Snake River Skies

The Newsletter of the Magic Valley Astronomical Society

Membership Meeting

Saturday, February 8th 2020
7:00pm at the
Herrett Center for Arts & Science
College of Southern Idaho.

Public Star Party
at the Centennial Observatory
7:00pm - Midnight

www.mvastro.org

Club Officers

Robert Mayer, President
mayerrbrt@gmail.com

Gary Leavitt, Vice President
leavittg@cableone.net

Dr. Jay Hartwell, Secretary

Jim Tubbs, Treasurer / ALCOR
jtubbs015@msn.com
208-404-2999

David Olsen, Newsletter Editor
editor@mvastro.org

Rick Widmer, Webmaster
rick@developersdesk.com

Magic Valley Astronomical Society is a member of the Astronomical League

---

M-51 imaged by
Rick Widmer &
Ken Thomason
Herrett Telescope
Shotwell Camera

MVAS President's Message
February 2020

Colleagues,

Have you seen the comet yet? You haven't? We get it. PANStarrs is going to be getting brighter and brighter in the morning sky, so be patient. We look forward to your pictures. While PANStarrs is expected to be even brighter in late Spring, this month could be a month of solar system fireworks. Venus continues to dazzle, and Mercury is a treat for those with a clear, low horizon. While those are the evening planets, there's a treat for those of you willing to get up in the morning. On the morning of Feb. 18th, not only will Jupiter, Saturn, and Mars line up in the southeast, the moon for many in the west may even occult the Red Planet. We look forward to hearing about what you saw.

The moon will be this month's topic for the Feb. 8 meeting at 7 p.m. in the Rick Allen Room of the Herrett Center... Rob Mayer will use his experiences striving to obtain the Astronomical League's "Lunar Observing Ió pin, reminding us that moon is far more than just a bright light that ruins two weeks of every month. He'll talk about fascinating nuances he gained in simply looking at the moon, and he'll illustrate his talk with images that include shots taken via the smartphone, an activity some members have been interested in learning about.

Of course, with this being February, there is a chance that the weather will ruin everything. With that in mind, our annual visit to the Faulkner Planetarium will be Saturday, Feb. 22, at 7 p.m. with "Volcanoes - The Fires of Creation.ò Of course, the 8 p.m. show is "Violent Universe: Catastrophes of the Cosmos" (with live sky tour),ò so some of us might take in a double feature.

Until then,

Rob Mayer

Calendar

February 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2 First Quarter Moon  Visible 54% ŷ Age: 7.78 Days	3	4	5	6	7	8 **MVAS Meeting** at 7:00pm at the Herrett Center. **Public Star Party** Centennial Obs. 7:00p - 12:00a
9 Snow Moon 12:33 am  Visible 100% Age: 14.98 Days	10	11 **Herrett Center Forum** **Telescope Tuesday** See page 3 for details	12	13	14 Last Quarter Moon  Visible: 51% Ź Age: 22.09 Days	15
16	17	18	19	20	21	22
23 New Moon Lunation 1202  Visible 0% ŷ Age: 29.41 Days	24	25 **Telescope Tuesday** 6:15p ï 9:00p Centennial Observatory	26	27	28	29

Herrett Center Forum

The Herrett Forum Lecture Series began in January, 2006. Programs on science, archaeology, history, music, art, and other topics of local interest are featured, by lecturers from around the world, many of whom have roots in our community.

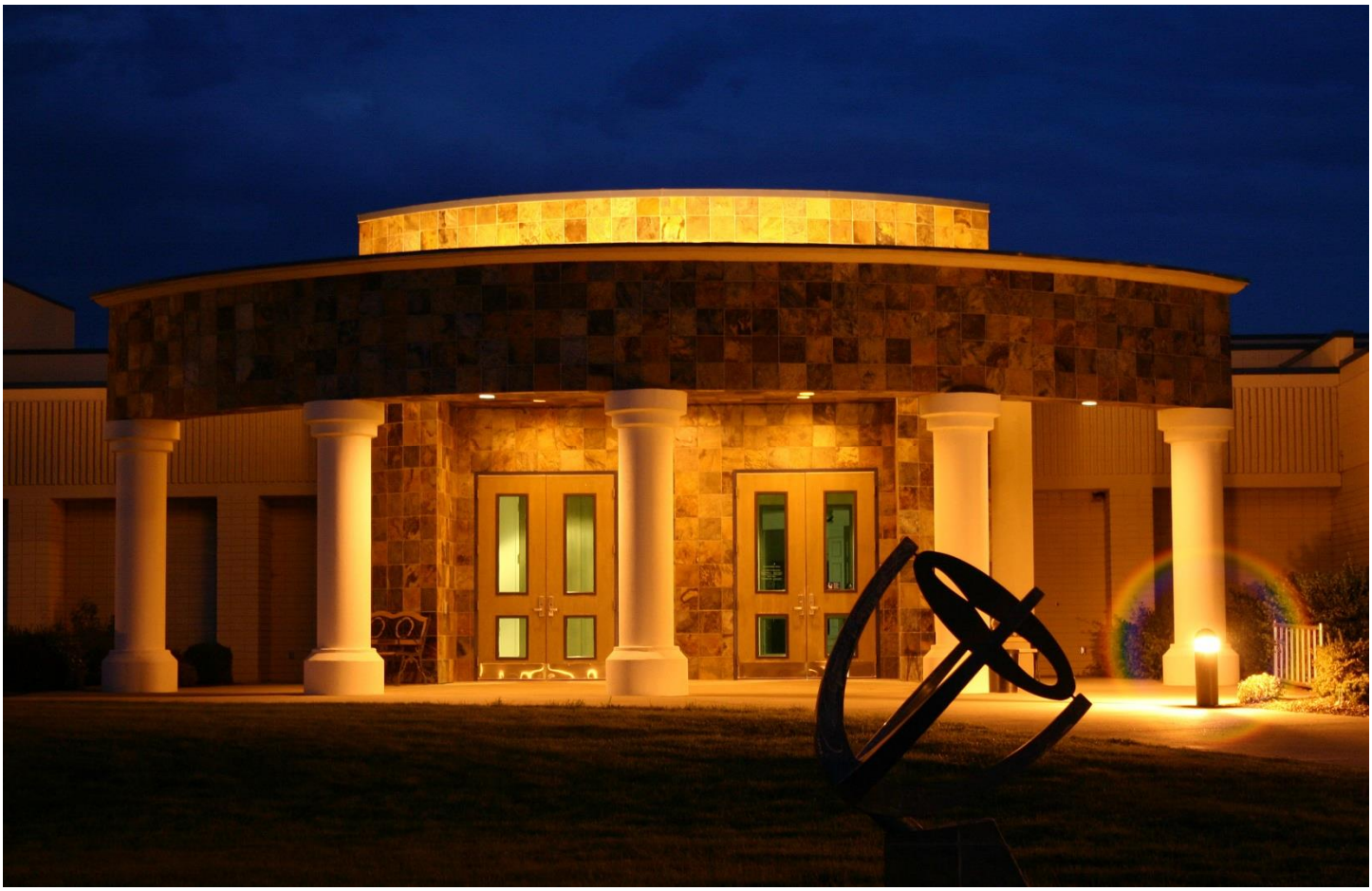
All lectures begin at 7:30 p.m. and are presented in the **Herrett Center's Rick Allen Room**. Admission is **free**.
To receive notices about upcoming lectures, send an e-mail with the subject "add" to herrettevents@csi.edu.

This monthôs forum lecture is:

ñBlack Hole Collisions and the Dawn of Gravitational Wave Astronomyò

by Dr. William Kells, Caltech LIGO Lab (ret.)
Tuesday, February 11th, 7:30 PM

Also on the second and fourth Tuesday night, the Centennial Observatory staff and MVAS Volunteers will open the observatory (weather permitting) to the general public for a night under the stars. There is a $1.50 admission fee, but this is waived if you attend the show at the Faulkner Planetarium.



The Evening Sky Map

ñThe Evening Sky Map (PDF) is a 2-page monthly guide to the night sky suitable for all sky watchers including newcomers to Astronomy.ò We canôt provide the map on this page; their legal terms of use prohibit our *e*-publishing the document. However, here is a link to the map page where you can DOWNLOAD and print your own copy:
http://skymaps.com/downloads.html

Sky Calendar -- February 2020 all times are in Universal Time (UT)

2 **First Quarter Moon** at 1:42 UT.

3 **Moon near the Pleiades** (evening sky) at 14h UT.
ÅThe Pleiades (Wikipedia)

4 **Moon near Aldebaran** (evening sky) at 7h UT.
ÅAldebaran (Wikipedia)

7 **Moon near Castor** (evening sky) at 9h UT.

7 **Moon near Pollux** (evening sky) at 13h UT.

8 **Moon near Beehive cluster M44** (evening sky) at 12h UT.
ÅBeehive Cluster (Wikipedia)
ÅM44: The Beehive Cluster (APOD)

9 **Full Moon** at 7:33 UT.

10 **Moon near Regulus** (morning sky) at 0h UT.
ÅRegulus (Wikipedia)

10 **Mercury at greatest elongation east** (18° from Sun, evening sky) at 14h UT. Mag. ī 0.5.

10 **Moon at perigee** (closest to Earth) at 20:31 UT (distance 360,461 km; angular size 33.1').

13 **Moon near Spica** (morning sky) at 16h UT.
ÅSpica (Wikipedia)

15 **Last Quarter Moon** at 22:18 UT.

17 **Moon near Antares** (morning sky) at 0h UT.
ÅAntares (Wikipedia)

18 **Moon near Mars** (morning sky) at 14h UT. Mag. 1.2.
ÅMars (Wikipedia)

19 **Moon near Jupiter** (43° from Sun, morning sky) at 20h UT. Mag. ī 1.9.
ÅJupiter (Wikipedia)

20 **Moon near Saturn** (34° from Sun, morning sky) at 15h UT. Mag. 0.6.
ÅSaturn (Wikipedia)

23 **New Moon** at 15:33 UT. Start of lunation 1202.
ÅLunation Number (Wikipedia)

26 **Mercury at inferior conjunction** with the Sun at 2h UT. Mercury passes into the morning sky.

26 **Moon at apogee** (farthest from Earth) at 12h UT (distance 406,278 km; angular size 29.4').

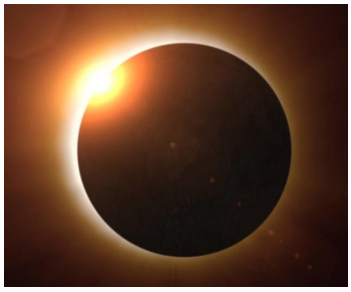
27 **Moon near Venus** (44° from Sun, evening sky) at 18h UT. Mag. ī 4.2.
ÅVenus (Wikipedia)

Betelgeuse, Betelgeuse, Betelgeuse

by Dr. Brian Jackson
and Loretta J Cannon

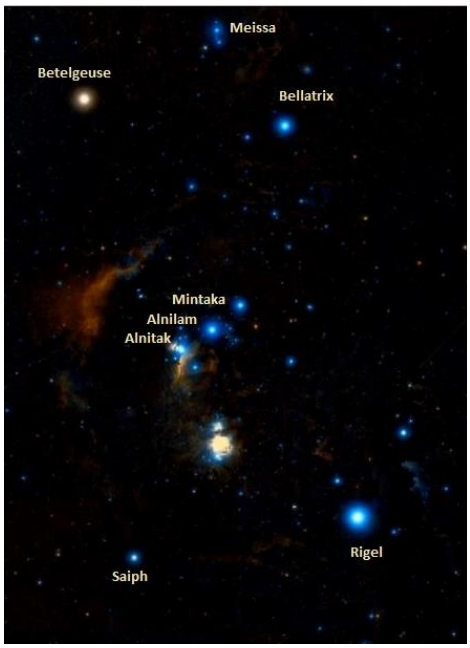
ñI myself am strange and unusual.ò
- Lydia Deetz, *Beetlejuice* (1987)

Cast your mind back to August 21, 2017, the day the Sun went dark across the United States. The eclipse was first evident in Idaho around 10:09 am along the western border with Oregon; the Sunôs radiance fell to about 60% of its usual summer glare. Within ten minutes, the eclipse was evident across the width of the state. Just over an hour later, the sunlight was gone, and for two minutes Idahoans experienced night in the middle of the day. Now imagine, what if, instead of going dark along a limited path every 18 months, the Sun dimmed every few years across the entire world, and for weeks or even years at a time? Such a cosmic drama is unfolding right now in our galactic backyard. Betelgeuse has dimmed by 50-60% over the last six months.


Solar eclipse 8-21-17 credit: NASA

Last December, the AstronomersôTelegram, an astronomical notification service, posted a bulletin that Betelgeuse dimmed by half a stellar magnitude, about 60% dimmer than usual: ñPhotometry ... shows the star has been declining in brightness since October 2019 é reaching a[n] all-time low é on 07 December 2019 UT. é Currently this is the faintest the star has been during é 50 years of photoelectric V-band observationsò (http://www.astronomerstelegram.org/?read=13341).

Famous as a shoulder star in the constellation Orion, Betelgeuse is a red supergiant about 600 light years from Earth, with a mass 20 times larger than the Sunôs and a radius 900 times larger. Though larger, Betelgeuse has only about 0.000007 the density of our Sun, which is very much less dense than the air we breathe. Extreme low density is common for a red giant star. Betelgeuseôs vibrant color belies its age and infirmity; the star is fast approaching the end of its main-sequence life.

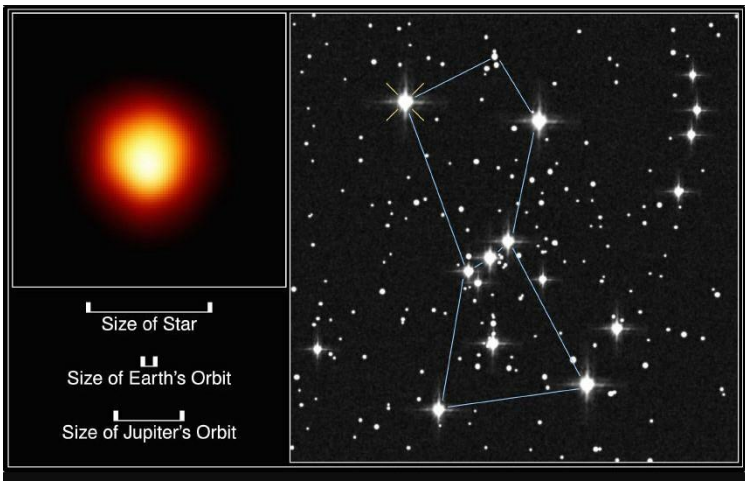


Orion credit: Wikisky

The apparent magnitude of Betelgeuse varies between 0.00 and 1.3 (more variation than any other first-magnitude star) such that it is often the 2nd brightest star in Orion. In the infrared wavelength, it is the brightest star in the sky. All stars progress through known stages of development, but some progress or age faster than others. Betelgeuse is aging rapidly. This contributes to its unusual appearance. When the star used up its supply of hydrogen, the core contracted, becoming hotter and more dense, and the atmosphere swelled, resulting in the red supergiant we have been observing since man first looked to the stars.

In 1836, John Herschel first noted that Betelgeuse exhibits irregular and pronounced variations in brightness. Thereôs evidence, however, of similar observations that are older, much older. The Lakota Sioux, of the northern central plains, knew Orion not as a hunter but rather as the severed arm of a blasphemous chief, with red, rippling Betelgeuse as the oozing wound. The Australian Aboriginal Kokathans tell the story of Nyeeruna the hunter (with the same stars as Orion) whoôs in love with the Yugarilya sisters (Pleiades) who turn away from him. The oldest sister, Kambugudha (Hyades star cluster) acts to protect her sisters. When Nyreeuna creates fire-magic (Betelgeuse) in his hand to fight her, she makes fire-magic (Aldebaran) with her foot and kicks dust into his face, humiliating him and putting out his fire-magic. Undaunted, Nyreeuna re-creates his fire-magic. When Kambugudha canôt re-create her fire-magic as quickly, she asks Babba (father dingo) for help. Babba fights Nyreeuna and places a row of dingo puppies (the row of small, faint stars between Orion and the Hyades) in front of Nyreeuna, which again humiliates the hunter and his fire-magic goes out again. This legend speaks not only to Betelgeuseôs variability but also that of Aldebaran, and further notes the difference in their periodicities. Since initially observed, Betelgeuse has been a pulsating star. Today it is classified as a semiregular variable type SRc, i.e., an extremely luminous red supergiant.

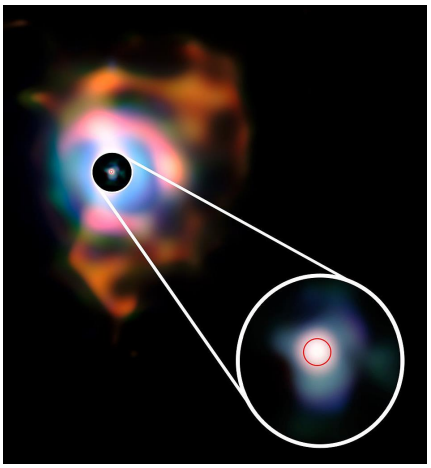
There are theories regarding Betelgeuseôs variability but no clear answers. A comprehensive study published in 2006 (https://academic.oup.com/mnras/article/372/4/1721/1189711) analyzed 48 variable stars, including Betelgeuse (Ŭ Ori), which was found to have two distinct periods ï a short one of 400 days and a longer one around 2,000 days. The shorter period was thought to be radial pulsations, specifically fundamental and first overtone pulsations, like a plucked string, and not uncommon in variable stars. Among the theories suggested for the long periods are chromospheric magnetic activity, non-radial g-modes, or massive convection columns influenced by the starôs rotation. This last theory applies to the disequilibrium within older stars between gravity (which pulls the star together) and nuclear fusion (which produces pressure that pushes material out), roiling the starôs distended atmosphere like a pot of boiling soup (hot liquid and gases released from the liquid rise to the surface while cooled liquid sinks). These convecting columns on Betelgeuse are enormous, some larger than our Sun, but act much like the pot of soup. The star periodically brightens as the hot material is pushed into the starôs atmosphere eventually thinning and cooling to a point when the material sinks, dimming the star. These cycles, though quick in cosmic time, take much longer for observers on Earth.



Betelgeuse credit: NASA (A.Dupree, R.Gilliland

Observation data for Betelgeuse has been gathered from historic records, and the star itself has been under direct observation, by the American Association of Variable Star Observers (AAVSO) for some time. Herschel (see above) noted that the star was ñstriking and unequivocalò between 1836 and 1840, but then became ñless conspicuousò. The star reached noticeable brightness again in 1852. In the 20th century, Betelgeuse dropped to its dimmest in 1927 and 1941 while, shortly after these dates, it peaked in brightness during 1933 and 1942. The starôs recent and dramatic dimming, as described above, has some speculating that the starôs end could be imminent. Or perhaps thereôll be a dramatic brightening as was seen in 1933 and 1942.

Advances in astronomy, including space telescopes, have further increased our knowledge of this star. A study published in *The Astrophysical Journal* in 2009 (https://iopscience.iop.org/article/10.1088/0004-637X/697/2/L127/pdf) reports that Betelgeuse had decreased in size by 15% over a period of 15 years. The star has been losing mass since it progressed to its red supergiant phase some 40,000 years ago. In 2011, research scientists working at the European Southern Observatoryôs (ESO) Very Large Telescope (VLT) on a mountain in Chile, have produced an infrared image of the material surrounding Betelgeuse. The cloud measures some 400 au across. The red circle indicates the extent of the star visible to the naked eye, while the black ócutoutô in the large image is where the brightest part of the image was masked to allow fainter parts to be imaged.


Betelgeuse's ejected material credit: ESO/P.Kervella

Although Betelgeuse will likely go supernova during the next 100,000 years, the current dimming likely results from chance alignment of several oscillatory modes within the atmosphere -- the same way the gait of two people walking side-by-side might randomly synchronize. When Betelgeuse does finally explode, it will outshine the full moon for about a month, though the supernova will pose no danger to Earth. Rather, the explosion, and observations leading up to it, will shine new light on the astrophysics of stellar novae.

The AAVSO encourages observations of variable stars. For Betelgeuse, they provide the following guidance: ñWhen observing for the AAVSO, please use magnitude 0.4 for Procyon (Ŭ CMi) and a magnitude of 0.9 for Aldebaran (Ŭ Tauri). An AAVSO a-scale chart is also available é (https://www.aavso.org/10-star-training). Send in your observations to the AAVSO to be incorporated into the International Database (https://www.aavso.org/webobs).ò

About the Author: Dr. Brian Jackson is an Associate Professor of Physics (Astronomy) at Boise State University. His research focuses primarily on orbital dynamics and transit observations of exoplanets. He also does some planetary science field work, e.g., terrestrial and Martian dust devils. He can be reached at BJackson@boisestate.edu. Website: http://www.astrojack.com

Phil Harrington's Cosmic Challenge

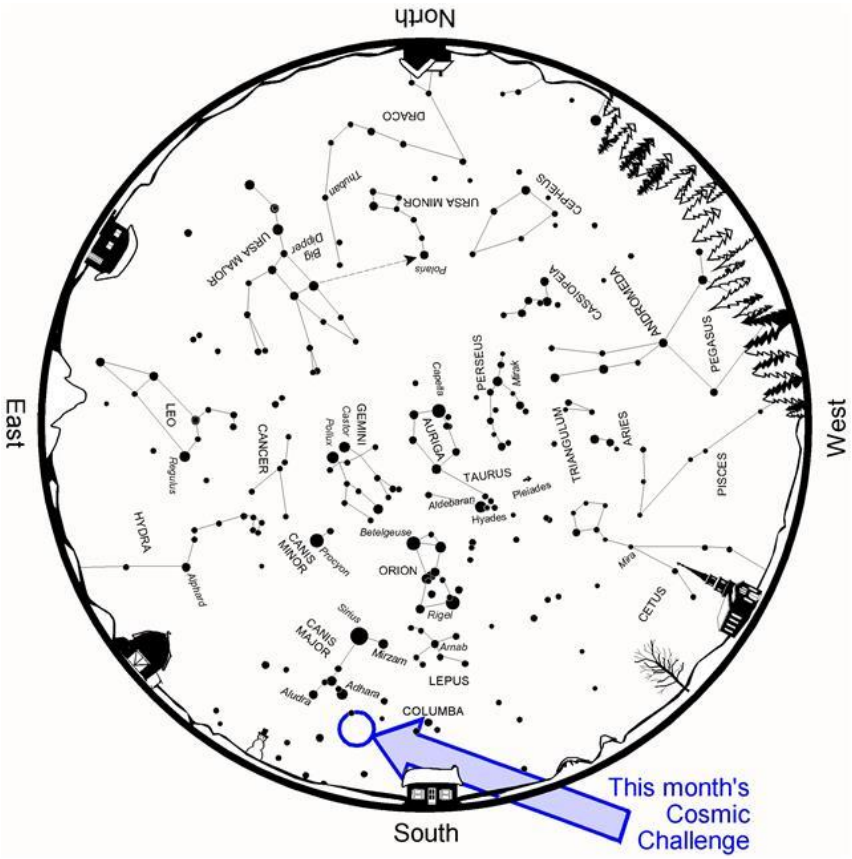
NGC 2298

	6- to 9.25-inch (15-23 cm) telescopes

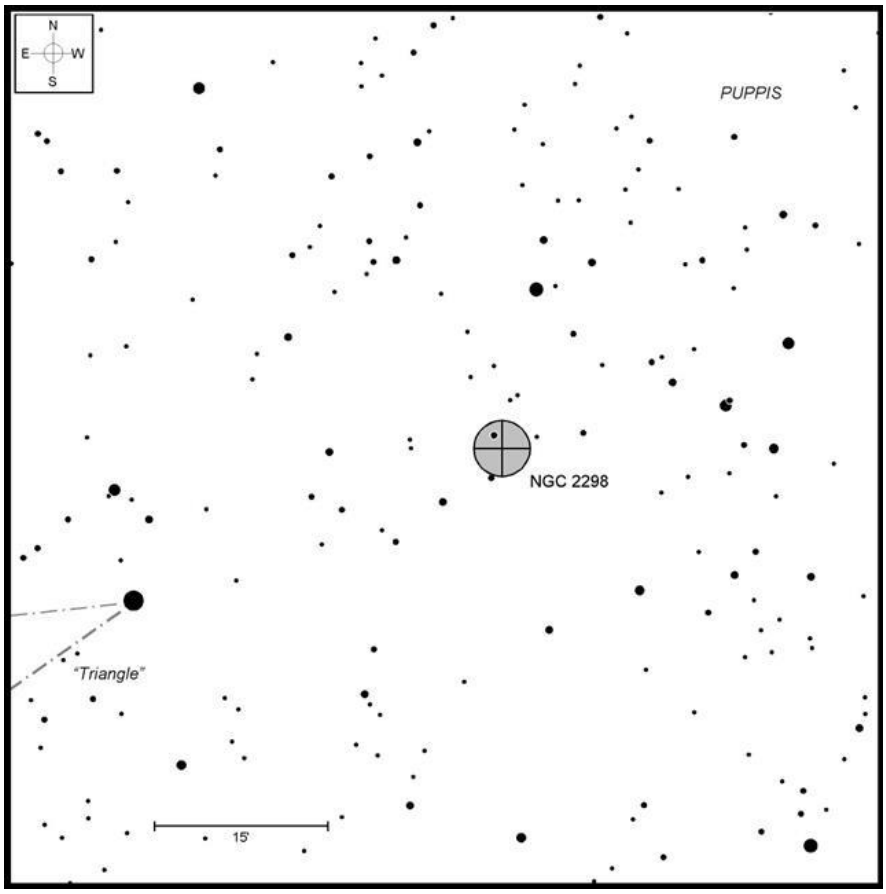
Target	Type	RA	DEC	Constellation	Mag	Size
NGC 2298	Globular cluster	06h 49.0m	-36° 00.3'	Puppis	9.2	5ô

Although most globular clusters line the summer sky as they huddle around the core of our galaxy, there are a few renegades that have stepped out on their own to occupy regions far beyond the rest. One such globular, nestled behind the rich Milky Way star fields of Puppis, is **NGC 2298**.

Discovered on May 30, 1826, by James Dunlop, NGC 2298 is a loner, some 40,000 light years from Earth. It orbits the Milky Way along a very broad, elliptical path that carries it as close as 6,500 light years from the galactic core and as far as 49,000 light years away across 304 million years.



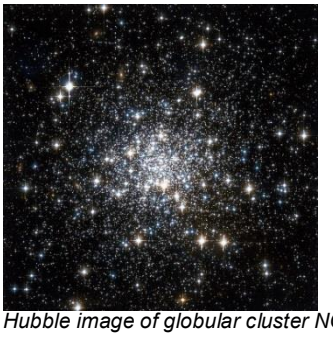
Evening star map. Credit: Map adapted from Star Watch by Phil Harrington



Finder chart for this month's Cosmic Challenge.
Click on the chart to open a printable PDF version.

Research suggests that NGC 2298 is actually a castaway of the Canis Major Dwarf Galaxy. The Canis Major Dwarf, first reported in 2003 by a team of French, Italian, British and Australian astronomers, is classified as an irregular galaxy populated by as many as one billion stars. If its projected distance of 25,000 light years is correct, it is the closest neighboring galaxy to Earth. Astronomers, however, believe that the dwarf is in the process of being cannibalized by the overpowering effect of our Milky Way's gravity. As a result, it has cast off NGC 2298. Other exiles include globular clusters M79, NGC 1851, NGC 2808, as well as open cluster Tombaugh 2.

Another study, this one published in 2007 and based on data collected by the Hubble Space Telescope, shows that NGC 2298 itself is losing mass at a high rate. As the authors discuss, "observations over the past years have revealed a growing number of globular clusters severely depleted of low-mass stars." A remote globular like NGC 2298 should show a greater abundance of low-mass stars than globulars that are closer to the Milky Way's core. But it does not. The study concludes from this that NGC 2298 is losing mass more rapidly than expected. In fact, as the title of the study surmises, NGC 2298, like its original parent galaxy, is on its way to disruption.



Hubble image of globular cluster NGC 2298

Not to worry, however; NGC 2298 will be around for a while longer. You can take your time finding it. To starhop its way, begin your quest at Aludra [Eta (ɖ) Canis Majoris], the tail star of the Large Dog. Slipping 3° southward, brings a right triangle of three bright stars into view, accompanied by many fainter points that collectively form the little-known star cluster **Collinder 140**. Its large size and sparseness masked the cluster's true nature until 1931, when Swedish astronomer Per Collinder included it as number 140 in his catalog. As I wrote in my February 2015 column here on CN, Collinder 140 is an easy target through just about any binocular. Its 30 stars range in brightness from 5th magnitude to fainter than 9th and span about 3/4°. Arizona deep-sky observer Steve Coe suggests the nickname "The Tuft" because of its location at the very tip of the dog's tail.

Drop another 5° southwest to 3rd-magnitude star, Pi (´) Puppis. Pi dominates another under-appreciated open cluster, **Collinder 135**. You will immediately notice Pi's striking orange color. Classified as a type K3 supergiant, its color is accentuated by the other blue-white cluster stars. Those stars also the double star v1 and v2 Puppis, just north of Pi, and a solitary 5th-magnitude star to the west. Together, they give the cluster a distinctive arrowhead shape. Once again, binoculars or your finderscope will likely offer a better view of both clusters than your telescope.

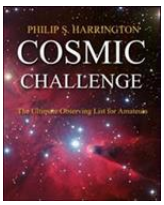
Finally, turn toward the northwest and shift 4°, or about half a finder field, from Pi to a small triangle of 6th- and 7th-magnitude stars. The triangle's westernmost star is labeled on the finder chart above. NGC 2298 is 1¾° away to its west-southwest and 15' south of an isolated 8th-magnitude field star.

NGC 2298 as seen through the author's 8-inch (20cm) reflector at 56x.

NGC 2298 will give most 6-inch telescopes a run for their money but seeing it through 8- and 9.25-inch scopes should pose little problem as long as the atmosphere is clear of any horizon-hugging haze and clouds. My notes made through my 8-inch at 56x recall a dim ball of starlight punctuated by a vague central condensation. Using averted vision and raising magnification to 142x, I could just make out a few faint points around the edges. None of the cluster's stars shines brighter than magnitude 13.5.

Good luck with this month's Cosmic Challenge!

Until next month, remember that half of the fun is the thrill of the chase. Game on!

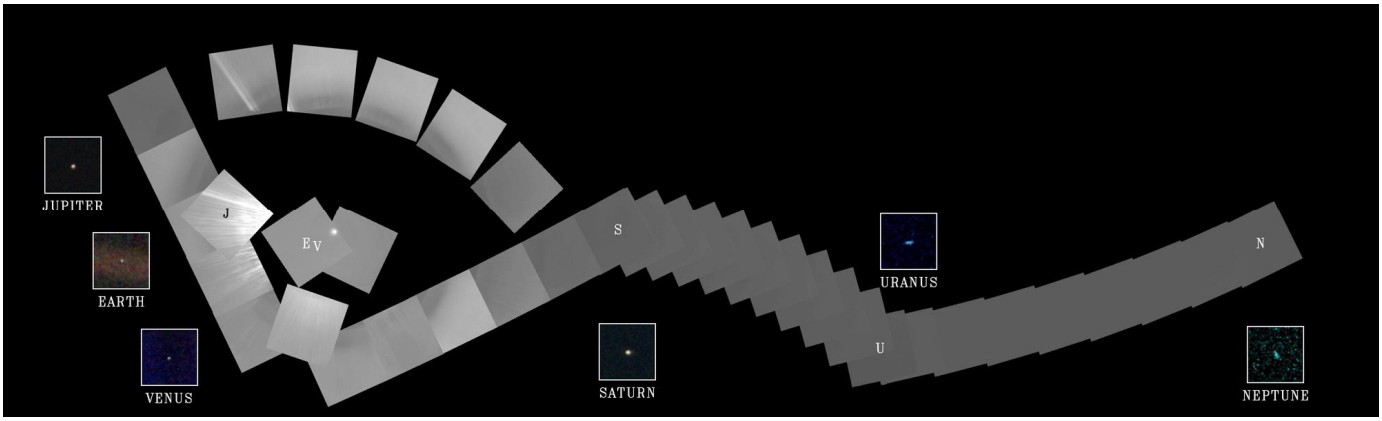


About the Author: Phil Harrington writes the monthly *Binocular Universe* column in Astronomy magazine and is the author of 9 books on astronomy. Visit his web site at www.philharrington.net to learn more.

The *Voyager* Odyssey
Chapter 12: Family Portrait
by Loretta J Cannon

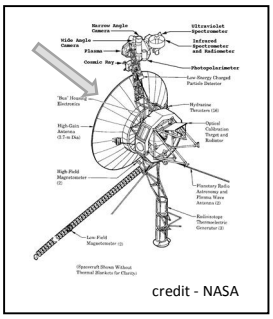
ñThe Earth in a sunbeam. é this is where we live, on a blue dot. é that's where everyone you know and everyone you ever heard of and every human being who ever lived, lived out their lives. I think this perspective underscores our responsibility to preserve and cherish that blue dot . . . the only home we have.ò
- Carl Sagan .
quoted in documentary *The Farthest Voyager in Space* (2017)

Thirty years ago this month, on February 14, 1990, *Voyager 1* looked down from an angle of approximately 32 degrees above the ecliptic (plane of the solar system) and took a series of 60 pictures that, after processing and analysis, became the mosaic shown below. Though originally proposed in late 1980 after the successful Saturn flyby, it would take another ten years before approval was given for this solar system portrait, the only one of its kind. Carl Sagan is credited with having first suggested this but there was a fair amount of opposition, not only the argument that pointing the cameras directly towards the sun (to visualize the inner planets) would fry them, but also the need to ensure that *Voyager 1*'s cameras were functional for any potential diagnostic should a problem with *Voyager 2*'s cameras arise during the flybys of Uranus and Neptune.

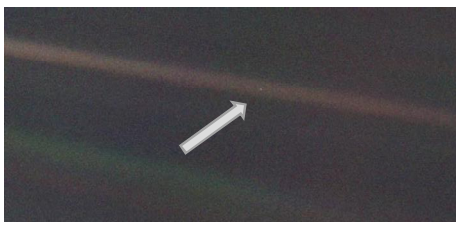


Solar system Family Portrait credit - NASA

So now it's late 1989, and *Voyager 2* has completed the Grand Tour of the outer planets, with its pass by Neptune's moon Triton, and has swung below the ecliptic on its way towards interstellar space. As the ñpicture of the centuryòwas debated, it was known that staffing, including the imaging experts needed to program the spacecraft and to process the images, would soon be leaving for other jobs. Further, they knew that *Voyager 2* was still too close below the ecliptic and that *Voyager 1* was rapidly rising above the ecliptic. Carl Sagan, along with Len Fisk and Richard Truly (both NASA officials with clout) were able to ensure that the staff were available for this historic photo shoot. And the task fell to *Voyager 1*.


credit - NASA

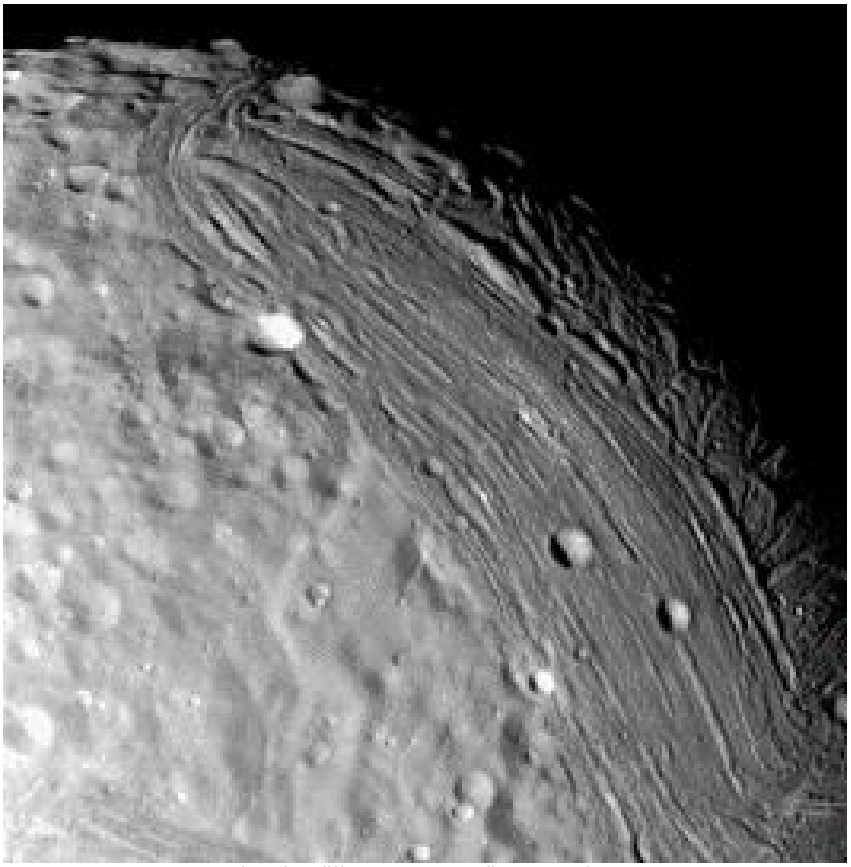
The cameras on *Voyager 1* began with Neptune and worked inwards. There was some difficulty ñseeingô the inner planets, which were very close to the oh-so-bright Sun. In his book *The Interstellar Age* (2015), Jim Bell relates the story that they maneuvered the spacecraft so that they could use the high-gain antenna (see diagram at right) to block some of the glare much as people do with their hand when looking towards an object brightly backlit. But even with that, neither Mercury nor Mars were imaged. The close-up of Earth, our planet in a sunbeam, is a now a classic (this author has added an arrow to indicate our less-than-a-pixel planet). Part of the NASA press conference in which the family portrait was introduced was included in the documentary *The Farthest Voyager in Space* (2017), the part where Carl Sagan points out our planet in this image. It is worth watching (quote above).


Earth in a sunbeam cred-NASA/JPL, Caltech

Like all of Uranusô moons, Miranda was named after a Shakespearian character. Discovered by Gerard Kuiper in 1948, this is the last moon found prior to the *Voyager* mission. This small world is a jumbled-up hodge-podge of water ice and silicate rock that averages a frigid -187°C with neither magnetic field nor atmosphere and sports a slightly inclined orbit.. On a world thatôs only 293 miles in diameter, it has fault canyons approaching 14 miles deep. There are also cliffs measuring more than 15,000 feet high. Earthôs Grand Canyon is only 6,093 feet deep. The image at right portrays the worldôs mosaic. It is as if the Magratheans (from *The Hitchhiker's Guide to the Galaxy*), before having been hired by the mice, were asked to create a small demo worldlet on which the planet makers had examples of different surface types, like a cosmic carpet sample book.

Voyager 2 was able to acquire some amazing close-up images of Miranda. The image at left was taken from a height of 22,000 miles and portrays the well-known chevron next to some deep crevasses. The image below shows multiple surface types, including steep cliffs.

Scientists have not deciphered yet how Miranda came to be. One theory of Mirandaôs appearance is that itôs a remnant of the planetary collision that tipped Uranus. A writer for SeaandSky.org notes that ñrecent theories suggest that the upwelling of partially melted ices may be responsible é .ò Another theory postulates that the ócoronaeô (the less cratered areas with ridges and valleys) are the result of large meteor impacts that melted ice pockets, which then surfaced as a liquid/rock slush that froze quickly. This author agrees with this last idea; parts of Mirandaôs look quite like frost heaves. This is the realm of the ice giants after all.



Miranda, cliffs credit ï NASA/JPL

Next month, weôll close out our travels with the *Voyagers*. Then in March, weôll learn about Pluto, from planet to Kuiper belt object.

About the Author: Loretta J Cannon is a 3rd generation Idahoan. She earned both of her Bachelor degrees from Boise State University and her Masters from Arizona State University. After almost 20 years working for local banks, non-profits and the Federal government, she is somewhat retired and devotes her time to science writing & editing and real estate. She can be reached at LorettaJCannon@gmail.com.

Solar System

The Sun, the Moon, & the Planets

The **Moon** is 6.9 days old, is illuminated 37.9%, subtends 29.9', and is located in the constellation of Pisces at 0:00 UT on February 1st. The Moon attains its greatest northern declination (+23.2 degrees) for the month on February 7th and its greatest southern declination (-23.2 degrees) on February 19th. Longitudinal libration is at a maximum of +6.6 degrees on February 17th and at a minimum of -7.0 degrees on February 5th. Latitudinal libration is at a maximum of +6.6 degrees on February 26th and a minimum of -6.6 degrees on December 12th. New Moon occurs on February 23rd. The Moon is at perigee (a distance of 56.52 Earth-radii) on February 10th and is at apogee (a distance of 63.70 Earth-radii) on February 26th. The Moon is about one degree from Graffias (Beta Scorpii) on the morning of February 16th. The waning crescent Moon joins Mars, Jupiter, and Saturn in the southeastern sky on the mornings of February 18th, February 19th, and February 20th. The Lunar X occurs on February 1st and the Curtiss Cross on February 17th. From certain parts of the world, the Moon occults 4 Vesta, 3 Juno, Mars, and Jupiter on February 2nd, February 13th, February 18th, and February 19th respectively. Browse http://www.lunar-occ...ota/iotandx.htm for information on lunar occultation events. Visit https://saberdoesthe...does-the-stars/ for tips on spotting extreme crescent Moons and http://www.curtrenz.com/moon06.html for Full Moon data. Consult http://time.unitariu...oon/where.html or download http://www.ap-i.net/avl/en/start for current information on the Moon. See https://svs.gsfc.nasa.gov/4768 for a lunar phase and libration calculator and https://svs.gsfc.nasa.gov/4768 for the Lunar Reconnaissance Orbiter Camera (LROC) Quickmap. Click on https://www.calendar...r/2020/february for a lunar phase calendar for this month. Times and dates for the lunar crater light rays predicted to occur this month are available at http://www.lunar-occ...o/rays/rays.htm.

The **Sun** is located in the constellation of Capricornus on February 1st. It enters Aquarius on February 16th.

Brightness, apparent size, illumination, distance from the Earth in astronomical units, and location data for the planets and Pluto on February 1: Mercury (magnitude -1.0, 5.6", 85% illuminated, 1.19 a.u., Capricornus), Venus (magnitude -4.1, 15.3", 73% illuminated, 1.09 a.u., Aquarius), Mars (magnitude +1.4, 4.8", 93% illuminated, 1.95 a.u., Ophiuchus), Jupiter (magnitude -1.9, 32.5", 100% illuminated, 6.07 a.u., Sagittarius), Saturn (magnitude +0.6, 15.1", 100% illuminated, 10.97 a.u., Sagittarius), Uranus (magnitude +5.8, 3.5", 100% illuminated, 20.17 a.u. on February 15th, Aries), Neptune (magnitude +8.0, 2.2", 100% illuminated, 30.85 a.u. on February 15th, Aquarius), and Pluto (magnitude +14.4, 0.1", 100% illuminated, 34.81 a.u. on February 15th, Sagittarius).

Mercury, Venus, and Neptune can be seen in the west and Uranus in the southwest in the evening sky. In the morning sky, Mars, Jupiter, and Saturn lie in the southeast.

Mercury, Venus, Mars, Jupiter, and Saturn all pass through the ecliptic during February.

The **zodiacal light** should be visible from a dark location in the west after evening twilight for two weeks starting on February 11th. Click on https://www.atoptics...ighsky/zod1.htm for more on the zodiacal light.

Mercury is at the ascending node on February 7th. It reaches greatest eastern elongation on February 10th and perihelion on February 12th. This will be a short but respectable evening apparition of the planet for northern hemisphere observers with the planet positioned ten degrees above the horizon for the first two weeks of February. Mercury will shine at brighter than zero magnitude during the first half of the month. Mercury is stationary on February 16th and is at heliocentric latitude north on February 22th. The speediest planet will dim dramatically as it approaches inferior conjunction on the evening of February 25th (February 26th UT).

Venus increases 15 degrees in declination during the month, rising from nearly 35 degrees to slightly more than 41 degrees in altitude at sunset from 40 degrees north. It decreases in illumination from 73 to 63% but grows in angular size from 15 to 19 arc seconds. The brightest planet crosses the celestial equator on February 9th. On February 15th, it is at the ascending node. The Moon passes six degrees north of Venus on February 27th. Venus sets approximately three and three-quarters hours after the Sun by the end of the month.

Mars passes the descending node of its orbit, moving to the south of the orbital plane of the Earth, and enters southern ecliptic latitudes on February 1st. The apparent diameter of the planet exceeds five arc seconds on February 10th. Mars enters Sagittarius on February 11th. Mars passes between M8 (the Lagoon Nebula) and M20 (the Trifid Nebula) on

February 17th. The waning crescent Moon passes less than one degree north of Mars on February 18th. A short article on the occultation that will occur for much of the continental United States, Canada, and parts of Central America can be found on page 50 of the February 2020 issue of Sky & Telescope.

As February begins, **Jupiter** rises 90 minutes before sunrise. It brightens from magnitude -1.9 to magnitude -2.0 and increases in apparent diameter from 32.5 arc seconds to 34.1 arc seconds this month. The waning crescent Moon passes just less one degree to the south of Jupiter on February 19th. The gas giant planet is at the descending node on February 26th. Data on Galilean satellite events is available online at http://www.shallowsky.com/jupiter/and http://www.skyandtel...watching-tools/ and on page 51 of the February 2020 issue of Sky & Telescope. Click on http://www.skyandtel...watching-tools/ or consult pages 50 and 51 of the February 2020 issue of Sky & Telescope to determine transit times of the central meridian by the Great Red Spot.

The Ringed Planet crosses the ecliptic on February 13th. Saturn departs Sagittarius and enters Capricornus in the middle of the month. The waning crescent Moon passes less than two degrees south of Saturn on February 20th. As the month ends, Saturnôs ring system spans 35 arc seconds and is inclined 22 degrees from edge-on. For information on the satellites of Saturn, browse http://www.skyandtel...watching-tools/.

Uranus is located about 12 degrees south of the second-magnitude star Hamal (Alpha Arietis). The ice giant sets around midnight local time early in the month and about two hours earlier as February draws to a close. Uranus and Venus are separated by about eight degrees on February 29th.

Neptune lies six degrees west of Venus and 18 arc minutes west of the class M red giant star Phi Aquarii (magnitude 4.2) on February 1st. By February 10th, Neptune is positioned just 2.3 arc minutes north of the star. Mercury and Neptune are in quasiconjunction on February 15th. Neptune disappears from view by the middle of the month.

See https://curtrenz.com/uranep.html for additional information on the two outer planets.

Finder charts for Uranus and Neptune are also available online at https://s22380.pcdn....020_updated.pdf

Click on http://www.skyandtel...watching-tools/ for JavaScript utilities that will illustrate the positions of the five brightest satellites of Uranus and the position of Triton, Neptuneôs brightest satellite.

The dwarf planet **Pluto** is not visible this month.

A guide to planetary observing for the year by the British magazine The Sky at Night is posted at https://www.skyatnig...nets-night-sky/

For more on the planets and how to locate them, browse http://www.nakedeyeplanets.com/.

Comets

Comet C/2017 T2 (PanSTARRS) is located a degree northwest of NGC 869 (the western half of the Double Cluster) on February 1st. By the middle of February, the comet is located a degree to the west of the open cluster Stock 2 (the Muscle Man Cluster). It can be found several degrees west of IC 1805 (the Heart Nebula) and IC 1848 (the Soul Nebula) as the month ends. Comet PanSTARRS may brighten to magnitude +8.8 by the end of February. Both article and finder charts appear on pages 48 and 49 of the February, 2020 issue of Sky & Telescope. Visit http://cometchasing.skyhound.com/ and http://www.aerith.ne.../future-n.html for additional information on comets visible this month.

Asteroids

Asteroid 4 Vesta shines at eighth magnitude as it exits Aries and enters Taurus this month. The First Quarter Moon occults 4 Vesta on February 1st for observers in Alaska and western Canada. Asteroids brighter than magnitude +11.0 that reach opposition this month include 37 Fides (magnitude +10.1) on February 2nd and 30 Urania (magnitude +10.6) on February 29th. A finder chart for 37 Fides can be found on page 49 of the February 2020 issue of Sky & Telescope. Consult http://asteroidoccul.../2020_02_si.htm for information on asteroid occultation events taking place this month. Visit http://www.curtrenz.com/asteroids.html to learn more about a number of asteroids

Meteor Showers

The major meteor showers that will occur this year are discussed at https://www.skyandte...howers-in-2020/.

Orbiting Earth

Information on passes of the ISS, the USAFôs X-37B, the HST, and other satellites can be found at http://www.heavens-a...ns-above.com/.

Stars

The famous eclipsing variable star Algol (Beta Persei) is at a minimum, decreasing in magnitude from 2.1 to 3.4, on February 3rd, 6th, 9th, 11th, 14th, 17th, 20th, 23rd, 26th, and 29th. Consult page 50 of the February 2020 issue of Sky & Telescope for the times of the minima. The Demon Star is at minimum brightness for approximately two hours centered at 12:21 a.m. EST on February 6th (4:21 UT), at 9:10 p.m. EST on February 8th (2:10 UT on February 9th), at 10:55 p.m. EST on February 28th (3:55 UT on February 29th).
For more on Algol, see http://stars.astro.i.../sow/Algol.html and http://www.solstatio...rs2/algol3.htm .

Forty binary and multiple stars for February: 41 Aurigae, Struve 872, Otto Struve 147, Struve 929, 56 Aurigae (Auriga); Nu-1 Canis Majoris, 17 Canis Majoris, Pi Canis Majoris, Mu Canis Majoris, h3945, Tau Canis Majoris (Canis Major); Struve 1095, Struve 1103, Struve 1149, 14 Canis Minoris (Canis Minor); 20 Geminorum, 38 Geminorum, Alpha Geminorum (Castor), 15 Geminorum, Lambda Geminorum, Delta Geminorum, Struve 1108, Kappa Geminorum (Gemini); 5 Lyncis, 12 Lyncis, 19 Lyncis, Struve 968, Struve 1025 (Lynx); Epsilon Monocerotis, Beta Monocerotis, 15 (S) Monocerotis (Monoceros); Struve 855 (Orion); Struve 1104, k Puppis, 5 Puppis (Puppis)

Deep Sky

Fifty deep-sky objects for February: NGC 2146, NGC 2403 (Camelopardalis); M41, NGC 2345, NGC 2359, NGC 2360, NGC 2362, NGC 2367, NGC 2383 (Canis Major); M35, NGC 2129, NGC 2158, NGC 2266, NGC 2355, NGC 2371-72, NGC 2392, NGC 2420 (Gemini); NGC 2419 (Lynx); M50, NGC 2232, NGC 2237, NGC 2238, NGC 2244, NGC 2245, NGC 2251, NGC 2261, NGC 2264, NGC 2286, NGC 2301, NGC 2311, NGC 2324, NGC 2335, NGC 2345, NGC 2346, NGC 2353 (Monoceros); NGC 2169, NGC 2174, NGC 2194 (Orion); M46, M47, M93, Mel 71, NGC 2421, NGC 2423, NGC 2438, NGC 2439, NGC 2440, NGC 2467, NGC 2506, NGC 2509 (Puppis)

Top ten binocular deep-sky objects for February: M35, M41, M46, M47, M50, M93, NGC 2244, NGC 2264, NGC 2301, NGC 2360

Top ten deep-sky objects for February: M35, M41, M46, M47, M50, M93, NGC 2261, NGC 2362, NGC 2392, NGC 2403

Challenge deep-sky object for February: IC 443 (Jellyfish Nebula) Right Ascension: $06^h\ 17^m\ 13^s$ | Declination +22° 31N05Nj

The objects listed above are located between 6:00 and 8:00 hours of right ascension.

Miscellaneous Links

A wealth of information on solar system celestial bodies is posted at http://www.curtrenz.com/astronomy.html and http://nineplanets.org/.

Various events taking place within our solar system are discussed at http://www.bluewater...ed-4/index.html

Information on the celestial events transpiring each week can be found at http://astronomy.com/skythisweekand http://www.skyandtel...ky-at-a-glance/

A monthly podcast on various astronomical topics is available at https://www.skyandte...onomy-podcasts/

Free star maps for the month can be downloaded at http://www.skymaps.com/downloads.html and http://www.telescope...thly-Star-Chart.

Data on current supernovae can be found at http://www.rochester...y.org/snimages/

Information on observing some of the more prominent Messier galaxies is available at http://www.cloudynig...ur-astronomers/

Finder charts for the Messier objects and other deep-sky objects are posted at https://freestarcharts.com/messierand https://freestarcharts.com/ngc-icand https://www.cambridg...s_january-march

Telrad finder charts for the Messier Catalog and the SACôs 110 Best of the NGC are posted at http://www.astro-tom...essier_maps.htmand http://sao64.free.fr...ataloguesac.pdf

Deep-sky object list generators can be found at https://dso-browser.com/ and http://www.virtualcolony.com/sac/ and http://tonightssky.com/MainPage.php.

Free sky atlases can be downloaded at http://www.deepskywa...-atlas-full.pdfand https://allans-stuff.com/triatlas/

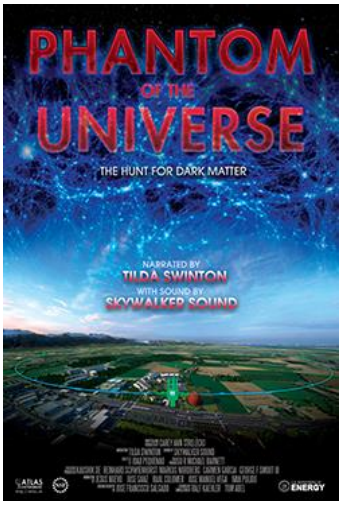
The distinctive wedge-shaped glow of the zodiacal light (at right) emerges from the western horizon on a winter night. Image credit: Brian Ventrudo.

Observatory and Planetarium

CSI Centennial Observatory / Faulkner Planetarium Herrett Center

Event	Place	Date	Time	Admission
Telescope Tuesday	Centennial Observatory	Tuesday, January 28th, 2020	6:30 to 9:00 PM	$1.50 or free with Faulkner Planetarium admission
Monthly Free Star Party	Centennial Observatory	Saturday, February 8th, 2020	7:00 PM to midnight	FREE
Telescope Tuesday	Centennial Observatory	Tuesday, February 11th, 2020	7:00 to 9:00 PM	$1.50 or free with Faulkner Planetarium admission
Telescope Tuesday	Centennial Observatory	Tuesday, February 25th, 2020	7:30 to 9:00 PM	$1.50 or free with Faulkner Planetarium admission

College of Southern Idaho Campus Twin Falls, ID
Faulkner Planetarium / Show Times



Now Showing

About the Magic Valley Astronomical Society

Magic Valley Astronomical Society
550 Sparks St.
Twin Falls, ID

The Magic Valley Astronomical Society (MVAS) was founded in 1976. The Society is a non-profit [501(c) 3] educational and scientific organization dedicated to bringing together people with an interest in astronomy.

In partnership with the Centennial Observatory, Herrett Center, College of Southern Idaho - Twin Falls; we hold regularly scheduled monthly meetings and observation sessions, at which we share information on current astronomical events, tools and techniques for observation, astrophotography, astronomical computer software, and other topics concerning general astronomy. Members enthusiastically share their telescopes and knowledge of the night sky with all who are interested. In addition to our monthly public star parties we hold members only star parties at various locations throughout the Magic Valley.

MVAS promotes the education of astronomy and the exploration of the night sky along with safe solar observing through our public outreach programs. We provide two types of outreach; public star parties and events open to anyone interested in astronomy, and outreach programs for individual groups and organizations (e.g. schools, churches, scout troops, company events, etc.), setting up at your location. All of our outreach programs are provided by MVAS volunteers at no cost. However, MVAS will gladly accept donations. Donations enable us to continue and improve our public outreach programs.

Membership is not just about personal benefits. Your membership dues support the work that the Magic Valley Astronomical Society does in the community to promote the enjoyment and science of astronomy.
Speakers, public star parties, classes and support for astronomy in schoolrooms, and outreach programs just to name a few of the programs that your membership dues support.

Annual Membership dues will be:
$20.00 for individuals, families, and $10.00 for students.
Contact Treasurer Jim Tubbs for dues information via e-mail: jtubbs015@msn.com

Donations to our club are always welcome and are even tax deductible. Please contact a board member for details.

Membership Benefits:
Lending Telescopes: The society currently has three telescopes for loan and would gladly accept others please contact President Robert Mayer, for more information on these and other benefits.

Telescopes are an individual thing and not practical for public use. However, everyone should have the experience of a good look at the moon for at least 5 minutes in their life time. It is a dimension and feeling that is unexplainable. Pictures or TV can't give this feeling, awareness, or experience of true dimension. A person will not forget seeing our closest neighbor, the moon. Norman Herrett in a letter to Dr. J. L. Taylor, president of the College of Southern Idaho, Twin Falls, ID, USA.