

# THE OBSERVER

## *East Valley Astronomy Club*

### From the Desk of the President

*by David Douglass*

So far, the summer of 2010 has been very busy for EVAC. We have many things underway, and many more coming. As most are now aware, we no longer use the Vekol Rd BLM lands for our dark sky observing site. A committee, headed up by our Vice-President, Bill Houston, has been busy looking for a new site. Criteria have been established, and the committee has checked out many locations. So far, a few good ones have been found, from an observing standpoint, but none seems acceptable when adding in the access to the

sites. The committee's work is ongoing, and we look forward anxiously to their continued reports.

The same problem that caused the Vekol Rd situation is affecting the annual All Arizona Star Party (AASP), which for many years was held at Farnsworth Ranch, south of Arizona City. The decision has been made to not use that location again until things are known to be safer than they are today. The officers and board of EVAC has worked hand-in-hand with the officers and board of SAC, and agreed to use the SAC

"Antennae Site" (aka Hovatter Rd, or US-10, exit 53) location this year for the AASP. Work is ongoing with BLM (the land owners) to secure proper permits. SAC is also evaluating the area for next year's All Arizona Messier Marathon (AAMM). There is a possible "improved viewing" area, just east of the current "Antenna Site", which may be used. This too is on BLM land, and is being included in the permit application.

The EVAC board approved the process of EVAC becoming a Member Society of the Astronomical League (AL

*Continued on page 12*

### UPCOMING EVENTS:

*Local Star Party - August 31*

*Public Star Party - August 7*

*Deep Sky Observing Night - August 13*

*Monthly General Meeting - August 20*

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

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### The Backyard Astronomer

#### Defunct Constellations

*by Bill Dellings*

There are 88 official constellations. At one time there were over 100. What happened to them?

Until the early 20th century, anyone could draw up a star map or atlas and disseminate it among the masses. Furthermore, along with the accepted popular constellations, one could include a few of their own creations from faint stars in "unclaimed" areas of the night sky - there was no scientific organization to monitor and approve changes to the constellations. It was open season on the night sky.

When the International Astronomical Union (IAU) was established in 1919,

one of its responsibilities was to bring order to the celestial drama played out in the heavens. Thus in 1922, the IAU whittled down the official constellation count to the original 48 ancient constellations and the 40 newer contemporary ones created by Keyser and DeHoutman, Plancius, Hevelius, and Lacaille between 1592 and 1763.

We'll look at a few of the more interesting constellations that were eliminated. One of these victims predated by 159 years the 1922 purge. During his studies of the southern sky in Cape Town, South Africa, French astronomer Nicolas

*Continued on page 2*

# The Backyard Astronomer

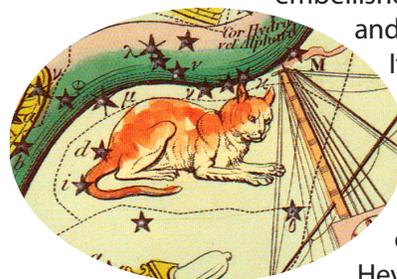
*Continued from page 1* Louis de Lacaille thought the ancient constellation of Argo Navis, the Ship Argos, covered too much sky for one constellation. He dismembered it into Puppis, the Stern, Carina, the Keel, and Vela, the Sails and they appeared in his 1763 atlas, *Coelum Australe Stelliferum*. So in this case, we lost one constellation but gained three new ones!



Another casualty from antiquity was Antinous, the Boy. It was comprised of faint stars between Aquila and Sagittarius. He is hanging from the grasp of Aquila and carries a bow and arrow. He was mentioned in Ptolemy's *Almagest* (circa 150 A.D.) and is illustrated

in a number of star maps including Johannes Hevelius' 1690 *Firmamentum Sobiescianum*, Johann Bode's 1801 *Uranographia*, Alexander Jamieson's 1822 *A Celestial Atlas*, and Elijah Burritt's 1835 *Geography of the Heavens*. For a look at Antinous, see Ian Ridpath's *Star Tales* (uses Bode maps), p.138; George Lovi's *Men, Monsters and the Modern Universe* (uses Jamieson maps), p.28; Samuel Leigh's *Box of Stars* (*Urania's Mirror*); and Burritt, Plate V.

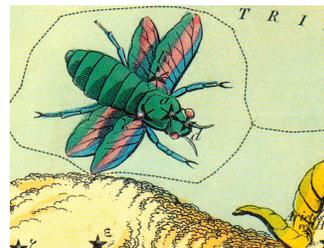
Hevelius created Cerberus, the three headed snake for his 1690 atlas. In Greek mythology the creature was a vicious multi-headed dog guarding Hades. Hercules had to conquer the hound as one of his Twelve Labors. Hevelius chose to depict it as a three headed snake in the Strongman's grasp. Later maps show it embellished with an apple tree branch and called Cerberus et Ramus. It's composed of a cluster of 4th - 5th magnitude stars between Hercules and Lyra, just below Xi, Lambda, and Delta Herculis. It can be seen on star maps of Hevelius, Jamieson, Bode, and Burritt. See *Star Tales*, p. 141; *Men and Monsters*, p. 28; and *Box of Stars*, Plate 11; Burritt, Plate V.



Felis, The Cat was created in 1799 by French astronomer and writer Joseph-Jerome de Lalande. Though a versatile astronomer, he was not into map making and his cat first appeared on Bode's 1801 *Uranographia*. Felis was located between Hydra and Antila. Regarding the kitty's origin, Lalande was quoted saying "I am very fond of cats. I will let this figure scratch on the chart. The starry sky has worried me quite enough in my life, so that now I can have my joke with it." *Men and Monsters*, p.61.

Also seen in *Star Tales*, p.142 and *Box of Stars*, plate 32.

Musca Borealis, the Northern Fly (its southern counterpart still buzzes around with the IAU's blessing). Such a long history for a small creature: In *Star Tales*, Ian Ridpath states Musca was originally shown on Petrus Planicus' 1613 globe as a bee (Apes). Jacob Bartsch changed it a wasp (*Vespa*) on his 1624 map. Finally, Hevelius morphed it into a fly in 1687. Musca was composed of the stars 33, 35, 39 and 41 Arietis. It's illustrated in *Star Tales*, p.146; *Men and Monsters*, p.14; *Box of Stars*, plate 16; Burritt, Plate II.



Noctua, The Owl, is a hoot. It was located between Hydra and Libra, with its claws resting on the tail of Hydra. A line drawn from Pi Hydrae to Alpha Librae runs through its torso. Purportedly created by French astronomer Pierre-Charles Le Monnier in 1776 as the Solitary Thrush, it appears on Bode's *Uranographia* (1801) as such. However, the next major star map, Jamieson's *A Celestial Atlas* (1822) depicts this star group as an owl. Burritt retains the owl on his 1835 star map also. See the Owl in *Star Tales*, p.151 (as a Thrush); *Men and Monsters* (owl) p.62; *Box of Stars* (owl) Plate 32; Burritt (owl), Plate IV.



Taurus Poniatovii, Poniatowski's Bull was the creation of Martin Poczobut in 1777 to commemorate his King, Stanislas II of Poland. Just east of Beta and Gamma Ophiuchi are several 3-4th magnitude stars forming a distinctive "V" which reminded Poczobut of the Hyades. Stars 66, 67, 68, 70 Ophiuchi form the face; 71, 72 Ophiuchi are the tip of a horn. Like the Hyades, its most prominent stars represent the Bull's face. Other faint stars form the rest of Bull's body. So for 175 years there

were two bulls in the sky - and that's no bull. It first appeared on Lalande's 1770 celestial globe. Of all the deceased northern constellations discussed here, this one is probably the easiest to spot



in the sky (at least its face, anyway). See *Star tales*, p.149; *Men and Monsters*, p.28; *Box of stars*, Plate 12; Burritt, Plate V.

We have looked at just a few of the many constellations shot out of the night sky by the IAU in 1922 (at least 18 more were expunged). The writer is indebted to Ian Ridpath's *Star Tales*, from which much of the above material was gleaned for this article.

*All illustrations appear courtesy of Ian Ridpath.*

# White Dwarfs (WD), Part One

by Henry De Jonge IV

White dwarfs are the endpoint in stellar evolution for most stars in the Universe and actually come in a variety of flavors so to speak. I used to think they were all alike and have learned though most are similar they are not all the same. Now I would like to discuss them in this article to learn more about their varied nature. In the first part we will briefly discuss what a white dwarf is and in the second part look more at the various types.

## What is a White Dwarf?

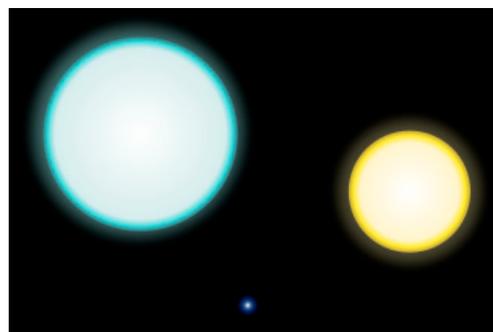
These stellar remnants result from stars relatively low in mass, (<7-10 solar masses) that have burned thru most of their H and He. This is the most common ending in stellar evolution since the vast majority of stars are well below these mass limits. Near the end of the stars life, the outer layers of these stars blow out to make planetary nebula and the core WD remains. The outer layers of this core can vary in composition but usually consist of thin layers of H and He.

In a low to medium mass star some of the He will fuse and form C and O in the core, the amount depending upon the initial mass of the star and the remaining mass of the core. Thus most WD are composed of C and O. Sometimes He is present in the core mixture. Regardless of the core composition, electron degeneracy pressure, (electrons are bound by the Pauli Exclusion Principle and follow Fermi-Dirac statistics) prevents

in a lower quantum state the remainder must be in a higher state, so that electron conduction becomes the main form of energy transfer rather than radiation. This causes the WD core to remain in a state of near isothermal equilibrium, while the non degenerative outer layers slowly radiate away. However this core maintains a tremendously high temperature in the millions of degrees K. Thus the heat leaks out very slowly over long periods of time. This heat can also cause convection in the outer layers. Models show that a WD cools from the center outwards into a crystalline structure, perhaps even into a large diamond, although perhaps not into the same structure as we would find on Earth!

The hot WD begins cooling from an initial surface temperature of about 100,000 to 150,000 degrees K and no further nuclear reactions take place unless the core explodes in a SN.

It takes about 100 million years to cool to 20,000 degrees K and another 800 million years to cool to 10,000 degrees K. In about 4-5 billion years it will have cooled down to near the surface



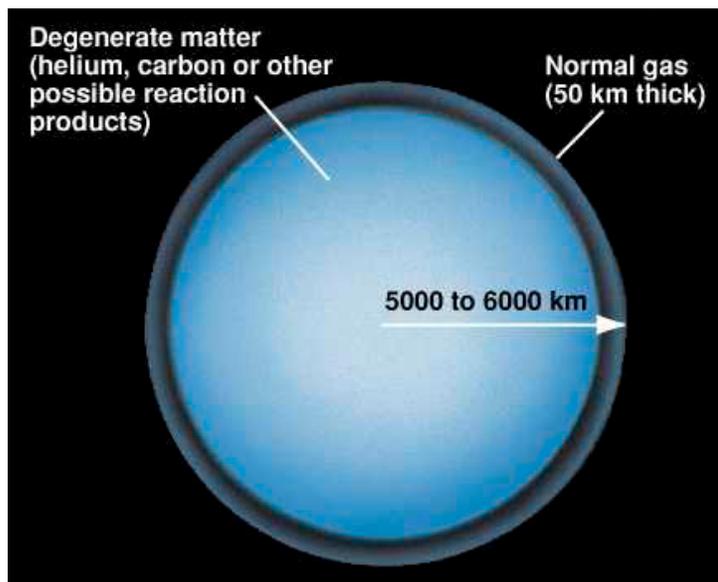
temperature of the sun, (at right) as compared to the WD IK Pegasi B, (at center) and its companion star IK Pegasi A, (on the left). The WD has a surface temperature of 35,500 degrees K.

low as 3900 degrees K, (WD 0346+246). Thus they cover a wide range of surface temperatures. The average surface temperature of a WD that is in the population relatively close to our galaxy is about 25,000 degrees K. A black dwarf would be the cinder of a WD that has completely cooled down. None of these has yet to be discovered, (gravitational lensing might be a detector?).

It is thought that the Universe has not been in existence long enough for most WD that exist today to have cooled down to become non radiating. Their lifetimes may be close to that of the proton, in the range of hundreds of billions of years or longer. Obviously due to their faint luminosity and physical size, WD are extremely difficult to detect and measure.

WD are unusually small so that they cool quite slowly. Since their radiation comes only from their stored heat, the rate of WD cooling and their current temperatures can be used to determine the ages of the groups of stars where they are found and even their host galaxies. Among the very first stars to form in the Milky Way only a small percentage are still burning H in their cores. By now any original stars formed at that time that were over 0.8 solar masses have most likely transformed into WD. There are thousands of WD in Pop II clusters in and around the Milky Way, and globular clusters usually have a high number of WD in them. It is estimated that about 15% of the older Pop II stars that formed in the Universe

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Typical structure of a WD

further collapse via gravitational attraction of the core. The core is usually about the size of the Earth or smaller. A WD core is basically composed up of electrons and loose neutrons and protons. The density can be well over 1 million times that of water, (1 cc would weigh about 1 ton).

The core of a WD is a very special and unique place. In a normal star photons travel further than particles do before they lose energy thru interactions. In a WD the opposite is true so that electrons travel longer distances than photons before interacting and losing energy via collisions. Due to the Pauli Exclusion Principle, since most of the electrons are already

# title

*Continued from page 3* about 12 billion years ago are now WD.

It appears that the more massive the companion star the more massive the WD. For younger clusters there seems to be a wider variation in WD masses, (due to the larger and more numerous high mass stars/systems) than in older star clusters that tend to have more evenly dispersed star/system mass distributions. This relationship needs to be better understood.

By understanding WD cooling rates, formation rates, and ages we will gain a better understanding of stellar models and galactic evolution. Our galaxy is thought to be about 8 billion years old from these types of calculations. However different WD compositions will have different cooling rates and we will study this more in the next article.

The first WD, (40 Eridani C) was discovered visually in 1783 by Wilhelm Herschel and identified as a WD in 1939 by Edward Pickering and Henry Russell. Sirius B, (the companion star of Sirius) was next. Currently there are well over 10,000 WD identified. It is estimated that the minimum time required to form a WD is at least 40,000,000 years. We know that that only about 1% of WD form SNIa explosions and that about 98% of all stars will form WD at the end of their lives.

It also appears that as WD undergo surface changes from convection, mass accretion, or mass loss, their stratified outer layers can change composition and thus their spectrum can also change. A WD that is slowly accreting small amounts of mass from a companion star may emit soft X rays, (low energy). They can also accumulate enough mass to occasionally and repeatedly go nova, (classical nova) and even become a CV as discussed in a previous article. These WD erupt with short, dramatic, bursts of energy as nuclear ex-

plosions rock their surface. WD are also known for their pulsations, (like ZZ Ceti variables) which are thought due to these surface compositional changes, (convection mixing of H and He for example) which also result in magnitude changes, typically a few tenths of a magnitude.

There is a well established mass-radius, (volume) relationship with WD. It turns out that the volume of a WD is an inversely proportional to its mass, (to the cube of the mass in a broader non relativistic model). Thus more massive WD are actually smaller. The reason is that electrons will be more closely confined and will generate a larger degeneracy pressure required to support the greater mass of the core. However due to relativity, (that a particle cannot travel faster than the speed of light as would happen if the core shrinks past a critical density) a massive WD is somewhat smaller than predicted by this mass-volume relationship. This

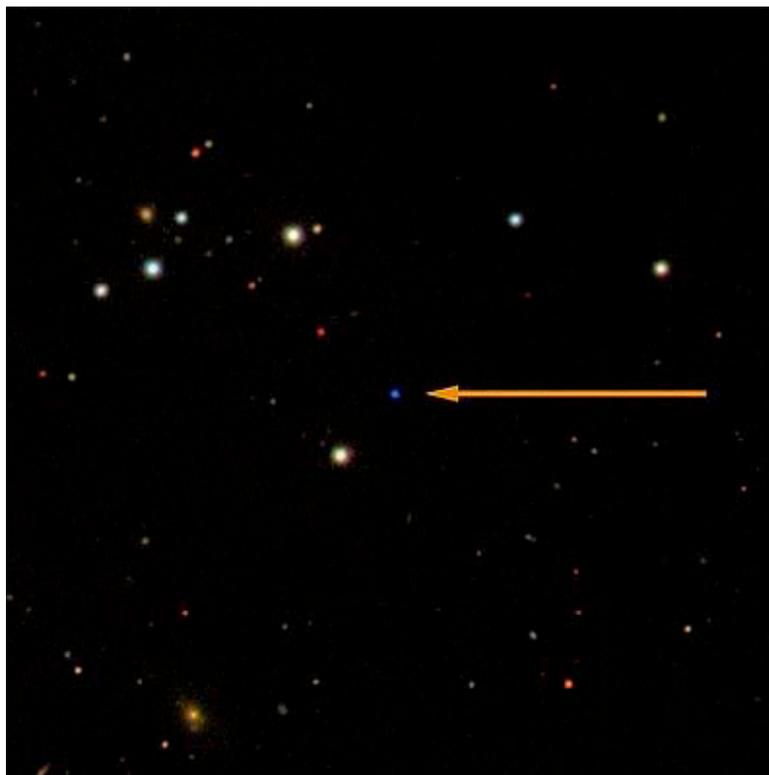
gives WD a maximum mass called the Chandrasekhar Limit, about 1.4 solar masses. If the WD is rotating, (as are most all objects in the universe) this limit increases only a bit.

Thus we see that WD are quite complex in their own right and can have a wide variety of characteristics. Their unique physics is still not completely understood and I am sure they have many surprises left to tell. Their numbers will become, (if not already) staggering in our Universe over time, so that we should have plenty of examples and time to study them in the future. It is the fate of our own sun to become WD in another 5 billion years or so. Next we will look at the types of WD that can exist in more detail and discuss their implications.

*Part two of this article will appear in the next issue.*



*Sirius A and the WD Sirius B, (the small dot to the lower left) as seen by the HST*



*A pulsating WD*

## August Guest Speaker: Gene Lucas

Gene Lucas claims to have been actively involved in amateur astronomy for nearly 50 years.

After viewing the planets through a big 12 inch reflector owned by a friend in South Florida, during high school he built a complete 8 inch f9 Newtonian reflector, grinding and polishing the mirror, and machining and assembling an equatorial mounting with a unique, tangent arm clock drive of his own design.

During his college years (majoring in physics), and following four years active duty in the U.S. Air Force (as an airborne radar tech), he settled in Phoenix and continued his interests in astronomy while working in aerospace.

In 1977 he co-founded the Saguaro Astronomy Club, still a highly successful, lively club today.

In 1985-6, he participated in a series of television programs on KAET-TV Channel 8 at Arizona State University – “SpaceProbe Eight” – broadcasting live images of Halley’s Comet and other sky events. Lucas engineered and operated the telescope hookup with a small TV camera and image intensifier equipment, and appeared on camera in live, unrehearsed interviews.

In 2001, the International Astronomical Union designated asteroid (17250) Genelucas, reflecting these accomplishments.

He is a long-time member of the International Occultation Timing Association, and continues to pursue and time the passage of asteroid shadows, using video equipment.

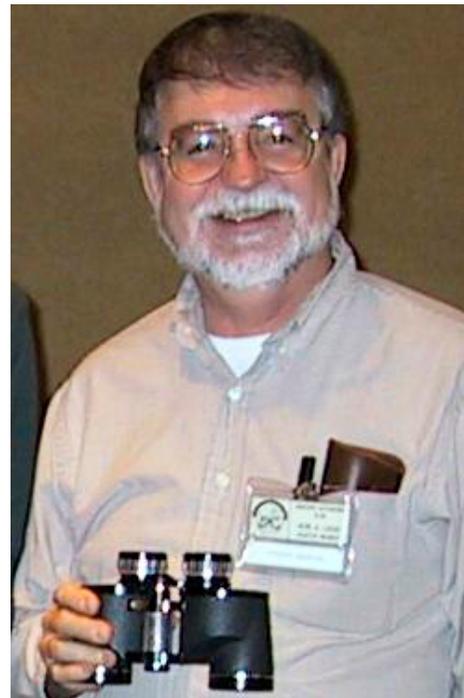
Over the years, he has made presentations at various astronomy conferences and club meetings on a number of topics, including occultations, video astronomy, and photometry of variable stars.

He is the co-author of a small book on astronomical electronic photometry using inexpensive equipment.

Since his recent retirement from a large aerospace firm, after 23 years in technical writing and editing on advanced technology topics, he now stays active by volunteering at the GRCO observatory in Gilbert, and attending activities of the two leading local astronomy clubs. In addition, he enjoys putting around in his home machine shop, tinkering with telescope equipment.

He recently attended the SAS Astronomical Sciences conference and the RTMC Astro Expo in Big Bear Lake, California, and the IMO Meteoroids 2010 conference in Breckenridge, Colorado.

Gene’s talk is entitled: *The Mystery (and History) of the Two Blue-Green Planets.*



The 2010 All-Arizona Star Party is scheduled for **November 5<sup>th</sup> - 6<sup>th</sup>**. The venue has changed... this year it will be held at the Hovatter Road site. This dark sky site (also known as the Antennas site) is located about 100 miles west of central Phoenix, just a couple of miles south of I-10 at exit #53. A map is available on the website and will appear in future issues of *The Observer*.

☾ **LAST QUARTER MOON ON AUGUST 2 AT 21:59**

○ **NEW MOON ON AUGUST 9 AT 20:08**

☽ **FIRST QUARTER MOON ON AUGUST 16 AT 11:14**

● **FULL MOON ON AUGUST 24 AT 10:05**

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**SPECIAL ANNOUNCEMENT**

Due to a scheduling conflict, Bob Birket's Astro-imaging Class scheduled for the 6:10 to 7:10 time slot on August 20<sup>th</sup> must be cancelled, and rescheduled for the September meeting night.

There will be no training class the night of the August General Membership meeting. The doors to the library will not be opened until 7:00 PM.

We apologize for any inconvenience, and look forward to the continuation of Bob's classes in September.



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# Upcoming Meetings

**August 20**  
**September 17**  
**October 15**  
**November 19**  
**December 17**  
**January 21**

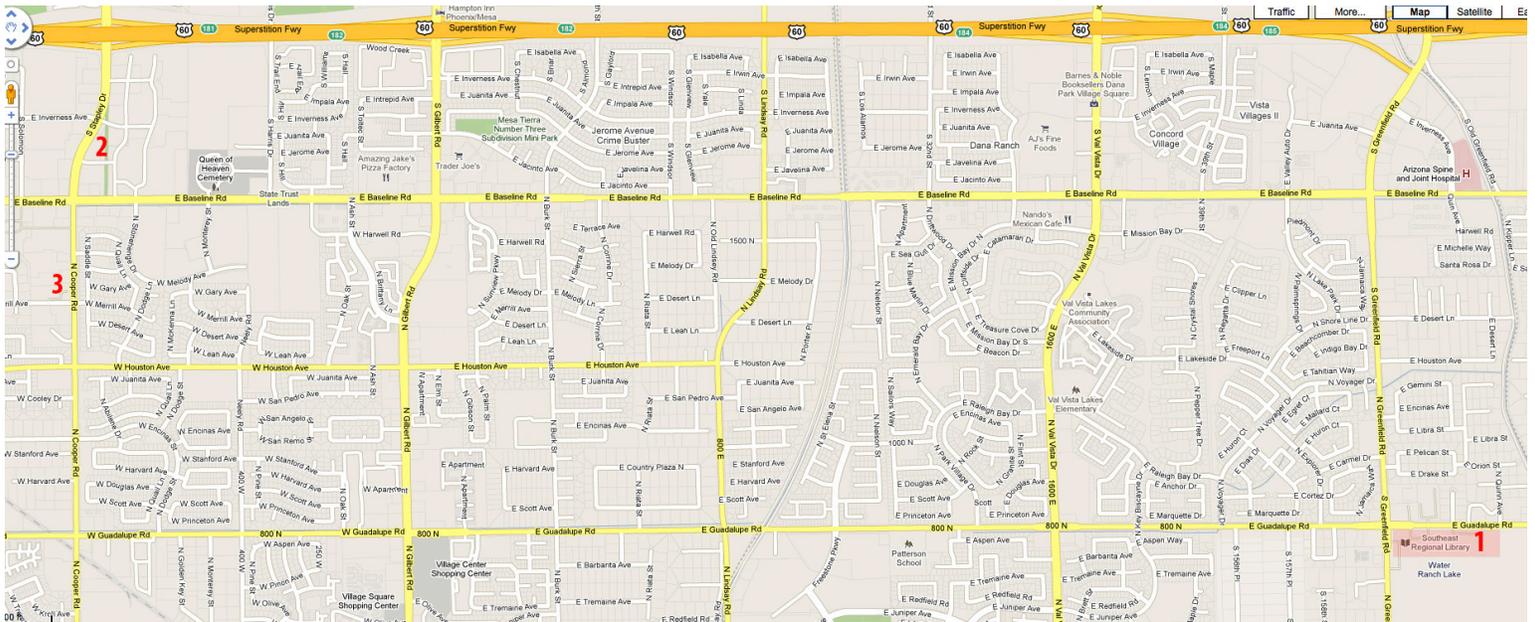
The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

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.

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.

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.

**Visitors are always welcome!**



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

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

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

## AUGUST 2010

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

**July 31** - Local Star Party at Boyce Thompson Arboretum

**August 13** - Public Star Party & SkyWatch at Riparian Preserve

**August 13** - Perseids Meteor Shower

**August 20** - General Meeting at Southeast Regional Library

## SEPTEMBER 2010

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

**September 4** - Local Star Party at Boyce Thompson

**September 10** - Public Star Party & SkyWatch at Riparian Preserve

**September 17** - General Meeting at SE Library

# East Valley Astronomy Club -- 2010 Membership Form

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

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

Select one of the following:

New Member
  Renewal
  Change of Address

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

<input type="checkbox"/> <b>\$30.00 Individual</b> January through March	<input type="checkbox"/> <b>\$22.50 Individual</b> April through June
<input type="checkbox"/> <b>\$35.00 Family</b> January through March	<input type="checkbox"/> <b>\$26.25 Family</b> April through June
<input type="checkbox"/> <b>\$15.00 Individual</b> July through September	<input type="checkbox"/> <b>\$37.50 Individual</b> October through December
<input type="checkbox"/> <b>\$17.50 Family</b> July through September	<input type="checkbox"/> <b>\$43.75 Family</b> 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: <input style="width: 300px; height: 25px;" type="text"/>	Phone: <input style="width: 300px; height: 25px;" type="text"/>
Address: <input style="width: 300px; height: 25px;" type="text"/>	Email: <input style="width: 300px; height: 25px;" type="text"/>
City, State, Zip: <input style="width: 250px; height: 25px;" type="text"/>	<input type="checkbox"/> Publish email address on website URL: <input style="width: 300px; height: 25px;" type="text"/>

**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):

<input type="checkbox"/> General Observing	<input type="checkbox"/> Cosmology
<input type="checkbox"/> Lunar Observing	<input type="checkbox"/> Telescope Making
<input type="checkbox"/> Planetary Observing	<input type="checkbox"/> Astrophotography
<input type="checkbox"/> Deep Sky Observing	<input type="checkbox"/> 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](http://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.

# EAST VALLEY ASTRONOMY CLUB

## *Release and Waiver of Liability Assumption of Risk and Indemnity Agreement*

I have read the Constitution and Bylaws of East Valley Astronomy Club and the guide to proper star party etiquette (documents freely available on its website) and hereby agree to abide by all specified rules and guidelines as a member of this club.

In consideration of attending any Star Party or other event 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 or other event and related areas.

I further agree that EVAC and its respective officers, directors, and agents (hereinafter referred to as the "Released Parties") shall not be liable or responsible for injury to me or damage to my property occurring during any EVAC events and resulting from acts or omissions occurring during the performance of the duties (in sponsoring, planning or conducting said events) of the "Released Parties", even where the damage or injury is caused by negligence (except willful neglect). I understand and agree that all EVAC members and their guests participate voluntarily and at their own risk in all EVAC activities and I assume all risks of injury and damage arising out of the conduct of such activities. EVAC only recognizes those who are members or invitees and who also have a signed Release and Indemnification Agreement on file as participants at an EVAC Star Party.

I release and hold the "Released Parties" harmless from any injury or loss to my person or property which may result from my participation in any EVAC activities and events. I understand that this means that I agree to indemnify any party indicated above should such party suffer any claims, liabilities, losses, demands, causes of action, suits and expenses (including legal 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 or other event. 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.

I further agree to waive all benefits flowing from any state statute which would negate the limit or scope of this Release and Indemnification Agreement.

By signing this Release, I certify that I have read this Release and fully understand it and that I am not relying on any statements or representations made by the "Released Parties".

---

*Member name (PLEASE PRINT)*

---

*Date*

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*Member signature*



## The Sun Can Still Remind Us Who's Boss

by Dr. Tony Phillips

Grab your cell phone and take a good long look. It's indispensable, right? It tells time, surfs the web, keeps track of your appointments and, by the way, also makes phone calls. Modern people can hardly live without one.

One good solar flare could knock it all out. "In the 21st century, we're increasingly dependent on technology," points out Tom Bogdan, director of NOAA's Space Weather Prediction Center in Boulder, Colorado. "This makes solar

activity an important part of our daily lives." Indeed, bad space weather can knock out power systems, telecommunications, financial and emergency services—basically, anything that needs electronics to work. That's why NOAA is building a new fleet of "space weather stations," the GOES-R satellites.

"GOES-R will bring our existing fleet of weather satellites into the 21st century," says Bogdan. "They're designed to monitor not only Earth weather, but space weather as well."

NOAA's existing fleet of Geostationary Operational Environmental Satellites (GOES) already includes some space weather capabilities: solar ultraviolet and X-ray telescopes, a magnetometer and energetic particle sensors. GOES-R will improve upon these instruments and add important new sensors to the mix.

One of Bogdan's favorites is a particle detector named "MPS-Low," which specializes in sensing low-energy (30 eV – 30 keV) particles from the sun.

Who cares about low-energy particles? It turns out they can be as troublesome as their high-energy counterparts. Protons and other atomic nuclei accelerated to the highest energies by solar flares can penetrate a satellite's exterior surface, causing all kinds of problems when they reach internal electronics. Low-energy particles, particularly electrons, can't penetrate so deeply. Instead, they do their damage on the outside.

As Bogdan explains, "Low-energy particles can build up on the surfaces of spacecraft, creating a mist of charge. As voltages increase, sparks and arcs can zap electronics - or emit radio pulses that can be misinterpreted by onboard computers as a command."

The Galaxy 15 communications satellite stopped working during a solar wind storm in April 2010, and many researchers believe low-energy particles are to blame. GOES-R will

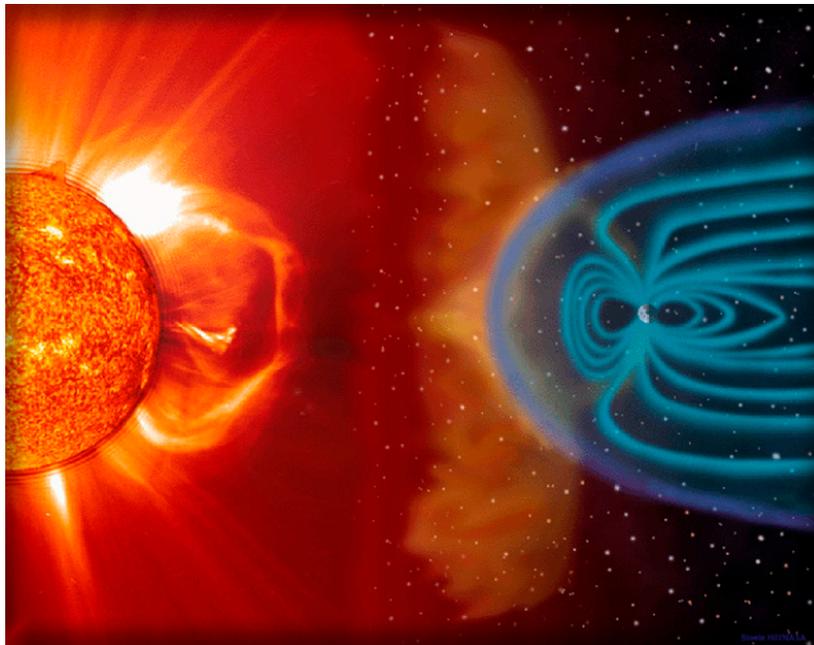
be able to monitor this population of particles and alert operators when it's time to shut down sensitive systems.

"This is something new GOES-R will do for us," says Bogdan. The GOES-R magnetometer is also a step ahead. It will sample our planet's magnetic field four times faster than its predecessors, sensing vibrations that previous GOES satellites might have missed. Among other things, this will help forecasters anticipate the build-up of geomagnetic storms.

And then there are the pictures. GOES-R will beam back striking images of the sun at X-ray and extreme UV wavelengths. These are

parts of the electromagnetic spectrum where solar flares and other eruptions make themselves known with bright flashes of high-energy radiation. GOES-R will pinpoint the flashes and identify their sources, allowing forecasters to quickly assess whether or not Earth is in the "line of fire."

They might also be able to answer the question, Is my cell phone about to stop working? The first GOES-R satellite is scheduled for launch in 2015. Check [www.goes-r.gov](http://www.goes-r.gov) for updates. Space weather comes down to Earth in the clear and fun explanation for young people on SciJinks, <http://scijinks.gov/space-weather-and-us>.



*In spite of Earth's protective magnetosphere, solar storms can wreak havoc with Earth satellites and other expensive electronics on the ground.*

*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 2010

*Celestial events (from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find information) customized for Prescott, Arizona. Remember, the Moon is 1/2 degree or 30 arc-minutes in diameter. All times are Mountain Standard Time.*

For the first half of the month, at about 8:30 PM, you can watch Venus (magnitude -4), Saturn (magnitude 1), and Mars (magnitude 1.5) dance around each other low in the west. This is our last chance to view Saturn conveniently for half a year.

For the second week of the month, after about 1:00 AM, you can see comet 10P/Tempel in a dark sky. Use a medium (6 inch) telescope and the chart in Astronomy magazine (August 2010, p. 42) to track the 8th magnitude object down.

On Monday, August 2, the Moon is at third quarter phase and rises at 11:17 PM.

On Thursday, August 5, you can see some events with Jupiter's moons. Here is the schedule:

9:43 PM Jupiter rises with Ganymede's shadow on the planet.

11:55 PM Ganymede's shadow leaves Jupiter.

1:12 AM Ganymede moves in front of Jupiter.

1:16 AM Io's shadow falls on the planet.

2:20 AM Io moves in front of the planet.

3:30 AM Io's shadow leaves the planet.

4:00 AM Ganymede moves from in front of the planet.

4:32 AM Io moves from in front of the planet.

On Monday, August 9, it is new Moon and you have all night to hunt for faint fuzzies.

On Thursday, August 12, after about 11:00 PM, you might see some Perseid meteors. The radiant (the point in the sky from which the meteors seem to radiate) will be rising in the northeast. Twilight starts to interfere about 4:30 AM (August

13). (See the next item for another excuse to stay up late that night.)

On Friday morning, August 13, you can see some events with Jupiter's moons. Here is the schedule:

12:47 AM Ganymede's shadow falls on Jupiter.

3:10 AM Io's shadow falls on Jupiter (2 shadows).

3:55 AM Ganymede's shadow leaves Jupiter (1 shadow left).

4:07 AM Io moves in front of Jupiter.

4:42 AM Ganymede moves in front of Jupiter.

On Saturday, August 14, Io's shadow will be on Jupiter from 9:40 PM till 11:55 PM. Io itself will be in front of Jupiter from 10:33 PM till 12:45 AM.

On Monday, August 16, it is first quarter Moon which sets at 11:27 PM.

The night of Thursday, August 19, starting about 12:30 AM (August 20), you might be able to see the Moon occult the globular cluster M 22 in Sagittarius. There is no question that the Moon will move in front of the cluster. The question is, will the 83% illuminated Moon be so bright that you won't be able to see the stars in the cluster? At least the stars will disappear behind the dark limb of the Moon. Use as big a telescope and as high magnification as possible. The show should be over by about 12:45 AM.

On Saturday, August 21, about 4:30 AM, you can see Callisto pass just north of Jupiter.

On Tuesday, August 24, at 6:56 PM (10 minutes before sunset), the full Moon rises spoiling any chance of hunting for faint fuzzies tonight.

On Friday, August 27, Europa's shadow is on Jupiter from 9:57 PM till 12:41 AM. Europa itself is in front of Jupiter from 11:11 PM till 1:51 AM.

## From the Desk of the President

*Continued from page 1* This will become a good benefit for our members who wish to work on, and receive recognition for completed observation programs for the AL. At the July general membership meeting, Randy Peterson received the AL award for the Herschel 400. Randy is the first EVAC member to complete this award. Other of EVAC's members have done so, but claimed membership in other astronomy clubs for their AL certification. We will have more information on the benefits available through the AL in coming issues of the Observer. You can check out the observing programs at: <http://www.astro-league.org/observing> . Note that many of the programs overlap EVAC programs. However, the AL requirements are unique, and vary from EVAC requirements.

EVAC runs on all volunteer power. There are some 15 officer, board members, and committee heads. And those 15 people are very active in performing their EVAC duties. Additionally, there are many members who contribute to EVAC activities, such as public star parties, both at the Riparian, and at various

school, and municipal park events during the year. Without volunteer power, EVAC would not exist. My thanks to all those volunteers who seem to be always available when called upon.

And that brings us to our upcoming elections. October is coming and will be here before you know it. Of our nine (9) elected officers and board members, all but 3 of the positions must be filled with new VOLUNTEERS (who of course need to be "voted into office"). Some have already stepped forward, but we still need 3 more VOLUNTEERS for President, Vice-President, and Secretary. There is a chart elsewhere in this issue of the Observer, showing current officer, and those willing to server next year. Please consider this opportunity to do your part for the future of EVAC.

I will not be able to attend the August meeting, and probably not the September meeting either. Our hard working Vice President, Bill Houston, will be covering the meeting duties for me. Until we meet again, please "Keep Looking Up !".

# EVAC Governing Body for 2011

It's that time again... time to choose the governing body for EVAC in 2011. As specified in our bylaws, nominations are due by October with elections held at the November general meeting.

The bylaws stipulate that the elected positions each carry a two-year term limit. Three executive positions (President, Vice President and Secretary), as well as three Board positions have to be filled.

Is this the year you step forward and help run the club?

The table below shows the elected officer positions. Those in red will need to be filled for 2011. Those in green are OK.

President	David Douglass has reached the term limit	The Presidency must be filled for 2011
Vice President	Bill Houston has decided to forego his final year of eligibility to run for a Board of Director position	The Vice Presidency must be filled for 2011
Secretary	Dave Coshow has reached the term limit	The Secretary position must be filled for 2011
Board Member	Howard Israel has reached the term limit	This position must be filled for 2011
Board Member	Claude Haynes has reached the term limit	This position must be filled for 2011
Board Member	Tom Polakis has reached the term limit	This position must be filled for 2011
Board Member	Ray Heinle has one year of eligibility left	Ray has agreed to serve another year
Board Member	Ed Thomas has a year of eligibility left	Ed has agreed to serve another year

## All-Arizona Star Party (AASP) Update *New Date & New Location*

The East Valley Astronomy Club has announced a new date and a new location for the 2010 All Arizona Star Party (AASP). Previously, EVAC hosted this event during the new moon weekend in October. With that date falling in early October this year, the decision was made to move the event to the new moon weekend in November. This was to avoid the repeated problem of hot daytime temperatures during the event. ***The official date for the AASP is Nov 5<sup>th</sup> and 6<sup>th</sup>, 2010.***

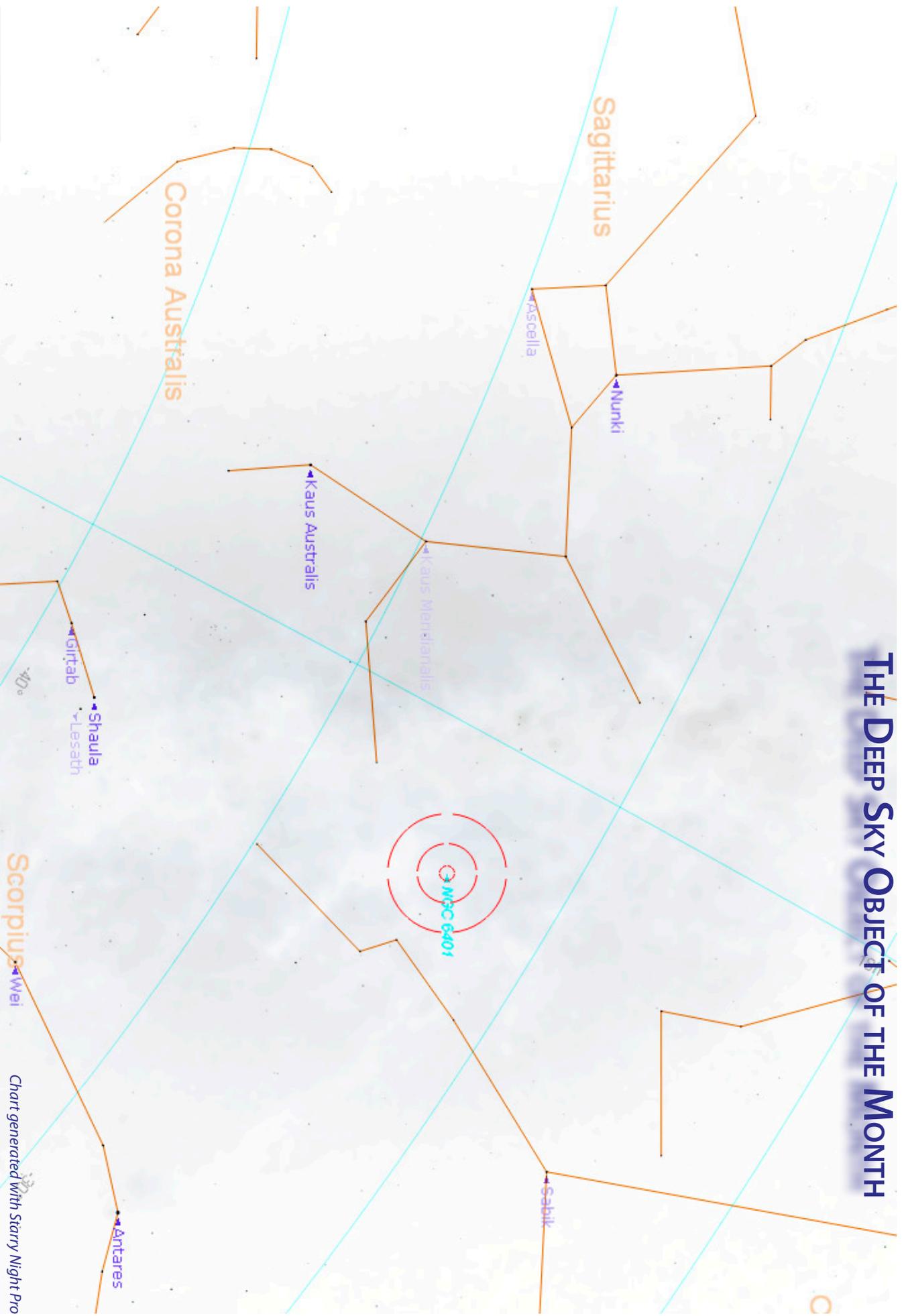
The new location is necessitated due to current political conditions in southern Arizona combined with recommendations of local law enforcement agencies. This year EVAC will be utilizing a BLM location normally used by the Saguaro Astronomy Club (SAC) for most non-summer events. This location, known to the SAC members as the "Antennas Observing Site", is also known as "Hovatter Rd". The location is 2 miles south of Exit 53 (Hovatter Rd) on Interstate 10. This site has a reputation of being a very dark site.

Access to the site is easy and gentle for private passenger cars, vehicles pulling trailers, and motorhomes. The grounds are in excellent shape, and will easily accommodate our normal crowds.

More information on the 2010 AASP will be made available on the EVAC website ( <http://www.evaconline.org> ) in the coming weeks.

If you have any questions about these changes you can contact EVAC President via email at: [President@evaconline.org](mailto:President@evaconline.org)

# THE DEEP SKY OBJECT OF THE MONTH



NGC 6401 Globular Cluster in Ophiuchus

RA: 17h 38m 37.0s Dec: -23° 54' 36" Magnitude: 7.40 Size: 4.8'

Chart generated with Starry Night Pro

# New EVAC Members in July

Sid Leach - Scottsdale

JaNel Grim - Gilbert

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