Saguaro Astronomy Club

# SACnews

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## Inside This Issue



# Data Analysis and Reality

## by Kurtis Williams, Professor Astronomy

As a scientist, I must always struggle to remember the difference between actual data and inferences based upon those data. This difference is often pretty clear. For example, if I take a picture of a star cluster, the actual data I've collected are counts of the number of photons arriving from different parts of the sky. I then infer that an excess of photons coming from a single point is a star, while an excess coming from an elongated smudge is likely a galaxy. My data are counts of photons, and my inferences are the nature of the object. Clear enough.

Sometimes the line is blurrier. For example, suppose I take a spectrum of the light from a star, where I split the light into its component colors. Typically, I see light from many colors of the rainbow, with perhaps a few specific colors missing (see some examples here). Those missing colors are due to individual elements, like hydrogen, helium, or oxygen, absorbing that light. Most often, that light is absorbed in the atmosphere of the star I'm looking at, and there are diagnostic tools that I can use that look at the lines and tell me the temperature of the star and how much of the given element exists in that star.

A few years ago, I wrote a paper on spectra of a group of white dwarf stars. I noticed that about one quarter of the white dwarf spectra showed the fingerprint of calcium. Calcium is an element that is very easy to see in stars, and it usually indicates the presence of many other elements, like iron and magnesium, that are not as easy to see. This is interesting, because the gravity of white dwarfs is so high that elements heavier than hydrogen and helium should sink out of sight below the stars' surfaces in a matter of years. Those white dwarfs with calcium and other heavier elements must therefore be swallowing this material from somewhere, and there's good reason to think that this material may be from asteroids or comets, the remains of solar systems around these dead stars. So, did 1/4 of my white dwarfs once have planets?

Sadly, the answer is no. I was seeing calcium, all right, but it wasn't in the star. It is probably mixed in with the interstellar gas that occupies the mostly (but not fully) empty space between the Earth and the white dwarf. In the meantime, I'd gone around proclaiming that the "data" showed there was calcium in the star. But my real data were just the number of photons of different colors of light, my spectra; the rest was just interpretation of what I was seeing. And my interpretation was not correct.

In the past couple of days, a couple of astronomy news stories have made the rounds that show that I'm not the only person who confuses data and interpretation. One story involves a cold spot in the Universe. The WMAP satellite has spent five years measuring the temperature of different parts of space using microwaves. Most of the Universe is about 3 degrees Kelvin, the "echo" of the Big Bang, but some parts are a little hotter and some a little cooler. Some of those hot and cool spots are relics of the earliest seeds of galaxies in the Universe, while others are caused by structures in space between us and the distant reaches of the Universe from

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NASA Space Place

# Staring at Lightning

There's something mesmerizing about watching a thunderstorm. You stare at the dark, dramatic clouds waiting for split-second bursts of brilliant light — intricate bolts of lightning spidering across the sky. Look away at the wrong time and (FLASH!) you miss it.

Lightning is much more than just a beautiful spectacle, though. It's a window into the heart of the storm, and it could even provide clues about climate change.

The strong vertical motions within a storm cloud help generate the electricity that powers lightning. These updrafts are caused when warm, moist air rises. Because warmth and lightning are inextricably connected, tracking long-term changes in lightning frequency could reveal the progress of climate change.

*The lightning mapper on the next generation of GOES satellites will detect extremely rapid transient bursts of light at near-infrared wavelengths.*

It's one of many reasons why scientists want to keep an unwavering eye on lightning. The best way to do that? With a satellite 35,800 km overhead.

At that altitude, satellites orbit at just the right speed to remain over one spot on the Earth's surface while the planet rotates around its axis — a "geostationary" orbit. NASA and NOAA scientists are working on an advanced lightning sensor called the Geostationary Lightning Mapper (GLM) that will fly onboard the next generation geostationary operational environmental satellite, called GOES-R, slated to launch around 2015.

"GLM will give us a constant, eye-in-the-sky view of lightning over a wide portion of the Earth," says Steven Goodman, NOAA chief scientist for GOES-R at NASA's Goddard Space Flight Center. Once GLM sensors are flying on GOES-R and its sister GOES-S, that view will extend 18,000 km from New Zealand, east across the Pacific Ocean, across the Americas, and to Africa's western coast.

With this hemisphere-scale view, scientists will gather an unprecedented amount of data on how lightning varies from place to place, year to year, and even decade to decade. Existing lightning sensors are either on the ground — which limits their geographic range — or on satellites that orbit much closer to Earth. These satellites circle the Earth every 90 minutes or so, quickly passing over any one area, which can leave some awkward gaps in the data.

Goodman explains: "Low-Earth orbit satellites observe a location such as Florida for only a minute at a time. Many of these storms occur in the late afternoon, and if the satellite's not overhead at that time, you're going to miss it."

GLM, on the other hand, won't miss a thing. Indeed, in just two weeks of observations, GLM is expected gather more data than NASA's two low-Earth orbiting research sensors did in 10+ years.

The new data will have many uses beyond understanding climate change. For example, wherever lightning flashes are abundant, scientists can warn aircraft pilots of strong turbulence. The data may also offer new insights into the evolution of storms and prompt improvements in severe weather forecasting. Staring at (FLASH!) Did you miss another one? The time has come for GLM.

Want to know how to build a weather satellite? Check the "how to" booklet at scijinks.gov/weather/technology/build_satellite.

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

NASA Space Place

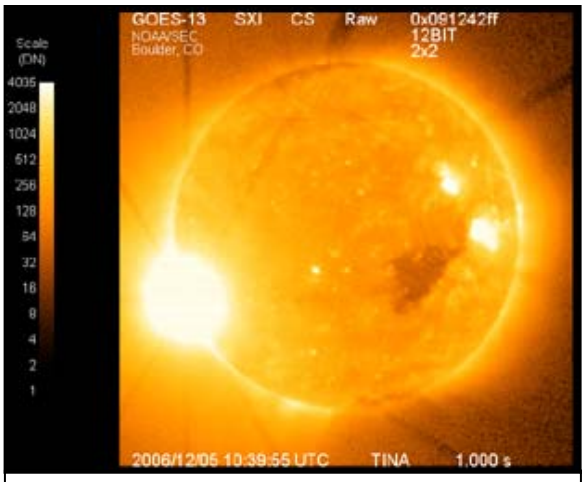
# Sunglasses for a Solar Observatory

## 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.*

# Call For Observations–Aquarius

By A.J. Crayon

Three years ago we did the first pass through Aquarius and now its time for another visit. Called the Water-Bearer or Cup-Bearer is one of the oldest recognized constellations. According to my horoscope I am an Aquarian and do like water. Its brighter stars appear like a man and including the fainter naked eye stars adds a bucket of $H_2O$.

Our first object is the barred spiral **NGC6962** and is the brightest of a 6 galaxy grouping within 30' of each other. They are all much fainter than the 12.1 mag of 6962 so don't worry if you can't detect them, but if you can just give us a count.
**12.5" f4.9 Newtonian, 175x**; Rick Rotramel: G - S, pF, brighter in middle, couldn't detect shape. Noted another faint oval galaxy in the same field.
**14.5" f5.2, Dob, 220X**; AJ Crayon: This one is faint, small a little elongated and has a brighter middle. It's 12th mag and 3'X2' is in an east of northeasterly position. It is the brightest of the 5 others in the field.
**18" f4.5, Dob, 460X**; Dan Gruber: This galaxy is elongated 3' X 2' E - W. The halo is dim, brightening to a core and a possible stellar nucleus (averted vision). There's another galaxy very close to the SE, perhaps NGC 6964. I saw another smaller and dimmer galaxy about 5' to the N (possibly NGC6959?).

Moving about 13° south is the beautiful globular cluster **M 72**.
**8" f10, SCT at 230X**; AJ Crayon: This is a very nice globular cluster of 9th mag, 5'; pretty faint, pretty large and a little brighter middle. There is a nice halo of stars around the edges with two 10th mag stars and many from 11th mag and fainter. The middle is partially resolved.
**12.5" f4.9 Newtonian, 100x**; Rick Rotramel: GC - pS, pB, vRich, fairly round, a bright group resolved in middle. Noted two bright field stars to the east. Very nice view.
**18" f4.5, Dob, 460X**; Dan Gruber: This globular cluster is dense, irregular, and roughly circular about 6' in diameter. I could resolve only about 15 stars, mostly in E - W rows across the disk. There are two mag 8 - 9 stars nearby to the E.

Then a short 1.4° east is next, **M 73**, with several 10th mag stars visible. Messier saw this as a nebulosity, but as we know there is none.
**8" f6, Newtonian, unspecified power**; AJ Crayon: there was no nebulosity, only 4 stars. I called it DULLSVILLE!
**12.5" f4.9 Newtonian, 100x**; Rick Rotramel: OC - S, fB, poor, group of 4 stars in a triangle shape.
**18" f4.5, Dob, 209X**; Dan Gruber: This Y-shaped asterism consists of 4 mag 9 or 10 stars. The Y is 2 or 3' in length and opens towards the NE.

Another galaxy waits us with **NGC7392**, which is towards the southern part of the constellation. It is another barred spiral of mag 11.9 that should show us some details.
**12.5" f4.9 Newtonian, 130x**; Rick Rotramel: G - pS, pF, oval, much brighter elongated in middle.
**14.5" f5.2 Dob at 220X**; AJ Crayon: This nice looking galaxy is 2'X1' in an easterly position and 12th mag. It has a suddenly brighter middle with a, possible, stellar nucleus. With averted vision it is bigger and brighter. There is a 13th mag star off the east side and one to the north.
**18" f4.5, Dob, 460X**; Dan Gruber: This is a faint, very elongated galaxy about 2' X 0.5' E - W, with a bright core. It's located along the base of a "squashed" triangle of mag 11 - 12 stars pointing N. This galaxy is isolated in a sparse field.

Our next selection is a bit different from what we have been observing. It is an asterism called the **DNA Strand** and is very large at 10°X3°. It includes the stars 86, 88, 89, 98, 99, 101, 104, 106, 107 and 108 Aquarii, naturally a naked eye object. Does it look like a twisted helix of pretty bright stars to you?
**Naked Eye,** Rick Rotramel: AST - L, fB, 10 x 3 degrees, three groups of three or four stars in a row with patterns opposing each other in a sequence of stars forming a pattern similar to a DNA strand. If one imagines alternate lines connecting the ends of each row of stars and

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squints, one could say it appears that way.

Moving to the northeast part of the constellation is **NGC7721** an Sc galaxy that is elongated about 3 to 1. Can you detect its brighter middle?
**12.5" f4.9 Newtonian, 130x**; Rick Rotramel: G - pS, pB, elongated, a little brighter in middle.
**18" f4.5, Dob, 329X**; Dan Gruber: A very faint galaxy elongated 3' X 1' N - S. The dim halo gradually brightens to an extended core. There are some bright areas in the core with averted vision, but I could not see a stellar nucleus. The surrounding field is virtually empty.

Our last selection is **NGC7723**, another galaxy what do you expect? This barred one is elongated and on the *Herschel 400* list. What details can you resolve in your scope?
**8" f6, Newtonian, 100X**; AJ Crayon: this galaxy is a little round, very faint and has a little brighter middle when using averted vision. The field has a 9th mag star 4' west and 10 others from 8th mag to 12th mag.
**16" f4.4 Newtonian**, Rick Rotramel: G - fS, pF, and low surface brightness, brighter in middle.
**18" f4.5, Dob, 460X**, Dan Gruber: This galaxy is slightly elongated 3' X 2' NE - SW. The dim halo gradually brightens to an extended core with a stellar nucleus. There are several bright spots in the core with averted vision.

## Call for Observations

I got a request to do some southern constellations, so with that in mind here's a heads up for Sculptor and its galaxies. Enjoy staying up late to get the following observations. Beginning in the north central part is the first, **NGC 24**, an 11.6 mag nearly edge-on normal spiral. Moving about 8° south is **NGC 134**, another nearly edge-on barred spiral. There are some 10th mag stars in the field of view. About 1.5° northeast is **NGC 148** that is rather faint and has a spindle shape. Coming up is the large S-shaped loose structured spiral **NGC 300**. It is 19'X13'. How much detail can you see in its middle? Moving on to **NGC7513**, another barred spiral but with some peculiarities. Can you detect any peculiarity in your scope? Finally, something we don't normally see is **IC 5332**. It is pretty bright for an IC galaxy, at mag 10.5, but is large at 8'X8', so beware for a low surface brightness. The SAC database reports it being between a double star. Can you identify this for us?

OK, you asked for it and you will get another southerly constellation – Fornax. If you haven't been here before you will be in for a treat. This area is called the *Fornax Galaxy Cluster* and it is chocked full of bright, interesting galaxies. We will go to *only* location and see 8 galaxies in a one-degree field with magnitudes 9.6 down to 11.5. Yes, at least 8 galaxies, one degree! Star hop, or dial up, NGC1381 and center up RA 03 37.0 Dec –35° 19' a short 7' to the southeast. We will discuss this one field of view from west to east Be sure to jack up the power on each of these treats to what kind of additional detail waits. The first is magnitude 11.1, **NGC1374** that is a little elongated and has a little brighter middle. Next is **NGC1379** a magnitude 10.5 elliptical galaxy that is, basically, round. Now slew 28' north to **NGC1380** a nice sized, bright, barred galaxy. Can you detect any trace of the bar? To get to **NGC1381** slew 19' south. This is a small faint, magnitude 11.5 galaxy. **NGC1387** carries us south of southeast. It is another, fairly small, bright, spiral. Moving to the most southerly galaxy is **NGC1389**, yes it is in Eridanus but well worth the trip. Isn't it? Now we are getting to the eastern part of the basic field of view with **NGC1399**. This magnitude 9.6 elliptical is just a tad elongated and pretty bright. How much of this gem can you resolve? Finally, just to the southeast is **NGC1404**, another elliptical that is a little fainter than the prior one, but has a slightly higher surface brightness. Now don't expect the galaxies to appear as bright as the magnitudes indicate because they will be low on the southern horizon. Yes you may see more galaxies and not just in this field of view but if you take some time to pan around or study the field on a star chart there will be numerous bright galaxies to be seen. Oh yes, we will wait and do the planetary nebula and the Fornax Dwarf another time.

# Call For Observations–Sculptor

## By A.J. Crayon

The constellation Sculptor got its name from Nicolas Louis de Lacaille who, originally, named it Apparatus Sculptoris for the sculptor's studio. Naturally this latter name didn't stick around. We all know this as a rather small and southerly constellation, which makes it suitable for observations for only a short time at night. SAC observers, again, took advantage of this and made another excellent observing report. Certainly you will notice there were only two sizes of telescopes used for these observations; perhaps a sign of popular sizes?

The first of the galaxies was **NGC 24**, an 11.6 mag nearly edge-on normal spiral. Seems we didn't notice the brighter middle.
**8" f6, Newtonian, 60X**; Charlie Whiting: detected this object with direct vision. At **150X** this galaxy is very elongated. It is likely called a spindle. In my scope it looked to be about 3' or 4' long by 1' wide; maybe slightly more. There's a 14th mag star just outside its northern point. The galaxy is aligned a little north of northeast. It appeared almost uniform in brightness overall. It diminished very gradually at the sides and points. No central condensation.
**8" f6, Dobsonian, 61X**; Rick Tejera: Seen as bright and elongated about 3-1 in PA E-W Rather uniform in brightness throughout. Averted vision needed to hold. Possible hint of a core during moments of steady seeing.
**14.5" f4.8, Dobsonian, 66X and 138X**; Paul Lind: Somewhat faint, small, very elongated spindle, not bright in middle. Just off a triangle of stars.

The second galaxy was **NGC 134**, another nearly edge-on barred spiral. There are some 10th mag stars in the field of view. Great job spotting the bar!
**8" f6, Newtonian, 60X**; Charlie Whiting: galaxy was detected without much difficulty. At **150X** It appeared elongated. Its visible length was about 3' and its width was about 1', maybe slightly more. It was aligned to the northeast. It had a brighter area in the middle. Gradually diminishing towards the points. It appeared a little thicker on its southeast side. There's a group of stars off its southwest point that form a bright square with a dimmer star in the center.
**8" f6, Dobsonian, 61X**; Rick Tejera: Seen as large & bright, slightly elongated about 2-1 NE-SW. The bar is evident running the length of the galaxy. The halo extends further to the South. There is an interesting ""Crux"" like asterism to the SW.
**14.5" f4.8, Dobsonian, 66X and 138X**; Paul Lind: a little bright, considerable elong., little brighter in middle, larger and brighter than NGC24, nearby is nice square of stars with middle, or central star.

**NGC 148**, next on the list, is rather faint has a spindle shape with a brighter middle. Its faint magnitude made detecting some detail somewhat difficult.
**8" f6, Newtonian, 60X**; Charlie Whiting: this object was visible as a star-like. At **150X** the galaxy was seen as very small and circular in shape. Its visible diameter was only about 10" to 20". The central area was much brighter than the halo. The brightness drops off quickly to the outside. To the northeast there's a 9.8 mag star. It marks the peak of the roof of a simple house figure which includes the galaxy at the base.
**8" f6, Dobsonian, 61X**; Rick Tejera: Seen with averted vision only. Saw it as barely visible and round. Did not see the Spindle shape. The seeing at the time was not that great, so this will go on the re-observe under better conditions list. It's be nice if the ""Better conditions"" meant somewhere in the southern hemisphere.
**14.5" f4.8, Dobsonian, 66X and 138X**; Paul Lind: Very Small, very Faint, elongated, hard to locate.

The large spiral **NGC 300** brought some interesting observing notes. Check them out and see what you think.
**8" f6, Newtonian, 60X**; Charlie Whiting: this is a very large galaxy and its low surface brightness makes it almost impossible to see. It is therefore a very very faint object. Only after staring at it for a long time did I just barely detect some of its ghostly nebulosity in the area near the 9.6 mag star superimposed almost at the center of the galaxy.
**8" f6, Dobsonian, 61X**; Rick Tejera: Seen as large & bright but with low surface brightness. Very slightly elongated. Could see three foreground stars superimposed on the galaxy. Slightly brighter to the north. There was some irregular fading to the east seen with averted vision that possibly could have been one of the spiral arms The western side was brighter and I drew what looked like a curved arc, although I think that was the pencil working on it's own.
**14.5" f4.8, Dobsonian, 66X and 138X**; Paul Lind: Quite low. Very Large, Considerably Faint. Could not see detail.

The next galaxy, **NGC7513** is listed with peculiarities, which no one was able to see or report on. Detail was also difficult to come by.
**8" f6, Newtonian, 60X**; Charlie Whiting: just barely detected the object with averted vision. At **150X** in brief moments I could detect the galaxy with direct vision. With averted vision I could see it better but only for a couple of seconds at a time. The visible size to me was about 1' x 0.5'. Its alignment is east south east. The central area is

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non-stellar, extended, and brighter than the halo. Some 13th and 14th mag stars could be seen to the north north east. An 8th mag star and its 10th mag companion could be seen east of due south. While I was "in the neighborhood" I meandered about 18' to the southwest to see NGC 7507. This galaxy was easily visible with direct vision, but averted vision showed it off better. Its visible diameter in my scope was about 1'. It appeared circular and splashy. Much brighter center, non-stellar. Textured halo. Worth the stopover!

**8" f6, Dobsonian, 61X**; Rick Tejera: Was able to match the field, but try as I might I could not say with any certainty that I could see this object. Also noted that NGC 7507 should have been in the field but could not see that either.

**14.5" f4.8, Dobsonian, 66X, 138X and 240X**; Paul Lind: Very Small, Considerably Bright, little Extended, much brighter in middle, possible N-S orientation, no detail.

I don't know why but this galaxy, **IC 5332,** appears twice in the SAC database. Ah, finally someone identified the double star in the same field. Thanks Charlie!

**8" f6, Newtonian, 150X**; Charlie Whiting: this galaxy lies between a pair of 10th and 11th mag stars on its west edge and a 13th mag star on its east edge. With averted vision I could just barely detect its presence. For only a second at a time I glimpsed a very faint, almost stellar core. The halo appeared only as a ghost that vanished as soon as it appeared. There's a 7.3 mag double star, SEE 489, to the south south west. I was not able to make out its duplicity.

**8" f6, Dobsonian, 61X**; Rick Tejera: Seen with averted vision as a slightly elongated smudge slightly north east of a pair of bright stars the bar seemed to come and go with the seeing. Not much else noted.

**14.5" f4.8, Dobsonian, 138X**; Paul Lind: very Faint, considerably Large and not brighter in middle.

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OK, after having done a couple of southerly constellations, it is time to get back to a northern one, and that one is **Triangulum**. So, for January 2010, we will leave the show piece for another time and will start with a selection of 5 galaxies and one open cluster. Beginning in the southwester part, near the Pisces border will be the elongated barred spiral **NGC 672**, which is listed as a coarse spiral. What does that mean to you? In the same 30' field is the fainter IC 1727 which is also elongated at about 90°. From this galaxy pair move about 40' to the southeast to the sole open cluster **Cr 21** containing about 15 or 20 stars with the brightest being about 8th mag. Beware the coordinates may be a little off, about 15', so you may have to pan around a little to find this, rather poor, grouping of stars. Now, moving much more to the north is the elliptical galaxy **NGC 750**. This galaxy is paired with NGC 750, they could, easily, be in contact with one another. Swing south, into the triangular part, is another elliptical, **NGC 777** along with its much fainter buddy NGC 778. Moving more to the south, almost near where we started, is the 12th mag barred spiral **NGC 784**. Quite elongated, don't you think? Moving to the very eastern part is the last of the selections, **NGC 1060**, which is said to be in the same position as NGC 1062 – watch that when you use your digital setting circles. At nearly 12th mag it should be rather faint but you should be able to detect the slightly brighter middle. While making this observation look for other field stars and galaxies. For the elliptical galaxies in this list estimate the ellipticy, that is assign the number that best describes its elongation. The number ranges from 0 for round to 7 for very elongated. No fair peeking before you observe but you should check afterwards to see how close you came with your estimates.

# President's Corner

## By Dick Harshaw


May I use this month's column as a forum for a "state of the club" speech?

As my term as the president draws to a close, I look forward to serving you next year (assuming the vote at the next general meeting exiles me to this post for a second term). I look forward also to working with four new board members (Veep, Secretary, Treasurer and Properties Manager). We have three volunteers for next year (and hopefully someone will step up to the Treasurer slot and we'll elect our slate of officers for 2010 at the second October meeting (October 30).

It has been a quiet year at Lake Wobegon / The Sonoran Desert. We had a worse monsoon than normal (in terms of heat and cruddy skies), but we did have an outstanding late winter / early spring, and this autumn is shaping up nicely for good skies too. A number of us have enjoyed observing together at our favorite sites, scooping up ancient photons like seashells on a distant shore. (Or, like Mr. Goss, scooping up ancient galactic poops with his 14-inch pooper scooper.)

The Grand Canyon Star Party-North Rim was a big success despite poor skies most nights, as we made friends with people from all over the world and found new public-minded amateur astronomers to connect with and kindle what will be life-long friendships. (I am already eagerly awaiting next June's event, scheduled for the 5th through 12th.) Steve Dodder has done an amazing job coordinating this great outreach event.

The International Year of Astronomy monthly events at the Arizona Science Center have been a great success. SAC has been exposed to over 16,000 guests this year, and the club owes a standing ovation to Gene Lucas, Chico Romero, Dave Frederickson, Walt and Becky Thomas, Steve Dodder, Chris Hanrahan, and others who have helped out, greeting people and talking about what stirs our hearts in the night sky.

The Messier Marathon was a big hit (even though I personally missed it), and A J Crayon and Rick Tejera did another starship trooper job. (As you may know, AJ will be stepping down in two years from this major task, but he has an able understudy, Rick Tejera, to take over.

The club's treasury is in good health right now thanks to the 50/50 raffles and with the dues increase slated to take place 1/1/10, we will be on solid financial ground for years to come. By the way, if you renew your 2010 dues before 12/31/09, you can renew at the current rates and beat the dues increase. Hint, hint.

Finally, the annual Holiday Party will be hosted by my wife, Loretta, and I on Saturday, December 5. We live at 4625 East Brilliant Sky Drive in Cave Creek, AZ. That's a long haul for you south-valley folks, but pack two days' worth of food and water in your car and you should be fine. We live in a gated community, so at the Oct 30 meeting (and by email to the SAC email servers) I will be giving maps and gate code information. The club will provide drinks, paper plates, cutlery, and napkins. Each party goer is asked to bring something to eat—your favorite party food, chips/dips, cocktail wieners, cakes, pies, cookies, candies… oh, I'd better stop. I'm getting hungry! And, weather permitting, I'll have Brilliant Sky Observatory open for those who want to check it out. (We have pretty dark skies up here for being only 30 miles from the airport!)

So, see you at the next General Meeting. Until then, clear skies, great seeing, and fully-dilated pupils to you!

# Sentinel-Schwaar Star Gaze

In a bout of nostalgia, Chris Hanrahan made a case that we change the Location of the November DOTM Star Party to Sentinel vs. the Antennas. He cited the past history of Sentinel and the contributions that Pierre Schwaar made to the club.

After some mild debate, it was decided that we really should continue the tradition.

The turnout was good with about 8 Folks on Friday and 20 folks showing up on Saturday. The nights were clear and many of us worked the southern constellation for AJ's Column.

A few of us took a side trip on Saturday morning to the Painted Rocks Petroglyph site about a 20 minute drive away.

It turned out to be a good way to close out the year.

# January 2010

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| | | | | | 1 | 2 |
| 3 | 4 | 5 | 6 | 7 ☾ | 8 | 9 SAC Star Party at Saddle Mtn. |
| 10 | 11 | 12 | 13 | 14 | 15 ● | 16 DOTM Star Party @ Antennas |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 ☽ |
| 24 | 25 | 26 ATM Meeting 1930, Paul Lind's House | 27 | 28 | 29 ○ SAC Meeting, GCU 1930 | 30 |
| 31 | | | | | | |

## Schedule of Events for January 2010

| | |
|---|---|
| Jan. 7th | Moon at last Quarter at 0339 mst.. |
| Jan, 9th | SAC Star Party at Saddle Mountain: Sunset 1742 Ast. Twilight 1918, Moonset 1923, Ast. Twilight Begins 0611, 10 Hrs, 48 min of Dark time |
| Jan. 15th | Moon is new at 0111mst. |
| Jan. 16th | DOTM Star Party at Antennas: Sunset 1750, Ast. Twilight Ends 1857, Ast. Twilight Begins 0538, 10 Hrs 41 Min of Dark time. |
| Jan. 23rd | Moon at First Quarter at 0352mst. |
| Jan. 26th | ATM/Astro-imaging Subgroup meeting at Paul Lind's garage |
| Jan. 29th | SAC General Meeting at grand Canyon University at 1900 |

## Future Planning

| | |
|---|---|
| March 13th | 2010 All Arizona Messier Marathon |

*(Continued from page 1)*
whence these microwaves came. If the microwaves travel through a bit of space that has more matter than average, they tend to heat up a bit. If the microwaves travel through an empty part of space, they tend to cool off a bit. The technical term for this is the *Integrated Sachs-Wolfe Effect*.

So, WMAP measured the temperature of each part of the sky. In one part of the southern hemisphere sky, there is a cool spot. Initial indications were that this spot was much cooler than any spot we would expect in the Universe. In fact, to get a spot this cool would require an absolutely humongous empty void of space, a void so large that the Big Bang theory says shouldn't be possible. Had astronomers discovered evidence of a problem with the Big Bang theory? Over the past five years, at least 125 papers have been written that talk about this cold spot. Some just mention it, but many do detailed studies of its shape, temperature, and how it means that exotic physics, like cosmic membranes or superstrings or "textures" or "domain walls" or even portals to other Universes exist at that point in the Universe.

However, there are some people who claim this cold spot is not real. A new paper by Ray Zhang and Dragan Huterer, physicists at the University of Michigan, claims that the spot is, in fact, an artifact of the way the data were analyzed. WMAP indeed found a cold spot in the Universe, but that doesn't mean that the cold spot is a giant void. The huge void is an interpretation of the data when the data are analyzed in a certain way. Analyzed another way, the cold spot could just be a normal-sized void, of which there are many in the Universe, and all of which are expected by the Big Bang theory. I don't think that this paper is the final word; we observational astronomers just need to go and look at the cold spot with other wavelengths of light and see if there's anything there. That will settle the issue. But, again, before we go tossing the Big Bang theory and searching for cosmic textures, perhaps we need to remember what is data (a cold spot in the microwave sky) and what is inference (superhuge voids).

The other story making the rounds where data and inference are being confused by some is yesterday's announcement that European astronomers had determined that one planet around another star, CoRoT-7b, is the first rocky planet found outside our own Solar System.

First, let's look at what we know for certain (or at least can infer with a high degree of certainty). The parent star, with the horrible name of TYC 4799-1733-1, is a pretty normal star. Last year, a satellite called CoRoT was observing this star, and saw the star dim slightly every 20.4 hours. This dimming is consistent with a planet that has twice the diameter of the Earth orbiting the star once every 20.4 hours! (For comparison, the Earth goes around the sun once every 365 days, and the hot little planet Mercury goes around the sun once every 88 days.) Such a planet is very, very close to its parent star, would be blasted by the star's light, and would be a horrible place to visit.

Since its discovery, scientists have been measuring the spectrum of the parent star with a very sensitive spectrograph at the European Southern Observatory in Chile. The spectrum shows that the star is moving back and forth very slightly every 20.4 hours, indicating that the star is being pulled ever so slightly by the planet's gravity. The astronomers have made an amazingly precise measurement, finding that the star moves back and forth at a speed of 12 kilometers an hour ( 7.5 miles per hour). I can run faster than this star moves, and yet we humans can measure that speed from 500 light years away. Just amazing.

Anyway, from that motion, we can use Newton's theory of gravity to calculate the mass of the planet, and it is about 5 times the mass of the Earth. And, since we know the planet's mass, and since we know its diameter, we can calculate its average density. That density is 5.8 grams per cubic centimeter, almost exactly the same as the Earth.

Let's review: the data we have are the number of photons from the parent star we detect on Earth over time, and the spectra of the star taken over time. Very careful data analysis allows us to infer (though with a very high degree of confidence) that the periodic dimming of the star is caused by a planet with a diameter twice that of the Earth, that the star is moving in response to the planet's gravity, that the planet must be five times the mass of the Earth, and that the planet's average density is similar to that of the Earth.

Next, the astronomers claim that this means that the planet must be made out of rocky material, just like the Earth. I think this is probably right, but it isn't as certain. We don't have pictures of the planet, showing that it is made out of rock. It is possible to dream up weird mixes of materials such as iron, rock, water, and/or gases that could give you a planet with the same diameter and mass as CoRoT-7b, but these are pretty contrived. In our Solar System, all the planets with density similar to that of the Earth all are made out of rocks. And, when we look at newly-forming planetary systems, we see signatures of rocks and rock-like dust. So, it seems very likely that CoRoT-7b is made out of rock. But this is not a proven fact; it's a supposition, an inference. We don't know for certain that this planet is made out of rock; that is just the most reasonable explanation we can think of right now.

Further, many of the news stories (notably *not* the original press release) imply that this means that the planet is solid, or has a solid surface. Again, the planet may well be solid. But we really have no clue. The part of the

*(Continued on page 11)*

# Giving Thanks to SAC

## By Steve Coe

I would like to take a moment to give thanks for SAC. I made it to 60 years old this year and I have been a SAC member for 30 of those years and have enjoyed those years very much. November is the month of Thanksgiving and so I am motivated to thank SAC members for continuing to create a lively and fun group for observers of the sky.

I spent a week at the Antennas site in October and observed and photographed the sky. I was joined by several club members and I enjoyed chatting with them and exchanging observations in our telescopes as the stars moved overhead. We took some break time and told stories about everything from eyepieces, filters, new astronomy software and even science fiction movies on DVD. It was all good. It served to remind me that I am a member of the best astronomy club in this arm of the galaxy--but, I am prejudiced.

There have been many fun and memorable times with the members of this club. The eclipse cruise and all the fun we had capped by a beautiful solar eclipse near Aruba. Traveling to see the Very Large Array in New Mexico, the MMT south of Tucson and several trips to Kitt Peak. Going to Australia with David Fredericksen and Chris Schuur to observe Halley's Comet and all that southern sky splendor.

As far as observing goes, we have several decades of viewing the stars together. From Buckeye Hills, Dugas Road, Cherry Road, Fessler's Ranch, Sentinel, Antennas and 5 Mile Meadow we have consistently had a large percentage of the club members show up, set up a wide variety of telescopes and let the fun begin.

We have had a group of astronomical computer users who have helped to create and maintain an excellent list of objects to view. These lists include: deep sky objects, lunar features, double stars, red stars, urban objects and asterisms. They are all available for free at www.saguaroastro.org.

The Amateur Telescope Makers Group has been active at all levels of telescope making from building entire telescopes to helping with accessories. I have often shown up with a problem and had someone else in the group offer a solution. I have seen several ATM group members jump in and help someone for hours to get their set up working in top condition.

Did I mention the meetings? We often get interesting speakers who come from a variety of disciplines. Listening to Rik Hill, Father George Coyne, David Bernstein and many others is fascinating and inspirational. And...we have time to discuss it all at JB's restaurant.

I have thought about the club members who are not with us anymore. Pierre Schwaar, Curt Taylor, Wally Brown, Bob Gardner and others I can't recall are observing the stars from the other side. Because we will all certainly join that group someday, we need to get out and enjoy the sky as much as we can now. The stars are not immortal, why should we think that we are going to live forever?

And so, I would like to thank those of you who have participated in the Saguaro Astronomy Club over the years. May this only be a great beginning.

*(Continued from page 10)*

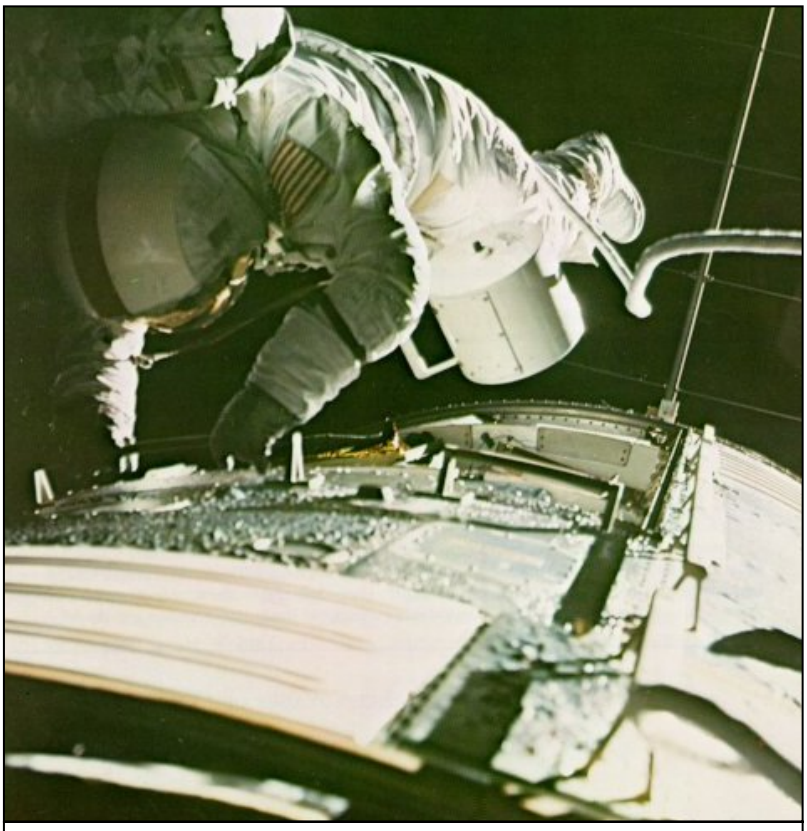
planet that faces its parent star could be as hot as 2000 degrees Celsius (3600 degrees Fahrenheit) -- hot enough that Earth-like rocks would be molten. The back side of the planet could be cold enough for water ice to form. Could there be a planet with a surface that is half lava, half ice? Or the planet could have some sort of thick atmosphere that gets denser until it just sort of merges into a solid or liquid state, though it is hard to imagine how a planet could hold on to an atmosphere at those temperatures. *We don't know. We don't really have a clue.* We just have educated guesses of what sort of surface such a planet could have.

So, again, let's remember to separate what we know (a planet about twice the diameter of the Earth, five times the mass of the Earth, and a density similar to that of the Earth) from that which we can only infer very indirectly, such as what the planet may be made out of and what its surface may be like. As we find more and more Earth-sized planets (and I am confident that we will find Earth-sized planets very soon), and as we find Earth-sized planets in orbits far enough from their parent star to be similar to Earth's orbit, we have to remember that we will know very little about what those planets are actually like. Do they have atmospheres? Do they have liquid water? Do they have life? Answers to those questions are likely still a decade or more away. In the next few years, all we will know are the diameters and masses of any Earth-sized planets. The rest will come. But we'll need real data, not inferences.

# Monthly Trivia Question

This month's question: What was a "Tindallgram"?

Last Month's Answer: What is a CIS-Lunar EVA and who are the three men who did this? (Hint: Think back to the last time Brent Archinal Spoke at a SAC Meeting).



Ron Evans performs his CIS-Lunar EVA during the Trans-Earth Coast on Apollo 17. Note the hand holds Installed on the SM to aid him in getting around. The mast in the background is for the Gamma Ray Spectrometer.

Al Worden, Ken Mattingly and Ron Evans share the distinction of being the only three men to have performed a CIS-Lunar EVA, or more commonly know as a Deep Space EVA. These EVA's were conducted on the return trip from the moon on Apollo's 15-17. The three astronauts were the Command Module Pilots. The reason for the EVA was to retrieve film cassettes from the scientific instruments located I the SIM (Scientific Instrument Module) Bay of the service module. The final three moon missions were known as the "J" Missions and were dedicated to extracting the most science possible. The Spacecraft were modified for longer lunar stays and various instruments & experiments were added to the mission, to be run by the CMP in lunar orbit while his crewmate explored the surface. The crews stayed in lunar orbit for a an extra day after the LM returned to gather as much data as possible.

Now since the Service module was doomed to be jettisons prior to reentry, someone had t go out there to get the film. This was tasked to the CMP. During the EVA he as tethered to the Command Module and got his oxygen through an umbilical fed from the spacecraft. He carried one of the emergency oxygen packs that was brought back The Mission Co from the moon as a back up. The Commander stood in the hatch after egress to take the canisters and stow them. During the EVA the Spacecrafts thrusters were disabled to avoid the possibility of them firing while the CMP was outside. Thus by the end of the EVA the spacecraft was usually in a much different attitude from when the EVA started, due to the motions of the CMP. A classic demonstration of Newton's third law!

# Such-A-Deal

"For sale-Vintage 1956 Coast Treckerscope 10" F/7 on hand-made German equatorial mount. Original fiberglass tube, mount, slow-motion control cable, finder scope and pedestal. New, low profile JMI focuser, tube rotation system and wheeled dolly for easy transport. Drive needs work. Tube and rotation system 80% complete refurbish. Worth several thousand dollars. Price: $1000. Must sell. Lost another job." Contact Steve Dodder at: fester00@hotmail.com

# Bits & Pisces, Minutes of the Oct. 2nd, 2009 General Meeting

## by AJ Crayon, Secretary

President Harshaw opened the meeting and asked for first time attendees. Two folks came forward. There were 43 people in attendance.

The treasurer's report was delivered by Dick Harshaw and was supplied by Charlie Whiting. We had $4100 in bank.

With elections coming up the following have accepted the following nominations –

- President – Dick Harshaw
- Vice Pres – Tom Polakis
- Treasurer - open
- Secretary – Paul Dickson
- Properties – Lynn Blackburn

A ballot for field trip next year was passed around, trips selected and turned in. We will hear results at next meeting.

Gene Lucas discussed the Pacific Astronomy and Telescope Show and came with several boxes of astronomy type magazines to distribute.

Walt Thomas discussed the Galileo telescope, an exact replica of the 1609 instrument used by Galilei Galileo, which come with 2 eyepieces. He also discussed an online astronomy program called the Class Room Astronomer, to help get them involved in the International Year of Astronomy.

The Christmas party may be scheduled to be held at Dick Harshaw's house although plans to have it at the Arizona Science Center may come to fruition before hand. Stay tuned for the latest update.

After the break it turned out that our featured speaker for the night was a no-show. So we chatted for a little while then made an early exit for JB's for more chatting.

# Bits & Pisces, Minutes of the Oct. 30th, 2009 General Meeting

## by AJ Crayon, Secretary

As the meeting began there were 38 folks in attendance.

The first order of business was the nomination and election of the board for 2010. The following were nominated, voted on and accepted.

President – Dick Harshaw
Vice-President – Tom Polakis
Treasurer – David Fredericksen
Secretary – Paul Dickson
Properties – Lynn Blackburn

Thanks to them for volunteering their time and energy.

Next order of business was an amendment to the Constitution of a contradictory statement. After its reading there was no discussion. A motion to vote was accepted and it was passed.

Charlie Whiting, out going treasurer, reported we had $4334.00 cash-on-hand and in the bank. Members were urged to pay the 2010 dues before the end of the year in order to avoid the rate hike.

The voting on a field trip was announced and the winner is the Large Binocular Telescope. It will take place on a Saturday, some time in the spring or summer of 2010. Cost is expected to be in the neighborhood of $40.00 for transportation.

The Holiday Party will be held (was as of this writing) at the Harshaw Residence. It was well attended, there was lots of great food (what did you expect from astronomers?). Thanks to the Harshaw's for putting up with us.

Steve Coe started the Show and Tell with a slide presentation of his Nevada, Washington and Oregon vacation that did include several star parties.

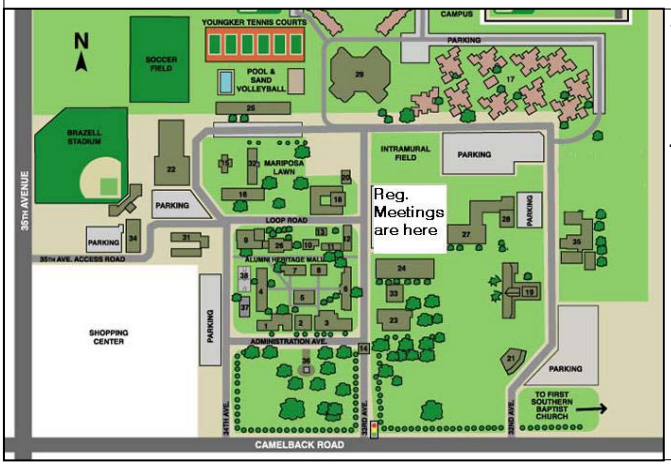
Steve Dodder worked the 50/50 raffle and the Grand Canyon Star Party – North Rim. The star party is quickly filling up and some may have to be turned down because of space limitations.

Gene Lucas discussed IYA 2009 and the activities at the Arizona Science Center.

After the break Dr. Evan Scannapieco, from ASU, was our speaker for the evening.

# SAC Member Services

## General Meetings




7:30 p.m. at Grand Canyon University, Fleming Building, Room 105: 1 mile west of I-17 on Camelback Rd., North on 33rd Ave., Second building on the right.

## Saddle Mountain Star Parties


After a test run last year, this new location near Saddle Mountain got pretty good reviews for a close in observing site. It is 55 Miles from the Loop 101/I-10 Intersection and just about 1 hour from there.

Based on this, we will hold our regular star parties on 3rd quarter moon here.

The GPS coordinates are:

N33 21.465 W113 02.323

Elevation: 1030'

| Direction | Leg Dist. | Total Dist. | Leg time | Total Time |
|---|---|---|---|---|
| From the loop 101 & I-10, head west | 0 ft | 0 ft | 0:00:00 | 0:00:00 |
| Take exit 98 to the right onto Wintersburg Rd | 34.3 mi | 34.3 mi | 0:27:08 | 0:27:08 |
| Turn left onto N Wintersburg Rd | 0.5 mi | 34.9 mi | 0:00:42 | 0:27:50 |
| Turn right onto W Elliot Rd | 9.6 mi | 44.5 mi | 0:09:23 | 0:37:13 |
| Turn right onto S 435th Ave | 6.1 mi | 50.6 mi | 0:06:47 | 0:44:00 |
| Turn left onto S Worley Dr | 4.0 mi | 54.6 mi | 0:05:26 | 0:49:26 |
| Saddle Mountain Observing Site | 0.4 mi | 55.0 mi | 0:01:14 | 0:50:40 |

# SAC Membership Services

**Membership**– Memberships are for the calendar year and are pro-rated for new members as follows: Jan– Mar: 100%; Apr– Jun: 75%; Jul-Sep: 50%; Oct-Dec; 25%.

- ☐ $32.00 Individual Membership
- ☐ $48.00 Family Membership
- ☐ $14.00 Newsletter Only
- ☐ $10.50 Nametag for members, Pinned Clasp
- ☐ $12.50 Nametag for members, Magnetic Clasp (will be mailed to address below)

## Magazine Subscription Services

The following magazines are available at a discount to club members. Check the magazines you wish to subscribe to or renew, and pay the club treasurer. Please allow 3-4 months for the order to be processed.

- ☐ Sky & Telescope $33.00/yr
- ☐ Astronomy $34.00/yr
- ☐ Astronomy $60.00 for 2 Years

Please Print

**Make Check Payable to : SAC**

Name:_____

Address:_____

City:_____ St:_____ Zip:_____

Phone:_____

E-Mail:_____

**Bring completed form to a meeting or mail it with your remittance to:**

SAC Treasurer
c/o Charlie Whiting
4526 W Purdue Ave
Glendale, AZ 85302

☐ **Check here if this is an update of information already on file.**

## SAC on the Internet

**SAC has several E-mail mailing lists. To subscribe, send an email to the email address and put Subscribe in the subject box.**

**SAC-Announce@freelists.org**: SAC-Announce is a mailing list for just club announcements, Typically 3-5 messages per month.

**SAC-Forum@freelists.org**: SAC-Forum is a general discussion mailing list. Topics should be related to Astronomy or SAC

**SAC-Board@freelists.org**: SAC-Board is a mailing list for discussions of club business. If you'd like to see how the club is run (or not run), or have a question about the club, this is the list to read. Typically month to month matters are discussed.

**AZ-Observing@freelists.org:** AZ-Observing while not a SAC list , is well attended by SAC members. This is the list to with observing places around Arizona. Find out where people are going and what they saw.

## Printed Newsletter

SAC can save a lot of money if you download the PDF version of the newsletter. PDF files are readable by both PC's and Macs. When the newsletter is published, a message will be sent to the address indicated above with the URL of the newsletter. Check the box below if you don't have access to the internet or if your prefer a printed copy.

☐ **Please send me a hard Copy of the newsletter**

# SAGUARO ASTRONOMY CLUB

4th Quarter 2009

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Glendale, AZ 85308-9117

Phone: 623-572-0713
Email: newsletter@saguaroastro.org

## Videmus Stellae

www.saguaroastro.org

# SAC Schedule of Events 2010

## SAC Meetings

| | |
|---|---|
| January 29, 2010 | July 23rd, 2010 |
| February 26, 2010 | August 20th, 2010 |
| March 26th, 2010 | September 24th, 2010 |
| April 30th, 2010 | October 22nd, 2010 |
| May 28th, 2010 | November 19th, 2010 |
| June 25th, 2010 | 2010 Holiday Party, TBA |

## Future Planning

| | |
|---|---|
| March 13th, 2010 | 2010 All Arizona Messier Marathon |
| June 5th-12th, 2010 | Grand Canyon Star Party |
| June 11th-12th, 2010 | 5 Mile Meadow Star Party |

## SAC Star Parties

| Date | Sunset | Astronomical Twilight Ends | Moonrise | Site |
|---|---|---|---|---|
| Jan. 9th, 2010 | 1742 | 1910 | 0351 | S |
| Feb. 6th, 2010 | 1809 | 1933 | 0244 | S |
| Mar. 6th, 2010 | 1833 | 1955 | 0131 | S |
| Apr. 3rd, 2010 | 1854 | 2019 | 0014 | S |
| May 8th, 2010 | 1919 | 2054 | 0245 | C |
| Jun. 5th, 2010 | 1939 | 2123 | 0140 | C |
| Jul, 3rd, 2010 | 1945 | 2130 | 2340 | C |
| Aug 7th, 2010 | 1924 | 2059 | 0357 | C |
| Sep. 4th, 2010 | 1850 | 2017 | 0246 | C |
| Oct. 2nd, 2010 | 1811 | 1934 | 0138 | C |
| Oct. 30th, 2010 | 1742 | 1906 | 0040 | S |
| Nov. 27th, 2010 | 1725 | 1852 | 2339 | S |

S= Saddle Mountain; C= Cherry Road; A=Antennas