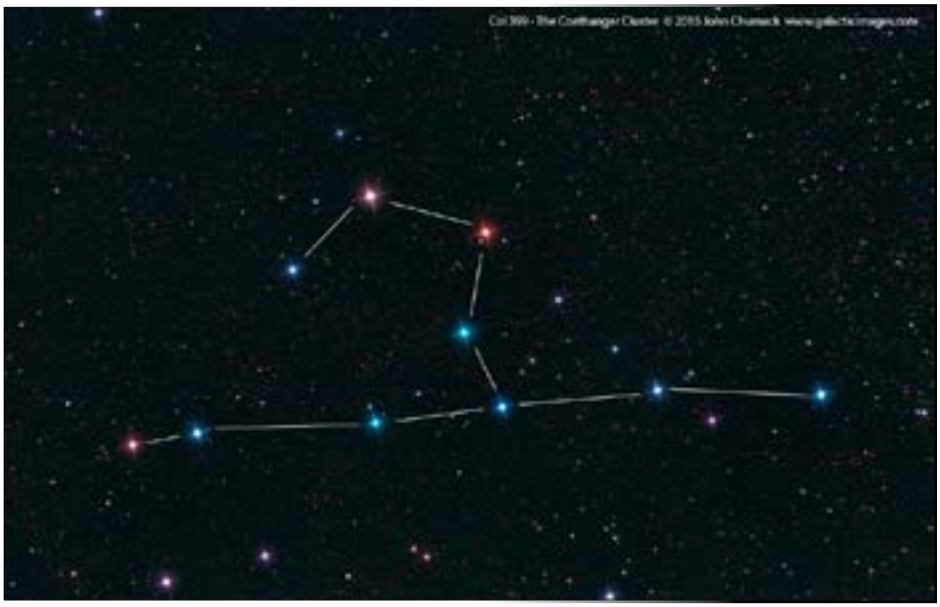
Volume 30 Issue 8

August 2016

The Observer

East Valley Astronomy Club



Collinder 399 the Coat Hanger
APOD 2015 August 26 - John Chumack

Upcoming Events:

Deep Sky Party - August 6

Public Star Party - August 12

Explore the Night Sky - August 15

EVAC Monthly Meeting - August 19

Meet at MCC Planetarium

1833 W Southern Ave

Mesa AZ

Local Star Party - August 27

Check out all of the upcoming club events in the Calendars on page 12.

Inside this Issue:

EVAC This Month

by Don Wrigley

This month we will have a special meeting at Mesa Community College Planetarium, at the corner of Dobson and Southern, (1833 W Southern) in Mesa. Dr. Kevin Healy will give a tour of the planetarium. THERE IS NO MEETING IN THE LIBRARY - MEET IN THE PLANETARIUM!

The pre-meeting dinner will be held at the usual time and place. Everyone is welcome to join us at the Golden Corral restaurant, located at 1318 N. Cooper Rd in Gilbert, beginning at 5:30 PM.

I still have quite a few tickets left for the Labor Day Weekend trip to Lowell Observatory. We will have them available at the August meeting . This is a rare opportunity to have a private tour and observing session with the newly refurbished, historic 24 inch Clark refractor. It has been completely restored, and is now a sparkling tower of fresh paint and polished brass.

All this takes place on the Sunday of Labor Day Weekend. We will leave from the Gilbert Library at 4:00 PM, and expect to arrive at Mars Hlll sometime between 7:00 and 7:30 PM. After we arrive, we

EVAC This Month

Continued from page 1

will have pizza in the lecture hall. I am told that the bookstore will be open for us prior to our observing session, which begins at 8:30 PM and ends at 10:00 PM. Tickets are only $25 for the cost of the trip, the admission to the observatory and the pizza dinner. Don't miss out on this once in a lifetime observing opportunity!

Don Wrigley

If It's Clear…

by Fulton Wright, Jr. Prescott Astronomy Club

August 2016

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

On Tuesday, August 2, it is new Moon and you have all night to hunt for faint fuzzies.

On Thursday, August 4, about 8:00 PM, you can see the thin crescent Moon near Mercury, and down and to the right, Venus near regulus. The next night the Moon has moved near Jupiter, but Venus is still near Regulus. This will be a difficult observation because it all happens very low in the West.

On Saturday, August 6, at 8:20 PM, the Moon occults the 4th magnitude star, Eta Virginis. The star reappears on the bright limb of the Moon at 9:18 PM, before the 9:47 PM setting of the star.

On Wednesday, August 10, the Moon is at first quarter phase and sets at 12:04 AM (Thursday).

On the night of Thursday, August 11, the Perseid meteor "shower" peaks. The Moon sets about 12:40 AM (Friday) and after that you should have a dark sky for observing. The prediction is that the event might even be better than usual. But remember, with meteors, there are no guarantees.

On Saturday, August 13, as darkness is falling (about 8:00 PM) the Moon will be passing through the open cluster,

M23. I'm not sure how much of the show will be visible, but it might be worth a look.

On Wednesday, August 17, at 6:51 PM (24 minutes before sunset), the full Moon rises spoiling any chance of seeing faint fuzzies for the night.

On Tuesday, August 23, after about 8:00 PM, you can see Mars pass between Antares (which also looks red) and Saturn. The show will also be good the night before and after.

On Wednesday, August 24, the Moon is at last quarter phase and rises at 11:43 PM.

On Saturday, August 27, in the early evening, you can see two bright planets near each other. Venus (magnitude -4) and Jupiter (magnitude -2) are 12 arc-minutes (less than half a full Moon diameter) from each other. The sun sets at 7:00 PM. The pair set an hour later. Look low in the West. Mercury (magnitude 1) is nearby (down and to the left) and sets 15 minutes before the other planets.

On Wednesday, August 31, it is new Moon (second time this month) and you have all night to hunt for faint fuzzies.

The Backyard Astronomer

by Bill Dellinges (August 2016)

Wonders of the August Sky

Midmonth finds the Milky Way ranging from the northeast to the southwest providing perhaps the best view we get of our home galaxy all year. This is possible because our Solar System is located halfway, about 26,000 lights years (LY), from the galaxy's center and outer edge. In a dark sky, this affords us a wonderful view of its myriad stars and meandering dark lanes of gas and dust. It's amazing that we can observe much of the structure of our own galaxy when we reside inside it! (Our Galaxy's spiral arms can be partially made out with radio telescopes).
The Milky Way "band" represents the main plane of our galaxy. Any constellations superimposed on it will contain the richest harvest of deep sky objects. One could spend an entire summer evening gorging on this booty. Let's take a look at some of its enticing treasures.

In Scorpius, Saturn, Mars and Antares are putting on quite a dance this month. On the 23rd all three will form a straight vertical line. Saturn's rings are tilted 26 degrees, almost to their maximum angle of 27 degrees. Looking down at you from high on the meridian is the Summer Triangle, a popular asterism comprised of Altair, Vega and Deneb. Their distances in light years (LY) are 16 LY, 25 LY and 2,600 Ly respectively. Altair was the star visited by spacemen in the 1950's sci-fi movie Forbidden Planet. Vega was the star Jodie Foster was transported to in the movie Contact (or was she?). Though Deneb looks like the faintest star in the Summer Triangle, it's really intrinsically the brightest star of the three. We stargazers normally deal with the apparent magnitudes of stars. There is another neat magnitude system called absolute magnitude, which is what a star's magnitude would be if placed 10 parsecs away (32.6 LY). This allows us to judge how bright stars really are because now we have them lined up at the same distance. So, we had Altair, Vega and Deneb with apparent magnitudes of +0.75, +0.03 and +1.26 respectively. Now put all three 32.6 LY away. How bright are they now? (keep in mind the bigger the number, the dimmer the star). Altair is now magnitude +2.1 because we increased its distance, Vega is now +0.3 for the same reason. But because we moved Deneb towards us from 2,600 LY to 32.6 LY, its magnitude is now -7.1! We say these are the star's absolute magnitude. We see our Sun as a -27 magnitude star but placed at 32.6 LY, its absolute magnitude would be +4.8, barely visible to the naked eye. Deneb is a white supergiant star, a real blow torch 60,000 times the luminosity of the Sun. It puts out more energy in one second than the Sun does in a day.

You can take your pick among a plethora of fine planetary nebulae in the summer skies: M27 (Vulpecula), M57 (Lyra), NGC 6543 (Draco) and NGC 7662 (Andromeda). M27 is the brightest planetary and rewarding in just about any sized telescope. It looks like a big cotton ball suspended in space.

Sagittarius contains more Messier objects (15) than any other constellation. One could easily spend several hours observing deep sky objects within its confines. The reason for this richness is that when we look in the direction of Sagittarius, we are looking towards the Galaxy's center where stars and nebulae are more numerous. Be sure not to miss M8, the Lagoon Nebula, M17, the Swan Nebula, M22, an impressive globular star cluster and the M24 Star Cloud. The latter stands out to the naked eye as a bright oblong detached piece of Milky Way between M8 and M17. It's a spectacular scene to behold in a 10x70 or 16x70 binocular, way too large for most telescope fields (60'x90').

If you find a break in this summer's monsoon season, take a look at some of these objects, you're sure to get happy feet.

Lets Get Naked and Singular

by Henry De Jonge IV

Introduction

Good-now that I have your attention let's discuss "naked singularities" (NS). In General Relativity, (GR) a naked singularity is a gravitational singularity without an event horizon. We usually assume that all gravitational singularities are black holes, (BH) which have around them an event horizon, (Schwarzschild or Kerr, etc.) that once beyond it nothing can ever come back out whether it be matter, energy, or information. That also means that we can never observe what is beyond this barrier, including the singularity itself. However the idea that the event horizon may not always be necessary is being discussed more nowadays by relativists and astronomers. In this brief paper we will talk about the possible existence of these naked singularities and some of their implications.

Naked Singularities and General Relativity

In GR we generally use Einstein's equation Guv = 8πTuv to investigate the spacetime geometry around events or regions of spacetime or even the entire Universe, as described by particular distributions of matter and energy. The curvature/gravity of the region as described on the left side of the equation is determined by the distribution of matter and energy as described on the right side of the equation-and vice versa.

This equation is very difficult to solve exactly due to the nonlinear nature of the partial differential equations derived in calculating the solution called the metric, (guv) which gives a detailed description of the spacetime geometry, (and gravity). In using this equation to describe the collapse of supermassive stars or massive regions of matter, (like dust clouds) it is generally initially assumed that the distribution of matter is spherical, uniform, homogeneous, and the forces like pressure are also evenly distributed or even nonexistent, so that the collapse is nice and symmetrical. Once we pass into initial conditions that are non-ideal, (like the real Universe) we encounter very great difficulties in solving Einstein's equation and resort to numerical methods with computers.

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

Figure 1. Einstein's Equation with Cosmological Constant

In using these numerical methods and non-ideal initial conditions, it has been found that solutions exist that can bring forth a temporary, partial, or non-existent event horizon. This seems especially possible when the collapse of matter fields is non symmetric due to uneven initial distributions of matter, (like clumps and irregular regions of high density) and/or various forces, (like pressure) acting upon and within the collapsing matter are included and may also be irregular. Basically the event horizon may never form, it may only form in small regions, form temporarily, or form much later in the process, thus creating for various periods of time, a naked singularity. This NS is essentially a BH center without any "shielding" from the rest of the Universe. It turns out that the initial conditions are a key parameter in the possible formation of a NS.

The main difference between a NS and a BH is the lack of an event horizon. It was postulated in the 1960s by Roger Penrose that all gravitational singularities must be surrounded by an event horizon-this is called the Cosmic Censorship Conjecture, (CCC). Basically it says that there are no "naked singularities" (that is a BH without an event horizon) formed in the Universe. However this conjecture makes many assumptions like those mentioned before and is still not 100% proven, despite it being quite "sensible" according to our current understanding. It is thought that there may be conditions in the Universe which cause this to be violated and which are still quite compatible with GR. Thus the quest for further understanding.

When solving Einstein's equation with very ideal conditions, it has been shown that normally the event horizon will form before the singularity, (although we do not know for sure) thus forever blocking us from observing what happens within. However if a NS were to form then we would be privileged to actually see what occurs "inside" the event horizon so to speak. A singularity is defined as a region, (more of an event than object?) of infinite density and infinite curvature, a topological change in the spacetime, (tear or hole?). As soon as a singularity occurs our ability to predict the future ceases. In GR nomenclature, a NS has future directed non-space like curves which reach infinity in the future and in the past terminate at the singularity. Basically we would be able to see, (and possibly travel or obtain information from) all the way to this singular point. Thus viewing the singularity as close as we wish, (without exactly being in it) may give us a clue to under-

Continued from page 4

standing quantum gravity for example, as at such points quantum effects are expected to dominate.

Besides stellar core collapse and collapsing dust models, other possible methods of forming a NS include disrupting a rapidly spinning BH, (as described by the Kerr metric). This may be done by adding some matter to the already spinning BH in certain ways and making it "super spinning" or by adding some charged matter to a spinning charged BH. This will affect the event horizon so that surrounding spacetime structure is radically altered and then the event horizon may be severely disrupted or even disappear. Such a super spinning Kerr BH that may become a NS is also called a superspinar.

Basically this would be like "breaking" a BH by overcharging or over spinning one. Is this even possible? Another question is whether or not we may slow down a spinning BH by adding angular momentum in the right manner? It appears from some researchers, especially those studying alternative theories of gravity that beyond a certain spin rate, making a Kerr BH spin even faster can produce a NS. Perhaps the merger of 2 rapidly spinning BH or a neutron star and a BH could make the event horizon disappear if they share the right angular momentum parameters.

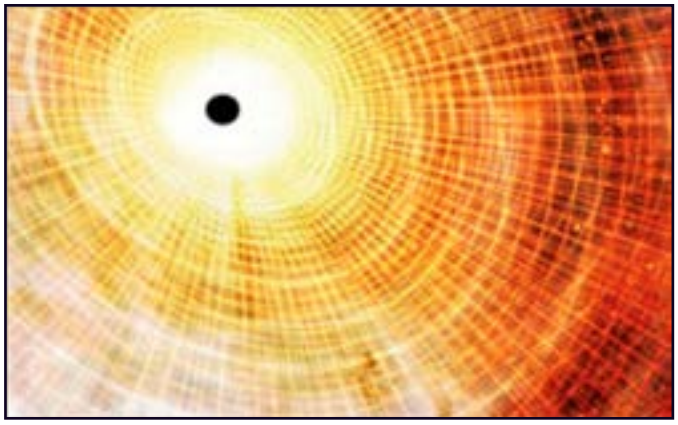


Figure 2. A NS as imaged by an artist

It is known that both a NS and a BH both can carry charge and angular momentum and by analyzing the x-ray emissions from a BH or a NS we can determine the angular momentum, (spin). However we need to understand that whatever their origins or similarities a NS and a BH are not the same-they are basically two different animals.

Can We Observe a Naked Singularity?

If NS exist in our Universe they would have some unique observational signatures that we could detect. Since NS are visible from the outside they offer a potentially inviting view of quantum behavior and a better understanding of singularities. These quantum qualities also would have their own unique observational traits.

The observational signatures of a NS will be somewhat different than those of a BH. For one, the accretion disk surrounding a NS should be different than that of a BH making them more easily observable. In particular it should be more luminous and the spectrum should have a higher frequency power law segment that carries a major fraction of the luminosity. This may be especially true as the accretion disk approaches the singularity and things become very nonlinear and unstable before they plunge into the singularity. Theory has shown that the overall radiative efficiencies of the accretion disks around a NS are higher than those for a BH with the Schwarzschild metric.

NS should also produce more effective and very energetic high energy particle collisions which would produce a unique spectral signature and this should also be detectable. As another observational technique we could look at the gravitational lensing signature of a NS since it would definitely be different than that of a BH.

One intriguing idea in possibly observing a NS is in regards to core collapse supernova, is that after the initial large scale collapse and explosion perhaps a second smaller scale one occurs at the quantum level which would be visible since there would be no event horizon. This collapse into a NS may leave a quantum signature, basically a quantum star, which would, consist of the super compact region around the NS governed by quantum gravity rules.

We all know about the recent detection of gravitational waves from two coalescing BH. This event is also what may trigger a short lived GRB. It has been announced that FERMI detected an electromagnetic counterpart to the gravitational wave that was recently detected. The confirmation of this counterpart and its possible explanation are still under scrutiny.

However if this proves true then perhaps during a BH merger with another BH for a short period, a NS forms which may be detected by the spectral signal of the event. The more accepted explanation is that a briefly existing accretion disk around

Lets Get Naked and Singular

Continued from page 5

the merging BHs could explain certain GRB features of the event, however another explanation is that a temporary NS could be formed instead as this merger creates a topological change. This NS would have a smaller yet more efficient accretion disk and account for the high electromagnetic energies released. More detailed observations and correlations will be needed to clarify this.

NS may also have been formed in the early Universe due to asymmetrical conditions, (especially pressure) along with primordial BH, and these primordial NS may also leave a distinct spectral signature.

One of the best places to look for such things as NS are the dense galactic centers where an abundance of exotic objects exists. Galactic centers with AGN and some x-ray binaries would be good places to see features that may correspond to a NS Vs a BH. AS mentioned it is also thought that in certain cases NS may offer another explanation for GRBs. More detailed analysis and observations are needed to refine these ideas. In a similar line of thought other questions abound, like do NS help explain AGN phenomenon?

In many ways a NS is like the Big Bang in reverse and perhaps by observing them we may get a better understanding of the origins of our Universe. In general it will be best to seek the differences between NS and BH in the strong relativistic realms.

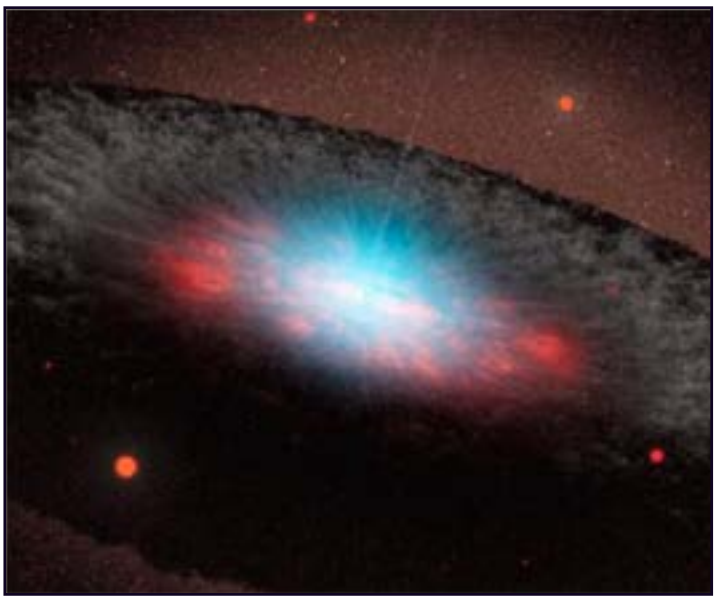


Figure 3. A galactic center with a SMBH-a great place to search for a NS

Many Questions and Summary

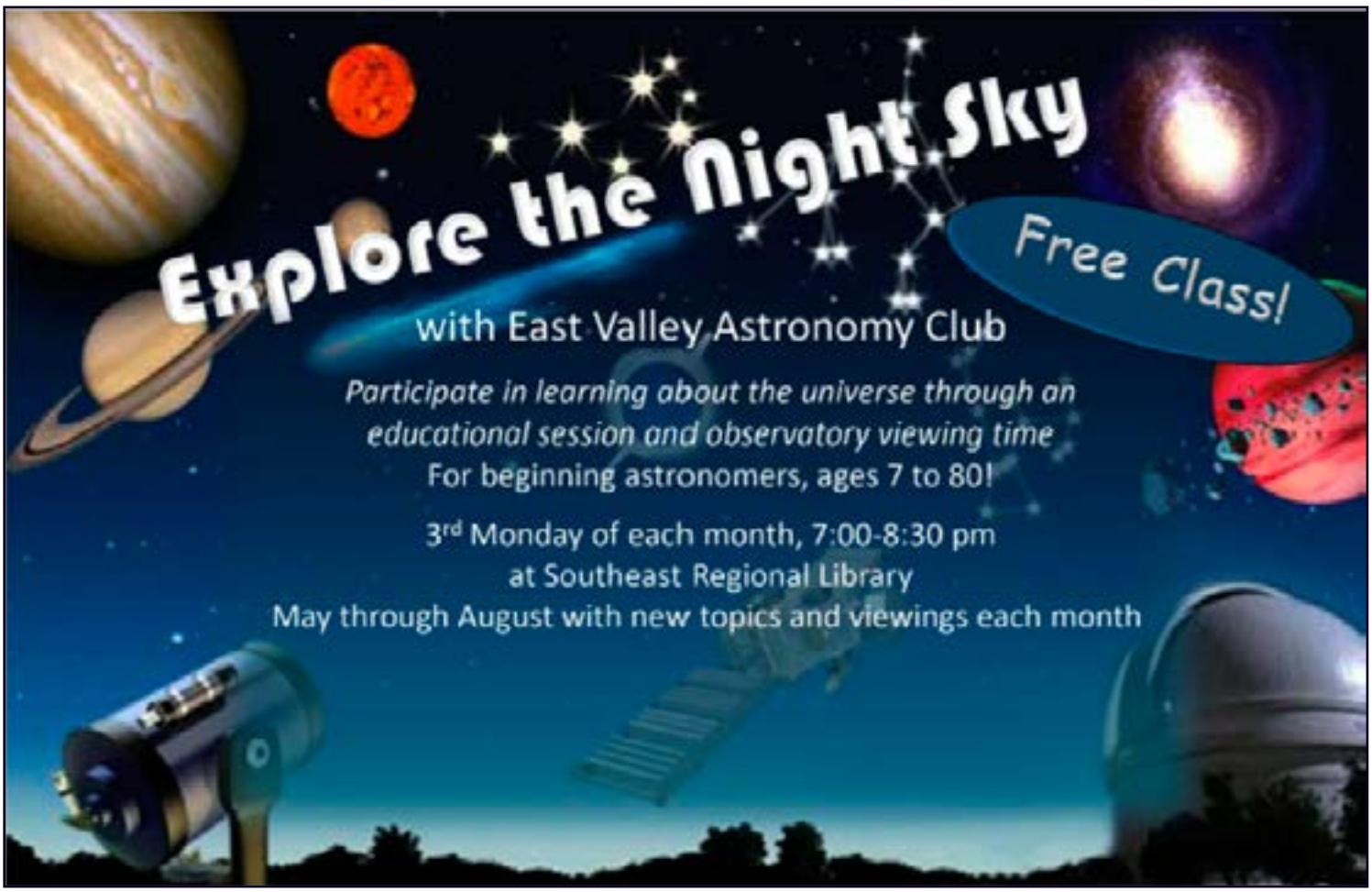
Isn't it interesting how BHs and NS conflict with both classical physics and quantum physics? However if NS exist and can be detected they may give us tremendous insight into new and revolutionary ideas and deeper understanding. They may also open up an entirely new form of gravitational theory. It turns out that there may be more than 4 dimensions of spacetime required or extremely varied new spacetime geometries for the event horizon to made to vanish, but as yet we do not know as to why this would be so difficult.

Our ability to make predictions for the future could be on shaky ground since causality violations, (or closed timelike curves) may be encountered near the singularity and open to the Universe. However the existence of a NS does not automatically give rise to causality violations or closed timelike curves. One question is what happens if "new information" comes out of the NS, (or also even from infinity) and enters our Universe? This could definitely upset our usual notions of time and causality in our Universe.

We have not really discussed the role of dark energy, (DE) and dark matter, (DM) in the formation and evolution of a NS. One thought however is that DE may sometimes trigger a "bounce" of a super massive cloud collapse into a BH which may then aid in the formation of a NS.

As we touched upon, the irregular and inhomogeneous collapse causing a NS should also generate shockwaves that may be another explanation for observed GRBs. What about a quantum explosion? Will quantum gravity, (if it exists) do away with singularities altogether? It remains to be seen if future concepts like quantum gravity will resolve these questions, perhaps a totally new type of understanding will be needed.

Do naked singularities exist in nature as real astrophysical objects, only future work will tell, however they are fun to ponder and make us think about many basic ideas regarding space, time, quantum mechanics, and gravitmerging BHs



Looking for that perfect weekend activity?

Why not resolve to getting involved?

Contact Claude Haynes to join the staff at GRCO

Email: grco@evaconline.org

Find Out What's Happening – Join EVAC-Announce List

If you would like to receive email announcements about EVAC meetings and activities please join the EVAC–Announce mailing list. Click on the link below to subscribe. Enter your full email address in the box titled User Options and press OK. You will receive a confirmation email. Your privacy is respected by EVAC and we will never sell your email address, or use it for non-club relevant solicitations. This mailing list is designed for communication from EVAC, and does not enable users to respond to the message. If you wish to contact club officers, please use the list on the Contact-Us tab.

To subscribe to the EVAC – Announce mail group click:

http://www.freelists.org/list/evac-announce

To unsubscribe use the same link, enter your email address and select Unsubscribe from the "Choose An Action" list.

New Moon on August 2 at 16:45

First Quarter Moon on August 10 at 14:21

***Full Moon on August 18 at 05:27**

Last Quarter Moon on August 24 at 23:41

Classified Ads

For Sale: TeleVue 540mm refractor - very good condition with case, eyepieces/diagonals as in linked images. Includes Altaz mount plus Celestron Advanced GT equatorial mount. North Scottsdale.

https://goo.gl/photos/1qGNk4D19VcS78Bd8

Jeff Watters: jhwatters615@gmail.com

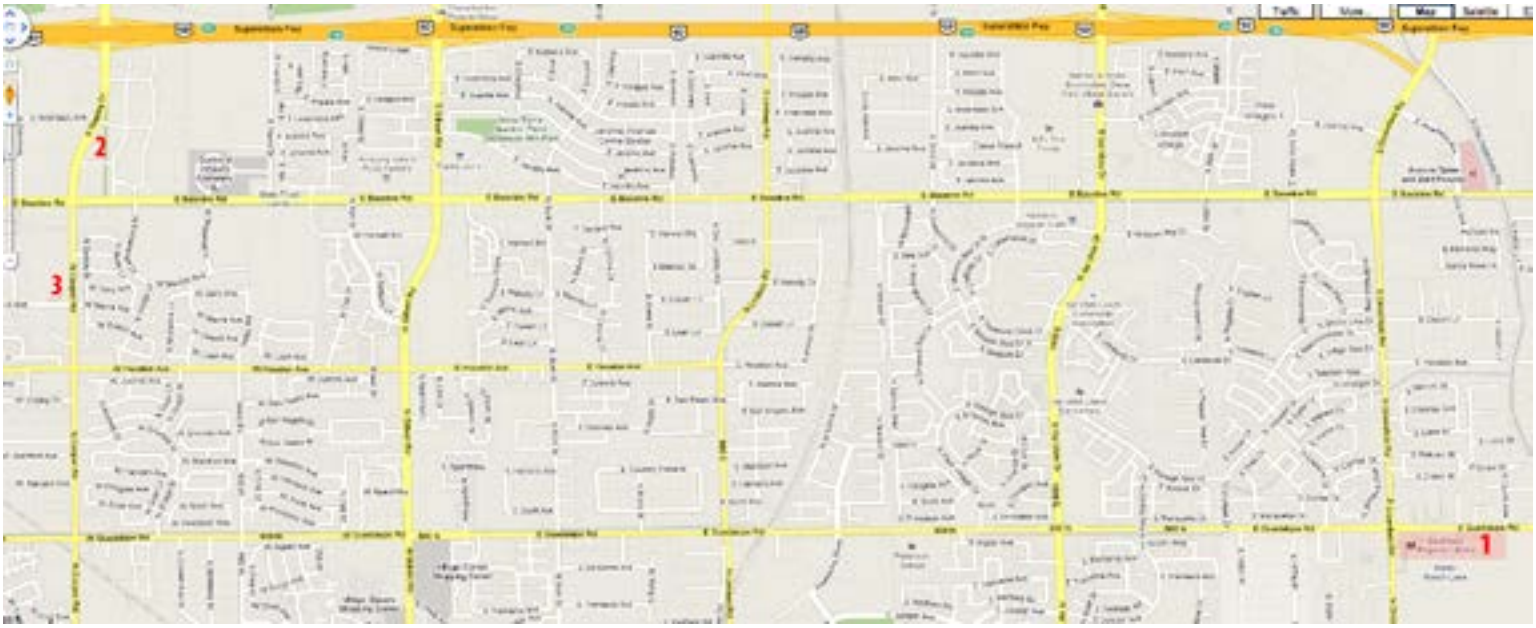
Upcoming Meetings

August 19
September 16
October 21
November 18
December 16
January 20
February 17
March 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.

Visitors are always welcome!



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

August 2016

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			

Aug 6 - Deep Sky Party

Aug 12 - Public Star Party

Aug 15- Explore the Night Sky

Aug 19 - EVAC Monthly Meeting

Aug 27- Local Star Party

September 2016

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	

Sept 3 - Deep Sky Party

Sept 4 - Field Trip to Lowell Observatory

$25 per peson - bus and pizza dinner

Leave from Gilbert Library at 4:00 PM (sharp)

Sept 9 - Public Star Party

Sept 16 - EVAC Monthly Meeting

Sept 24- Local Star Party

East Valley Astronomy Club -- 2016 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: ☐

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.

☐ General Observing ☐ Cosmology

☐ Lunar Observing ☐ Telescope Making

☐ Planetary Observing ☐ Astrophotography

☐ Deep Sky Observing ☐ Other

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. 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.

The East Valley Astronomy Club is a 501(c)(3) nonprofit charitable organization.

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