Volume 31 Issue 3

March 2017

The Observer

East Valley Astronomy Club

NGC 5584 - APOD March 30, 2011
NASA, ESA, A. Riess (STScI/JHU), L. Macri (Texas A & M Univ.) et al., Hubble Heritage (STScI/AURA)

Upcoming Events:

Public Party - March 10

EVAC Monthly Meeting - March 17

Local Star Party - March 18

Messier Marathon - March 25

Check out all of the upcoming club events in the Calendars on page 13.

Inside this Issue:

EVAC This Month

by Don Wrigley

Lacking much to write about for this month, I turn to Wikipedia for fascinating and pretty much worthless information. March was originally the first month of the ancient Roman calendar as evidenced by the names of our last four months, whose names coincide with the Roman numbers for 7, 8, 9, and 10. All this changed when Julius Caesar introduced Rome to the Julian Calendar, which began the year on January 1st. The Roman Senate showed its appreciation by assassinating him on March 15th of his new calendar. Not everyone likes change. March 14th has become known internationally as Pi day (3.14). Not to be outdone, in the U.S., March 2nd has been designated National Banana Cream Pie day. No reason is given for this particular choice, nor is any given for March 1st as National Pig Day.

There is a reason why March 25-26 is Messier Marathon weekend: it is the weekend closest to the new moon when it might be possible to see all 110 of the object now listed in the catalog compiled in the late 18th century by the French comet hunter Charles Messier. The Messier list is the most popular choice for beginners as their first observing list, because many of the objects are fairly bright and easy to find. Finding all 110 of them in one night, however, is

EVAC This Month

Continued from page 1

somewhat of a challenge. If you have never tried the MM, don't hesitate to attempt it. Certificates are awarded for finding 50 or more of the objects, and even the most inexperienced novice can achieve this with only a little help. Many will arrive at the site on Friday March 24th (see page 6 details and directions to the site), and make it a two night stay using Friday night as a "practice night".

Our regular monthly meeting will occur one week earlier on March 17th, at the usual time and place. I'm hoping to observe all 68 paid members in one night and maybe add a few to the list.

Don Wrigley

If It's Clear…

by Fulton Wright, Jr. Prescott Astronomy Club

March 2017

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 Wednesday, March 1, starting about 7:30 PM, you can see a lot of solar system objects. First find Venus, bright at magnitude -4.6, about 18 degrees above the horizon in the west. Use a telescope to see the slim but big crescent with its horns pointing up. Next, look for comet 2P/Encke, much dimmer at magnitude 5, and halfway to the horizon below Venus. This will be the tough one to observe. Next, look up and to the left from Venus for the thin crescent Moon (magnitude -6.6). Next move a short distance to the right for Mars (magnitude +1.3, size 4.6 arc-seconds, don't expect to see much through a telescope). Finally, look a short distance below Mars (half the distance from the Moon, but down) for Uranus (magnitude 5.9, size 3.4 arc-seconds). That gets you the Moon, three planets, and a comet.

From Thursday, March 2 through Monday, March 6 the Northern part of the Moon is tipped toward us so it is a good time to look along the terminator above and below Mare Frigoris.

On Saturday, March 4, the Moon is at first quarter phase and sets at 1:15 AM (Sunday). At 8:19 PM (Saturday), the dark limb of the Moon occults Aldebaran. At 9:34 PM the star reappears from behind the bright limb of the Moon.

On Sunday, March 12, at 2 AM, most of the rest of the United States engages in the silly ritual of going on Daylight Savings Time (springing forward by setting their clocks to 3 AM). Arizona, with its superior knowledge of the universe, remains on Mountain Standard Time.

On Monday, March 13, the full Moon rises at 7:54 PM, spoiling any chance of hunting for faint fuzzies for the night.

On Friday, March 17, Io and its shadow transit Jupiter between 10:16 PM and 12:55 AM (Saturday). Notice how the satellite and its shadow grow closer as Jupiter approaches opposition (April 7).

On Sunday, March 19, the Moon is at third quarter phase and rises at 1:17 AM (Monday).

On Monday, March 20, spring comes to the northern hemisphere and we have equal days and nights.

On Wednesday, March 22, Europa and its shadow transit Jupiter from 10:23 PM to 1:32 AM (Thursday).

On Monday, March 27, it is new Moon and you have all night to hunt for faint fuzzies.

On Friday, March 31, at around 7:30 PM, Mercury will be about 10 degrees above the western horizon. It is not going to be more visible in the evening for the rest of the year. At 8:45 PM, the Moon occults the magnitude 3.6 star Gamma Tauri. The star reappears at 9:16 PM. The program I use, Sky Safari, lists it as a very close double, but doesn't give the secondary's magnitude, so you might see it disappear in two steps.

The Backyard Astronomer

by Bill Dellinges (March 2017)

White Dwarfs, Neutron Stars, and Black Holes

A brief description of these strange and fascinating objects

To help in understanding how the objects below can exist, it's important to know a couple of basic facts about these freaks of nature:

1) All three are the collapsed cores of stars. 2) A star is a large ball of hydrogen gas. During most of a star's life, it's in a state of balance between the outward force of energy produced from nuclear fusion of hydrogen into helium at the star's core and the inward force of gravity. If this delicate balance is disturbed (and eventually it will be), the star's stability is adversely effected.
(Italics = Research term for more detail)

White Dwarfs: Stars convert hydrogen into helium to power themselves. Stars with the mass of our Sun (one solar mass) can go on to fuse helium into carbon and oxygen. The Sun does not have enough mass to generate high enough temperatures to fuse carbon and oxygen into heavier elements, thus energy production at the core ceases and there is no longer a force pushing upward. Gravity then dominates and the inner carbon core of the star collapses until a density is reached where the repulsive force of the atoms' sea of electrons halts the collapse (Electron Degeneracy Pressure). At this point the object is about the size of a small planet like Earth and can contain up to 1.4 solar masses (the Chandrasekhar Limit). A teaspoon of its matter weighs about one ton. Nuclear reactions have ceased and the star is considered "dead" even though it still shines white hot from compression only, not hydrogen fusion. Because it's white hot and small, it's called a White Dwarf. Over billions of years it will cool with its color changing from white, to yellow, to red, then ending up as a black dwarf. This is the fate of our Sun in about five billion years (for brevity, the concurrent development of the star into a Red Giant and Planetary Nebula is not discussed here).

Neutron Stars: When core fuel is exhausted in stars several times the mass of the Sun, there's more mass falling towards the center of the star. The additional weight overwhelms any ability of the core to utilize the electron repulsive force, as in the white dwarf situation. The inrushing mass pushes past the point of white dwarf density, crushing down core material to a very dense object about 10 miles in diameter. At this point electrons merge with protons creating neutrons which merge with the neutrons that were in the atom's nuclei resulting in a ball of mostly neutrons – a neutron star. A teaspoon of this material weighs about 100 million tons. Like the repulsive force of the white dwarf which halted its collapse, the neutrons exhibit a Neutron Degeneracy Pressure which stops the core's collapse. This implosion transpires in about one second. Meanwhile the rest the star's material still falling inwards slams into the newly minted neutron star and rebounds back out as a Supernova explosion, one of nature's most spectacular releases of energy. For a few weeks the supernova releases as much energy as the Sun does in its entire 10 billion year existence and briefly becomes as bright as all the other stars in its galaxy combined. Neutron stars can survive supernova explosions. Since stars rotate (the Sun in 25 days at its equator), a neutron star's rotation is spun up by its collapse due to the conservation of angular momentum to extraordinary rates. The neutron star in the Crab Nebula, a supernova remnant in Taurus, spins 30 times a second. The fastest spinning pulsar known today rotates 716 times a second (PSR J1748-2446ad).

The fast spin rates and intense magnetic fields of a neutron star accelerate charged particles and emit them from their magnetic poles, which are offset from the star's rotation axis and thus sweeps across space like a lighthouse beacon. If the emitted beam happens to sweep across Earth, we call the phenomenon a Pulsar. It's interesting to note supernovae progenitors are massive enough to fuse carbon into elements up to iron (Nucleosynthesis). Iron doesn't efficiently fuse, so iron cores collapse leading to supernovae explosions in which the crushing pressure and extreme temperatures produce all the remaining elements heavier than iron.

Now a mind- blowing thing to think about: These elements, along with what was left of the star's original material, are blasted into the interstellar medium to mix with gas and dust to form new stars in the future - and likely planets around those stars. So the atoms of carbon, oxygen, iron, calcium, potassium, etc., in your body, the aluminum atoms in cans of soda and beer, the metals in your car, the gold and silver in jewelry, all those atoms were created in stars that lived and died before our Solar System ever existed. So yep, the Earth and everything on

it, including us, is made of star stuff.

Black Holes: Just as a white dwarf's mass can be no more than 1.4 solar masses (otherwise it caves in to form a neutron star), astronomers believe the maximum mass of a neutron star is about 3 solar masses. Any additional matter added to the neutron star will override its neutron pressure resistance and cause it to collapse in on itself. The collapse continues until the object's density is so dense that its surface gravity intensifies to the point where the escape velocity from its surface exceeds the speed of light. Nothing can get out, not rockets, telephone calls, tweets, tennis balls, or light. The weird thing about a black hole is the core's collapse never stops. It starts out with at least 3 solar masses and keeps that mass even though it's diameter shrinks to the size of an atom or smaller. Astronomers call this object a Singularity and are at a loss to explain what condition matter is like at these unimaginable densities. Since it's mass hasn't changed, it still has gravity. A lot of it in a small space. Though the singularity is just a point now, it's range of gravitational attraction is still defined by its mass. There is a demarcation boundary line surrounding the singularity called the Event Horizon which is considered the "size" of the black hole. It's also referred to as the Schwarzschild Radius, the point of no return of the black hole's gravitational attraction. It's a one-way trip into a black hole. Cross it and you will be lost forever as far as the rest of the universe is concerned. By the way, you will be torn apart by the differential gravitational effects on your body just before crossing the Event Horizon.

The Schwarzschild Radius (SR) can be roughly computed by multiplying each solar mass by 1.8 miles. Thus a 10 solar mass black hole has a SR of 18 miles. By the way, theoretically anything can be made into a black hole if you squeeze it down enough such that its surface gravity becomes intense enough to prevent light from escaping; 40 aircraft carriers reduced to the size of the ball in a ballpoint pen. The Earth to just under 1 inch. The Sun to a diameter of 3 ½ miles (in theory; recall that normally the Earth and Sun are not massive enough to make a black hole.

Since it's black and things falling in disappear, it's called a black hole, a name coined by physicist John Wheeler in 1967. So, a black hole is basically the collapsed core of a star that likely started out as a star of 20 or more solar masses (It's difficult to nail down the minimum mass of a star that can make a black hole because of the many variables involved, but many sources estimate about 20 solar masses).

The idea of a large star collapsing into a small dense object has been around since the 18th century. It was not until Einstein's General Theory of Relativity in 1915 that scientists started to mathematically explore the possibility of what would come to be known as a black hole. Many scoffed at the idea. Then, in 1964, Cygnus X-1, a double star system in the constellation of Cygnus was discovered. Calculations of their masses, periods, and the variation of x-ray emission due to mass transfer from the 25 solar mass star to the smaller 10 solar mass dark object convinced many astronomers they'd found a real black hole – nothing else could explain Cygnus X-1. Since then, many other similar candidates, including super-massive black holes in the centers of galaxies, have astronomers today accepting the concept of black holes. At least until a better explanation for the weird things they see going on out there comes along! Stay tuned.

EVAC Meeting Minutes

by Cynthia Jones (February 17, 2017)

EVAC Monthly Meeting Minutes February 17, 2017
Number in attendance: 78

The meeting was called to order by the President at 07:30 February 17, 2017.

Guests and visitors introduction were made.

Board Members and Officers were introduced – a full list is on the EVAC website.

Lynn covered calendar events:

- There are a significant number of events taking place and any help will be appreciated.
- There is a large event at Gilbert Community College which was well publicized by the college so a large turnout is expected.
- March 18th at the Phoenix Zoo is Night Camp and EVAC will be there after dark to participate.
- Night Sky Volunteer Pins were given to the following individuals:

1. Don Wrigley
2. Claude Haynes
3. Amber Doig
4. David Doig
5. Ron Rothfuss
6. Frank Pino
7. Brooks Scofield
8. Wayne Thomas
9. David Hatch
10. Ray Heinle
11. Forrest Sims
12. Ron Risko
13. Silvio Jaconelli
14. Marty Pieczonka.
15. Derek Youngson
16. Dan Hahne
17. Gordon Rosner
18. Lynn Young

Announcements from the Board

- August Meeting is cancelled due to eclipse attendance anticipated by many members.speakers
- October meeting date has been adjusted to Oct 27th to avoide conflict with all AZ Star Party

GRCO items from Claude:

- Gilbert Outdoor Expo taking place Feb 25 at Riparian Reserve – see website for info
- AZ Sci Tech Festival in which EVAC will participate
- Renaaissance Festival is a participation event for EVAC
- There is one Deep Space Calendar left to purchase as well as several Observer Handbooks. There are free back copies of Sky & Telescope available

Membership comments/report:

- There are 53 paid members as of now.
- Pens may be on order by the President for those who renew.
- A number of unclaimed EVAC badges need to be picked up – we will reach out to try and get members to claim their badges.
- The tokens of appreciation, from the Symposium were shared: Pluto telescope diagram, telegram announcing the naming of Pluto and notes from the original research. These were made available for members to examine.

Member Presentation by David Douglass:
Some comets from DaHut. Images were shared, David commented that 3a.m. until sunrise was most productive time for clear sky views and mentioned that Space X launch can be found on youtube. Google Space X to find launch.

Q & A Session was opened as per a new procedure reintroduced by the EVAC Board.

Guest Speaker presentation by Craig Hardgrove (see summary in this issue of the newsletter)

EVAC January Guest Speaker Highlights

by Cynthia Jones

Craig Hardgrove
School Of Earth and Space Exploration
Assistant Professor
ASU Faculty, TEMPE Campus

Dr. Hardgrove presented a detailed overview of his current work at ASU with tiny spacecraft called CubeSats (Cube Satellites) which are used for interplanatary exploration. As he explained the technology behind CubeSats, which are much smaller than typical spacecraft, and he compared the size of CubeSats to a loaf of bread or the size of a baskeball players shoebox. CubeSats are able to go into deep space at a fraction of the price of typical spacecraft. Dr. Hardgrove provided images to explain the "Lunar Polar Hydrogen Mapper LunaH-Map Mission" which is searching for water at the moons poles. CubeSats will fly much closer than larger more expensive craft are allowed (or able) to as they seek to measure water in the permanantly shadowed areas of the moon. The process that takes place which results in the collection of hydrogen on the moon was also discussed. The huge diffeence in cost, with the emerging CubeSat technology, was illustrated by Dr. Hardgrove's comparision of dollars spent. One of the largest satellites in orbit was cited as costing $1.62 per person per year of tax dollars, whereas, a CubeSat might cost a comparative 2¢ per person per year of tax dollars. In summary Dr. Hardgrove highlighted some of the pros of CubeSats, beyond the cost/benefit ratio, as being a technology endeavor that can involve small businesses as possible partners, allow student participation in the science, and facilitate the continued encouragement of innovative solutions for future space exploration. CubeSats are new players in the game that will take risks that NASA is unwilling or unable to take with big rockets.

Assistant Professor: Arizona State University, School of Earth and Space Exploration (Jan 2016 - present)
Postdoc: Arizona State University, ASU NewSpace Initiative Director of Research (2013 - Dec 2015)
Assistant Staff Scientist: Malin Space Science Systems, MSL and CTX operations (2012-2013)
Postdoc: Stony Brook University, Infrared spectroscopy of microcrytalline phases (2011-2012)
PhD: Geology (Planetary Science) "Remote Sensing of Sediments and Volatiles on the Martian Surface and Terrestrial Analog Sites" from University of Tennessee, (2011)
BS: Physics from Georgia Tech, (2004)

Short Bio:
Principal Investigator of the LunaH-Map mission, the first planetary science mission designed, built and operated by ASU. Participating Scientist on the Mars Science Laboratory Curiosity rover Dynamic Albedo of Neutrons (DAN) team. Principal Investigator of SINGR (Single Scintillator Neutron and Gamma-Ray Spectrometer) instrument development project. Dr. Hardgrove has experience working on many Mars rover and orbiter missions (MER Spirit and Opportunity, MSL Curiosity, Mars Reconnaissance Orbiter-CTX, Mars-2020 Mastcam-Z). Dr. Hardgrove's research interests are in planetary geochemistry, specifically volatile abundances in the near-surface, as well as in applications of infrared remote sensing on planetary surfaces to understand sedimentary processes.

Submitted by Cynthia F Jones, EVAC Secretary

2017 All Arizona Messier Marathon Events

Saturday, March 25th, @ The Salome Emergency Airfield Site

More info here: http://saguaroastro.org/content/messier2017.htm Directions to the site: http://saguaroastro.org/content/AAMM/directions.txt
Contacts: About the Marathon, Rick Tejera: Mailto:saguaroastro@cox.net; In General, Mike Collins: Mailto:president@saguaroastro.org

Swap Meet

Saturday, March 25, 3:00 – 4:30 PM
@ Central Tables/Canopies

You can bring your unused astronomy items you would like to sell. This could be a great time to pick up previously loved items and get a little cash for your own. Bring plenty of small bills so you can make change for your sales. Bring a chair and table if you can.

Silent Auction

New this year, you can Silent Bid on astronomy related items. Bidding from 3:00 PM - 6:00 PM. Winners will be announced after the dinner. Items up for bidding with (Opening Bids):
Sold Out, Signed & Numbered Kim Poor prints:
"Saturn From Dione" & "Jupiter From Io" ($25 each)
iOptron Cube Pro mount ($50)
Book, "The Stars," H. A. Rey ($5)
10" Pierre Schwaar telescope w/Telrad, (such as it is) & Solar Filter ($75)
Tele Vue 19mm & 24mm Wide Field eyepieces ($25 each)
Tele Vue 7 mm Nagler eyepiece ($50)
Tele Vue 2.5x 1-1/4" Barlow ($25)
Meade 8.3 mm Super Wide Field eyepiece ($15)
Orion 2x 2" Barlow ($15)
Lumicon UHC Premium filter, 1-1/4" ($25)
Lumicon OIII filter, 1-1/4" ($20)
Lumicon Deep Sky Premium filter, 1-1/4" ($25)

AAMM Dinner and Raffle

Panorama of the 2015 AAMM Dinner and Raffle photos: Rick Rotramel

Dinner starts at 5:00 PM, for $5.00 each, that you can reserve in advance:

Email Lori Prause: Mail to:loriprause@gmail.com

The dinner menu is a large hunk of sub sandwich along with fruit, a soft drink and dessert.

Enjoy the **Raffle** after the dinner, before the **Sunset Talk**, by coordinator, Rick Tejera, about the Messier Marathon. **Arrive early** to set up your telescope. **Raffle tickets** sold before & at the dinner, $1 ea, or 6 for $5 or 25 for $20.

Special Door Prize: Sky-Watcher 14" Telescope:
All in attendance will have a ticket for this **Special Door Prize!**

Thank you to Kevin Le Gore & Sky-Watcher Telescopes!

Sky-Watcher

* **Terms of sale**: Item is sold "as is," with no warranty expressed or implied. Full payment to Treasurer of SAC required prior to transfer of possession to winning bidder. Make checks payable to: **SAC**. If winning bidder fails to make arrangements for payment **before 8:00PM 3-25-2017**, the next highest bidder will be offered the item at their bid price. Payment is not required at the site of the All Arizona Messier Marathon, however the item may not be claimed by the winning bidder until payment arrangements have been accepted by the Treasurer.

Thanks to Lori Prause for doing the dinner. Also, a great big thank you goes out to Claude Haynes who provides the tables and shade canopies.

If you can bring some ice Saturday for the soda, that would be great.

The ***Midnight Cafe*** will again serve hot cocoa, coffee, snacks and lots of encouragement. Please consider donating a snack such as some cookies, cupcakes, a pie or other treats to stock up the cafe. A gallon of drinking water would also be appreciated.

The 25th Annual All Arizona Messier Marathon

Saturday Eve, March 25, 2017 * Rick Tejera, Coordinator

This year marks the 25th year of the AAMM held by the Saguaro Astronomy Club!

In addition, the field will be available on the night of Friday, March 24 for an extra night of observing. Reminder, the Friday date is NOT the marathon. It has been set aside for more time to observe from your personal observing list. It will also provide more time for socializing on Saturday.

In recent years there has been growing participation by younger astronomers. To help encourage this trend, this year, the All Arizona Messier Marathon will offer a separate award category for observers under the age of 18. All U18 observers will receive a certificate of participation. Those observing 25 or more objects will receive a certificate of achievement. And the top 3 observers in the U18 category will receive plaques as well as the certificates. So, if you are under 18 and have an interest in astronomy come on out and observe! If you know a young astronomer, let them know and encourage them to join us. The only caveat is all U18 observers must be accompanied by a responsible adult and must be listed on that adults Liability waiver.

Required Waiver for all attendees to fill out: http://saguaroastro.org/content/AAMM/2017waiver.pdf

Set your own goals. The marathon is for having fun!
Set your goals in order for you to have fun!
The guidelines are pretty simple, please read them over if you plan on participating.

It's an honor system. No one is going to be looking over your shoulder to verify your Observations. Have an observing list (from the coordinator) to keep track of observations
Fill out the heading.
Find an object.
Observe/image it with your eye through the main eyepiece of your telescope.
Mark off the entry. Go to the next object.
Hand in your filled out sheet to Rick Tejera's camp table by Sunrise before leaving!

Salome Emergency Airfield (Hovatter Airstrip) (south of I-10 at Exit #53)

EVAC Book Library Inventory
David Hatch

EVAC has a collection of miscellaneous astronomy related books. At the March meeting, we are going to make these available to members for a donation of 50 cents each, or three for a dollar.. Hopefully some of these books will still be useful to someone.

ALIENS IN THE SKY- A SCIENTIFIC REBUTTAL 1968
ASTRONOMY THRU A SMALL TELESCOPE- J.MUIRDEN 1985
ASTRONOMY- STRUCTURE OF THE UNIVERSE- D.CLARK 1977
ASTRONOMY- THE COSMIC JOURNEY- HARTMAN
ASTRONOMY MADE SIMPLE- M. HAMBURG 1993
ASTRONOMY MATHMATICS WITH A POCKET CALCULATOR
JONES 1978
ASTRONOMY AND ASTROPHYSICS- SMITH / ZEILK 1988
ASTRONOMY- FROM THE EARTH TO THE UNIVERSE
PASACHOFF 1988
ASTRONOMY- FROM THE RANDOM HOUSE LIBRARY 1975
ATOMS OF SILENCE- H. REEVES 1984
BURNHAMS CELESTIAL HANDBOOK- R. BURNHAM 1978
VOLUME 1- ANDROMEDA THRU CETUS
VOLUME 3- BEYOND THE SOLAR SYSTEM
BLACK HOLES- S. HAWKING 1993
CCD CAMERA COOKBOOK- HOW TO MAKE YOUR OWN CCD CAMERA 1994
DEEP SKY OBSERVING- STEVE COE 2000
ENCYCLOPEDIA OF ASTRONOMY AND SPACE- CROWELL
FIELD GUIDE TO STARS AND PLANETS- MENZEL 1967
GALAXIES AND THE UNIVERSE- D.EICHER 1993
LIGHTWEIGHT GIANTS- A GUIDE TO TRUSS TUBE TELESCOPES 1992
LONELY HEARTS OF THE COSMOS- OVERBYE 1991
MARS THE ABODE OF LIFE- PROF. A. LOWELL 1908 NEW ED.
MONUMENTS OF MARS- THE CITY ON THE EDGE OF FOREVER HOAGLAND 1987
MORE SMALL OBSERVATORYS- PATRICK MOORE 2002
OPTICAL GLASS WORKING- TWYMAN 1955
OPTICAL AND INFRARED TELESCOPES- KITT PEAK OBSERVATORY, VOLUME 1 AND 2 1980
OUTLINES OF ASTRONOMY- HERSCHEL 1860
VERY FRAGILE, BINDINGS TORN & COMING APART
$320.00 MARKED INSIDE FRONT COVER {Not for Sale}

PHOTO GUIDE TO THE CONSTELATIONS 1998
SKY ATLAS 2000- LAMINATED EDITION- WIL TIRION 1998
STARWARE- THE GUIDE TO SELECTING, BUYING, USING TELESCOPES AND EQUIPMENT- HARRINGTON 1998
TELESCOPE HANDBOOK AND STAR ATLAS- CROWELL 1974
THE NEW COSMOLOGY- ALLEN 2002
THE NEW COSMOS- KALMBACH BOOKS
THE UNIVERSE AROUND US- JEANS 1928
THE X RAY UNIVERSE- GIACCONI 1988
THEORETICAL COSMOLOGY- OXFORD STUDYS 1979
UNIVERSE GUIDE TO THE STARS AND PLANETS
TIRION / RIDPATH 1988
URANOMETRIA 2000 TIRION / RAPPAPORT
VOLUME 1- NORTHERN HEMISPHERE NO DATE
VOLUME 2- SOUTHERN HEMISPHERE NO DATE
WEBB SOCIETY- DEEP SKY OBSERVERS HANBOOKS
VOLUME 1- DOUBLE STARS 1988
VOLUME 2- PLANATARY NEBULAS 1988
VOLUME 3- GLOBULAR AND OPEN CLUSTERS 1988
VOLUME 4- GALAXIES 1988
VOLUME 7- THE SOUTHERN SKY 1988

First Quarter Moon on March 5 at 06:32

Full Moon on March 12 at 10:54

Last Quarter Moon on March 20 at 06:29

New Moon on March 27 at 22:57

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.

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

Classified Ads

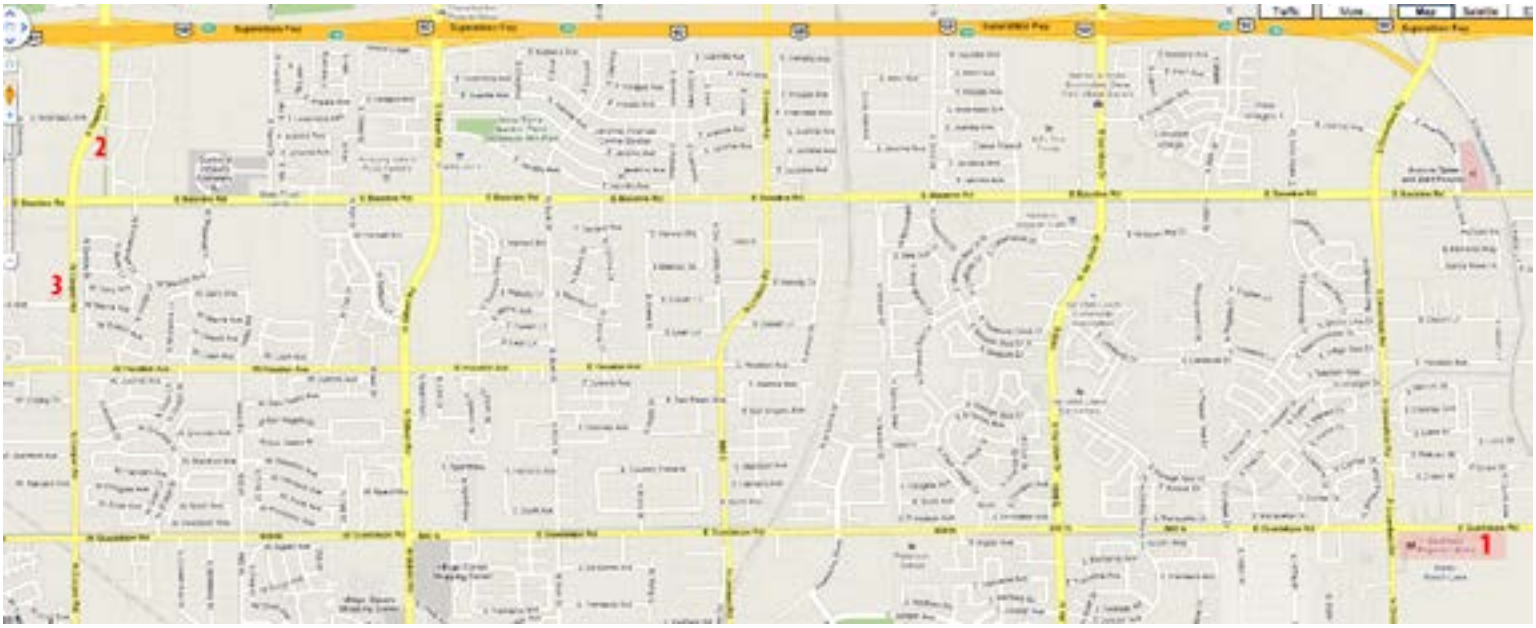
Upcoming Meetings

March 17
April 21
May 19
June 16
July 21
September 15
October 27
November 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

March 2017

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	

Mar 7 - Irving Elementary School

Mar 9 - Pomeroy Elementary School

Mar 10 - Public Star Party

Mar 17 - EVAC Monthly Meeting

Mar 18 - Local Star Party

Mar 18 - Phoenix Zoo Night Camp

Mar 22 - CGCC Star Party

Mar 24-25 - Messier Marathon

April 2017

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**

Apr 14 - Public Star Party

Apr 21 - EVAC Monthly Meeting

Apr 22 - Local Star Party

Apr 29 - Deep Sky Party

East Valley Astronomy Club -- 2017 Membership Form

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

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

Select one of the following:

☐ New Member ☐ Renewal ☐ Change of Address

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

☐ **$30.00 Individual** January through March

☐ **$35.00 Family** January through March

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$37.50 Individual** October through December

☐ **$43.75 Family** October through December

Includes dues for the following year

Renewal (current members only):

☐ **$30.00 Individual** ☐ **$35.00 Family**

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.

www.evaconline.org

East Valley Astronomy Club
PO Box 2202
Mesa, Az. 85214-2202