Volume 28 Issue 11

November 2014

The Observer

East Valley Astronomy Club

The Pleiades Deep and Dusty
APOD February 25, 2014 David Lane

Upcoming Events:

Public Star Party - November 14

Local Star Party - November 15

EVAC Monthly Meeting- November 21

Deep Sky Party - November 22

Check out all of the upcoming club events in the Calendars on page 11

Inside this Issue:

EVAC This Month

by Claude Haynes

The All Arizona Star Party was great fun. The unexpected clouds on Saturday kept a few folks away, but they cleared out and it was a beautiful night. Thanks again to everyone who helped with set up and take down. The best part of the party are the stars who help make it happen, and share their weekend with their fellow star gazers.

This month we elect officers for next year. The slate is:
President – Claude Haynes
Vice President – Dan Hahne
Secretary – Jan Barstad
Treasurer – Dave Shiel
Board – Gordon Rosner
Brook Scofield
Ken Sumiec
John Goerger
Wayne Thomas

Our speaker is Dr Buell T. Jannuzzi. He is the head of the Astronomy Department at the University of Arizona, and the Director of Steward Observatories, which includes Kitt Peak. It should be a great meeting.

Please check the calendar for school star parties. There are

Evac This Month

Continued from page 1

nine currently scheduled, plus the second Friday Public Star Party. They really are a lot of fun, and a great way to share the joy of our hobby.

Keep Looking up

Claude

If It's Clear…

by Fulton Wright, Jr. Prescott Astronomy Club

November 2014

If it's clear for November 2014
by Fulton Wright, Jr.
Prescott Astronomy Club

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.

The first few days of November are the best time to catch Mercury early in the morning. At 5:50 AM (about an hour before sunrise) Mercury will be about 5 degrees above the East horizon.

On the night of Friday, October 31, after midnight (Saturday), you can see some events with Jupiter's moons. Here is the schedule:
12:34 AM Jupiter rises with Ganymede's shadow on it.
01:13 AM Ganymede moves slightly in front of Io.
02:13 AM Ganymede's shadow leaves Jupiter.
02:24 AM Callisto's shadow falls on Jupiter.
03:38 AM Ganymede moves in front of Jupiter.
04:50 AM Callisto moves slightly in front of Io.
05:55 AM Nautical twilight starts.

On Sunday, November 2, at 2:00 AM, the rest of the United States will set their clocks back an hour as daylight savings time ends. Arizona, ignoring such silliness, will sleep peacefully through the night.

On Sunday, November 2, about 8:00 PM, you can see Algol, the famous variable star, at its minimum (magnitude 3.4). It will remain dim for about an hour, then slowly brighten to magnitude 2.1 as the night progresses.

On Tuesday, November 4, at 2:08 AM, Europa passes in front of Ganymede (two of Jupiter's moons).

On Thursday, November 6, at 5:42 PM (10 minutes after sunset), the full Moon rises, spoiling any chance of seeing faint fuzzies for the night.

On Tuesday, November 11, at 5:41 AM, Europa passes in front of Ganymede.

On Thursday, November 13, the Moon is at third quarter phase and rises at 11:42 PM.

On the night of Monday, November 17, the Leonid meteor "shower" peaks. The prediction is for nothing special, but with meteors, you never know.

On Wednesday, November 19, at 12:36 AM, Callisto almost completely covers Europa.

On the night of Thursday, November 20, you can see some events with Jupiter's moons. Here is the schedule:
11:24 PM Jupiter rises.
12:04 AM (Friday) Europa's shadow falls on Jupiter.
02:30 AM Europa moves in front of Jupiter.
02:54 AM Europa's shadow leaves Jupiter.
04:37 AM Io's shadow falls on Jupiter.
05:27 AM Europa moves from in front of Jupiter.
05:50 AM Io moves in front of Jupiter.
06:11 AM Nautical twilight starts.
06:53 AM Io's shadow leaves Jupiter.

On Friday, November 21, it is new Moon, and you have all night to hunt for faint fuzzies.

On Sunday, November 23, at 12:17 AM, Io will move in front of Jupiter and Europa will appear from behind Jupiter at the same time and in the same place. It will look like a satellite is bouncing off of Jupiter. Io's shadow is on the planet at this time.

If It's Clear...

Continued from page 2

On Tuesday, November 25, at 6:40 PM, you have another chance to catch Algol at its minimum. Again, it stays there for an hour then slowly brightens.

On Wednesday, November 26, at 8:28 PM, the Moon occults magnitude 6 Beta2 Capricorni. At 8:34 PM, the Moon occults magnitude 3 Beta1 Capricorni. Both stars are listed as wide doubles, so you may see more action. The stars appear from behind the bright limb of the Moon at 9:25 PM and 9:31 PM. At this time they will be only 3 degrees above the horizon.

On Friday, November 28, the Moon is at first quarter phase and sets at 12:03 AM (Saturday).

The Backyard Astronomer

by Bill Dellinges (November 2014)

The Fall Sky

Between summer and winter the night's stars are pretty tame. Like the spring, we are looking away from the plane of the Galaxy. In the spring we look north of the Milky Way band and in the fall, south of it. As a stargazer I have always had a penchant for facing initially south to get my celestial bearings. From this viewpoint the prominent fall constellation is Pegasus, the Flying Horse, nearly overhead (and upside down!). Pegasus is a large constellation but with rather dim second and third magnitude stars. Its main four stars make an asterism called the Great Square. This represents the steed's torso, though technically the northeast star of the Square, Alpheratz, is assigned to Andromeda. The northwest corner of the Square sprouts a string of third magnitude stars creating a pair of galloping legs. From the southwest corner a string of stars forms the long neck then turns northwest to the star Enif, the horse's snout - and a nice triple star.

Below the horse there is a large absence of stars all the way to the horizon because you are looking out of the plane of the Galaxy towards the South Galactic Pole (SGP). There are constellations here but they are dim ones like Capricornus, Piscis Austrinus, Aquarius, Pisces, and Cetus. These constellations are sometimes referred to as the "Watery Constellations" for obvious reasons. Though dim, two of them have lucidas worth noting. A neat coincidence is that both sides of the Great Square aim at them. A line drawn down the Square's west side points to Fomalhaut in Piscis Austrinus. A line drawn down the east side leads to Diphda in Cetus, the Whale. These two stars, magnitude 1.2 and 2.0 respectively, stand out conspicuously in this stellar void. The SGP is ten degrees due south of Diphda, very close to NGC 288.

While in the area of Pegasus, take a look at M15, one of the more impressive globular clusters in the sky. It can easily be found by following a line from Delta and Epsilon Pegasi northwestward. Higher up in the constellation is NGC 7331, a magnitude 9.5 galaxy. About half a degree southwest is a far more challenging object, Stephen's Quintet, a tight grouping of magnitude 13 galaxies 200+ light years away. I was unable to see them in an 11" telescope from my semi-rural site but have seen the grouping at a dark site with a C-14. This time of year one can also reap rewards by swinging a telescope towards the north and northeast. Directly north of the Square in western Andromeda is a fine planetary nebula, NGC 7662. You can catch this "Blue Snowball" in just about any sized telescope. Ten degrees west in Lacerta is a marvelous multiple star. Eight Lacertae (SAO 72509) has five components and is like a small star cluster! I can see them all in my 11" at 107x. Certainly one of the finest deep sky objects in the sky is the Double Cluster in Perseus. It can be detected naked eye even in semi light polluted skies. Located between Perseus and Cassiopeia, the twin clusters are seen to best advantage in instruments yielding a field of view of at least one degree. I can get that with the 11" using a 55mm eyepiece and the view is stunning. Fortunately for field challenged scopes, the clusters have similar declinations so one can easily slew back and forth to see one, then the other in the center of the eyepiece. While each cluster is wonderful, my favorite is the western cluster NGC 869 which has a denser core with a jewel-like spattering of colorful stars. There is an interesting chain of stars running from NGC 869 northwestward to the large sparse star cluster Stock 2. That trip is best made with binoculars.

Turn southward to visit a most interesting and overlooked object in Perseus. Its brightest star is Mirphak and as you

The Backyard Astronomer

Continued from page 3

study it, you may notice there is a soft glow below it. Spy it with a binocular with a seven degree field and you will be delightfully surprised. This is the large open star cluster Melotte 20 (aka, the Perseus OB Association). To me the brighter stars form a serpentine-like "S". Seen on tripod mounted binoculars, I feel it's almost as pretty as the soon to rise Pleiades.

Another neglected object in the area is poor M34, an otherwise respectable open star cluster located midway between Almaak (Gamma Andromedae) and Algol (Beta Persei). I don't think I've ever heard anyone at a star party shout out, "Hey, I've got M34 here!" It was very nice in the 11" at 90x but the clusters stars barely fit in the scope's 0.9 degree field.

Let's end our voyage with the best galaxy in the sky – the great Andromeda Galaxy, M31. It needs no introduction. You WILL need a large field of view for this baby. It's two and half degrees long – five full moons (in a dark sky). It's huge because it's "close", only 2.5 million light years away. It's probably the most distant thing in the sky you can see with the naked eye. This galaxy can easily be seen in any binocular or 8x50 finder. It's placed just above a line from Beta and Mu Andromedae. In my 11" at 90x and 0.9 degree field, I can get both M31 and its satellite galaxy M32 in the same field. M31 is elongated because we view it obliquely. Dark lanes between spiral arms can usually be seen but only at dark sites. If I slew M32 just out of the field, I can pick up M110 (NGC205) on the other side of M31. The ghostly M110 is much fainter than M32 and can be easily missed. The best views of this trio are through wide field short focus telescopes.

These objects are just a few of the treasures in the fall sky. Many more can be found in your atlases. Enjoy them as a warm up for the coming winter goodies.

Magnetars Part I

by Henry De Jonge IV

Introduction

Magnetars are a very rare and exotic item. They possess the most powerfully known magnetic fields in the Universe, are not well understood, and bring to light extreme, strange, and as yet unexplained phenomena.

When I began investigating these objects I thought it would be "fairly" straightforward to study them as a small subset of NS-however they turned out to be more complex than originally thought (who would think?!) and with all the new discoveries about them, this turned out to be a bigger project than anticipated. Thus we will look briefly at magnetars in 2 parts. In this first section we will look at what they are, some of their unusual properties and characteristics, and how common are they. In section 2 we will examine theories about their origins, their cosmic roles, and future research, before offering a short summary.

What they are and some of their properties

Magnetars are a rare type of young neutron star, (NS) with an extremely powerful magnetic field. A neutron star is a stellar remnant that results from the collapse of a very massive star in a supernova explosion which does not collapse further into a BH. As such they have the densest matter in the Universe, about 10 times that of a normal atomic nucleus. Stars in the range of 20-25 solar masses are considered good candidates for NS. Only about 10% of NS, (of which slightly over 2,000 are known to date) are thought to become magnetars. They are suspected to be only on the order of thousands of years old and seem to be relatively isolated. Some of their ages can also be inferred by their location as SN remnants. It is suspected that there are millions of magnetars in our galaxy alone, obviously most still undetected.

Figure 1. Relative size of a Magnetar

Pulsars and magnetars are types of neutron stars, the crushed core of a star that has exploded. Neutron stars crush half a million times more mass than Earth into a sphere no larger than Manhattan. It is their powerful magnetic field and its eventual decaying that is thought to power their high energy x-rays and gamma rays. They emit overall high energy x-rays and gamma rays combined with sporadic higher than average outbursts of of X-rays and gamma rays. These transient x-ray outbursts can

Magnetars Part I

Continued from page 4

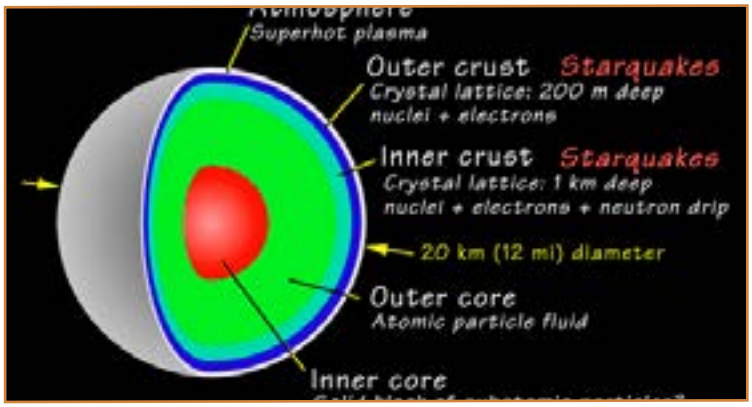


Figure 2. Simplified structure of a neutron star

last from milli-seconds to years and are also known as quasiperiodic oscillations or QPOs. They generally have spin rates lower than that of most NS. Their spin rate ranges from about 0.2-12 seconds while their overall x-ray luminosities are in the range of 10 to the 31st to 10 to the 35th erg/sec. This large output of energy is mainly powered by their intense surface magnetic fields which are at least 100,000,000,000,000 to 10,000,000,000,000,000 Gauss. The interior magnetic fields of magnetars are thought to be several orders of magnitude stronger!

For perspective remember that the surface magnetic field of the earth is about 0.25-0.65 Gauss, and that of the Sun is about 1 Gauss, a common hand held magnet is about 100 Gauss, a sunspot can be in the range of a few thousand Gauss, an MRI machine makes about 10,000 Gauss, the strongest magnetic fields briefly produced on Earth are about a few million Gauss, and a "normal" pulsar is about 10 to the 12th Gauss. So magnetars have magnetic fields that are hundreds to thousands of times stronger than a regular pulsar. In general magnetar activity is proportional to the third power of the magnetic field which makes magnetars very sensitive to any magnetic field changes in, on, or nearby the magnetar.

Figure 3. Artistic conception of a magnetar showing field lines

The general theory of magnetars was proposed in the early 1990's however the first powerful outbursts were thought to have been detected in the late 1970's. The general theory predicts that magnetars, (neutron stars) are about 1.4 solar masses with a radius of 10-20km, (or about 6-10 miles). The magnetic field structure and strength seems to be radically different between a regular pulsar and a magnetar. The interior of NS and magnetars is usually modeled as a neutron superfluid, (some even think it can be thought of as a quark star).

Like magnetars, isolated NS also generally have a decreasing rotation rate, (but generally have much higher spin rates) which are thought to be caused by magnetic field dipole radiation loss over time. Also some magnetars have been known to suddenly increase their spin rates or more infrequently suddenly decrease their spin rates before sometimes speeding back up. This strange behavior is also not well understood. We will examine these ideas more closely next month. Remember that all pulsars are neutron stars but that not all neutron stars are pulsars, while all magnetars are pulsars, but not all pulsars are magnetars.

Very strange things can happen in the intense magnetic fields about and in magnetars, such as energetic x-ray photons being split or merging together, the space-time vacuum can become polarized, (magnetic lensing) and atoms can be deformed into strange shapes like cylinders and even needles. Theoretically the most powerful magnetic field that can be made is about 10 to the 49th to 10 to the 53rd Gauss, at which point the basic structure of space-time, (quantum foam) would break down.

How common are they?

There are less than a couple of dozen known magnetars in the Universe to date, (21 as of August 2014 with 5 additional candidates). Generally we detect them by their powerful and often frequent gamma ray and x-ray outbursts, however it is thought that for the older magnetars they may only experience such outbursts about once a year. Here we describe a few known examples of magnetars.

SGR 0418+5729 is a magnetar recently discovered in 2009 by its highly powered burst of x-rays. It lies in our galaxy about 6500 ly from earth. Prior to this flare up the magnetic field was in the order of 10 to the 12th Gauss but the flare indicated a localized magnetic strength of about 10 to the 15th Gauss! It is thought that this flare up, which has been declining over the years occurred on an area of only a few hundred meters on the surface of the magnetar and is yet one of the most powerful bursts seen in the Universe!

Magnetars Part I

Continued from page 5

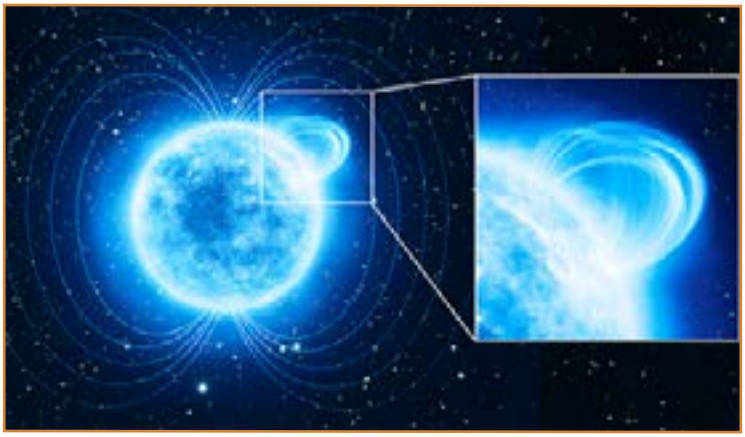


Figure 4. Artistic version of a magnetic loop outburst on SGR 0418+5729 as detected by NEWTON

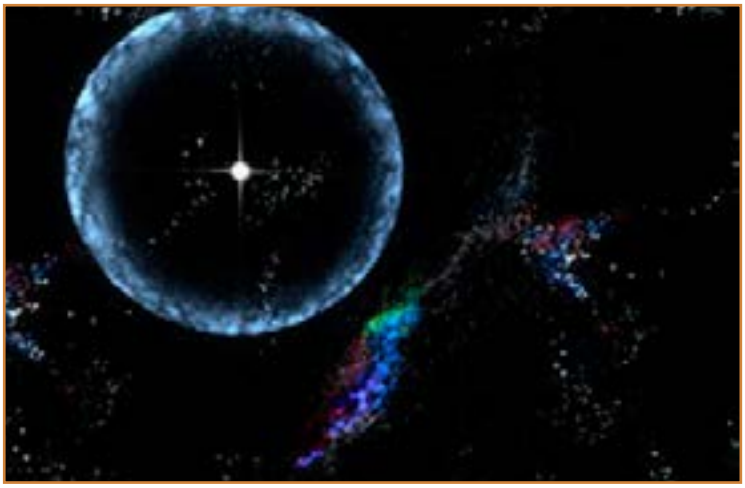


Figure 5: On 27 December 2004, a burst of gamma rays from SGR 1806-20 passed through the Solar System. This powerful burst had effects on Earth's atmosphere, despite its distance of about 50,000 light years in the constellation Sagittarius, (artists drawing of event).

Magnetar 1E 1841-045 is located in the SN remnant Kes 73 and was first identified in 1997. It has a slow 11.8s spin period with a magnetic field of 7 x 10 to the 14th Gauss. This SNR is thought to be between 750-2,000 years old with a large progenitor mass of over 20 solar masses. It has been measured by RXTE, INTEGRAL, SWIFT, NEWTON, CHANDRA, and NuSTAR. This detailed analysis has given us great information for the models of magnetar emissions which is still being debated.

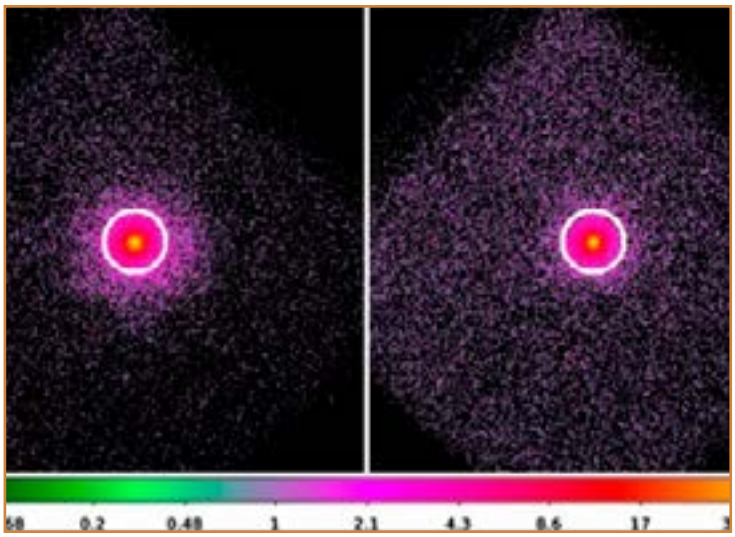


Figure 6. NuStar images of magnetar 1E 1841-045 with flare showing.

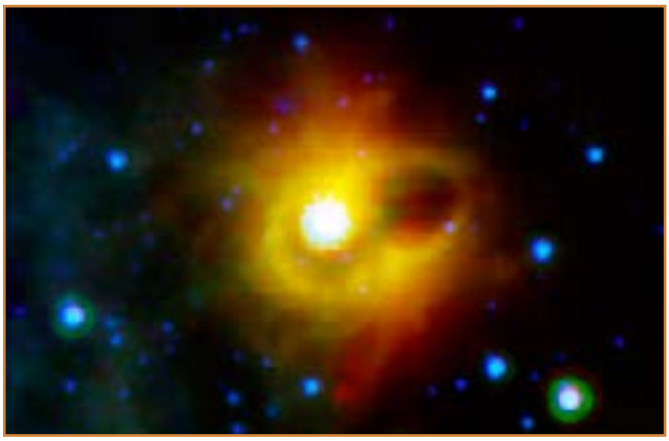


Figure 7: Magnetar SGR 1900+14 is in the center of the image, which shows a ring of gas seven light-years across in the infrared, as seen by the Spitzer Space Telescope in 2008. This ring is thought to be from a very powerful burst in 1998 that was so powerful that it saturated 2 satellite gamma ray detectors and almost caused an automatic shutdown of the gamma ray detector on the NEAR satellite. The magnetar itself was born in a SN explosion about 1,500 years ago, is visible in X-ray light, and is about 20,000 ly distant in the constellation Aquila.

Summary Part 1

We have seen that magnetars are very strange and powerful objects which are somewhat rare and very complex. We still do not know where the magnetic fields of massive stars come from or how it evolves. Our journey in this arena is just beginning. Next part we will examine their unique cosmic roles and theories of origin. Exotic objects like AXPs, SGRs, MWDs, SN, GRBs, and even BHs will all play a role. Thank you.

*Full Moon on November 6 at 17:23

Last Quarter Moon on November 14 at 10:16

New Moon on November 22 at 7:32

First Quarter Moon on November 29 at 5:06

East Valley Astronomy Club Election of Officers

Friday - November 22, 2014

President - Claude Haynes

Vice President - Dan Hahne

Secretary - Jan Barstad

Treasurer - Dave Shiel

Board Members:

John Goerger

Gordon Rosner

Brook Scofield

Ken Sumiec

Wayne Thomas

Looking for that perfect weekend activity?

Why not resolve to getting involved?

Contact Dave Coshow to join the staff at GRCO

Email: grco@evaconline.org

Business For Sale

Successful astronomy-related manufacturing business for sale, currently doing business in Northern Arizona. Popular astronomy brand with great reputation and strong international sales.

Please call for more information.

(702) 823-8087 ask for Robert.

Upcoming Meetings

November 21

December 19

January 16

February 20

March 20

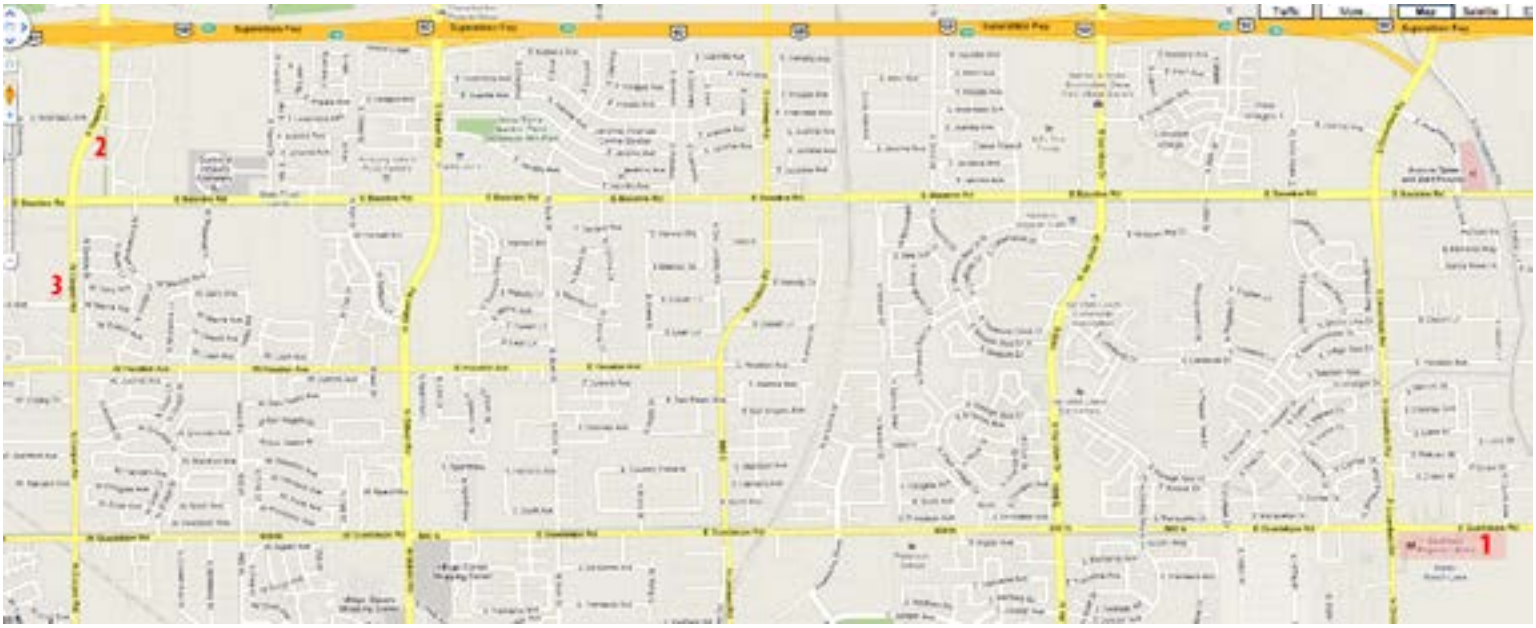
April 17

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.

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

November 2014

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

Nov 6 - Paragon Science Academy

Nov 10 - J. O. Combs Middle School

Nov 12- Higley Unified Schol District

Nov 13 - Elona P Cooley Childhood Devel.

Nov 14 - Public Star Party

Nov 15 - Local Star Party

Nov 17 - Zaharis Elementary

Nov 19 - Arcadia Learning Center

Nov 20 - Biscayne Bay

Nov 21 - EVAC Monthly Meeting

Nov 22 - Deep Sky Star Party

December 2014

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	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			

Dec 2 - Smith Junior High

Dec 4 - Concordia Charter School

Dec 5 - Centennial Middle School

Dec 9- Akimel A-al Middle School

Dec 10 - Poston Junior High

Dec 11 - Edu-Prize School

Dec 12 - Riparian Public Star Party/Skywatch

Dec 13 - Local Star Party

Dec 15- Fremont Junior High

Dec 16 - Queen Creek Middle School

Dec 19 - EVAC Monthly Meeting

Dec 20- Deep Sky Star Party

East Valley Astronomy Club -- 2013 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

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$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**

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.evaconline.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.

The Observer is the official publication of the East Valley Astronomy Club. It is published monthly and made available electronically as an Adobe PDF document the first week of the month. Printed copies are available at the monthly meeting. Mailed copies are available to members for a slight surcharge to offset printing and mailing expenses.

Please send your contributions, tips, suggestions and comments to the Editor at: news@evaconline.org Contributions may be edited. The views and opinions expressed in this newsletter do not necessarily represent those of the East Valley Astronomy Club, the publisher or editor.

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www.evaconline.org

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