# SIRIUS ASTRONOMER

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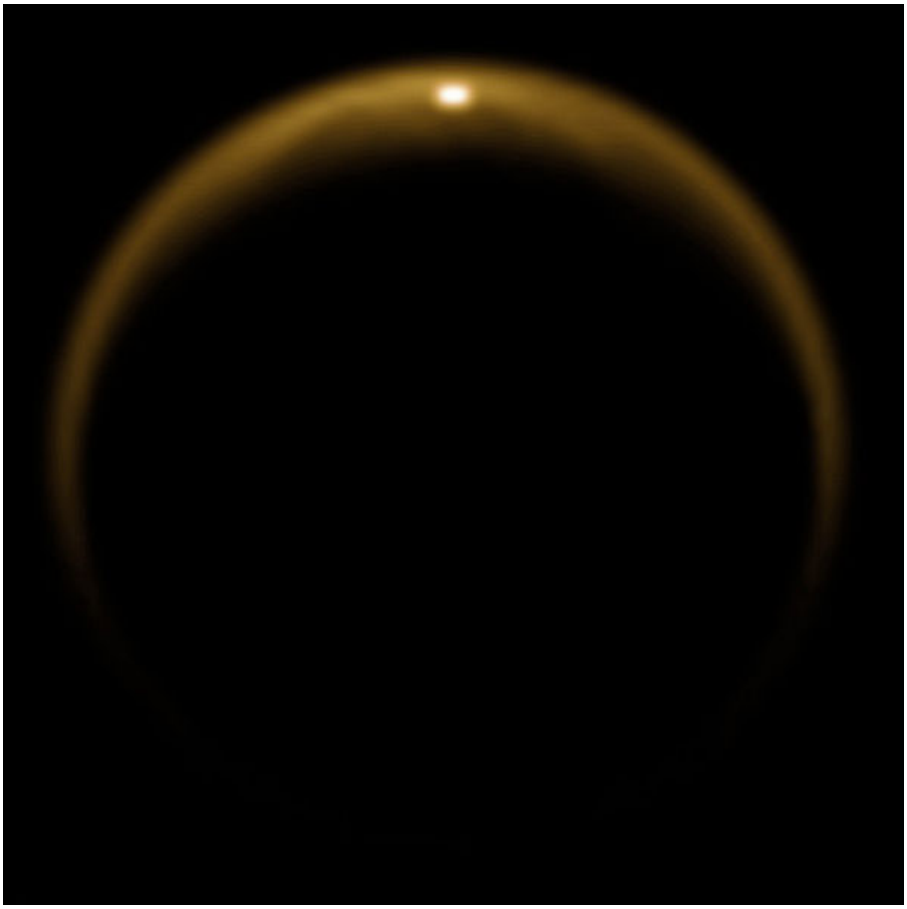
The Newsletter of the Orange County Astronomers

**January 2010** *Free to members, subscriptions $12 for 12 issues* **Volume 37, Number 1**


## REMINDER: CLUB ELECTIONS THIS MONTH! DON'T FORGET TO VOTE!



This image, obtained using Cassini's Visual and Infrared Mapping Spectrometer (VIMS), shows the first observed flash of sunlight reflected off Kraken Mare, a lake on Saturn's moon Titan. Credit: NASA/JPL/ University of Arizona/DLR.

## OCA CLUB MEETING

The free and open club meeting will be held January 8th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month is our annual Members Night, where club members present talks on interesting astronomy-related projects.

NEXT MEETING: February 12th

## STAR PARTIES

The Black Star Canyon site will be open on January 9th. The Anza site will be open on January 16th. Members are encouraged to check the website calendar, for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

*You are also reminded to check the web site frequently for updates to the calendar of events and other club news.*

## COMING UP

The next session of the Beginners Class will be held on Friday, February 5th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana. There is no Beginners Class in January!

GOTO SIG: TBA

Astro-Imagers SIG: Jan. 19th, Feb. 16th

Remote Telescopes Jan. 27th, Feb. 24th

Astrophysics SIG: Jan. 15th, Feb. 11th

Dark Sky Group: TBA

# January 2010 President's Message

**By Barbara Toy**

2010 is off and running, and, depending on how you look at it, this is either the last year of the first decade or the first year of the second decade of the new millennium. Either way, we're going to have to get used to putting a "1" in the year where we have been used to putting a "0." Getting used to a new tens-place designator is something we have to do every 10 years, but I guess it shouldn't be as tough a change as getting used to writing "20" instead of "19" ten years ago.

We're now past the shortest day/longest night of the year, and our nights will slowly be getting shorter as we head back toward the summer solstice in June. Fortunately for those who like winter viewing, we won't notice much of a difference for a while. Compared to places further north, the change in the length of our nights over the course of the year may be considered pretty minor – we do get several hours of full dark even during shortest nights of the year – but we southlanders still find it significant. At any rate, I hope you're enjoying some nice long nights of viewing, and that you find any problems with winter cold to be a lot less than you imagined!

**On Passing the Baton…**

This is my last President's Message before turning both the honor and the office over to my successor, who I expect to be Craig Bobchin even though, as I write this, the election has not yet taken place. We need regular changes in leadership to keep the club healthy, and I'm looking forward to seeing how he takes on the challenges of the presidency.

It's been a real privilege to serve all of you as president for the six (non-consecutive) years that I've held the office. I've had a lot of fun in that position, met a lot of interesting people and had a lot of experiences that I wouldn't have had if Liam Kennedy and the others on the Board at the time hadn't convinced me to run for the office in the first place, back near the end of 2002.

There have been changes and developments in the club in the period since I first took office, such as the development and adoption of the Anza site plan that is allowing us to build more observatories and other structures, the new roof for the club Observatory and the new roof for Anza House, improvements to the Kuhn, and the growth of the outreach program and several of the special-interest groups, among other things. My main role in most of what's been done to improve things in the club during my time in office has been to stay out of the way of the fine folks who took those projects on – I encouraged them, lent a hand where I could, but generally let those with the expertise get the job done. I'm really happy that a lot of good things have happened during my presidency, but the credit has to go to a wide range of talented people in the club, such as:

- Jim Benet and his volunteers for the continued development of the outreach program and, in particular, its tremendous success in our local schools;

- Dave Radosevich, Jim Hannum, John Kerns and their crew for the new roof on the club observatory;

- Dave Radosevich for renovating the Kuhn telescope and putting in the new motors and control system;

- Pat Knoll for fine-tuning the Kuhn (and repairing it when needed) and for developing an interface so it can be guided while imaging;

- Gary Schones for doing the maintenance on the roads on the Anza site and around it, arranging for the new roof on Anza House and the new front door on the club observatory – among many other contributions;

- Bob Buchheim, Gary Schones, Charlie Oostdyk, Don Lynn, Jerry Floyd, John Castillo, Tom Kucharski, Leonard Voorhis, Alan Smallbone and the others who contributed to the work of the Anza Site Planning Committee for developing the new site plan – Bob did a tremendous amount of work to pull the ideas of the committee together into a form that allowed a formal plan to be drawn up and submitted to the county for approval, which we finally did obtain;

- Gary Schones for shepherding various plans through and otherwise dealing with the Riverside County Planning Department, clearing the new observatory pad areas, dealing with Anza Power, and innumerable other tasks (including actual construction) that have made our Anza Site Plan a reality and are now resulting in new member observatories at Anza;

- Vance Tyree and his crew for putting in the fiber optic cable for the on-site network at Anza:

- Karen Schnabel for the continual revitalizing of our library with new materials and resources;

- Dave Pearson for taking over the Beginners Astronomy Class on short notice when Antonio Miro had to give it up due to health problems, and for developing new materials and approaches to teaching the class that have helped keep it very active;

- Steve Short for his constant activities to improve the Black Star Canyon star parties, including efforts to strengthen ties with the Irvine Co. and Nature Conservancy;

- Don Lynn for putting the fence in around the Anza site and too many activities around the site to enumerate that help keep it going (not to mention such additional activities as his column in the Sirius Astronomer and his contributions at all of the many meetings he attends);

- Steve Condrey for his capable efforts both as editor of the Sirius Astronomer and as Anza House Coordinator (the latter with his wife, Sandy);

- Charlie Oostdyk for so many contributions it's hard to know where to start – besides looking after the club's finances, tax filings, insurance and other necessary components of his job as treasurer, they include such things as maintaining the club membership information, processing and mailing out the Sirius Astronomer each month, trouble-shooting the club's weather station and the uploading of information from Anza to the club website, and dealing with satellite and other Anza Internet issues, among many others.

These are just a few of the many members who have contributed to the club's success over the last seven years – I wish I could give proper credit to everyone. Thank you to all of you for all you have done to help improve the club's activities and facilities over the years!

**OCA Desk Calendars:**

As a reminder – you can still get our 2010 OCA AstroImage desk calendar – contact Alan Smallbone (asmallbone@earthlink.net) to order the number you want, and he will have them made. To maximize the benefit to the club, we are not printing a big inventory of calendars, but are having them made as they are needed. Charlie Oostdyk has a few in stock as I write this, but (we hope) will sell them by the time you see this – having a lot of calendars left would be a loss to the club rather than an effective fund-raiser.

The price is $10.00, which includes the case that folds over to form the stand for the calendar. Everything over the costs of the printing and the cases goes to the club. The calendars themselves show off the talents of our own imagers, and they fit in well on almost any desk or counter – you should definitely order one while the new year is young, if you haven't gotten one already!

**"How To Use Your Telescope" Class**

Several years ago, we decided to include a "How To Use Your Telescope" section as part of our regular Beginners Astronomy Class. Since then, we've been doing it twice a year, usually as the fifth of the six regular Beginners Class sessions. This usually means that this session falls in January (conveniently close to Christmas) and July.

This year, the regular date for the January Beginners Class session is January 1, 2010. As you might guess, this was not a good night for "How to Use Your Telescope" session for many reasons, particularly the fact that potential class members and the volunteers who would be needed to help them are all very likely to have other obligations that day. So, we agreed that the best course would be to cancel the January class and move the "How To Use Your Telescope class to the February class date. It will therefore take place on February 5, 2010, at 7:30 p.m. outside the classroom (inside if it's raining) at the Heritage Museum of Orange County (formerly the Centennial Heritage Museum), located at 3101 West Harvard Street, Santa Ana.

Most unfortunately, this means that we will not be able to have the imaging session of the Beginners Class, which Kyle Coker has developed and taught over the last few years, in this cycle of the class. The next beginners' imaging session will therefore be in August, 2010, as the last session of the next cycle of the Beginners Class. If you are interested in imaging and want information and help getting started, our AstroImage group is a great resource, and I encourage you to attend their meetings and/or join our astroimaging email group at AstroImage@yahoogroups.com.

As to the "How to Use Your Telescope" session, this is for anyone who has a telescope and needs some help learning to set it up or use it, or who may be interested in getting a telescope and want guidance on what to get. It's essentially a mini-star party, where the people attending the class set up their scopes with help from club volunteers, who work with different people setting up equipment, answer questions and help with whatever difficulties people may be having with their equipment and getting started finding objects. When the weather cooperates, people who attend get the experience of finding and seeing the moon, whatever planets may be visible, and other objects through their own telescopes – and sharing the view with others.

Of course, to make the sessions a success, we need to have volunteers, and if you can come help us out on February 5, we would really appreciate it. Over the time we've been doing this class, the GoTo group has been very generous in providing help for these sessions, as have several active Outreach volunteers – those of us who are involved with the Beginners Class are very grateful for the help all of you have given us in the past, and hope you'll be able to help us out again this February.

This class is always a lot of fun, whether you come as a participant or volunteer, and we look forward to seeing you there!

*(continued on page 5)*

**A Winter Blast of Fun!**
**January, 2010**
**By Tom Koonce**
**Antelope Valley Astronomy Club, Inc.**
**Lancaster, California**

The weather is often keeping us inside at this time of year. The only stars we get to see are those as we are dashing from the car to the house in the evenings. For a few seconds we may glance up at Orion's Belt or perhaps a bright planet through bitterly cold, but alluringly steady, clear skies. You might briefly think about going inside and grabbing your telescope and coming back out for a few minutes of observing, but then the choice between the bitter cold and the Siren's song of the warmth of the house becomes clear as you retreat inside. It's frustrating, surely, but while amateur astronomy is a hobby that teaches patience and perseverance we don't want to sit idly by all winter.

Perhaps we should treat the winter months as an "opportunity". We could use these few months to explore our creativity, get our equipment finely tuned and ready, or even expand our horizons online by conducting real science for professional astronomers. With that in mind, here are a few ideas for the winter months. Maybe you'll like to try a few. These could count as New Year's Resolutions. All count as fun!

- Clean all of your eyepieces (http://www.televue.com/engine/page.asp?ID=143)
- Clean your telescope (http://www.ehow.com/how_10336_care-telescope.html , http://sctscopes.net/SCT_Tips/Maintenance/Cleaning_Your_Optics/cleaning_your_optics.html)
- Change the batteries in your Telrad, red light flashlights and other powered accessories.
- Inventory all of your astronomy gear. Take pictures of all of it for insurance purposes.
- Organize your eyepiece case and / or make a new eyepiece case (http://www.cloudynights.com/item.php?item_id=1090)
- Image process all of those great shots that you've been meaning to get to (http://www.spacetelescope.org/projects/fits_liberator/improc.html)
- Accomplish real science on your home computer – help scientists classify galaxy types: (http://www.galaxyzoo.org/)
- Build a model of the Cassini Spacecraft (or many others!) (http://www.jpl.nasa.gov/scalemodels/)
- Establish an "astronomy fun fund" for yourself and put $5/week into it
- Write a few letters to your town in favor of lighting control (http://www.darksky.org/)
- Review the Astronomical League list of observing clubs. There are a few new ones you might like try. (http://www.astroleague.org/observing.html)
- Repaint your old telescope with a cool pattern (http://www.cloudynights.com/ubbthreads/showflat.php/Cat/0/Board/classics/Number/2294472/page/0/view/collapsed/sb/5/o/o/fpart/all)
- Update your GoTo software on-line to the latest version
- Build your own dobsonian telescope (http://www.backyardvoyager.com/dobplans.html)
- Create a list of community outreach activities that you think your club might be able to do this year.
- Sketch out what your backyard observatory will look like one day (http://obs.nineplanets.org/obs/obslist.html)

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**A Couple of Reminders re: Anza...**

If you stay at Anza House while you are using the Anza site, please remember that the charge for staying at Anza House is $5.00 per night, to help cover maintenance, supplies and the other costs associated with the house. This applies whether you are in one of the bedrooms or are sleeping on one of the couches in the living room or even on your own cot or the floor. We recently realized that people sleeping in the living room apparently believed that the charge didn't apply to them, which is a mistake on their part – the charge applies to everyone staying at Anza House.

We generally have used the honor system for these payments, and we would like to keep it that way, so please do your part and, if you stay there, put your payment in the box on the wall, ideally in one of the envelopes that should be under the box, with your name written on the envelope so we can properly account for the payment. Even if you don't sleep there, if you use Anza House a lot, it would be helpful if you could drop a few dollars in the box now and then to help cover expenses.

As another reminder – all of us who use the Anza site need to be sure that Anza House and the club observatory are locked up before the last person leaves the site. So, if you've been using the facilities at the club observatory and don't see anyone else around as you are preparing to leave – make sure the restroom and the warming room are locked, and that the lock box is locked once you put the key back inside it. If you do see someone else around, make sure that he or she knows to check the observatory before leaving. If you were in the lower part of the site and using the facilities at Anza House, please be sure Anza House is locked up before you leave, and that the lockbox there is locked, as well – and, if you don't lock it up because someone else is there, please be sure that person knows to lock up when he or she leaves.

**Final Words...**

Your new president will formally take office at the January 2010 Board meeting – I know we all wish him the best of luck as he takes on this new position! In addition to giving him whatever help I can during this transition, I'll be continuing to work with the Kuhn as Observatory Custodian and Star Member Trainer, and I'm hoping I'll have more time to work on membership issues as Member Liaison and to get more activity going with our Dark Sky group – and I expect I'll still be writing for the Sirius Astronomer. My current job is taking a lot more of my time than past jobs, though, so this may be a bit optimistic. However it all works out, 2010 should be an interesting year – I hope it turns out to be a truly excellent year for all of you and those dear to you!

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- Survey your club members about what was their best astronomy-related experience this past year. Try to have more of those this next year.
- Make a glare shield for your telescope from black foam craft sheet (http://www.atoztelescopes.com/products/dew_shield.asp)
- Listen to an astronomy related podcast on your computer (http://www.astronomycast.com/)
- Write a letter to your state congressmen and senators in favor of the space program
- Explore Google Moon and Google Mars
- Make a cover for your telescope when not in use

I hope that you find this short list inspirational on the cold, dark, days of winter and that it prepares you for the upcoming warmer weather and "Messier Marathon" in March.

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**For Sale:** Meade ETX 125 PE Astro with Meade 5000 eyepiece kit. Barely used, must sell! $500. Contact Mark Hunter at 949-370-9300 or mrplant2000@yahoo.com.

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**Wanted:** Old style 84-key AT keyboard for DOS/Windows PC (the kind with the function keys on the left instead of above the other keys). Tim Hogle timhogle@aol.com, (626) 357-7770.

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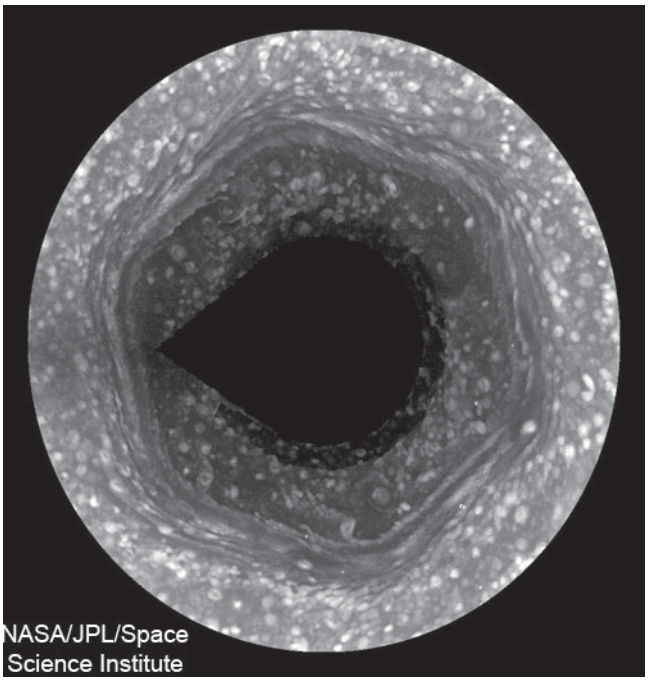
**Wanted:** assistance in transferring data from Apple II disks (ProDOS format); primarily word processing documents written in AppleWorks. Would like data either printed out or converted to modern format (preferably ASCII). Contact Steve Condrey 951-678-0189

# AstroSpace Update

January 2010
Gathered by Don Lynn from NASA and other sources




**Cassini** (Saturn mission) has observed the strange hexagon at the north pole, since it recently returned to daylight for the 1st time in 15 years, due to the change of seasons on Saturn. In the dark, Cassini was able to see the hexagon in infrared, but the spacecraft's visible light instruments have far better resolution. The result revealed concentric circles, curlicues, walls and streamers not seen before. The hexagon was discovered by the Voyager spacecraft nearly 30 years ago, and the figure was found to be largely unchanged since that time. The hexagon is known to be a jet stream blowing around the pole, but why it makes 6 sharp bends has remained unexplained.

**Titan lakes** – Cassini images of Saturn's moon Titan show that there are about 20 times as many lakes (of methane) in the northern hemisphere as there are in the southern. There are also more dry lake beds in the north. A new paper explains this as due to Saturn's eccentric orbit. During Titan's southern summer, the planet and Titan are closer to the Sun than during the northern summer. This difference increases the methane rainfall in relation to lake evaporation in the north, and hence more lakes form there. Over tens of thousands of years, the perihelion of the orbit moves with respect to the seasons, so eventually the lakes should be more prevalent in the south.

**Martian methane** was discovered in 1999. Later the rate at which methane is destroyed at Mars was measured, indicating a substantial amount of the gas is being created there every year to replace the loss. 4 sources of the gas have been suggested: volcanic activity releases it, meteorite collision releases it, water acting on certain volcanic rock produces it, or bacteria generate it. The first theory (volcanic) was ruled out a few years ago. A new study rules out the meteorite theory. The new study calculated the rate of methane production that could be a result of meteorites, and it falls far short. The study recreated Martian meteor conditions in the lab and measured methane. That leaves only the 2 most exciting theories: that liquid water or life (or both) exist on Mars. Either would have to be underground.

**Spirit** (Mars rover) – Mission managers commanded the rover to rotate its wheels several times in an effort to extricate Spirit from the powdery material in which it has been stuck since April. The 1st attempt stopped quickly when the rover exceeded its tip limit, which has been set quite small for safety reasons. The second wheel spin moved the rover more than half an inch, though the wheels spun several feet. That was encouraging, since that is the behavior shown by the other rover when it was stuck in soft material, and repeated spinnings eventually got it out. A later attempt was stopped when Spirit detected that the right rear wheel had stopped turning. Subsequent tests showed that this wheel motor has failed. The right front wheel motor failed 3 years ago, so now only 4 of the 6 wheels can rotate. Then all wheels were tested again, and the wheel broken for the last 3 years turned! So maybe 5 wheels now work. The Free Spirit saga will continue.

**Mars Reconnaissance Orbiter** (MRO) has been taken out of safe mode and is soon to resume observations. Late in August MRO went into safe mode when the control computer unexpectedly restarted. Subsequent analysis showed that 2 closely spaced safe mode events could be unrecoverable. So MRO was left in safe mode until a fix for this problem could be loaded into its computers, which was accomplished in late November. MRO is also resuming relaying data and commands between Earth and the Mars rovers. During the safe mode, Mars Odyssey (another orbiter) was used to relay the rovers.

**Martian rivers** – A computer program was written to analyze altitude data regarding Mars in order to identify river valleys by their shape. It found about twice as many as had been identified by eye. The network of valleys supports that the planet in the distant past had frequent rainfall, sparser in the south, which would be explained if a large evaporation source occurred only in the north. Thus the valley network supports also the theory that the northern lowlands were once a sea. Some astronomers had proposed that the river valleys were formed by ground water sapping, not by rainfall, but the abundance of valleys newly found supports rainfall.

**Kuiper Belt** (icy asteroids beyond Neptune) – The Hubble Space Telescope (HST) has discovered the smallest object ever detected by visible light in the Kuiper Belt. Astronomers analyzing over 4 years of data from the HST guidance sensors found one instance of an object crossing in front of a guide star. Though the object was too dim to be imaged, the drop in light from the star was detectable. The distance was estimated by the time it spent in front of the star (0.3 seconds), and its size (about 3200 feet) was calculated from the amount of dimming. The smallest Kuiper Belt object previously imaged in visible light is about 30 miles across. It has long been predicted that collisions in the Kuiper Belt should produce objects of much smaller sizes than can be

*(continued on page 8)*

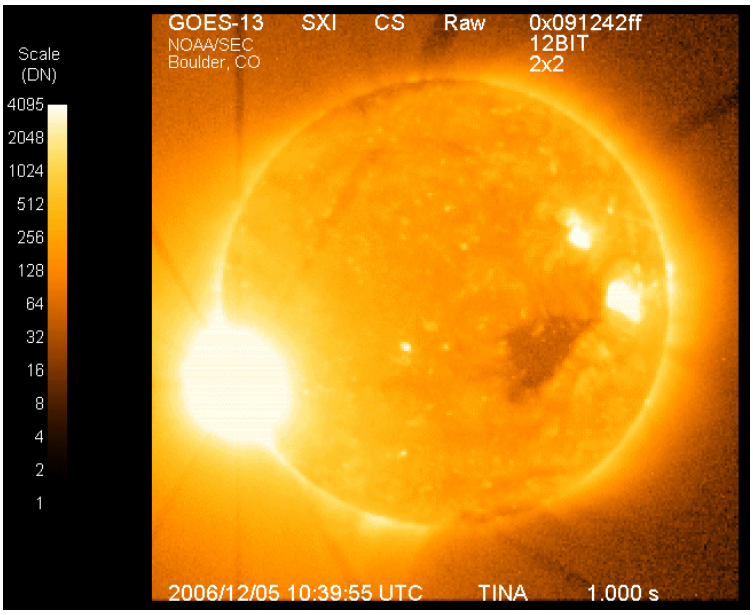
# NASA's Space Place

## Sunglasses for a Solar Observatory

By Patrick Barry

In December 2006, an enormous solar flare erupted on the Sun's surface. The blast hurled a billion-ton cloud of gas (a coronal mass ejection, or CME) toward Earth and sparked days of intense geomagnetic activity with Northern Lights appearing across much of the United States.

While sky watchers enjoyed the show from Earth's surface, something ironic was happening in Earth orbit. At the onset of the storm, the solar flare unleashed an intense pulse of X-rays. The flash blinded the Solar X-Ray Imager (SXI) on NOAA's GOES-13 satellite, damaging several rows of pixels. SXI was designed to monitor solar flares, but it must also be able to protect itself in extreme cases.




*X-9 class solar flare December 6, 2006, as seen by GOES-13's Solar X-ray Imager. It was one of the strongest flares in the past 30 years.*

That's why NASA engineers gave the newest Geostationary Operational Environmental Satellite a new set of sophisticated "sunglasses." The new GOES-14 launched June 27 and reached geosynchronous orbit July 8. Its "sunglasses" are a new flight-software package that will enable the SXI sensor to observe even intense solar flares safely. Radiation from these largest flares can endanger military and civilian communications satellites, threaten astronauts in orbit, and even knock out cities' power grids. SXI serves as an early warning system for these flares and helps scientists better understand what causes them.

"We wanted to protect the sensor from overexposure, but we didn't want to shield it so much that it couldn't gather data when a flare is occurring," says Cynthia Tanner, SXI instrument systems manager for the GOES-NOP series at NASA's Goddard Space Flight Center in Greenbelt, Maryland. (GOES-14 was called GOES-O before achieving orbit).

Shielding the sensor from X-rays also reduces the amount of data it can gather about the flare. It's like stargazing with dark sunglasses on. So NASA engineers must strike a balance between protecting the sensor and gathering useful data. When a dangerous flare occurs, the new SXI sensor can protect itself with five levels of gradually "darker" sunglasses. Each level is a combination of filters and exposure times carefully calibrated to control the sensor's exposure to harmful high-energy X-rays. As the blast of X-rays from a major solar flare swells, GOES-14 can step up the protection for SXI through these five levels. The damaged sensor on GOES-13 had only two levels of protection—low and high. Rather than gradually increasing the amount of protection, the older sensor would remain at the low level of protection, switching to the high level only when the X-ray dose was very high. "You can collect more science while you're going up through the levels of protection," Tanner says. "We've really fine-tuned it."

Forecasters anticipate a new solar maximum in 2012-2013, with plenty of sunspots and even more solar flares. "GOES-14 is ready," says Tanner.

For a great kid-level explanation of solar "indigestion" and space weather, check out spaceplace.nasa.gov/en/kids/goes/spaceweather.

***This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.***

*(continued from page 6)*
detected by normal means, but this discovery is the first observational evidence that such small objects exist. The astronomers plan to analyze the remaining HST guider data to look for more such incidents.

**Exoplanets** (planets outside our solar system)– A team of planet hunters announced they have discovered 5 and possibly 6 low-mass planets orbiting 2 nearby Sun-like stars. The findings include 2 super-Earths, that is, planets more massive than Earth, but not large enough to be gas giants, so are likely mostly solid rock like our planet. These are the first super-Earths found orbiting Sun-like stars. They have masses of 5 and 7.5 times that of our planet. They are both quite close to their stars, so are too hot to support liquid water or life. Three of the newly discovered planets orbit the star 61 Virginis, a naked-eye star in Virgo, only 28 light-years away. Their masses range from 5 to 25 times that of Earth. The second system found orbits the star HD 1461, a naked-eye star in Cetus, 76 light-years distant. Both systems were discovered using Earth-based telescopes using the radial-velocity method, in which are detected wobbles in a star caused by the gravity of its planets orbiting. The wobbles indicate definitely 2 planets and possible 3 at HD 1461. According to one of the discoverers, there appear to be small planets (less than Neptune's mass) orbiting about half of the stars in the Sun's neighborhood.

**Exoplanet imaged** – Yet another exoplanet has been directly imaged, raising the total to 10, just over a year after the first was imaged in visible light. The other 400 known exoplanets have been found by methods other than imaging them. The newly imaged planet orbits a Sun-like star GJ 758. The exact mass is not known, though it is at least 10 times that of Jupiter, so there is a possibility that the object is a small brown dwarf rather than a large planet. It orbits its star at about the same distance as Neptune orbits the Sun. It is about 600° F, which is attributed to its internal heat from having formed recently. It is too far from its star to have been heated by it. The image was taken with an adaptive optics instrument on the Subaru Telescope in Hawaii.

**Retrograde exoplanet** – A second exoplanet (designated HAT-P 7b) has been found to revolve about its star in the direction opposite to the star's rotation. The method of determining this was the same as the 1st: see what part of the spectrum of the star is blocked at the beginning and end of transit of the planet in front of its star. The redshifted part is from the side of the star rotating away from us. Due to uncertainties in the measurement, it is possible that the planet does not revolve in the retrograde direction, but if so, then it has to be in a very steeply inclined (relative to the star's equator) orbit. Planned observations by the Kepler spacecraft should be able to determine which is the case. In either case, that is a very unusual orbit. Planets form from clouds of material swirling about a star in the same plane and direction as the rotation of the star. So a retrograde or steeply inclined planet would require a major disturbance since it formed.

**Possibly not an exoplanet** – I reported here in July that after about 50 years of attempts to find exoplanets with astrometry, there was finally a success. Astrometry is measuring the location of a star very precisely, and in the case of planet search, looking for wobbles in that location. However, another astronomer using the radial-velocity method has been unable to find a planet at the same star. Either astrometry made yet another error in attempting to find planets, or the radial-velocity measurements just made were not sensitive enough. The debate will continue.

**Spitzer** (infrared space telescope) contributed to the discovery of the youngest brown dwarf known. Brown dwarfs generally fall between planets and stars in terms of their masses and temperatures. It has been debated whether brown dwarfs form the same way stars do, or as planets do. The newly discovered brown dwarf appears to have formed as stars do, adding one piece of evidence toward that theory. Its age was determined from temperature and brightness. It is being called a proto brown dwarf, since it is still in the process of forming. It was hidden in the cloud that formed it, but infrared light was able to penetrate that cloud. A second young brown dwarf was also found in the same cloud.

**WISE** (infrared survey space telescope) was launched December 14, and after a month of calibration is planned to map the entire sky 1.5 times over. Its critical parts are cooled with a frozen block of hydrogen, which should last for about 10 months. WISE will see the sky with sensitivity and resolution far better than the last infrared sky survey, which occurred 26 years ago. It is expected that WISE will detect many planet-forming disks, hundreds of thousands of asteroids, and hundreds of millions of stars and galaxies. The atlas of objects that WISE sees should provide astronomers with data for years. The atlas will also help plan observations with the planned James Webb infrared space telescope, which is far more sensitive, but sees such a small portion of the sky that it will never come close to observing the entire sky.

**Strange supernova explained** – After examining old images of the area, astronomers found that supernova 2008iy took 400 days to rise to peak brightness. No other supernova had taken over about 100 days. Most Type II supernovas rise in about a week. A new paper appears to explain the slow rise. The unusual spectrum of 2008iy showed that it was a Type IIn, a core collapse of a large star, with narrow spectral lines. There is evidence for a strong pre-supernova stellar wind, which produced clouds of matter surrounding the star. These clouds initially hid the supernova from view, but were eventually broken through by the force of the explosion. As this happened, apparently over 400 days, the supernova came into our view. This scenario matches the spectra and the rise time. Pre-supernova mass loss sufficient to obscure the explosion could probably come from only an LBV (luminous blue variable) star.

**STEREO** (twin solar space telescopes) – In the past what appear to be huge waves of hot plasma traveling across the Sun have occasionally been seen. Their sheer size prompted disbelief among many astronomers, and the phenomenon has been theorized to be simply shadows of mass ejections, which were known to be that large. STEREO observed such a wave from its 2 locations, providing a 3-dimensional view, and the huge waves are real. The waves have been given the name fast-mode magnetohydrodynamical

waves, or for short MHD waves or solar tsunamis. STEREO's tsunami moved at 560,000 mph and was 60,000 miles high. It was observed to hit a prominence and knock it about.

**Fermi** (gamma-ray space telescope) has detected a major flare up in gamma rays from the blazar 3C454.3. A blazar is a quasar whose brightness varies wildly. It is about 10 times as bright in gamma rays as it was before the flare, and is now the brightest gamma-ray object in the sky. The blazar has also brightened significantly in infrared, X-ray, radio and visible light. This blazar has been seen to flare up 3 previous times, but this is the brightest in gamma rays. It is not the brightest of the flare ups in all wavelengths though. The cause of blazar flare ups has not been determined; it may be shifting of its jets more toward us, shock waves, more material falling into its black hole, or some other cause.

Fermi has also detected flares of gamma rays in the binary system Cygnus X-3. This system is a **microquasar**, that is, a stellar mass black hole that has formed jets like the quasars found in the centers of some distant galaxies, but much smaller. This is the first detection of a microquasar in gamma rays, though they have been seen in many other wavelengths of light.

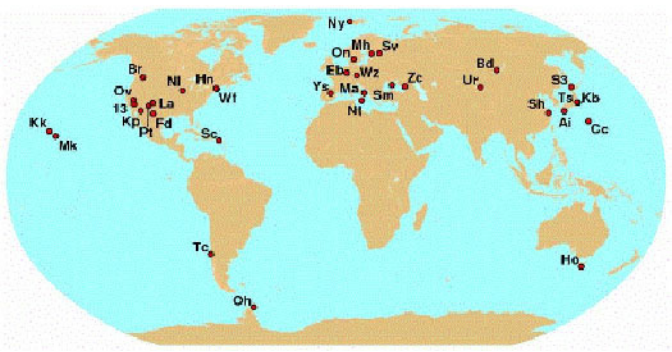
**Star formation** – Using the Very Long Baseline Array of radiotelescopes for a 2-year look at "proplyds", or planet-forming disks, in Orion has provided astronomers with a high-resolution time-lapse movie revealing the process of how a massive star forms. The VLBA sees thousands of silicon monoxide gas clouds that are masering (like a laser but at microwave wavelengths), which are often associated with star formation. The masers' motion was tracked periodically to make the movie. The movie reveals signs of a rotating accretion disk, where gas is swirling closer to the protostar at its center. It also shows material flowing outward perpendicular to the disk in two large cones of gas. Intriguingly, the outflow stream curve as they leave the disk. This is key evidence that magnetic fields may be bending the gas motions close to the protostar. It is not known whether the magnetic fields originate in the star or the accretion disk. Future observations by larger telescopes may be able to distinguish between these.

**Star formation and quasars** – A quasar (designated HE0450-2958) has been caught causing star formation in a galaxy. Furious star formation is occurring in the path of the quasar jet. That quasars could cause star formation in their surrounding galaxies has been postulated. But this quasar is causing star formation in a nearby galaxy. Further, the deepest images, even in infrared that penetrates obscuring clouds, fail to show a galaxy surrounding the quasar. Theorists had proposed that interstellar gas could possibly collapse into a black hole, the core of a quasar, without forming a galaxy about it, and this appears to be the case with this quasar.

**Big Dipper** – Astronomers observing with the Palomar Hale Telescope using adaptive optics and an occulting device to block out bright star light managed to image a dim companion star to Alcor, one of the stars of the Big Dipper. Alcor's neighbor, Mizar, has long been known to be composed of 4 stars orbiting each other, but Alcor was thought to be single. The new discovery is a red dwarf star. It was determined to be a companion to Alcor, not just a background star, by observing its parallactic motion, the apparent motion caused by the Earth orbiting the Sun, and the motion was found to match Alcor's. It was thought that Alcor and Mizar are too far apart for their gravity to be holding them in orbit about each other, but the added mass of Alcor's companion may negate this, making it a 6 star system.

**Flyby anomaly** – Since the early 1990s scientists have noticed that some spacecraft that flyby the Earth experienced a very small, but measurable, unpredicted change in speed. So they were carefully watching the flyby of the Rosetta spacecraft on November 13. This was the 3rd flyby for Rosetta, but only the 1st showed the anomaly. Several theories, some bizarre, have been proposed to explain the anomaly. They include tidal effects, atmospheric drag, pressure from reflected radiation, dark matter, dark energy, and General Relativity. But none of them seems to fit all the observations. The Rosetta flybys made fitting the observations even more difficult.

**Hayabusa** (Japanese asteroid sample return mission) – When we last checked on Hayabusa, it was on its way back toward Earth and the 3rd of its 4 ion thrusters had failed (the chemical rocket system had long ago failed). Controllers were hesitant to turn on the 4th, since voltage spikes seemed to be destroying the thrusters. Spacecraft engineers discovered that 2 of the failed thrusters, if both turned on, would form one complete thruster, since different parts had failed. The only disadvantage is that it uses twice as much fuel and electricity as one thruster, but with no more force produced. But there is enough spare fuel and electric power. So Hayabusa is back on track to meet Earth (Australia specifically) next June. Then we will find out if the failures during sample recoveries prevented some or all of the sample from being gathered. The other earlier failures were overcome by, among other things, using backup systems and taking a different orbit back to Earth, resulting in a substantial delay.




**Largest telescope** – 35 radio telescopes on 6 continents (and some off continents) were linked together to act as one, forming the largest telescope ever, and made observations for 24 hours. The previous record was 23 radiotelescopes linked. The reason for the link was to make the most accurate measurements ever of the locations of more than 200 quasars scattered over the entire sky. This will be used to make a frame of reference for the precise location of all astronomical objects, not just by radiotelescope observations, but in all wavelengths.

*(continued on page 11)*

# TOP TWENTY THINGS AN ASTRONOMER SHOULD SEE

By Helen Mahoney

As a lifelong amateur astronomer, I have had the opportunity to see so many exciting and wonderful things related to astronomy.

I started many years ago to make a list of the things I wanted to see, and I have managed to experience a good many of those things. In addition, I have had the fortune to experience a lot of great astronomical spectacles that I wasn't planning or expecting to see.

I decided to compile them and describe them to give my fellow amateur astronomers an idea of what I feel are the astronomical top twenty things to see. It's kind of a "bucket list" for amateur astronomers.

There are amazing things an astronomer can see every year—every day even. The key is being in the right place at the right time. Sometimes, it also means having the right equipment, such as a telescope. Most of the things on my list do not require expensive or sophisticated equipment; however, some of the better ones do usually require planning and travel.

Living in Long Beach, California most of my life, there is a limit to what I can see from home. The Los Angeles and Orange County areas are severely light polluted. Those of you who live in darker sky areas will not have to travel far to see many of the things on my list. A few of them can even be seen from light polluted areas.

So, here they are—arranged from the easiest ones to see to the more difficult, rare, and spectacular—are my Top Twenty Things an Amateur Astronomer Should See:

#20 The International Space Station
#19 Saturn's rings
#18 Jupiter's moons, including moon shadows
#17 The green flash
#16 The Andromeda Galaxy naked eye
#15 A total lunar eclipse
#14 Messier objects with binoculars or a small telescope
#13 Any object through a large telescope
#12 Sun with a hydrogen alpha telescope
#11 Venus in daylight
#10 The Milky Way from a really dark sky
#9 A naked eye comet
#8 A really great meteor shower
#7 The Aurora
#6 The Southern sky
#5 The midnight sun
#4 The moon occulting a planet
#3 A transit of Mercury or Venus
#2 A supernova
#1 A total solar eclipse

Next month, I will start with #20, and work through the list, giving you an idea of why you should consider putting each of these on your personal "must-see" list. I will also give you some advice from my personal experience on how you can have these experiences.

*(continued from page 9)*

**Instant AstroSpace Updates**

Observing **Centaurus A**, a galaxy known to have suffered a merger, in infrared using the New Technology Telescope in Chile, astronomers found a large ring of recently formed and still forming stars near the center of the galaxy. It is hidden in visible light by a huge dust lane.

**Terzan 5**, long thought to be a globular cluster, has been found to have stars of 2 different ages, while globulars generally have only 1 age of stars. Thus it is probably instead a dwarf galaxy that got grabbed by the Milky Way.

Observations of nova **V445 Puppis** show that it is quite bright for a white dwarf and has been depleted of hydrogen and therefore it may be nearing the point where it becomes a Type Ia supernova. That is where a companion star dumps enough material onto a white dwarf star so that it exceeds the limit of what such a star can support and it implodes.

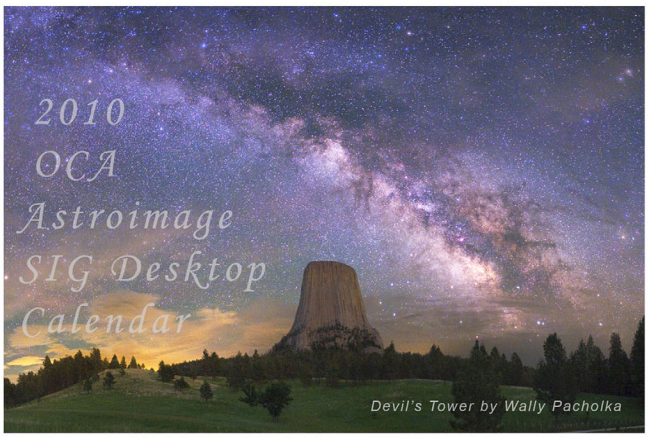
There was no doubt that the **Large Hadron Collider,** which is mostly in Switzerland, was the largest particle collider in the world (17 miles around), but now it is the most powerful, since it was run at 1.18 teraelectron volts (TeV) (the previous record was 0.98 at Fermilab). This is just tune up, as regular operations will proceed up to 7 TeV next year

Hubble Space Telescope (HST) has repeated its **ultra deep field** image but using the new more sensitive camera (WFC3) and doing it in infrared instead of visible light. Even dimmer, more distant galaxies were found.

The **WFPC 2** camera that was removed from HST during the recent service mission to make space for the new and improved WFC3 was returned to Earth and is going on display in the Smithsonian Air and Space Museum. WFPC 2, with its correction for the error in the shape of the primary mirror, saved HST. WFPC 2 spent 15 years in space and took over 135,000 images.

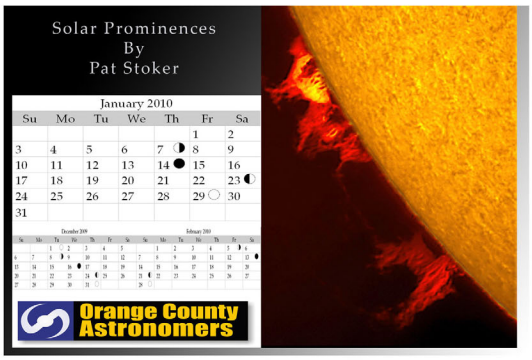
The **ALMA** radiotelescope, located high in the Andes Mountains, made its first observation, using the 2 completed antennas of the 66 under construction. It achieved interferometric lock on a distance quasar at submillimeter wavelengths. ■

# 2010 OCA Astroimage SIG Desktop Calendar - Now Available!




With Images by Jeff Malmrose, Craig Bobchin, Pat Stoker, Jim Windlinger, Gary Carlson, Ronald Royer,Sam Saeed, Gary Schones, Dave Kodama, Bill Warden, Jon Mayfield, John Castillo, Bruce Waddington, Alan Smallbone and Wally Pacholka!

## 14 months of images by OCA members to enjoy!




# ONLY $10!!!

See Charlie Oostdyk at the general meetings, or contact Barbara Toy or Alan Smallbone for information about ordering and picking up at other OCA meetings! Great Gift Idea!

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