ISSN-0039-2502

Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 52, Number 3, Summer 2010

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Founded in 1947

Inside this issue . . .

- ***Complete ALPO Conference 2010 registration details!***
- ***A comparison of ALPO member observations with MESSENGER images***
- ***The Phase and Twilight Arc of Venus***
- ***Apparition report: Saturn in 2007-2008***

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

Comet McNaught (C/2009 R1) as imaged by Michael Jager on 2010 June 6.02, using a 20-cm telescope. Using an SXV-H9 CCD camera, he obtained separate 70-second exposures using red, green, and blue filters and then combined the images to form the color picture above. It was discovered by Australian astronomer Robert McNaught last September using the 0.5-meter Uppsala Schmidt telescope and a CCD camera. This comet is expected to be a bright one as June progresses. On the morning of June 20, the comet will be about magnitude +3 and about 15° above the horizon; and barely visible in the morning and evening sky on June 25 at about +2.5. The comet will be at its brightest magnitude of about +2 from June 30 to July 2 and then be an evening sky object, with an altitude of about 5° each day (possibly very difficult to see). Source for this caption, http://cometography.com/lcomets/2009r1.html .

Journal of the Association of Lunar & Planetary Observers

The Strolling Astronomer

Volume 52, No. 3, Summer 2010
This issue published in June 2010 for distribution in both portable document format (pdf) and also hardcopy format.

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

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

For membership or general information about the ALPO, contact:

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Point of View

ALPO Website Resources

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

(The following is a repeat effort to get you folks to visit the ALPO website. Just do it!)

Well folks, in case you hadn't noticed and just take things for granted, we have one heck of a website guru in our midst, that being Larry Owens. Besides doing website work for his employer (AT&T), Larry also handles online work for one of the Atlanta (Georgia) astronomy clubs (*www.ceastronomy.org*) .

Even if you check the ALPO website sporadically, you're sure to notice the professional hand he lends to our important activities. From the ALPO Picture of the Day (though it tends to last much longer) to the simple layout and easy navigation of the entire website, it's Larry's doing.

One of the most useful features I've found is the bank of utilities located on the right side of the ALPO homepage.

- JPL Space Calendar
  With a listing of thousands of astronomical events to help you plan observing.
- JPL Ephemeris Generator
  This will make an observing ephemeris for any location, any solar system object, any time or date.
- JPL Solar System Simulator
  See any major body in the solar system as it looks at any time from any other major body!
- An Excellent Astronomy Resource Site
  Lots of tables, charts and lists for educators and observers!
- The Astronomy Yellow Pages
  Your one-stop shopping guide to all things astronomical!
- Universe Today
  Space news from around the Internet, updated every weekday.
- SpaceWeather.com
  Space/Astronomy news, updated every day.
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Jacksonville, Florida

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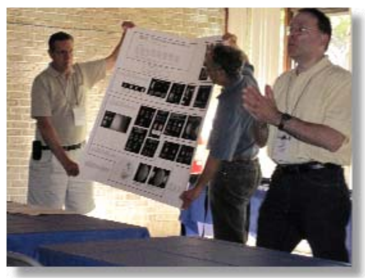

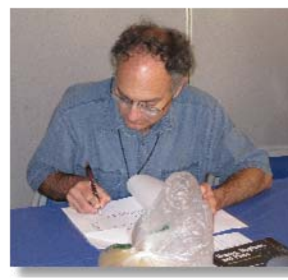

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☎ **Call for Papers will be issued by Dr. Richard Schmude, ALPO Director**

Registration information posted at www.alpo-astronomy.org

☞ ***For additional information please contact Dr. Mike Reynolds; mreynold@fscj.edu***

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2010 ASSOCIATION OF LUNAR & PLANETARY OBSERVERS CONFERENCE

July 29th through July 31st

Jacksonville, Florida

PLEASE PRINT!

Name ____

Spouse or Other Family Member ______________________________

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____

Email Address(es) ______________________________________
→Receipt of your Registration will be acknowledged via email, as well as any updates

Name(s) for your Name Badges (Tom, Betty, etc.) ______________________

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Your 2010 ALPO Conference Hosts!

FLORIDA STATE COLLEGE at Jacksonville

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News of General Interest

Don't Forget: ALPO 2010

The 2010 annual conference of the Assn of Lunar & Planetary Observers will be held Thursday through Saturday, July 29 - 31, at Florida State College at Jacksonville.

Participants are encouraged to submit research papers, presentations, and experience reports concerning Earth-based observational astronomy of our solar system for presentation at the event.

Note that on July 1, 2010, late registration fee begins (late registration via mail accepted up to July 15; then in-person at conference afterwards).

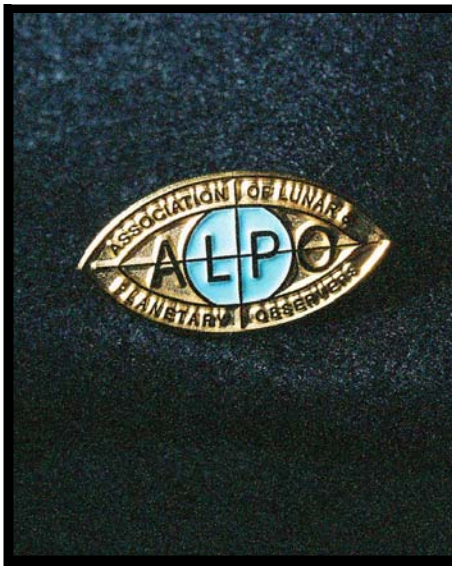
For more information, contact Dr. Richard Schmude, Professor of Chemistry, Gordon College, Barnesville, Georgia 30204; 770-358-0728 schmude@gdn.edu

Join/ renew your ALPO membership online

Save yourself the postage and either join or renew your ALPO membership at either of two online locations:

- Telescopes by Galileo www.galileosplace.com/ALPO/
- The Astronomical League, (online readers click here); hard copy readers, go to http://www.astroleague.org, then left-click on "Login for AL Store" in the left panel, then left-click on ALPO in the list of categories page, then left-click on the ALPO membership choice.

The ALPO thanks both *Telescopes by Galileo* and *The Astronomical League* for providing this valuable online service.



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Send orders to: ALPO, PO Box 13456, Springfield, IL 62791-3456. E-mail to: matt.will@alpo-astronomy.org

ALPO Interest Section Reports

Web Services

Larry Owens,
acting section coordinator
Larry.Owens@alpo-astronomy.org

Visit the ALPO home page online at www.alpo-astronomy.org

Computing Section

Larry Owens,
acting section coordinator,
Larry.Owens@alpo-astronomy.org

Important links:

- To subscribe to the ALPOCS yahoo e-mail list, http://groups.yahoo.com/group/alpocs/
- To post messages (either on the site or via your e-mail program), alpocs@yahoogroups.com.
- To unsubscribe to the ALPOCS yahoo e-mail list, alpocs-unsubscribe@yahoogroups.com
- Visit the ALPO Computing Section online at www.alpo-astronomy.org/computing.

Lunar & Planetary Training Program

Tim Robertson,
section coordinator
cometman@cometman.net

For information on the ALPO Lunar & Planetary Training Program, go to www.cometman.net/alpo/; regular postal mail to Tim Robertson, 195 Tierra Rejada Rd. #148, Simi Valley CA, 93065; e-mail to cometman@cometman.net

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ALPO Observing Section Reports

Eclipse Section

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

Please visit the ALPO Eclipse Section online at www.alpo-astronomy.org/eclipse.

Comets Section

Gary Kronk,
acting section coordinator
kronk@cometography.com

Visit the ALPO Comets Section online at www.alpo-astronomy.org/comet.

Meteors Section

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

Our planned expedition to the Mojave Desert to view the 2010 Lyrid meteor shower was cancelled due to stormy weather. We had some interest to form an expedition for the upcoming Perseids in August, but this too is likely to be cancelled. Needless to say it would not have been to the Mojave Desert with its 100°F weather that time of year! A better bet is for the 2010 Geminids, which will peak on December 13. The weather is usually clear in the Mojave Desert in December, plus the temperatures usually remain above freezing. The Moon will be at its first quarter phase and will be setting as the best portion of the show gets into full swing. Reports of numerous fireballs during last year's Geminids offer a peek at what may occur this year under even better conditions. We hope other ALPO members will consider joining us under the dark Mojave skies!

Visit the ALPO Meteors Section online at www.alpo-astronomy.org/meteor.

Meteorites Section

Dolores Hill, section coordinator
dhill@lpl.arizona.edu

Visit the ALPO Meteorite Section online at www.alpo-astronomy.org/meteorite/

Solar Section

Kim Hay, section coordinator,
kim.hay@alpo-astronomy.org

For information on solar observing – including the various observing forms and information on completing them – go to www.alpo-astronomy.org/solar

Mercury Section

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

Visit the ALPO Mercury Section online at www.alpo-astronomy.org/mercury.

Venus Section

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

Venus now appears low in the West after sunset as the 2010 Eastern (Evening) Apparition progresses. Venus is passing through its waning phases (a progression from fully illuminated through crescentic phases). At the time of this report, the gibbous disk of Venus is about 11.0" across and 90.0% illuminated [see attached illustration]. During the 2010 Eastern (Evening) Apparition, observers are witnessing the leading hemisphere of Venus at the time of sunset on Earth. The Geocentric Phenomena in Universal Time (UT) are presented in the accompanying table here for the convenience of observers for the 2010 Eastern (Evening) Apparition.

Mario Frassati of Crescentino, Italy, submitted this excellent drawing of Venus on April 5, 2010 at 18:15 UT using a 20.3cm (8.0 in.) SCT. He used a W80A (light blue) filter at 160x to produce the drawing which depicts vague banded dusky features and terminator shading. Seeing = 3, Transparency 4. Apparent diameter of Venus is 10.7", phase (k) 0.938 (93.8% illuminated), and visual magnitude 3.9. South is at top of image.

Observers have begun sending in observations for the 2010 Eastern (Evening) Apparition, and readers are reminded that high quality digital images of the planet taken in the near-UV and near-IR, as well as other wavelengths through polarizing filters, are still needed by the Venus Express (VEX) mission, which started systematically monitoring Venus at UV, visible (IL) and IR wavelengths nearly four years ago in late May 2006. This Professional-Amateur

Geocentric Phenomena of the 2010 Eastern (Evening) Apparition of Venus in Universal Time (UT)

Superior Conjunction	2010	Jan 11 (angular diameter = 9.8 arc-seconds)
Predicted Dichotomy	2010	Aug 17.64 (exactly half-phase)
Greatest Elongation East	2010	Aug 20 (46° east of the Sun)
Greatest Brilliancy	2010	Sept 24 ($m_V = -4.7$)
Inferior Conjunction	2010	Oct 19 (angular diameter = 58.3 arc-seconds)

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(Pro-Am) effort continues, and observers should submit images in *.jpg format to the ALPO Venus Section as well as to the VEX website at:

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

Routine observations of Venus are still needed throughout the period that VEX is observing the planet, which continues into 2010. Since Venus has a high surface brightness it is potentially observable anytime it is far enough from the Sun to be safely observed.

Regular observational work carried out by the ALPO Venus Section includes:

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

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

Individuals interested in participating in the programs of the ALPO Venus Section are encouraged to visit the ALPO Venus Section online at www.alpo-astronomy.org/venus.

Lunar Section:
Lunar Topographical Studies / Selected Areas Program

Report by Wayne Bailey, acting program coordinator
wayne.bailey@alpo-astronomy.org

During this quarter, the ALPO Lunar Topographical Studies Section (ALPO LTSS) received a total of 137 new observations from 15 observers, including 13 banded crater program forms.

"Focus On" features in *The Lunar Observer* continued with articles on Snellius-Furnerius and Ray Craters.

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Lunar Calendar, July thru September 2010 (all times UT; Geocentric Data)

July 01	10:13	Moon at Apogee (405,035 km – 251,677 miles)
July 03	16:00	Moon 6.0° NNW of Uranus
July 03	20:00	Moon 6.5° NNW of Jupiter
July 04	14:36	Last Quarter
July 06	16:54	Extreme North Declination
July 11	19:40	New Moon (Start of Lunation 1083)
July 11	19:40	Total eclipse of the Sun
July 12	23:00	Moon 3.9 SSW of Mercury
July 13	11:22	Moon at Perigee (361,114 km - 224,386 miles)
July 14	22:00	Moon 5.5° SSW of Venus
July 16	00:00	Moon 5.6° SSW of Mars
July 16	14:00	Moon 7.4° SSW of Saturn
July 18	21:59	First Quarter
July 22	11:18	Extreme South Declination
July 26	01:36	Full Moon
July 28	02:00	Moon 4.3° NNW of Neptune
July 28	23:51	Moon at Apogee (405,954 km - 252,248 miles)
July 30	22:00	Moon 5.9° NNW of Uranus
July 31	02:00	Moon 6.6° NNW of Jupiter
Aug. 06	02:54	Extreme North Declination
Aug. 03	04:60	Last Quarter
Aug. 10	03:08	New Moon (Start of Lunation 1084)
Aug. 10	17:57	Moon at Perigee (357,857 km - 222,362 miles)
Aug. 12	00:00	Moon 2.2 SSW of Mercury
Aug. 13	02:00	Moon 7.3° SSW of Saturn
Aug. 13	08:00	Moon 4.2° SSW of Venus
Aug. 13	14:00	Moon 5.5° SSW of Mars
Aug. 16	18:14	First Quarter
Aug. 18	17:06	Extreme South Declination
Aug. 24	07:00	Moon 4.2° NNW of Neptune
Aug. 24	17:05	Full Moon
Aug. 25	05:52	Moon at Apogee (406,389 km - 252,518 miles)
Aug. 27	01:00	Moon 5.8° NNW of Uranus
Aug. 27	05:00	Moon 6.6° NNW of Jupiter
Sept. 01	17:22	Last Quarter
Sept. 02	11:18	Extreme North Declination
Sept. 07	22:00	Moon 1.7° S of Mercury
Sept. 08	04:02	Moon at Perigee (357,191 km - 221,948 miles)
Sept. 08	10:29	New Moon (Start of Lunation 1085)
Sept. 09	18:00	Moon 7.2° SSW of Saturn
Sept. 11	04:00	Moon 4.8° SSW of Mars
Sept. 11	14:00	Moon 0.56° SE of Venus
Sept. 14	23:48	Extreme South Declination
Sept. 15	05:49	First Quarter
Sept. 20	13:00	Moon 4.2° NNW of Neptune
Sept. 21	08:04	Moon at Apogee (406,167 km - 252,380 miles)
Sept. 23	04:00	Moon 6.5° NNW of Jupiter
Sept. 23	05:00	Moon 5.7° NNW of Uranus
Sept. 23	09:18	Full Moon
Sept. 29	17:36	Extreme North Declination

(Table courtesy of William Dembowski)

Future subjects include Dark-Halo Craters and the Mare Nectaris basin. Three contributed articles were published and 19 observations included extensive comments.

Visit the following online web sites for more info:

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

Lunar Domes Survey

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

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

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Lunar Meteoritic Impacts

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

Please visit the ALPO Lunar Meteoritic Impact Search site online at www.alpo-astronomy.org/lunar/lunimpacts.htm.

Lunar Transient Phenomena

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

Finally, live LTP alerts are now available via Twitter at http://twitter.com/lunarnaut.

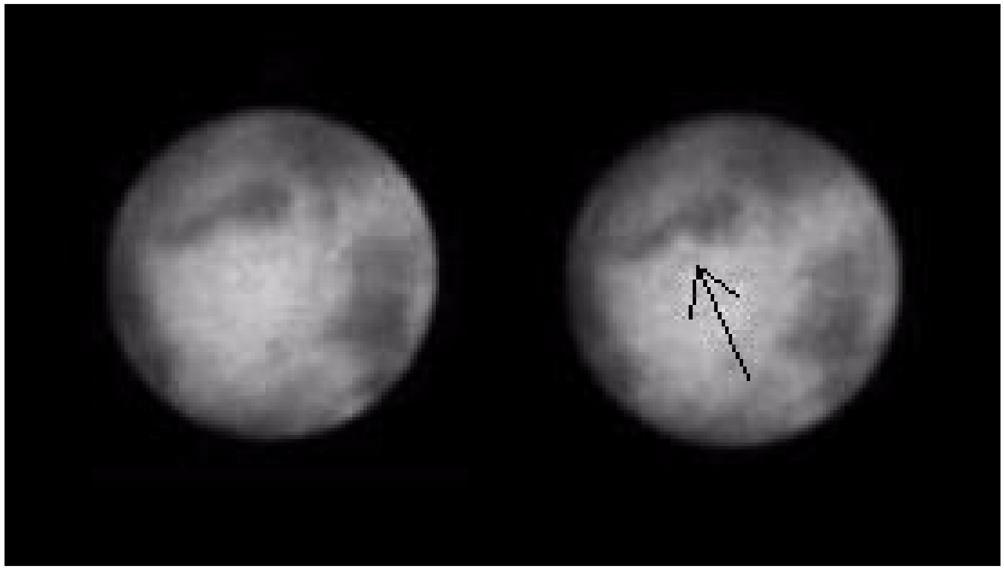
Please visit the ALPO Lunar Meteoritic Impact Search site online at www.alpo-astronomy.org/lunar/lunimpacts.htm.

Mars Section

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

Mars is now in the evening sky, being past eastern quadrature. It appears small, about 6.7 arc seconds in mid-May, as it is just past aphelion and Earth is racing ahead and away from it around the Sun. Northern summer began in mid-May, and the North Polar Cap is now small. Many observers are still actively imaging and drawing the planet, routinely recording orographic clouds as well as albedo features. You can access everyone's images and participate in the discussion by joining the Mars Observers' Group at http://tech.groups.yahoo.com/group/marsobservers .

An old image has come to our attention that shows a possible flash on the surface of Mars. This event is not in the compilation that Tom Dobbins and Bill Sheehan made (see "Solving the Martian Flares Mystery," on our website at http://www.alpo-astronomy.org/mars/articles/MartianFlaresALPO.pdf). The image was made by Timothy J. Parker on April 17, 1999 (see accompanying image). Note that there are two images, one made 14 minutes before the other.



Tim Parker's images. The left image was made at 10:06 UT on April 17, 1999, and is a stack of 4 exposures of 0.2 seconds each, selected from many made with a Starlight Xpress HX516 camera with a W25 (red) filter. CM is 347. The right image is a stack of 3 images made identically, 14 minutes later. CM is 351°. Seeing 8, transparency 5. Newtonian telescope of 200 mm aperture, with eyepiece projection

The first one shows the Edom Promontorium area with a normal appearance, while the second one shows it bright (arrowed.) There is slight mottling of the desert surface in these images, indicating that the signal-to-noise ratio is low, so it is possible that the anomalous brightening is an artifact due to imaging noise. However, the image is highly suggestive of a brief specular reflection from Edom.

This is the same area in which flashes were observed by Saheki in 1954, by McClelland in 1954, by Tasaka in 1958, and by the ALPO group in the Florida Keys in 2001. That ALPO group included Tom Dobbins, Bill Sheehan, Don Parker, Jeff Beish, Richard Schmude, and planetary videographer David Moore; Rick Fienberg and Gary Seronik from Sky and Telescope; Tippy and Patty D'Auria of the Southern Cross Astronomical Society; and Timothy Parker, who had made the images shown here about two years before.

Tim Parker is an astro-geologist working at the Jet Propulsion Laboratory. He has done much work on interpreting the findings of the Mars Exploration Rovers and is working on the coming Mars Science Laboratory. Tim is the originator of the Mars global ocean hypothesis. He lives with his wife Mari, who is an archeologist, and they have two adult children. When he is not restoring antique cars or making telescopes, Tim continues to image Mars.

Visit the ALPO Mars Section online at www.alpo-astronomy.org/mars.

Minor Planets Section

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

In *Minor Planet Bulletin* Vol. 37, No. 2, 2010 Apr. - June, a worldwide consortium of observers led by Petr Pravec and Brian Warner report improved system parameters for the binary Hungaria-type asteroids 1509 Esclangona and 2131

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Mayall, and the parameters for the newly discovered binary (26471) 2000 AS152.

Most amateur asteroid photometry has been differential photometry, in which the asteroid brightness is compared with the mean of several fixed stars in the field but without obtaining real magnitudes. These intrumental magnitudes obtained on different nights with different comparison stars are adjusted up or down to obtain a good fit, sufficient to reliably determine rotation period and amplitude. An increasing number of people are now comparing asteroid magnitudes with the real magnitudes of stars. This technique has been applied to asteroids 244, 1130, 1176, and 2093 to obtain absolute magnitudes and the rate at which these change with phase angle.

Julian Oey has found evidence that 2705 Wu, with a long period of 150.5 hours, shows changes indicative of tumbling rather than pure principal axis rotation, but the complete behavior is not yet defined.

Lightcurves with derived rotation periods and amplitudes only have been published therein for 67 other asteroids, numbers 53, 81 285, 298, 419, 449, 452, 527, 546, 588, 610, 649, 652, 985, 990, 1023, 1101, 1131, 1345, 1355, 1398, 1564, 1583, 1626, 1750, 1819, 1906, 1994, 2001, 2083, 2235, 2456, 2625, 2888, 3086, 3548, 3564, 3793, 4125, 4531, 4554, 4736, 5230, 5841, 6141, 6444, 8135, 9739, 14614, 14934, 15967, 16669, 17683, 20421, 24654, 26380, 29242, 29308, 31628, 31850, 37634, 38047, 40203, 40701, 46530, 66037, 75985, 80509, 94763, 114127, 127311, 136849, 189265, 218144, 2005 UB275, 2006 SZ217, 2008 UE7, 2009 XR2.

Some of these provide secure period determinations, some only tentative ones. Some are of asteroids with no previous lightcurve photometry, others are of asteroids with previous determinations and may be consistent or inconsistent with the earlier values.

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

In addition, please visit the ALPO Minor Planets Section online at *http://www.alpo-astronomy.org/minor*.

Jupiter Section

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

People have already submitted the first observations of the new 2010-11 apparition. Anthony Wesley's images show a strong North Equatorial Belt and a faint South Equatorial Belt on Jupiter. The Great Red Spot is visible. Currently, Jupiter can only be seen during the early morning hours. It will reach opposition in September.

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You coordinator submitted the 2006-07 Jupiter apparition report to the editor of this Journal in February. The 2008 Jupiter apparition report is nearly finished. One exciting development in 2008 was the appearance of the rare South South South Temperate Current jet stream. Both the BAA and ALPO detected this current in 2008. This coordinator has started on the 2009-10 Jupiter report with plans to have it completed in May.

Visit the ALPO Jupiter Section online at *http://www.alpo-astronomy.org/jupiter*

Galilean Satellite Eclipse Timing Program

John Westfall, assistant Jupiter section coordinator
johnwestfall@comcast.net

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

Contact John Westfall via regular mail at P.O. Box 2447, Antioch, CA 94531-2447 USA or e-mail to *johnwestfall@comcast.net* to obtain an observer's kit, also available on the Jupiter Section page of the ALPO website.

Saturn Section

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

Saturn is now visible right after sunset in the East when skies darken, situated in the constellation of western Virgo at apparent visual magnitude +0.8. Saturn passed opposition on March 21, 2010, and the northern hemisphere and north face of the rings are becoming increasingly visible as the ring tilt towards Earth increases throughout the next several years, with regions south of the rings becoming progressively less favorable to view. Right now, the rings are inclined about +2.0 toward Earth. This tilt will continue to diminish towards a minimal inclination to our line of sight by late May into early June, then begin increasing to as much as to +6.0 right before conjunction with the Sun on October 1.

The table of geocentric phenomena for the 2009-10 apparition which accompanies this report is presented for the convenience of observers.

For the 2009-10 apparition, as was the case during the immediately preceding observing season, small inclinations of rings will allow observers to continue to witness transits, shadow transits, occultations, and eclipses of satellites lying near Saturn's equatorial plane. Apertures under about 20.3 cm (8.0 in.) are usually unable to produce the best views of these events, except perhaps in the case of Titan.

Those who can image and obtain precise timings (UT) to the nearest second of ingress, CM passage, and egress of a satellite or its shadow across the globe of the planet at or near edgewise presentations of the rings should send their data to the ALPO Saturn Section as quickly as possible. Notes should be made of the belt or zone on the planet crossed by the shadow or satellite, and visual numerical relative intensity estimates of the satellite, its shadow, and the belt or zone it is in front of is important, as well as drawings of the immediate area at a given time during the event.

So far this apparition, observers have submitted over 200 images and sketches of Saturn. Activity has been imaged in the South Tropical Zone (STrZ) in the form of a small, evolving white spot that began as a rather compact feature in early March, becoming somewhat elongated and exhibiting changes in overall morphology with time. Observers are continuing to image the STrZ white spot, which should be monitored carefully as the apparition progresses. There have also been reports in mid-April of a very diffuse South Equatorial Belt Zone (SEBZ) white spot and a general brightening of the northern Equatorial Zone (EZn).

The following are important activities for ALPO Saturn observers and include Pro-Am opportunities in support of the ongoing Cassini mission:

- Visual numerical relative intensity estimates of belts, zones, and ring components.
- 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 in 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 940 nm – 1,000 nm.
- Imaging Saturn using a 890 nm narrow band methane (CH_4) filter with apertures of 31.8 cm (12.5 in.) or larger to alert the Cassini team of interesting large-scale targets and suspected changes in belt and zone reflectivity.

Geocentric Phenomena for the 2009-2010 Apparition of Saturn in Universal Time (UT)	
Conjunction	2009 Sep 17^d
Opposition	2010 Mar 21^d
Conjunction	2010 Oct 01^d
Opposition Data:	
Equatorial Diameter Globe	15.7 arc-seconds
Polar Diameter Globe	14.0 arc-seconds
Major Axis of Rings	35.6 arc-seconds
Minor Axis of Rings	4.2 arc-seconds
Visual Magnitude (m_v)	0.9 m_v (in Leo)
B =	+6.4°

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Saturn image taken on April 16, 2010, at 21:43 UT by Emil Kraaikamp of Drenthe, The Netherlands, with a 25.4 cm. (10.0 in.) f/4.5 Meade Starfinder Newtonian @ f/36 and a modified DMK21 CCD outfitted with Astronomik RGB filters. The STrZ white spot is quite apparent in this excellent image, with a hint of a possible SEBZ white feature and brightening of the EZn. S is at the top of the image. Ring tilt is +2.2°. CMI = 137.2 , CMII = 300.0 , CMIII = 21.1 .

- Regular digital imaging of Saturn and its satellites at various wavelengths.

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

The ALPO Saturn Section appreciates the dedicated work by so many observers who faithfully submit their reports and images. Professional astronomers are continuing 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 *www.alpo-astronomy.org/saturn*.

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

Remote Planets Section

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

Pluto is now well placed in the early morning sky. Uranus and Neptune were visible in April and May in the early morning sky. Uranus entered a new season in 2007. Right now it is spring in its northern hemisphere.

The 2008 apparition report of the remote planets was published in the Volume 52, No. 2 (Spring 2010) issue of *The Strolling Astronomer.*

I am planning to prepare the 2009 apparition report in June. I am hoping that more people will observe the remote planets in 2010. We did not have many observations last year.

A reminder that my book, *Uranus, Neptune and Pluto and How to Observe Them,* is now available from Springer at *www.springer.com/astronomy/popular+astronomy/book/978-0-387-76601-0* or elsewhere (such as *www.amazon.ca/Uranus-Neptune-Pluto-Observe-Them/dp/0387766014*) to order a copy.

Visit the ALPO Remote Planets Section online at *http://www.alpo-astronomy.org/remote*.

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We ask all who are considering an online purchase of Orion astronomical merchan-

Inside the ALPO
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In Memoriam: Dick Wessling, 1935 - 2010

(The following was taken from comments by our own Matthew Will and also an online tribute by Mark & Carol Stephenson, and Steve & Sue Rismiller posted at http://www.pinesoptical.com/)

Dick Wessling, whose career as an active ALPO volunteer staff member spans many years, passed away peacefully in the early morning hours of March 17 after having suffered a stroke several days earlier. He is survived by his wife, Noreen, daughter, Diana, son, David, one grandson Alex, and a sister, Mary.

Dick, of Milford, Ohio (near Cincinnati) was a former coordinator of the retired ALPO Instruments Section and also a former coordinator of the ALPO Training Program from 1971 through 1973. In addition to instructing budding observers for the ALPO, his main contribution to the program was the Novice Observer Handbook, that served as an instructional guide to the program. While the book was later revised to meet the program needs in the mid-1990's, the basic approach and philosophy of the handbook that Dick established remained unchanged. Dick's concept for preparing the novice amateur was to have them think ahead about what they wanted to accomplish with an astronomical observation before performing an observation. Dick called it "preplanning". An oxymoron? Perhaps. But Dick wanted to emphasize the importance of planning ahead.

Dick was very supportive of the revised version and was apparently genuinely pleased that the ALPO was serious about his work.

We sometimes forget that putting together such materials was a really big effort back thirty to forty years ago. Dick produced typewritten mimeographs of the handbook from his home in Ohio. Anyone that has had to do that already knows how difficult that is, since the mimeo sheet demands perfection from the typist!

Besides his interest in astronomy, Dick was an avid golfer and an accomplished musician (he played the bass fiddle in a local bluegrass band – The Out to Lunch Bunch). He was also an expert skier, and served for many years as a ski instructor at Perfect North Slopes, a ski resort in southeastern Indiana. But, Dick was most well known as one of the world's top creators of premium quality telescope mirrors. Dick made his first mirror in 1965. He joined the Mirror Makers Club at the Cincinnati Observatory and completed a 10" f/6 mirror. It turned out so well that he soon began making mirrors for others, and in1991, he established the Pines Optical Shop.

For many years Dick worked for U.S. Precision Lens which later became 3M Precision Optics where he was the senior specialist for optical analysis and testing. He retired from 3M in 2006 to devote his full time attention to Pines Optical.

Dick was active both in local and national amateur astronomy circles. Locally, he served as President of the Cincinnati Astronomical Society (CAS), and steadfastly supported public star gazes sponsored by the CAS, the Cincinnati Observatory, and the Midwestern Astronomers. He performed in numerous capacities for many years with the Association of Lunar and Planetary Observers, including serving as the assistant coordinator of the Instruments Section and head of the Jupiter Section.

Dick worked with the CAS to place a fine 16" f/5.5 mirror in the existing 16-inch telescope. His legendary optical expertise was not confined to mirrors. When the primary objectives of the 1904 16" Alvan Clark and the 1842 11.25" Merz und Mahler at the Cincinnati Observatory Center needed cleaning, it was Dick who came to the rescue. Likewise, Dick performed his magic on the University of Illinois' 12" Brashear refractor's objective when it was being refurbished. Dick was always generous with his time, and enjoyed nothing more than sharing his expertise and advice with newbies and seasoned ATMs alike.

On the night before Dick had his stroke, he was working on a mirror, and then observed with his 10.25" f/8 and 16" f/4 Dobs. It is somewhat comforting to know that Dick's last activities were doing the things he loved most: pushing glass and observing.

Sponsors, Sustaining Members, and Newest Members

by Matthew L. Will, ALPO Membership Secretary/Treasurer

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

As of May 1, 2010:

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Russell O Wheeler	Edmond	OK	

NEWEST MEMBERS...

The ALPO would like to wish a warm welcome to those who recently became members. Below are those persons who have become new members from April 23, 2009 through May 1, 2010: where their location and their interest(s) in lunar and planetary astronomy. The legend for the interest codes are located at the bottom of the page. Welcome aboard!

Member Name	City	State	Country	Interest(s)
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Maurizio Morini	Milano		Italy	
Michael Minor	Gainesville	VA		
Gennadiy A Mitrofanov	Virginia Beach	VA		

Member Name	City	State	Country	Interest(s)
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Brandon Ritchie	Pittsburgh	PA		
Deborah Rockel	Chesapeake	OH		
Robert Rogers	Arvada	CO		
Dr H A Russell II (Art)	Orange Park	FL		
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Richard Schmidt	Washington	DC		
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Clifton Weaver	Mays Landing	NJ		
Michael White	Levin	Horowhenua	New Zealand	
Dennis Wilde	West Babylon	NY		
Ronnie Williams	Big Rock	TN		
Thomas Wilson	Woodstock	GA		

Interest Abbreviations

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

Feature Story

Mercury Observations During the Second and Third MESSENGER Flybys

By Frank J Melillo, coordinator,
ALPO Mercury Section
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Abstract

Mercury was observed by ALPO members during the MESSENGER spacecraft's second and third flybys. The ALPO observations were of sufficient quality to allow comparison to the MESSENGER images. Some features seen in the MESSENGER images can be seen also in those by amateurs.

Introduction

On January 14, 2008, the MESSENGER spacecraft successfully flew by Mercury. During that first flyby, the probe sent back thousands of pictures showing double-ringed craters, smooth plains, bright rayed craters and bright maria. Although the images reminded us of the moon, careful study revealed important differences. Images from the second flyby on October 6, 2008, revealed a large part of the planet's surface, amounting to 1/3 of the entire surface, that had never before been seen. The third and final flyby was on September 29, 2009. With each of these close encounters, the spacecraft danced with the planet in such a way as to transfer some of its orbital energy to the planet, thus slowing the craft. It had gained great speed due to the Sun's gravity, on its infall from Earth. Having completed the third flyby, its speed is now close to that of Mercury, so that it can enter orbit around that planet in March of 2011. Its primary mission in Mercury orbit is planned to last about one Earth year.

This writer previously reported the observations by ALPO members during the first flyby (Melillo 2009a). This observational work continued during the second and third flybys, and these observations are reported here. The Mercury section has received high quality observations taken at nearly the same central meridian (CM) longitudes as the spacecraft viewed during the inbound journeys, but at slightly different angles during the outbound journeys. We can easily correlate the features that are seen in both the ALPO images and the MESSENGER images.

ALPO Observations Near the Time of the Second Flyby

MESSENGER's closest approach was on October 6, 2008, at 8:40 UT. Mercury was near inferior conjunction with the sun and could not be seen from Earth. However, it emerged quickly into the morning sky, with a declination favorable to observers in the Northern Hemisphere. Members of the ALPO Mercury Section were waiting to get the first glimpse of the planet after the flyby. Our perspective on the planet was similar to that the spacecraft had during the inbound journey. The first observation was made nine days after closest approach.

John Boudreau successfully imaged Mercury during the crescent phase on October 15. His image can be compared with the MESSENGER inbound image because they have similar CM's, though the planet had rotated slightly since the flyby (Figure 1.) MESSENGER's image showed a crescent with longitude 260° at the terminator and 314° at the limb, while Boudreau's image was ten degrees different, with longitude 270° at the terminator and 324° at the limb.

During the outbound journey, MESSENGER looked back and imaged most of that part of the surface that had never before been seen. It recorded a gibbous phase with CM 30°, with about 90° longitude on the terminator and about 300° on the limb. Unfortunately, the view from Earth was from a different angle, and most Earth-based images cannot be matched to those of MESSENGER. However, there is one image taken on November 2 by John Boudreau that shows similar features. The CM was 328°, while the terminator was at 267° and the limb 58°. Much of the planet's surface that is visible in his image is also seen in the MESSENGER image, so that the major features seen in the

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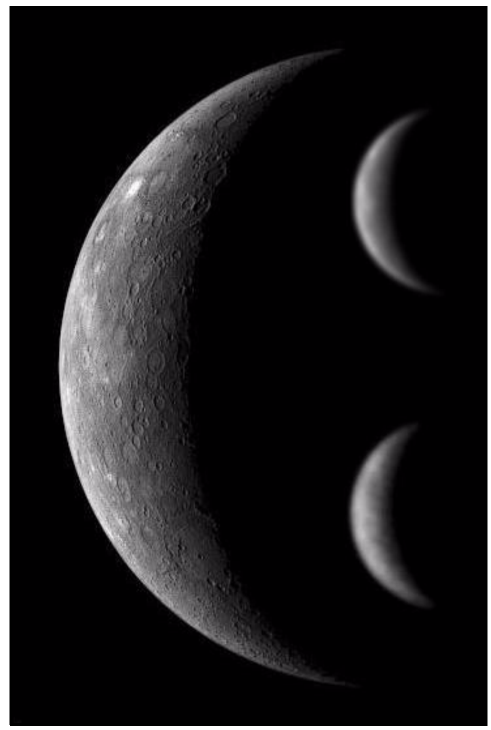

Figure 1. The large crescent on the left is an inbound image taken during MESSENGER's second flyby, on October 6, 2008; CM = 224°. The upper crescent on the right is the same MESSENGER image, blurred and shrunk to match the size of John Boudreau's image. The lower crescent on the right is John Boudreau's image of October 15, 2008; CM = 234°. The resemblance between the albedo features in the two images on the right is striking. Boudreau's image was made with a Schmidt-Cassegrain telescope of 28 cm aperture, with a Barlow lens to yield f/18. In this and all other images in this article, north is up and planetary east is to the right.

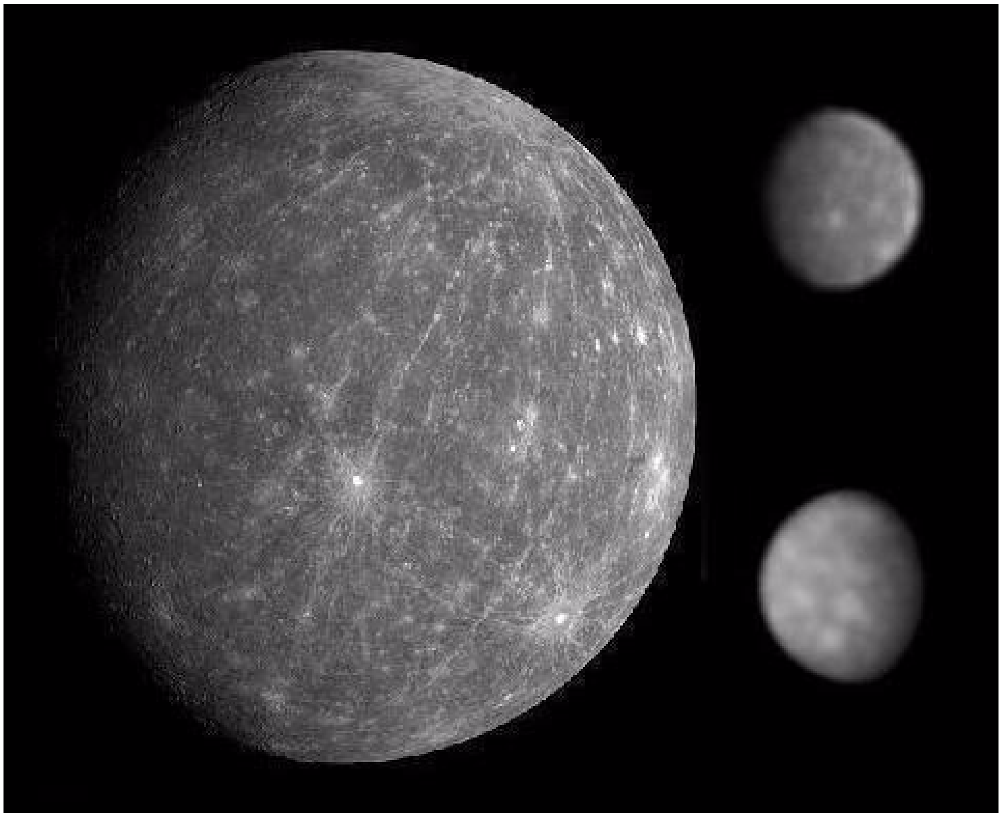

Figure 2. The large image at the left is MESSENGER's outbound image on the second flyby made on October 6, 2008; CM = 30°. It is this image that revealed much of Mercury's previously unseen surface. The upper image on the right is the same MESSENGER image, but blurred and shrunk to match the size of John Boudreau's image. The lower image on the right is Boudreau's image of November 2, 2008; CM = 328°. Matching these two images can be confusing because the viewpoints of the two are very different — MESSENGER was presented with the gibbous phase with the terminator on the left and the limb on the right, while Boudreau was presented with the gibbous phase with the terminator on the right and the limb on the left. Nevertheless, the rotation of the planet in the 27 days between the two images allowed much of the same surface to be visible in each. The bright spot near the center of the MESSENGER image can be seen in Boudreau's image on the limb just below the limb's center. The bright spot near the center of the limb of the MESSENGER image is near the center of Boudreau's image.

MESSENGER image can be matched to it (Figure 2.)

ALPO Observations Near the Time of the Third Flyby

The third flyby was about a year after the second flyby, with closest approach on September 29, 2009, at 22:00 UT. The images taken during the inbound leg had a vantage point similar to our perspective from Earth. Unfortunately there was an unexpected glitch prior to closest approach and the craft passed the planet in sleep mode. No images were taken during the outbound journey.

Mercury underwent a favorable morning apparition a few days after the time of closest approach. In the first week of October, Earthbound imagers had an opportunity to observe its crescent phase. The longitudes of the illuminated part of the planet were nearly the same as those imaged by MESSENGER about a week earlier. ALPO images show many of the bright rayed craters and dark basins documented by MESSENGER, and overall, their images are strikingly similar to MESSENGER's (Figure 3.)

Drawings by Carl Roussell

Carl Roussell made drawings of the MESSENGER images while observing those images from a distance. In this way, he mimicked the view of the planet as seen from Earth. His drawings (Figures 4, 5, and 6) are similar to those he and others have previously made of the planet while observing visually with their telescopes (Melillo 2008, Melillo 2009b.) Indeed, many of the features that he drew correspond well to named albedo features on the planet. This supports the notion that the albedo features drawn and named by recent observers are real planetary features, not illusions created by the difficulties of observing this elusive planet.

Conclusion

Only a decade ago, most Earth-based observations of Mercury showed only its phase. For Mercury studies, the imaging techniques used by ALPO members have been improving for years, and observers are now documenting Mercury's surface features in unprecedented detail. By matching our images to those made by the MESSENGER spacecraft, we have demonstrated the reality of the features we are imaging. This bodes well for the future of amateur observations of this difficult planet. In 2011, a map of the entire surface will be made from Messenger images, so that, at any central meridian, we shall be able to correlate albedo features seen in our best images with known surface features.

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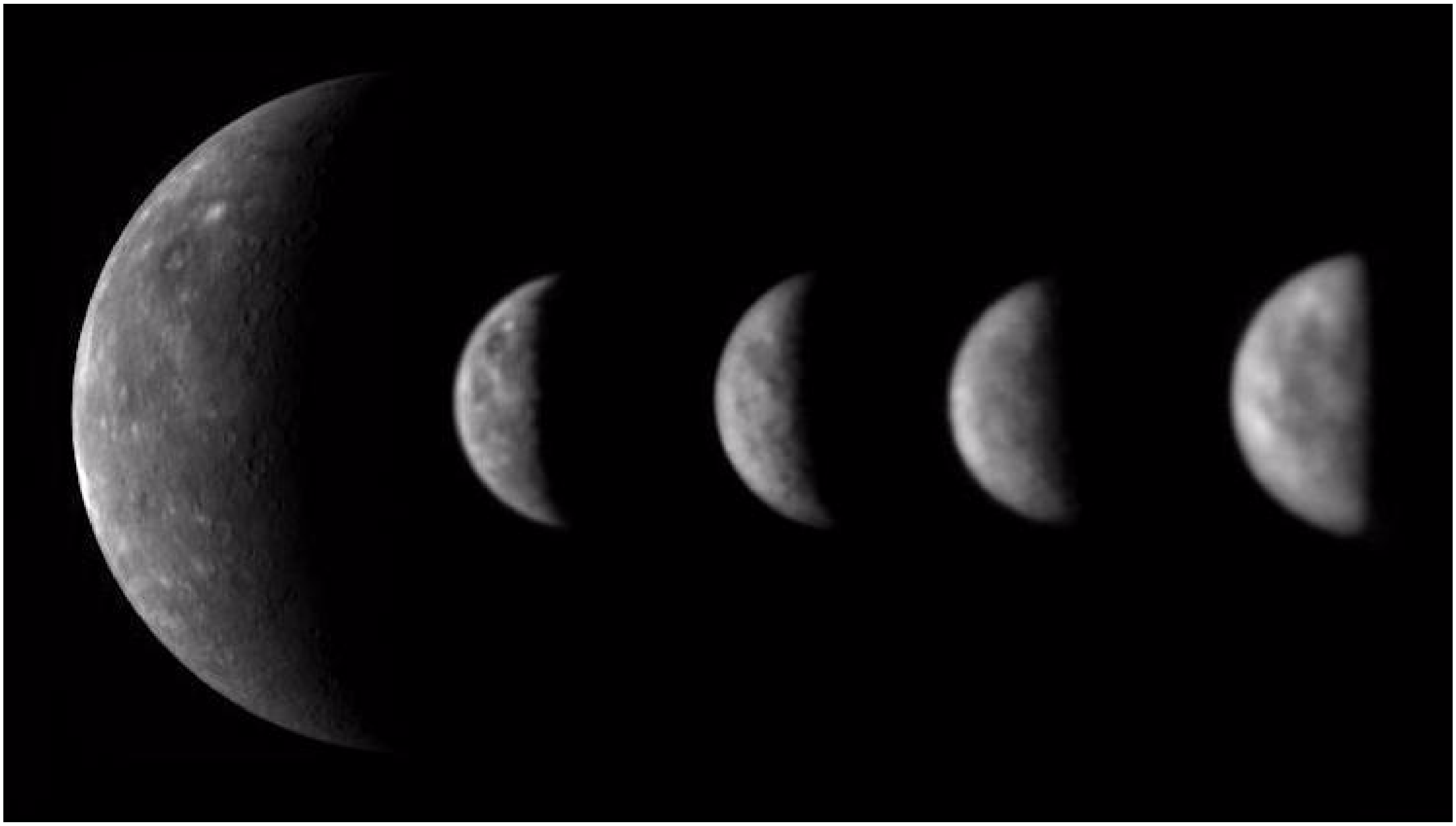

Figure 3. The large crescent on the left is an inbound image taken during the MESSENGER third flyby, on September 29, 2009. The smaller image next to it is the same MESSENGER image, after blurring, contrast enhancement, and shrinking to match the size of the images of John Boudreau and Ed Lomeli. The middle image was made by Boudreau on October 2, 2009; CM = 253°. To its right is an image by Lomeli made on October 4, 2009; CM = 264°. The right-most image was made by Boudreau on October 6, 2009; CM = 274°. Many details of albedo features can be matched between the blurred MESSENGER image and those of the ALPO observers.

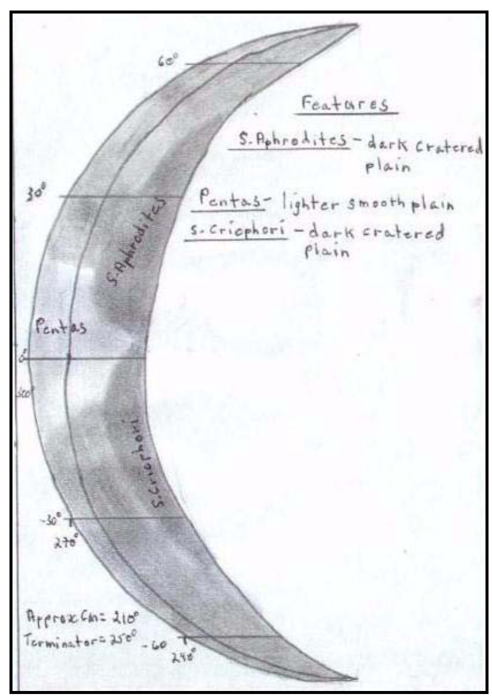

Figure 4. Carl Roussell's drawing of the MESSENGER image taken on the inbound leg of the second flyby. Compare to Figure 1, and compare to drawings published in previous apparition reports of the ALPO Mercury section.

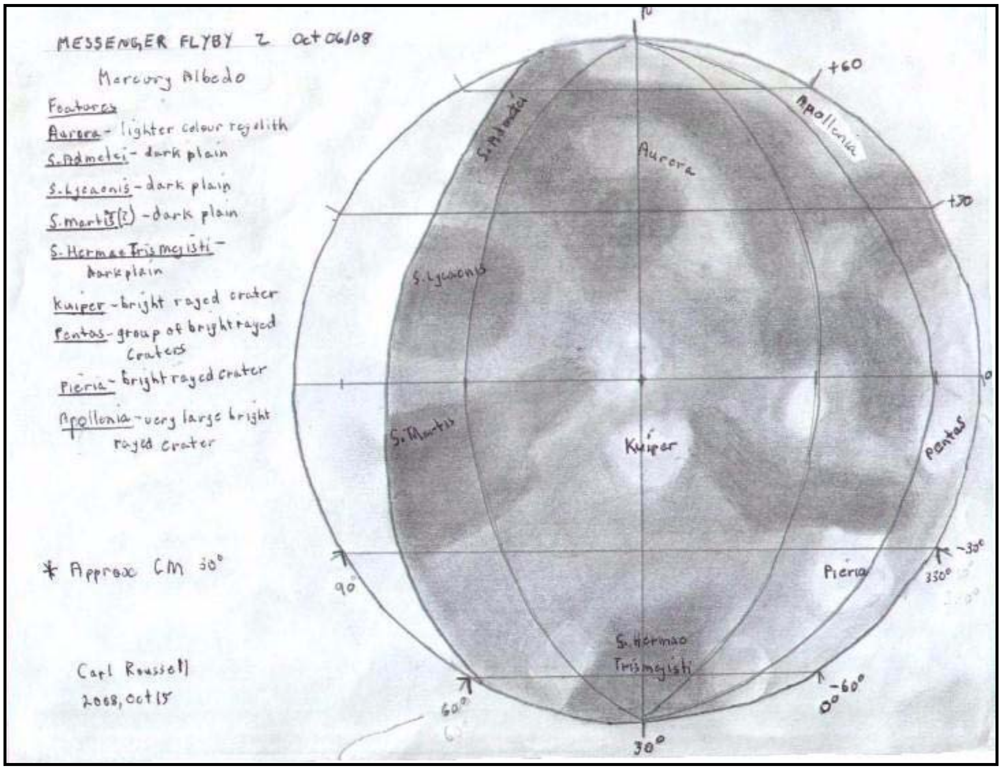

Figure 5. Carl Roussell's drawing of the MESSENGER image taken during the outbound leg of the second flyby. Compare to Figure 2.

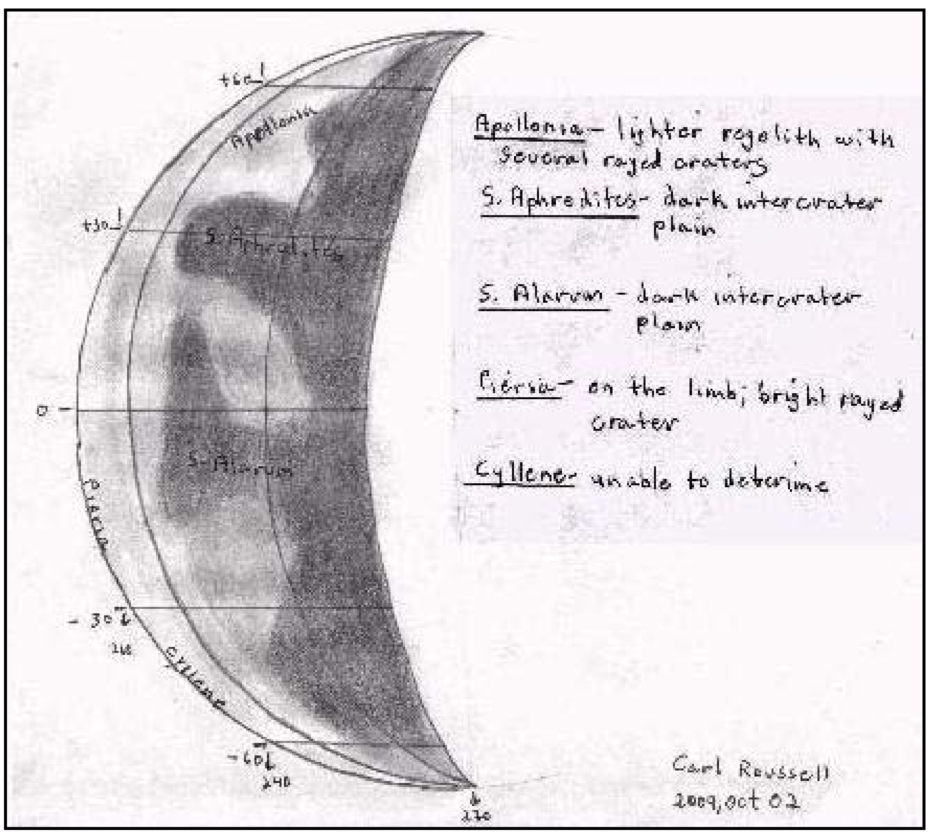

Figure 6. Carl Roussell's drawing of the MESSENGER image taken during the inbound leg of the third flyby. Compare to Figure 3.

Feature Story: Venus

The Phase and Twilight Arc of Venus

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Abstract

This report summarizes phase estimates and cusp extension estimates of Venus made by the writer during the 2007 and 2008-2009 eastern (evening) elongations. All estimates were made in white (integrated) light. The estimated phase was usually about 0.03 or 3% below the predicted phase except for phases between 0.6 and 0.8. For these phases, the estimated phase was about 0.08 or 8% below the predicted value. The writer estimated the cusp extension on many different dates. From these estimates, he computed average twilight arc values of 4.0° ± 0.5° and 3.8° ± 0.5° for the 2007 and 2008-2009 eastern elongations, respectively.

Introduction

The recent discovery of a bright cloud on Venus in visible light by Frank Melillo (Beatty, 2009, 38) and in ultraviolet by Toshihiko Ikemura is evidence that Venus' atmosphere can change. Cloud changes may be due to volcanic activity or cyclic cloud changes. The writer believes that observations of the Schröter Effect and cusp extensions will help us better understand Venus' atmosphere.

The phase is the maximum width of the illuminated fraction of the disc divided by the disc diameter. The phase is a number between 0.00 and 1.00. The phase, in percent, is the phase multiplied by 100%. For example, if the phase is 0.25 then the phase, in percent, equals 25%.

In the late eighteenth century, Johann Schröter noticed that when Venus was predicted to be at exactly half-phase (or dichotomy) that it appeared to be a little less than half-phase. This is called the "Schröter Effect". During eastern (evening) elongations, the observed date of dichotomy is a few days before the predicted date of dichotomy. The situation reverses for western (morning) elongations. McKim (2008a, 131; 2008b 255) summarizes results of 20 elongations between 1991 and 2006 based on observations by members of the British Astronomical Association (BAA).

Benton (1985, 83; 1989a, 5; 1989b, 154; 1991a, 120; 1991b, 162; 1992, 105; 1996, 164; 1998, 59; 1999a, 62; 1999b, 85; 1999c, 183; 2000, 154; 20002, 30; 2006, 19; 2007, 30; 2008, 34) summarizes the results of 17 different elongations between 1982 and 2005 based on observations by members of the Association of Lunar & Planetary Observers (ALPO). The average discrepancy between the observed and predicted dates of dichotomy is five days for both the BAA and ALPO data just mentioned. Venus is usually observed to be at dichotomy when its predicted phase is between 0.52 and 0.53. This translates into a discrepancy of between 0.02 and 0.03 in Venus' phase.

Observations of Venus' cusps may also yield information on its atmosphere. The cusps of Venus are the tips of its crescent phase. The cusps on a spherical, airless planet should be about 180° apart at all phases. This is not the case for Venus. The cusps on it are often more than 180° apart. When this occurs, the cusps are said to be extended. The angular perimeter (**p**) is the angle between one cusp and the other one measured along the illuminated limb. Angular perimeter values exceeding 180° are believed to be due to two factors: a portion of Venus' atmosphere, beyond the terminator, is

Terminology: Western vs Eastern

"Eastern" apparitions are those when that planet is **east of the Sun,** as seen in our sky after sunset.

"Western" apparitions are those when an "inferior" planet (Mercury or Venus, whose orbits lie inside the Earth's orbit around the Sun) is **west of the Sun**, as seen in our morning sky before sunrise.

All Readers

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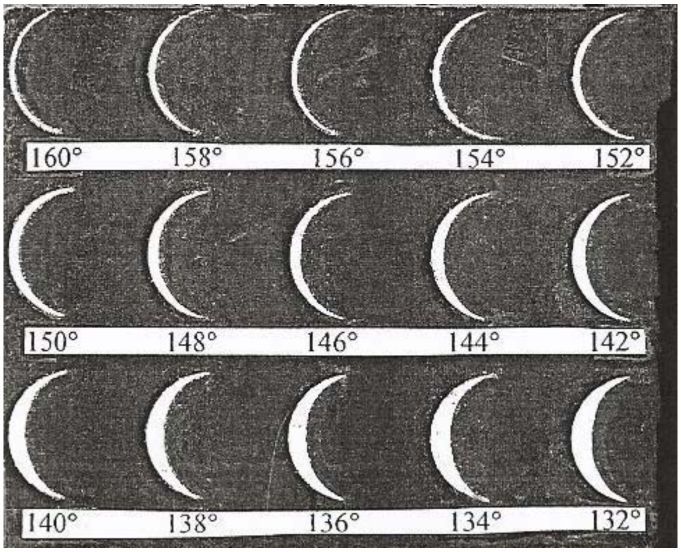

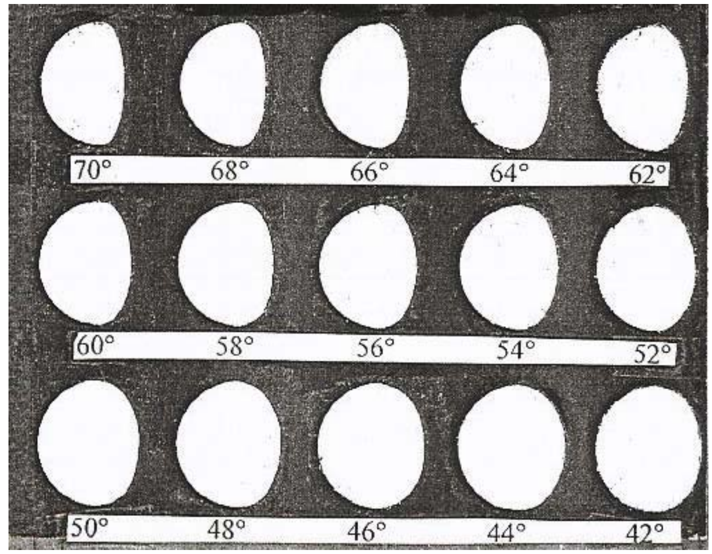

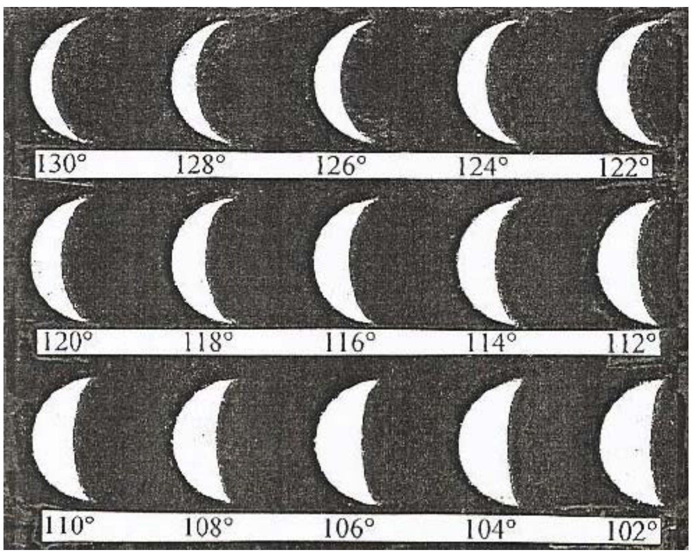

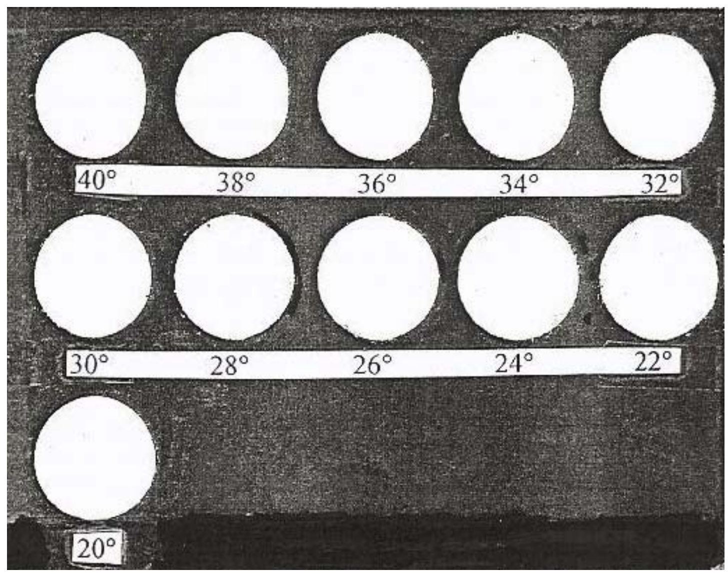

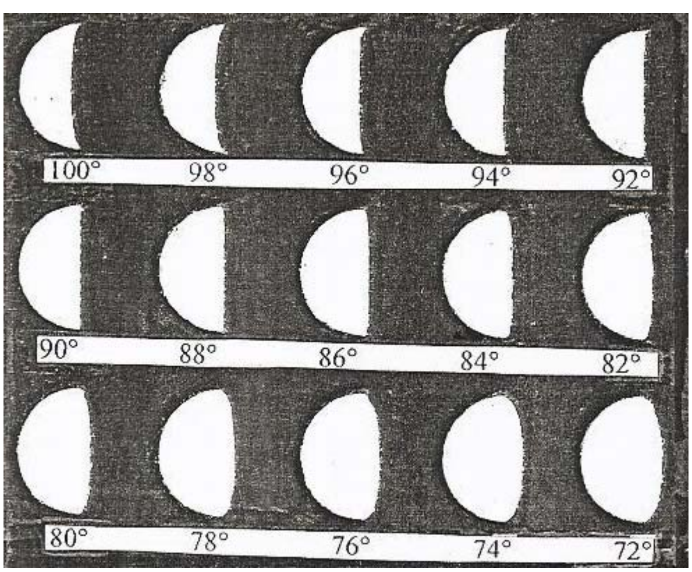

Figure 1: A grid showing a spherical, airless object illuminated at different solar phase angles. The solar phase angle is the angle between the observer and the Sun measured from the center of the target which is Venus. The solar phase angles range from 20 up to 160. The writer constructed two-inch drawings of each shape, joined each shape into one of five blocks and reduced each block. The resulting five blocks are shown here.

illuminated by scattered sunlight; and the much larger Sun illuminates just over half of Venus. The portion of Venus' atmosphere which lies beyond the terminator and is illuminated by sunlight is called the twilight arc (Haas, 2000, 61). The width of Venus' "twilight arc" has ranged from about 2° to over 9° over the last two centuries (Schmude, 2001, 21).

The goal of this work is to compare the estimated and predicted phase of Venus at all phases and not just at dichotomy. In this way, we may learn more about the causes of the Schröter Effect. A second goal of this work is to obtain measurements of Venus' twilight arc from angular perimeter estimates.

In this report the writer summarizes his estimates of Venus' phase. He also presents his estimates of the twilight arc of Venus during the eastern elongations in 2007 and 2008-2009.

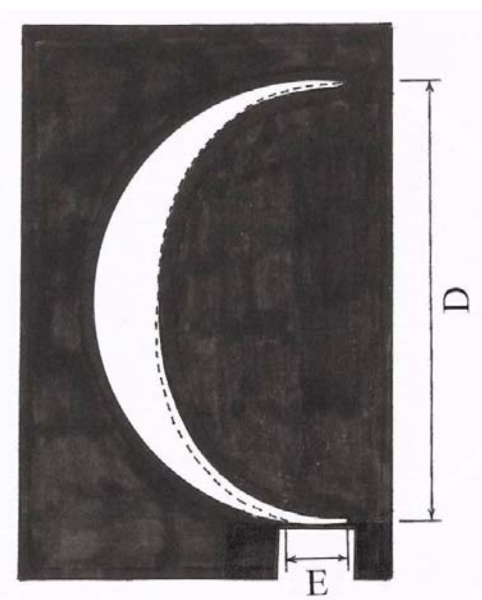

Figure 2: This drawing illustrates how the writer estimated the angular perimeter (p). The dashed crescent is from the grid and the solid crescent is the observed shape of Venus
Figure 3: This drawing illustrates how the

Table 1: A summary of the predicted minus observed phase of Venus based on white light estimates. The number of phase estimates is given in brackets.

Predicted Phase	Predicted Minus Estimated Phase, 2007 (Eastern Elongation) (May 28, 2007 to July 31, 2007)	Predicted Minus Estimated Phase 2008-2009 (Eastern Elongation) (Sept. 13, 2008 to Mar. 6, 2009)
0.800-0.899	---	0.046 [16]
0.700-0.799	---	0.099 [21]
0.600-0.699	---	0.094 [6]
0.500-0.599	0.043 [6]	0.046 [11]
0.400-0.499	0.040 [10]	0.038 [7]
0.300-0.399	0.041 [3]	0.037 [5]
0.200-0.299	0.049 [5]	0.035 [8]
0.100-0.199	0.040 [6]	0.021 [3]
0.000-0.099	0.025 [1]	---

Method and Materials

The writer made all phase estimates with a 0.12 meter (4.7 in.) refractor telescope at a magnification near 250x in white (or integrated) light. The phase was estimated in three ways:

- Measurement from a sketch
- Estimation from the eyepiece
- Estimation with a grid

A phase estimate was the average of the phases obtained from these three methods. The grid is shown in *Figure 1*.

The angular perimeter (**p**) was also estimated using the three methods just mentioned for phase estimates. My procedure for estimating the angular perimeter (**p**) using the grid was to select the crescent shape on the grid which best matched Venus. Next, I looked at Venus with one eye, looked at the grid with the other and superimposed the two images as shown in *Figure 2*. I held the grid in such a way that the images of Venus and the shape on the grid appeared to be nearly the same size. After this, I then estimated the extension (**E**) in terms of Venus' diameter (**D**). The quantity **E/D** was then converted to degrees and added to 180° to obtain the angular perimeter (**p**). The angular perimeter estimates were used in computing the width of the twilight arc using the same procedure outlined in Haas (2000, 61).

A sample calculation is shown below and is based on the estimate illustrated in *Figure 2*. The cusp extension in *Figure 2* equals the quantity **E**. This is converted to degrees through *Equation 1*:

Extension in degrees =
$(E \div D) \times (360° \div 3.1416)$
(1)

In this equation, **D** is the diameter in the illustration. In *Figure 2*, **E** ÷ **D** = 0.14 and, hence, the extension is 0.14 × (360° ÷ 3.1416) = 16°. The quantity **E/D** is estimated at the eyepiece. The angular perimeter is **p** = 180° + 16° = 196°. The twilight arc (ℓ), in degrees, is computed in *Equation 2* as:

$\ell = \text{inv} \sin[-\sin(i) \times \cos(p \div 2)]$
(2)

If the solar phase angle is **i** = 135°, then the twilight arc is computed as:

ℓ = inv sin[-sin(135°) × cos(196° ÷ 2)]

ℓ = inv sin[-sin(135°) × cos(98°)]

ℓ= inv sin[-0.7071 × -0.1392]

ℓ = inv sin[0.09841]

ℓ = 5.648° = 5.6°

Results

Figure 3 shows the estimated phase (dots) compared to the predicted phase (curve) of Venus for the 2007 eastern elongation. The predicted phase curve is from predictions in the *Astronomical Almanac* (2005). Most of these estimates were made during the day under clear and nearly haze-free skies. *Figure 4* shows phase estimates (dots) compared to the predicted phase for the 2008-2009 eastern elongation of Venus. The predicted phase curve in *Figure 4* is based on predictions in the *Astronomical Almanac* (2006, 2007).

In both the 2007 and 2008-2009 eastern elongations, the estimated phase of Venus was below the predicted value. This is consistent with observations of the Schröter Effect. What is surprising is that the phase discrepancy is not constant over the range of predicted phases. During the eastern elongation in 2008-2009, the discrepancy was largest when Venus' predicted phase was about 0.7 (November 2008). During this time, the difference between the estimated and predicted phase was about 0.08 (or 8%), whereas the difference dropped to 0.03 (or 3%) during early 2009 when the predicted phase was below 0.5. *Table 1* lists the average values of the predicted minus estimated phase of Venus for different ranges of the predicted phase. All measurements are based on the writer's white light estimates.

Table 2: Cusp extension estimates, predicted solar phase angles and twilight arc values for the 2007 eastern (evening) elongation of Venus. In this table, *p* is the angular perimeter which is the angle between the two cusps measured along the illuminated limb, *i* is the predicted solar phase angle in degrees, and ℓ is the twilight arc in degrees.

Date (UT)	p	i	ℓ	Date (UT)	p	i	ℓ
May 28 (1:00)	186	82.9	3.0	June 24 (23:53)	189.8	101.7	4.8
May 30 (0:00)	184	84.1	2.0	June 27 (0:50)	188.2	103.3	4.0
June 3 (22:22)	188	87.0	4.0	June 27 (22:40)	191.2	104.1	5.4
June 4 (22:13)	188	87.7	4.0	July 12 (0:27)	186.8	117.4	3.0
June 5 (23:40)	188	88.3	4.0	July 12 (22:58)	191.4	118.5	5.0
June 10 (23:55)	189.2	91.6	4.6	July 15 (22:50)	191.4	121.8	4.8
June 12 (0:00)	189.2	92.2	4.6	July 17 (23:20)	186.8	124.3	2.8
June 12 (23:00)	186.8	92.9	3.4	July 19 (0:10)	189.2	125.5	3.7
June 13 (23:00)	189.2	93.6	4.6	July 21 (22:45)	191.4	129.4	4.4
June 14 (22:15)	188.8	94.2	4.4	July 23 (22:00)	193.8	132.1	5.1
June 16 (22:45)	188.0	95.7	4.0	July 25 (22:35)	196.0	135.0	5.6
June 17 (22:35)	191.2	96.4	5.6	July 26 (23:45)	193.8	136.5	4.7
June 18 (22:40)	190.8	97.1	5.4	July 28 (23:30)	191.4	139.6	3.7
June 22 (23:12)	188.6	100.0	4.2	July 30 (21:30)	198.4	142.6	5.6
June 24 (0:24)	188.4	100.8	4.1	July 31 (22:45)	204.0	144.4	7.0
Average (30 measurements)							**4.4°**

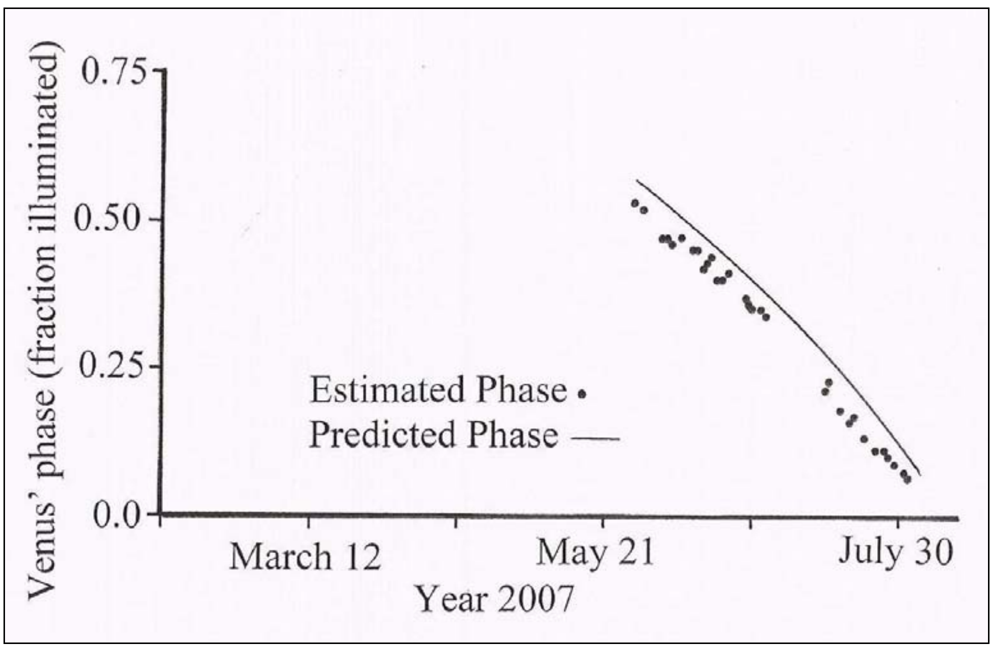

Figure 3: This drawing shows a graph of Venus' phase versus the date in 2007. Phase estimates made by the writer are shown as dots and the predicted phase listed in the Astronomical Almanac for the Year 2007 is shown as the curve. In all cases, the estimated phase was smaller than the predicted phase.

Cusp extensions were estimated as a fraction of Venus' polar diameter and were later converted to angular perimeter (**p**) values in degrees using *equations 1 and 2*. With these estimates, I computed the twilight arc values using the procedure outlined by Haas (2000, 61). My results are shown in *tables 2 and 3*.

The average widths of the twilight arcs for the 2007 and 2008-2009 eastern elongations were 4.4° ± 0.5° and 4.2° ± 0.5°, respectively. Since the Sun is larger than Venus, we should subtract half the angular diameter of the Sun as seen from Venus, which is 0.37° from both results. Therefore, the selected values of the twilight arc are 4.0° ± 0.5° and 3.8° ± 0.5° for the 2007 and 2008-2009 eastern elongations, respectively. These values are consistent with the value of 3.6° ± 0.5° selected by Haas for his 1937-1998 measurements.

Discussion

Dobbins et al (1992, 38) report that solar activity may affect the extension of Venus' cusps. The implication is that increased amounts of solar activity may cause the cusps to be extended leading to higher values of the angular perimeter (**p**) and a thicker twilight arc. During 2007 and 2008-2009, solar activity was near a minimum. During 2001, however, solar activity was much higher. As it turns out, the average width of the twilight arc in 2001 (after the 0.37° was subtracted for the fact that the Sun is much larger than Venus) was 4.1° ± 0.6° (Jan. 31 to March 25) and 4.5° ± 0.3° (April 18 to June 2). These values are a bit larger than the corresponding values reported in 2007 and 2008-2009 during solar minimum. Therefore, increased solar activity may increase the width of the twilight arc and, hence, increase the angular perimeter of Venus during its crescent-phase stage.

Table 3: Cusp extension estimates, predicted solar phase angles and twilight arc values for the 2008-2009 eastern (evening) elongation of Venus. In this table, p is the angular perimeter which is the angle between the two cusps measured along the illuminated limb, i is the predicted solar phase angle in degrees, and ℓ is the twilight arc in degrees.

Date (UT)	p	I	ℓ	Date (UT)	p	i	ℓ
Dec. 31 (21:45)	182.4	81.1	1.7	Feb. 5 (22:00)	190.3	104.0	5.0
Jan. 1 (21:40)	184.6	81.4	2.3	Feb. 6 (22:30)	190.5	104.8	5.1
Jan. 4 (23:55)	185.7	83.2	2.8	Feb. 7 (~22:10)	190.1	105.6	4.9
Jan. 8 (23:30)	184.6	85.4	2.3	Feb. 12 (22:30)	189.9	110.2	4.6
Jan. 9 (23:10)	186.9	85.9	3.4	Feb. 15 (23:15)	191.5	113.1	5.3
Jan. 13 (22:00)	187.8	88.2	3.9	Feb. 16 (21:40)	191.5	114.1	5.2
Jan. 14 (22:15)	187.6	88.8	3.8	Feb. 18 (23:50)	189.9	116.2	4.4
Jan. 15 (23:20)	186.4	89.4	3.2	Feb. 19 (22:30)	190.3	117.3	4.6
Jan. 16 (22:45)	187.3	90.0	3.7	Feb. 20 (23:40)	190.3	118.4	4.5
Jan. 18 (22:15)	188.3	91.2	4.1	Feb. 21 (23:10)	189.2	119.5	4.0
Jan. 22 (22:35)	188.5	93.8	4.2	Feb. 23 (21:00)	191.5	121.8	4.9
Jan. 23 (23:30)	185.7	94.4	2.9	Feb. 24 (21:50)	191.5	123.0	4.8
Jan. 29 (22:30)	189.9	98.6	4.9	Mar. 4 (21:10)	196.0	133.9	5.8
Jan. 30 (22:30)	188.7	99.4	4.3	Mar. 5 (23:30)	192.6	135.4	4.4
Jan. 31 (22:30)	191.0	100.1	5.4	Mar. 6 (22:00)	196.0	136.8	5.5
Average (30 measurements)							**4.2°**

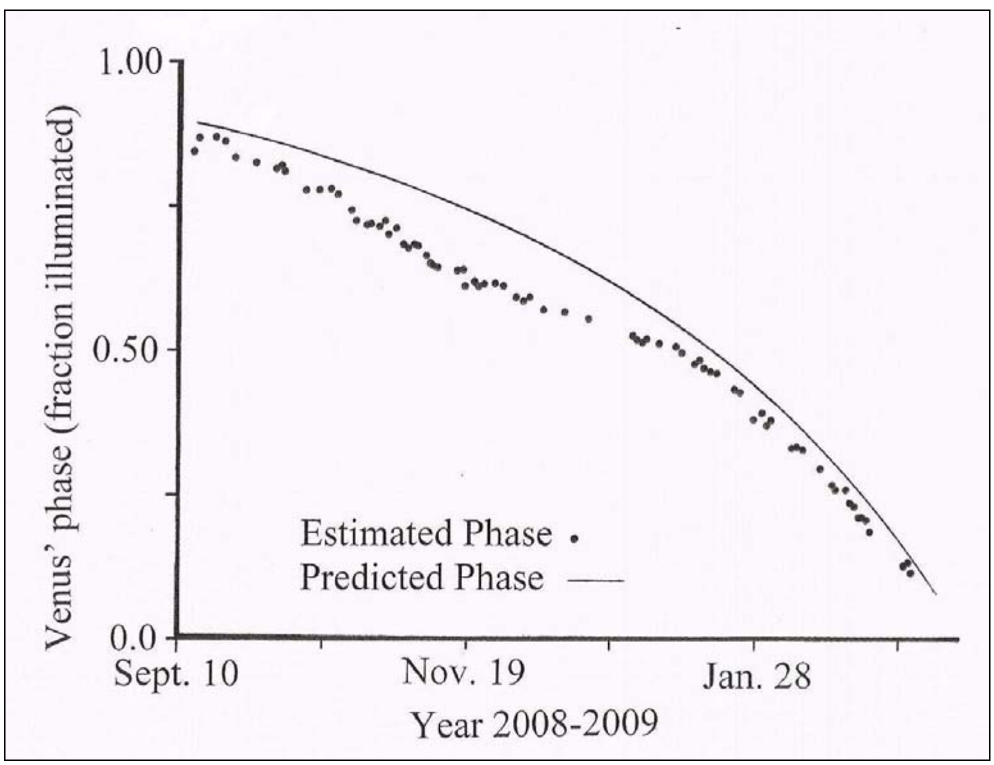

Figure 4: This drawing shows a graph of Venus' phase versus the date in 2008-2009. Phase estimates made by the writer are shown as dots and the predicted phase listed in the Astronomical Almanac for the Years 2008 and 2009 is shown as the curve. In all cases, the estimated phase was smaller than the predicted phase.

Acknowledgements

The writer would like to thank Sue Gilpin and Diane Pitts for their assistance.

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Feature Story: ALPO Observations of Saturn During the 2007 - 2008 Apparition

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

Please note that when a visual observer records or suspects a specific feature on Saturn, it is important to secure future observations quickly if we wish to obtain the period of rotation. For this purpose we encourage observers to use these facts: In System I (EZ plus NEB or SEB), 7 rotations are accomplished in close to 3 Earth-days, while in Sysyem II (rest of planet), 9 rotations require close to 4 such days.

A complete set of Saturn Observing Forms are available for downloading at *http://www.alpo-astronomy.org/publications/ALPO Section Publications/SaturnReportForms - All.pdf*

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Abstract

The ALPO Saturn Section received 355 visual observations and digital images during the 2007-08 Apparition (with an observing season from October 8, 2007 through July 1, 2008) which were contributed by 45 observers in the United States, Canada, China, France, Germany, Iran, Italy, Japan, the Netherlands, the Philippines, Portugal, Spain, and the United Kingdom. Instruments used to carry out the observations ranged from 9.0 cm (3.5 in.) up to 40.6 cm (16.0 in.) in aperture. Recurring short-lived dark features were observed or imaged throughout much of the observing season in the South Equatorial Belt (SEB), sometimes extending as dusky festoons into the EZs. Observers imaged the recurring presence of small white spots in the South Tropical Zone (STrZ) and South Equatorial Belt Zone (SEBZ) during the apparition, and less frequently, similar white features were observed or imaged in the South Temperate Zone (STeZ), Equatorial Zone (EZs), and North Equatorial Belt (NEB). A few recurring central meridian (CM) transit timings were submitted for a few of these features. The inclination of Saturn's ring system toward Earth, B,

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

Conjunction		2007	Aug	21d	23h UT
Opposition		2008	Feb	24d	10h
Conjunction		2008	Sep	04d	02h
Opposition Data					
Visual Magnitude		0.20			
Constellation		Leo			
Declination		+11.336°			
B		-8.374°			
B'		-8.225°			
Globe	Equatorial Diameter	20.04”			
	Polar Diameter	18.12”			
Rings	Major Axis	45.49”			
	Minor Axis	6.63²			

All Readers

Your comments, questions, etc., about this report are appreciated. Please send them to: *ken.poshedly@alpo-astronomy.org* 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).

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) as the standard on the numerical sequence. The outer third is the brightest part of Ring B, and it has been assigned a constant 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 2: Contributing Observers, 2007-08 Apparition of Saturn

	Observer	Location	No. of Observations	Telescopes Used
1.	Adelaar, Jan	Arnhem, Netherlands	7	23.5-cm (9.25-in.) SCT
2.	Akutsu, Tomio	Cebu City, Philippines	1	35.6-cm (14.0-in.) SCT
3.	Allen, Ethan	Sebastopol, CA	1	30.5-cm (12.0-in.) NEW
4.	Arditti, David	Middlesex, United Kingdom	12	35.6-cm (14.0-in.) SCT
5.	Benton, Julius L.	Wilmington Island, GA	53	15.2-cm (6.0-in.) REF
6.	Bosman, Richard	Enschede, Netherlands	3	28.0-cm (11.0-in.) SCT
7.	Boucheau, John	Saugus, MA	1	28.0-cm (11.0-in.) SCT
8.	Casquinha, Paolo	Palmela, Portugal	13	35.6-cm (14.0-in.) SCT
9.	Chang, Daniel	Hong Kong, China	1	25.4-cm (10.0-in.) NEW
10.	Chester, Geoff	Alexandria, VA	5 3	20.3-cm (8.0-in.) SCT 30.5-cm (12.0-in.) REF
11.	Cudnik, Brian	Columbia, TX	2	35.6-cm (14.0-in.) CAS
12.	Delcroix, Marc	Tournefeuille, France	20	25.4-cm (10.0-in.) SCT
13.	Frassati, Mario	Crescentino, Italy	1	20.3-cm (8.0-in.) SCT
14.	Ghomizadeh, Sadegh	Tehran, Iran	7	35.6-cm (14.0-in.) SCT
15.	Ghouchkanlu, Taha	Tehran, Iran	1	23.5-cm (9.25-in.) SCT
16.	Go, Christopher	Cebu City, Philippines	11	28.0-cm (11.0-in.) SCT
17.	Grafton, Ed	Houston, TX	6	35.6-cm (14.0-in.) SCT
18.	Haas, Walter H.	Las Cruces, NM	4	31.8-cm (12.5-in.) NEW
19.	Haberman, Bob	San Francisco, CA	3	25.4-cm (10.0-in.) SCT
20.	Hill, Rik	Tucson, AZ	1 25	9.0-cm (3.5-in.) MAK 35.6-cm (14.0-in.) SCT
21.	Ikemura, Toshihiko	Osaka, Japan	7	38.0-cm (15.0-in.) SCT
22.	Jakiel, Richard	Douglasville, GA	2	30.5-cm (12.0-in.) SCT
23.	Lawrence, Pete	Selsey, United Kingdom	2	35.6-cm (14.0-in.) SCT
24.	Lazzarotti, Paolo	Massa, Italy	2	31.5-cm (12.4-in.) NEW
25.	Llewellyn, Dan	Decatur, GA	1	35.6-cm (14.0-in.) SCT
26.	Lomeli, Ed	Sacramento, CA	3	23.5-cm (9.25-in.) SCT
27.	Maxson, Paul	Phoenix, AZ	40	25.4-cm (10.0-in.) CAS
28.	Melillo, Frank J.	Holtsville, NY	9	25.4-cm (10.0-in.) SCT
29.	Melka, Jim	St. Louis, MO	8	30.5-cm (12.0-in.) SCT
30.	Niechoy, Detlev	Göttingen, Germany	43	20.3-cm (8.0-in.) SCT
31.	Owens, Larry	Alpharetta, GA	3	35.6-cm (14.0-in.) SCT
32.	Parker, Donald C.	Coral Gables, FL	2	40.6-cm (16.0-in.) NEW
33.	Peach, Damian	Norfolk, United Kingdom	7	35.6-cm (14.0-in.) SCT
34.	Pettenpaul, Oliver	Littfeld, Germany	1	23.5-cm (9.25-in.) SCT
35.	Phillips, Jim	Charleston, SC	9 1	20.3-cm (8.0-in.) REF 25.4-cm (10.0-in.) REF
36.	Phillips, Michael A.	Swift Creek, NC	3	20.3-cm (8.0-in.) SCT
37.	Roussell, Carl	Hamilton, ON, Canada	11	15.2-cm (6.0-in.) REF

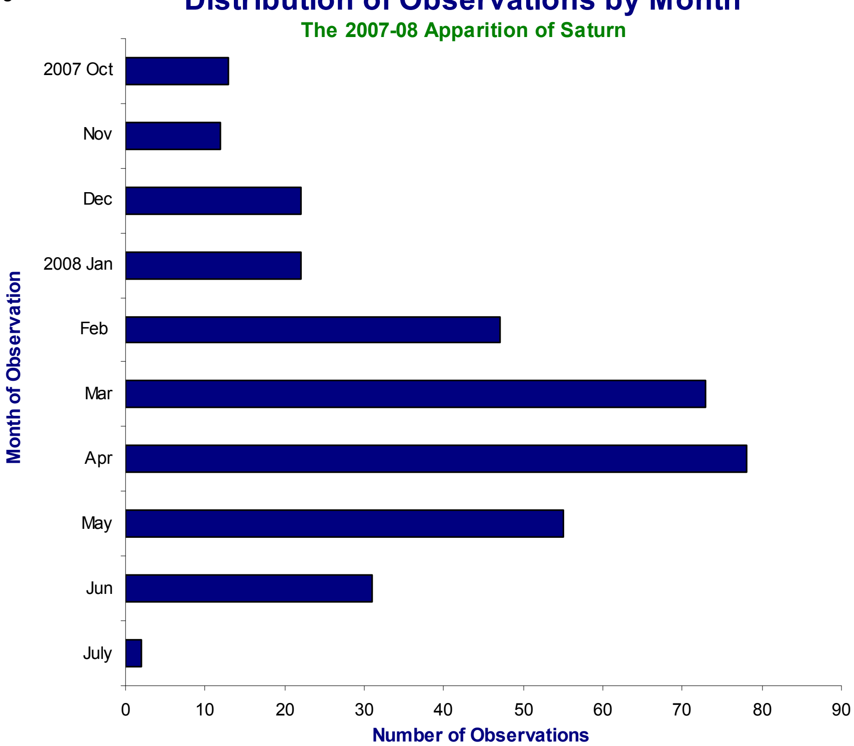
Table 2: Contributing Observers, 2007-08 Apparition of Saturn (Continued)

	Observer	Location	No. of Observations	Telescopes Used
38.	Sabia, John D.	Scranton, PA	2	24.1-cm (9.5-in.) REF
39.	Sanchez, Jesus	Cordoba, Spain	1	26.0-cm (10.2-in.) SCT
40.	Sharp, Ian	West Sussex, UK	1	28.0-cm (11.0-in.) SCT
41.	Sweetman, Michael E.	Tucson, AZ	9	15.2-cm (6.0-in.) SCT
42.	Tasselli, Andrea	Florence, Italy	1 3	25.4-cm (10.0-in.) NEW 30.0-cm (11.8-in.) NEW
43.	Tatun. Randy	Richmond, VA	1	25.4-cm (10.0-in.) NEW
44.	Viladrich, Christian	Paris, France	1	20.3-cm (8.0-in.) MAK
45.	Zannelli, Carmelo	Palermo, Italy	1	28.0-cm (11.0-in.) SCT
	TOTAL OBSERVATIONS		355	
	TOTAL OBSERVERS		45	

Instrumentation Abbreviations:
CAS = Cassegrain, MAK= Maksutov-Cassegrain, NEW = Newtonian, REF = Refractor, SCT = Schmidt-Cassegrain

attained a maximum value of –9.94° on May 2, 2008. Despite the reduced tilt of the Globe and Rings toward Earth in 2007-08, observers continued to see and image many of Saturn's traditional Southern Hemisphere features, but situated those near the planet's extreme South limb (e.g., SPR) were more foreshortened as the Rings gradually closed up headed toward edgewise orientation in 2009-10. More and more of the Northern Hemisphere of the planet could be seen or captured with digital imagers. Major components and intensity minima of the South ring face could still be detected even though the value of B continued to diminish during the observing season. Visual observations and digital images of Saturn contributed during the apparition are summarized, including the results of continuing efforts to image the bicolored aspect and azimuthal brightness asymmetries of the Rings. Accompanying the report are references, drawings, photographs, digital images, graphs, and tables.

Figure 1



Introduction

This report is a result of an analysis of 355 visual observations, descriptive notes, and digital images dispatched to the ALPO Saturn Section by 45 observers made from October 8, 2007 through July 1, 2008, referred to hereinafter as the 2007-08 "observing season" of Saturn. Several drawings and images are included with this summary, integrated as much as feasible with topics discussed in the text, with times and dates all given in Universal Time (UT).

Table 1 provides geocentric data in Universal Time (UT) for the 2007-08 Apparition. The numerical value of **B**, or the Saturnicentric latitude of the Earth referred to the ring plane (positive when north), ranged between the extremes of -6.62° (December 14, 2007) and -9.94° (May 2, 2008). The value of **B'**, the saturnicentric latitude of the Sun, varied from -10.34° (October 8, 2007) to -6.27° (July 1, 2008).

Table 2 lists the 45 individuals who all together submitted 355 reports to the ALPO Saturn Section this apparition, along with their observing sites, number of observations, telescope aperture, and type of instrument. *Figure 1* is a histogram showing the distribution of observations by month, where it is can be seen that 27.0 percent were made prior to opposition (February 24, 2008), none at opposition, and 73.0 percent thereafter. There is a continuing natural tendency for observers to view Saturn around the date of opposition when the planet is well-placed high in the evening sky (80.0 percent of all observations occurred from February through June 2008), but to improve overall coverage, observers are urged to begin drawing and imaging Saturn as soon as it becomes visible in the eastern sky before sunrise right after conjunction. Our goal is to carry out regular observational surveillance of the planet for as much of its mean synodic period of 378d as possible (this period refers to the elapsed time from one conjunction of Saturn with the Sun to the next, which is slightly longer than a terrestrial year).

Figure 2 and *Figure 3* show the ALPO Saturn Section observer base and the international distribution of all observations submitted during the apparition. The United States accounted for slightly less than half of the participating observers (48.9 percent) and a little more than a half of the submitted observations (55.5 percent). With 51.1 percent of all observers residing in Canada, China, France, Germany, Iran, Italy, Japan, the Netherlands, the Philippines, Portugal, Spain, and the United Kingdom, whose total contributions represented 44.5 percent of the observations, international cooperation continued to be excellent this observing season.

Figure 4 graphs the number of observations this apparition by instrument type. Roughly three-eights (38.3 percent) of all observations were made with telescopes of classical design (refractors, Newtonians, and Cassegrains). Classical designs with superb optics and precise collimation frequently produce high-resolution views with excellent contrast, a likely reason why they have often been the instruments of choice for visual studies of the Moon and planets. In recent apparitions, however, since a variety of adapters are readily available to attach digital imagers to them, the utilization of comparatively compact and portable Schmidt-Cassegrains and Maksutov-Cassegrains has been growing. It has been repeatedly established that such instruments outfitted with quality well-collimated optics produce very fine images of Saturn.

Telescopes with apertures of 15.2 cm (6.0 in.) or larger accounted for 99.7 percent of the observations contributed this apparition. Even so, there are numerous historical instances where considerably smaller instruments of good quality ranging from 10.2 cm (4.0 in.) to 12.7 cm (5.0 in.) have been quite useful for many aspects of our Saturn observing programs.

The ALPO Saturn Section appreciates all of the data, descriptive reports, digital images, and visual drawings submitted by the dedicated observers listed in *Table 2* for the 2007-08 Apparition, without which this report would not have been possible. Readers desiring to participate in the observing programs for Saturn using visual methods (i.e., drawings, intensity and latitude estimates, and CM transit timings) and digital imaging techniques are encouraged to do so in upcoming observing seasons as we continue our quest for maintaining international cooperative studies of Saturn. All methods of recording observations are considered crucial to the success of our programs, whether there is a preference for sketching Saturn at the eyepiece or simply writing descriptive reports, making visual numerical relative intensity or latitude estimates, or pursuing digital imaging. It should be noted that, in recent years, too few experienced observers are making routine visual numerical relative intensity estimates, which are badly needed for a continued comparative analysis of belt, zone, and ring component brightness fluctuations over many apparitions.

The ALPO Saturn Section, therefore, appeals to observers to set aside a few minutes while at the telescope to record intensity estimates (visual photometry) in integrated light and with standard color filters. The ALPO Saturn Section is always pleased to receive observations from novices, and the author is always delighted to offer assistance as one becomes acquainted with our programs.

Figure 2

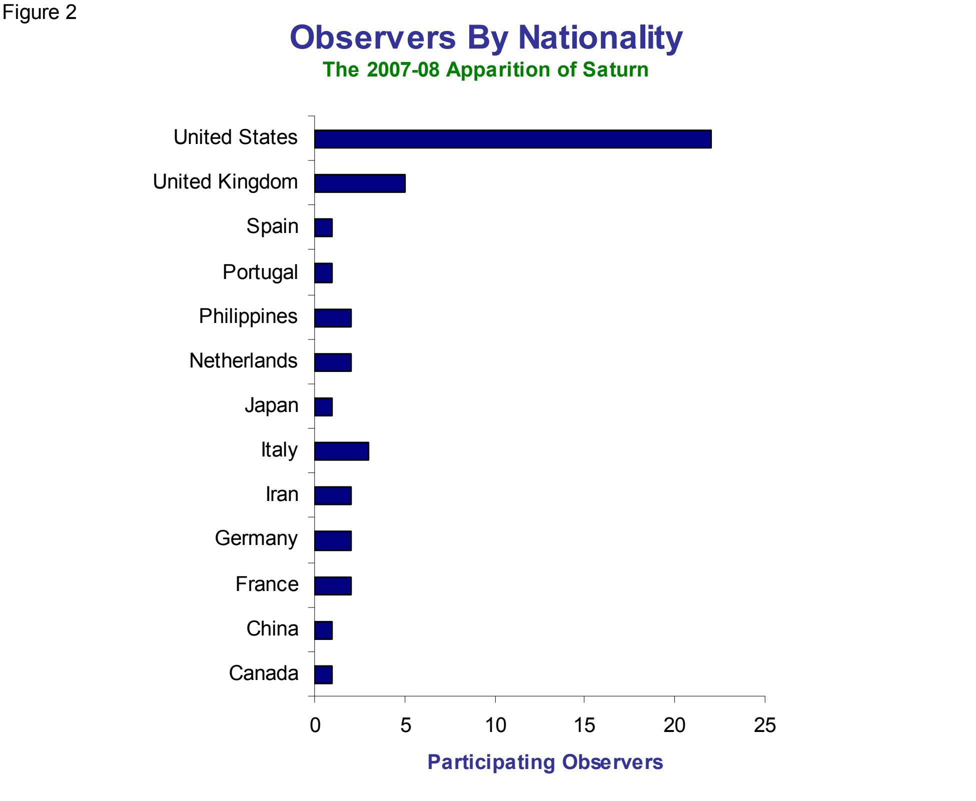


Table 3: Visual Numerical Relative Intensity Estimates and Colors (2007-08 Apparition of Saturn)

Globe/Ring Feature	# Estimates	2007-08 Mean Intensity & Standard Error	Intensity Change Since 2006-07	Mean Derived Color
Zones:				
SPR	21	3.56 ± 0.19	-0.47	Dark Gray
SSTeZ	1	6.00 ± 0.00	-----	Yellowish-White
STeZ	13	5.12 ± 0.08	-0.63	Dull Yellowish-White
STrZ	17	6.26 ± 0.16	+0.15	Yellowish-White
SEBZ	11	4.67 ± 0.10	-0.17	Dull Yellowish-Gray
EZs	22	7.52 ± 0.12	+0.26	Bright Yellowish-White
EZn	6	7.22 ± 0.19	+0.72	Pale Yellowish-White
NTrZ	8	5.38 ± 0.19	-----	Dull Yellowish-White
NPR	2	5.00 ± 0.00	+0.28	Light Gray
Globe N of Rings	12	5.33 ± 0.12	+0.54	Light Gray
Belts:				
SPB	4	3.00 ± 0.31	0.00	Dark Gray
SSTeB	1	2.50 ± 0.00	0.00	Very Dark Gray
STeB	5	4.00 ± 0.46	-0.40	Dull Grayish-Brown
SEBw (whole)	12	3.59 ± 0.17	-0.74	Dark Grayish-Brown
SEBs	12	4.10 ± 0.06	-0.07	Dark Grayish-Brown
SEBn	14	3.99 ± 0.06	+0.26	Dark Grayish-Brown
NEBw (whole)	14	3.93 ± 0.31	-----	Dark Grayish-Brown
Rings:				
A (entire)	14	7.25 ± 0.11	+0.46	Yellowish-White
A5	2	1.00 ± 0.00	0.00	Very Dark Gray
A0 or B10	8	0.69 ± 0.42	+0.69	Grayish-Black
B (outer 1/3)	26	8.00 ± 0.00 STD	0.00	Brilliant White
B (inner 2/3)	16	7.03 ± 0.07	-0.01	Bright Yellowish-White
C (ansae)	16	1.47 ± 0.18	+0.36	Very Dark Gray
Crape Band	5	2.60 ± 0.61	-0.06	Very Dark Gray
Sh G on R	13	0.15 ± 0.06	+0.15	Black shadow
Sh R on G	14	0.36 ± 0.16	+0.36	Black shadow
Terby White Spot (TWS)	4	8.38 ± 0.11	-1.12	Brilliant white

Notes:
For nomenclature and definition of the ALPO Standard Numerical Intensity Scale 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.

The Globe of Saturn

The 355 observations submitted to the ALPO Saturn Section during 2007-08 were used in preparing this summary of the observing season. Except in captions accompanying illustrations or in instances where the identity of individuals is relevant to the discussion, names have been omitted to maintain brevity. Drawings, digital images, tables and graphs are included here so that readers may refer to them as they study the text. Features on the **Globe of Saturn** are described in south-to-north order and can be identified by referring to the nomenclature diagram shown in *Figure 5*. If no reference is made to a global feature in our south-to-north discussion, the area was not reported by observers during the 2007-08 Apparition. It has been customary in past Saturn apparition reports to compare the morphology and brightness of atmospheric features

Table 4: White Spots in the STeZ During the 2007-08 Apparition of Saturn

Date	UT Start	UT End	CM Start			CM End				Instrument				
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)	Observer	Aper (cm)	Type	S	Tr	NOTES
2007														
Dec 07	03:22		126.1	043.9	084.4				Peach	35.6	SCT			STeZ white spot may be just E of CM; more obvious in red light

between observing seasons, and this practice continues with this report so readers are aware of very subtle, but nonetheless recognizable, variations that may be occurring seasonally on the planet.

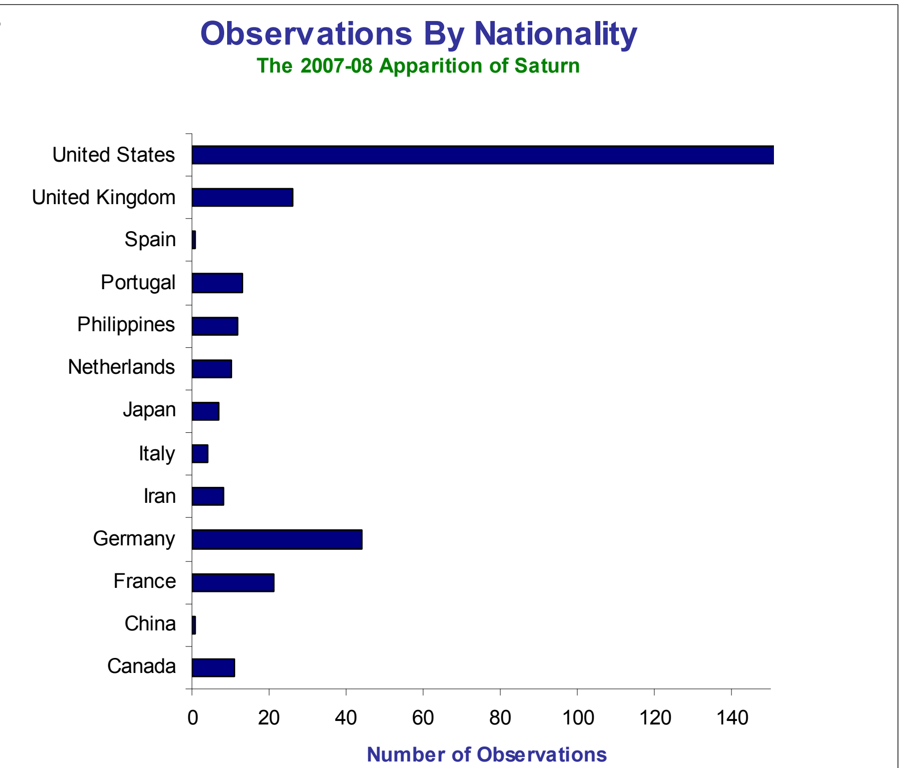
Small intensity fluctuations of Saturn's atmospheric features (see *Table 3*) may be simply due to the varying inclination of the planet's rotational axis relative to the Earth and Sun, although photometric work in the past has shown that tiny oscillations of roughly 0.10 in the visual magnitude of Saturn over nearly a decade likely occur. Transient and longer-lasting atmospheric features seen or imaged in various belts and zones on the Globe may also play a role in subtle apparent brightness fluctuations. Regular photoelectric photometry of Saturn, in conjunction with carefully executed visual numerical relative intensity estimates, is encouraged.

The intensity scale routinely employed by Saturn observers is the *ALPO Standard Numerical Relative Intensity Scale*, such that 0.0 denotes a total black condition (e.g., complete shadow) and 10.0 is the maximum brightness of a feature or phenomenon (e.g., an unusually bright EZ or dazzling 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 determined by subtracting a feature's 2006-07 intensity from its 2007-08 value. Suspected changes of 0.10 mean intensity points are usually considered insignificant, while reported changes in intensity that do not equal or exceed roughly three times the standard error are probably not important.

It is always worthwhile to evaluate digital images of Saturn contributed by ALPO observers using different apertures and filter techniques. The goal is to understand the level of detail seen and how it compares with visual impressions of the **Globe** and **Rings**, including any correlation with spacecraft imaging and results from professional observatories. So in addition to routine visual studies, such as drawings and visual numerical relative intensity estimates, Saturn observers should systematically image the planet every possible clear night to try to document individual features on the **Globe** and in the **Rings**, their motion and morphology (including changes in intensity and hue), to serve as input for grouping with images taken by professional ground-based observatories and spacecraft monitoring Saturn at close range. Furthermore, comparing images taken over several apparitions for a given hemisphere of Saturn's **Globe** provides information on seasonal changes long suspected by observers making visual numerical relative intensity estimates. Images and systematic visual observations by amateurs are being used as initial alerts of interesting large-scale features on Saturn that professionals may not already know about but can subsequently examine further with considerably larger specialized instrumentation.

Particles in Saturn's atmosphere reflect different wavelengths of light in very distinct ways, which causes some belts

Figure 3



and zones to appear especially prominent, while others look very dark, so imaging the planet with a series of color filters may help shed light on the dynamics, structure, and composition of its atmosphere. In the UV and IR regions of the electromagnetic spectrum, it is possible to determine additional properties as well as the sizes of aerosols present in different atmospheric layers not otherwise accessible at visual wavelengths, as well as useful data about the cloud-covered satellite Titan.

UV wavelengths shorter than 320nm are effectively blocked by the Earth's stratospheric ozone (O_3), while H_2O-vapor and CO_2 molecules absorb in the IR region beyond 727nm, although it should be noted that only portions of the IR are blocked and several "windows" exist in the region. The human eye is insensitive to UV light short of 320nm and can detect only about 1.0 percent at 690nm and 0.01 percent at 750nm in the IR (beyond 750nm visual sensitivity is essentially nil).

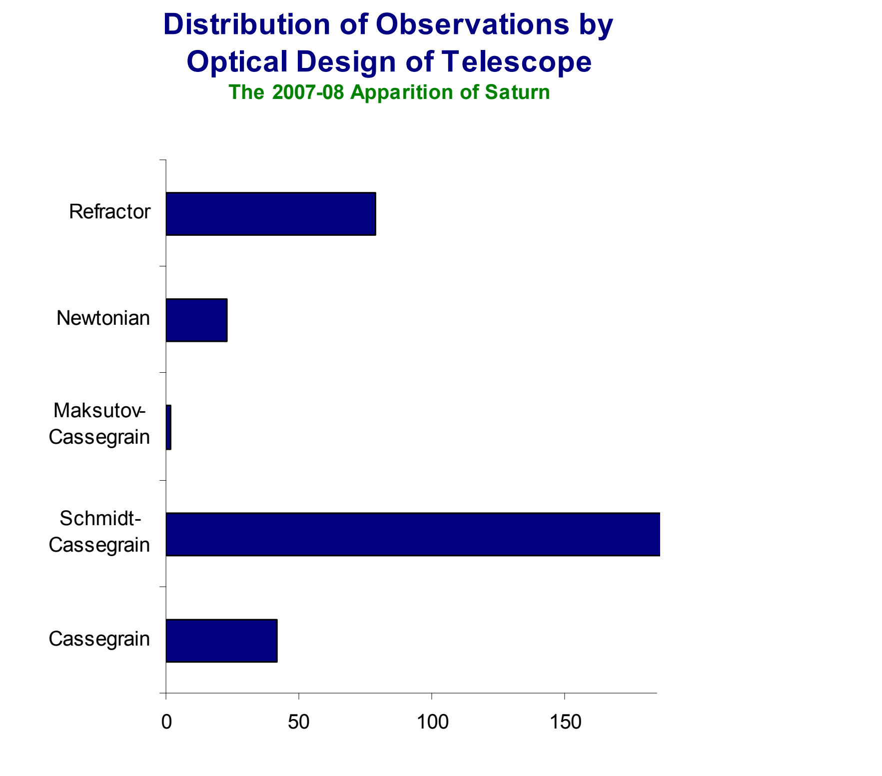
Although most of the reflected light from Saturn reaching terrestrial observers is in the form of visible light, some UV and IR wavelengths that lie on either side and in close proximity to the visual region penetrate to the Earth's surface, and imaging Saturn in these near-IR and near-UV bands has in the past provided some remarkable results. The effects of absorption and scattering of light by the planet's atmospheric gases and clouds at various heights and with different thicknesses are often noticeable. Indeed, such images periodically show differential light absorption by particles with dissimilar hues intermixed with Saturn's white NH_3 clouds.

Estimates of Latitude of Global Features Observers should try to utilize the handy visual method developed by Haas over 60 years ago to perform estimates of Saturnian global latitudes every apparition. It is easy to employ. Observers simply estimate the fraction of the polar semidiameter of the Saturn's **Globe** subtended on the central meridian (CM) between the limb and the feature whose latitude is desired. As a control on the accuracy of this method, observers should include in their estimates the position on the CM of the projected ring edges and the shadow of the **Rings**. The actual latitudes can then be calculated from the known values of **B** and **B'** and the dimensions of the **Rings**, although this test cannot be effectively applied when **B** and **B'** are near their maximum attained numerical values. Experienced observers have used this visual technique for many years with very reliable results, especially since filar micrometers are hard to find and tend to be very expensive, not to mention sometimes tedious to use. Few observers submitted estimates of Saturnian latitudes during 2007-08, and it would be very good if more observers would employ this simple and convenient method in future apparitions. A detailed description of the technique can be found in the author's book entitled *Saturn and How To Observe It*, published by Springer and available from booksellers worldwide.

Southern Regions of the Globe During the 2007-08 Apparition, **B** attained a maximum negative value of -9.94°, so observers continued to see regions of the Southern Hemisphere of Saturn to good advantage, although the extent of areas near the extreme south limb (e.g., SPR) diminished somewhat due to the decreasing tilt of the **Rings** toward our line of sight with the approaching edgewise presentation in 2009-10. After reducing visual numerical relative intensity estimates received this apparition, the mean brightness of the Southern Hemisphere features of Saturn showed no significant change since 2006-07. Some visual observers strongly suspected, however, that several belts and zones in the Southern Hemisphere showed signs of a continued subtle decline in overall brightness over the last six observing seasons. It will be interesting to see if this alleged trend continued as Saturn's tilt toward our line of sight decreased as the edgewise ring orientation in 2009-10 approached.

Beginning in early December 2007 and continuing through late June 2008, many observers visually suspected (using color filter techniques) or digitally imaged small evolving white spots in the **STrZ** and **SEBZ**, as well as isolated white spot activity in the **STeZ** in early December 2007 and in the **EZs** in early January 2008. Dusky features within the **SEBs** and **SEBn** were sketched or imaged on several occasions from mid-October 2007 through late April 2008. These phenomena are discussed in the forthcoming paragraphs dealing separately with each region of Saturn's Globe. The **EZs, SEBZ, STrZ**, and **STeZ**

Figure 4



white spots, usually caused by upward convection of NH_4 (ammonia) in Saturn's atmosphere, exhibited small but recognizable morphological changes over time. The structure of zonal wind profiles in these latitudes appear to contribute to the emergence and behavior of such discrete features. High-resolution imaging documented several white spots and dark features in these regions for a few rotations of Saturn, but re-identification and subsequent tracking of the same features proved difficult, thus no CM transit timings were provided to derive drift rates of these transient phenomena.

There have been discussions over the last several apparitions that suspected slight increases or decreases in atmospheric activity on Saturn could be a consequence of the planet's seasonal insolation cycle, but measurements in the past suggest only a slow thermal response to solar heating at Saturn's perihelion distance of ~9.0 AU from the Sun. So, as time elapses with succeeding apparitions following Saturn's perihelion passage back in 2003, observers should still maintain a watchful eye on the planet's Southern Hemisphere, since a lag in the planet's atmospheric thermal response could roughly mimic what we experience on Earth; that is, the warmest days do not arrive on the first day of summer but occur several weeks later. Any similar effect on Saturn would be extremely subtle, however, and probably not noticed for quite a number of years.

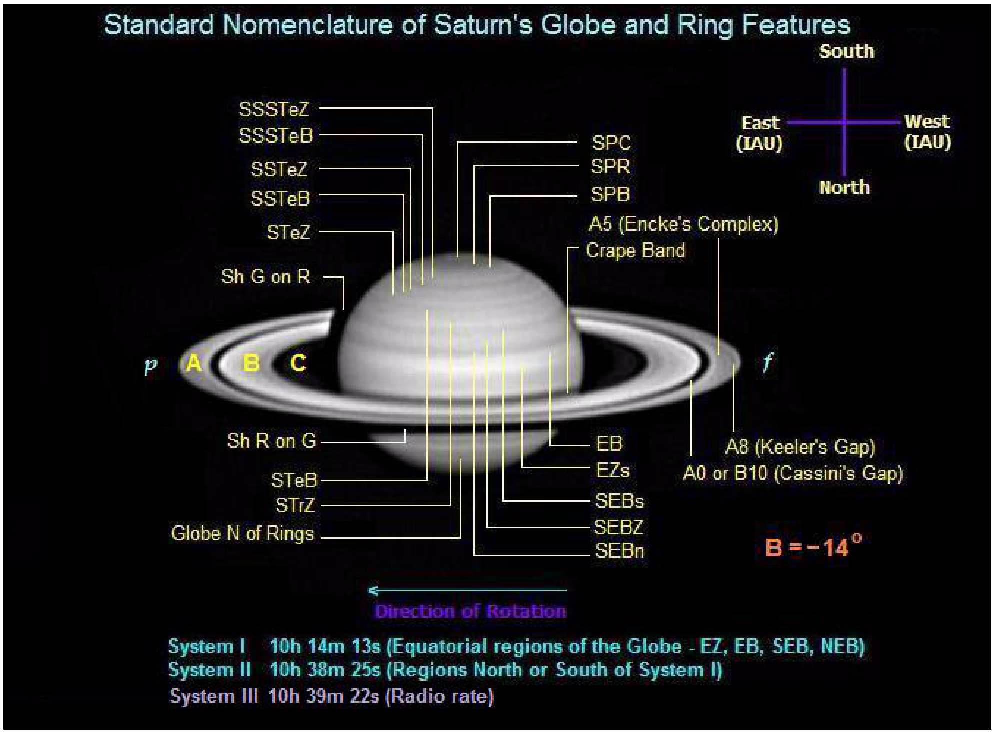


Figure 5. Saturn nomenclature, where A = Ring A, B = Band or Ring B or saturnicentric latitude of Earth, C = Ring C or Cap, E = Equatorial, f = following (celestial east), G = Globe, n = north component, N = North, p = preceding (celestial west), P = Polar, R = Ring(s) or Region, s = south component, S = South, Te = Temperate, Tr = Tropical, Z = Zone. The ring Ansae (not labeled) are the easternmost and westernmost protrusions of the Ring System. Note that "Gap" is also called "Division" or "Complex." South is at the top in this inverted view, similar to the orientation seen through an inverting telescope in Earth's Northern Hemisphere.

South Polar Region (SPR) Based on visual numerical relative intensity estimates submitted during the 2007-08 Apparition, the dark gray **SPR** may have been just a bit darker in appearance than in 2006-07 (by a subtle mean visual intensity value of only -0.47). Despite the suspicion of a slight brightening of this region back in 2004-05, the weak darkening trend believed to be underway every apparition since the 2001-02 observing season may have continued in 2007-08. No drawings by visual observers or digital images of the **SPR** revealed discrete activity in this region during the apparition. The **South Polar Cap (SPC)** was not reported by observers making visual numerical relative intensity estimates in 2007-08, possibly a consequence of the increasingly smaller ring tilt to our line of sight, affecting the overall extent of this feature and the encompassing **SPR**. Most digital images submitted this observing season at visual wavelengths depicted the **SPC** as a feature slightly lighter than the surrounding dark gray **SPR**, especially in red or green light [*Illustration No. 1* and *No. 2*]. A dark gray South Polar Belt (**SPB**) encircling the **SPR** was reported only rarely by visual observers during the apparition, but this feature was apparent in at least a few digital images received [*Illustration No. 3*].

South South Temperate Zone (SSTeZ) The yellowish-white **SSTeZ** was detected visually only once during this observing season, but several digital images in 2007-08 revealed a narrow **SSTeZ** devoid of any recognizable activity [*Illustration No. 4*].

South South Temperate Belt (SSTeB) The very dark gray **SSTeB** was reported on only one occasion visually during 2007-08, but this narrow belt could be seen on several high-resolution digital images [*Illustration No. 4*].

South Temperate Zone (STeZ) The dull yellowish-white **STeZ** was reported frequently by visual observers in 2007-08, as well as being apparent on most digital images submitted. Compared with the previous observing season, the **STeZ** was slightly darker in overall intensity this apparition (mean factor of –0.63). The **STeZ** appeared uniform in intensity during this observing season as it crossed the Globe of Saturn, but Damian Peach of Norfolk, UK, imaged what he described as a very small white spot in red light just East of the CM on December 07, 2007 at 03:22 UT using a 35.6-cm (14.0-in.) SCT (see *Table 4*) [*Illustration No. 5*]. No other observers submitted confirming images of this ill-defined, apparently ephemeral **STeZ** white feature. No white spot activity in the **STeZ** was reported by visual observers during the 2007-08 Apparition.

General Caption Note for Illustrations 1-31. B = saturnicentric latitude of the Earth; B' = saturnicentric latitude of the Sun; CMI, CMII and CMIII = central meridians in longitude Systems I, II and III; IL = integrated light; S = Seeing on the Standard ALPO Scale (from 0 = worst to 10 = perfect); Tr = Transparency (the limiting naked-eye stellar magnitude). Telescope types as in Table 2; feature abbreviations are as in Figure 5. In all figures, south is at the top and IAU east is to the left.

Illustration 1. 2007 Nov 10 05:44 UT. Digital image by Marc Delcroix using a 25.4-cm (10.0-in.) SCT, with RGB + IR blocking filter. S = 5.0 Tr = 3.0. CMI = 092.2°, CMII = 159.1°, CMIII = 232.0°, B = -7.2°, B´ = 9.9°. SPC is visible as a feature slightly lighter than the surrounding dark gray SPR.

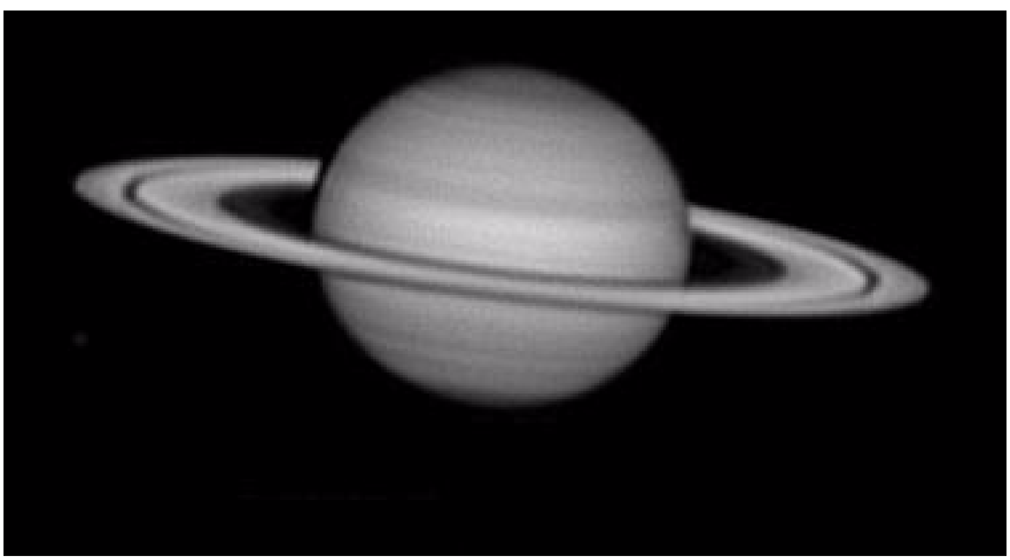


Illustration 2. 2008 Feb 13 00:27 UT. Digital image by Andrea Tasselli employing a 30.0-cm (11.8-in.) NEW with RGB filters + IR blocker. S = 7.5, Tr = 2.0. CMI = 201.7°, CMII = 086.9°, CMIII = 045.6°, B = -8.0°, B´ = 8.4°. SPC is visible as a feature slightly lighter than the surrounding dark gray SPR.

South Temperate Belt (STeB) The dull grayish-brown **STeB** was reported sporadically by visual observers during this apparition, but high-resolution digital images depicted this dusky feature in 2007-08. There was no apparent activity within the **STeB** when it was seen visually or digitally imaged. Limited mean intensity data suggested the **STeB** may have dropped slightly in mean intensity by a rather insignificant value of -0.40 since the immediately preceding apparition, and it was the lightest of the belts in the Southern Hemisphere of Saturn based on mean intensity data.

South Tropical Zone (STrZ) Visual observers reported the yellowish-white **STrZ** rather frequently during the 2007-08 Apparition, and it was basically unchanged in mean intensity this observing season when compared with 2006-07 (minor variation of only +0.15), exceeded in brightness only by the **EZs** and **EZn**. It was considerably more prominent than its Northern Hemisphere counterpart, the **NTrZ**. Visual impressions suggested no variations in overall morphology during the apparition, but there were numerous images and at least one drawing, submitted from early December 2007 through late June 2008, that showed at least two small **STrZ** white spots that became more diffuse and spread out in longitude over time (see *Table 5*). During this period, the first image of an **STrZ** white spot at 19:26 UT on December 3, 2007 in fair seeing was contributed by Christopher Go of Cebu City, Philippines, using a 28.0-cm (11.0-in.) SCT [*Illustration No. 6*]. Subsequent images of this feature continued to flow in to the ALPO Saturn Section from Christopher Go and quite a few other observers for at least another five months. Simultaneous observations (digital images) of the **STrZ** white spot occurred on February 17, 2008 by Ed Lomeli of Sacramento, CA, at 07:14 UT, employing a 23.5-cm (9.25-in.) SCT, and Frank Melillo of Holtsville, NY, with a 25.4-cm (10.0-in.) SCT at 07:15 UT [*Illustration No. 8*]. A visual sighting of the **STrZ** white spot near the CM in good seeing occurred on March 10, 2008 at 01:45 UT by Carl Roussell, observing from Hamilton, ON, Canada, using a 15.2-cm (6.0-in.) REF at 300X [*Illustration No. 10*]. A near-simultaneous pair of images were captured on April 18, 2008 by Paul

Table 5: White Spots in the STrZ during the 2007-08 Apparition of Saturn

Date	UT Start	UT End	CM Start			CM End				Instrument				
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)	Observer	Aper (cm)	Type	S	Tr	NOTES
2007														
Dec 03	19:26	19:42	193.8	219.3	263.8	203.2	228.3	272.8	Go	28.0	SCT	6.0	4.0	STrZ white spot near CM
Dec 07	03:22		126.1	043.9	084.4				Peach	35.6	SCT		-	STrZ white spot W of CM; more obvious in red light
Dec 07	20:08		356.0	251.2	290.9				Go	28.0	SCT	8.0	4.0	STrZ white spot is barely visible in image E of CM
2008														
Jan 04	09:21		219.1	304.4	310.8				Llewellyn	35.6	SCT			STrZ white spot E of CM
Jan 18	02:28		278.4	280.8	270.6				Casquinha	35.6	SCT			STrZ white spot W of CM
Jan 29	23:39	23:54	232.1	210.6	186.2	240.9	219.0	194.6	Delcroix	25.4	SCT	5.0	1.5	STrZ white spot W of CM
Jan 31	00:27		024.6	329.7	304.1				Sanchez	26.0	SCT			STrZ white spot E of CM
Feb 11	01:05	01:23	335.2	284.2	245.2	345.8	294.3	255.3	Tasselli	30.0	NEW	5.5	4.0	STrZ white spot near CM
Feb 16	23:18	23:56	298.8	056.3	010.2	321.1	077.7	031.6	Delcroix	25.4	SCT	5.5	4.0	STrZ White Spot
Feb 17	06:50	07:14	203.8	311.2	264.8	217.9	324.8	278.3	Lomeli	23.5	SCT	6.5	6.0	STrZ White Spot W of CM
Feb 17	07:15		218.5	325.3	278.8				Melillo	25.4	SCT	5.5		STrZ White Spot W of CM (near simultaneous with E. Lomeli)
Feb 19	12:58	14:04	308.3	342.9	293.7	347.1	020.1	330.9	Ikemura	38.0	SCT			STrZ White Spot
Feb 26	03:39		131.2	312.2	255.0				Parker	40.6	NEW	8.0	4.0	STrZ white spot is quite diffuse and spread out somewhat in latitude and longitude
Mar 01	14:29	15:12	289.8	327.0	264.5	315.0	351.2	288.7	Go	28.0	SCT	8.0	4.0	STrZ White Spot is W of CM
Mar 02	23:06		357.3	350.6	286.4				Delcroix	25.4	SCT	4.0	3.0	STrZ White Spot W of CM; suspected STrZ White Spot slightly E of CM
Mar 03	23:20	23:48	129.8	090.5	025.2	146.3	106.3	040.9	Casquinha	35.6	SCT			STrZ near CM
Mar 04	00:03		155.1	114.8	049.4				Casquinha	35.6	SCT			STrZ just E of CM
Mar 06	23:19	23:39	142.4	006.2	297.1	154.1	017.5	308.4	Casquinha	35.6	SCT			STrZ White Spot approaching and crossing the CM
Mar 07	19:40		138.3	334.7	264.7				Ghomizadeh	35.6	SCT			STrZ White Spot W of CM
Mar 10	01:45	02:10	241.0	004.6	291.9	255.6	018.7	306.0	Roussell	15.2	REF	5.0	4.0	Suspected small STrZ white spot on CM
Mar 13	03:56	05:26	330.9	354.7	278.2	023.6	045.4	328.9	Melillo	25.4	SCT	9.0		STrZ White Spot near CM
Mar 14	22:20		022.5	349.2	270.7				Zannelli	28.0	SCT	7.5	4.0	STrZ White Spot on CM; very nice image
Mar 14	22:30	23:25	028.3	354.8	276.3	060.6	025.9	307.3	Viladrich	35.6	SCT			STrZ White Spot on CM; very nice image
Mar 25	13:54		013.4	356.2	264.7				Go	28.0	SCT	7.0	4.0	STrZ White Spot W of CM

Table 5: White Spots in the STrZ during the 2007-08 Apparition of Saturn (Continued)

Date	UT Start	UT End	CM Start			CM End				Instrument				
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)	Observer	Aper (cm)	Type	S	Tr	NOTES
Apr 01	00:25		049.2	184.0	084.8				Adelaar	23.5	SCT	3.0	3.0	STrZ White Spots suspected; may be noise in overprocessed image.
Apr 04	11:38		096.7	119.5	016.1				Go	28.0	SCT	7.0	5.0	STrZ white spot
Apr 04	20:52	22:04	061.5	071.9	328.0	103.6	112.5	8.5	Delcroix	25.4	SCT	3.5	2.0	STrZ possibly still present in image
Apr 07	03:19		177.0	114.1	007.5				Maxson	25.4	CAS			STrZ White Spot barely visible in image near CM
Apr 14	03:23		329.2	040.2	285.2				Maxson	25.4	CAS			STrZ White Spot near CM
Apr 15	19:04	21:01	285.1	302.8	185.7	353.7	008.8	251.6	Bosman	28.0	SCT			STrZ White Spot is W of CM in 21:01 UT image
Apr 15	21:17	22:00	003.1	017.8	260.6	028.3	042.0	284.8	Delcroix	25.4	SCT	6.0	3.0	STrZ White Spot is W of CM (near simultaneous with image by Bosman)
Apr 18	03:17		102.7	044.7	284.8				Maxson	25.4	CAS			STrZ White Spot just W of CM
Apr 18	03:39		115.6	057.1	297.2				Melillo	25.4	SCT	5.5		STrZ White Spot just E of CM (near simultaneous with Maxson image same date)
Apr 18	12:37	13:40	071.0	000.5	240.1	108.0	036.0	275.5	Go	28.0	SCT	7.0	5.0	STrZ White Spot
Apr 19	00:51		141.4	054.4	293.3				Tatum	25.4	NEW			STrZ White Spot slightly E of CM
Apr 22	02:42	02:48	219.2	032.7	268.1	222.7	036.1	271.5	Boudreau	28.0	SCT	7.0	3.0	STrZ White Spot is W of CM
Apr 22	03:32		248.5	060.9	296.3				Hill	35.6	SCT	7.0		STrZ White Spot is on CM
Apr 22	22:59	23:34	212.7	359.0	233.3	233.3	018.7	253.0	Casquinha	35.6	SCT			STrZ White Spot has rotated into view W of CM (especially notable on 23:34 UT image)
Apr 23	01:38	02:58	306.0	088.7	322.8	352.9	133.8	007.8	Grafton	35.6	SCT			STrZ White Spot is well E of CM looking rather condensed.
Apr 23	21:02	21:10	268.3	024.9	258.2	273.0	029.5	262.7	Arditti	35.6	SCT			STrZ White Spot has rotated into view W of CM
Apr 26	03:28		023.1	066.5	296.9				Maxson	25.4	CAS			STrZ White Spot near CM
Apr 27	01:49		089.3	102.6	332.0				Grafton	35.6	SCT			STrZ White Spot is well E of CM followed by dimmer new emerging STrZ White Spot trailing behind
Apr 30	03:18		154.2	068.6	294.3				Melka	30.0	NEW	3.0	4.0	Older STrZ White Spot is on CM followed by dimmer new emerging STrZ White Spot trailing behind
May 01	01:04	01:56	199.9	085.0	309.5	230.4	114.3	338.8	Phillips, J	20.3	REF			Older STrZ White Spot has faded and more diffuse; new trailing STrZ White Spot has brightened rapidly
May 01	01:38		219.9	104.2	328.7				Grafton	35.6	SCT			Older STrZ White Spot has faded and more diffuse; new trailing STrZ White Spot has brightened rapidly
May 01	01:49		226.3	110.4	334.9				Phillips, M	20.3	SCT	6.0	3.0	Older STrZ White Spot has faded and more diffuse; new trailing STrZ White Spot has brightened rapidly

Table 5: White Spots in the STrZ during the 2007-08 Apparition of Saturn (Continued)

Date	UT Start	UT End	CM Start			CM End				Instrument				
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)	Observer	Aper (cm)	Type	S	Tr	NOTES
May 01	01:51		227.5	111.5	336.0				Jakiel	30.5	SCT	5.0	6.0	Older STrZ White Spot has faded and more diffuse; new trailing STrZ White Spot has brightened rapidly
May 01	20:48		174.2	032.5	256.1				Arditti	35.6	SCT			Leading older STrZ White Spot is rotating into view at W limb
May 01	21:18		191.8	049.5	273.0				Sharp	28.0	SCT	5.0		Older STrZ White Spot is elongated; trailing new STrZ White Spot is coming into view (both W of CM)
May 02	18:32		218.5	047.8	270.2				Ghomizadeh	35.6	SCT			Older STrZ White Spot is elongated; trailing new STrZ White Spot is coming into view (both W of CM)
May 02	19:29		251.9	079.9	302.3				Lazzarotti	31.5	CASS	5.5	2.0	Older STrZ White Spot is diffuse, elongated, and fading; trailing STrZ White Spot is brighter and spreading out somewhat
May 02	21:04	21:11	307.6	133.5	355.8	311.7	137.4	359.8	Arditti	35.6	SCT			Older fading diffuse STrZ White Spot is at E limb followed by brighter new STrZ White Spot
May 03	01:09	01:14	091.3	271.6	133.8	094.2	274.4	136.6	Phillips, J	20.3	REF			Rhea
May 04	03:18	03:54	291.1	076.3	297.2	312.3	096.6	317.4	Melka	30.0	NEW	3.0	4.0	Both STrZ White Spots straddle the CM
May 05	01:15	01:25	343.3	098.9	318.6	349.1	104.5	324.2	Parker	40.6	NEW	6.0	4.0	Both STrZ White Spots are close to CM; both are becoming progressively more diffuse; newer trailing spot is still the brightest of the two.
May 05	02:14		017.9	132.2	351.8				Chester	20.3	SCT	6.0	6.0	Both STrZ White Spots are at E limb; satellites visible in image
May 05	02:30	02:49	027.2	141.2	000.8	038.4	151.9	011.5	Hill	35.6	SCT	6.0		Both STrZ White Spots are at E limb; small SEBZ White Spot is possibly present W of CM; satellites appear in the 02:49 UT image
May 06	20:14	21:09	055.2	113.0	330.6	087.5	144.0	001.5	Adelaar	23.5	SCT	3.0	3.0	Both elongated STrZ White Spots are visible near CM
May 08	03:36		078.5	094.2	310.1				Maxson	25.4	CAS			Both STrZ White Spots straddle the CM
May 12	03:36		215.4	101.8	313.0				Maxson	25.4	CAS			Both STrZ White Spots straddle CM; trailing spot is still slightly brighter
May 21	20:39	21:09	133.0	065.7	265.1	150.6	082.6	282.0	Delcroix	25.4	SCT	4.0	3.0	STrZ White Spot (newest) is barely detectable at W limb
May 28	03:04	03:12	023.8	114.1	306.0	028.5	118.6	310.5	Hill	35.6	SCT	6.0		STrZ White Spots (diffuse and elongated) are near CM; satellites captured in 03:12 UT image
May 28	03:53		052.5	141.8	333.6				Maxson	25.4	CAS			STrZ White Spots (diffuse and elongated) are near CM
Jun 18	20:36	20:51	008.0	116.5	282.3	016.8	125.0	290.7	Delcroix	25.4	SCT	4.0	4.0	Are the STrZ White Spots still lingering?

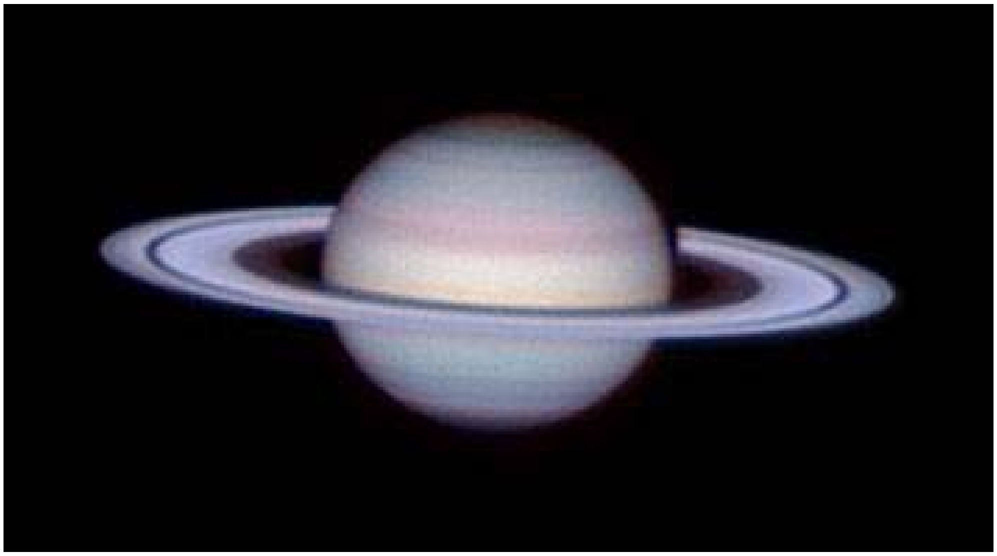


Illustration 3. 2008 Mar 13 03:41 UT. Larry Owens' digital image made with a 35.6-cm (14.0-in.) SCT with LRGB filters + IR blocker. S = 4.0, Tr = 6. CMI = 322.1°, CMII = 346.2°, CMIII = 269.7°, B = -9.1°, B´ = 8.0°. The dark gray South Polar Belt (SPB) is present encircling the SPR.

Maxson of Phoenix, AZ, at 03:17 UT with a 25.4-cm (10.0-in.) CAS, and at 03:39 UT by Frank Melillo utilizing a 25.4-cm (10.0-in.) SCT [*Illustration No. 12*]. The initial **STrZ** white spot continued to slowly evolve, spreading out and becoming more diffuse over time, and on April 27, 2008 at 01:49 UT Ed Grafton of Houston, TX, imaged another **STrZ** white spot with a 35.6-cm (14.0-in.) SCT that had just emerged following the brighter older spot [*Illustration No. 13*]. Both of these features were more obvious in images captured at red wavelengths, and images taken by the Cassini spacecraft orbiting Saturn on April 29, 2008 clearly showed detail in the older **STrZ** white spot as well [*Illustration No. 14*]. A final pair of near-simultaneous images of **STrZ** white spots were made on May 28, 2008 by Rik Hill of Tucson, AZ, with a 35.6-cm (14.0-in.) SCT at 03:04 UT and Paul Maxson of Phoenix, AZ, at 03:53 UT using a 25.4-cm (10.0-in.) CAS [*Illustration No. 16*]. As can be seen from *Table 5*, there were several other instances where near-simultaneous observations of white features in the **STrZ** occurred during the 2007-08 Apparition. [include with report also *Illustrations No. 7, 9, 11, and 15*].

South Equatorial Belt (SEB) The dark grayish-brown **SEB** was reported frequently by visual observers in 2007-08, normally subdivided into dark grayish-brown **SEBn** and **SEBs** components (where **n** refers to the **North Component** and **s** to the **South Component**), with the **SEBZ** lying in between them during good seeing conditions and with larger apertures. Taken as a whole, the **SEB** was one of the darkest belts on Saturn's **Globe** during this apparition (ranking only behind the darker, but seldom seen, **SPB** and **SSTeB**), appearing to visual observers a little darker in 2007-08 than in 2006-07 (by -0.74 mean intensity points).

When the **SEBn** and **SEBs** were both reported visually, the **SEBn** was usually

Table 6: White Spots in the SEBZ during the 2007-08 Apparition of Saturn

Date	UT Start	UT End	CM Start			CM End				Instrument				
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)	Observer	Aper (cm)	Type	S	Tr	NOTES
2007														
Dec 04	07:43	09:40	266.0	274.9	318.8	334.6	340.9	024.7	Peach	35.6	SCT			SEBZ white spot near CM
2008														
Jan 12	02:54	02:56	267.3	102.8	100.0	268.5	104.0	101.1	Casquinha	35.6	SCT			SEBZ white spot just barely E of CM
Feb 11	01:50	02:13	001.6	309.5	270.5	015.1	322.5	283.5	Lawrence	35.6	SCT	7.0	4.0	SEBZ white spot E of CM
Feb 22	23:00	23:22	314.5	238.7	185.3	327.4	251.1	197.7	Delcroix	25.4	SCT	5.5	4.0	Very small SEBZ barely visible in images
Apr 17	02:03		295.1	271.0	152.4				Grafton	35.6	SCT			SEBZ White Spot is E of CM
Apr 24	02:16		092.4	202.0	075.0				Chester	20.3	SCT	6.0	5.0	SEBZ White Spot W of CM
Apr 24	03:05		121.2	229.6	102.6				Owens	35.6	SCT	4.0	5.0	Small SEBZ White Spot is visible in IR image E of CM
Apr 28	22:59	23:06	238.1	190.6	057.7	242.2	194.6	061.6	Arditti	35.6	SCT			Small SEBZ White Spot appears on CM
May 27	03:42		281.8	043.7	236.7				Maxson	25.4	CAS			A small SEBZ White Spot may be just E of the CM

Illustration 4. 2007 Dec 06 09:45 UT. Digital image by Damian Peach with a 35.6-cm (14.0-in.) SCT, with RGB filters. S and Tr not specified. CMI = 226.3°, CMII = 167.8°, CMIII = 209.2°, B = -6.7°, B´ = 9.5°. The SSTeZ and SSTeB are quite apparent in this very detailed image; a considerable number of S- and N-Hemisphere belts and zones are also quite obvious.

the darker of the two visually. Both belt components were virtually unchanged since the immediately preceding apparition. The dull yellowish-gray **South Equatorial Belt Zone** (**SEBZ**) showed very little change in overall intensity since 2006-07 (a trivial difference of -0.17 mean intensity points). Most digital images of Saturn submitted during 2007-08 showed the **SEB** as a very prominent belt sometimes as a singular feature, but most often subdivided into a lighter **SEBs** and **SEBn** with the lighter **SEBZ** lying in between [*Illustration No. 17*]. The **SEBn** appeared considerably wider than the **SEBs** in images as well as visually.

From early December 2007 through late June 2008 observers imaged one or more small, diffuse white spots within the **SEBZ** that appeared to elongate somewhat with time, but the overall appearance and brightness of these features did not change significantly during this period. Paolo Casquinha, observing from Palmela, Portugal, captured a small **SEBZ** white spot near the CM of Saturn on January 12, 2008 at between 02:54-02:56 UT using a 35.6-cm (14.0-in.) SCT [*Illustration No. 18*]. David Arditti of Middlesex, UK, imaged the **SEBZ** white spot with red filter on April 28, 2008 at 22:59 UT with a 35.6-cm (14.0-in.) SCT [*Illustration No. 19*]. *Table 6* gives a complete listing, with supporting data and short comments, of the small white spots imaged in the **SEBZ** during 2007-08. Visual observers rarely suspected any white spots in the **SEBZ** during the observing season, and it is debatable if any of the small white spots imaged in this region could have been detected visually. Simultaneous visual observations concurrent with imaging will help determine the threshold of visibility of

Table 7: Dark Features in the SEB during the 2007-08 Apparition of Saturn

Date	UT Start	UT End	CM Start			CM End				Instrument				
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)	Obs	Aper (cm)	Type	S	Tr	NOTES
2007														
Oct 15	03:23	04:01	018.0	207.9	312.3	040.3	229.3	333.7	Niechoy	20.3	SCT	3.0	3.0	Festoons suspected extending from SEBs into EZs
Oct 17	03:28	04:24	269.5	034.6	136.7	302.3	066.2	168.2	Niechoy	20.3	SCT	3.0	3.0	Festoons suspected extending from SEBs into EZs
Nov 24	05:02	06:16	008.2	343.7	039.8	051.6	025.4	081.5	Niechoy	20.3	SCT	3.0	3.0	Festoons suspected extending from SEBs into EZs
Dec 16	02:18	03:02	127.8	116.3	146.1	153.6	141.1	170.9	Niechoy	20.3	SCT	3.0	3.0	Dark features and possibly a brighter region along SEB?
2008														
Mar 02	20:49	21:08	277.0	273.4	209.3	288.1	284.1	220.0	Niechoy	20.3	SCT	3.0	3.0	Festoon(s) emanating from SEBs across EZ?
Mar 03	21:56	22:40	080.6	043.2	337.9	106.4	068.0	002.6	Niechoy	20.3	SCT	3.0	3.0	Festoon(s) emanating from SEBs across EZ?
Mar 08	20:10	20:43	280.2	083.7	012.4	299.6	102.3	031.0	Niechoy	20.3	SCT	3.0	3.0	Festoon(s) emanating from SEBs across EZ?
Mar 10	01:45	02:10	241.0	004.6	291.9	255.6	18.7	306.0	Roussell	15.2	REF	5.0	4.0	Dark spots along SEBs W of CM
Apr 15	19:20		294.5	311.8	194.7				Frassati	20.3	SCT	4.0		Dark features along SEBn

Table 8: White Spots in the EZ During the 2007-08 Apparition of Saturn

Date	UT Start	UT End	CM Start			CM End			Observer	Instrument				NOTES
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)		Aper (cm)	Type	S	Tr	
2008														
Jan 04	04:30		048.4	140.3	146.9				Phillips, M	20.3	SCT	5.0	5.0	Possible white feature in EZs at CM in red light?

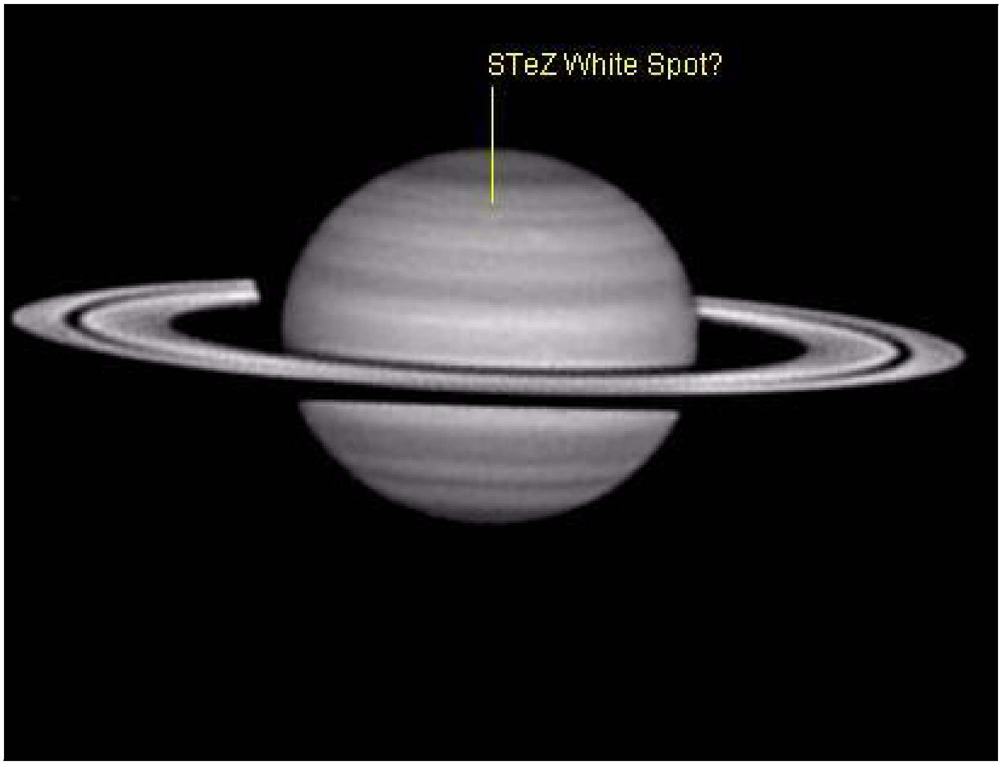


Illustration 5. 2007 Dec 07 03:32 UT. Digital image by Damian Peach with a 35.6-cm (14.0-in.) SCT, and RGB filters. S and Tr not specified. CMI = 131.9°, CMII = 049.5°, CMIII = 090.1°, B = -6.7°, B´ = 9.5°. The STeZ white spot is suspected just E of the CM in red wavelengths; the more diffuse STrZ white spot is also visible W of the CM.

such features in upcoming apparitions.

Recurring visual accounts of suspected dusky markings and festoon activity within the **SEB** were received from late October 2007 through mid-May 2008. Most of these were described as dusky markings or festoons along the northern edge of the **SEBs**, sometimes extending into the **SEBZ**, as well as similar dark features protruding from the **SEBn** into the **EZs**, or simply dark knots or disturbances within either the **SEBs** or **SEBn** in varying seeing conditions. Table 7 lists all of the reports of dark spot activity in associated with **SEB** and **SEBZ** during 2007-08 [*Illustrations No. 10, No. 20, and No. 21*].

Equatorial Zone (EZ) The southern half of the bright yellowish-white **Equatorial Zone** (**EZs**) was the region of the **EZ** mostly visible and imaged between where the **Rings** cross the **Globe** of Saturn and the **SEBn** in 2007-08. Observers also began reporting and imaging portions of the **EZn** during the apparition due to the diminished tilt of the **Rings** to our line of sight. Based on visual observations and accompanying numerical relative intensity estimates, the **EZs** was the brightest zone on Saturn's **Globe** during 2007-08, showing only a rather trivial elevation in brightness of +0.26 mean intensity points

Table 9: White Spots in the NEB During the 2007-08 Apparition of Saturn

Date	UT Start	UT End	CM Start			CM End			Observer	Instrument				NOTES
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)		Aper (cm)	Type	S	Tr	
2007														
Dec 05	09:13	09:54	083.2	057.7	100.4	107.2	080.8	123.5	Peach	35.6	SCT			Subtle bright mottlings in NEB?
Dec 06	07:58	09:50	163.6	107.5	149.0	229.2	170.6	212.0	Peach	35.6	SCT			Subtle bright mottlings in NEB?

Table 10: Visual Observations of the Bicolored Aspect of Saturn's Rings During the 2007-08 Apparition

						Filter		
Observer	**UT Date and Time**	**Telescope**	**Mag.**	**S**	**Tr**	**Bl**	**IL**	**Rd**
Roussell	2008 Mar 10 01:45 - 02:10					E	=	=
Roussell	2008 Mar 17 04:31 – 04:50	REF 15.2 cm (6.0 in.)	300	5.0	4.0	W	=	=
Roussell	2006 Apr 15 06:11 – 06:26					=	=	W

Notes:
Telescope types are as in Table 2. Mag. is magnification, Seeing (S) is the 0-10 ALPO Scale, and Transparency (Tr)y 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 **Rd** to the red W25 or W23A filters. **E** means the east ansa was brighter than the **W**, **W** that the west ansa was the brighter, and **=** means that the two ansae were equally bright. East and west directions are as noted in the text.

since 2006-07. Although visual observers did not report white spot activity in the **EZs** during 2007-08, an apparently transient small white feature was imaged near the CM on January 4, 2008 at 04:30 UT by Mike Phillips of Swift Creek, NC, using a 20.3-cm (8.0-in.) SCT (see *Table 8*). [*Illustration No. 22*]. The typically narrow light gray **Equatorial Band** (**EB**) was not reported by visual observers during the apparition, but it was often captured using digital imagers during the observing season [*Illustration No. 23*].

Northern Portions of the Globe With Saturn inclined at only -8.374° to our line of sight (at opposition) during 2007-08, several regions of the emerging Northern Hemisphere of the planet could be viewed or imaged to greater advantage, in particular the **NEBw, NTrZ** and **NPR**. Studies of Saturn’s Northern Hemisphere became easier as the **Rings** approached edgewise presentation in 2009-10, following by even better views of this hemisphere as it becomes increasingly tilted toward Earth, with corresponding growing unfavorable views of the Southern Hemisphere as it is tilted away from us. This apparition it was finally possible to compare some of the features between hemispheres as well (e.g., **SEBw** vs. **NEBw**, etc.). [*Illustration No. 4*].

North Equatorial Belt (NEB) The dark grayish-brown **NEB** was reported frequently by visual observers in 2007-08, but was undifferentiated into components like its equivalent belt in the South. The **NEBw** was slightly lighter (by +0.34 mean intensity points) than the **SEBw**. Rather subtle whitish mottlings along the otherwise dusky **NEB** were imaged on at least two occasions during December 2007 (see *Table 9*). For example, look at the image taken between 09:13 and 09:54 UT on December 5 by Damian Peach with a 35.6-cm (14.0-in.) SCT, which marginally shows a series of white features within the **NEB** [*Illustration No. 24*].

North Temperate Belt (NTeB) The light grayish-brown **NTeB** was not

Table 11: Satellite Transit Phenomena during the 2007-08 Apparition of Saturn

Date	UT Start	UT End	CM Start			CM End				Instrument				
UT	hh:mm	hh:mm	I (°)	II (°)	III (°)	I (°)	II (°)	III (°)	Observer	Aper (cm)	Type	S	Tr	NOTES
2007														
Dec 10	07:38	08:41	289.2	104.4	141.1	326.2	139.9	176.6	Peach	35.6	SCT			Tethys in transit across Globe N of Rings; sh of Tethys in transit of Globe N of Rings
Dec 31	02:36	03:27	204.1	067.6	079.2	234.0	096.3	108.0	Casquinha	35.6	SCT			Tethys and Dione transiting the Globe N of the Rings
2008														
Jan 17	01:58	02:38	136.4	171.7	162.8	159.8	194.3	185.4	Casquinha	35.6	SCT			Tethys in transit across Globe N of Rings; shadow of Tethys in transit of Globe N of Rings.
Mar 26	21:39		050.3	350.4	257.4				Bosman	28.0	SCT			Tethys and shadow cast against N hemisphere
Apr 04	11:38		096.7	119.5	016.1				Go	28.0	SCT	7.0	5.0	Enceladus in transit
Apr 09	03:23	03:34	067.8	300.4	191.3	074.3	306.6	197.5	Melillo	25.4	SCT	5.5		Shadow of Tethys in N hemisphere?
Apr 25	01:12		179.2	257.9	129.6				Phillips, M	20.3	SCT	6.0	1.0	Enceladus transit

reported by visual observers in 2007-08, but high-resolution digital images showed this feature from time to time. There was no activity noted within the **NTeB** on images submitted this apparition.

North Temperate Zone (NTeZ) This yellowish-white zone was not reported visually during 2007-08, but a few of the best digital images displayed the features devoid of discrete phenomena during the apparition.

North North Temperate Belt (NNTeB) The dull gray **NNTeB** was apparent on at some of the higher resolution digital images in good seeing conditions in 2007-08, but visual observers did not report it. There was no activity detected along this narrow belt.

North North Temperate Zone (NNTeZ) During 2007-08 the dull yellowish-gray **NNTeZ** was not reported visually but was occasionally evident on images taken with larger apertures during the observing season. There was no activity imaged within this zone.

North Polar Region (NPR) The very few visual numerical relative intensity estimates received during the 2007-08 Apparition suggested the light gray **NPR** was somewhat lighter (by a mean factor of +1.44) in visual numerical relative intensity than the dark gray **SPR**. Digital images routinely showed what appeared to be the dusky southernmost edge of the NPR [*Illustration No. 17*].

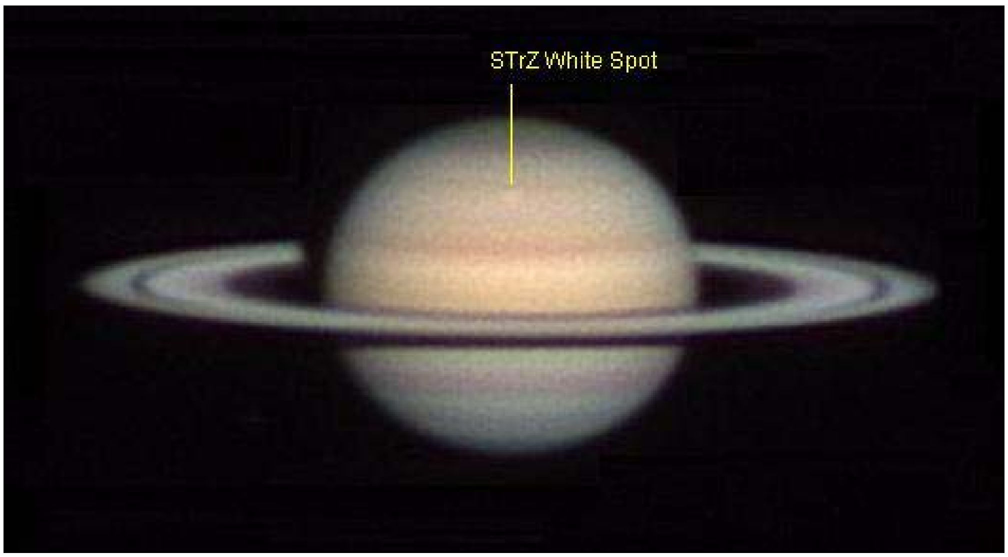


Illustration 6. 2007 Dec 03 19:26 UT. Digital image captured by Christopher Go. 28.0-cm (11.0-in.) SCT with RGB filters. S = 6.0, Tr = 4.0. CMI = 194.0°, CMII = 219.3°, CMIII = 263.8°, B = -6.7°, B´ = 9.5°. STrZ white spot is located slightly E of the CM.

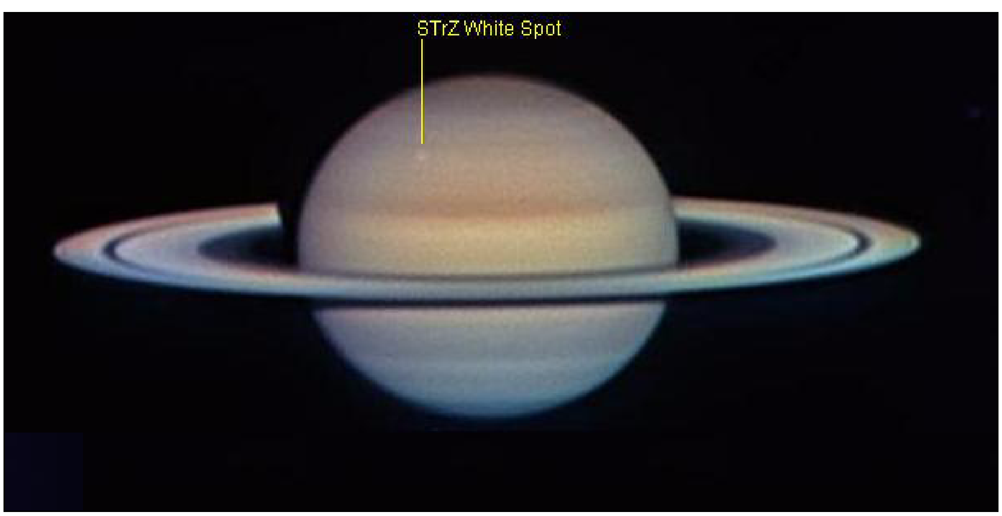


Illustration 7. 2008 Jan 04 09:21 UT. Digital image contributed by Dan Llewellyn. 35.6-cm (14.0-in.) SCT with RGB filter. S and Tr not specified. CMI = 219.1°, CMII = 304.4°, CMIII = 310.8°, B = -6.8°, B´ = 9.0°. Compact STrZ white spot is well E of the CM.

Shadow of the Globe on the Rings (Sh G on R) The **Sh G on R** was visible to observers as a geometrically regular black shadow on either side of opposition during 2007-08. Any presumed variation of this shadow from a totally black intensity (0.0) is a merely a consequence of bad seeing conditions or the presence of extraneous light. Digital images revealed this feature as completely black. Readers are reminded that, in an inverted image with south at top, 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 precisely at opposition (no shadow) as illustrated in Figure 6 (digital images furnished by David Arditti observing from Middlesex, UK, using a 35.6-cm (14.0-in.) SCT on December 12, 2007, February 24, 2008, and May 2, 2008).

Saturn's Ring System

The discussion in this section is based on visual studies of Saturn's ring system with the customary comparison of mean intensity data between apparitions, and impressions from digital images of the **Rings** are included below as well. The southern face of the **Rings** was still readily apparent during 2007-08 as the inclination of the **Rings** (value of **B**) toward observers on Earth reached as much as -9.942°, but it has increasingly become more troublesome for observers to trace divisions and intensity minima around the circumference of the **Rings** as their tilt toward us diminishes.

Ring A The majority of visual observers agreed that the yellowish-white **Ring A**, taken as a whole, was perhaps marginally brighter in 2007-08 than in 2006-07 based on visual numerical relative intensity estimates (difference of +0.46 mean intensity points). Visual observers usually described **Ring A** as one overall component, not being differentiated into inner and outer halves. Most digital images of Saturn in 2007-08, however, depicted inner and outer halves of **Ring A**, with the inner half slightly brighter than the outer half, especially at red wavelengths. The very dark gray **Encke's Division** (A5), described at times as an intensity "complex" halfway out in **Ring A** at the ansae, had a mean visual numerical relative intensity in 2007-08 equal to that of 2006-07, although this impression was based on very few observations. **Encke's Division** was apparent on quite a few digital images during the observing season, as was **Keeler's Division** (A8) further out in the ring, but the latter was not reported by visual observers [*Illustration No. 11*].

Ring B The outer third of **Ring B** is the established standard of reference for the *ALPO Saturn Visual Numerical Relative Intensity Scale*, with an assigned value of 8.0. To visual observers during 2007-08 the outer third of **Ring B** appeared brilliant white with no variation in intensity, and compared with other ring components and atmospheric phenomena of Saturn's **Globe**, it was always the brightest intrinsic feature. The inner two-thirds of **Ring B** during this apparition, which was described as bright yellowish-white and uniform in intensity, displayed essentially the same mean intensity as in the immediately preceding observing season. Digital images confirmed most visual impressions during 2007-08. Dusky, vague spoke-like features were weakly suspected at times within the inner portion of **Ring B** near the E and W ansae during the apparition, but none were confirmed by simultaneous visual observations. Digital images sometimes showed faint intensity minima at positions B1, B2, B5, and B8 within **Ring B**, but visual observers did not describe occurrences of such features during the observing season [*Illustration No. 25*].

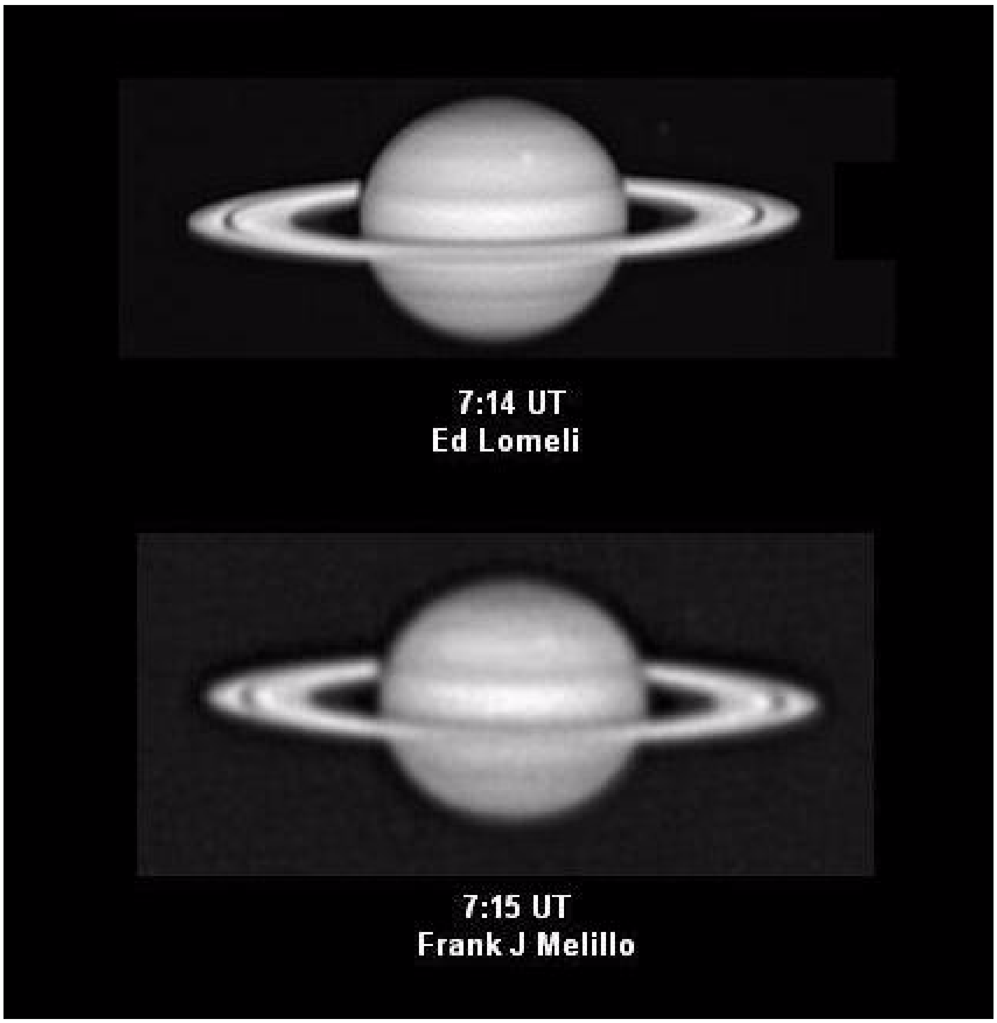


Illustration 8. Simultaneous observations (digital images):

- 2008 Feb 17 07:14 UT (top image) by Ed Lomeli employing a 23.5-cm (9.25-in.) SCT in IL + IR blocking filter. S = 6.5, Tr = 6.0. CMI = 217.9°, CMII = 324.8°, CMIII = 278.3°, B = -8.1°, B´ = 8.4°.
- 2008 Feb 17 07:15 UT (bottom image) by Frank Melillo using 25.4-cm (10.0-in.) SCT in IL + IR blocking filter. S = 5.5, Tr not specified. CMI = 218.5°, CMII = 325.3°, CMIII = 278.8°, B = -8.1°, B´ = 8.4°.

Images confirm small STrZ white spot W of the CM.

Cassini's Division (A0 or B10)

Cassini's Division (A0 or B10) was frequently reported by visual observers during the 2007-08 Apparition, described as grayish-black gap at both ansae. It was seldom noticeable all the way around Saturn's ring system by visual observers due to the small numerical value of **B** this apparition, but a few of the best high-resolution images with larger apertures revealed **Cassini's Division** around the circumference of the **Rings** [*Illustration No. 25*]. While a black **Cassini's Division** was usually apparent on many of the digital images received during the 2007-08 observing season, a deviation from a totally black intensity for **Cassini's Division** was a consequence of bad seeing, scattered light, or insufficient aperture. The general visibility of major ring divisions and other intensity minima across the breadth of the South face of the **Rings** was considerably less favorable this apparition as the continued shrinking toward 0° as Saturn approaches the next edgewise orientation toward our line of sight in 2009.

Ring C The very dark gray **Ring C** was often visible at the ansae in 2007-08, perhaps only faintly lighter in visual numerical relative intensity since 2006-07 by +0.36 mean intensity points. The **Crape Band** (merely **Ring C** in front of the **Globe** of Saturn) appeared dark gray in color and uniform in intensity, and was roughly the same brightness as in 2006-07. **Ring C** was captured on most digital images [*Illustration No. 9*], generally confirming many of the visual impressions of this ring component during 2006-07.

Opposition Effect During 2007-08 a few observers noticed the "opposition effect" (also known as the Seeliger effect), which is a perceptible brightening of Saturn's ring system during a very short interval on either side of opposition, typically when the phase angle between Sun, Saturn, and the Earth is less than about 0.3°. This ring brightening is due to coherent back-scattering of sunlight by their constituent m-sized icy particles, which do so far more effectively than the particles of Saturn's atmosphere. This phenomenon was supposed to peak around 10:00 UT on February 24, 2008 (date of opposition), but observers who detected it suggested the effect was not as pronounced the last two apparitions because of the narrowing ring tilt toward Earth.

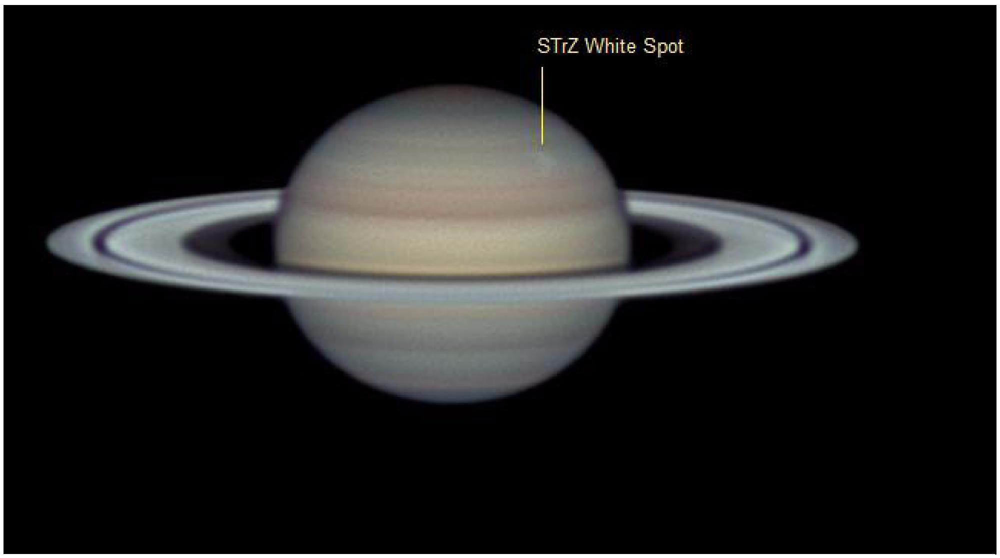


Illustration 9. 2008 Feb 26 03:39 UT. Digital image by Donald C. Parker using a 40.6-cm (16.0-in.) NEW with RGB filters + IR blocker. S = 8.0, Tr = 4.0. CMI = 131.2°, CMII = 312.2°, CMIII = 255.0°, B = -8.5°, B′ = 8.2°. Initial STrZ exhibited spreading in latitude and longitude, becoming more diffuse as illustrated in this image of the feature located W of the CM.

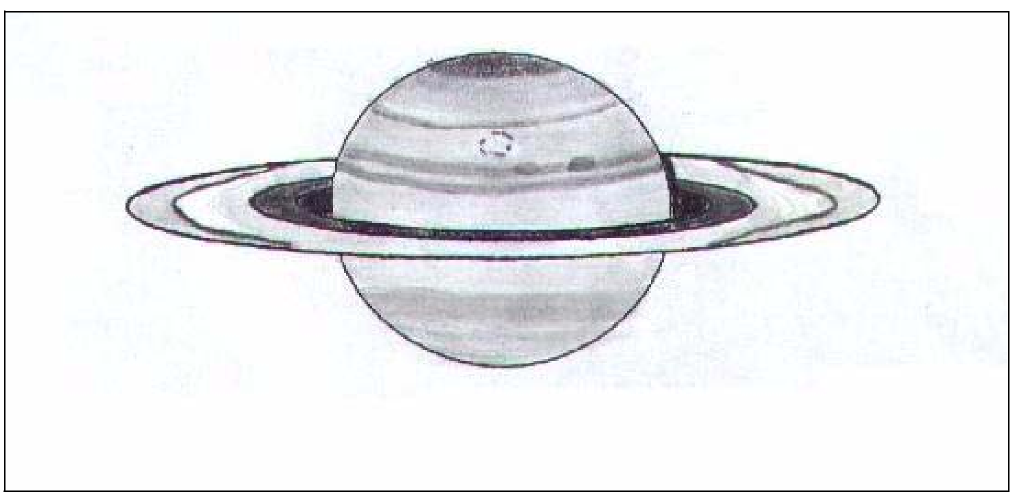


Illustration 10. 2008 Mar 10 01:45 - 02:10 UT. Drawing by Carl Roussell using a 15.2-cm (6.0-in.) REF at 300X in IL and W23A (light red), W58 (green), and W38A (light blue) filters. S = 5.0, Tr = 4.0. CMI = 241.0° to 255.6°, CMII = 004.6° to 018.7°, CMIII = 291.9° to 306.0°, B = -9.0°, B′ = -8.0°. STrZ white spot is on CM as well as a pair of dark spots along the SEBs W of the CM.

Shadow of the Rings on the Globe (Sh R on G) This shadow in 2007-08 was almost always described as a completely black feature where the **Rings** crossed Saturn's **Globe**. Reported departures from an overall black (0.0) intensity occurs for the same reason as previously noted in our discussion regarding the **Sh G on R**. When **B** and **B'** are both negative, and 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 February 21, 2008 [*Illustration No. 26*]. When **B** and **B'** are both negative, and the value of **B** exceeds that of **B'**, the shadow of the **Rings** on the **Globe** is cast to their south, circumstances that occurred starting February 21, 2008 through July 1, 2008 (the final observation received for the apparition); the **Crape Band** then is seen south of the projected **Rings A** and **B** [*Illustration No. 27*]. At times when the shadows of **Ring A, Ring B**, and **Ring C** projection are superimposed, it is often very challenging to distinguish between them 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**. There were a few instances when this feature was reported by visual observers during 2007-08. It is purely an artificial contrast effect and not a real feature of Saturn's Rings, but it is useful to try to find any correlation that might exist between the visual numerical relative intensity of the **TWS** and the varying tilt of the **Rings**, including its brightness and visibility using variable-density polarizers, color filters, photographs, and digital images.

Bicolored Aspect of the Rings and Azimuthal Brightness Asymmetries The **bicolored aspect of the Rings** refers to an observed difference 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 10* when the **bicolored aspect of the ring ansae** was thought to be present in 2007-08. As in the rest of this report, directions in *Table 10* 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.

In recent years, observers have been systematically attempting to document the presence of the bicolored aspect of the **Rings** using digital imagers (there have been rare instances when the phenomenon was allegedly photographed in the past, if at all possible at the same time it is sighted visually. In 2007-08 there were no images submitted with any evidence of this phenomenon, but it is hopeful that observers will eventually be successful imaging this curious effect at the same time visual observers report it now that digital imaging is quite commonplace. Indeed, documenting the presence of the bicolored aspect of the **Rings**, especially when it occurs independent of similar effects on the **Globe** of Saturn (which would be expected if atmospheric dispersion was a contributing factor), is of tremendous value. So, to reiterate, the importance of coinciding visual observations of Saturn with imaging of the planet cannot be stressed enough to allow simultaneous confirmation of the bicolored aspect of the **Rings**.

Professional astronomers are well-acquainted with Earth-based sightings of azimuthal variations in the **Rings** (initially confirmed by Voyager spacecraft), which is probably a result of light-scattering by denser-than-average clumps of particles orbiting in **Ring A**. ALPO Saturn observers are encouraged to try to image any azimuthal brightness asymmetries in **Ring A**, preferably at the same date that visual observers report it.

The Satellites of Saturn

Many of Saturn's satellites show tiny fluctuations in visual magnitude as a result of their varying orbital positions relative to the planet and due to asymmetries in distribution of surface markings on a few of them. Despite close proximity sensing by spacecraft, the true nature and extent of all of the observed satellite brightness variations is not completely understood and merits further investigation.

Visual Magnitude Estimates and Photometry ALPO Saturn Section observers in 2007-08 submitted no systematic visual estimates of Saturn's satellites employing recommended techniques by the ALPO Saturn Section. Even though photometry has largely replaced visual magnitude estimates of Saturn's moons, visual observers should still try to establish the comparative brightness of a satellite relative to reference stars of calibrated brightness when the planet passes through a field of stars that have precisely known magnitudes. To do this, observers need to employ a good star atlas that goes faint enough and an accompanying star catalogue that lists reliable magnitude values. A number of excellent planetarium computer programs exist that create precise plots of Saturn's path against background stars for comparative magnitude estimates.

The methodology of visually estimating satellite magnitudes is quite simple. It first begins with selection of at least two stars with well-established magnitudes and which have about the same color and brightness as the satellite. One of the stars chosen should be slightly fainter and the other a little brighter than the satellite so that the difference in brightness between the stars is roughly 1.0 magnitude. This makes it easy to divide the brightness difference between the two comparison stars into equal magnitude steps of 0.1.

To estimate the visual magnitude of the satellite, simply place it along the scale between the fainter and brighter comparison stars.

In the absence of suitable reference stars, however, a last resort alternative is to use Saturn's brightest satellite, **Titan**, at opposition visual magnitude 8.4. **Titan** is known to exhibit only subtle brightness fluctuations over time compared with the other bright satellites of Saturn that have measured amplitudes.

Some observers have begun using digital imagers with sensitivity adequate to capture the satellites of Saturn together with nearby comparison stars, thereby providing a permanent record to accompany visual magnitude estimates as described above.

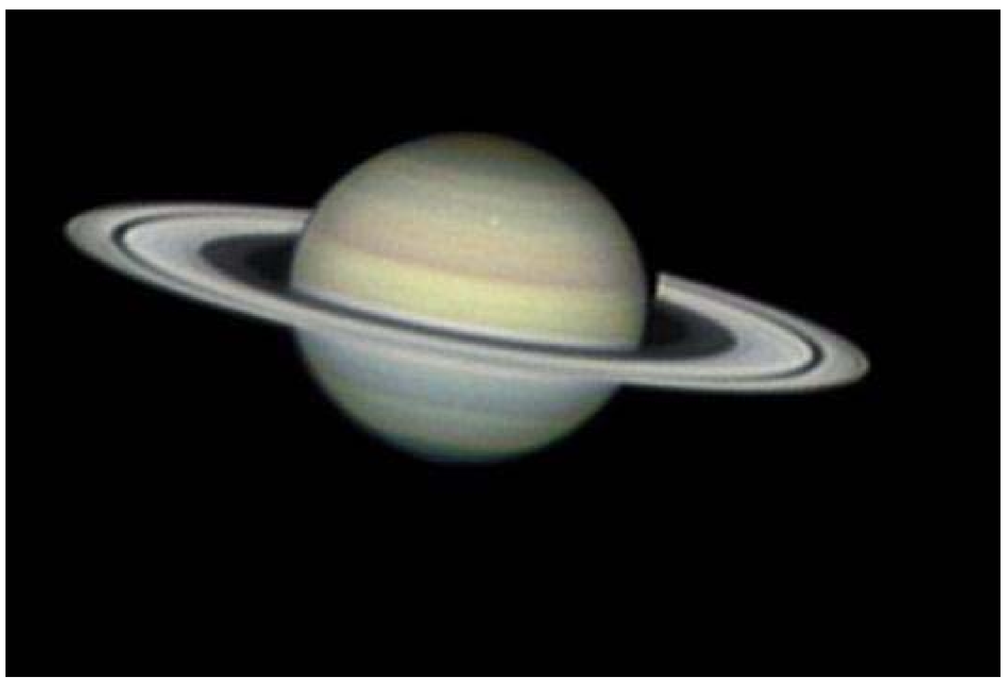


Illustration 11. 2008 Mar 14 22:20 UT. Digital image by Carmello Zannelli using a 28.0-cm (11.0-in.) SCT with LRGB filters. S = 7.5, Tr = 4.0. CMI = 022.5°, CMII = 249.2°, CMIII = 270.7°, B = -9.1°, B′ = 8.0°. Encke's Division (A5) is visible in Ring A as well as Keeler's Division (A8) farther out in the ring. STrZ white spot is approaching the CM.

Images of the positions of satellites relative to Saturn on a given date and time are worthwhile for cross-checking against ephemeris predictions of their locations and identities. It is important to realize, however, that the brightness of satellites and comparison stars on digital images will not necessarily be exactly the same as visual impressions because the peak wavelength response of the CCD chip is different than that of the eye. Observers who have photoelectric photometers may also contribute measurements of Saturn's satellites, but the satellites are notoriously difficult to measure owing to their faintness compared with the planet itself. Rather sophisticated techniques are required to correct for scattered light surrounding Saturn and its **Rings**.

Spectroscopy of Titan Since 1999, observers have been urged to attempt spectroscopy of Titan whenever possible as part of a cooperative professional-amateur project. Although **Titan** has been studied by the Hubble Space Telescope (HST), very large Earth-based instruments, and at close range by the ongoing *Cassini-Huygens* mission, opportunities continue for amateurs to contribute systematic observations using appropriate instrumentation. As the *Cassini-Huygens* mission revealed beginning in 2004, **Titan** is a very dynamic world with transient and long-term variations. From wavelengths of 300nm to 600nm, **Titan's** hue is dominated by a reddish methane (CH_4) atmospheric haze, and beyond 600nm, deeper CH_4 absorption bands appear in its spectrum. Between these CH_4 wavelengths are "portals" to **Titan's** lower atmosphere and surface, so regular monitoring in these regions with photometers or spectrophotometers is a useful complement to professional work.

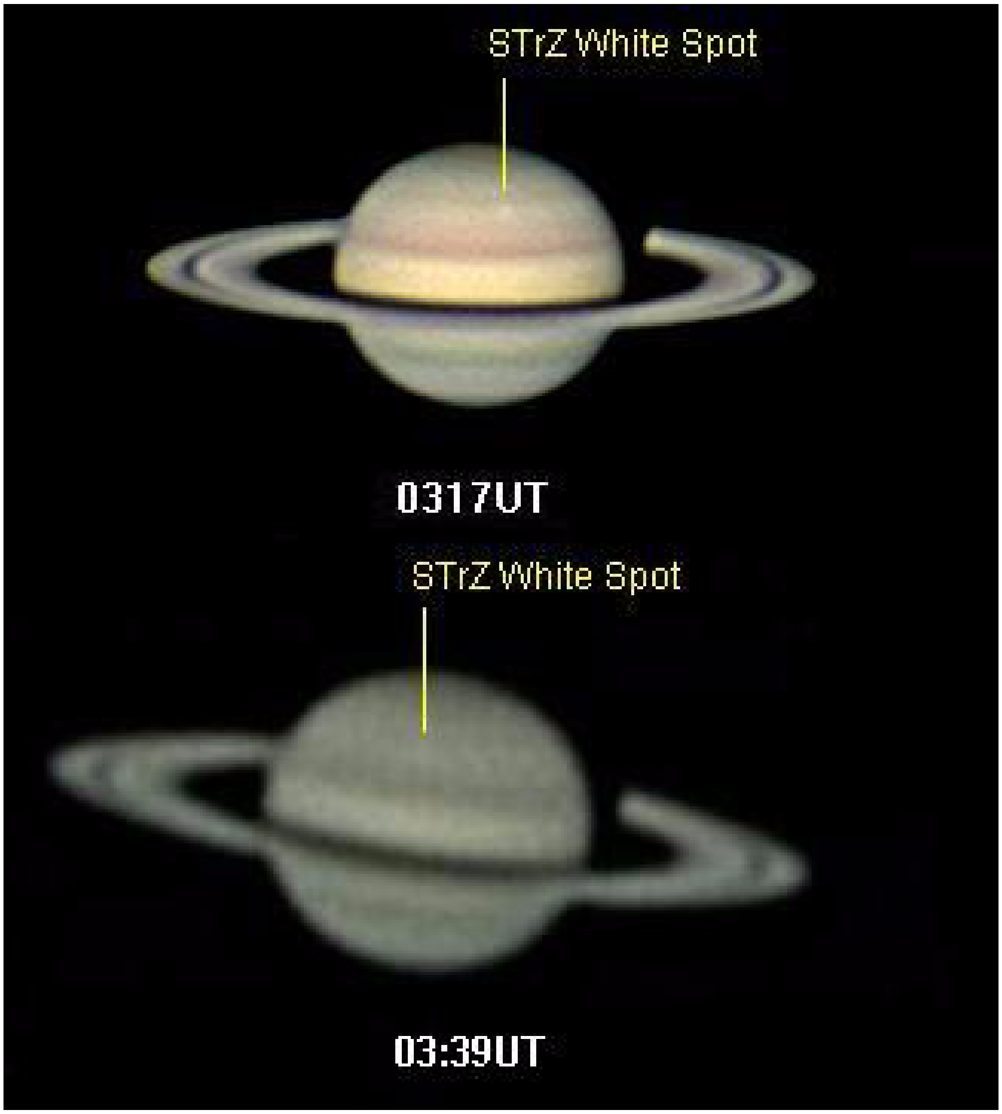


Illustration 12. Near-simultaneous observations (digital images):

- 2008 Apr 18 03:17 UT (top image) by Paul Maxson using a 25.4-cm (10.0-in.) CAS in IL + IR blocking filter. S and Tr not specified. CMI = 102.7°, CMII = 044.7°, CMIII = 284.8°, B = -9.9°, B´ = 7.4°.
- 2008 Apr 18 03:39 UT (bottom image) by Frank Melillo using 25.4-cm (10.0-in.) SCT in IL + IR blocking filter. S = 6.0, Tr not specified. CMI = 115.6°, CMII = 057.1°, CMIII = 297.2°, B = -9.9°, B´ = 7.4°.

Images show a small STrZ white spot near the CM.

Long-term studies of **Titan's** brightness from one apparition to the next is meaningful in helping shed light on **Titan's** known seasonal variations. Observers with suitable equipment are being asked to participate in these professional-amateur projects, and further details can be found on the Saturn page of the ALPO website at http://www.alpo-astronomy.org/ as well as directly from the ALPO Saturn Section.

Transits of Saturnian Satellites and their Shadows During the 2007-08 Apparition, increasingly the small inclinations of Saturn's ring plane to our line of sight afforded observers opportunities start witnessing transits and shadow transits of satellites lying near the planet's equatorial plane. Apertures less than about 20.3 cm (8.0 in.) are not usually sufficient to produce the best views of these phenomena for satellites other than perhaps **Titan**, but observers with digital imagers in 2007-08 submitted some interesting results as listed in *Table 11*.

Consider for example the superb image submitted by Damian Peach of Norfolk, UK, imaging **Tethys** and its shadow transiting the **Globe** of Saturn north of the Rings on December 10, 2007 at 07:38 UT with a 35.6-cm (14.0-in.) SCT [*Illustration No. 28*], as well as an image of **Enceladus** barely detectable in transit across Saturn's Northern Hemisphere taken by Christopher Go observing from Cebu City, Philippines, using a 28.0-cm

(11.0-in.) SCT on April 4, 2008 at 11:38 UT [*Illustration No. 29*]. Another superb image of a transit of **Dione** and its shadow was captured by Richard Bosman of Enschede, The Netherlands, at 19:04 UT on April 15, 2008 employing a 28.0-cm (11.0-in.) SCT [*Illustration No. 30*].

A highly worthwhile and extremely interesting project for individuals with adequate aperture is to observe and routinely image satellites and/or their shadows as they pass near and in front of the **Globe**. Simultaneous observations using visually at the same time that imaging is occurring will help to establish the limits of visibility of such events using both methods. Precise timings should be made to the nearest second of ingress, CM passage, and egress of a satellite or its shadow across the **Globe** of the planet at or near edgewise ring orientations. Notes should also be made of the belt or zone on the planet crossed by the shadow or satellite, and visual numerical relative intensity estimates of the satellite, its shadow, and the belt or zone it is in front of is important, as well as drawings of the immediate area at a given time during the event.

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 unparalleled chances for firm verification of ill-defined or traditionally controversial phenomena.

The ALPO Saturn Section has organized a simultaneous observing team so that several individuals in reasonable proximity to each another can maximize the opportunities for viewing and imaging Saturn at the same time using similar equipment and methodology. 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 2007-08 [*Illustrations No. 8 and No. 12*], but as in previous observing seasons, such observations usually occur rather fortuitously.

Experienced observers usually are the more common participants in such an endeavor, but newcomers are encouraged to get involved as well. Readers are invited to inquire about our simultaneous observing efforts.

Pro-Am Opportunities

Our cooperative involvement in professional-amateur (Pro-Am) projects continued this apparition. Readers of this Journal may recall the appeal that occurred a couple of apparitions ago from NASA's Radio and Plasma Wave Science (RPWS) team for amateur astronomers to monitor Saturn's Southern Hemisphere for bright clouds following a sudden occurrence of radio noise caused by a dynamic storm in the **STrZ** in January 2006.

Sure enough, on January 25, 2006, ALPO observers imaged a small white spot in this zone, which apparently corresponded with the outburst of radio noise detected by the Cassini spacecraft.

Throughout the rest of the 2005-06 apparition, the **STrZ** white spot and its subsequent evolution was carefully and systematically imaged by ALPO observers. Equivalent observational work continued during the immediately preceding apparition and in 2007-08, and the results were made available to the professional community for subsequent cross-reference with Cassini data.

But this was not the first concerted Pro-Am effort in recent observing seasons: Coinciding with the time Cassini was to start observing Saturn at close range in April 2004, digital images at wavelengths ranging from 400nm - 1m under good seeing conditions were solicited by professionals from amateurs.

This Pro-Am effort has continued ever since, and to participate, observers simply need to utilize classical broadband filters (e.g., Johnson system: B, V, R and I) with telescopes of 31.8 cm (12.5 in.) in aperture or greater, and also imaging through a 890-nm narrow band CH_4 (methane) filter [*Illustration No. 31*]. The Cassini Team requests that observers systematically patrol the planet every clear night for individual features, watching their motions and morphology, and

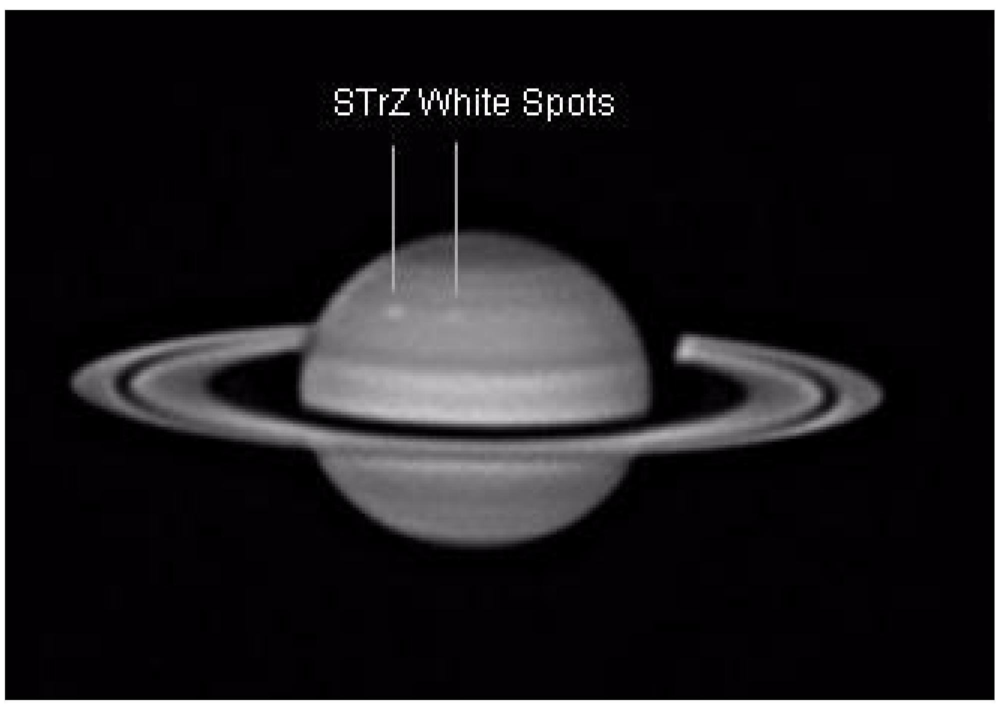


Illustration 13. 2008 Apr 27 01:49 UT. Digital image captured by Ed Grafton with a 35.6-cm (14.0 in) SCT in IL + IR blocking filter. S and Tr not specified. CMI = 089.3°, CMII = 102.6°, CMIII = 332.0°, B = -10.0°, B′ = 7.3°. The leading STrZ white spot is spreading out and becoming a bit more diffuse, while a newer following STrZ white spot is also apparent in the image.

thereby provide input of interesting large-scale targets for Cassini's imaging system to begin close-up surveillance. Accounts of suspected variations in belt and zone reflectivities (i.e., intensity) and color are also very useful, so visual observers can continue to play a very meaningful role by making routine visual numerical relative intensity estimates.

The Cassini team combines ALPO Saturn Section images with data from the Hubble Space Telescope and from other professional ground-based observatories for immediate and future study. As a means of facilitating regular amateur-professional observational cooperation, readers are requested to contact the ALPO Saturn Section with any questions they may have as to how they can share their observational reports, drawings, and images of Saturn and its satellites with the professional community. The author is always delighted to offer guidance to novices, as well as more experienced observers. A very meaningful resource for learning 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.

Illustration 14. 2008 Apr 29 image captured by the Cassini spacecraft shows the detail associated with STrZ white spot activity imaged by ALPO observers during the 2007-08 Apparition. Image courtesy of Cassini Mission.

Conclusions

Based on mean visual numerical relative intensity estimates during 2007-08 and comparing the results with the immediately preceding apparition, only very subtle fluctuations in belt and zone intensities were suspected. It would be difficult to conclude that atmospheric activity on Saturn's **Globe** increased or decreased substantially over the last several apparitions, but using standard visual observing methods and digital imaging, limited atmospheric activity was apparent in the form of small white spots in the **STrZ, STeZ, SEBZ, EZs**, and **NEB**.

There were some small changes noted in morphology for the **STrZ** white spots, along with a "spreading out" in latitude and longitude during 2007-08, but the other white features reported this observing season remained rather compact and undifferentiated.

Dark spots and other dusky features were also suspected or imaged within the **SEB**.

Therefore, with the exception of the **STrZ** and **SEBZ** white spots and occasional dark festoons or disturbances associated with the **SEBs** and **SEBn**, most of the 2007-08 atmospheric phenomena associated with the belts and zones on Saturn were poorly-defined and generally short-lived.

With respect to the **Ring System**, apart from routine visual observations and

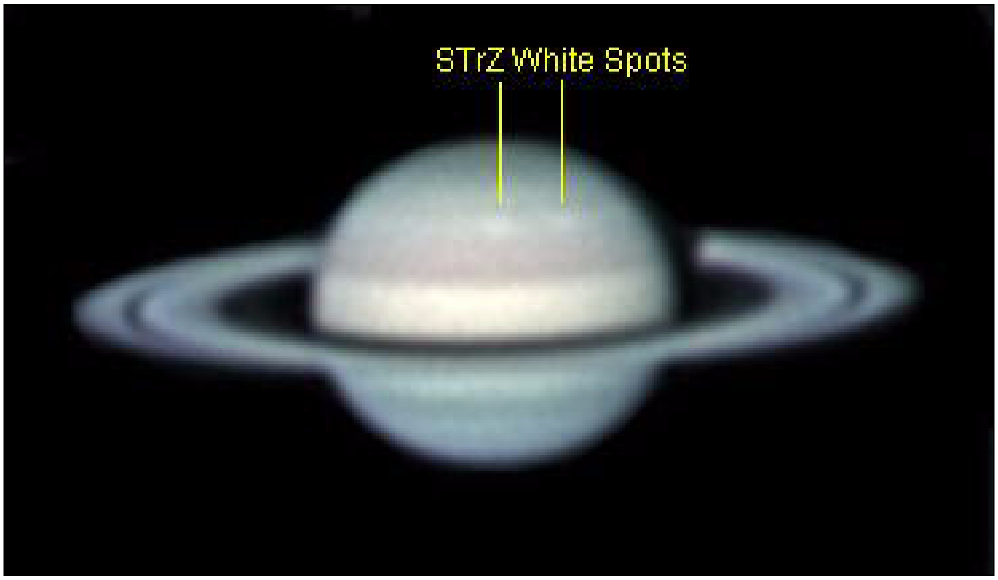
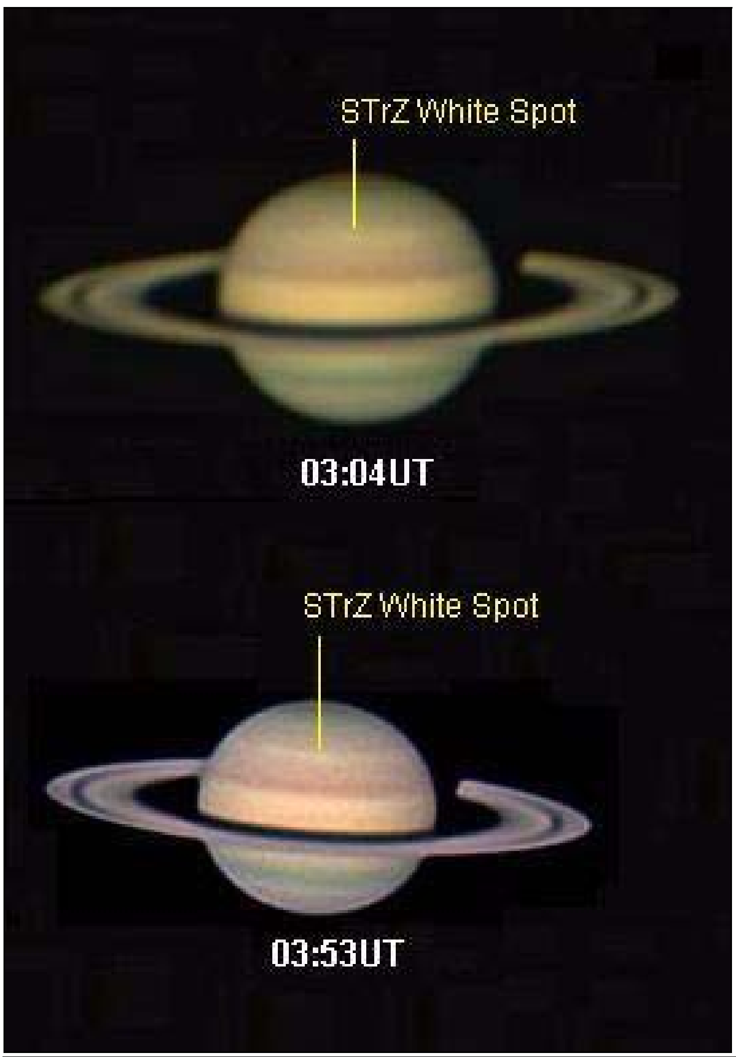


Illustration 15. 2008 Apr 30 03:18 UT. Digital image by Jim Melka using a 30.5-cm (12.0-in.) SCT with UV filter + IR blocking filter. S = 3.0, Tr = 4.0. CMI = 154.2°, CMII = 068.6°, CMIII = 294.3°, B = -10.0°, B´ = 7.3°. Both evolving STrZ white spots are easily seen approaching the CM.



digital images showing **Cassini's** (A0 or B10), **Encke's** (A5), and **Keeler's** (A8) **Divisions**, several less-conspicuous intensity minima at different locations within **Ring B** were recorded with digital imagers. One or two visual observers suspected dusky ring spokes within **Ring B** during 2007-08, but there were no digital images submitted this observing season that showed such features in **Ring A** or **B**. There were only three separate reports by one observer of the bi-colored aspect of the **Rings** during the apparition, and no submitted digital images hinted at this phenomenon in 2007-08.

Illustration 16. Near-simultaneous observations (digital images):

- 2008 May 28 03:04 UT (top image) by Rik Hill using a 35.6-cm (14.0-in.) SCT in UV + IR blocking filter. S = 6.0, Tr not specified. CMI = 023.8°, CMII = 114.4°, CMIII = 306.0°, B = -9.7°, B´ = 6.8°.
- 2008 May 28 03:53 UT (bottom image) by Paul Maxson using a 25.4-cm (10.0-in.) CAS in UV + IR blocking filter. S and Tr not specified. CMI = 052.5°, CMII = 141.8°, CMIII = 333.6°, B = -9.7°, B´ = 6.8°.

Both images show a small STrZ white spot situated near the CM.

Digital imaging, which now routinely takes place along with visual studies of Saturn, often reveals discrete detail on the **Globe** and in the **Rings** often below the normal visual threshold. The combination of both methods greatly improves the opportunities for detecting changes on Saturn during any given observing season, and monitoring different regions of Saturn with digital imagers may detect outbursts of activity that visual observers may subsequently be able to study with their telescopes, allowing the establishment of limits of visibility of such features.

In addition, during the 2007-08 Apparition, increasingly small inclinations of Saturn's ring plane to our line of sight gave observers a chance to start witnessing transits and shadow transits of satellites lying near the planet's equatorial plane, such as **Dione, Enceladus, Tethys**, and **Titan**.

The author is very grateful for the efforts of all the individuals mentioned in this report who submitted drawings, digital images, descriptive reports, and visual numerical relative intensity estimates during the 2007-08 Apparition.

It was also quite pleasing to see increased simultaneous observations this apparition. Dedicated systematic observational work makes our programs a success and helps amateur and professional astronomers alike to obtain a better understanding of Saturn and its dynamic ring system. Observers everywhere are encouraged to participate in our programs in future apparitions.

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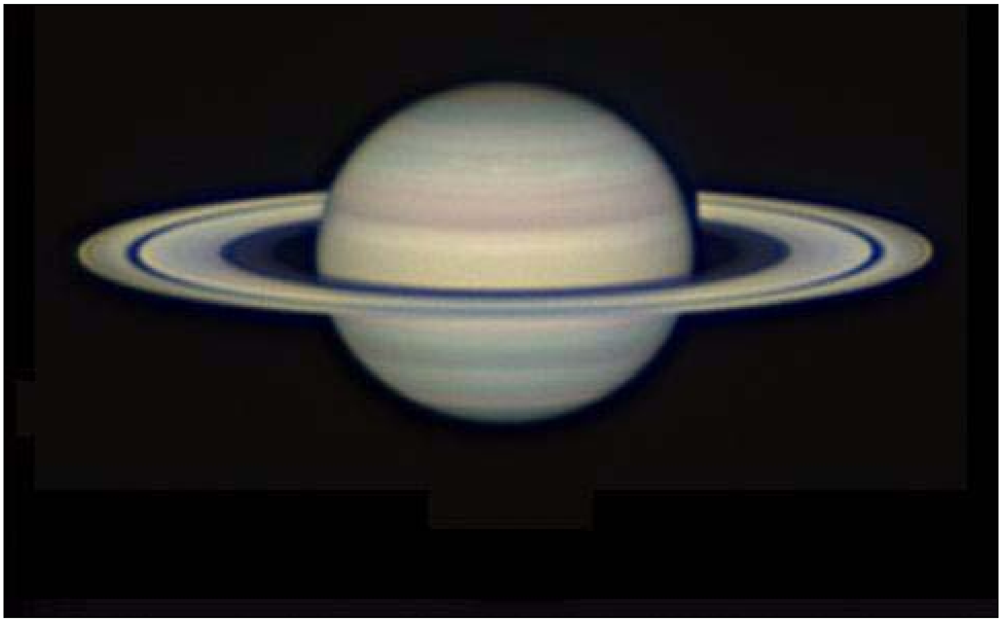

Illustration 17. 2008 Mar 14 23:25 UT. Digital image by Christian Viladrich using a 35.6-cm (14.0-in.) SCT with RGB + IR blocking filter. S and Tr not specified. CMI = 060.6°, CMII = 025.9°, CMIII = 307.3°, B = -9.1°, B′ = 8.0°. SEBs and SEBn are quite apparent in this image with SEBZ lying in between. STrZ white spot activity is also apparent near the CM.

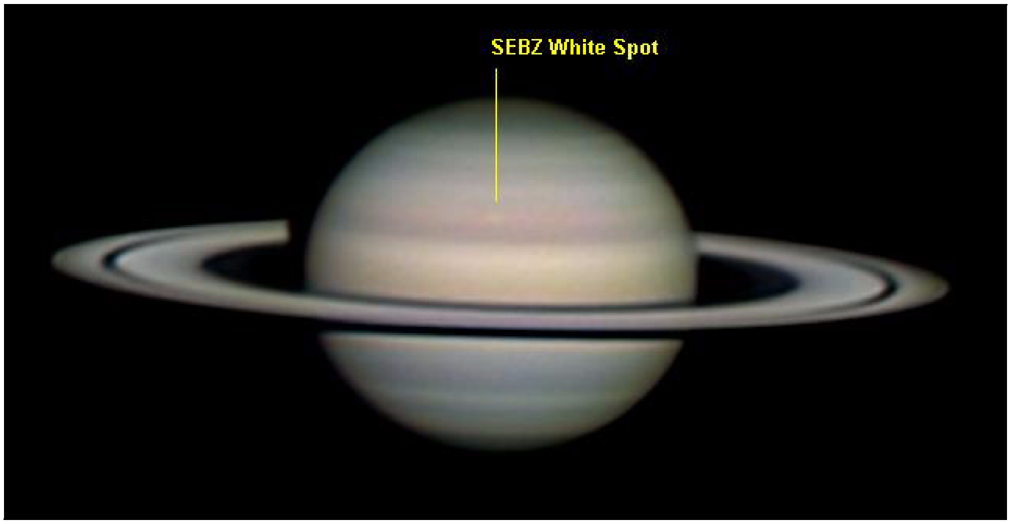

Illustration 18. 2008 Jan 12 02:55 UT. Digital image by Paolo Casquinha employing a 35.6-cm (14.0-in.) SCT with RGB + IR blocking filter. S and Tr not specified. CMI = 267.9°, CMII = 103.4°, CMIII = 100.5°, B = -7.0°, B′ = 8.9°. Small SEBZ white spot is visible slightly E of the CM.

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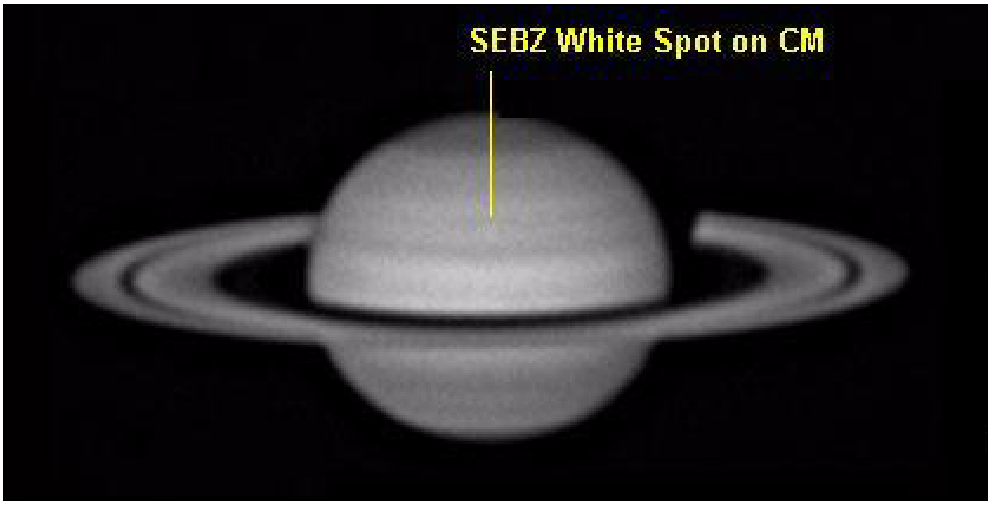


Illustration 19. 2008 Apr 28 22:59 UT. Digital image by David Arditti with a 35.6-cm (14.0-in.) SCT with red filter + IR blocking filter. S and Tr not specified. CMI = 238.1°, CMII = 190.6°, CMIII = 057.7°, B = -10.0°, B′ = 7.3°. Small SEBZ white spot is on the CM; most prominent using red filter.

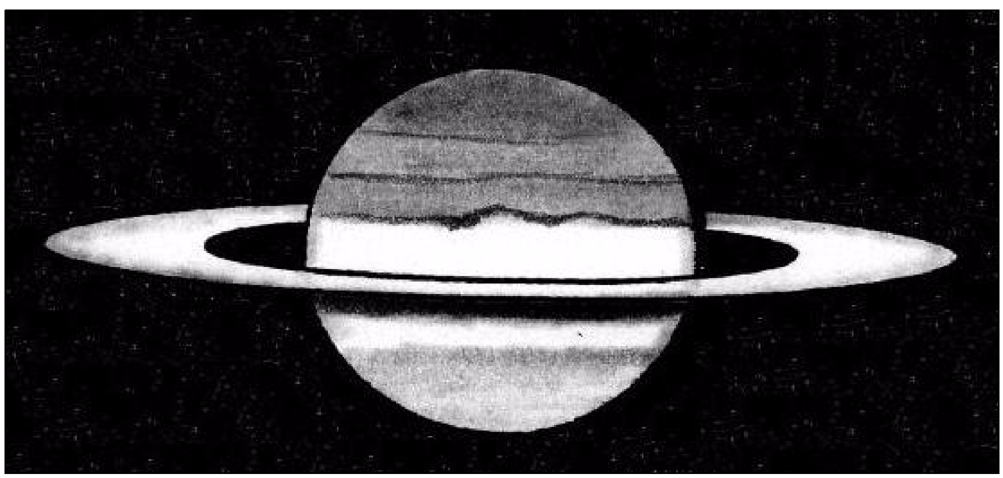


Illustration 20. 2007 Dec 16 03:02 UT. Drawing by Detlev Niechoy using a 20.3-cm (8.0-in.) SCT at 225X in IL. S = 3.0, Tr = 3.0. CMI = 153.6°, CMII = 141.1°, CMIII = 170.9°, B = -6.7°, B′ = 9.3°. Wavy, somewhat irregular SEBn is shown in this drawing.

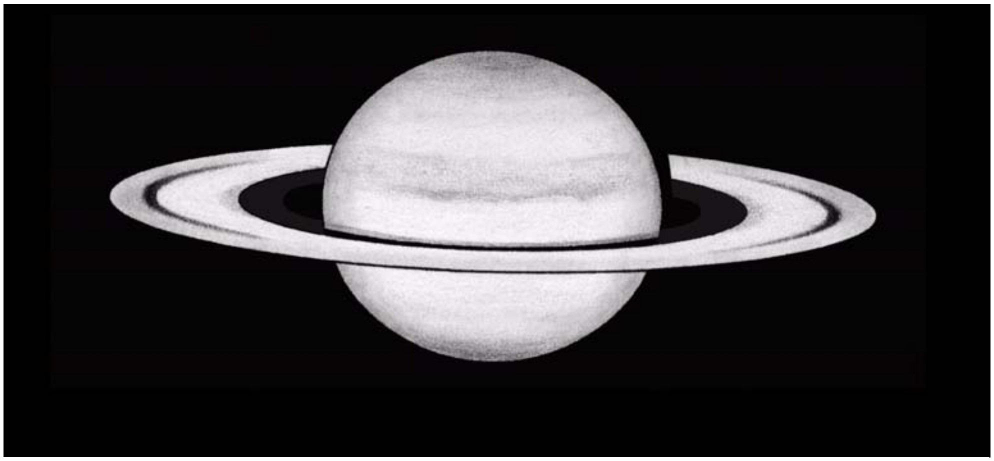


Illustration 21. 2008 Apr 15 19:20 UT. Excellent sketch by Mario Frassati using a 20.3-cm (8.0-in.) SCT at 250X in IL. S and Tr not specified. CMI = 294.5°, CMII = 311.8°, CMIII = 194.7°, B = -9.9°, B´ = 7.5°. Small dark features are apparent along the North edge of the SEBn, extending very slightly into the EZ.

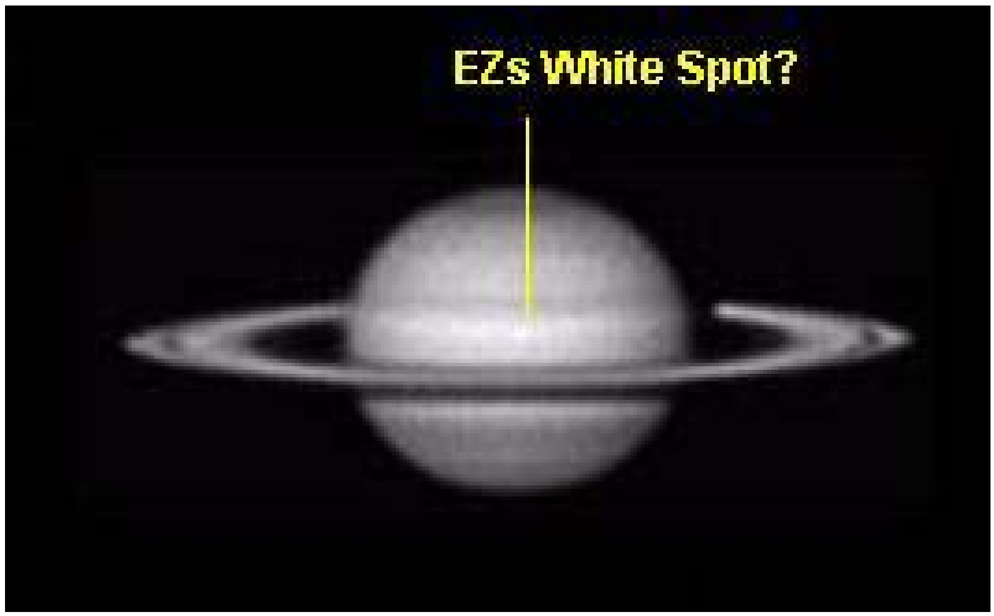


Illustration 22. 2008 Jan 04 04:30 UT. Digital image contributed by Michael A. Phillips using a 20.3 cm (8.0-in.) SCT in RGB + IR blocking filter. S = 5.0, Tr = 5.0. CMI = 048.4°, CMII = 140.3°, CMIII = 146.9°, B = -6.8°, B´ = 9.0°. Apparently transient small white spot appears in the Ezs near the CM.

Illustration 23. 2008 May 27 01:50 - 02:05 UT. Digital image by Jim Phillips using a 20.3-cm (8.0-in.) REF in RGB + IR blocking filter. S = 8.0, Tr not specified. CMI = 216.2 to 225.0°, CMII = 340.5 to 349.0°, CMIII = 173.6 to 182.1°, B = -9.7°, B´ = 6.8°. Narrow EB is apparent running across the Globe of Saturn.

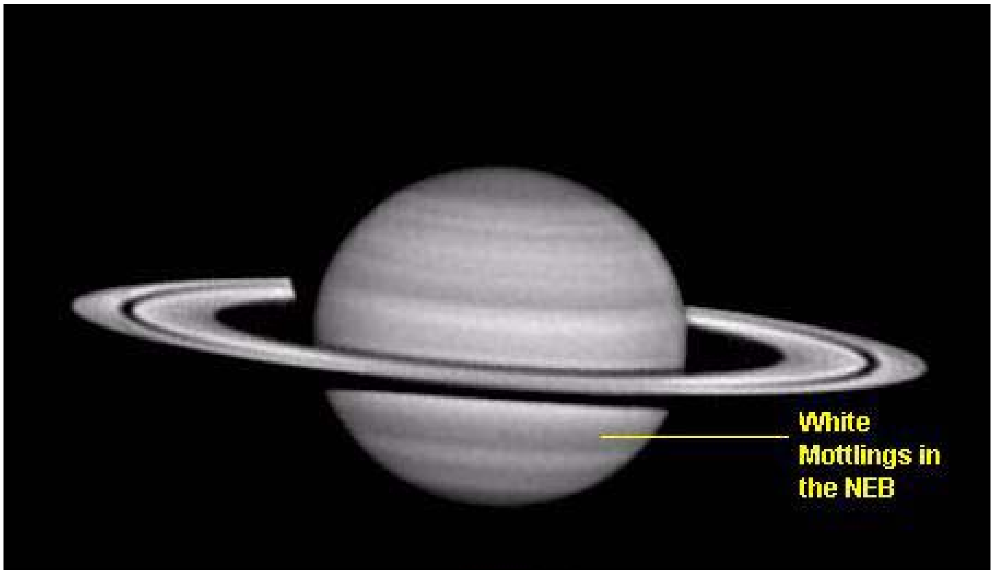


Illustration 24. 2007 Dec 05 09:13-09:54 UT. Digital image by Damian Peach utilizing a 35.6-cm (14.0-in.) SCT in green light. S and Tr not specified. CMI = 083.2° to 107.2°, CMII = 057.7° to 080.8°, CMIII = 100.4° to 123.5°, B = -6.7°, B´ = 9.5°. Very subtle whitish mottlings are possibly present in the NEB.

Illustration 25. 2008 Mar 20 12:51 UT. Digital image by Christopher Go using a 28.0-cm (11.0-in.) SCT in RBG + IR blocking filter. S = 8.0, Tr = 8.0. CMI = 074.9°, CMII = 220.6°, CMIII = 135.2°, B = -9.3°, B´ = 7.9°. Cassini's Division (A0 or B10) is seen around the circumference of the Rings, through which the Globe of Saturn is visible; Encke's Complex (A5) and Keeler's Division (A8) are apparent in Ring A at both ansae. Several intensity minima in Ring B are also barely perceptible at the ansae.

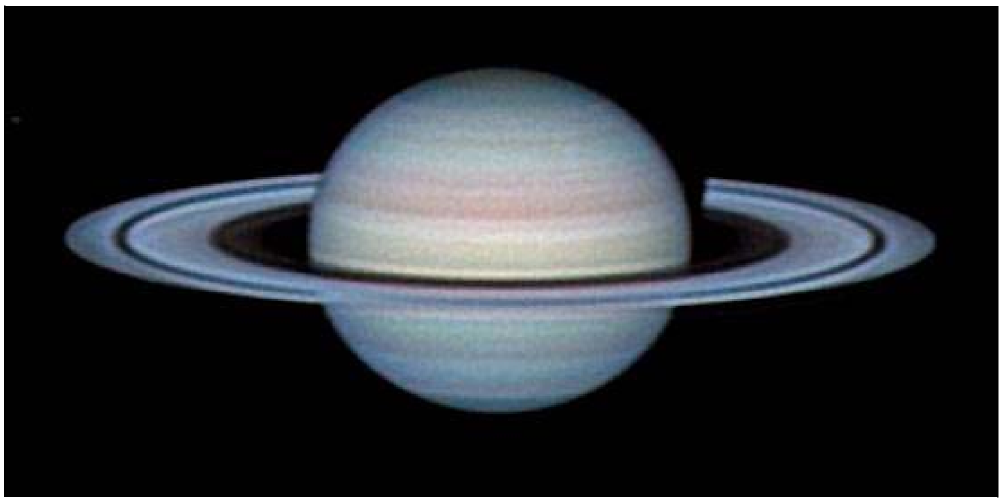
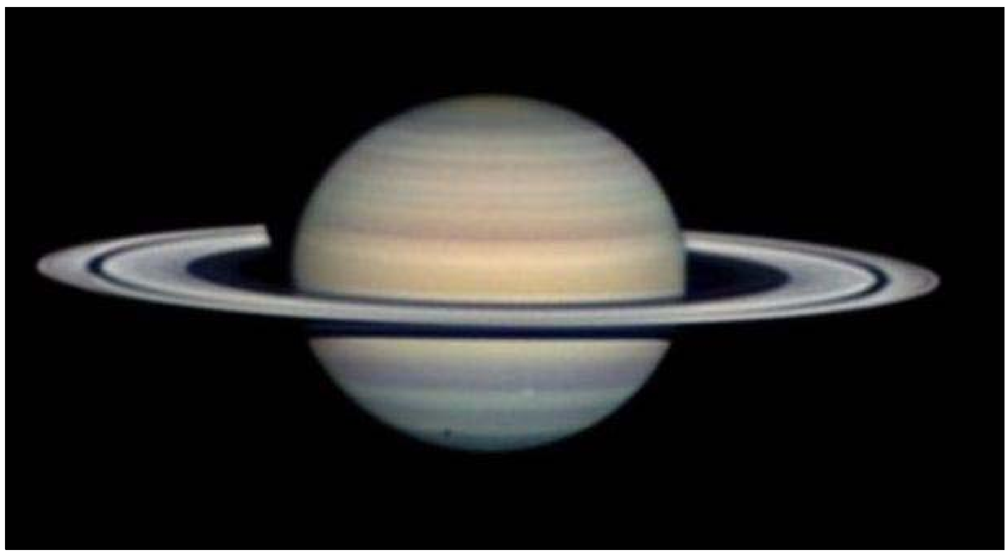


Illustration 26. 2007 Oct 18 05:35 UT. Digital image submitted by Pete Lawrence using a 35.6-cm (14.0-in.) SCT in IL + LRGB filters. S = 7.0, Tr = 6.0. CMI = 108.2°, CMII = 198.2°, CMIII = 298.9°, B = 8.0°, B´ = 10.2°. The shadow of the Rings on the Globe (Sh R on G) is cast to the north of the ring system in this image (see text for a discussion of the circumstances governing the location of this feature with time).

Illustration 27. 2008 Jun 03 16:48 UT. Digital image by Sadegh Ghomizadeh using a 35.6-cm (14.0-in.) SCT in IL. S and Tr not specified. CMI = 171.8°, CMII = 049.9°, CMIII = 233.9°, B = -9.5°, B′ = 6.7°. The shadow of the Rings on the Globe (Sh R on G) is cast to the south of the ring system (and visible through the wider Crape Band) in this detailed image (see text for a discussion of the circumstances governing the location of this feature with time).

Illustration 28. 2007 Dec 10 07:38 UT. Digital image by Damian Peach with a 35.6-cm (14.0-in.) SCT in RGB. S and Tr not specified. CMI = 289.2°, CMII = 104.4°, CMIII = 141.1°, B = -6.7°, B′ = 9.4°. Excellent view of Tethys and its shadow transiting the Globe of Saturn north of the Rings.



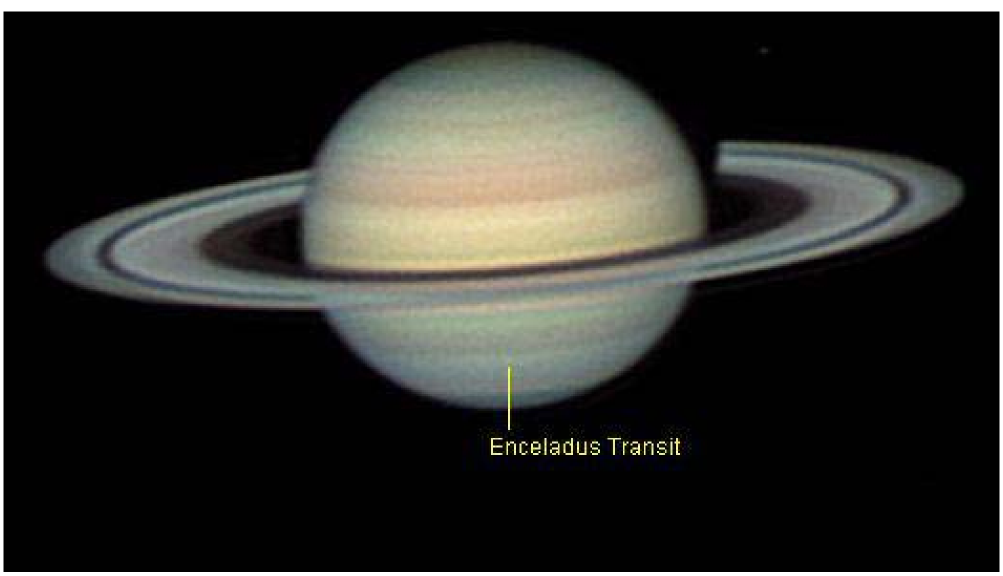


Illustration 29. 2008 Apr 04 11:38 UT. Digital image by Christopher Go using a 28.0-cm (11.0-in.) SCT in IL. S = 7.0, Tr = 5.0. CMI = 096.7°, CMII = 119.5°, CMIII = 016.1°, B = -9.7°, B′ = 9.4°. Enceladus is barely detectable as it transits Saturn's Northern Hemisphere.

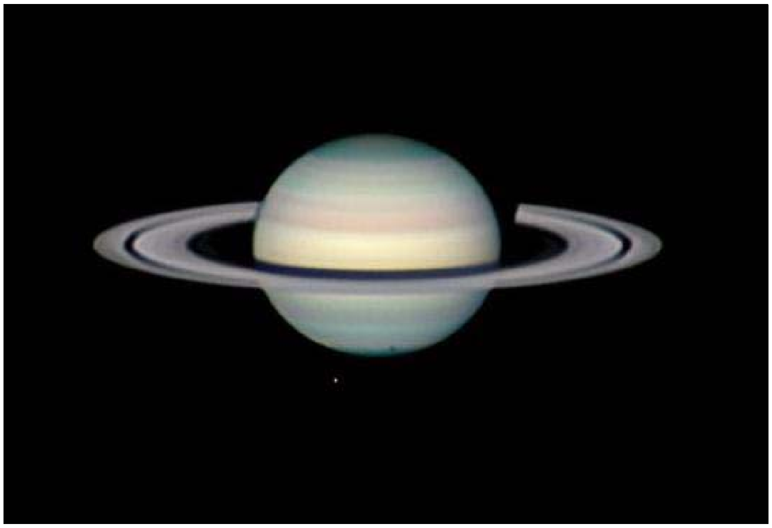
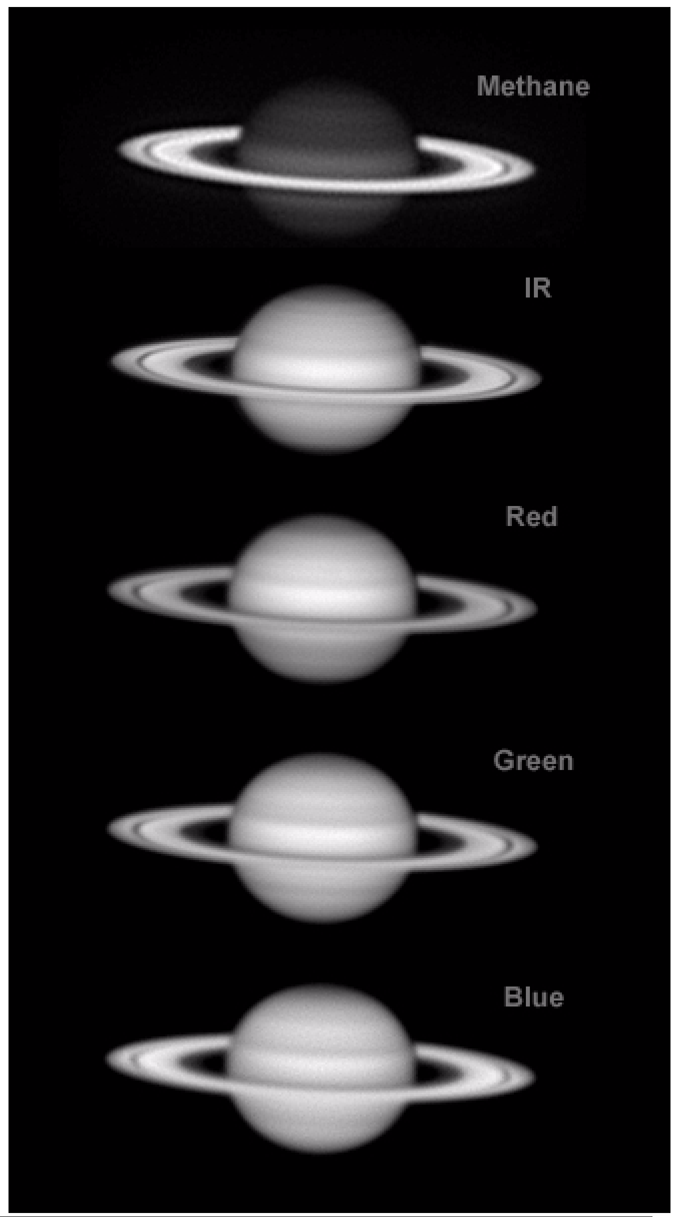


Illustration 30. 2008 Apr 15 19:04 UT. Digital image by Richard Bosman using a 28.0-cm (11.0-in.) SCT in IL. S and Tr not specified. CMI = 285.1°, CMII = 302.8°, CMIII = 185.7°, B = -9.9°, B´ = 7.5°. Superb image of a transit of Dione (north of the planet) and its shadow crossing the Globe.

Illustration 31. 2008 Mar 02 06:45 UT. Digital image by Larry Owens utilizing a 35.6-cm (14.0-in.) SCT with methane 889nm, LRGB, IR 720-1000nm filters. S = 3.5, Tr = 6.0. CMI = 142.1°, CMII = 157.4°, CMIII = 094.0°, B = -8.7°, B´ = 8.2°. This image exemplifies utilization of different filters with moderate to larger apertures to image Saturn at different wavelengths for participation in various Pro-Am projects (see text).



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http://www.alpo-astronomy.org/publications/Monographs page.html

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There is NO CHARGE for any of the ALPO monographs.

- **Monograph No. 1.** *Proceedings of the 43rd Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, August 4-7, 1993. 77* pages. File size approx. 5.2 megabytes.
- **Monograph No. 2**. *Proceedings of the 44th Convention of the Association of*

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People, publications, etc., to help our members

Lunar and Planetary Observers. Greenville, South Carolina, June 15-18, 1994. 52 pages. File size approx. 6.0 megabytes.

- **Monograph No. 3**. *H.P. Wilkins 300-inch Moon Map.* 3rd Edition (1951). Available as one comprehensive file (approx. 48 megabytes) or five section files (Part 1, 11.6 megabytes; Part 2, 11.7 megabytes; Part 3, 10.2 megabytes; Part 4, 7.8 megabytes; Part 5, 6.5 megabytes)
- **Monograph No. 4.** *Proceedings of the 45th Convention of the Association of Lunar and Planetary Observers. Wichita, Kansas, August 1-5, 1995.*127 pages. Hard copy $17 for the United States, Canada, and Mexico; $26 elsewhere. File size approx. 2.6 megabytes.
- **Monograph No. *5.*** *Astronomical and Physical Observations of the Axis of Rotation and the Topography of the Planet Mars. First Memoir; 1877-1878.* By Giovanni Virginio Schiaparelli, translated by William Sheehan. 59 pages. Hard copy $10 for the United States, Canada, and Mexico; $15 elsewhere. File size approx. 2.6 megabytes.
- **Monograph No. *6.*** *Proceedings of the 47th Convention of the Association of Lunar and Planetary Observers, Tucson, Arizona, October 19-21, 1996.*20 pages. Hard copy $3 for the United States, Canada, and Mexico; $4 elsewhere.File size approx. 2.6 megabytes.
- **Monograph No. 7.** *Proceedings of the 48th Convention of the Association of Lunar and Planetary Observers. Las Cruces, New Mexico, June 25-29, 1997.*76 pages. Hard copy $12 for the United States, Canada, and Mexico; $16 elsewhere.File size approx. 2.6 megabytes.
- **Monograph No. 8**. *Proceedings of the 49th Convention of the Association of*

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Lunar and Planetary Observers. Atlanta, Georgia, July 9-11,1998.122 pages. Hard copy $17 for the United States, Canada, and Mexico; $26 elsewhere.File size approx. 2.6 megabytes.

- **Monograph Number 9**. *Does Anything Ever Happen on the Moon?* By Walter H. Haas. Reprint of 1942 article. 54 pages.Hard copy $6 for the United States, Canada, and Mexico; $8 elsewhere.File size approx. 2.6 megabytes.

- **Monograph Number 10.** *Observing and Understanding Uranus, Neptune and Pluto*. By Richard W. Schmude, Jr. 31 pages. File size approx. 2.6 megabytes.

- **Monograph No. 11**. *The Charte des Gebirge des Mondes* (Chart of the Mountains of the Moon) by J. F. Julius Schmidt, this monograph edited by John Westfall. Nine files including an accompanying guidebook in German. Note files sizes: Schmidt0001.pdf, approx. 20.1 mb; Schmidt0204.pdf, approx. 32.6 mb; Schmidt0507.pdf, approx. 32.1 mb; Schmidt0810.pdf, approx. 31.1 mb; Schmidt1113.pdf, approx. 22.7 mb; Schmidt1416.pdf, approx. 28.2 mb; Schmidt1719.pdf, approx. 22.2 mb; Schmidt2022.pdf, approx. 21.1 mb; Schmidt2325.pdf, approx. 22.9 mb; SchmidtGuide.pdf, approx. 10.2 mb

ALPO Observing Section Publications

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

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

- **Lunar & Planetary Training Section:** *The Novice Observers Handbook* $15. An introductory text to the training program. Includes directions for recording lunar and planetary observations, useful exercises for determining observational parameters, and observing forms. Available as pdf file via e-mail or send check or money order payable to Timothy J. Robertson, 2010 Hillgate Way #L, Simi Valley, CA 93065; e-mail cometman@cometman.net.

- **Lunar (Bailey):** (1) *The ALPO Lunar Selected Areas Program (*$17.50). Includes full set of observing forms for the assigned or chosen lunar area or feature, along with a copy of the *Lunar Selected Areas Program Manual.* (2) o*bserving forms,* free at http://moon.scopesandscapes.com/alpo-sap.html, or $10 for a packet of forms by regular mail. Specify *Lunar Form*s. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO lunar SAP section. Observers should make copies using high-quality paper.

- **Lunar**: *The Lunar Observer*, official newsletter of the ALPO Lunar Section, published monthly. Free at http://moon.scopesandscapes.com/tlo.pdf or $1.25 per hard copy: send SASE with payment (check or money order) to: Wayne Bailey, 17 Autumn Lane, Sewell, NJ 08080.

- **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):** Introductory information for observing Venus, including observing forms, can be downloaded for free as pdf files at http://www.alpo-astronomy.org/venus. The *ALPO Venus Handbook* with observing forms included is available as the *ALPO Venus Kit* for $17.50 U.S., and may be obtained by sending a check or money order made payable to “Julius L. Benton” for delivery in approximately 7 to 10 days for U.S. mailings. The *ALPO Venus Handbook* may also be obtained for $10 as a pdf file by contacting the ALPO Venus Section. All foreign orders should include $5 additional for postage and handling; p/h is included in price for domestic orders. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Venus section. Observers should make copies using high-quality paper.

- **Mars:** *(1) ALPO Mars Observers Handbook,* send check or money order for $15 per book (postage and handling included) to Astronomical League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail leaguesales@astroleague.org. *(2) Observing Forms;* send SASE to obtain one form for you to copy; otherwise

ALPO Resources

People, publications, etc., to help our members

send $3.60 to obtain 25 copies (send and make checks payable to "Deborah Hines", see address under "Mars Section").

- **Jupiter:** *(1) Jupiter Observer's Handbook*, $15 from the Astronomical League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail leaguesales@astroleague.org. (2) *Jupiter*, the ALPO section newsletter, available online only via the ALPO website at http://mysite.verizon.net/macdouc/alpo/jovenews.htm; (3) *J-Net*, the ALPO Jupiter Section e-mail network; send an e-mail message to Craig MacDougal. (4) *Timing the Eclipses of Jupiter's Galilean Satellites* free at http://www.alpo-astronomy.org/jupiter/GaliInstr.pdf, report form online at http://www.alpo-astronomy.org/jupiter/GaliForm.pdf; send SASE to John Westfall for observing kit and report form via regular mail. (5) *Jupiter Observer's Startup Kit*, $3 from Richard Schmude, Jupiter Section coordinator.

- **Saturn (Benton):** Introductory information for observing Saturn, including observing forms and ephemerides, can be downloaded for free as pdf files at http://www.alpo-astronomy.org/saturn; or if printed material is preferred, the *ALPO Saturn Kit* (introductory brochure and a set of observing forms) is available for $10 U.S. by sending a check or money order made payable to "Julius L. Benton" for delivery in approximately 7 to 10 days for U.S. mailings. The former *ALPO Saturn Handbook* was replaced in 2006 by *Saturn and How to Observe It* (by J. Benton), and it can be obtained from book sellers such as Amazon.com. NOTE: Observers who wish to make copies of the observing forms may instead send a SASE for a copy of forms available for each program. Authorization to duplicate forms is given only for the purpose of recording and submitting observations to the ALPO Saturn Section.

- **Meteors:** (1) *The ALPO Guide to Watching Meteors* (pamphlet). $4 per copy (includes postage & handling); send check or money order to Astronomical League Sales, 9201 Ward Parkway, Suite 100, Kansas City, MO 64114; phone 816-DEEP-SKY (816-333-7759); e-mail leaguesales@astroleague.org. (2) *The ALPO Meteors Section Newsletter*, free (except postage), published quarterly (March, June, September, and December). Send check or money order for first class postage to cover desired number of issues to Robert D. Lunsford, 1828 Cobblecreek St., Chula Vista, CA 91913-3917.

- **Minor Planets (Derald D. Nye):** *The Minor Planet Bulletin*. Published quarterly; free at http://www.minorplanetobserver.com/mpb/default.htm or $24 per year via regular mail in the U.S., Mexico and Canada, $34 per year elsewhere (air mail only). Send check or money order payable to "Minor Planet Bulletin" to Derald D. Nye, 10385 East Observatory Dr., Corona de Tucson, AZ 8564I-2309.

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

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

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

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