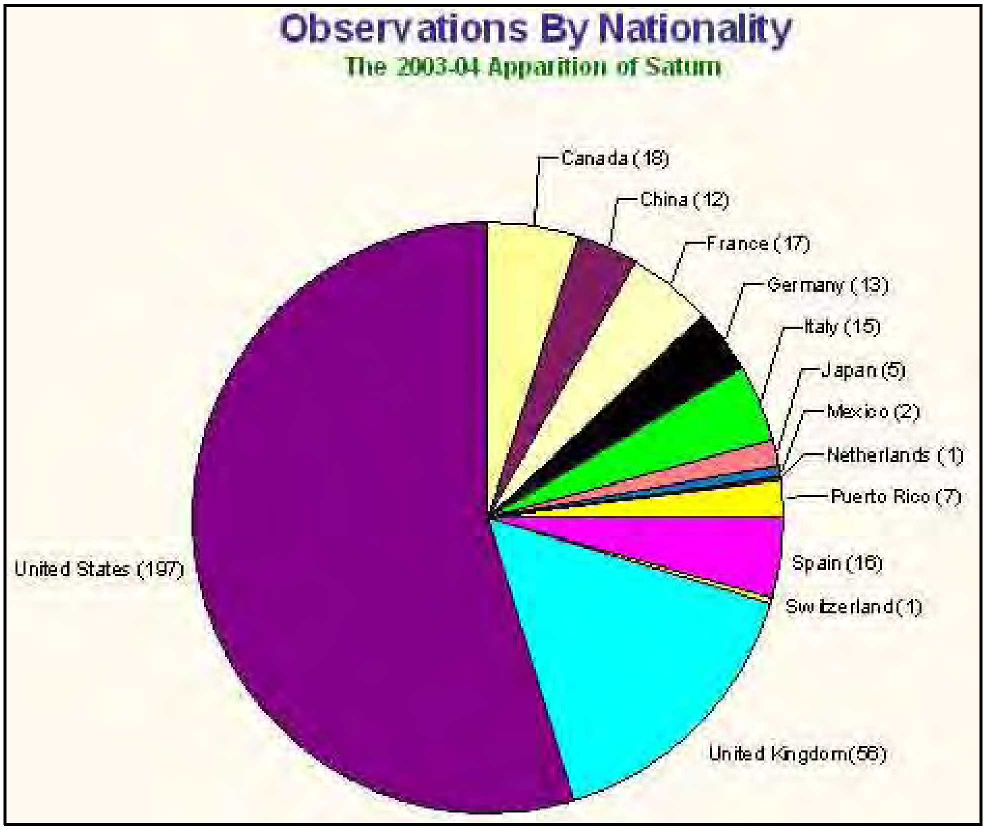

Figure 3.

observers should include in their estimates the positions on the CM of the projected ring edges and the shadow of the rings. The actual latitudes can then be computed from the known values of **B** and **B'** and the dimensions of the rings, but this test cannot be effectively applied when **B** and **B'** are near their maximum attained numerical values. In describing each feature on Saturn's globe, gleanings from latitude data are incorporated into the text where appropriate. A detailed description of Haas' visual technique can be found in *The Saturn Handbook* available from the author in printed or pdf format.

Southern Regions of the Globe. During the 2003-04 apparition, the maximum value of **B** was -26.29°, not far from the maximum inclination the ring system can theoretically have for observers on Earth (the greatest recent inclination to our line of sight occurred in 2002-03). So, much like the immediately preceding apparition, relatively good views of Saturn's Southern Hemisphere were possible during the 2003-04 observing season, while most of the northern hemisphere of the globe remained obscured by the rings as they crossed in front of the planet. From the observational data submitted for 2003-04, the southern hemisphere of Saturn displayed nearly the same mean numerical relative intensity as in 2002-03, yet some observers were convinced that a delicate reduction in overall brightness of this hemisphere as a whole has progressively occurred over the last two apparitions. It will be quite interesting to see if this suspected trend continues in subsequent observing seasons as the tilt of the southern hemisphere of Saturn toward out line of sight diminishes with time. Beginning on 2003 August 15 through 2004 February 10, a substantial number of observers either sketched or imaged small white spots in the STeZ, STrZ, SEBZ, and EZs that will be discussed in the appropriate sections below. Many of these white spots, which were confirmed by several observers and apparently persisted for more than a month or so, were likely the result of convection of NH3 (ammonia) in Saturn's atmosphere, which later dissipated. The structure of the zonal wind profile in these regions may contribute to the emergence and behavior of such discrete, relatively short-lived white spots. A few transient dark spots or dusky elongations were also reported in mid-temperate regions, as well as in the SEB, during the aforementioned time span. As a result of high-resolution imaging, many of these white spots and dark features could be monitored for several rotations of Saturn, facilitating a limited number of CM transit timings and tentative drift rates.

Saturn reached perihelion on 2003 July 26, which occurs every 29.5 terrestrial years (one Saturnian year), right after the start of the 2003-04 observing season. Some investigators have suggested that any perceived slight increases in atmospheric activity could go hand in hand with the seasonal insolation cycle on Saturn, although prior measurements point to an enormously slow thermal reaction to solar heating at the planet's distance from the Sun of 9.0 AU. Observers are encouraged to keep the southern hemisphere under close watch in upcoming apparitions now that Saturn has passed perihelion, since a lag in the planet's atmospheric thermal response may possibly mimic a similar one we experience on Earth, where the warmest days do not actually occur on the first day of summer, but a few weeks later. On Saturn, however, any corresponding effect would be immensely subtle and may not be noticed for quite a few years.

South Polar Region (SPR). The dark gray SPR remained reasonably stable in intensity throughout the 2003-04 apparition, but it continued what many observers thought was a slight darkening trend since 2001-02; that is, the SPR seemingly appeared to diminish a little in brightness (by -0.74 mean intensity points) since the immediately preceding apparition, just as it apparently did from 2001-02 to 2002-03 (by a mean value of -0.78). A very dark gray and rather distinct South Polar Cap (SPC) was seen by most observers throughout the 2003-04 observing season, considerably darker than the surrounding SPR, and noticeably less bright than in 2002-03 by a factor of -1.87 in mean intensity. The appearance of the very dark SPC, surrounded by a much lighter SPR, was particularly exemplified by drawings made by Hernandez in Florida using a 22.9 cm (9.0 in.) MAK at 243X at 07:00UT on 2003 November 26, by Calia, observing from Connecticut with a 12.7 cm (5.0 in.) MAK at 205X on 2003 December 31 at 03:25-03:45UT, and by

Table 3: Visual Numerical Relative Intensity Estimates and Colors for the 2003-04 Apparition of Saturn

Globe/Ring Feature	# Estimates	2003-04 Mean Intensity & Standard Error	Intensity Change Since 2002-03	Mean Derived Color
Zones:				
SPC	28	2.63 ± 0.22	–1.87	Very Dark Gray
SPR	35	3.26 ± 0.13	–0.74	Dark Gray
SSTeZ	1	5.00 ± 0.00	–1.80	Dull Yellowish-Gray
STeZ	9	6.70 ± 0.18	+0.49	Yellowish-White
STrZ SEBZ	15 17	6.24 ± 0.20 5.44 ± 0.12	–0.11 ------	Yellowish-White Yellowish-Gray
EZs	64	7.01 ± 0.10	–0.51	Light Yellowish-White
Globe S of Rings	28	5.26 ± 0.07	+0.33	Dull Yellowish-Gray
Belts:				
SPB	15	3.55 ± 0.13	–0.21	Dark Gray
STeB	6	4.58 ± 0.21	–0.36	Light Grayish-Brown
SEB (whole)	29	4.13 ± 0.09	–0.34	Grayish-Brown
SEBs	38	4.17 ± 0.10	+0.49	Grayish-Brown
SEBn	40	3.78 ± 0.11	+0.73	Dark Grayish-Brown
EB	11	4.74 ± 0.18	+0.72	Light Gray
Rings:				
A (whole)	38	6.58 ± 0.09	+0.40	Yellowish-White
Ring A (outer ½)	13	6.75 ± 0.11	–0.05	Pale Yellowish-White
Ring A (inner ½)	13	6.61 ± 0.06	+0.01	Pale Yellowish-White
A5	24	2.36 ± 0.28	–1.18	Very Dark Gray
A0 or B10	51	0.73 ± 0.12	+0.09	Grayish-Black
B (outer 1/3)	64	8.00 ± 0.00 STANDARD	0.00	Brilliant White
B (inner 2/3)	41	7.14 ± 0.04	+0.08	Bright Yellowish-White
B1	5	3.66 ± 0.14	–0.07	Dark Gray
C (ansae)	48	1.24 ± 0.10	+0.49	Grayish-Black
Crepe Band	23	1.96 ± 0.04	–0.61	Very Dark Gray
Sh G or R	46	0.15 ± 0.04	–0.19	Dark Grayish-Black
Sh R of G	17	0.41 ± 0.15	------	Dark Grayish-Black
TWS	11	8.84 ± 0.15	+0.05	Brilliant White

Notes: *For nomenclature see text and Figure 5. A letter with a digit (e.g. A0 or B10) refers to a location in the ring specified in terms of units of tenths of the distance from the inner edge to the outer edge. Visual numerical relative intensity estimates (visual surface photometry) are based upon the ALPO Intensity Scale, where 0.0 denotes complete black (shadow) and 10.0 refers to the most brilliant condition (very brightest Solar System objects). The adopted scale for Saturn uses a reference standard of 8.0 for the outer third of Ring B, which appears to remain stable in intensity for most ring inclinations. All other features on the Globe or in the rings are compared systematically using this scale, described in the Saturn Handbook, which is issued by the ALPO Saturn Section. The "Intensity Change Since 2002-03" is in the same sense of the 2002-03 value subtracted from the 2003-04 value, "+" denoting an increase in brightness and "–" indicating a decrease (darkening). When the apparent change is less than about 3 times the standard error, it is probably not statistically significant.*

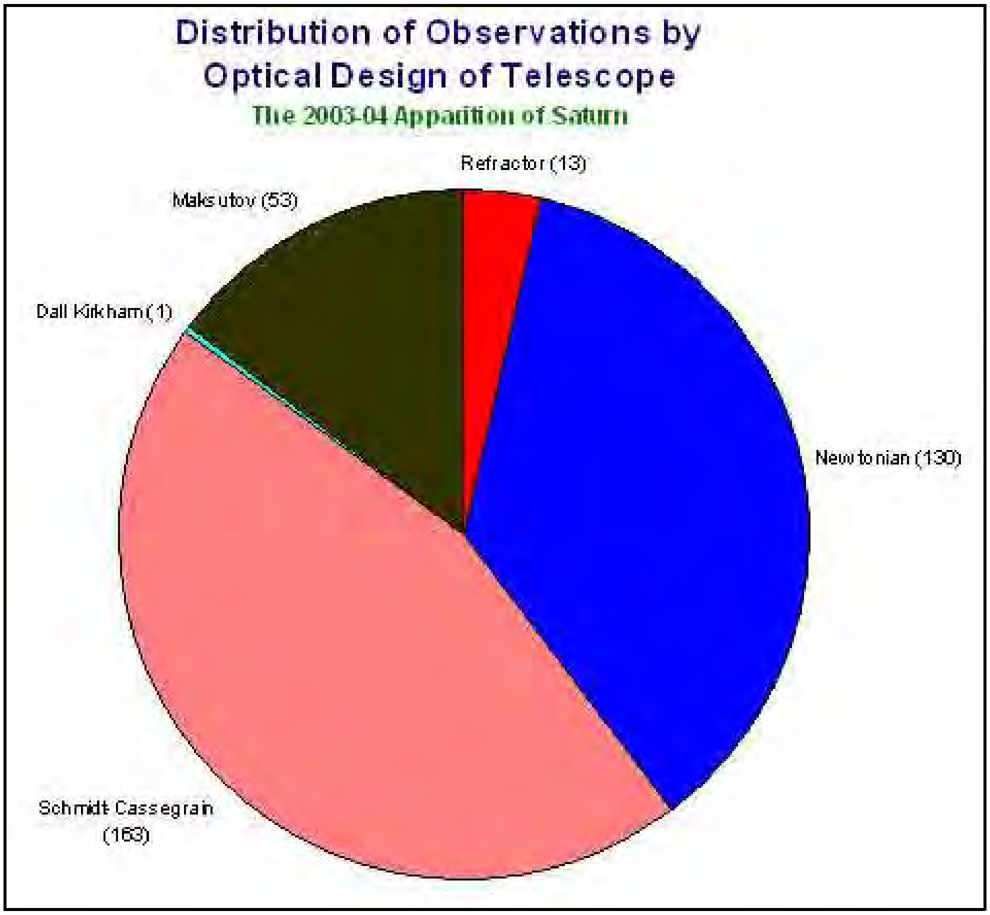

Figure 4.

Budine in New York with a 12.7 cm (5.0 in.) refractor at 200X on 2004 February 27 at 01:15-01:40UT. There were quite a few more visual observers who made similar sketches depicting the same appearance of the SPC and SPR. The majority of digital images submitted during 2003-04 confirmed these visual impressions, showing an extremely small dark SPC precisely at the South Pole of Saturn plainly surrounded by a much lighter annulus in the SPR, also strikingly apparent in several HST images. A dark grayish South Polar Belt (SPB) encircling the SPR, running across Saturn's globe from limb to limb, was glimpsed only occasionally during the 2003-04 apparition by visual observers, but it was nearly always evident in the best digital images of the planet and was the darkest belt of Saturn's Southern Hemisphere during the observing season. The SPB maintained roughly the same mean intensity since 2002-03 (negligible mean intensity variance between apparitions of -0.21).

South South Temperate Zone (SSTeZ). The SSTeZ was reported only once by visual observers throughout the 2003-04 apparition. Based on this single sighting, the SSTeZ was dull yellowish-gray and appeared darker by an intensity factor of -1.80 since 2002-03, although one estimate is hardly conclusive. Most digital images received during 2003-04 revealed a somewhat diffuse and narrow SSTeZ, largely devoid of activity during the apparition.

South South Temperate Belt (SSTeB). Visual observers did not report the SSTeB during the 2003-04 apparition, but most images showed this dusky feature running across the globe of Saturn from limb to limb.

South Temperate Zone (STeZ). The yellowish-white STeZ was seen periodically by visual observers in 2003-04 and was consistently apparent in most images of Saturn. When compared with 2002-03, the STeZ was virtually unchanged in overall intensity (mean intensity difference of +0.49), and it was second only to the EZs in brightness during the 2003-04 apparition. The STeZ was basically uniform in intensity throughout the observing season as it extended across the globe of Saturn, although Grafton, using an ST5 camera attached to his 35.6 cm (14.0 in.) SCT, imaged what seemed to be a small, presumably short-lived whitish oval in this region at Saturnigraphic latitude -50° near the CM on 2003 November 04 (08:48-09:20UT). What may have been the same white spot was recovered again by Grafton with the same instrumentation on November 30th (07:18-07:26UT), along with a couple of other white spots reported in the STrZ and SEBZ (see discussion in the appropriate sections below). Subsequent sightings and images of this low contrast bright condensation, or others, in the STeZ were apparently lacking. No discrete phenomena in the STeZ were reported by visual observers during 2003-04.

South Temperate Belt (STeB). The light grayish-brown STeB was seldom reported by visual observers during the 2003-04 observing season, but it was frequently shown in high resolution images contributed during the apparition. When visual observers saw this belt, it was usually devoid of activity as it ran uninterrupted across the globe of Saturn. Based on mean intensity data, the STeB exhibited no convincing variance in brightness (mean difference of -0.36) since 2002-03.

South Tropical Zone (STrZ). Visual observers witnessed the yellowish-white STrZ occasionally during the 2003-04 apparition, and as gleaned from submitted intensity estimates, the STrZ displayed essentially the same mean intensity since 2002-03 (negligible variance of -0.11) and ranked third in order of brightness behind the EZs and STeZ. Although images mostly corroborated visual impressions of this feature during the observing season, just like in the 2002-03 apparition, digital images of small white spot disturbances near Saturnigraphic latitude -42° were received fairly often by the ALPO Saturn Section, beginning in 2003 September. The first image of a small white spot in the STrZ during the 2003-04 apparition was captured by Pellier in France with a ToUcam webcam attached to a 18.0 cm (7.1 in.) Newtonian on 2003 September 13 (03:59-04:19UT). Using a

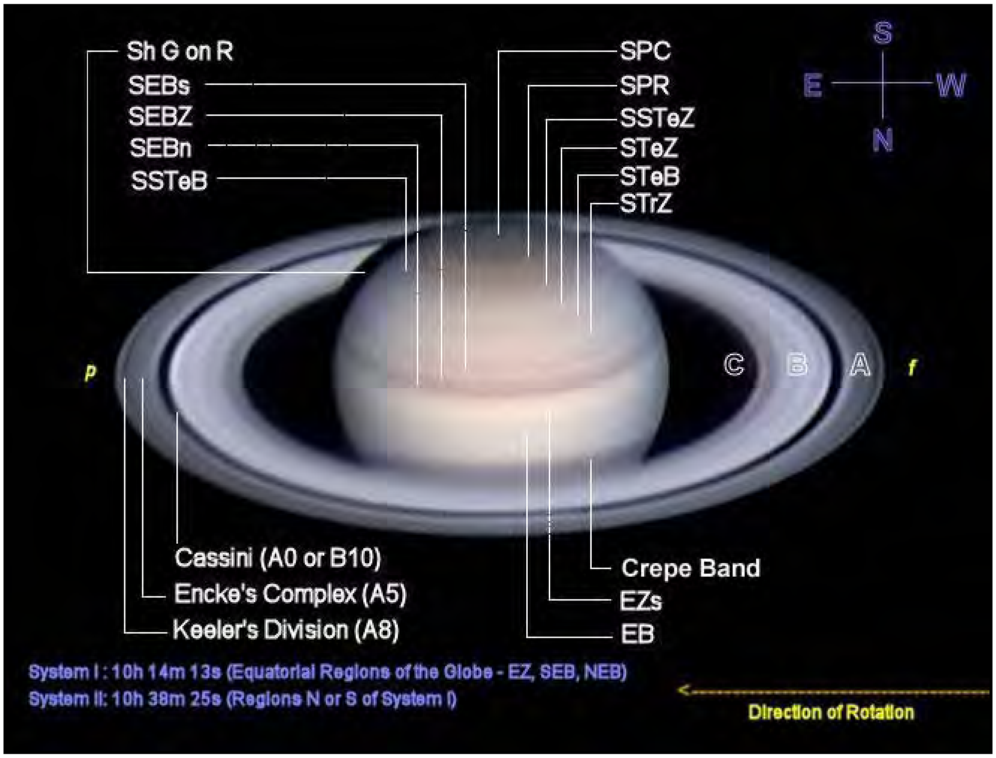

Figure 5. General nomenclature of Globe and Ring features of Saturn, where: B = Belt, C = Cap, E = Equatorial, f = following, G =- Globe, p = preceding, P = Polar, R = Region or Ring, S or s = South, Te = Temperate, Tr = Tropical and Z = Zone. A, B and C are Ring designations.

ST5 CCD camera with a 35.6 cm (14.0 in.) SCT Grafton, observing from Texas, imaged this same feature on 2003 October 12 (11:12UT). Nearly three nights later, on 2003 October 15 (04:00-05:32UT), Peach imaged the STrZ white spot from the UK employing a ToUcam webcam and a 28.0 cm (11.0 in.) SCT. Parker in Florida recorded an STrZ white spot on 2003 November 23 (05:27-06:55UT) with a ToUcam webcam and a 25.4 cm (10.0 in.) Dall-Kirkham, and just ten days later, on December 02 (22:54-23:17UT), Fattinnanzi in Italy captured a similar white spot in the STrZ. These sightings were followed by webcam shots by Sanchez from Spain on December 12 (02:26UT) and December 13 (00:18UT) using a 28.0 cm (11.0 in.) SCT, and Lazzarotti from Italy recording frames on December 13 (23:02-23:57UT) with a 25.4 cm (10.0 in.) Newtonian. Discrete white spot activity continued into 2004, showing up on images by Grafton on January 20 (04:38-05:51UT) with a 35.6 cm (14.0 in.) SCT and ST5 CCD, by Sanchez again (same equipment) on January 21 (23:19UT), by Maxson in Arizona on January 31 (02:20UT) using a ToUcam webcam coupled to a 20.3 cm (8.0 in.) SCT, and by Zannelli and Puglia from Italy on February 01 (21:16UT) imaging with a Vesta Pro webcam and a 41.2 cm (16.2 in.) Newtonian. The last digital image of STrZ white spot activity submitted to the ALPO Saturn Section was captured by Pellier using a 40.0 cm (15.7 in.) Newtonian on February 04 (23:23-23:45UT). It appears quite possible that the STrZ white spots imaged during November, December, January, and February were different from the features reported by Pellier and Peach back in September and October, mainly because it is commonly believed by theorists that such small features are relatively short-lived phenomena. No confirming visual sightings of these discrete phenomena in the STrZ were received during 2003-04, probably because they were all below the threshold of vision in most telescopes used and of generally poor contrast. Remember that the smallest features appearing in most images become more obvious because of image

Table 4: Latitudes of Saturn's Belts Derived from Visual Estimates for 2003-04

Saturnian Belt	# Estimates	Eccentric (Mean) Latitude	Planetocentric Latitude	Planetographic Latitude
N edge SPB	16	–83.99° ± 0.43 (2.58)	–83.27° ± 0.48 (2.89)	–84.63° ± 0.38 (2.31)
N edge SPR	5	–87.33° ± 0.37 (-------)	–87.01° ± 0.41 (-------)	–87.61° ± 0.33 (-------)
Center STeB	1	–54.60° ± 0.00 (-------)	–51.48° ± 0.00 (-------)	–57.60° ± 0.00 (-------)
N edge SEB	16	–29.10° ± 0.37 (1.27)	–26.43° ± 0.35 (1.19)	–31.93° ± 0.39 (1.34)
S edge SEB	15	–33.18° ± 0.23 (0.82)	–30.28° ± 0.22 (0.78)	–36.21° ± 0.24 (0.85)
Center EB	7	–13.66° ± 0.21 (–2.90)	–12.25° ± 0.19 (–2.61)	–15.23° ± 0.23 (–3.22)

Notes: For nomenclature see Figure 5. Latitudes are calculated using the appropriate geocentric tilt, **B**, for each date of observation, with the standard error also shown. Planetocentric latitude is the angle between the equator and the feature as seen from the center of the planet. Planetographic latitude is the angle between the surface normal and the equatorial plane. Eccentric, or "Mean," latitude is the arc-tangent of the geometric mean of the tangents of the other two latitudes. The change shown in parentheses is the result of subtracting the 2002-03 latitude from the 2003-04 latitude.

Figure 6. 2003 Nov 26 07:00UT Carlos Hernandez. 22.9 cm (9.0in.) MAK, Drawing. 257-343X, IL. S = 6.0, Tr = 6.0. CMI = 223.8°, CMII = 162.7°, CMIII = 177.8° B = -24.9°, B´ = -25.7°. Dark SPC with considerably lighter surrounding SPR.

processing that helps bring out very subtle detail.

South Equatorial Belt (SEB). The wide, grayish-brown SEB was frequently reported by visual observers throughout the 2003-04 apparition, more often than not subdivided into SEBn and SEBs components (where n refers to the North Component and s to the South Component), with a fairly distinct SEBZ lying in between during the best seeing conditions and with larger apertures. This impression was also confirmed by images during the observing season. Taken as a whole, many observers were of the opinion that the SEB looked slightly darker in 2003-04 than in 2002-03, but once again, a difference of only -0.34 mean intensity points between observing seasons is far from being noteworthy. Next, when the SEBn and SEBs components were visible, their mean intensity in 2003-04 was perhaps marginally lighter than in 2002-03, but the yellowish-gray South Equatorial Belt Zone (SEBZ) could not be compared with the immediately preceding apparition due to the lack of intensity estimates during that observing season. Grafton imaged a small whitish oval in the SEBZ at 11:12UT on 2003 October 12 located at approximately Saturnigraphic latitude -29° using a ST5 and a 35.6 cm (14.0 in.) SCT (appearing in the same image was also the previously described white spot or disturbance in the STrZ). This was confirmed to be the same feature that was imaged by

Table 5: Visual Observations of the Bicolored Aspect of Saturn's Rings During the 2003-04 Apparition

Observer	UT Date and Time	Telescope Type & Aperture	Filter					
			X	S	Tr	Blue	IL	Red
Roussell	2003 Sep 24 09:30-10:00UT	NEW 15.2 cm (6.0 in.)	204	3.0	4.0	=	=	E
Roussell	2003 Nov 09 10:00-11:00UT	NEW 15.2 cm (6.0 in.)	204	3.0	4.0	=	=	E
del Valle	2003 Dec 17 02:50-03:03UT	NEW 20.3 cm (8.0 in.)	400	7.0	4.0	=	E	=
Cudnik	2004 Jan 04 00:00UT	SCT 35.6 cm (14.0 in.)	326	9.0	6.0	=	=	W
Haas	2004 Mar 07 03:02-03:48UT	NEW 31.8 cm (12.5 in.)	321	3.0	4.0	=	=	E
Haas	2004 Mar 15 02:09-02:53UT	NEW 31.8 cm (12.5 in.)	321	3.0	3.5	=	=	E
Haas	2004 Mar 31 03:32-04:26UT	NEW 20.3 cm (8.0 in.)	203	3.0	4.0	W	=	=
Haas	2004 Apr 13 02:47-03:28UT	NEW 20.3 cm (8.0 in.)	203	3.0	3.5	W	=	=
Haas	2004 Apr 25 02:16-02:38UT	NEW 20.3 cm (8.0 in.)	231	4.0	4.0	W	=	=
Haas	2004 May 03 03:20-04:02UT	NEW 20.3 cm (8.0 in.)	203	2.0	3.5	W	=	=
Haas	2004 May 04 03:15-03:46UT	NEW 20.3 cm (8.0 in.)	203	2.0	3.5	W	=	=
Haas	2004 May 05 04:25-04:30UT	NEW 20.3 cm (8.0 in.)	203	1.0	3.0	W	=	=
Haas	2004 May 14 02:32-03:01UT	NEW 20.3 cm (8.0 in.)	321	2.0	3.5	W	=	=
Haas	2004 May 21 02:51-03:43UT	NEW 20.3 cm (8.0 in.)	321	2.0	3.0	W	=	=
Cudnik	2004 May 28 02:18-02:25UT	NEW 25.4 cm (10.0 in.)	254	6.5	3.0	E	=	=
Haas	2004 Jun 01 03:08-03:15UT	NEW 20.3 cm (8.0 in.)	181	1.0	3.5	W	E	=

Notes: Telescope types are as in Table 2. Seeing is the 0-10 ALPO Scale, and Transparency is the limiting visual magnitude in the vicinity of Saturn. Under “Filter,” **Bl** refers to the blue W47 or W80A filters, **IL** to integrated light (no filter), and **Red** to the red W25 or W23A filters. **E** means the East ansa was brighter than the W, **W** that the West ansa was brighter, and **=** means that the two ansae were equally bright. East and West directions are as noted in the text.

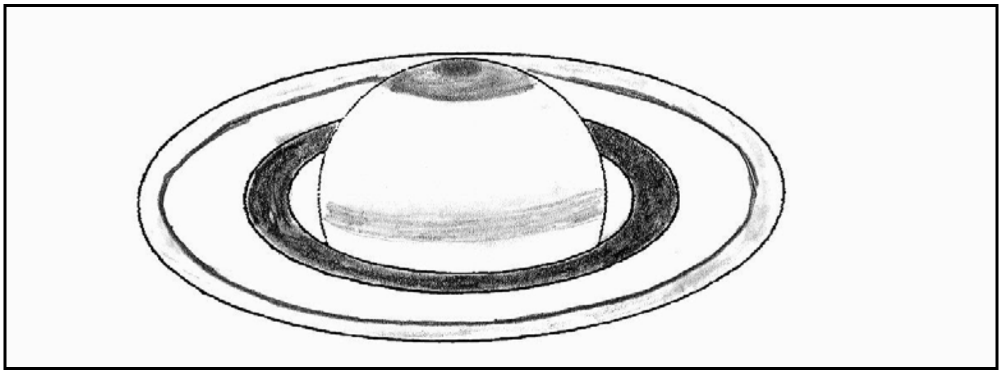

Figure 7. 2003 Dec 31 03:25-03:45UT. C. Laird Calia. 12.7 cm (5.0 in.) MAK, Drawing. 205X, IL. S = 6.5 Tr = 4.0. CMI = 131.9°-143.6°, CMII = 25.1°-36.3°, CMIII = 358.2°-09.4° B = -25.4°, B´ = -25.5°. Dark SPC and lighter encompassing SPR.

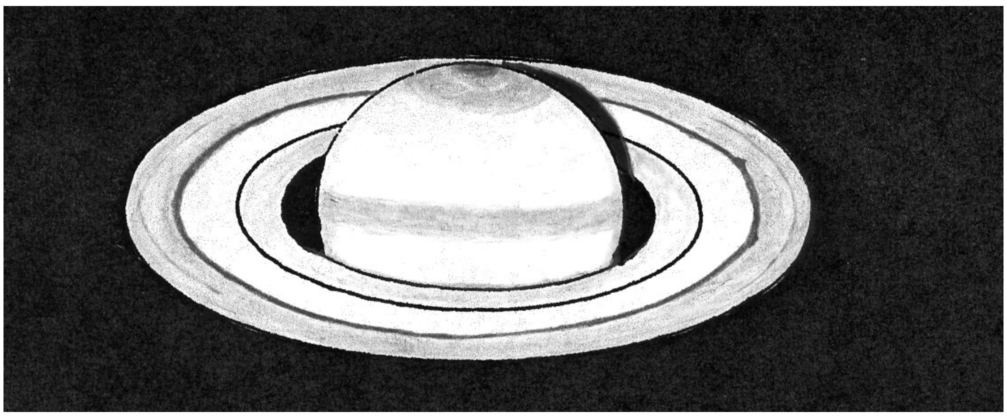

Figure 8. 2004 Feb 27 01:15-01:40UT Phil Budine. 12.7 cm (5.0 in.) REF, Drawing. 200X, IL. S = 8.5 Tr = 3.0. CMI = 66.6°-81.2°, CMII = 249.3°-263.4°, CMIII = 152.6°-166.7° B = -26.1°, B´ = -25.2°. Dark SPC and much lighter SPR.

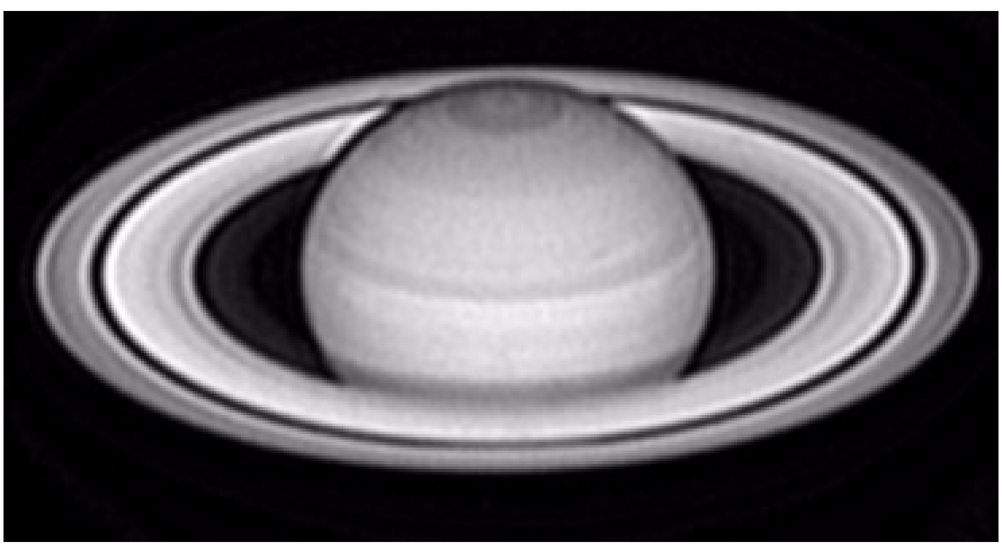

Figure 9. 2003 Dec 15 23:42UT. Damian Peach. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. CMI = 295.1°, CMII = 317.8°, CMIII = 309.2° B = -25.2°, B´ = -25.6°. Tiny dark feature is visible along N edge of SEBs.

the Hubble Space Telescope (HST) on 2003 August 25, with corroborating notes and images provided by Agustin Sánchez-Lavega of the International Outer Planets Watch (IOPW). Peach, employing a 28.0 cm (11.0 in.) SCT captured digital images of the same feature in the SEBZ on October 24 (03:36-04:21UT) and on October 28 (04:17-04:32UT).

Less than a week later, on November 02 (08:48UT), Chavez observing from Georgia captured an image of the SEBZ white spot using a ToUcam webcam and a 31.8 cm (12.5 in.) Newtonian. On November 30 (07:18-07:26UT) Grafton imaged the SEBZ white spot with his 35.6 cm (14.0 in.) SCT and a ST5 camera, along with the aforementioned STrZ and STeZ white spots, and Lazzarotti in Italy caught frames of this feature, which seemed much more diffuse, on 2004 February 10 (20:00UT) using a 25.4 cm (10.0 in.) Newtonian and a Vesta Pro webcam. Following this date, the SEBZ spot was not reported or imaged again by observers.

In addition to white spot activity in the SEBZ, dark features were imaged and sighted in the SEB during the 2003-04 apparition. For example, on 2003 November 06 (09:20-09:58UT) with his 35.6 cm (14.0 in.) SCT Grafton took ST5 CCD images of a dark elongation riding along the north edge of the SEBs with what looked like a diffuse whitish area following it in the SEBZ. Just one day later on November 7th (16:59-17:02UT) Ikemura in Japan, with a 30.5 cm (12.0 in.) Newtonian, imaged a dark feature or festoon emanating from the north edge of the SEBs into the SEBZ. Later, on December 15 (23:42UT) and December 16 (00:15-00:42UT), Peach imaged similar dark spots along the north edge of the SEBs with a 28.0 cm (11.0 in.) SCT and ToUcam webcam, then on 2004 January 14 (05:03-05:35UT) Grafton, with the same telescope and camera he employed on November 6th, imaged a dark spot at the north edge of the SEBs. From the standpoint of visual observations, dark undulations and elongated features along the northern edge of the SEBn were occasionally reported, as exemplified by drawings submitted by Roussell in Canada, using a 15.2 cm (6.0 in.) Newtonian at 204X on 2003 November 09 (10:00-11:00UT), and Robbins, viewing from New Jersey with a 15.2 cm (6.0 in.)

Figure 10. 2003 Nov 04 08:48UT. Ed Grafton. 35.6 cm (14.0 in.) SCT, ST5 CCD Image, IL. CMI = 70.3°, CMII = 357.4°, CMIII = 39.0° B = -24.8°, B´ = - 25.8°. Small STeZ white spot near CM.

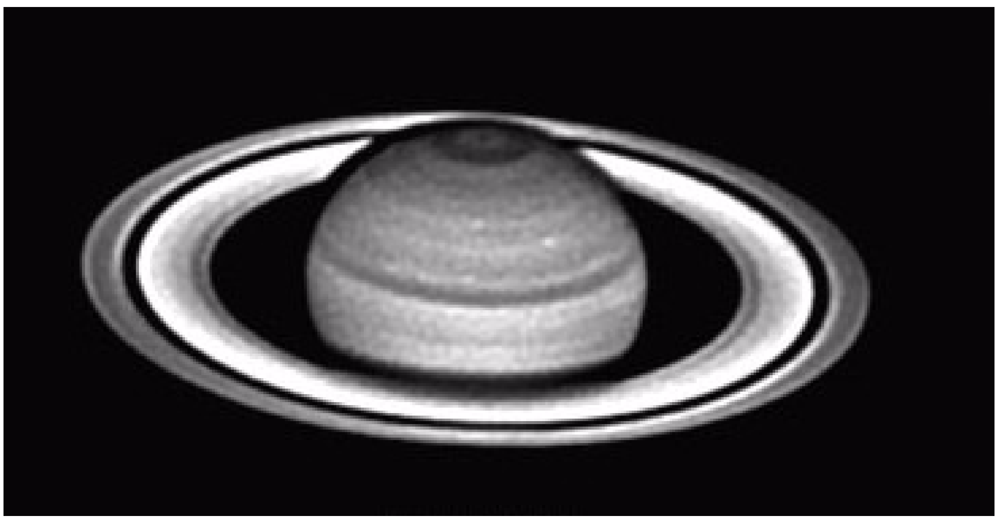

Figure 11. 2003 Nov 30 07:26UT. Ed Grafton. 35.6 cm (14.0 in.) SCT, ST5 CCD Image, IL. CMI = 16.7°, CMII = 185.8°, CMIII = 196.0° B = -25.0°, B´ = -25.7°. Small STeZ white spot; additional white spot activity is clearly visible in the SEBZ and STrZ.

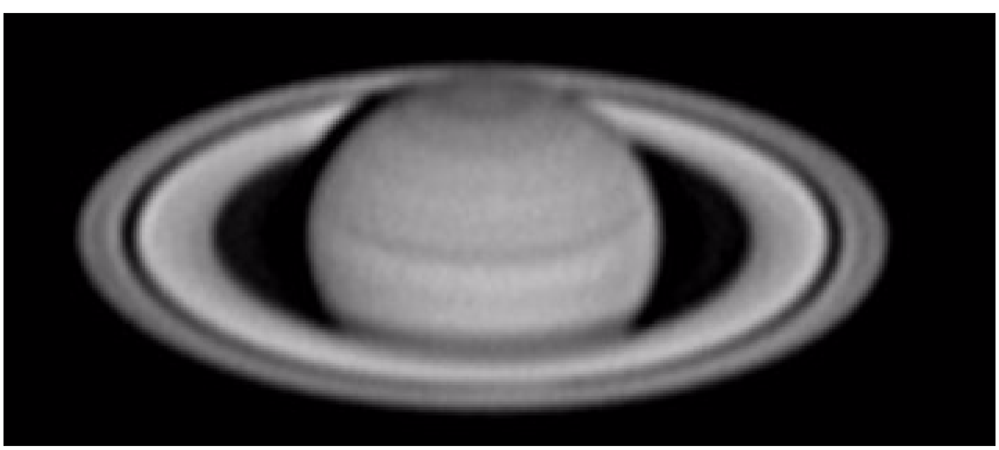

Figure 12. 2003 Sep 13 03:59UT. Christophe Pellier. 18.0 cm (7.1 in.) NEW, ToUcam webcam image, IL. S = 7.0, Tr = 6.0 CMI = 274.9°, CMII = 88.2°, CMIII = 192.7° B = -25.0°, B´ = -26.0°. First reported sighting of a small STrZ white spot during 2003-2004 apparition.

refractor at 400X on 2004 February 04 (6:00-6:18UT). Furthermore, vague dusky festoons were sometimes sighted by a few observers protruding from the northern edge of the SEBn into the EZs, in some cases nearly touching the faint EB.

As a singular belt, the grayish-brown SEB ranked second to the SPB as being the darkest belt on Saturn's globe during the 2003-04 apparition. The very dark grayish-brown SEBn (mean intensity of 3.78) and grayish-brown SEBs (mean intensity 4.17) also ranked behind the dark SPB during the observing season. Based on the 2003-04 intensity data, the SEBn was darker than the SEBs by an insignificant mean value of -0.39, and the best images supported visual impressions of these two belt components.

Equatorial Zone (EZ). The southern half of the light yellowish-white Equatorial Zone (EZs) was the area of the EZ visible between where the rings cross the globe of Saturn and the SEBn in 2003-04 (the EZn was not readily apparent during the apparition). The brightness of the EZs during the 2003-04 apparition, by most observer accounts, seemed to fade ever so slightly since 2002-03 by a factor of -0.51 in mean intensity. Yet, it was still the brightest zone on Saturn's globe according to visual reports and digital images. Cudnik provided a drawing of Saturn made on 2003 August 15 (11:02-11:24UT) with a 25.4 cm (10.0 in.) Newtonian at 250X showing an elongated white feature in the EZs just past the CM. Over a month later, on 2003 September 24 (00:37-01:27UT) using a 20.3 cm (8.0 in.) SCT at 225X, Niechoy in Germany also suspected a vague white condensation in the EZs. Once again Cudnik sketched a diffuse white spot in the EZs on November 29 (11:54-12:22UT), this time with a 31.8 cm (12.5 in.) Newtonian at 278X. No images were submitted during 2003-04 clearly depicting EZs white spots, and aside from vague suspicions of whitish mottlings from time to time, the foregoing were the only reports of white spot activity within this zone. In good seeing during 2003-04, visual observers periodically described a narrow, continuous light gray Equatorial Band (EB) spanning Saturn's globe. This feature was usually visible in images of Saturn, and mean intensity data in 2003-04 suggested that the EB was perhaps a bit brighter than in 2002-03 by

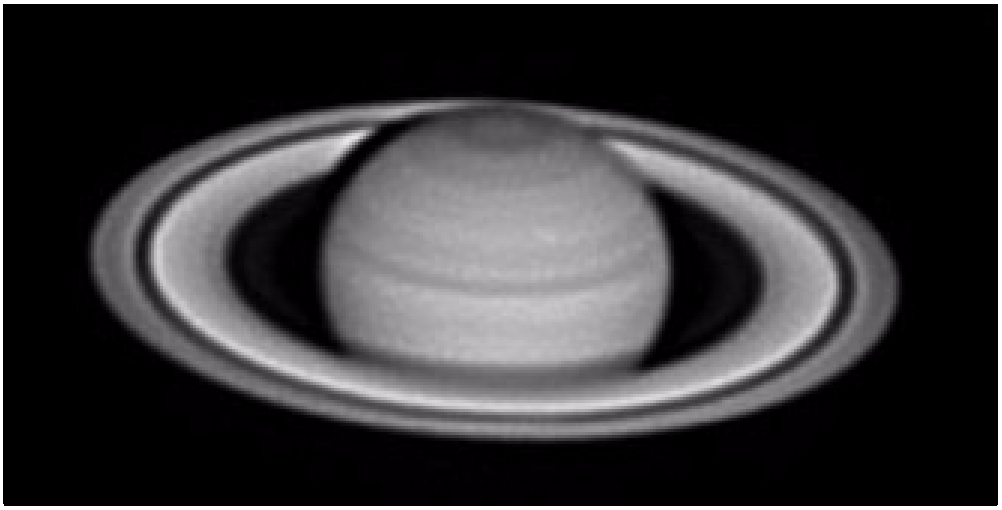

Figure 13. 2003 Oct 12 11:12UT. Ed Grafton. 35.6 cm (14.0 in.) SCT, ST5 CCD Image, IL. CMI = 174.2°, CMII = 121.0°, CMIII = 190.2° B = -24.8°, B´ = -25.9°. Small STeZ and SEBZ white spots are visible.

+0.72 mean intensity points; it was also the lightest belt in the Southern Hemisphere of Saturn during the observing season.

Northern Portions of the Globe. With Saturn tipped as much as -26.29° to our line of sight in 2003-04, virtually none of the planet's Northern Hemisphere could be viewed. Studies of Saturn's Northern Hemisphere will resume in subsequent apparitions when geometric circumstances for observing these regions are more favorable.

Shadow of the Globe on the Rings (Sh G on R). The Sh G on R was visible to observers as a geometrically regular dark grayish-black feature on either side of opposition during 2003-04. Suspected departures from a true black (0.0) intensity were due to poor seeing conditions or the presence of extraneous light. Most images revealed this feature as completely black. Note that the globe of Saturn casts a shadow on the ring system to the left or IAU East prior to opposition, to the right or IAU West after opposition, and on neither side exactly at opposition (no shadow).

Shadow of the Rings on the Globe (Sh R on G). This shadow in 2003-04 was described as a dark grayish-black feature south of the rings where they passed across Saturn's globe. Any reported variations from an intrinsic black (0.0) condition were due to the same reasons cited above for the Sh G on R.

Saturn's Ring System

The next several paragraphs relate to visual studies of Saturn's ring system, that include traditional comparisons of mean intensity data between apparitions. Impressions garnered from images of the rings are also included in the discussion. Observations of the southern face of the rings were near optimal during 2003-04 as the inclination of the rings (value of **B**) toward observers on Earth reached as much as -26.29°.

Ring A. A fair number of observers suspected that the yellowish-white Ring A, when considered as a whole, seemed a little lighter in intensity by a mean factor of +0.40 in 2003-04 as opposed to 2002-03. On a few occasions during the observing season Ring A was described visually as being separated into pale yellowish-white outer and inner halves, with the outer half of Ring A marginally brighter than the inner half. Most images of Saturn taken during the 2003-04 apparition depicted inner and outer halves of Ring A also, but the two areas looked basically equal in brightness, although there were a handful of images that supported the impressions of visual observers. The very dark gray Encke's Division (A5), sometimes described as an intensity minima "complex" halfway out in Ring A, was seen frequently at the ring ansae by visual observers and frequently captured on digital images. Several images showed Keeler's Division (A8), but no visual observers actually estimated its intensity. No other intensity minima in Ring A were reported in 2003-04 either visually or in digital images. On 2003 November 10 (02:30UT) Vandebergh, observing from The Netherlands using an 18.0 cm (7.1 in.) Newtonian and a ToUcam webcam, imaged what resembled radial dusky spokes in Ring A (and also in Ring B) in what he rated as excellent seeing conditions. This was the only image and report

Figure 14. 2003 Oct 15 04:12UT Damian Peach. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. CMI = 301.0°, CMII = 160.3°, CMIII = 226.3° B = -24.8°, B´ = -25.9°. Small STrZ white spot near the CM.

Figure 15. 2003 Nov 23 05:35UT. Don Parker. 25.4 cm (10.0 in.) Dall-Kirkham, ToUcam webcam image, IL. S = 5.5 Tr = 5.0. CMI = 160.7°, CMII = 198.4°, CMIII = 217.2° B = -24.9°, B´= -25.7°. White spot in STrZ.

of such features in Ring A during the 2003-04 apparition.

Ring B. The outer third of Ring B remains the traditional standard of reference for the ALPO Saturn Visual Numerical Relative Intensity Scale, with an assigned value of 8.0. To visual observers during 2003-04 the outer third of Ring B was brilliant white, stable in intensity, and consistently the brightest feature on Saturn's globe or in the ring system, with the possible exception of the spurious Terby White Spot (TWS). The inner two-thirds of Ring B in 2003-04, which was described as bright yellowish-white in hue and uniform in intensity, portrayed essentially the same mean intensity since 2002-03. Observers using digital cameras were in general accord with the visual results during the apparition.

As in the immediately preceding apparition, several observers recorded dusky spoke-like features near the ansae in Ring B. For instance, Cudnik suspected spokes at the E ansa (IAU) and sketched them using a 35.6 cm. (14.0 in.) SCT at 326X on 2003 August 24 (11:34-11:58UT), and as mentioned previously in our discussion of Ring A, on November 10th (02:30UT) Vandebergh imaged what looked like dusky spokes in Ring B at both ansae with a ToUcam webcam attached to his 18.0 cm (7.1 in.) Newtonian in reportedly good seeing. Niechoy described what he thought could be radial spokes in the inner portion of Ring B at both ansae on 2004 April 27 (21:07UT) with a 20.3 cm (8.0 in.) SCT at 336X. There were no additional images or drawings by other observers of such spoke-like structures during the observing season. Observers are urged to continue attempts to image these elusive ring features when they are suspected visually; indeed, establishing their presence by simultaneous visual observations, with concurrent imaging, is exceedingly important.

Visual observers also suspected dark gray intensity minima at positions B1, B2, B4 and B6 in Ring B during 2003-04. A few of these faint features were noticeable in the images of Saturn, as well as some drawings that were contributed. Also imaged (but not recorded visually) were intensity minima at B5 and B8 positions in Ring B.

Cassini's Division (A0 or B10). Cassini's division (A0 or B10) was regularly detected visually as a grayish-black gap at both ansae during 2003-04, while in good seeing with moderate apertures this feature could be traced around the circumference of Saturn's ring system. A black Cassini's division was generally quite apparent in images received during 2003-04, and in some of the highest-quality images, the Northern Hemisphere of Saturn's could be perceived through Cassini's Division. It should be pointed out that any departure from a totally black intensity for Cassini's Division is merely a result of bad seeing, scattered light, inadequate aperture, and so forth. Also, the visibility of major ring divisions and other intensity minima was favorable in 2003-

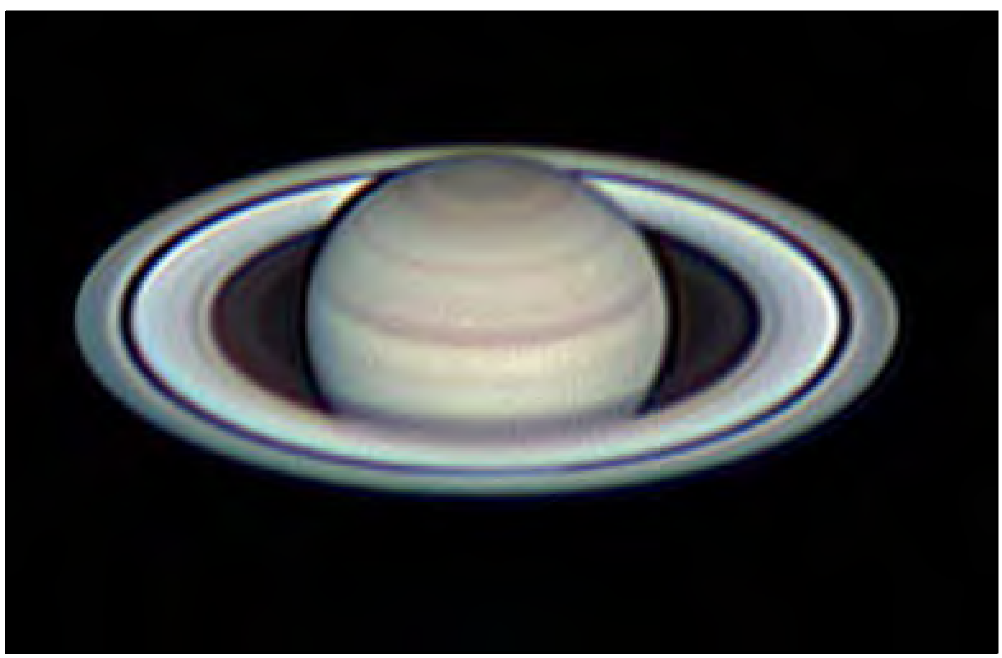

Figure 16. 2003 Dec 02 22:58UT. Cristian Fattinnanzi. 25.4 cm (10.0 in.) NEW, Vesta Pro webcam. IL + IR rejection filter. S = 7.0. CMI = 92.0°, CMII = 175.6°, CMIII = 182.7° B = -25.0°, B´ -25.7°. White spots in STrZ and SEBZ.

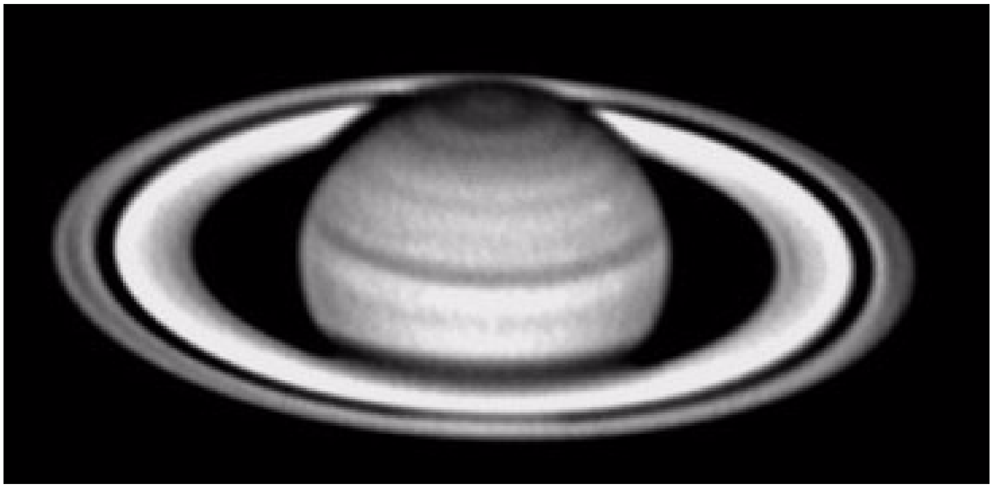

Figure 17. 2003 Dec 12 02:26UT. Jesus R. Sanchez. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. S = 6.5. CMI = 253.7°, CMII = 41.9°, CMIII = 37.9° B = -25.1°, B´ -25.6°. Small STrZ white spot.

04 because the numerical value of B attained -26.29° during the apparition, not too far from their maximum possible inclination to our line of sight that occurred in 2002-03. Accordingly, because of this substantial tilt of the rings toward Earth, Cassini's Division continued to look conspicuously dark, much like it did during 2002-03.

Ring C. The grayish-black Ring C at the ansae was routinely visible in 2003-04, and it was also considered perhaps a bit lighter in overall intensity when compared with 2002-03 data (mean intensity difference of +0.49). The Crepe Band, or simply Ring C in front of the globe of Saturn, appeared very dark gray in color and uniform in intensity, looking somewhat darker in 2003-04 than in 2002-03 (by a mean intensity factor of -0.61). Images revealed Ring C encircling the globe of Saturn and confirming most visual impressions of this ring component during 2003-04. When **B** and **B'** are both negative, and the numerical value of **B** exceeds that of **B'**, the shadow of the rings on the globe is cast to their south, circumstances that transpired starting 2004 January 05 through June 01 (the last observation received for the apparition). The Crepe Band then is situated south of the projected Rings A and B. If the value of **B** is less than that of **B'**, the ring shadow is to the north of the projected rings, which happened prior to January 05th. When the shadows of Rings A and B, and the Ring C projection are superimposed, it is very hard to tell them apart in ordinary apertures and seeing conditions, and the shadow of Ring C is a further complication.

Terby White Spot (TWS). The TWS is an apparent brightening of the rings immediately adjacent to the Sh G on R. On several dates during 2003-04 visual observers saw a brilliant TWS (intensity of 8.84), but this feature is just an artificial contrast effect, not a real feature of Saturn's rings. It is still useful, however, to try to determine what correlation might occur between the visual numerical relative intensity of the TWS and the varying tilt of the rings, including its brightness and visibility in variable-density polarizers, color filters, photographs, and digital images. Many processed images submitted during the 2003-04 apparition showed the spurious Terby White Spot as well.

Bicolored Aspect of the Rings and Azimuthal Brightness Asymmetries. The bicolored aspect of the rings refers to an observed variance in coloration between the East and West ansae (IAU system) when systematically compared with alternating W47 (where W denotes the Wratten filter series), W38, or W80A (all blue filters) and W25 or W23A (red filters).

The circumstances of visual observations are listed in *Table 5* when the bicolored aspect of the ring ansae was thought to be present in 2003-04. As in the rest of this report, directions in *Table 5* refer to Saturnian or IAU directions, where West is to the right in a normally-inverted telescope image (observer located in the Northern Hemisphere of the Earth) which has South at the top.

Of particular note in connection with *Table 5* were the comments by Haas referring to his views of the bicolored aspect of the rings on 2004 May 3, comparing the W and E ansae using a W47 (blue) filter, stating that "the difference is perhaps the greatest I have ever seen in all my years of studying this curious phenomenon." He was also quite impressed by his observations on May 5th, 14th, and 21st reporting that the "W (IAU) ansa is again much brighter than the E" in a W47 (blue) filter. Haas was clearly convinced, as he and other experienced observers have been in

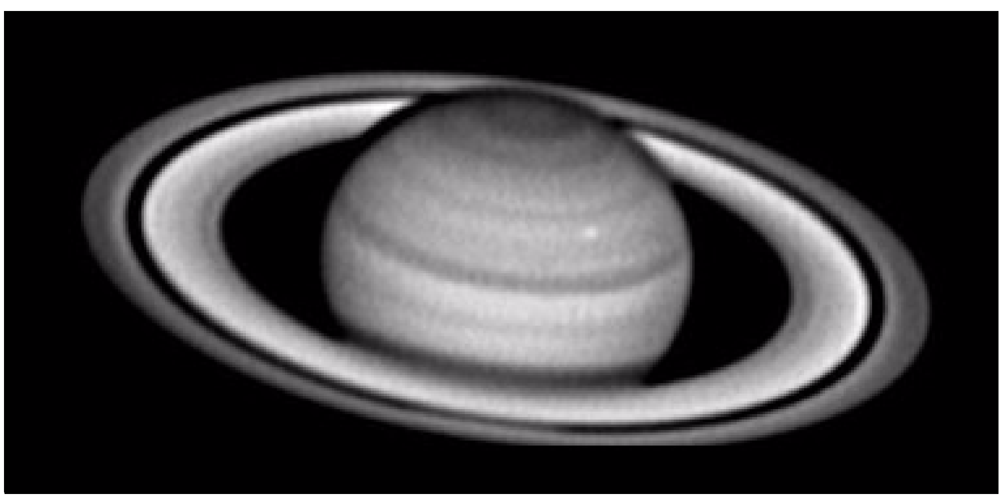

Figure 18. 2003 Dec 13 00:18UT. Jesus R. Sanchez. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. S = 6.5. CMI = 303.0°, CMII = 61.8°, CMIII = 56.8° B = -25.2°, B´ -25.6°. Small STrZ white spot.

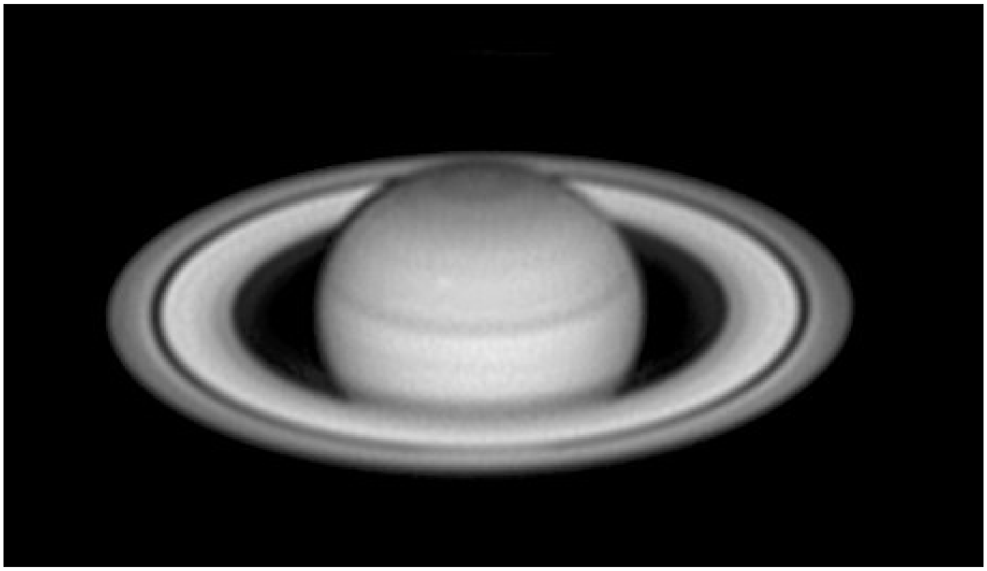

Figure 19. 2003 Dec 13 23:02UT. Paolo Lazzarotti. 25.4 cm (10.0 in.) NEW, with Vesta Pro webcam, IL. S = 6.0, Tr = 2.0. CMI = 22.9°, CMII = 111.0°, CMIII = 104.9° B = -25.2°, B´ -25.6°. Small STrZ white spot.

the past, that the phenomenon he saw was real.

In the last several apparitions, including 2003-04, observers have been systematically trying to capture the bicolored aspect of the rings using digital cameras, but results have so far been rather inconclusive. During the 2003-04 observing season, there were no images submitted in which this phenomenon was unmistakably apparent, but as imaging Saturn becomes an increasingly routine practice, the greater will be the likelihood of success. Combining simultaneous visual observations of Saturn with imaging of the planet on any given night by a group of observers is a worthwhile effort in searching for and confirming the bicolored aspect of the rings. In like fashion, Saturn observers are urged to try to digitally capture subtle azimuthal brightness asymmetries in Ring A that may be reported by visual observers working on the same date and at the same time. Documenting these phenomena, particularly when they occur independently of similar effects on the globe of Saturn (which would be expected if atmospheric dispersion was at fault), is extremely valuable. Professional astronomers are well-acquainted with Earth-based sightings of azimuthal variations in the rings (which were confirmed by Voyager spacecraft) that apparently arise when light is scattered by denser-than-average clumps of particles that orbit in Ring A, and thus such images by ALPO Saturn observers are in great demand. Consequently, observers are asked to continue imaging Saturn while others are viewing it simultaneously to try to capture the bicolored aspect of the rings and any azimuthal brightness differences in future observing seasons.

The Satellites of Saturn

Observers in 2003-04 submitted no systematic visual estimates of Saturn's satellites employing recommended systematic techniques. Also, photoelectric photometry coupled with regular visual magnitude estimates of Saturn's satellites is strongly encouraged in future apparitions. As far back as the 1999-2000 apparition, observers have been asked to attempt spectroscopy of Titan as part of a newly-introduced professional-amateur cooperative project. Although Titan has been occasionally studied by the Hubble Space Telescope (HST) and very large Earth-based instruments, and now extensively by the highly successful Cassini-Huygens mission, opportunities nevertheless still remain for systematic observations by amateurs with suitable instrumentation. As we all have witnessed during the ongoing Cassini-Huygens mission in 2004 and early 2005, Titan is a very dynamic satellite exhibiting transient as well as long-term variations. As mentioned in previous apparition reports, from wavelengths of 3000Å to 6000Å, Titan's color is dominated by a reddish methane (CH4) atmospheric haze, and beyond 6000Å, deeper CH4 absorption bands appear in its spectrum. Between these CH4 bands are “windows” to Titan's lower atmosphere and surface, so daily monitoring in

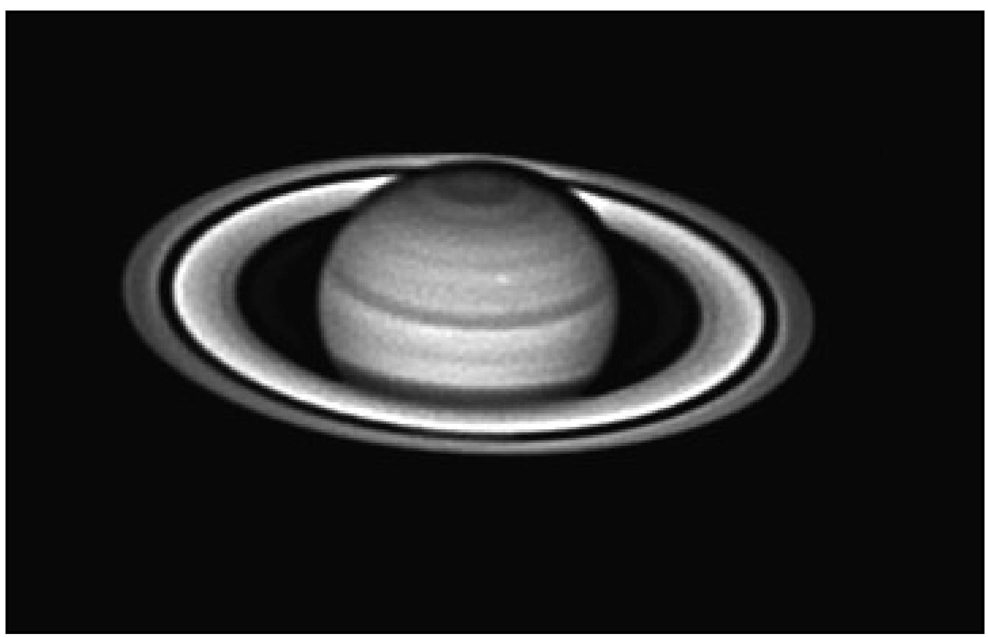

Figure 20. 2004 Jan 20 05:21UT. Ed Grafton. 35.6 cm (14.0 in.) SCT, ST5 CCD Image, IL. CMI = 167.4°, CMII = 132.0°, CMIII = 80.8° B = -25.8°, B´= -25.4°. Small STrZ white spots are visible.

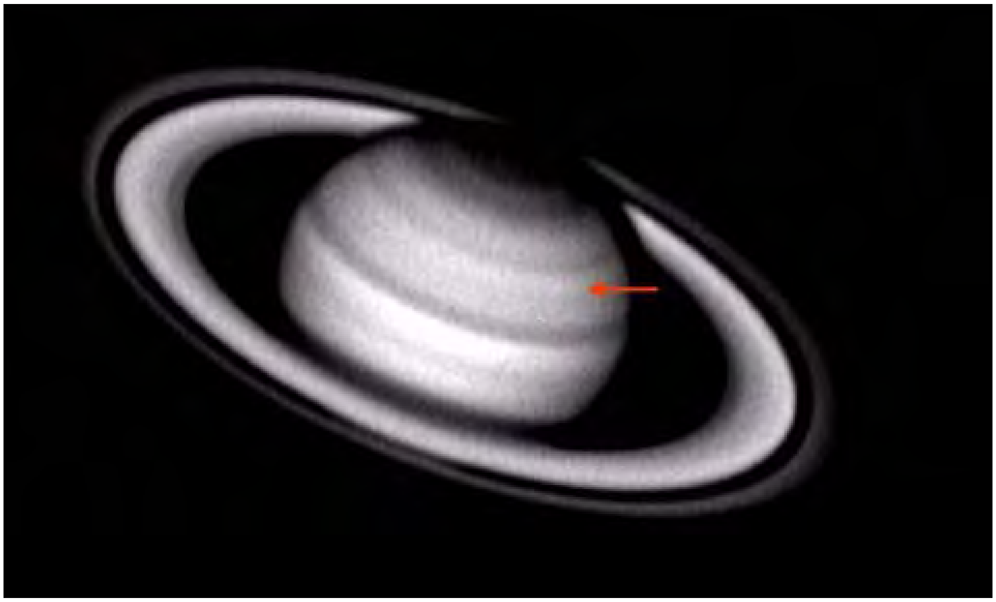

Figure 21. 2004 Jan 21 23:19UT. Jesus R. Sanchez. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL + IR blocking filter. S = 6.0. CMI = 203.8°, CMII = 111.9°, CMIII = 58.7° B = -25.8°, B´= -25.4°. Small STrZ white spot.

these "windows" with photometers or spectrophotometers is worthwhile for cloud and surface studies to supplement professional work underway in support of Cassini-Huygens. In addition, long-term studies of other areas from one apparition to the next is helpful in shedding light on Titan's known seasonal variations. Observers with the proper equipment are strongly urged to participate in these interesting and valuable professional-amateur projects. Further details on these endeavors can be found on the Saturn page of the ALPO website at *http://www.lpl.arizona.edu/alpo/* as well as from the ALPO Saturn Section.

Simultaneous Observations

Simultaneous observations, or studies of Saturn by individuals working independently of one another at the same time and on the same date, offer great opportunities for verification of ill-defined or traditionally controversial Saturnian phenomena. The ALPO Saturn Section has organized a simultaneous observing team so that several individuals in reasonable proximity of one another can maximize the chances of viewing and imaging Saturn at the same time using similar equipment and methods. Joint efforts like this significantly reinforce the level of confidence in the data submitted for each apparition. Several simultaneous, or near-simultaneous, observations of Saturn were submitted during 2003-04, but as in previous observing seasons, such observations occur mostly by chance. More experienced observers usually participate in this endeavor, but newcomers to our programs are wholeheartedly welcome to get involved. Readers are urged to inquire about how to join our simultaneous observing team.

Occultations of Stars by Saturn and its Rings

During the 2003-04 apparition, observers in North and South America (other regions, such as Europe, had less favorable circumstances) were afforded an opportunity to witness the rare event of a star of visual magnitude 8.6 (SAO 78867) in Gemini passing behind the rings and globe of Saturn. An occultation event like this involving a star of 8.6 magnitude, from the standpoint of visual observations, is best viewed with instruments well in excess of 15.2 cm (6.0 in.) aperture, but smaller instruments with digital imagers attached can capture phases of the occultation that might not otherwise be possible. From the Eastern United States, the star made contact with the outer edge of Ring A at roughly 05:30UT, then passed behind Cassini's Division somewhere around 06:00UT, traveled behind Ring C from 6:40-7:00UT and subsequently was hidden by the globe of Saturn, not reappearing at the opposite limb of the planet until about 10:40UT (times varied depending on the location of the observer). The reverse sequence of events followed thereafter until the star was clear of Ring A by around 12:40UT. Of course, the overwhelming brilliance of the ring system complicated matters immensely, lending great difficulty to any attempts by observers to estimate fluctuations in stellar magnitude, but several people suspected they could see the star when it was behind Cassini's Division using instruments rang-

Figure 22. 2004 Jan 31 02:02UT Paul Maxson. 20.3 cm (8.0 in.) SCT, ToUcam webcam, IL. S (not specified). CMI = 338.4°, CMII = 312.2°, CMIII = 247.9° B = -25.9°, B´= -25.4°. Small STrZ white spot.

Figure 23. 2004 Feb 01 21:16UT. Carmelo Zannelli and Giorgio Puglia. 41.2 cm (16.2 in.) NEW, Vesta Pro webcam, IL + IR rejection filter. CMI = 59.4°, CMII = 334.9°, CMIII = 268.5° B = -25.9°, B´= -25.4°. White spot in STrZ.

ing upwards from 25.4 cm (10.0 in.). On 2003 November 15, simultaneous observations in the form of sequential digital images of the star's passage behind Ring C were provided by Chavez (06:43-07:06UT), using a 20.3 cm (8.0 in.) Newtonian and ToUcam webcam, and Grafton (06:43-07:10UT) with a ST5 CCD and a 35.6 cm (14.0 in.) SCT. Later on the morning of November 15th, Williamson in New Mexico imaged the beginning of the second passage of the star behind Ring C using a ToUcam webcam attached to a 20.3 cm (8.0 in.) Newtonian at 10:58UT.

On the previous night, on November 14th at about 00:13UT, SAO 78867 (the same star) was to be occulted by Titan, but there were no reports of this sequence of events from ALPO observers, probably because the best opportunity to catch this occultation was from South Africa.

Conclusions

Saturn's atmosphere showed a fair amount of discrete activity, largely in the form of small white spots in the STeZ, STrZ, SEBZ, and EZs with occasional dark features showing up along the SEB during 2003-04. The perceived darkening of the SPC, with a lighter surrounding SPR, was another highlight of this apparition, confirmed both visually and with digital imaging. Aside from frequent visual observations and digital images of Cassini's (A0 or B10) and Encke's (A5) divisions, several observers imaged Keeler's gap (A8). Visual observers spotted, and imagers recorded, other intensity minima at various locations in Ring B. A couple of visual observers had strong suspicions and made drawings or descriptive reports of dusky ring spokes that were possibly evident in Ring B during 2003-04, and one webcam image of what looked like radial spokes in both Ring A and Ring B was contributed to the ALPO Saturn Section. Four different observers submitted accounts of the visibility of the bicolored aspect of the ring ansae during the observing season.

To conclude that there was an increase in activity in Saturn's Southern Hemisphere throughout 2003-04 (just as in the last apparition) is quite tentative and risky, however, because a considerable number of reports of atmospheric activity (especially very small white spots) during the observing season came about as a result of imaging of the planet which, when coupled with subsequent image processing, revealed features that were not otherwise detected visually. Of course, visual observers did record occasional diffuse white ovals in the EZs, as well as dark festoons and undulations along the northern edge of the SEBn. In addition, suspected fluctuations in belt and zone intensities emerged from quality visual work. But overall, it is probably correct to say that no major outbreaks of atmospheric phe-

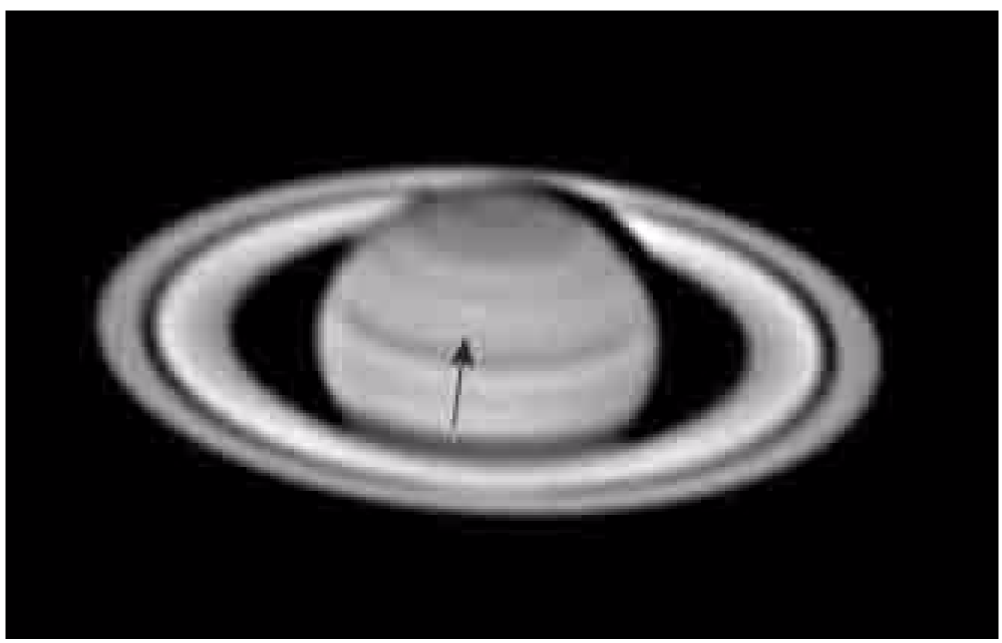

Figure 24. 2004 Feb 04 23:35UT. Christophe Pellier. 40.0 cm (15.7 in.) NEW, CCD image, IL. S = 5.5, Tr = 6.0 CMI = 153.8°, CMII = 329.4°, CMIII = 259.2° B = -26.0°,B´= -25.3°. White spot in STrZ.

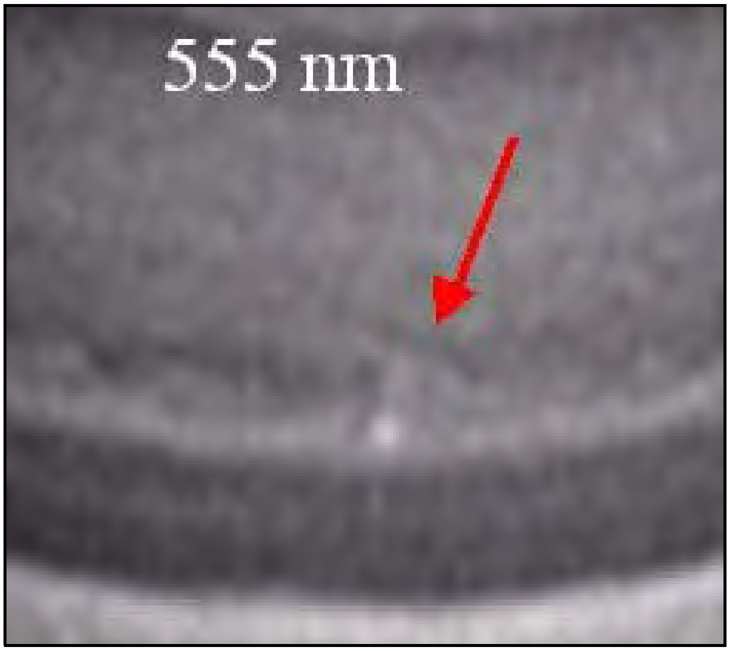

Figure 25. 2003 Aug 25 HST Image courtesy of Agustin Sánchez-Lavega of the International Outer Planets Watch (IOPW). White spot in SEBZ near Saturnigraphic latitude -29°.

nomena occurred on Saturn during the 2003-04 observing season. In the future, it should be anticipated that digital imaging, which now effectively supplements (but far from replaces) careful routine visual work, will reveal details on the globe and in the rings previously missed, which only helps improve our monitoring of Saturn as a planet. Furthermore, first indications of activity in various regions on Saturn by digital imagers may signal the beginning of an outbreak that visual observers may be able to witness and monitor later on, plus establish what the limits of visibility of such features might be. The combination of both visual work and imaging only helps expand out horizons as students of the planet Saturn and increases the opportunities for amateur and professional collaboration. These are, indeed, good and intriguing times for planetary enthusiasts who enjoy following Saturn and many of the other members of our solar system!

The author extends his sincerest thanks to all of the observers mentioned in this report who submitted visual drawings and digital images, and descriptive reports during the 2003-04 apparition. Systematic observational work in support of our programs helps amateur and professional astronomers alike to obtain a better understanding of Saturn and its always intriguing ring system, and observers everywhere are invited to join us in our studies Saturn in the coming year.

Readers should not forget about the opportunity that arose in 2004-05 for participation in the Amateur-Professional Cassini Observing Patrol, with Cassini's arrival at Saturn on 2004 July 01, followed by the Titan probe entry and orbiter flyby that occurred on 2004 November 27. Amateurs were encouraged to participate jointly with the professional community in capturing digital images of Saturn at wavelengths ranging from 400 nm - 1 micron in good seeing using digital cameras and videocams. This effort started during the 2003-04 observing season in 2004 April, coinciding with the time that Cassini began observing Saturn at close range, continuing into the 2004-05 apparition. The use of classical broadband filters (e.g. Johnson system: B, V, R and I) has been recommended, and for telescopes with apertures of 31.8 cm (12.5 in.) or greater, imaging through a 890-nm narrow band methane filter is desired. The Cassini Team wants observers to 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. Reports of suspected changes in belt and zone reflectivity (i.e., intensity) and hue are also useful, so visual observers have a chance to play a very useful role by making routine visual numerical relative intensity estimates. The Cassini team plans to combine ALPO Saturn Section images with data from the Hubble Space Telescope and from other professional ground-based observatories.

As an additional means of facilitating active amateur-professional observational cooperation, readers are urged to share their observations and images of Saturn and its satellites with the International Outer Planets Watch (IOPW) at http:// www.ehu.es/iopw/ or http:// iopw@lg.ehu.es in addition to sending data to the ALPO Saturn Section.

The ALPO Saturn Section Coordinator is always pleased to furnish guidance to new, as well as more experienced observers. A very meaningful resource for learn-

Figure 26. 2003 Oct 24 03:42UT. Damian Peach. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. CMI = 322.7°, CMII = 252.0°, CMIII = 307.1° B = -24.7°, B´ -25.9°. Small SEBZ white spot.

Figure 27. 2003 Oct 25 04:01UT. Damian Peach. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. CMI = 98.2°, CMII = 354.8°, CMIII = 48.6° B = -24.7°, B´ -25.8°. Small SEBZ white spot.

Figure 28. 2003 Oct 28 04:32UT. Damian Peach. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. CMI = 129.5°, CMII = 288.5°, CMIII = 338.7° B = -24.7°, B´ -25.8°. Small SEBZ white spot.

ing how to observe and record data on Saturn is the ALPO Training Program, and it is recommended that beginners take advantage of this valuable educational resource.

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Figure 29. 2003 Nov 02 08:48UT. Rolando Chavez. 31.8 cm (12.5 in.) NEW, with ToUcam webcam, IL. S (not specified). CMI = 181.5°, CMII = 173.2°, CMIII = 217.2° B = -24.7°, B´ -25.8°. Small SEBZ white spot.

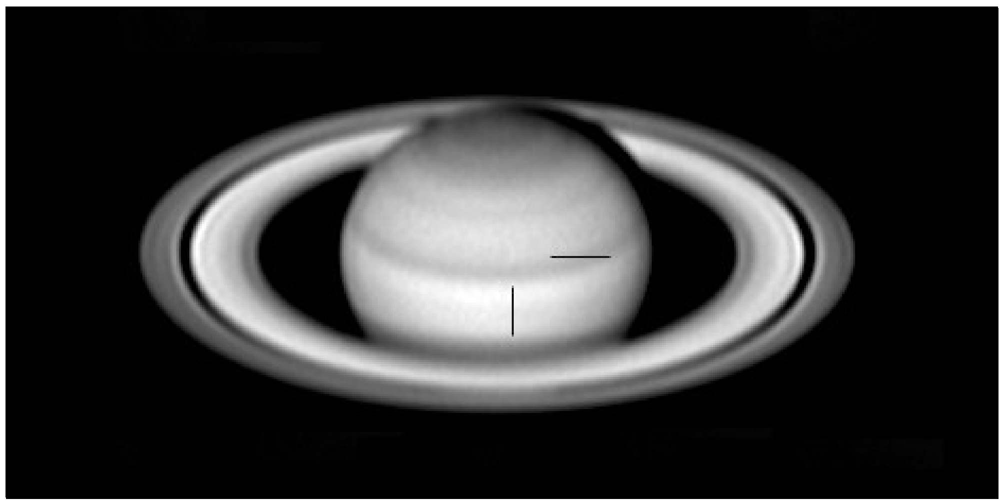

Figure 30. 2004 Feb 10 20:00UT. Paolo Lazzarotti. 25.4 cm (10.0 in.) NEW, with ToUcam webcam, IL. S = 7.0, Tr = 2.0. CMI = 53.5°, CMII = 40.1°, CMIII = 323.0° B = -26.0°, B´= -25.3°. Small SEBZ white spot.

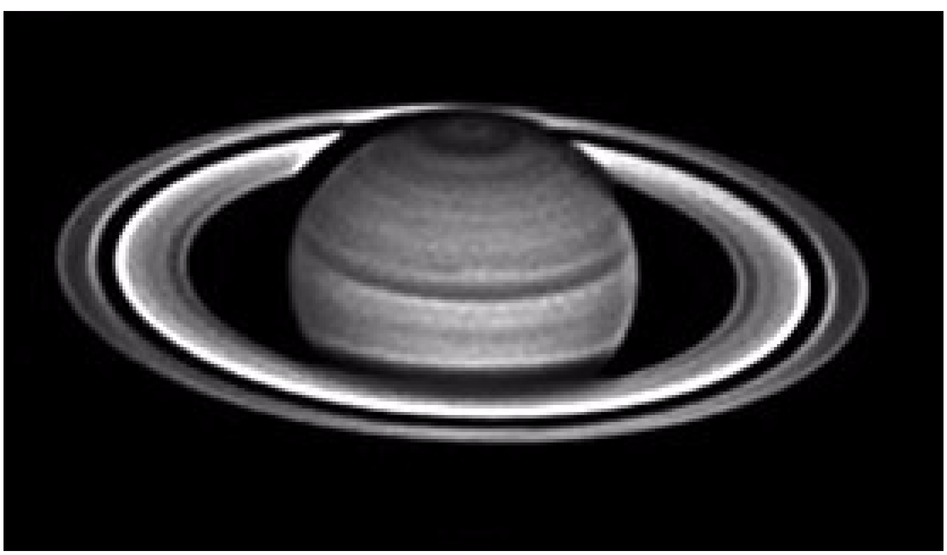

Figure 31. 2003 Nov 06 09:20-09:58UT. Ed Grafton. 35.6 cm (14.0 in.) SCT, ST5 CCD Image, IL. CMI = 353.1°, CMII = 214.3°, CMIII = 353.4° B = -24.8°, B´= -25.8°. Dark elongation riding along the N edge of the SEBs with what looked like A diffuse whitish area following it.

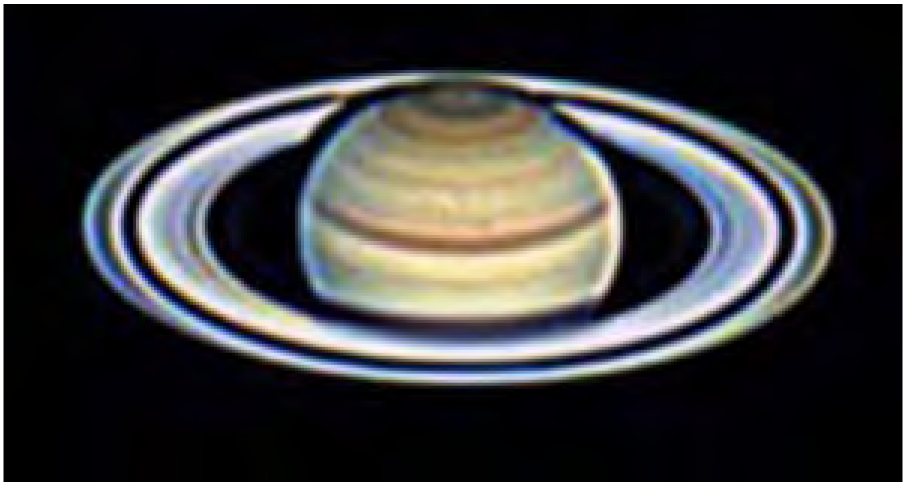

Figure 32. 2003 Nov 07 16:59-17:02UT. Toshihiko Ikemura. 30.5 cm (12.0 in.) NEW, CCD Image, IL. S (not specified). CMI = 12.6°, CMII = 191.7°, CMIII = 229.2° B = -24.8°, B´= -25.8°. Dark feature along the N edge of the SEBs.

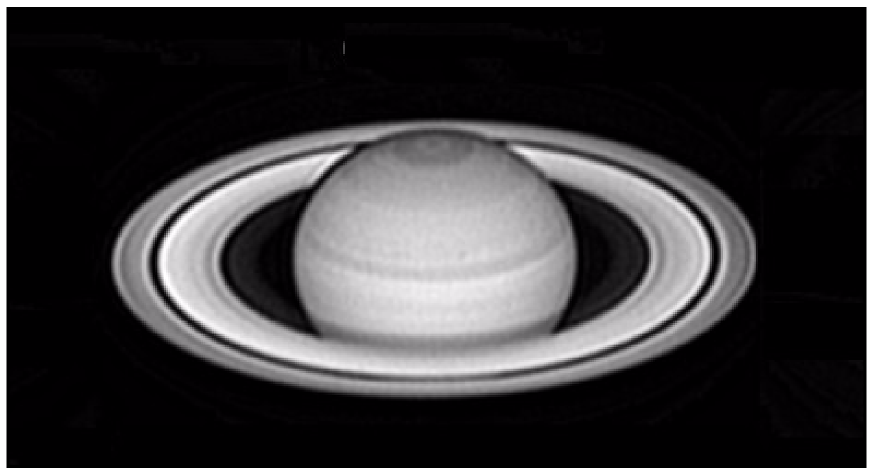

Figure 33. 2003 Dec 16 00:15UT. Damian Peach. 28.0 cm (11.0 in.) SCT, with ToUcam webcam, IL. CMI = 314.5°, CMII = 336.4°, CMIII = 327.8° B = -25.2°, B´ -25.6°. Small dark feature along N edge of SEBs.

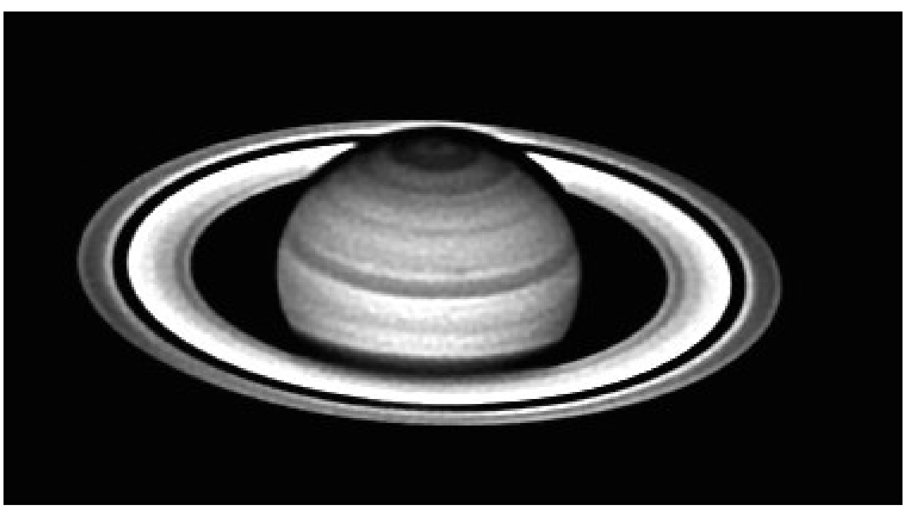

Figure 34. 2004 Jan 14 05:24UT. Ed Grafton. 35.6 cm (14.0 in.) SCT, ST5 CCD Image, IL. CMI = 143.0°, CMII = 301.3°, CMIII = 257.4° B = -25.7°, B´= -25.5°. Dark feature along the N edge of the SEBs.

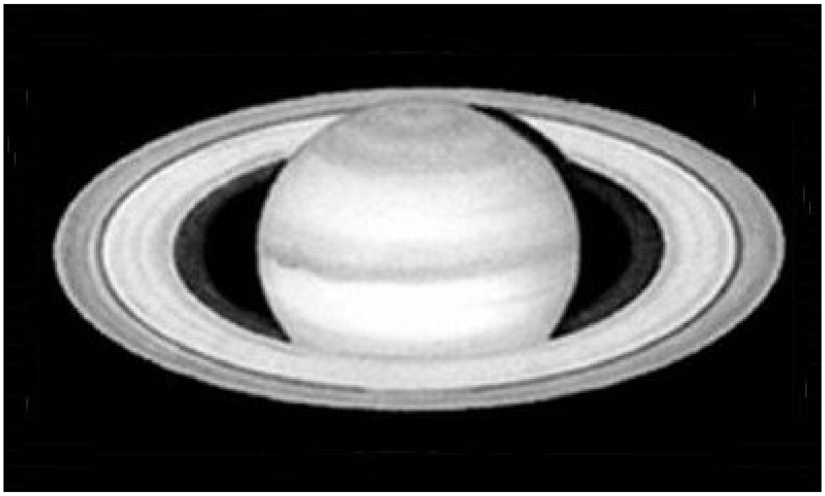

Figure 35. 2003 Nov 09 10:00-11:00UT. Carl Roussell. 15.2 cm (6.0 in.) NEW, Drawing. 204X, IL, W80A, W58, and W25 filters. S = 5.0 Tr = 3.0. CMI = 14.5°- 49.7°, CMII = 138.5°-172.3°, CMIII = 173.9°- 207.7° B = -24.8°, B´= -25.8°. Dark elongation along the N edge of the SEBn.

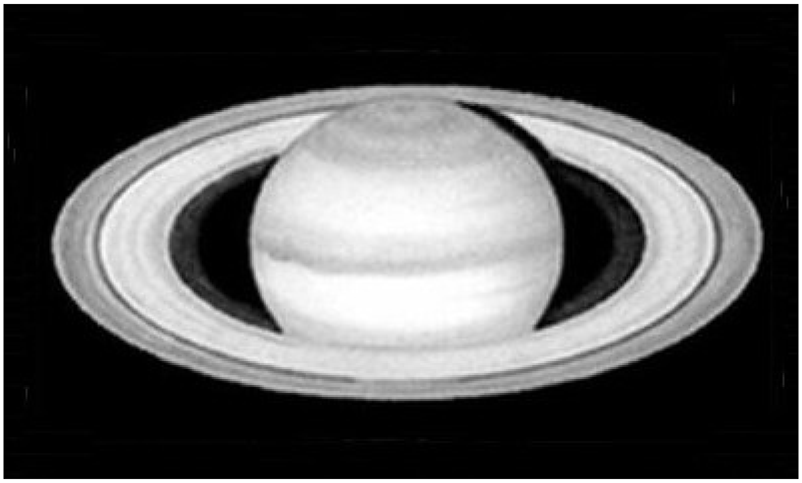

Figure 36. 2004 Feb 04 16:00-16:18UT. Sol Robbins. 15.2 cm (6.0 in.) REF, Drawing. 400X, IL. S = 7.0. CMI = 257.6°, CMII = 82.9°, CMIII = 13.2° B = -26.0°, B´= -25.3°. Dark elongation along the N edge of the SEBs near E limb.

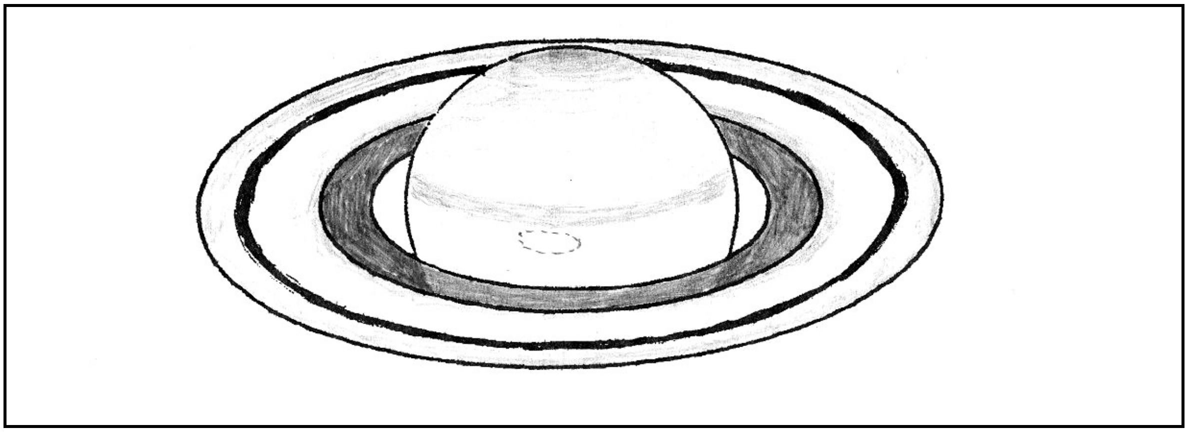

Figure 37. 2003 Aug 15 11:02-11:24UT. Brian Cudnik. 25.4 cm (10.0 in.) NEW, Drawing. 250X, IL, W80A, W21, and W47 filters. S = 6.5 Tr = 3.0. CMI = 159.1°- 172.0°, CMII = 179.7°-192.1°, CMIII = 318.9°- 331.3° B = -25.5°, B´= -26.1°. Elongated white area in the EZs just past the CM.

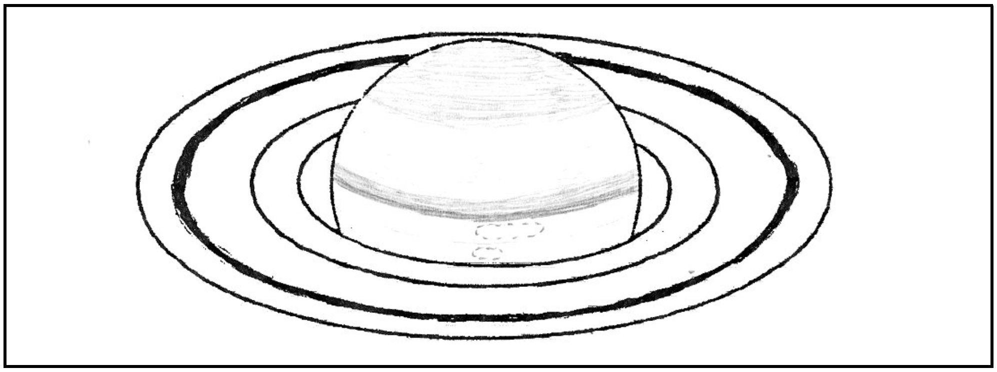

Figure 38. 2003 Nov 29 11:54-12:22UT. Brian Cudnik. 31.8 cm (12.5 in.) NEW, Drawing. 278X, IL, W80A, W25, and W47 filters. S = 8.0 Tr = 6.0. CMI = 49.4°- 65.8°, CMII = 244.8°-260.6°, CMIII = 256.1°- 271.8° B = -25.0°, B´= -25.7°. Elongated white area in the EZs just past the CM.

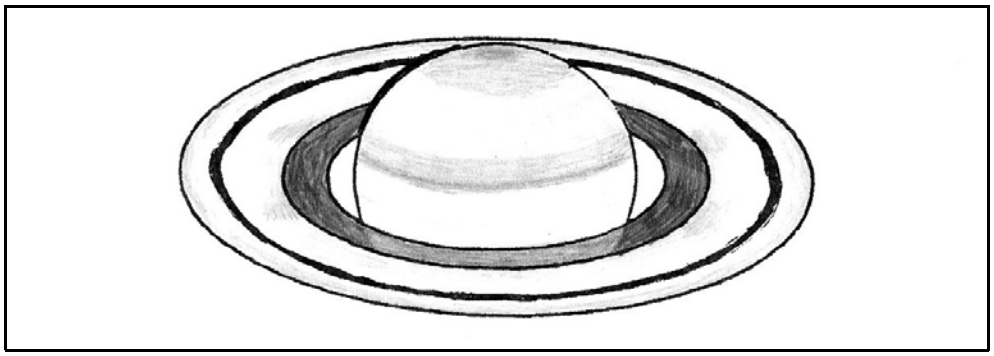

Figure 39. 2003 Aug 24 11:34-11:58UT. Brian Cudnik. 45.6 cm (14.0 in.) SCT, Drawing, 326-652X, IL, W80A, W25, and W47 filters. S = 8.0 Tr = 3.0. S = 6.5 Tr = 3.0. CMI 216.1°-230.8°, CMII = 305.3°- 319.4°, CMIII = 73.6°- 87.7° B = -25.4°, B´= -26.1°. Spokes suspected at both ansae in Ring B.

Figure 40. 2003 Nov 10 02:30UT. Ralf Vandebergh. 18.0 cm (7.1 in.) NEW. ToUcam webcam image, IL. S = 8.0. CMI = 235.0°, CMII = 336.8°, CMIII = 11.4° B = -24.8°, B´= -25.8°. Spokes at both ansae in Ring A and Ring B?

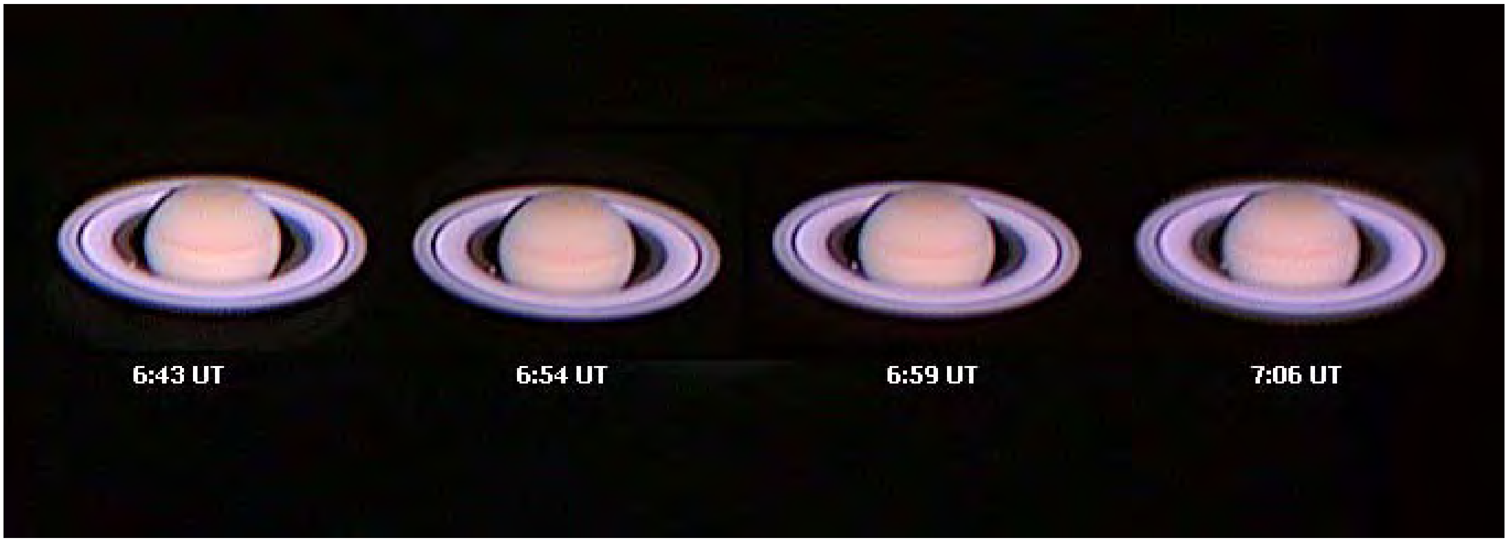

Figure 41. 2003 Nov 15 06:43-07:06UT. Rolando Chavez. 20.3 cm (8.0 in.) NEW, with ToUcam webcam, IL. S (not specified). CMI = 285.4° - 298.8°, CMII = 219.9°- 232.9°, CMIII = 248.4°- 261.3° B = -24.8°, B´= -25.8°. Sequential images of 8.6 magnitude star (SAO 78867) in Gemini passing behind Ring C.

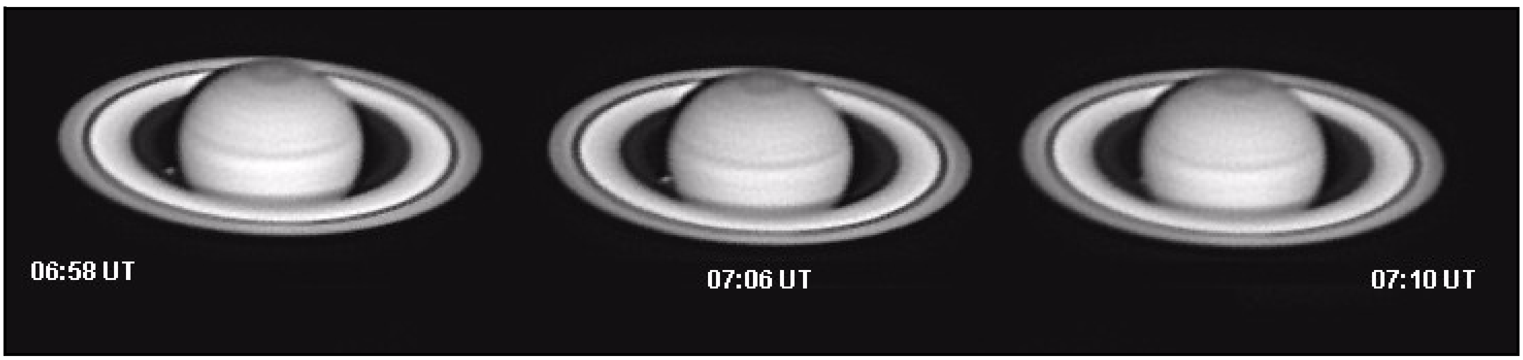

Figure 42. 2003 Nov 15 06:58-07:10UT. Ed Grafton. 35.6 cm (14.0 in.) SCT, ST5 CCD Image, IL. CMI = 294.2° - 301.2°, CMII = 228.4°- 235.2°, CMIII = 256.8°- 263.6° B = -24.8°, B´= -25.8°. Sequential images of 8.6 magnitude star (SAO 78867) in Gemini passing behind Ring C.

Figure 43: 2003 Nov 15 10:58UT. Thomas Williamson. 20.3 cm (8.0 in.) NEW, ToUcam webcam image, IL IL. CMI = 74.9°, CMII = 3.7°, CMIII = 31.9° B = -24.8°, B´= -25.8°. Second passage of 8.6 magnitude star (SAO 78867) in Gemini behind Ring C.

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Online Readers

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

ALPO Resources

People, publications, etc., to help our members

ALPO Solar Section Assistant Coordinator and Archivist Jamey Jenkins, this publication replaces *Observe and Understand the Sun* and its predecessor, *The Association of Lunar& Planetary Observer's Solar Section Handbook for the White Light Observation of Solar Phenomena*, both by the ALPO's own Rik Hill. To order, send check or US money order made payable to Jamey Jenkins, 308 West First Street, Homer, Illinois 61849; e-mail to *jenkinsjl@yahoo.com*

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

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

- **Lunar**: *The Lunar Observer*, official newsletter of the ALPO Lunar Section, published monthly. Free at *http://www.zone-vx.com/tlo.pdf* or 70 cents per copy hard copy; send SASE with payment (check or money order) to: William Dembowski, Elton Moonshine Observatory, 219 Old Bedford Pike, Windber, PA 15963

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

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

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

- **Jupiter:** *(1) Jupiter Observer's Handbook*, $15 from the Astronomical League Sales, c/o Marion M. Bachtell, P.O. Box 572, West Burlington, IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. (2) *Jupite*r, the ALPO section newsletter, available online only via the ALPO website; (3) *J-Ne*t, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougal. (4) *Timing the Eclipses of Jupiter's Galilean Satellites* observing kit and report form; send SASE to John Westfall. (5) *Jupiter Observer's Startup Ki*t, $3 from the Richard Schmude, Jupiter Section coordinator.

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

- **Meteors:** (1) *The ALPO Guide to Watching Meteors* (pamphlet). $4 per copy (includes postage & handling); send check or money order to Astronomical League Sales, c/o Marion M. Bachtell, P.O. Box 572, West Burlington,

ALPO Resources

People, publications, etc., to help our members

IA 52655; FAX: 1-319-758-7311; e-mail at alsales@astronomicalleague.com. (2) *The ALPO Meteors Section Newsletter*, free (except postage), published quarterly (March, June, September, and December). Send check or money order for first class postage to cover desired number of issues to Robert D. Lunsford, 1828 Cobblecreek St., Chula Vista, CA 91913-3917.

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

Other ALPO Publications

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

- ***An Introductory Bibliography for Solar System Observers.*** **No charge.** Four-page list of books and magazines about Solar System objects and how to observe them. The current edition was updated in October, 1998. Send self-addressed stamped envelope with request to current ALPO Membership Secretary (Matt Will).

- ***ALPO Membership Directory.*** Provided only to ALPO board and staff members. Contact current ALPO membership secretary/treasurer (Matt Will).

- ***Back issues of The Strolling Astronomer (JALPO)***. 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 56):

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