January 2010

Volume 24 Issue 1

The Observer

East Valley Astronomy Club

From the Desk of the President
by David Douglass

Welcome to 2010, the year after the Year of Astronomy (2009). I was wondering how the press was going to handle the transition from IYA to whatever followed, and read that comment somewhere the other day. From everything I have read so far in different locations, 2010 will be a year of reflection and calculation, to determine the impact of the IYA campaign. For EVAC, it will be a year of continuation. IYA did not bring much new to us, as we have been an organization that focused on public outreach for several years, and will continue to do so.

Many ***Thank Yous*** to Tom and Jennifer Polakis. They have once again opened their home to the annual EVAC Holiday gathering. Many of our members attended, and a good time was had by all.

The new officers for 2010 are already getting started with their chores. Presentations are being scheduled, and paperwork is being transferred from person to person. 2010 is looking good!

Howard Israel is ready to resume his 4-part lecture series on Basic Astronomy at the January 15th meeting. His talk will begin at 6:10 pm, and last about 1 hour, followed by a short break, and then the General Membership meeting starts at 7:30. Attendance has been excellent at the first two sessions, and the sessions have been very well received.

If you have some new equipment, or recent activity that you would like to tell the gathered membership about, please send me an email at president@evaconline.org and I will arrange some time for you. If you have a question for the membership, just bring it with you. We have altered our meeting presentation to allow *Continued on page 12*

Inside this Issue:

The Backyard Astronomer
Who Are These Guys? *by Bill Dellinges*

As amateur astronomers, we cut our teeth tracking down the plethora of Messier and NGC objects scattered across our star charts. But what about those other mysterious designations we find sprinkled here and there like Cr 70, I.4665, Mel 111, or Tr 24? What do they stand for? And who were the guys who created them? Astronomy is notorious for its many esoteric catalogs and lists. Here we will look at a few of the more common ones other than the Messier and NGC objects found in atlases.

B objects: Edward Emerson Barnard (1857-1923) was a legendary and prolific American astronomer who is probably most remembered for his work on identifying dark nebulae in the Milky Way. He was an early proponent of the theory they were not holes or "windows" in the Milky Way but dark clouds of nebulae obscuring bright clouds of stars behind them. By 1919 he had gathered 182 of his dark nebulae for an article in the Astronomical Journal, On the Dark Markings of the Sky. After his death, a collection of his photographs was published in 1927 by Yerkes Observatory Director Edwin B. Frost and Mary K. Calvert, Barnard's niece. Other dark nebulae were later added to the catalog. By 1966 they totaled 366. Barnard also discovered 16 comets and Jupiter's fourth moon, Amalthea, the latter with the Lick 36" refractor. This was to be the last moon discovered visually in our Solar System. In 1916 he discovered the star with the highest proper motion (10.3"/year). "Barnard's Star," the fourth near- *Continued on page 2*

Upcoming Events:

Public Star Party – January 8

Local Star Party – January 9

Monthly General Meeting – January 15

Deep Sky Star Party – January 16

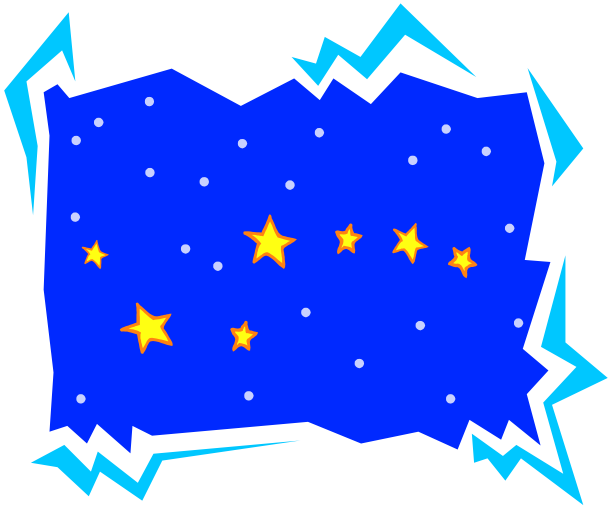
Check out all of the upcoming club events in the Calendars on page 8

The Backyard Astronomer

Continued from page 1 est star to the Sun after the Alpha Centauri triple star system is 6 light years away. Examples of Barnard objects are the Pipe Nebula (B78), Snake Nebula (B72) in Ophiuchus and Horsehead Nebula (B33) in Orion.

Cr: Swedish astronomer Per Collinder (1890-1974) published a list of 471 open star clusters as an appendix to his 1931 doctoral dissertation, On the Structural Properties of Open Galactic Clusters and Their Spatial Distribution. He found most while examining photographic plates of both hemispheres. Examples of Cr objects are Cr 399, the "Coathanger" in Vulpecula (not a true cluster), Cr 70, the large star field around Orion's Belt, Cr 69, the stars comprising Orion's head, and Cr 50, the Hyades in Taurus.

IC: The most numerous objects after the Messier and NGC catalogs are the Index Catalog (I.C.) objects (usually shown with the "C" omitted, as in "I.4756"). In 1888, Danish astronomer J.L.E. Dreyer published his New General Catalog of Nebulae and Clusters of Stars (N.G.C.) containing 7,840 deep sky objects, many of which were based on previous observations of William and John Herschel. Dreyer later would publish two supplementary catalogs to the NGC. The first Index Catalog of 1,529 objects was published in 1895. The second was published in 1908 and contained 3,857 objects. I.C. objects are generally less impressive than NGC objects, being comprised of fainter nebulae and clusters. It's important to note that at the time it was not known that some nebulae were in fact galaxies, thus the omission of "Galaxies" in the original title of Dreyer's publication. An example of an I.C. object would be I.4665, a large open star cluster in Ophiuchus near Beta Ophiuchi best seen in binoculars.



Mel: Philibert Jacques Melotte (1880-1961), whose parents had immigrated to England from Belgium, published A Catalog of Star Clusters shown on the Franklin-Adams Chart Plates in 1915 of 245 open star clusters he found on plates taken by astronomer John Franklin-Adams (1843-1912). Melotte discovered Jupiter's moon Pasiphae in 1908 and asteroid 676 Melitta in 1909. Probably his most well known object is Mel 111, the Coma Berenices Star Cluster, a large sparse cluster in the northwestern section of that constellation. A binocular with at least a six degree field of view is required to view it all. Mel 20 is the Perseus OB Association around the star Mirfak. Mel 31 is the "Leaping Minnow" cluster in Auriga, three degrees west of M36.

PK: Czechoslovakian astronomers Lubos Perek (1919 -) and Lubos Kohoutek (1935 -) produced a catalog 1510 planetary nebulae known in the Milky Way as of 1999 by. Some of the brighter planetaries also share a NGC number, as in PK 261+32.1 (NGC 3242) the "Ghost of Jupiter" in Hyrda. PK nomenclature reflects Galactic longitude and latitude as opposed to the more standard right ascension and declination system used in astronomy. Kohoutek will forever be remembered as the discoverer of Comet Kohoutek in 1973 which failed to live up to its public expectations. Kohoutek discovered three comets and 75 asteroids.

Sh: As a graduate student at Yerkes Observatory, American astronomer Stewart L. Sharpless (1926 -) studied distances to bright stars and nebulae to help define Milky Way spiral arm structure. At Mount Wilson Observatory he worked on photographing galaxies with Walter Baade and Edwin Hubble. At the U. S. Naval Observatory he compiled his Sharpless catalog of 313 emission nebulae (ionized hydrogen regions) within the Galaxy from Palomar Sky Survey plates. They were published in two editions in 1953 and 1959. Sharpless gave Sh numbers to many bright Messier and NGC objects like Sh 2-6 (M20, Trifid Nebula) and Sh 2-117 (NGC 7000, North American Nebula). Star charts generally ignore Sharpless designations on these brighter objects, preferring M/NGC notation and only use Sharpless numbers on fainter objects without M/NGC numbers.

St: A compilation of 24 loose clusters, half of which are in Cassiopeia, published in 1958 by German born astronomer Jurgen Stock (1923 – 2004). The following year Gerard Kuiper sent him to Chile to scout a location for a 1.5 meter telescope. The mission was expected to take several weeks. Stock stayed three years, sometimes using horses or mules to reach remote sites. He settled for a mountain called Cerro Tololo. The rest is history. A fine Stock object is St 2 in Perseus, about three degrees north of the Double Cluster. Follow a chain of fifth magnitude stars from the latter to this large one degree wide sparse stellar grouping. St 2 is best seen in binoculars.

Tr: Robert Julius Trumpler (1886-1956). This Swiss born astronomer was invited to the U.S. in 1915 to work at Allegheny and Lick observatories. His prime interest was galactic clusters and their use as standard candles to determine distance in mapping spiral arm structure in the Milky Way. He advanced the theory that interstellar dust reddened and dimmed stars making them appear dimmer and thus more distant than they were. His open cluster classification system has been accepted over those of Melotte and Shapley. In 1930 he published an article on open clusters including his catalog of 37 clusters. He was president of the Astronomical Society of the Pacific in 1932 and 1948 and a professor of astronomy at UC Berkeley until 1951. A fairly well known Trumpler object is Tr 24, a large sparse cluster about a degree northeast of NGC 6231. Together, they form the "False Comet" in southern Scorpius.

While these are just a few of the more commonly seen catalog objects in star atlases, it's interesting to learn who these people are and their place in astronomical history. What other interesting astronomers are behind the myriad cryptic symbols found littered across star charts?

Gamma Ray Bursts: An Introduction (part one)

by Henry De Jonge IV

In the next two articles I would like to explore gamma ray bursts, (GRBs). Imagine the entire mass of the sun being converted into pure energy in a matter of seconds! This is typically the energy level of a GRB. They are currently the most violent and powerful explosions known in the universe and as are yet far from being understood completely. Currently we have much more observational evidence for these explosions than we have explanations for them. Observationally since the early 1990s, we have classified GRBs into two broad classes. The first are short bursts with gamma ray bursts of less than 2 seconds, and the second class are long bursts with gamma ray bursts of longer than 2 seconds.

Short bursts are usually associated with older stellar populations and not usually associated with SN, (however this is not totally true) and have been found out to z = 2.61, (2009), while long bursts are usually seen in younger stellar populations and associated with SN explosions. Long bursts have been seen out to Z=8.2, (2009). One must realize that these classifications are statistical in nature and that often the distinction is not as clear as we shall see. To date thousands of GRBs have been detected.

It used to be thought that the distinction between short and long bursts was clear. It was determined that short bursts were the result of a merger between a BH and a NS or NS and NS, while a long burst was the result of a powerful HN or SN explosion that resulted in a NS or BH. The merger of compact stellar remnants as in a typical short burst is now called a Type I origin and the explosions of massive stars typical of a long burst is now called a Type II origin.

GRBs in general are characterized by a prompt release of high energy gamma and x-ray photons followed by a multi wavelength afterglow emission. The explosions are strongly relativistic and often highly collimated. They can end up having a torus like disk which may power a fireball relativistic jet. Their light curves are usually complex with a mixture of attributes that makes the classification very difficult. It was not until recently that we were able to follow the initial gamma ray detection with other instruments and could begin detecting the full spectrum of GRBs, especially in the optical and x-ray regions.

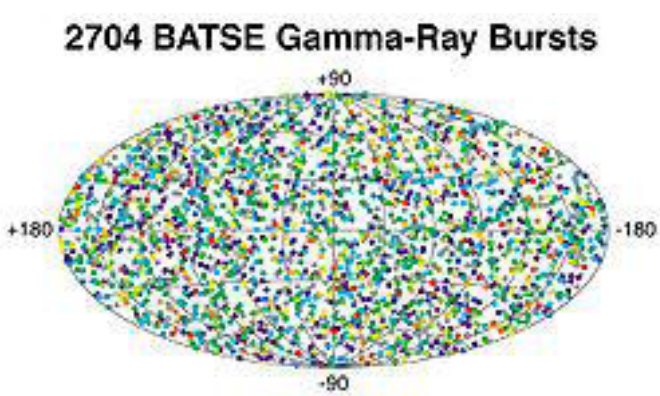


Figure 1: Here we see a distribution of GRBs in the sky. For a real time view of GRBs see the following web site: http://grb.sonoma.edu/

The time scales for changes in the GRB light curves is also quite varied and these curves in general show regions of prompt emission, x-ray tails, fast decay intervals, afterglow plateaus, and jets. However the light curves for many GRBs is seldom so well defined and complete. For example many short bursts have an extended afterglow tail (GRB 07024A) while some long bursts do not show the usual SN spectral signatures, (GRB 060614). A "naked" GRB is one which does not have a noticeable afterglow emission.

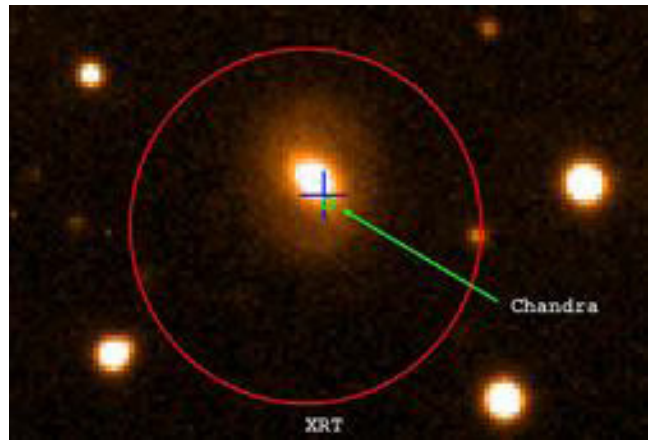


Figure 2: Short GRB 050724 as seen with Chandra

There are some loose connections between GRBs and their environment. We have seen the correlation between long bursts with some SN, their afterglows, and host galaxies so this connection seems to be somewhat well established. However, long bursts can also occur outside of star formation regions, (GRB 071003).There have been observed a few Type I GRBs in non star forming galaxies, (GRB 050509B, & 050724), while some Type I GRBs were also seen at the edge of star forming galaxies, (GRB 050709). One confusing example in 2006 was GRB 060614 a close Type II GRB with many characteristic of a Type I GRB. Thus there seems to be an overlap of properties based upon the current classification scheme. We have now seen that some long GRBs can have a Type I origin while some short GRBs can have a Type II origin, (GRBs 080913 & 090423).

I was aware of this older classification scenario as well until I began the research for this article and found out that we still have a long way to go in understanding these explosions and in making their classification better defined and more closely related to their origins.

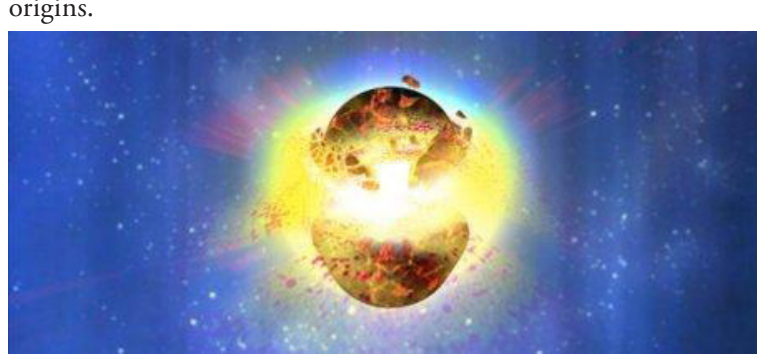


Figure 3: Drawing of a short GRB, a merger of two compact stellar remnants.

Continued on page 4

Gamma Ray Bursts: An Introduction

Continued from page 3

We are theoretically convinced that the fantastic energy released in GRBs comes from the release of gravitational energy with possible contributions from rotational and magnetic energy. The "standard model" for explaining the energy release in GRBs dictates a prompt emission and energy release through the relativistic explosion via internal shocks, synchrotron emission, reverse Compton emission, and reverse shocks, combined with magnetic fields and interaction with the ISM especially from the forward shock front. The complete existence of all these segments, their exact timing and sequence in describing the light curves of GRBs is still much debated. Even the basic understanding of how these segments exist and their complete and primary properties is under debate.

Many problems in this model exist. One problem in the "standard model" is that the time scales of these observed segments do not follow the known model for NS-NS coalescence paradigm for short bursts. Many times the afterglows for both short and long bursts look very similar and are of similar length despite their usually occurring in completely different stellar environments. Some missing segments of the light curve such as jet activity or afterglow are still not understood or even well classified. This model also fails to explain naked GRBs. Thus the theoretical work continues.

It was also once thought that GRBs could become a new "standard candle" for measuring intergalactic distances and probing the large scale structure of our Universe. However this will require much more work due to the vast differences in light curves for even the same type of GRB.

One interesting alternative explanation to the "standard model" is the magnetar model in which all GRBs are explained in terms of accreting matter inflows onto NS or white dwarfs, (forming a NS that is a magnetar). Some of this accreting matter is flung off at relativistic speeds from the rotating magnetar at tremendously high energies. This scheme of interaction can explain many of the properties of the light curves. It also explains many similarities between long and short bursts and also works well in replacing the collapsar model of SN. However so little is understood of the role of magnetic fields in such models and this is one of the biggest challenges for the future. This model also has many problems including explaining the release of one or two solar masses of matter into energy in seconds. On an extended note, there is another model that also uses magnetars and claims that all GRBs are actually in our own Galaxy.

Thus we see that after decades of observation and analysis we are still very far away from any full understanding of GRBs. Their origin and progenitors are still a puzzle. We see that our current bimodal classification scheme is not very well defined and this will probably need to be refined in the future to more accurately reflect their origins. This is especially true for the Type I or short burst origins. It would appear that many short GRBs could be a combination of both Type I and Type II origins. It is estimated that only about 10% of the short GRBs are true Type I in origin. In the future gravitational wave detection and measurements will be able to determine these results much more conclusively, and with higher accuracy. Using gravitational waves for Type I GRBs may also result in a new standard candle for measuring intergalactic distances. Finally, more data from both the bursts and their host galaxies (or other environments), will be needed and combined with future theoretical work to get a good handle on understanding these complex and fantastically powerful explosions.

● Full Moon on December 31 at 12:14

◑ Last Quarter Moon on January 7 at 03:41

○ New Moon on January 15 at 00:12

◐ First Quarter Moon on January 23 at 03:53

● Full Moon on January 29 at 23:19

January Guest Speaker: Kim Hermann

Kim Hermann is a postdoctoral research scientist at Lowell Observatory in Flagstaff. Kim earned her Ph.D. from Penn State in 2008 after completing her undergraduate work at Behrend College.

As a Lowell postdoc, Kim is working with Deidre Hunter on her LITTLE THINGS project, and is very much enjoying an introduction to reducing radio data. Kim's thesis work was on using planetary nebulae to probe the disk mass of face-on spiral galaxies. She worked with Robin Ciardullo and used MOSAIC and OPTIC on the CTIO 4-m and WIYN telescopes, respectively, as well as the Hydra multi-fiber spectrograph on both telescopes. Kim loves participating in astronomy outreach and greatly looks forward to exploring such opportunities at Lowell.

Kim's talk is entitled *Probing Spiral Galaxies with Planetary Nebulae.*

Basic Astronomy Four Part Lecture Series

Howard Israel is presenting a four part lecture series that began at the October 2009 EVAC meeting. The Lecture Series will be presented in four separate (monthly) sessions, each beginning at 6:10 PM, lasting for one hour, followed by a break, and then the regular EVAC meeting will begin at 7:30 PM.

Following is a brief outline of the topics that will be covered during the lecture series:

- The terms of astronomy – words you need to know
- Star gazing basics
- Learning the sky – planets, constellations, stars, deep sky objects
- Visual observing – How to see the wonders of the heavens with your own eyes
- How to use a Planisphere
- How to read a star map
- Secrets of deep sky observing
- Where to get free astronomy software
- Choosing a pair of binoculars
- Choosing your first telescope
- Light pollution – what you can do about it

Session 1 (Oct 23rd) covers general basic astronomical terms, (ascension, declination, etc)
Session 2 (Nov 20th) covers the Solar System and how to observe planets.
Session 3 (Jan. 15th) covers deep sky observing
Session 4 (Feb. 19th) covers binoculars, telescopes, eyepieces, etc.

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Alex Vrenios axv@att.net

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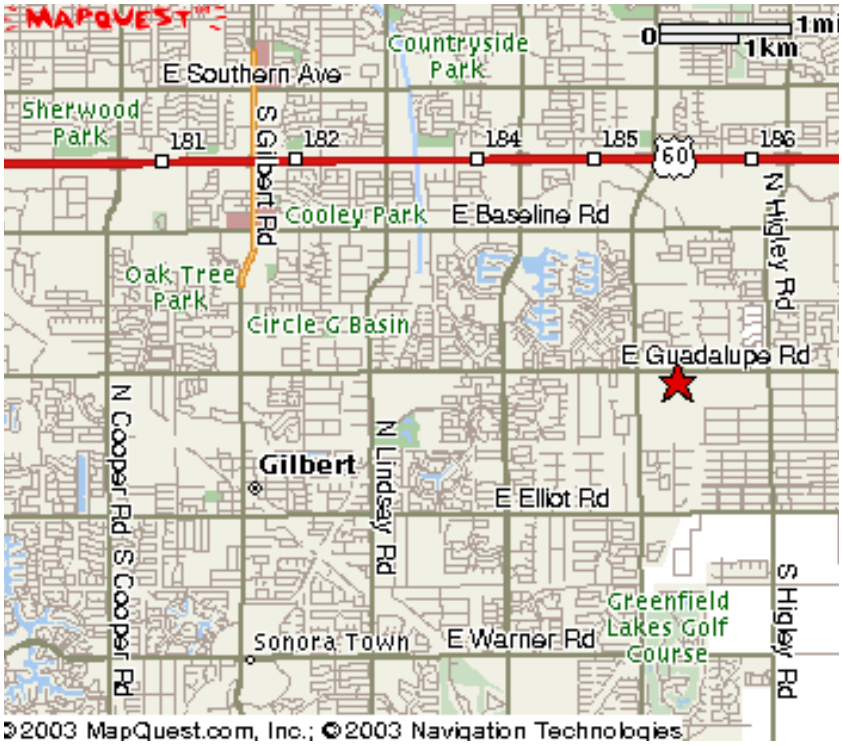
$1300.

Mike Sargeant 480-839-3209

www.eastvalleyastronomy.org/grco/obs.asp

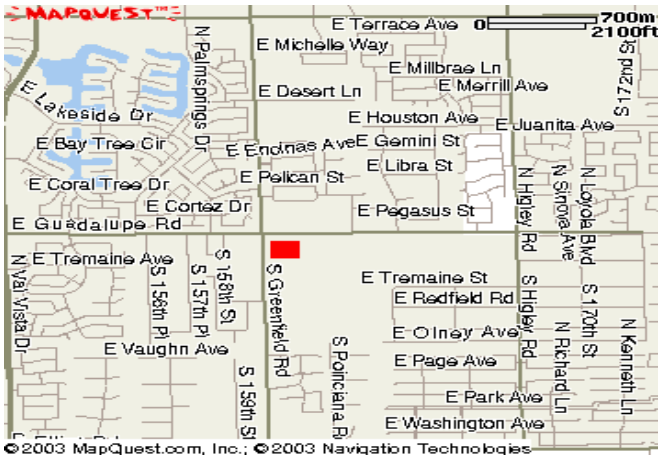


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

Our meetings are held on the third Friday of each month at the Southeast Regional Library in Gilbert. The library is located at 775 N. Greenfield Road; on the southeast corner of Greenfield and Guadalupe Roads.

Meetings begin at 7:30 pm.

Visitors are always welcome!



Upcoming Meetings

January 15
February 19
March 19
April 16
May 15
June 19

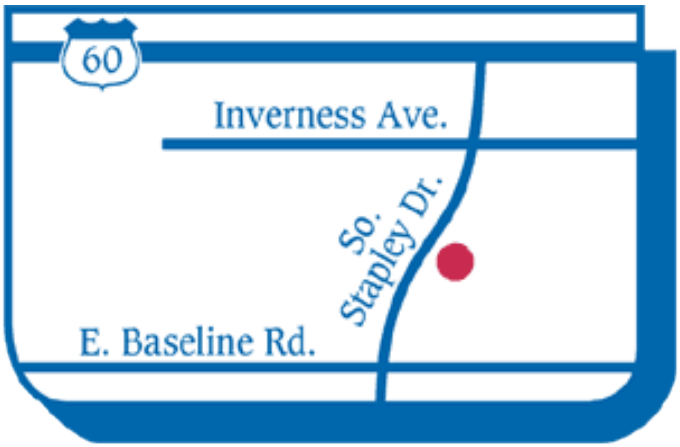
Southeast Regional Library
775 N. Greenfield Road
Gilbert, Az. 85234

All are welcome to attend the pre-meeting dinner at 5:30 pm. We meet at Old Country Buffet, located at 1855 S. Stapley Drive in Mesa. The restaurant is in the plaza on the northeast corner of Stapley and Baseline Roads, just south of US60.

Old Country Buffet
1855 S. Stapley Drive
Mesa, Az. 85204

Likewise, all are invited to meet for coffee and more astro talk after the meeting at Denny's on Cooper (Stapley), between Baseline and Guadalupe Roads.

Denny's
1368 N. Cooper
Gilbert, Az. 85233



January 2010

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	**8**	**9**
10	11	12	13	14	**15**	**16**
17	18	**19**	**20**	21	**22**	23
24	25	26	27	**28**	**29**	30
31						

January 8 - Public Star Party & SkyWatch at Riparian Preserve

January 9 - Local Star Party at Boyce Thompson Arboretum

January 15 - General Meeting at Southeast Regional Library

January 16 - Deep Sky Star Party at Vekol

January 19 - Las Sendas Star Party

January 20 - Centennial Middle School Star Party

January 22 - Chandler Environmental Center Star Party

January 28 - Jacobson Elementary Star Party

January 29 - Red Mountain Ranch Elementary Star Party

February 2010

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	**3**	**4**	5	**6**
7	8	9	10	**11**	**12**	**13**
14	15	16	**17**	**18**	**19**	20
21	22	23	24	25	26	27
28						

February 3 - Haley Elementary Star Party

February 4 - Humphrey Elementary Star Party

February 6 - Local Star Party at Boyce Thompson Arboretum

February 11 - Ryan Elementary Star Party

February 12 - Public Star Party & SkyWatch at Riparian Preserve

February 13 - Deep Sky Star Party at Vekol

February 17 - St. John Bosco Star Party

February 18 - Barbara Bush Elementary Star Party

February 19 - General Meeting at Southeast Regional Library

East Valley Astronomy Club -- 2010 Membership Form

Please complete this form and return it to the club Treasurer at the next meeting or mail it to EVAC, PO Box 2202, Mesa, Az, 85214-2202. Please include a check or money order made payable to EVAC for the appropriate amount.

IMPORTANT: All memberships expire on December 31 of each year.

Select one of the following:

☐ New Member ☐ Renewal ☐ Change of Address

New Member Dues (dues are prorated, select according to the month you are joining the club):

☐ **$30.00 Individual** January through March

☐ **$35.00 Family** January through March

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$37.50 Individual** October through December

☐ **$43.75 Family** October through December

Includes dues for the following year

Renewal (current members only):

☐ **$30.00 Individual** ☐ **$35.00 Family**

Magazine Subscriptions (include renewal notices):

☐ **$34.00** Astronomy ☐ **$33.00** Sky & Telescope

Name Badges:

☐ **$10.00** Each (including postage) Quantity: _____

Name to imprint: _____

Total amount enclosed: ☐

Please make check or money order payable to EVAC

☐ Payment was remitted separately using PayPal ☐ Payment was remitted separately using my financial institution's online bill payment feature

Name: ☐ Phone: ☐

Address: ☐ Email: ☐

☐ Publish email address on website

City, State, Zip: ☐ URL: ☐

How would you like to receive your monthly newsletter? (choose one option):

☐ Electronic delivery (PDF) *Included with membership* ☐ US Mail **Please add $10 to the total payment**

Areas of Interest (check all that apply):

☐ General Observing ☐ Cosmology

☐ Lunar Observing ☐ Telescope Making

☐ Planetary Observing ☐ Astrophotography

☐ Deep Sky Observing ☐ Other

Please describe your astronomy equipment:

Would you be interested in attending a beginner's workshop? ☐ Yes ☐ No

How did you discover East Valley Astronomy Club? ☐

PO Box 2202
Mesa, AZ 85214-2202
www.eastvalleyastronomy.org

All members are required to have a liability release form (waiver) on file. Please complete one and forward to the Treasurer with your membership application or renewal.

Liability Release Form

In consideration of attending any publicized Star Party hosted by the East Valley Astronomy Club (hereinafter referred to as "EVAC") I hereby affirm that I and my family agree to hold EVAC harmless from any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), which may directly or indirectly be connected to EVAC and/or my presence on the premises of any EVAC Star Party and related areas.

I further agree to indemnify any party indicated above should such party suffer any claims, liabilities, losses, demands, causes of action, suits and expenses (including attorney fees), caused directly or indirectly by my negligent or intentional acts, or failure to act, or if such acts or failures to act are directly or indirectly caused by any person in my family or associates while participating in an EVAC Star Party.

My signature upon this form also indicates agreement and acceptance on behalf of all minor children (under 18 years of age) under my care in attendance.

EVAC only recognizes those who are members or invitees and who also have a signed Liability Release Form on file as participants at an EVAC Star Party.

Please print name here

Date

Please sign name here

PO Box 2202
Mesa, AZ 85214-2202
www.eastvalleyastronomy.org

Sunglasses for a Solar Observatory

by Patrick Barry

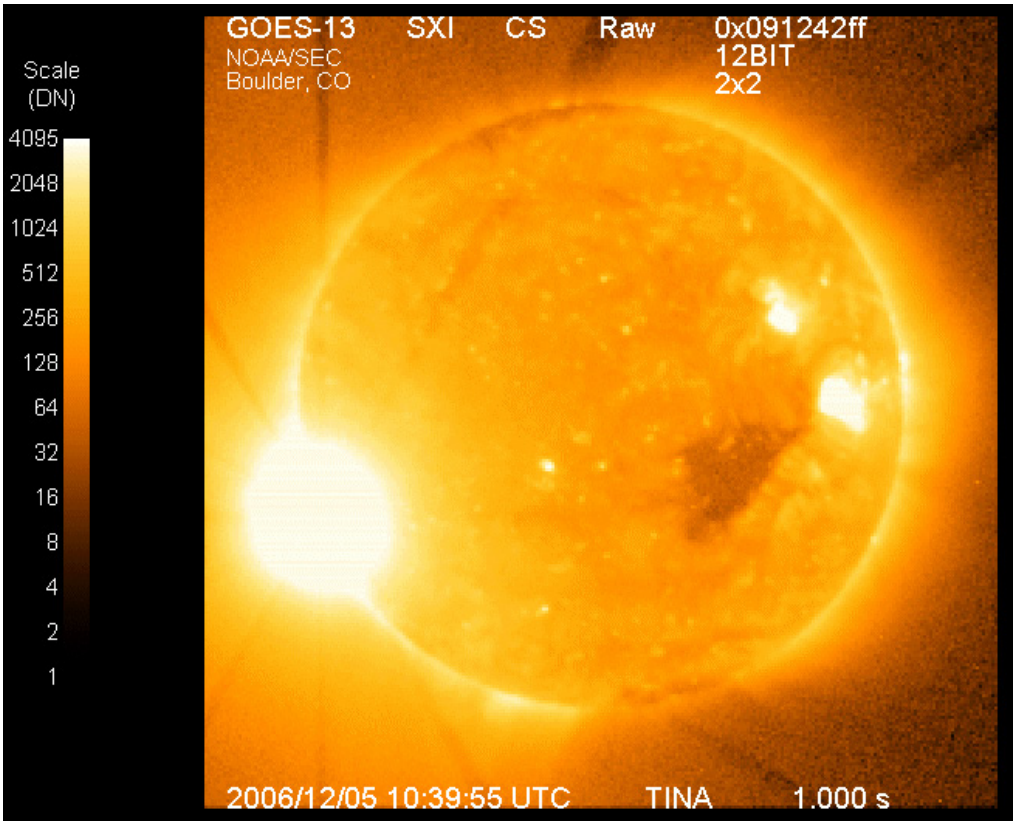
In December 2006, an enormous solar flare erupted on the Sun's surface. The blast hurled a billion-ton cloud of gas (a coronal mass ejection, or CME) toward Earth and sparked days of intense geomagnetic activity with Northern Lights appearing across much of the United States.

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.

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.



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.

"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.

If It's Clear...

by Fulton Wright, Jr.
Prescott Astronomy Club

January 2010

Celestial events customized (from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find information) for Prescott, Arizona. All times are Mountain Standard Time.

This month and next are good ones for observing Mars. It will be near opposition (January 29) and fairly close to the earth. No, it will not be as big as the full Moon, but you should be able to see some features with a medium (6 inch) telescope. On January 1 it rises at 8:20 PM. On January 31 it rises at 5:30 PM. If you wait for the planet to be high in the sky before you observe it, you will have less trouble with atmospheric turbulence.

On Friday, January 1, from 6:14 PM to 9:04 PM (when Jupiter sets), you can see Europa's shadow on the planet. Europa itself moves from in front of Jupiter at 7:13 PM.

On Saturday, January 2, starting at dusk (around 6:00 PM), you can see Jupiter's moon, Ganymede, in front of the planet. At 8:03 PM the satellite moves from in front of the planet. 14 minutes later the satellite's shadow falls on the planet, which is now only 8 degrees above the west-southwest horizon.

On Thursday, January 7, at 12:42 AM, the third quarter Moon rises.

On Monday, January 11, at 4:54 AM, the very thin crescent Moon and Antaries rise about a degree apart a little east of southeast.

On Tuesday, January 12, from dusk (around 6:05 PM) till 8:22 PM, you can see Io's shadow on Jupiter. At 7:36 PM Io itself moves from in front of the planet.

On Friday, January 15, it is new Moon so you have all night to observe faint fuzzies.

On Friday, January 22, it is first quarter Moon. It sets at 12:58 AM (January 23).

Around Sunday, January 24, about 6:45 AM, you can see Mercury (magnitude 0) low in the southeast. It should also be visible a few days on either side of this date.

On Friday, January 29, at 5:39 PM (17 minutes before sunset) the full Moon rises. Because the Moon is near perigee (closest to Earth), it will seem slightly larger than usual.

It's January of 2010
A New Year !

Which means... your EVAC membership dues are now due.
Single Membership is $30. Family Membership is $35.

If you have not already paid your 2010 dues, please consider visiting with the Treasurer before the meeting, or during the break. You can also make a check out to EVAC – Treasurer, and mail it to PO Box 2202, Mesa, Arizona 85214. Another option is to go online, and use the PayPal option. The link would be: http://evaconline.org/join_evac.htm

From the Desk of the President

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some additional time for Show and Tell (and Ask).

It has been such a pleasure to see Orion coming up in the late evening. That is one area of the sky, that, to me, contains so much to look at. I think I could spend an entire "career" searching its contents, and never be bored. And never finish. I look forward to seeing you all at the January 15th meeting. Until then… Keep Looking Up!

Spirit Faces Uncertain Future as New Year Dawns

On Januray 3rd NASA's Mars rover Spirit will mark six years of unprecedented science exploration and inspiration for the American public. However, the upcoming Martian winter could end the roving career of the beloved, scrappy robot.

Spirit successfully landed on the Red Planet at 8:35 p.m. PST on Jan. 3, 2004, and its twin Opportunity arrived at 9:05 p.m. Jan. 24, 2004. The rovers began missions intended to last for just three months but which have instead gone on for six Earth years, or 3.2 Mars years. During this time, Spirit has found evidence of a steamy and violent environment on ancient Mars that was quite different from the wet and acidic past documented by Opportunity, which has been operating successfully halfway around the planet.

An artist's concept portrays a NASA Mars Exploration Rover on the surface of Mars. Image credit: NASA/JPL/Cornell University

A sand trap and balky wheels are challenges to Spirit's mobility that could prevent NASA's rover team from using a key survival strategy for the rover. The team may not be able to position the robot's solar panels to tilt toward the sun to collect power for heat to survive the severe Martian winter.

Nine months ago, Spirit's wheels broke through a crusty surface layer into loose sand hidden underneath. Efforts to escape this sand trap barely have budged the rover. The rover's inability to use all six wheels for driving has worsened the predicament. Spirit's right-front wheel quit working in 2006, and its right-rear wheel stalled a month ago. Surprisingly, the right-front wheel resumed working, though intermittently. Drives with four or five operating wheels have produced little progress toward escaping the sand trap. The latest attempts resulted in the rover sinking deeper in the soil.

"The highest priority for this mission right now is to stay mobile, if that's possible," says Steve Squyres of Cornell University in Ithaca, N.Y. He is principal investigator for the rovers.

If mobility is not possible, the next priority is to improve the rover's tilt, while Spirit is able to generate enough electricity to turn its wheels. Spirit is in the southern hemisphere of Mars, where it is autumn, and the amount of daily sunshine available for the solar-powered rover is declining. This could result in ceasing extraction activities as early as January, depending on the amount of remaining power. Spirit's tilt, nearly five degrees toward the south, is unfavorable because the winter sun crosses low in the northern sky.

Unless the tilt can be improved or luck with winds affects the gradual buildup of dust on the solar panels, the amount of sunshine available will continue to decline until May 2010. During May, or perhaps earlier, Spirit may not have enough power to remain in operation.

"At the current rate of dust accumulation, solar arrays at zero tilt would provide barely enough energy to run the survival heaters through the Mars winter solstice," says Jennifer Herman, a rover power engineer at NASA's Jet Propulsion Laboratory in Pasadena, Calif.

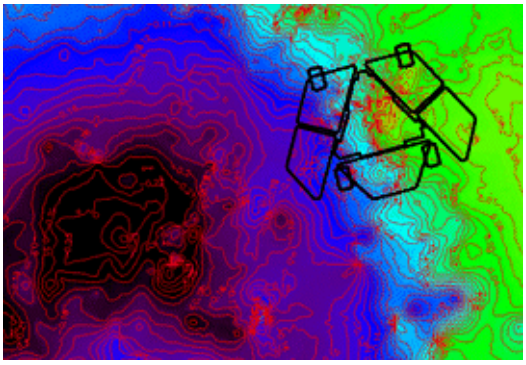
The team is evaluating strategies for improving the tilt even if Spirit cannot escape the sand trap, such as trying to dig in deeper with the wheels on the north side. In February, NASA will assess Mars missions, including Spirit, for their potential science versus costs to determine how to distribute limited resources. Meanwhile, the team is planning additional research about what a stationary Spirit could accomplish as power wanes.

"Spirit could continue significant research right where it is," says Ray Arvidson of Washington University in St. Louis, deputy principal investigator for the rovers. "We can study the interior of Mars, monitor the weather and continue examining the interesting deposits uncovered by Spirit's wheels."

A study of the planet's interior would use radio transmissions to measure wobble of the planet's axis of rotation, which is not feasible with a mobile rover. That experiment and others might provide more and different findings from a mission that has already far exceeded expectations.

"Long-term change in the spin direction could tell us about the diameter and density of the planet's core," says William Folkner of JPL. He has been developing plans for conducting this experiment with a future, stationary Mars lander. "Short-period changes could tell us whether the core is liquid or solid," he said.

Spirit may be stuck and in peril, but the rover still has a lot of work to do.


A topographic map of Spirit's surroundings at Troy.

Article courtesy of Science@NASA, edited by Dr. Tony Phillips.

The Deep Sky Object of the Month

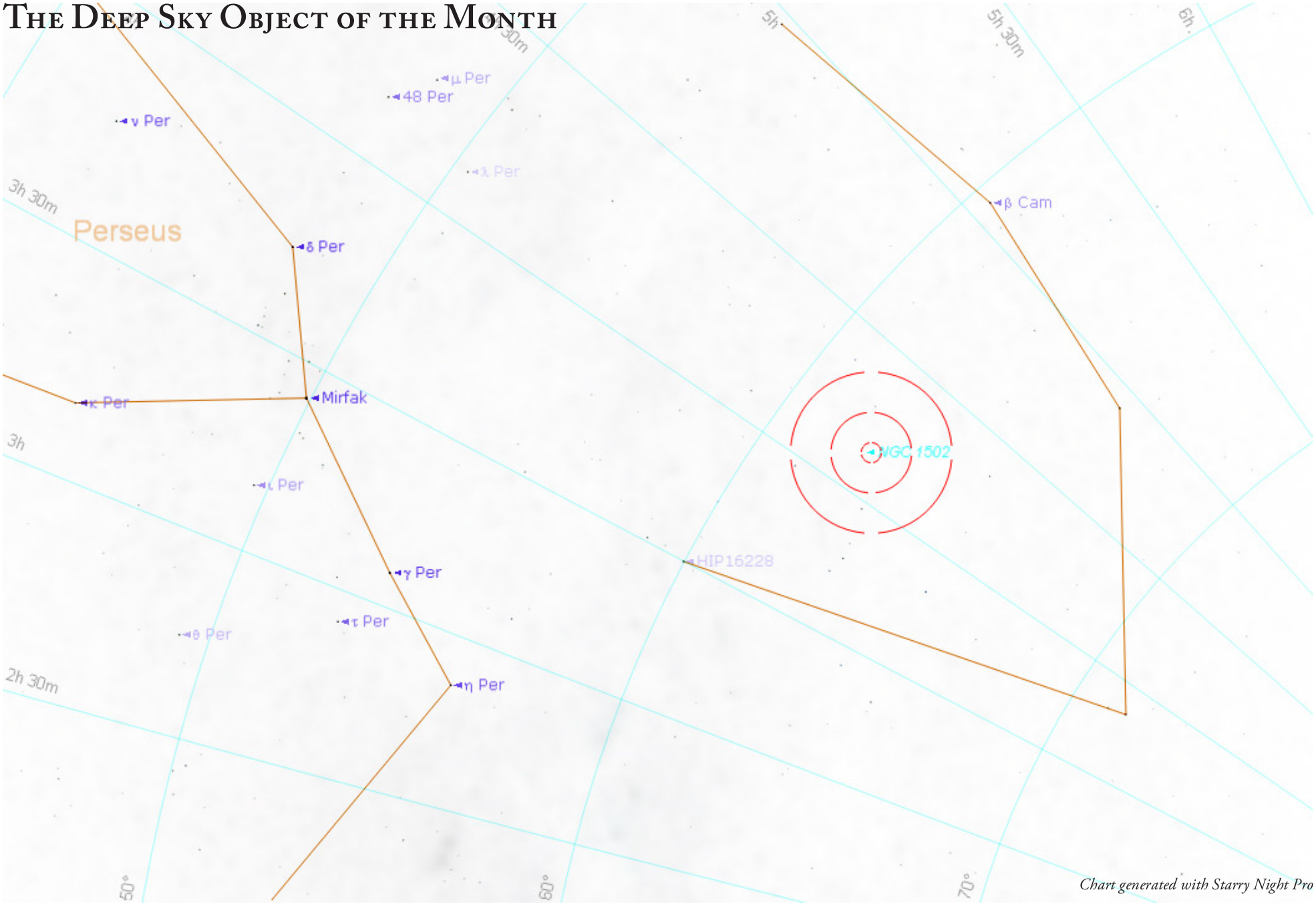


Chart generated with Starry Night Pro

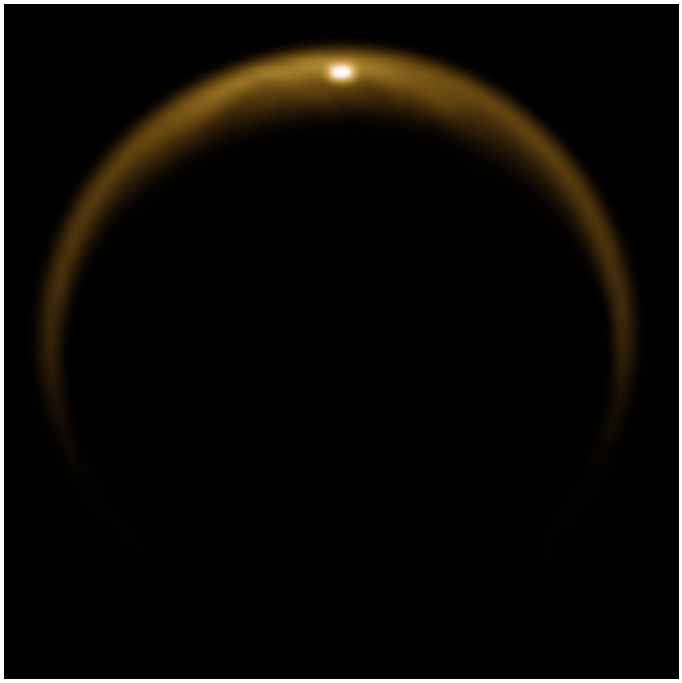
NGC 1502 (Collinder 45) Open Cluster in Camelopardalis

RA 04h 07m 50.0s DEC +62° 19' 54" Magnitude: 4.1 Size: 8.0'

A Flash of Light from Titan

NASA's Cassini spacecraft has photographed a flash of sunlight reflecting from a lake on Saturn's moon Titan, confirming the presence of liquid hydrocarbons on a part of the moon dotted with many lake-shaped basins.

Cassini scientists had been looking for the glint, also known as a specular reflection, since the spacecraft began orbiting Saturn in 2004. But until recently Titan's northern hemisphere, where most of the lakes are located, had been veiled in winter darkness. Now, however, the seasons are changing and sunlight has returned to the north, allowing Cassini to capture this serendipitous image:



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

The picture, which shows sunlight reflecting from the smooth surface of a liquid on July 8, 2009, was presented at the Fall meeting of the American Geophysical Union in San Francisco.

"This one image communicates so much about Titan -- a thick atmosphere, surface lakes and an otherworldliness," says Bob Pappalardo, Cassini project scientist, based at NASA's Jet Propulsion Laboratory. "It's an unsettling combination of strangeness yet similarity to Earth. This picture is one of Cassini's iconic images."

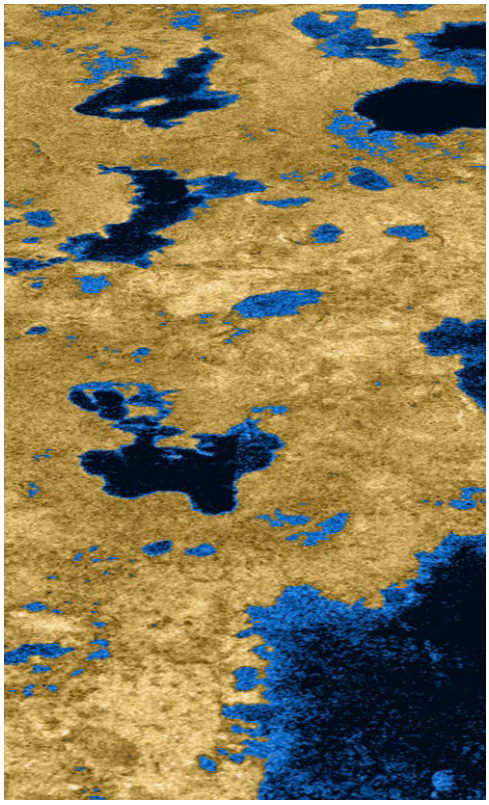
Titan, Saturn's largest moon, has captivated scientists because of its many similarities to Earth. Scientists have theorized for 20 years that Titan's cold surface hosts seas or lakes of liquid hydrocarbons, making it the only other planetary body besides Earth believed to have liquid on its surface. While data from Cassini have not indicated any vast seas, they have revealed what appeared to be large lakes near Titan's north and south poles.

In 2008, Cassini scientists using infrared data confirmed the presence of liquid in Ontario Lacus, the largest lake in Titan's southern hemisphere. But they were still looking for the smoking gun to confirm liquid in the northern hemisphere, where the basins are larger and more numerous.

Katrin Stephan, of the German Aerospace Center (DLR) in Berlin, an associate member of the Cassini visual and infrared mapping spectrometer team, was processing the initial image and was the first to see the glint on July 10, 2009.

"I was instantly excited because the glint reminded me of an image of our own planet taken from orbit around Earth, showing a reflection of sunlight on an ocean," Stephan said. "But we also had to do more work to make sure the glint we were seeing wasn't lightning or an erupting volcano."

Team members at the University of Arizona in Tucson processed the image further. They were able to pinpoint the reflection at the southern shoreline of a lake called Kraken Mare. The sprawling Kraken Mare covers about 400,000 square kilometers (150,000 square miles), an area larger than the Caspian Sea, the largest lake on Earth.



A false-color radar map of putative methane lakes in Titan's northern hemisphere. Credit: Cassini Radar Mapper, JPL, ESA, NASA

By comparing this new image to radar and near-infrared images acquired since 2006, scientists were able to show that the shoreline of Kraken Mare has been stable over the last three years and that Titan has an ongoing hydrological cycle that brings liquids to the surface. Of course, in this case, the liquid in the hydrological cycle is methane rather than water, as it is on Earth.

"These results remind us how unique Titan is in the solar system," says Ralf Jaumann, who leads the scientists at the DLR who work on Cassini. "They also show us that liquid has a universal power to shape geological surfaces in the same way, no matter what the liquid is."

Article edited by Dr. Tony Phillips, courtesy of Science@NASA.

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Keep Looking Up!

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