August 2009

The Observer

East Valley Astronomy Club

Volume 23 Issue 8

From the Desk of the President
by David Douglass

It has been harder and harder this summer to get to clear skies. Rumor control says that we have a few members who have traveled to China to observe the solar eclipse. Hopefully, they will have good weather. Either way, I am sure they will be bringing back some interesting stories for us. We also have a group going to tour the Mt. Graham observatories. Hopefully, they too will have some pictures and stories to share with us upon their return.

Chuck Dugan of NOAO (Kitt Peak) made an interesting presentation about Project Astro at the July meeting. More information can be found at http://www.noao.edu/education/astro/. The currently scheduled teacher/astronomer training session is Sept 18-19 in Tucson. There seemed to be a large interest in this program, and Chuck said that if we could come up with about 10 teachers and 10 astronomers, a local training session could be considered. Based upon a show of hands, the task at hand now is to find 10 teachers. We will survey our school contacts, and make more information available at a later date. If you are interested in participating in this program, please send me a private email at president@evaconline.org and I will start a list. If you are thinking of attending the Tucson training session, please go to the above site, and complete the enrollment form. There are no fees, and the "application" is a single sheet, with mostly name and address information. Be sure and mail/fax the form as soon as possible.

I will be unable to attend the August and September EVAC meetings. I will be at the Julian Starfest over by San Diego in August, and will be attending the Tucson Project Astro training in Sep-

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The Backyard Astronomer
Top Ten Celestial Objects *by Bill Dellinges*

I was thinking about David Letterman's famous "Top Ten" list. What celestial splendors would be on my top 10 list? About 20 quickly came to mind. Now I had to cull the 20 down to 10. They should be striking in appearance to even a layperson. The list should include a variety of objects (I wouldn't want a list of 10 planetary nebulae). Their order doesn't matter – they're all winners. With that in mind, away we go.

1) ***The Moon***: Perhaps nothing seen in a telescope is more stunning than the moon. Since the moon is the closest astronomical body to Earth, we can see more telescopic detail than any other object in space even with a modest telescope. Its craters, mountains, maria, and ever changing shadows playing across the moon's ragged terrain never fail to amaze lunar observers.

2) ***Saturn***: You can always count on Saturn to deliver gasps of amazement. Even with its rings edgewise this year, many people at public star parties still express delight at seeing the thin ring. Little do they know how spectacular it would look with the rings wide open!

3) ***The Double Cluster in Perseus***: There is nothing in the sky quite like this object. Two open clusters for the price of one. Beautiful in any telescope or binocular, the clusters are best seen with apertures over 6" with a real field of at least one degree to get them both in the field; two degrees is even better in order to nicely frame the two stellar groupings. A dark sky gives their stars the appearance of diamond dust on black velvet.

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Inside this Issue:

Upcoming Events:

Public Star Party – August 14

Local Star Party – August 15

Monthly General Meeting – August 21

Deep Sky Star Party – August 22

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

The Backyard Astronomer

Continued from page 1

4) ***M42, the Orion Nebula***: This fine nebula has always been a popular target for new telescope owners - and for a good reason. This is the best example of an emission nebula in the northern hemisphere and looks impressive even in a small telescope. It also holds up well in light polluted skies. At a distance of 1600 light years, this cloud of hydrogen gas and dust is virtually a stellar nursery, forming stars even as we speak - enough gas, astronomers say, to create 10,000 Suns.

5) ***M7, Open Cluster in Scorpius***: It was love at first sight when I stumbled upon this cluster several decades ago. It's among my top five favorite open clusters and can be detected with the naked eye as a small detached piece of Milky Way just east of the Scorpion's stinger. M7's stars are brighter than most other clusters and spread out over 50 arc minutes, requiring a large field of view. As a result, I believe M7 is best seen in medium to large binoculars. The view is outstanding in 20x100's.

NGC 869 and NGC 884 - The Double Cluster in Perseus
November 25, 2006
Takahashi Epsilon 210 Astrograph F/3 SBIG STL11000M Camera (30R 20G 30B)
Photo courtesy of Jon Christensen

6) ***M45, the Pleiades or "Seven Sisters" in Taurus***: "Glitter, like a swarm of fireflies tangled in a silver braid" (Alfred Tennyson, Locksley Hall). It's tough to top that description. The Pleiades are certainly the king of the open star clusters. Even laypersons ask about this mysterious knot of stars that so captivates the eye. Perhaps no object in the sky has more star lore associated with it, an indication of its popularity through the ages. The cluster is composed of about 100 stars about 380 light years away, close enough that the human eye can resolve it without optical aid. Most people can pick out 6 stars; good eyesight can snag 7 (or more), thus the "Seven Sisters." The Pleiades cover about one degree of sky, so unless your telescope can obtain that much field, use binoculars to view this beautiful star group.

7) ***M13, Globular Star Cluster in Hercules***: While open star clusters tend to be comprised of perhaps a 100 – 1000 or so young stars found in the spiral arms of galaxies, globular star clusters are populated by older stars and are found in a halo around the Galaxy. They typically contain anywhere from 50,000 to 1 million stars. M13 is probably the most impressive globular in the northern skies. M22 in Sagittarius comes in as a close second and if situated higher in the sky, with less atmospheric extinction, might be top dog. M13 is about 25,000 light years away and is composed of approximately 500,000 stars. Whereas a small telescope shows open clusters well, globulars are so far away that considerable aperture is required to resolve them well enough to make them impressive in a scope. It was with an 8" SCT that I first glimpsed a well resolved M13 and it was an Oh-My-God moment. When it comes to observing globulars, the operative word is aperture - the bigger, the better. Even in my 14" SCT, I often think, "I wish I had a little more aperture."

8) ***M27, the Dumbbell Nebula in Vulpecula***: Planetary nebulae (PN) are dying stars that have sloughed off their outer layers, sometimes exposing a white dwarf remnant at the planetary's center. I can think of no PN as large and bright as the Dumbbell Nebula; it never fails to impress me. I think it's the best of the litter. M57, the Ring Nebula in Lyra, gets a lot of press and viewing time but is somewhat small. NGC 7293, the Helix Nebula in Aquarius is bigger but extremely faint.

9) ***Albireo, double star in Cygnus***: While I appreciate a nice double star, I didn't think the general public would! But years of showing off this fine binary at public star parties proved me wrong. Invariably, the newly initiated junior astronomer expresses astonishment that he's actually seeing a two star system. In fact, most folks have no idea that stars can have companions. Albireo's brightness, generous separation of 34 arc seconds, and colorful yellow and blue components instantly tames down unruly crowds. Tip: for the best "wow" effect, throw the pair slightly out of focus to bring out the colors.

10) ***M31, the Andromeda Galaxy***: M31 is the Milky Way's nearest major galactic neighbor at a distance of about 2.5 million light years (M33 is just as far away but much smaller. The nearby Magellanic Clouds are satellite galaxies to the Milky Way). As such, it naturally looks awesome in a telescope. Its angular length is about two and a half degrees (five full moons!). So you'll need a telescope with a low focal ratio and low power eyepiece to fit this monster into your field. I have used a C-8 with an F-6.3 focal reducer to accommodate most of M31 and its two satellite galaxies, M32 and NGC 205 in the same field. It's always a pleasure to inform the guest viewer that the amorphous blob they're looking at is another "Island Universe" similar to ours whose light is just now getting to us after traveling through 2.5 million light years of space at the speed of light. This glow is the aggregate light of several hundred billion stars, many of which, no doubt, have planets. Perhaps someone on one of them is looking back at us!

Supernovae Types, Part Two

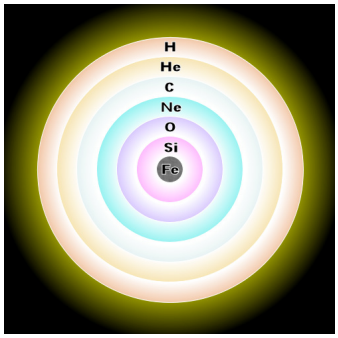
by Henry De Jonge IV

In this second installment we will examine Type II SN, the fate of massive stars.

Type II SN are defined as SN light curves without the presence of hydrogen. They are typically formed from a core collapse, whereby a relatively young, massive, (usually 8-9 solar masses or greater) yet mature star near the end of its life, has undergone fusion from hydrogen to iron in the core, with each fusion reaction period forming an onion like shell around this iron core. Iron is the end of the line since it takes more energy to fuse iron than it releases, (endothermic). When the massive iron core, (including all the previous by products) exceeds the Chandrasekhar limit it no longer supports fusion and the gravitational attraction of the star overcomes the pressure from the heat of fusion so that it begins to collapse.

The inner most part of the collapsing star is compressed into super dense neutrons, by reactions such as the protons capturing an electron and forming a neutron and a neutrino. This rapid reaction, (along with a tremendous production of neutrinos, unlike SNIa) and supersonic inner core collapse, causes the closer infalling material to bounce back forming an outward moving shock wave. This shock wave is slowed down by the remaining infalling material, but also gains energy by additional nuclear reactions that produce more neutrinos and continues outward, blasting away the remaining material, leaving the neutron formed core, (typically about 30 miles in diameter) as a degenerate remnant. It is hard to believe that the surrounding debris and infalling material can be so dense that it may actually slow down or impede the outflow of neutrinos temporarily!

It is thought that the relatively small amount of remaining hydrogen surrounding the star is blown away by the massive explosion and thus does not show up in the light curve. The remaining stellar core which can be either a neutron star or even a black hole is surrounded by the out flowing gaseous remains, which continue to support nuclear reactions while forming heavy elements beyond iron. For a couple of months a SN II can have as much luminosity as the entire host galaxy!



Here we see the fusion shells of a mature massive star, prior to explosion. In between the nuclear burning shells are layers of inert material from previous burns, with a remnant outer layer of H and He.

SN II typically are observed to have a rapid rise in luminosity, followed by a steady decrease over a year or more in time with emission lines of hydrogen, (from the outer layer remains) and other heavier metals in their spectra. They can be further divided into sub groups such as Types Ib and Ic which are exploding massive stars like type II SN, except that they have shed more of their outer layer of hydrogen in strong stellar winds before exploding and are typically associated with regions of relatively new star formation. Type Ic have also shed their He layers which is why they show a lack of He in their spectra.

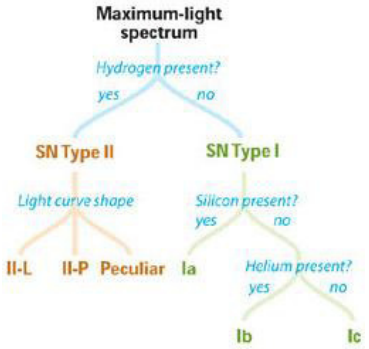
In terms of mass type II are thought to be the lowest massive star progenitors, with the next massive Ib, and then Ic the most massive. However the actual ranges and limits of this classification is under much study and debate. It is theorized that SNIb produce mainly neutron stars, while SNIc produce both neutron stars and BHs. Progenitors for SNII, Ib and Ic are often Wolf-Rayet stars, (massive, violent stars, with strong outflows). Type Ic, (the most massive SN) also are related to long soft GRBs and hypernova, however that is the topic of another paper.

The metal content of these progenitors can affect the final outcome of the explosion. For example, a low metal content would produce more BHs. Stars with a higher metal content have stronger stellar winds which blow off the outer layers and more mass.

They, (SNII) can also be classified generally by their light curves as SNII-P, (for plateau) or SNII-L, (for linear). The plateau type exhibit a plateau in their light curves between 30-80 days after maximum light while the linear types do not show this feature. The source of the plateau is the radioactive decay of large amounts of nickel into cobalt with the release of neutrinos, gamma radiation, and positrons. This decay energy sustains the light curve made by the shock front as it blasts its way through the infalling stellar debris.

Type Ia, (from an exploding white dwarf) typically have a strong emission line at 6150 Angstroms from Si II, Type Ib have the presence of strong He I lines, while Ic show a lack of He I lines. Type Ia as we examined in the first article, are found in almost all stellar environments, while Ib and Ic are found mostly in spiral galaxies and irregular galaxies, and near areas of recent star formation, (rich H II regions). There are also another sub grouping of SNII called SN In which are thought to have strong interactions with the ISM as the ejected photosphere expands during the explosion.

Below is a general overview of the light curves and spectra of SN.



One of the most well known SNII seen by the naked eye, (since the one seen by Kepler in 1604) was SN1987A in the LMC, about 50 Kpc away. The interesting thing was that the progenitor, (Sanduleak 69-202) was a compact blue supergiant, unlike the more common red giant or red supergiant stars that were predicted by theory. However this SN explosion may have resulted from this system being a binary system and the progenitor may have consumed the companion star in its red giant

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Supernovae Types

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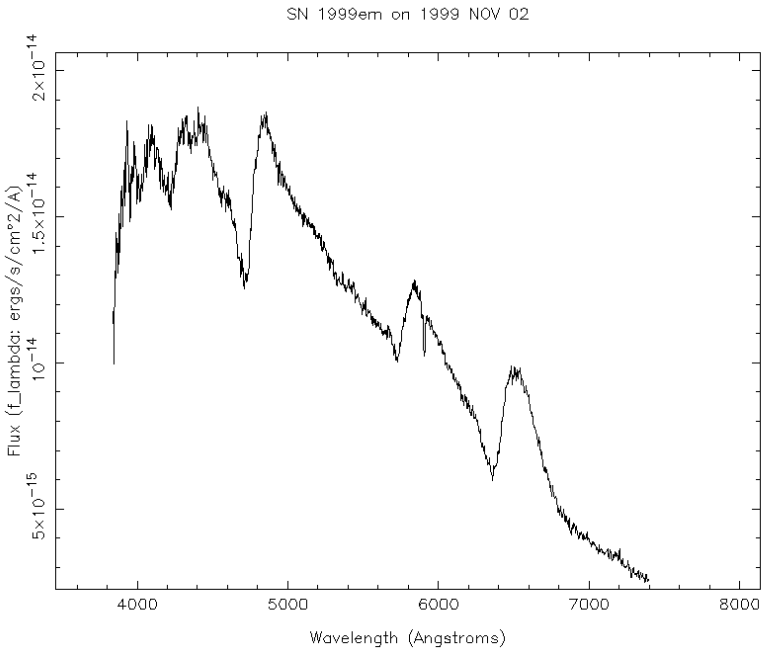
phase turning it into a blue supergiant. It was a very slow riser compared to most SNII, taking 80 days to reach maximum light, and had an estimated mass of about 18-20 solar masses before exploding. It was also the first SN that we detected neutrinos from prior to the explosion!

Type SNII usually generate SNR shells that have fast moving knots of matter which are also very bright at both radio and X-ray wavelengths with the X-rays being generated mainly by thermal emission. Some SNII like the Crab nebula are filled in to their centers and are called plerions. It takes about 100 days for the shells of Type II SN to become optically thin and form the common sight we call a nebula.



Here is a typical SN II light curve, (1999em)

A famous SNR is the Crab Nebula which was seen by Earth on July 4, 1054AD. This was a SNII that was witnessed throughout the world. It is still expanding at about 1500 kilometers per second and is very bright due to the pulsar, (neutron star) that is spinning at its center. It is about 2000 light years away in the constellation Taurus Since SNII often occur in young stellar environments, (gas clouds) they can act as an initiator for stellar birth by compressing the surrounding gas. Their SNR's also enrich the ISM with heavy elements, while stirring up the general ISM vicinity with fast winds and creating turbulence. It is now thought that SNII add to the creation of cosmic rays which we feel here on Earth. Type II SN are also known to be contributors to cosmic dust, (which has been detected in their SNR) but the exact mechanism and amounts are still under research.

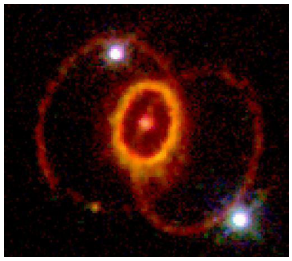
Here is a picture of SN 1987a a Type II SN.

Like SNIa, Type II SN have been considered for use as standard candles for over 3 decades due to their extremely high intrinsic luminosity and are now being considered as standard candles much as SNIa are. There seems to be less uncertainty in their models than with SNIa, (such uncertainties in SNIa were discussed in the first installment). The progenitor stars are well known and they would seem to be more common, (directly correlated to star formation rate) as we look back further in cosmic time. However the effects on their light curves by dust and stellar age, and metallicity, are thought to be different than SNIa. The type II SN defined by the presence of hydrogen in their spectra, (due to a thick hydrogen atmosphere) and a "plateau" in their light curves, (SNII-P) would appear to be the best bet. This plateau lasts for about 100 days in the spectral output. They are significantly more common than SNIa and their rate increases dramatically beyond redshift 3 and further, thus allowing us more information back in time. The progenitors of these plateau type SNII are know to be red supergiants and over 40 have been calibrated with other distance indicators to date. Future telescopes like the JWT and other planned space borne telescopes will give us much more information on using these types of SNII as distance standards.

In summary we have seen that Type Ia SN are the result of an interaction of two stellar objects while those of SNII, Ib, & Ic are, (usually) the result of a single massive star. One question for further study is the exact role of a companion star, (binary system) may have in regards to Type II SN. In both types of SN the fate of the star is certain to be one of annihilation, a neutron star, or a BH, (as far as we can tell). The core collapse mechanism in all cases is due to the central mass exceeding the Chandrasekhar limit and collapsing.

SN are contributors to the ISM of many elements and constituents, including the iron in our bodies coming mainly from SNIa, and are factors in star formation and evolution, galaxy evolution, and are becoming well defined cosmic standard candles. The full understanding of SN explosions with respect to rotation, metal content, initial mass, and companion influences is not complete and under much study. The relationship of progenitor metal content, with the local a galactic metal content is another topic under study. Although Type II SN do not have strong emission lines in hydrogen and sometimes helium they do eject these elements into the ISM, and the exact amount of this is under study. Future telescopes will hopefully allow us to see more distant SN and SN closer to the cores of galaxies. SN will continue to be a richly rewarding, complex, and beautiful sight in the night sky.

Here is an HST image of SN 1987a showing structure in the SNR. The diameter of the inner ring is about 0.42pc and is composed up of material that was ejected by the star prior to the explosion.

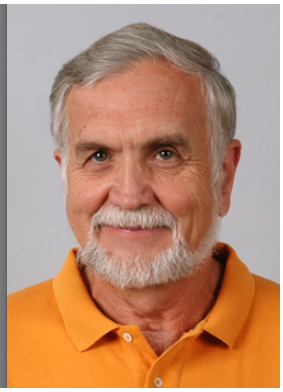


August Guest Speaker: Ron Greeley

Ronald Greeley, Regents' Professor, Director of the NASA Regional Planetary Image Facility, School of Earth and Space Exploration at Arizona State University, has been involved in lunar and planetary studies since 1967. Current research is focused on understanding planetary surface processes and geological histories. The approach involves a combination of spacecraft data analysis, laboratory experiments, and geological field studies on Earth of features analogous to those observed on the planets.

Dr. Greeley will give a talk about the moons of Jupiter.

" . . . for me creativity involves curiosity about the world (and worlds) around us, the stimulus of new observations, and interactions with other people who are also curious."



Basic Astronomy Four Part Lecture Series to Begin in September

Howard Israel will be presenting a four part lecture series beginning at the September 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 (Sep 18th) covers general basic astronomical terms, (Ascension, declination, etc)
Session 2 (Oct 23rd) covers the Solar System and how to observe planets.
Session 3 (Nov 20th) covers deep sky observing
Session 4 (Jan 15th) covers binoculars, telescopes, eyepieces, etc.

● Full Moon on August 5 at 17:55

◑ Last Quarter Moon on August 13 at 11:56

○ New Moon on August 20 at 03:01

◐ First Quarter Moon on August 27 at 04:42

18" f4.5 Obsession

18-inch aperture truss tube Dobsonian type telescope. Built in September 2004 with OMI optics. Upgrades include 96% enhanced coatings on OMI primary mirror, Argo Navis digital setting circles w/ wireless hand controller, StellarCat's ServoCat dual-axis drive system, Markless Stalk for DSC support, Powered ground board, Feathertouch dual-speed focuser, custom-fitted Obsession light shroud, Astrocrumb filter slide, mirror fan and Telrad. Obsession Serial No.: 1083. OMI Serial No.: 18-81-032803

Cost new in 2004: $9,920 (includes shipping to Arizona)
Cost new Today: $11,100 (includes shipping to Arizona)
Asking: $9,920 (includes delivery to Phoenix)

Will meet seriously interested parties at dark sky site for demo.

Bill Ferris
928-606-2447
BillFerris@aol.com

Celestron Ultima 8

Celestron 8" SCT. Heavy Duty photographer's scope with Periodic Error Correction that computer duplicates the first two minutes of hand guiding. Includes Sky Wizard computerized setting circles, tripod with bag, foam lined scope and accessories case, Celestron Ultima series eyepieces, in 4mm, 5mm, 7.5mm, 10mm, 18 mm, and 30 mm, motorized RA, Dec and Focus, manuals, star maps, books, planisphere.
$1300.

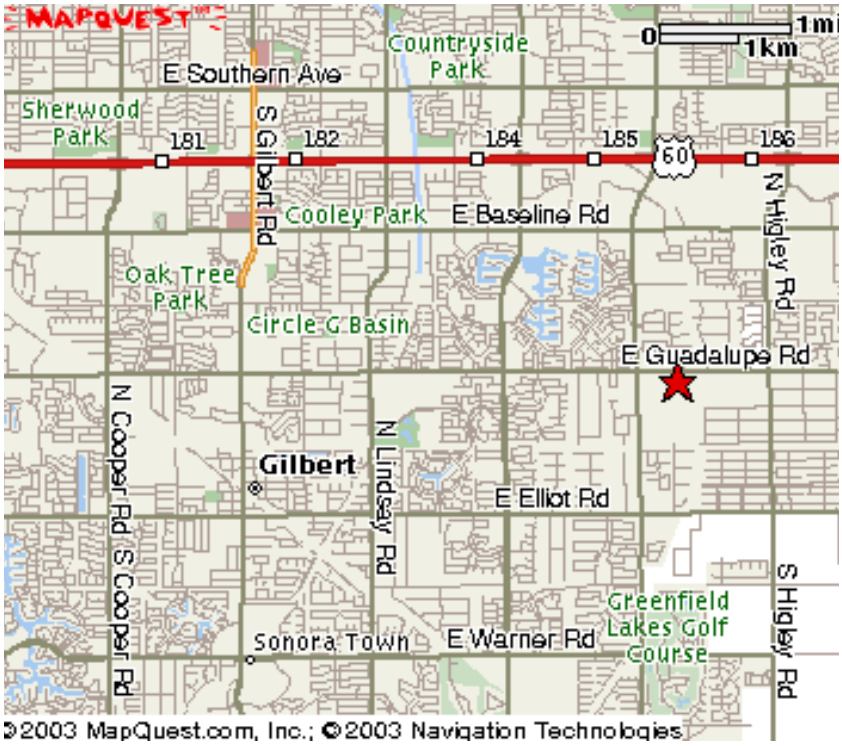
Mike Sargeant 480-839-3209

Accessories for Sale

TeleVue Visual Paracorr: $295
22 mm TeleVue Nagler T4 : $390
17 mm TeleVue Nagler T4: $330
12 mm TeleVue Nagler T4: $300
2 inch Lumicon OIII Filter: $200
2 inch Lumicon UHC Filter: $200
2 inch Lumicon H-beta Filter: $200
Catsperch Adjustable Height Observing Chair: $200

Bill Ferris
928-606-2447 BillFerris@aol.com

www.eastvalleyastronomy.org/grco/obs.asp

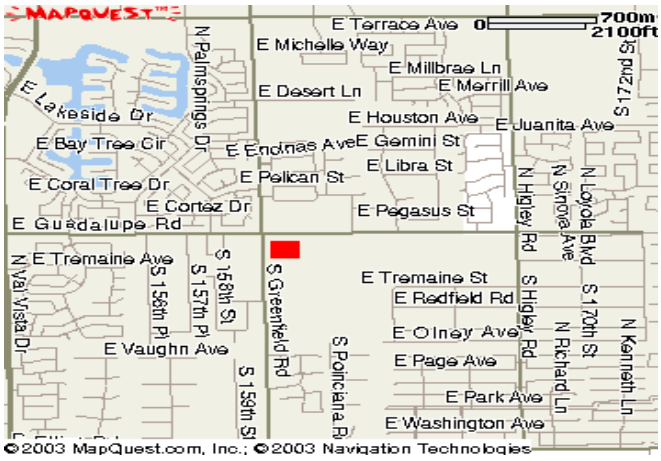


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

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.

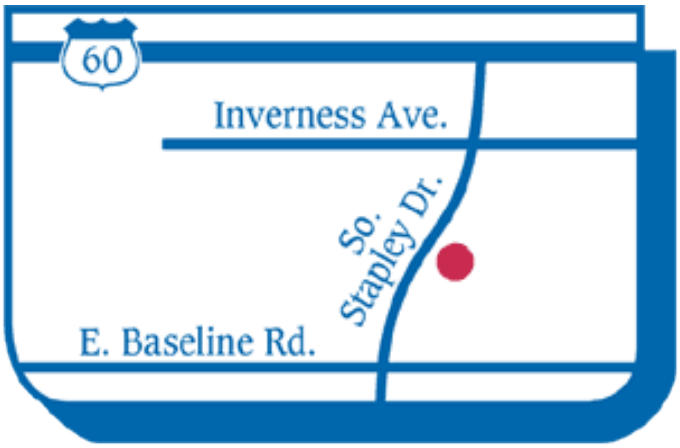
Meetings begin at 7:30 pm.

Visitors are always welcome!



Upcoming Meetings

August 21
September 18
October 23
November 21
December 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

August 2009

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					

August 1 - Mt. Graham Tour

August 14 - Public Star Party at Riparian Preserve in Gilbert

August 15 - Local Star Party at Boyce Thompson Arboretum

August 20 - Julian Starfest

August 21 - General Meeting at Southeast Regional Library in Gilbert

August 22 - Deep Sky Star Party at Vekol Road

September 2009

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			

Spetember 11 - Public Star Party at Riparian Preserve in Gilbert

Spetember 12 - Local Star Party at Boyce Thompson Arboretum

Spetember 18 - General Meeting at SE Regional Library in Gilbert

Spetember 19 - Deep Sky Star Party at Vekol

East Valley Astronomy Club -- 2009 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

SARSAT to the Rescue

If a plane crashes in the woods and nobody hears it, does it make a sound?

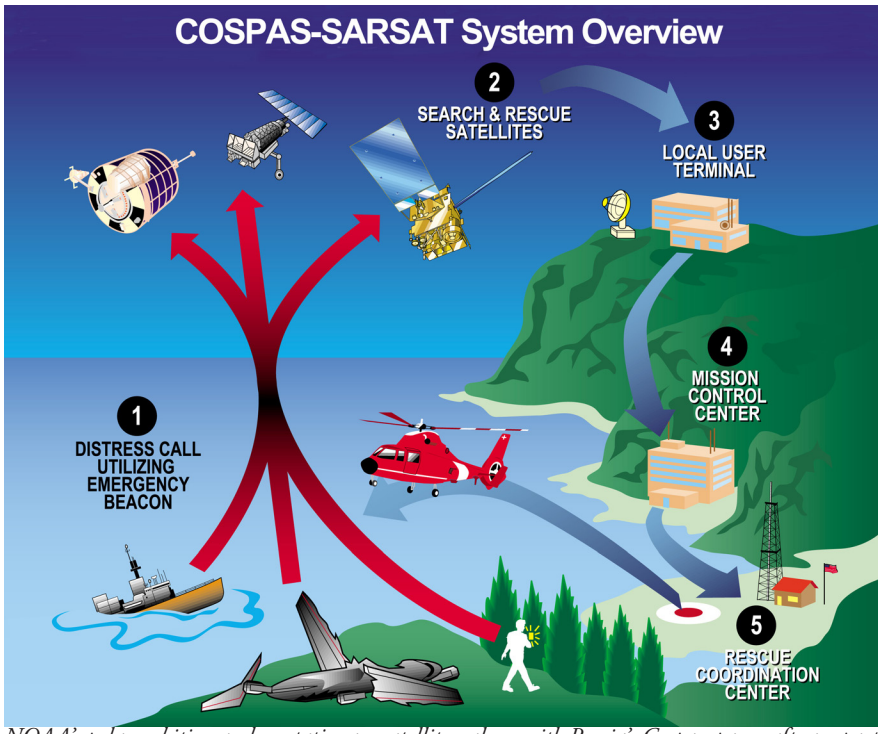
Never mind contemplating this scenario as a philosophical riddle. This can be a real life or death question. And the answer most of the time is that, even if no people are nearby, something is indeed listening high above.

That something is a network of satellites orbiting about 450 miles overhead. The "sound" they hear isn't the crash itself, but a distress signal from a radio beacon carried by many modern ships, aircraft, and even individual people venturing into remote wildernesses.

In the last 25 years, more than 25,000 lives have been saved using the satellite response system called Search and Rescue Satellite-aided Tracking (SARSAT). So what are these life-saving superhero satellites?

Why they are mild-mannered weather satellites.

"These satellites do double duty," says Mickey Fitzmaurice, a National Oceanic and Atmospheric Administration (NOAA) systems engineer for SARSAT. "Their primary purpose is to gather continuous weather data, of course. But while they're up there, they might as well be listening for distress signals too."



NOAA's polar-orbiting and geostationary satellites, along with Russia's Cospas spacecraft, are part of the sophisticated, international Search and Rescue Satellite-Aided Tracking System.

In February, NASA launched the newest of these Polar-orbiting Operational Environmental Satellites (or POES) into orbit. This new satellite, called N-Prime at launch and now dubbed NOAA-19, prevents a gap in this satellite network as another, aging NOAA satellite reached the end of its operational life.

"The launch of N-Prime was a big deal for us," Fitzmaurice says. With N-Prime/NOAA-19 in place, there are now six satellites in this network. Amongst them, they pass over every place on Earth, on average, about once an hour.

To pinpoint the location of an injured explorer, a sinking ship, or a downed plane, POES use the same Doppler effect that causes a car horn to sound higher-pitched when the car is moving toward you than it sounds after it passes by.

In a similar way, POES "hear" a higher frequency when they're moving toward the source of the distress signal, and a lower frequency when they've already passed overhead. It takes only three distress-signal bursts — each about 50 seconds apart — to determine the source's location.

Complementing the POES are the Geostationary Operational Environmental Satellites (GOES), which, besides providing weather data, continuously monitor the Western Hemisphere for distress signals. Since their geostationary orbit leaves them motionless with respect to Earth below, there is no Doppler effect to pinpoint location. However, they do provide near instantaneous notification of distress signals.

In the future, the network will be expanded by putting receivers on new Global Positioning System (GPS) satellites, Fitzmaurice says. "We want to be able to locate you after just one burst." With GPS, GOES will also be able to provide the location of the transmitter.

Philosophers beware: SARSAT is making "silent crashes" a thing of the past.

Download a two-page summary of NOAA-19 at www.osd.noaa.gov/POES/NOAA-NP_Fact_Sheet.pdf. The Space Place gives kids a chance to rescue stranded skiers using their emergency rescue beacons. The Wild Weather Adventure game awaits them at spaceplace.nasa.gov/en/kids/goes/wwa.

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

August 2009

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.

On Sunday, August 2, after 9:50 PM, you can watch a complete cycle of Io passing in front of Jupiter. With a medium (6 inch) telescope catch Jupiter 20 degrees above the southeast horizon. Here is the schedule of events:

9:50 PM Io's shadow falls on Jupiter
10:07 PM Io moves in front of Jupiter
12:06 AM Io's shadow leaves Jupiter
12:24 AM Io moves from in front of Jupiter

On Monday, August 3, at 9:39 PM, a "5th" satellite appears from behind Jupiter. Actually the one emerging from occultation is Io and the middle one of the 5 is the star 45 Capricorni.

On Wednesday, August 5, at 7:20 PM (8 minutes before sunset), the full Moon rises, spoiling any chance of deep sky observing for the whole night. However, Moonrise occurs only an hour and a half after a penumbral eclipse (which we couldn't even try to see because the Moon is below the horizon at the time). That means the sun is illuminating the entire earth-facing hemisphere of the Moon and even binoculars or a telescope won't reveal any shadows due to craters or mountains.

On Wednesday, August 12, you might see some Perseid meteors. Meteors are usually better after midnight, but that's when the Moon will interfere, so it is hard to say when it is best to look. You might also see some the next night.

On Thursday, August 13, at 11:55 AM, the Moon is at 3rd quarter phase and won't spoil your deep sky observing tonight till 11:24 PM when it rises.

On Friday, August 14, at 12:53 AM, you can see Io almost completely occult Europa. As you watch these 2 moons of Jupiter, you will see them appear to merge for about 10 minutes. Then you can turn your attention to…

Also on Friday, August 14, from about 1:00 to 4:00 AM, you can see the Moon move through the Pleiades, occulting several bright stars. Stars disappear on the bright limb of the just-past-third-quarter Moon and appear again from behind the dark limb. The bigger telescope you use, the dimmer stars you will be able to watch wink out and back on. Here is a schedule for the major stars:

1:10 AM Electra (magnitude 3.7) disappears
1:31 AM Merope (magnitude 4.2) disappears
1:52 AM Electra appears
2:02 AM Alcoyne (magnitude 2.7) disappears
2:28 AM Merope appears
2:50 AM Pleione (magnitude 5.0) disappears
2:54 AM Atlas (magnitude 3.6) disappears
3:06 AM Alcoyne appears
3:36 AM Atlas appears
3:49 AM Pleione appears

On Tuesday, August 18, about 8:15 PM when you can find Jupiter in the twilight low in the southeast, you can see Io and its shadow in front of the planet. Because Jupiter is near opposition, the satellite and the shadow are close to each other. Io emerges from in front at 10:18 PM, the shadow leaves at 10:24 PM.

On Wednesday, August 19, it is new Moon and you can hunt for faint fuzzies the whole night.

On Friday, August 21, you can see Io move in front of Europa twice! The first time is at 3:16 AM and Io completely covers Europa for about 1 minute. The second time is at 9:06 PM (the next night, more convenient) but only about 40% of Europa's diameter is covered. Even a big (12 inch) telescope will have a hard time showing detail in these events.

On Wednesday, August 26, about 8:15 PM when you can find Jupiter in the twilight low in the southeast, you can see Ganymede and Europa, and their shadows on Jupiter. The two satellites are close together near the center of the planet, but hard to see because they are about the same brightness as the planet. Here is the schedule of subsequent events:

9:16 PM Io appears from behind Jupiter.
9:33 PM Europa moves from in front of Jupiter
10:02 PM Ganymede moves from in front of Jupiter
10:10 PM Europa's shadow leaves Jupiter
11:18 PM Ganymede's shadow leaves Jupiter

Also on Wednesday, August 26, at 10:45 PM, the 1st quarter Moon sets.

From the Desk of the President

Continued from page 1

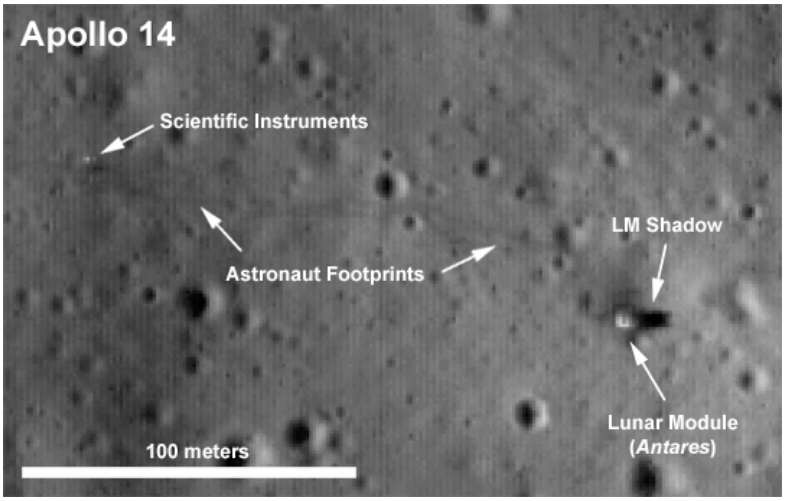
tember. Our able Vice-President, Wayne Thomas, will be handling the meetings for me.

It is time to start thinking about the annual election of officers and board members. The election is in November, but it always seems to take some time to find people who are willing to serve in these positions. The elected positions (President, Vice President, Secretary, Treasurer and five Directors for the Board) are all subject to term limits (two consecutive annual terms in the same position). Thus, we know that we need a new Treasurer (replacing Ray Heinle), and two new Board members (replacing Bill Houston and Joan Thompson). I will be polling the other officers to see if they are willing to continue serving (if elected), and will report back next month.

If you are interested in any of the positions, please let me know. If you have any questions about the elected positions, or appointed committee jobs, please contact me or any of the officers, and we would be glad to discuss them with you. Nominations for the 2010 year positions will open in October. Elections will be conducted at the November meeting in accordance with the club's bylaws.

Apollo Landing Sites Photographed

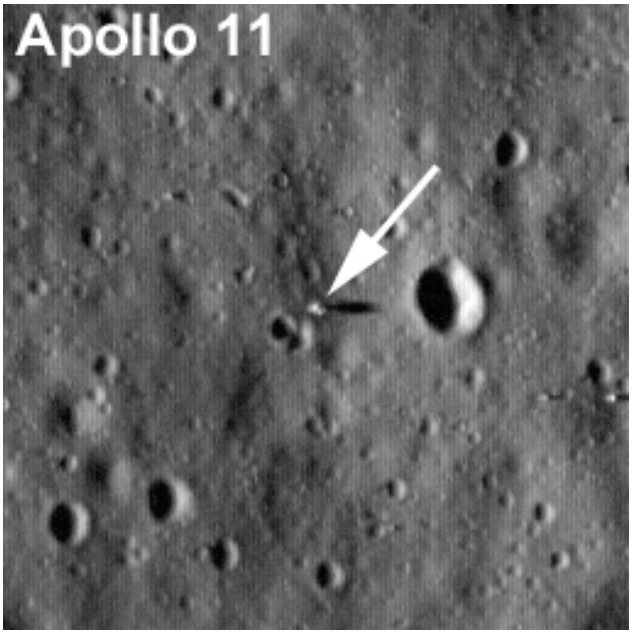
NASA's Lunar Reconnaissance Orbiter, or LRO, has returned its first imagery of the Apollo moon landing sites. The pictures show the Apollo missions' lunar module descent stages sitting on the moon's surface, as long shadows from a low sun angle make the modules' locations evident. The Lunar Reconnaissance Orbiter Camera, or LROC, was able to image five of the six Apollo sites, with the remaining Apollo 12 site expected to be photographed in the coming weeks.



An LROC photo of the Apollo 14 landing site.

"The LROC team anxiously awaited each image," said LROC principal investigator Mark Robinson of Arizona State University. "We were very interested in getting our first peek at the lunar module descent stages just for the thrill -- and to see how well the cameras had come into focus. Indeed, the images are fantastic." The satellite reached lunar orbit June 23 and captured the Apollo sites between July 11 and 15. Though it had been expected that LRO would be able to resolve the remnants of the Apollo mission, these first images came even before the spacecraft reached its final mapping orbit. Future LROC images from these sites will have two to three times greater resolution.

Although these pictures provide a reminder of past NASA exploration, LRO's primary focus is on paving the way for the future. By returning detailed lunar data, the mission will help NASA identify safe landing sites for future explorers, locate potential resources, describe the moon's radiation environment and demonstrate new technologies.



Apollo 11 lunar module, Eagle. Image width: 282 meters (about 925 ft.)

"Not only do these images reveal the great accomplishments of Apollo, they also show us that lunar exploration continues," said LRO project scientist Richard Vondrak of NASA's Goddard Space Flight Center in Greenbelt, Md. "They demonstrate how LRO will be used to identify the best destinations for the next journeys to the moon."

The spacecraft's current elliptical orbit resulted in image resolutions that were slightly different for each site but were all around four feet per pixel. Because the deck of the descent stage is about 12 feet in diameter, the Apollo relics themselves fill an area of about nine pixels. However, because the sun was low to the horizon when the images were made, even subtle variations in topography create long shadows. Standing slightly more than ten feet above the surface, each Apollo descent stage creates a distinct shadow that fills roughly 20 pixels.

The image of the Apollo 14 landing site had a particularly desirable lighting condition that allowed visibility of additional details. The Apollo Lunar Surface Experiment Package, a set of scientific instruments placed by the astronauts at the landing site, is discernable, as are the faint trails between the module and instrument package left by the astronauts' footprints.

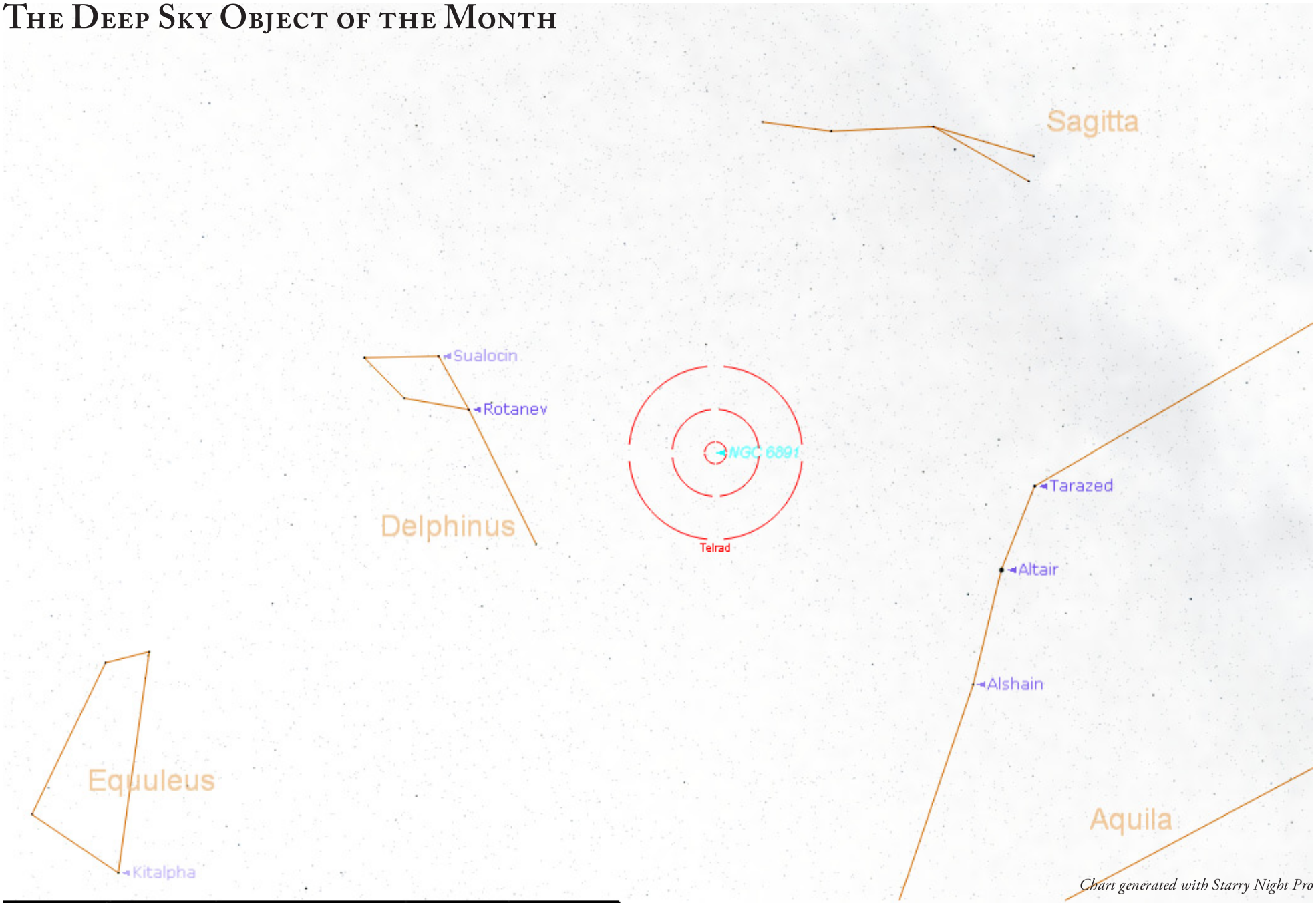
Launched on June 18, LRO carries seven scientific instruments, all of which are currently undergoing calibration and testing prior to the spacecraft reaching its primary mission orbit. The LROC instrument is made up of three cameras -- two high-resolution Narrow Angle Cameras and one lower resolution Wide Angle Camera. LRO will be directed into its primary mission orbit in August, a nearly-circular orbit about 31 miles above the lunar surface.

Stay tuned for more photos from LRO!

New EVAC Members in July

Casidy Ward - Carefree
Mike Sargeant - Tempe
Roger Walters - Mesa
Bob Birket - Mesa
David Calvino - Gilbert
Phil Feruglio - Chandler
Michael Smith - Gilbert
Scott Tannehill - Scottsdale
Jason Pociask - Mesa

The Deep Sky Object of the Month



NGC 6891 (PK 054-12.1) Planetary Nebula in Delphinus

RA 20h 15m 08.8s DEC +12° 42' 16" Magnitude: 10.5 Size: 16"

Robert Burnham Jr. Memorial

The Robert Burnham Jr. Memorial is now a part of Lowell Observatory, promintly positioned between Saturn and Jupiter.

Robert Burnham compiled his three volume Celestial Handbook while working at Lowell Observatory as part of the Stellar Proper Motion Survey. This grassroots effort began on a Cloudy Nights discussion forum, and with the guidance of Burnham's sister, Viola Courtney, and her daughter Donna Cox, has grown to include numerous members of the astronomy community, including the honorary chairman of our fundraising committee Jack Horkheimer of the Miami Science Museum, better known for his PBS Star Gazer series. Special thanks to Tony Ortega and Tom and Jennifer Polakis!

Please join us in the unveiling celebration at Lowell Observatory's Giclas Hall, located in the Steele Visitors Center, 1400 W. Mars Hill Road, Flagstaff, Az. 86001. The ceremony will be held on Saturday, August 15th beginning at 2:00 pm.

Directions to Lowell Observatory can be found on their site:
http://www.lowell.edu/index.php

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Keep Looking Up!

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