Vol.73 No.2* Mar-Apr, 2016

SVAS OBSERVER

Sacramento Valley Astronomical Society

Founded in 1945

The James Webb Space Telescope by NASA

Launch Scheduled in 2018!

The James Webb Space Telescope will be a giant leap forward in our quest to understand the Universe and our origins. JWST will examine every phase of cosmic history: from the first luminous glows after the Big Bang to the formation of galaxies, stars, and planets to the evolution of our own solar system.

Continued pg 13

Inside This Issue

SVAS Event Calendar

Mar 5, Sat

Blue Canyon, weather permitting.

Mar 8, Tues

New Moon.

FOLLOW SVAS twitter

Join Twitter by clicking the link in our SVAS web site. Follow what's happening up to the minute.

Mar 18, Annual Election Meeting Friday at 8:00pm

Sacramento City College, Mohr Hall Room 3
3835 Freeport Boulevard, Sacramento, CA.

Apr 6 , Wed

New Moon.

Apr 9, Sat

Blue canyon, weather permitting.

Apr 15, General Meeting, Friday at 8:00pm

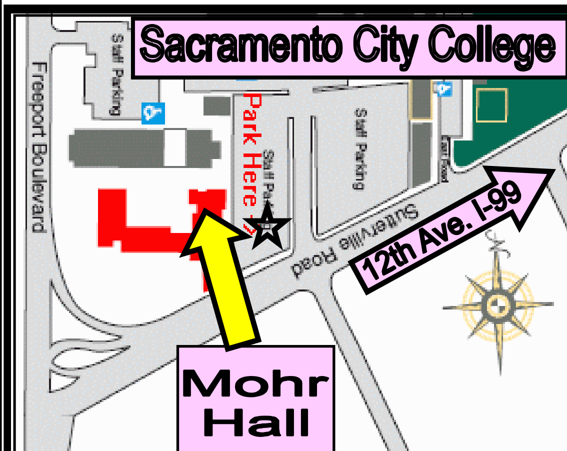
Sacramento City College, Mohr Hall Room 3
3835 Freeport Boulevard, Sacramento, CA.

Star Party Schedule for 2016

Star Parties

Mar 5
April 9
May 7
June 4
July 2
July 29,30,31, Star-B-Q
Sept 3
Oct 1
Oct 29
Dec 3

Blue Canyon



Community Star Parties

Contact Wayne Lord

Help Us Make the SVAS Great!

Lonnie Robinson
SVAS Vice President

We, the Board, are always asking ourselves and each other, how can we make the SVAS a better experience for you the membership? That's a tough question because you all have so many different specialized interests. There is a long learning curve in astronomy, and it takes awhile to find your own special nitch. Traveling the journey from that first telescope as a youngster to buying or making your own telescope, requires time at each skill level learning all you can and deciding what comes next. Will you ultimately become an astrophotographer, video astronomer, visual deep sky observer, or will you be more interested in sharing your knowledge at public outreach activities? What do you enjoy viewing the most, deep faint galaxies, globular clusters, star clusters, nebula, double stars, or planets?

I am a visual observer and really enjoy star parties at Blue Canyon viewing galaxies, so naturally I tend to concentrate my efforts in that direction. Over the past several years we (the Board) have supported improvements in HGO, principally in upgrading the telescopes and building maintenance. We made huge progress with the 16" Ritchey by installing a SiTech go-to controller with servo motors. It's a joy to use, amazing to watch the massive Mathis fork mount move with the precision of a fine watch centering objects one after another.

Don't forget there are several telescopes for members to use at HGO. We have a 16" Dob outfitted with wheelbarrow handles to roll on the tarmac, a portable 10" Discovery Dob, two 8" Celestrons, and an 8" Orion equatorial. We highly recommend trying these scopes before buying your own. On occasion it's great fun to jump in your car, without loading all your heavy equipment, and just enjoy the telescopes, clear high mountain skies, and friendships HGO has to offer.

In general, member participation seems to concentrate in three areas; star parties, club meetings, and public outreach. The Board tries our best to support all areas equally, many of us specializing in what we know best. Star Parties are the core of our club, and viewing at HGO is certainly a highlight activity.

We are asking for your help, by letting us know which areas we can improve to make your experience with the SVAS exceptional. Please contact me or any Board member, and share your thoughts. Visit our web site and click on the e-mail links next to the Board members, our phone numbers are on the last page of this newsletter.

What can we do to help get you more involved? More one on one guidance?
How can we improve our star parties? More special destination star parties? Winter sites?
More Bar-B-Q's? More group activities at Blue Canyon? Enforce the white light rules better?
Would you like specialized help with your interests? Messier Marathon? Photography training?
More ATM meetings? Help with your equipment?
Should we do more public outreach? Astronomy Day? Will you help in these areas?
More great speakers for our meetings? More astronomy and less club business?
In general, how and where can we improve?

The SVAS Board members are your representatives, I would like to see each of them get directly involved with you the membership. They are the leaders who organize outreach events, special interest groups, and most club activities. The real bottom line is, as a member please get involved with your club. We can't do it all for you, we need your support, input, and participation!

We will listen to your comments, concerns, and ideas.
Let's talk and get things done together!

Penumbral Lunar Eclipse of 2016 Mar 23

Ecliptic Conjunction = 12:01:58.9 TD (= 12:00:49.3 UT)
Greatest Eclipse = 11:48:21.3 TD (= 11:47:11.8 UT)

Penumbral Magnitude = 0.7747 P. Radius = 1.1821° Gamma = 1.1591
Umbral Magnitude = -0.3118 U. Radius = 0.6473° Axis = 1.0469°

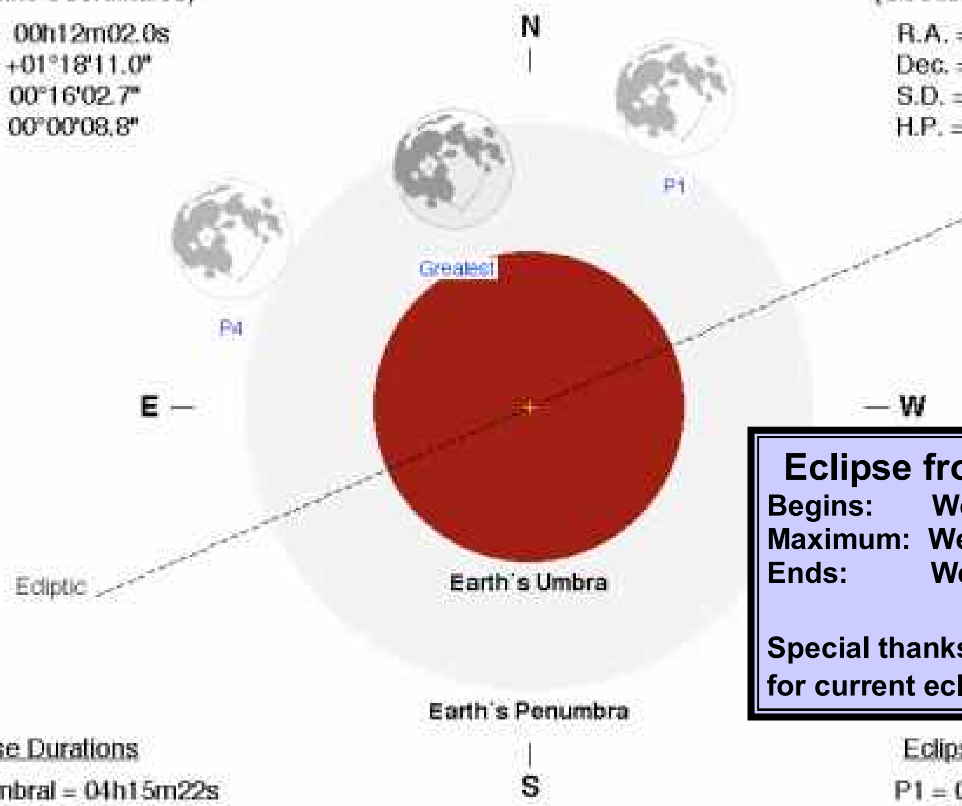
Saros Series = 142 Member = 18 of 74

Sun at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 00h12m02.0s
Dec. = +01°18'11.0"
S.D. = 00°16'02.7"
H.P. = 00°00'08.8"

Moon at Greatest Eclipse
(Geocentric Coordinates)

R.A. = 12h13m18.5s
Dec. = -00°18'21.3"
S.D. = 00°14'46.0"
H.P. = 00°54'11.6"



Eclipse from Sacramento:
Begins: Wed, Mar 23, at 2:39am
Maximum: Wed, Mar 23, at 4:47am
Ends: Wed, Mar 23, at 6:54am

Special thanks to Ralph Merletti for current eclipse information.

Eclipse Durations

Penumbral = 04h15m22s

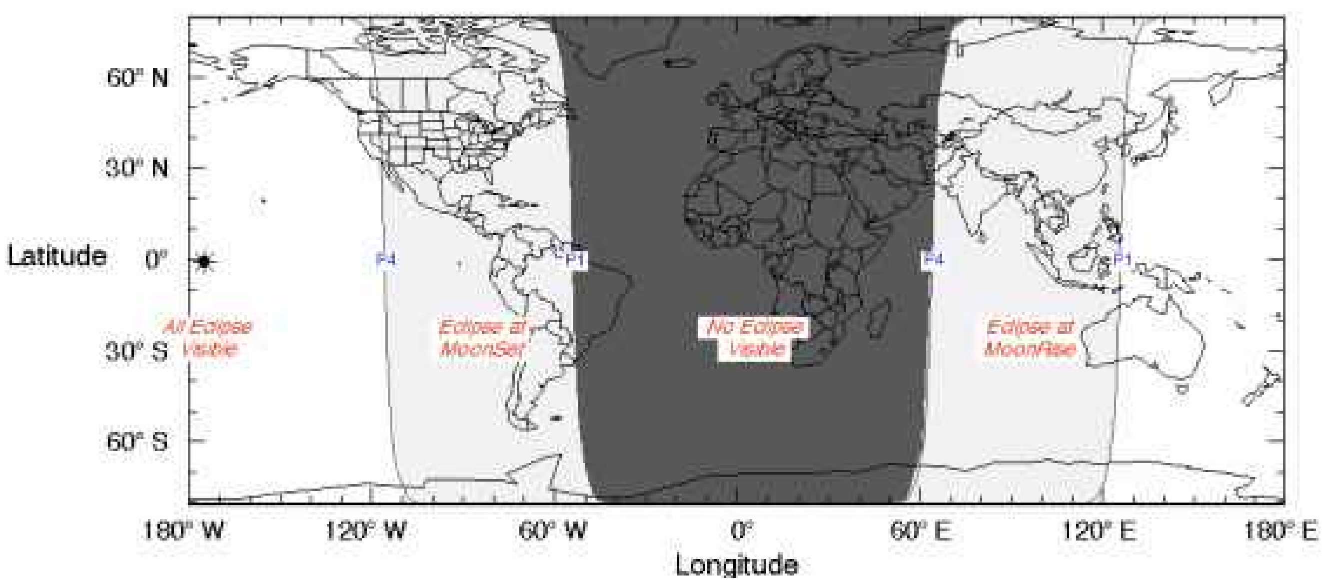
Eclipse Contacts

P1 = 09:39:29 UT
P4 = 13:54:50 UT

ΔT = 70 s
Rule = CdT (Danjon)
Eph. = VSOP87/ELP2000-85

F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html

Credit NASA



Blue Canyon Nights: Winter 2016

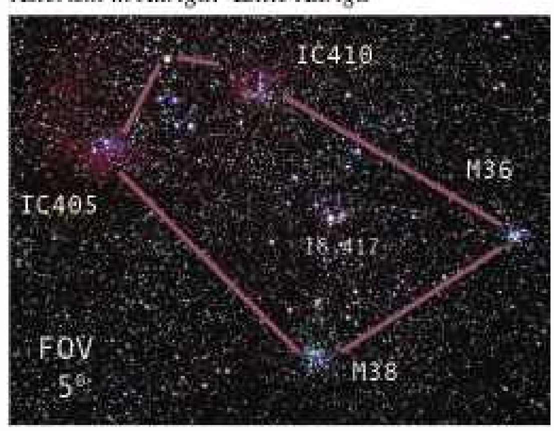
Seasonal notes and photos contributed by SVAS memebers

Nebula in Auriga: IC405, IC410, IC417

While the observatory at Blue Canyon (HGO) is blocked by snow this year, members have still walked in taking advantage of the long dark nights, using the C14 in the dome or their own equipment. One of the more interesting constellations to observe during these winter months is Auriga, the Charioteer, hosting the Messier clusters M36, M37, and M38. But, in fact, this constellation also contains some outstanding nebulae, most notably IC405, 410, and 417, from the Index Catalogue (IC) of nebulae, an appendix of the NGC. The star chart shows the outline of the entire constellation and the approximate position of the nebulae, with north pointing down since Auriga is high above the North Pole during winter.

SVAS members have taken photos of the nebulae using a variety of cameras with greatly varying exposure times and fields of view (FOV) from 5 degrees of a DSLR lens to a half degree view through prime focus of the C14 with a focal reducer.

Asterism in Auriga: Little Auriga



FOV 1 deg of IC 405, 6" Refractor, 5 30-min RGBL, Ha filter *Gary Shulak*

Kevin Lucidi

Wide FOV (2 deg) of IC405 taken with Stellarvue Refractor, 3 one-hour shots, RGB

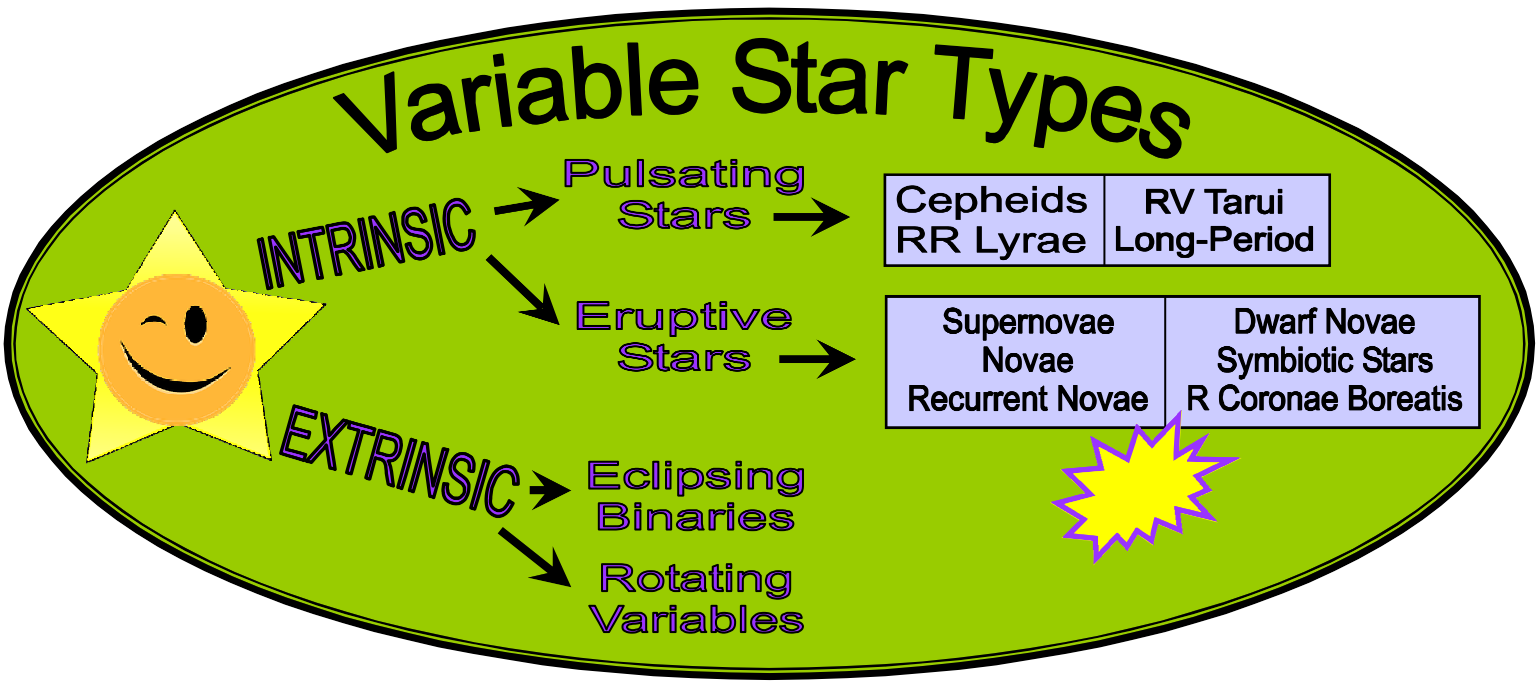
Stuart Schulz

Close-up (FOV 30min) of IC405 taken with Canon 60Da at prime focus on C14 with reducer, 20 60-sec shots stacked with CCD-Stack, processed in PS6.

VARIABLE Stars

A Dutchman, David Fabricus, observed Omicron Cetus (Mira [the wonderful]) disappearing in 1595. It was mistakenly described as a nova in 1596. The variability of Omicron Cetus was correctly documented by another Dutchman, Johannes Holwarda of Holland, in 1863, and is the most famous long period pulsating variable with a period of about 11 months. Algol is the second star to be described as a variable, and was first documented by Geminiano Montanari in 1669. Since then the General Catalogue of Variable Stars lists more then 46,000 variable stars in our galaxy, and as many as two thirds of these appear to pulsate. Any star that changes brightness is a variable star, but the reasons why they change leads us to the many different classifications. There are two major categories; **Extrinsic Variables** describes all causes outside the star such as eclipsing orbiting companions and massive sun spot rotation. **Intrinsic Variables** are caused by physical variations in the star themselves. Let's discuss a few of the well known Intrinsic types, leaving the eruptive Nova and Super Nova for another article.

The most famous and historically important of the intrinsic variables are the **Delta Cepheids**. "The pulsation of Cepheids is known to be driven by oscillations in the ionization of helium, and the mathematical equations that define these physical changes were first presented by a 1930s astronomer Arthur Stanley Eddington." "Suppose the star is in the swelling phase. It's outer layers expand, causing them to cool. Because of the decreasing temperature the degree of ionization also decreases. This makes the gas more transparent, and thus makes it easier for the star to radiate it's energy (making it brighter). This in turn will make the star start to contract. As the gas is thereby compressed, it is heated and the degree of ionization again increases. This makes the gas more opaque, and radiation temporarily becomes captured in the gas (making it dimmer). This heats the gas further, leading it to expand once



again. Thus a cycle of expansion and compression is maintained." (*1) "Cepheid variables pulsate with periods from 1 to 70 days, with light variations from 0.1 to 2 magnitudes. These massive stars have high luminosity and are of F spectral class at maximum, and (change to) G to K at minimum. The later the spectral class of a Cepheid, the longer is its period. Cepheids obey the period-luminosity relationship." (*2)

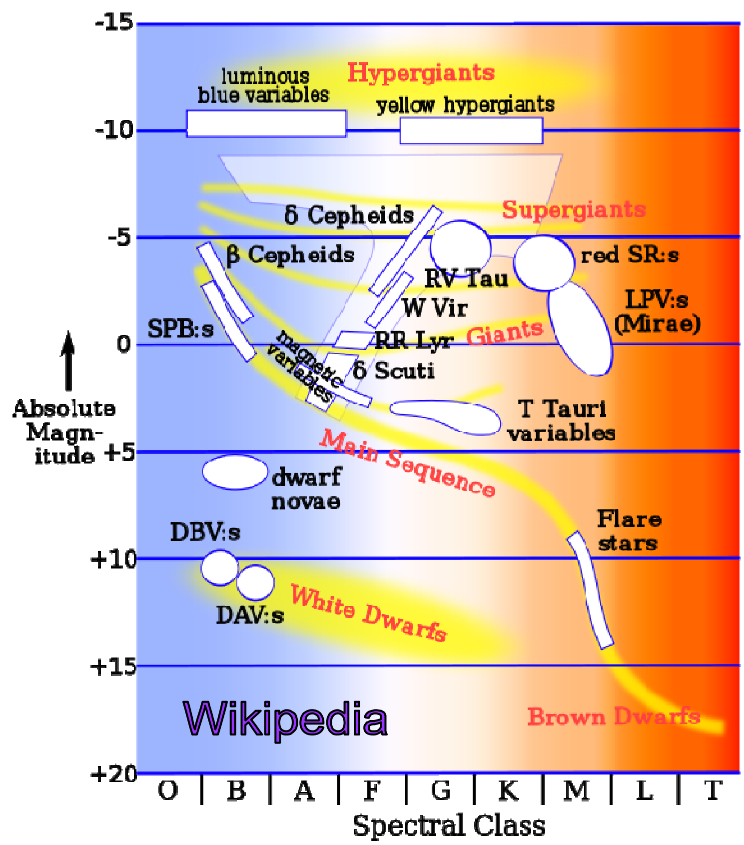
Cepheids demonstrate a direct relationship between brightness and the variable pulse period. Because of this relationship they are used to help find distances of far away galaxies, by comparing the known actual brightness associated with the observed variable period and adjusting the distance to match the observed brightness. Edwin Hubble used them to determine the distance to the Andromeda Galaxy, proving that the nebula were indeed distant stellar universes outside our Milky Way. Hubble's law, which describes an expanding universe, was formulated using Cepheid distances combined with Vesto Slipher's spectral red shift measurements of how fast these galaxies are moving away from us (published in 1929). In general, the more distant the galaxy the faster it is moving away. "In the mid 20th century, significant problems with the astronomical distance scale were resolved by dividing the Cepheids into different classes with very different properties. In the 1940s, Walter Baade recognized two separate populations of Cepheids (classical [type I] and type II). Classical Cepheids are younger and more massive population I stars, whereas type II Cepheids are older fainter Population II stars. Classical Cepheids and type II Cepheids follow different period-luminosity relationships. The luminosity of type II Cepheids is, on average, less than classical Cepheids by about 1.5 magnitudes (but still brighter than RR Lyrae stars). Baade's seminal discovery led to a fourfold increase in the distance to M31, and the extragalactic distance scale. RR Lyrae stars, then known as Cluster Variables, were recognized fairly early as being a separate class of variable, due in part to their short periods." "Delta Cephei is also of particular importance as a calibrator of the Cepheid period-luminosity relation since its distance is among the most precisely established for a Cepheid, thanks in part to its membership in a star cluster and the availability of precise Hubble Space Telescope/Hipparcos parallaxes. The accuracy of the distance measurements to Cepheid variables and other bodies within 7,500 light years was vastly improved by combining images from Hubble taken six months apart when the Earth and Hubble are on opposite sides of the Sun." (*1)

RR Lyrae Variables

"These stars are somewhat similar to Cepheids, but are not as luminous and with shorter pulsation periods. They are older than type I Cepheids, belonging to population II, but of lower mass than type II Cepheids. Due to their common occurrence in globular clusters, they are occasionally referred to as *cluster Cepheids*. They also have a well established period-luminosity relationship, and so are also useful distance indicators. These A-type stars vary by about 0.2–2 magnitudes (20% to over 500% change in luminosity) over a period of several hours to a day or more." (*1)

RV Tauri Variables

"These are yellow supergiant stars (actually low mass post-AGB stars at the most luminous stage of their lives) which have alternating deep and shallow minima. This double-peaked variation typically has periods of 30–100 days and amplitudes of 3–4 magnitudes. Superimposed on this variation, there may be long-term variations over periods of several years. Their spectra are of type F or G at maximum light and type K or M at minimum brightness. They lie near the instability strip, cooler than type I Cepheids and more luminous than type II Cepheids. Their pulsations are caused by the same basic mechanisms related to helium opacity, but they are at a very different stage of their lives." (*1)



Long Period Variables

"The long period variables are cool evolved stars that pulsate with periods in the range of weeks to several years." (*1)

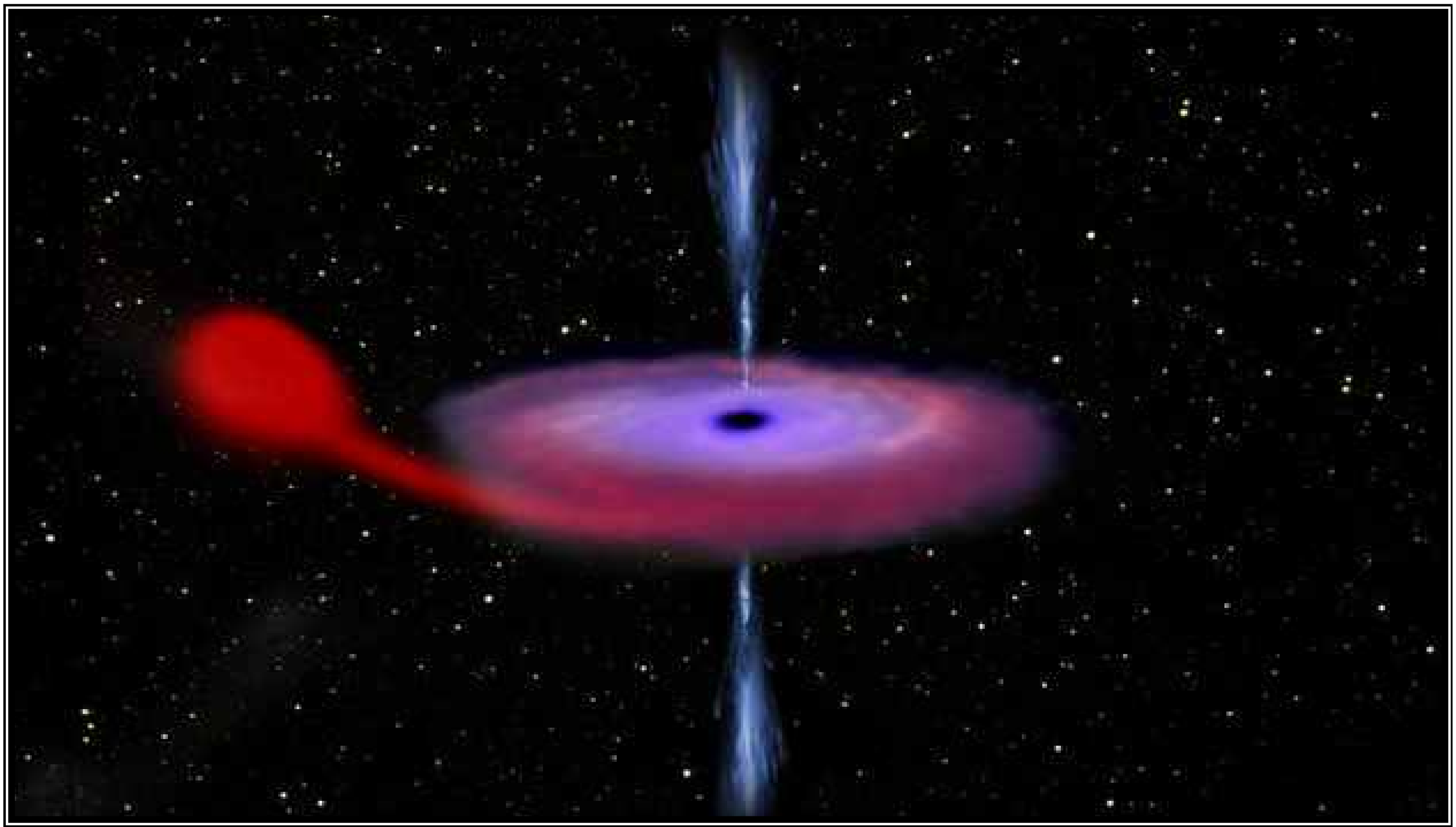
It's interesting to view where these intrinsic variable stars reside on the Hertzsprung-Russell diagram. They are in, or close to, an area described as the **Instability Strip**. Our Sun is about mid way in the Main Sequence, which is populated by very stable average sized and temperature stars. The spectral class (OBAFGKM) relates to the stars temperature and color (blue is hot, red cooler), and the absolute magnitude generally follows size (larger stars have more surface = brighter). Note too that most of these variable stars are very bright, fairly hot, and Giants to Supergiants.

I hope this discussion helps simplify a very complicated topic, and you are invited to do some research on your own. Contact the AAVSO (American Association of Variable Stars) and become a member. It is a fascinating scientific area where amateurs can make important observational contributions to modern astronomy.

www.aavso.org Observer Editor References: (*1) Wikipedia (*2) AAVSO

Variable Star V404 Cygni is Awake After 26 Years

V404 Cygni has been known as a variable star residing in the constellation Cygnus since the 18th century. It was believed to be a nova, a compact binary system containing a white dwarf primary and a sun-like secondary star, that undergoes unpredictable episodes of dramatic brightening - or 'outbursts' - before settling back down to quiescence for decades, until the next outburst.



**Artist's impression of a black hole binary system.
Image credit: ESA/ATG medialab.**

The last outburst occurred in 1989. At that time, V404 Cyg released enormous amounts of energy in the x-ray, optical and radio wavelengths for several months before quieting back down again. The 1989 outburst offered the first chance for astronomers of the space age to observe V404 Cyg with satellites and ground based telescopes. From what they learned, V404 Cygni was reclassified as one of a new class of X-ray transient sources called low mass X-ray binaries (LMXBs), x-ray emitting binary systems where one of the components is either a black hole or neutron star.

On June 15th, 2015- after a 26 year wait- V404 Cygni woke up again. The first signs of renewed activity were spotted by the Burst Alert Telescope on NASA's Swift satellite, when it detected a sudden burst of gamma rays. This then triggered observations with its own X-ray telescope. Soon after, MAXI (Monitor of All-sky X-ray Image), part of the Japanese Experiment Module on the International Space Station, observed an X-ray flare from the same patch of the sky.

These observations triggered alerts throughout networks of professional and amateur astronomers around the world, causing hundreds of instruments to point towards the latest outburst. Analysis of this unprecedented amount of data has begun to bear fruit.

One international research team found that observations of black hole binary outbursts in visible light could reveal important phenomena, such as the flickering light emerging from gases surrounding the black hole. The team's results, published in Nature, indicate that optical rays and not just X-rays provide reliable observational data for black hole activity.

"We now know that we can make observations based on optical rays -- visible light, in other words -- and that black holes can be observed without high-spec X-ray or gamma-ray telescopes," explains lead author Mariko Kimura, a master's student at Kyoto University.

Based on analyses of optical and X-ray data, Kyoto astronomers and their collaborators showed that the light originates from X-rays emerging from the innermost region of the accretion disk around a black hole. These X-rays irradiate and heat the outer region of the disk, making it emit optical rays and thus becoming visible to the human eye.

These important outburst observations were the fruit of international collaboration across countries in different time zones.

"Stars can only be observed after dark, and there are only so many hours each night, but by making observations from different locations around the globe we're able to take more comprehensive data," says co-author Daisaku Nogami. "We're very pleased that our international observation network was able to come together to document this rare event."

The team obtained unprecedented amounts of data from V404 Cygni, detecting repetitive patterns having timescales of several minutes to a few hours. The optical fluctuation patterns were correlated with those of X-rays.

The study also revealed that these repetitive variations occur at mass accretion rates lower than one tenth of that previously thought, indicating that the mass accretion rate isn't the main factor triggering repetitive activity around black holes, but rather the orbital periods.

Four members of the American Association of Variable Star Observers (AAVSO) are listed as co-authors on the paper in recognition of the high quality optical data they supplied to the research team - Lewis M. Cook, William (Bill) Goff, Michael Richmond and William (Bill) Stein.

***"It is not a star I normally observe", explained Bill Goff*, "but when I saw AAVSO Alert Notice 520 requesting observations I decided to get on it."**

Bill continued, "The observations made on this target were immediately exciting. Seeing changes greater than one magnitude in less than an hour, and some high frequency changes occurring in the minutes range, was a wonder to see. I kept imagining how this target must be going through unbelievable eruptive changes."

The AAVSO is a non-profit worldwide scientific and educational organization of amateur and professional astronomers who are interested in stars that change in brightness—variable stars. Founded in 1911 to coordinate variable star observations—made largely by amateur astronomers— the AAVSO is an independent, private research organization headquartered in Cambridge, Massachusetts. With active participants in 108 countries, and an archive of over 30 million variable star observations, it is the world's largest association of variable star observers. **www.aavso.org**

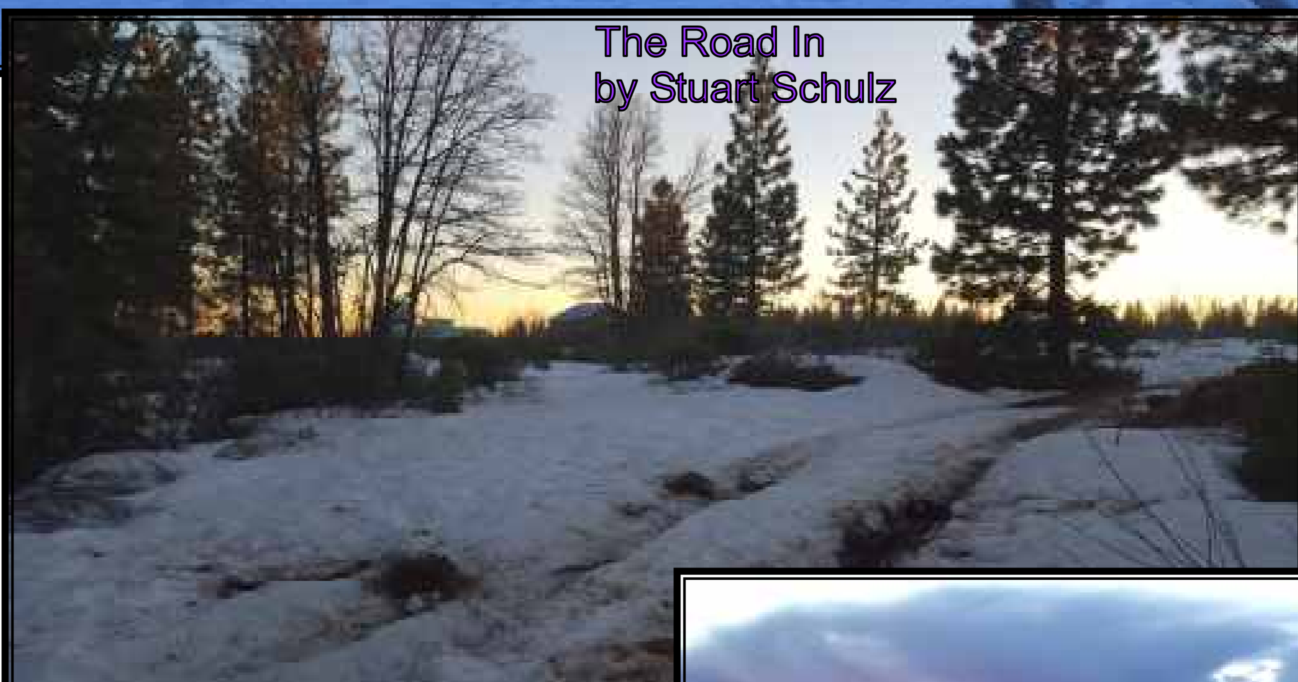
Stormy Seas in Sagittarius

Some of the most breathtaking views in the Universe are created by nebulae — hot, glowing clouds of gas. This new NASA/ESA Hubble Space Telescope image shows ***the center of the Lagoon Nebula***, an object with a deceptively tranquil name, in the constellation of Sagittarius. The region is filled with intense winds from hot stars, churning funnels of gas, and energetic star formation, all embedded within an intricate haze of gas and pitch-dark dust.

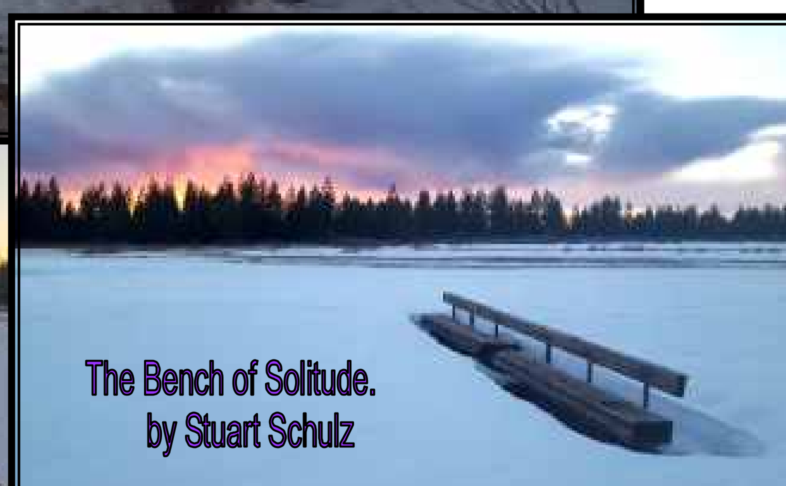
Image Credit: NASA, ESA, J. Trauger (Jet Propulson Laboratory)

Almost Spring at HGO

Mike Baily photo
Sat, Feb 6th



The Road In
by Stuart Schulz

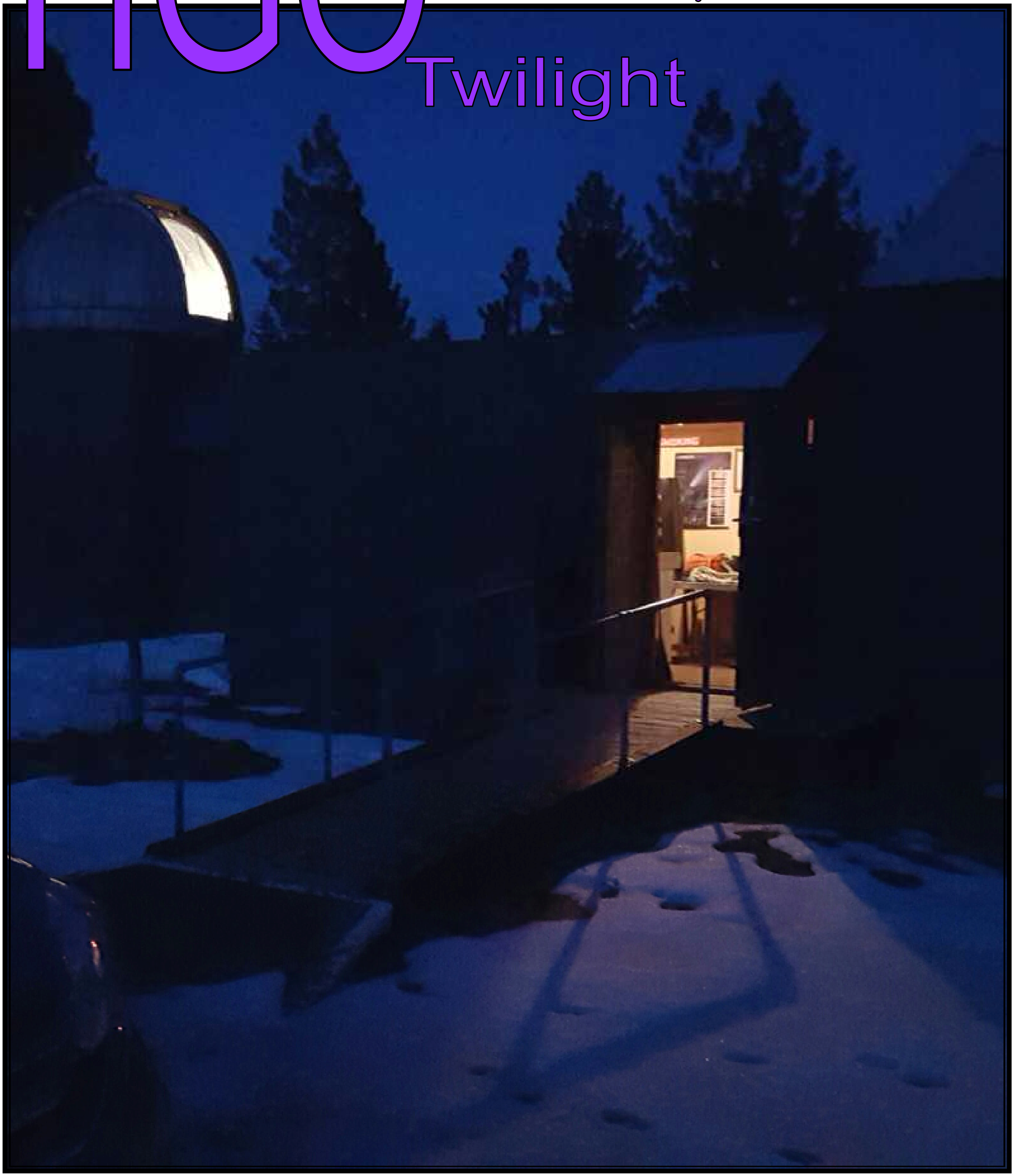


The Bench of Solitude.
by Stuart Schulz

Looking Down From the Dome
by Stuart Schulz

HGO Twilight

by Stuart Shulz

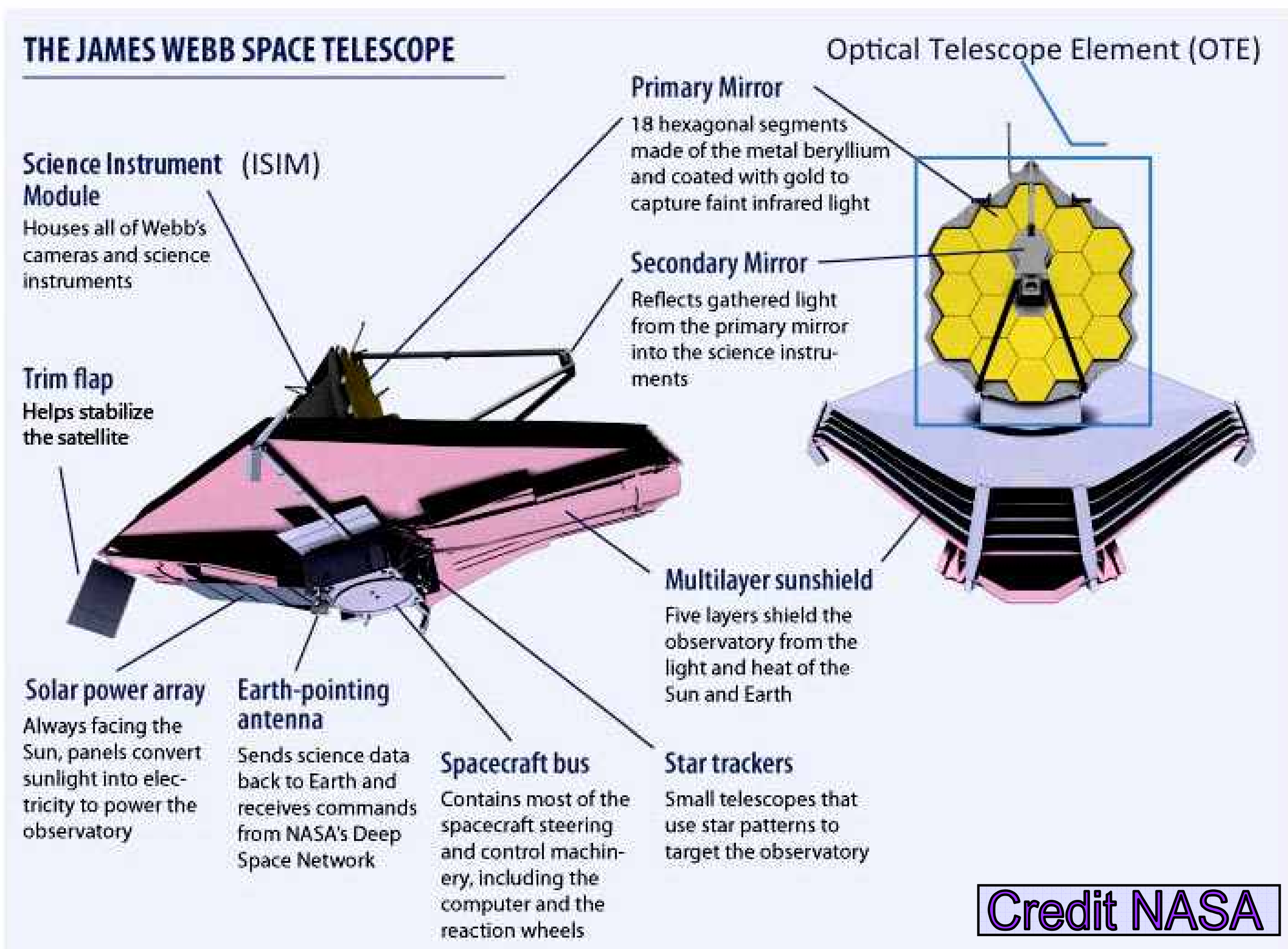


James Webb Telescope continued from page 1

The science goals for the Webb can be grouped into four themes:

- **The End of the Dark Ages: First Light and Reionization**- JWST will be a powerful time machine with infrared vision that will peer back over 13.5 billion years to see the first stars and galaxies forming out of the darkness of the early universe.
- **Assembly of Galaxies** - JWST's unprecedented infrared sensitivity will help astronomers to compare the faintest, earliest galaxies to today's grand spirals and ellipticals, helping us to understand how galaxies assemble over billions of years.
- **The Birth of Stars and Protoplanetary Systems** - JWST will be able to see right through and into massive clouds of dust that are opaque to visible-light observatories like Hubble, where stars and planetary systems are being born.
- **Planetary Systems and the Origins of Life** - JWST will tell us more about the atmospheres of extrasolar planets, and perhaps even find the building blocks of life elsewhere in the universe. In addition to other planetary systems, JWST will also study objects within our own Solar System. NASA

The Observatory is the space-based portion of the James Webb Space Telescope system and is comprised of three elements, the Integrated Science Instrument Module (ISIM), the Optical Telescope Element (OTE), which includes the mirrors and backplane, and the Spacecraft Element, which includes the spacecraft bus and the sunshield. Credit NASA

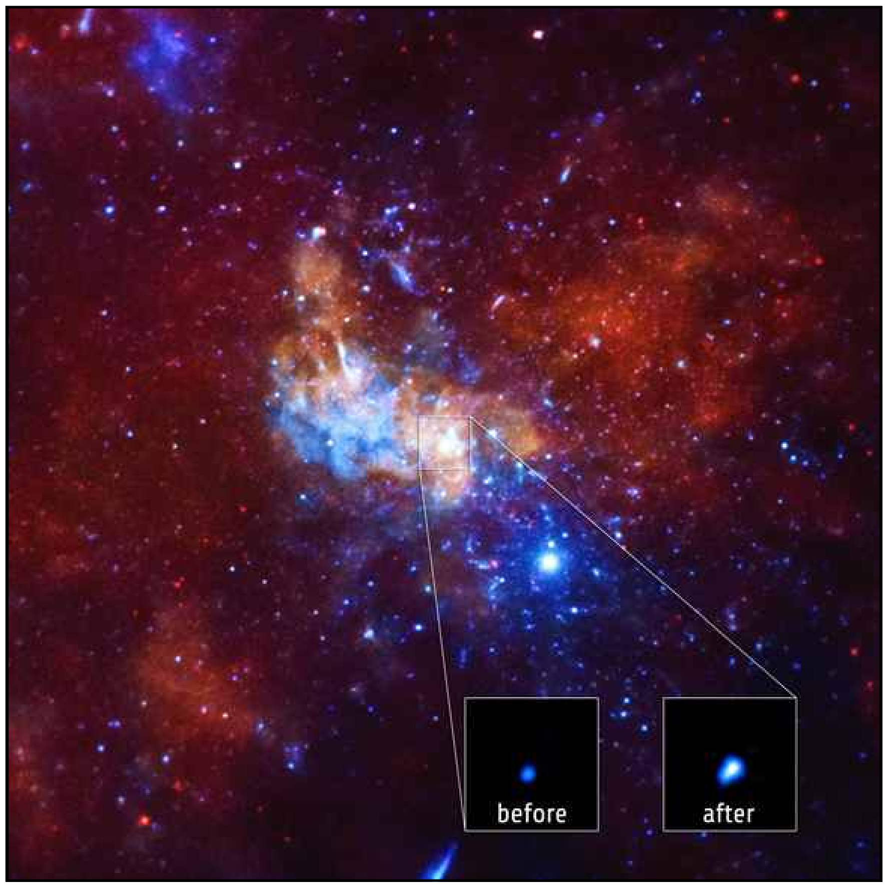


Credit NASA

How will we finally image the event horizon of a black hole?

by Ethan Siegel

One hundred years ago, Albert Einstein first put forth his theory of General Relativity, which laid out the relationship between spacetime and the matter and energy present within it. While it successfully recovered Newtonian gravity and predicted the additional precession of Mercury's orbit, the only exact solution that Einstein himself discovered was the trivial one: that for completely empty space. Less than two months after releasing his theory, however, the German scientist Karl Schwarzschild provided a true exact solution, that of a massive, infinitely dense object, *a black hole*.



One of the curious things that popped out of Schwarzschild's solution was the existence of an event horizon, or a region of space that was so severely curved that nothing, not even light, could escape from it. The size of this event horizon would be directly proportional to the mass of the black hole. A black hole the mass of Earth would have an event horizon less than a centimeter in radius; a black hole the mass of the sun would have an event horizon just a few kilometers in radius; and a supermassive black hole would have an event horizon the size of a planetary orbit.

Our galaxy has since been discovered to house a black hole about four million solar masses in size, with an event horizon about 23.6 million kilometers across, or about 40 percent the size of Mercury's orbit around the sun. At a distance of 26,000 light years, it's the largest event horizon in angular size visible from Earth, but at just 19 micro-arc-seconds, it would take a telescope the size of Earth to resolve it – a practical impossibility.

But all hope isn't lost! If instead of a single telescope, we built an *array* of telescopes located all over Earth, we could simultaneously image the galactic center, and use the technique of VLBI (very long-baseline interferometry) to resolve the black hole's event horizon. The array would only have the light-gathering power of the individual telescopes, meaning the black hole (in the radio) will appear very faint, but they can obtain the resolution of a telescope that's the distance between the farthest telescopes in the array! The planned Event Horizon Telescope, spanning four different continents (including Antarctica), should be able to resolve under 10 micro-arc-seconds, imaging a black hole directly for the first time and answering the question of whether or not they truly contain an event horizon. What began as a mere mathematical solution is now just a few years away from being observed and known for certain!

Image credit: NASA/CXC/Amherst College/D.Haggard et al., of the galactic center in X-rays. Sagittarius A is the supermassive black hole at our Milky Way's center, which normally emits X-ray light of a particular brightness. However, 2013 saw a flare increase its luminosity by a factor of many hundreds, as the black hole devoured matter. The event horizon has yet to be revealed.*

Note: This month's article describes a project that is not related to NASA and does not suggest any relationship or endorsement. Its coverage is for general interest and educational purposes.

Classifieds

Check out Cloudy Nights Classifieds for used Astro Stuff

SVAS Main Events

SVAS Sponsors!

SVAS Officers

President
Walt Heiges

Vice President
Lonnie Robinson

Secretary
Kevin Heider

Treasurer
Kevin Normington

Past President
Ross Gorman

SVAS Board of Directors

~ Even Year Term ~
Perry Preston Porter, Tom Braun, Fera Zamani

~ Odd Year Term ~
Bill Marquardt, Chuck Real, Charles Jones, David Macho

Committees

Membership / New Members	Walt Heiges / Kevin Normington
Star-B-Q & Resources	Walt Heiges
Yosemite Star Party	Tom Braun
Newsletter Editors	Lonnie Robinson / Walt Heiges
Speaker Seeker	Fera Zamani
SVAS Web Site	Gary Shuluk / Walt Heiges
Public Outreach Director	Walt Heiges
Community Star Parties	Wayne Lord
Observatory Director	Perry Preston Porter
Help for Beginners	Perry Preston Porter
HGO Maintenance Director	Stuart Schulz
Amateur Telescope Making	Lonnie Robinson / Bill Thomas
Scholarships	Chuck Real / Kevin Normington

Where We Meet

General Meetings the third Friday of each month beginning at 8:00pm. **Board Meetings** begin at 6:30 on the same day. All members are welcome. **Star Parties** on weekends nearest the new Moon.

Sacramento City College
Mohr Hall Room 3
3835 Freeport Boulevard
Sacramento, CA.
(12th St. Exit West off I-99)
WWW.SVAS.ORG

SVAS Observer - Newsletter

To Subscribe– First send in your membership application form below, with your dues, and upon approval by the Board of Directors the Observer newsletter (published bi-monthly beginning January) will be sent to your supplied email address in .pdf format. Second, request to join the SVAS Yahoo Group at http://groups-yahoo.com/group/svas-members. This group will keep you informed with the day to day current events and discussions.

Articles– Manuscripts and letters are welcome in MS Word, MS Publisher, or plain text format, and emailed to the SVAS Editor. Submission deadline is the 15th of the newsletter release month.

Advertising– Commercial, non-personal advertising, business card, and full page are available. Classified advertising is free to SVAS members.

SVAS Membership Application

Date___/ ___ /___ **Membership** *(check one)* **New:** ___ **or Renew:**___

Annual Renewal Date June 1st (Expires July 1st)

(Four months minimum membership is requested, please include the following year if necessary)

General Member *(Family–Individual)*	*Prorate @ $3 per month*	**$36 per yr**	________
Observatory Member *(Please read Observatory Membership)*	*Prorate @ $7 per month*	**$84 per yr**	________
Student Member *(ID required)*	*Prorate @ $2 per month*	**$24 per yr**	________

Additional Tax Deductible Contribution $ _________

Total Enclosed Amount $ _________

Print Name____

Address____

City ______________________________ **Zip**__________

Phone______________________ *(E-mail required for newsletter mailing)*

E-mail____

Signature____

Observatory Membership

Observatory Membership offers the benefits of a regular membership plus the private use of the Henry Grieb Observatory (HGO) at Blue Canyon. **To apply, you must have been a general member for six months or longer, be certified and approved by the Observatory Director, and then approved by the SVAS Board of Directors.**

Please allow 30 Days Or More for Application Approval

By signing this application, I acknowledge I have accessed the SVAS website **SVAS.org**, read and understand the SVAS bylaws and the rules governing the USFS Special Use Permit. In doing so, I agree to abide by the respective "terms and conditions" of each as they relate to using the SVAS property and facilities. I further understand and acknowledge that failure to abide by these "terms and conditions" can result in revocation of use privileges and/or SVAS membership.

Detach, *SIGN*, & mail with payment.

To: SVAS Membership Application
PO Box 15274 –0274
Sacramento, California. 95851-0274