Snake River Skies

The Newsletter of the Magic Valley Astronomical Society

www.mvastro.org

Membership Meeting

Saturday, January 9th 2016
7:00pm at the
Herrett Center for Arts & Science
College of Southern Idaho.

Public Star Party Follows at the Centennial Observatory

Club Officers

Robert Mayer, President
mayerrbrt@gmail.com
208-312-1203

Paul McClain, Vice President
plmccln@gmail.com

Gary Leavitt, Secretary
leavittg@cableone.net
208-731-7476

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

President's Message

Colleagues,

As 2016 opens up, it's time to talk about an old tradition and hopefully a new one. First of all, the annual telescope clinic conducted by Tom Gilbertson will be Saturday, Jan. 9, at 7 p.m. at the Herrett Center. This is a great chance to help friends out who may have received telescopes for Christmas. Please encourage them to come, and please feel free on attending. The more participation we get, the better the chance we have of connecting to the public.

Then there's the new tradition we're hoping to carry out. On Friday, March 4th, we're planning on renting out the Lodge at Castle Rocks State Park. According to the Park's website, the Lodge can hold up to eight people in four rooms. Jay Naegele went there a couple of months ago, and reported back that the experience was worth it. What we'd do then, is just hold a members' star party at the Lodge.

To help offset the cost, we are asking for $15 from each person who attends.

If you are interested in going, please let me know, for the sooner we can make reservations, the better. If I hear from more than seven people -- I'm already in -- then we will look into also reserving the bunkhouse. Now granted, that's not as nice. If you talked to me about it at the Christmas Party, please send me another E-mail reminder...

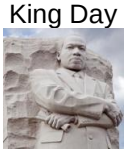
Once I start getting "reservations" from people, we'll work out more details such as meals, payment arrangements, sleeping arrangements and weather contingency plans. You will want to hurry, for I have already received some inquiries.

Until then,

Clear Views,
Robert Mayer

Calendars for December

Event Calendar

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 New Years Day 	2 Last Quarter 48% Visible Moon at Apogee Subtending 29' 
3	4	5	6	7	8	9 MVAS General Mtg. at the Herrett Center Public Star Party follows at the Centennial Observatory
10 New Moon Lunation 1151 	11	12	13	14	15	16 First Quarter 45% Visible 
17	18 Martin Luther King Day 	19	20	21	22	23
24 Full Moon (Wolf Moon Algonquin) 	25	26	27	28	29	30
31						

Snake River Skies is the Newsletter of the Magic Valley Astronomical Society and is published electronically once a month.

January Celestial Calendar and Trivia

All times are UT (subtract seven hours and, when appropriate, one calendar day)

1/3 The Martian summer solstice occurs at 3:00; the Moon is 4.5 degrees north-northeast of the first-magnitude star Spica (Alpha Virginis) at 7:00; the Curtiss Cross, an X-shaped illumination effect located between the craters Parry and Gambart, is predicted to begin at 10:22; Mars is 1.4 degrees south-southwest of the Moon at 20:00
1/4 Mercury is at the ascending node at 2:00.
1/5 The latest sunrise of 2016 at latitude 40 degrees north occurs today; Mercury is stationary in right ascension at 5:00; Pluto is in conjunction with the Sun at 22:00.
1/7 Venus is 3.1 degrees south of the Moon at 1:00; Saturn is 3.3 degrees south of the Moon at 5:00; Uranus is at eastern quadrature at 12:00; Venus is 6.3 degrees north of the first-magnitude star Antares (Alpha Scorpii) at 16:00.
1/8 The latest onset of morning twilight of 2016 at latitude 40 degrees north occurs today; Mercury is at perihelion (0.375 a.u. from the Sun) at 18:00; Jupiter is stationary in right ascension at 20:00.
1/9 Venus is 0.08 degree north of Saturn, the second closest planetary appulse of 2016, at 4:00; Pluto is 3.1 degrees south of the moon at 19:00.
1/10 Mercury is 2.1 degrees south of the Moon at 18:00.
1/13 Neptune is 2.2 degrees south-southeast of the Moon at 14:00.
1/14 Mercury is in inferior conjunction at 14:00.
1/15 The Moon is at perigee, subtending 32' 02" from a distance of 229,671 miles, at 2:14.
1/16 Uranus is 1.4 degrees north-northwest of the Moon at 7:00; the Lunar X (the Purbach or Werner Cross), an X-shaped illumination effect involving various rims and ridges between the craters La Caille, Blanchinus, and Purbach, is predicted to begin at 22:56.
1/18 Mercury is at its greatest heliocentric latitude north (7 degrees north of the ecliptic plane) at 23:00
1/19 Asteroid 2 Pallas is in conjunction with the Sun at 10:00.
1/20 The Moon is 0.5 degree north-northwest of the first-magnitude star Aldebaran (Alpha Tauri), with an occultation occurring in western Europe, southern Greenland, Canada, the United States, and northern Mexico, at 2:00; the Sun enters the constellation of Capricornus at 8:00.
1/21 The Moon is 5.9 degrees south of the bright open cluster M35 in Gemini at 18:00.
1/25 Comet C/2013 US10 (Catalina) is at opposition at 14:00; Mercury is stationary in right ascension at 19:00
1/26 The Moon is 2.4 degrees south-southwest of the first-magnitude star Regulus (Alpha Leonis) at 4:00
1/28 Jupiter is 1.3 degrees north-northeast of the Moon at 0:00; Venus is at its greatest declination south (-22.5 degrees) at 4:00
1/30 The Moon is at apogee, subtending 29' 45" from a distance of 404,553 kilometers (251,377 miles), at 9:00; Mercury is 0.5 degree north-northeast of Pluto at 15:00; the Moon is 4.8 degrees north-northeast of Spica at 15:00

Johannes Hevelius (1611-1687) was born this month.

Galileo Galilei discovered Io, Europa, and Callisto on January 7, 1610. He discovered Ganymede on January 13, 1610. William Herschel discovered Titania and Oberon, two satellites of Uranus, on January 11, 1787. Giuseppe Piazzi discovered the first asteroid, 1 Ceres, on January 1, 1801.

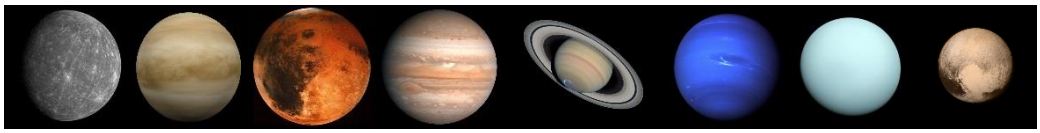
The Moon is 20.6-days old, is illuminated 61.6%, subtends 29.4 arc minutes, and is located in Virgo on January 1st at 0:00 UT. The Moon is at apogee on January 2nd and January 30th and at perigee on January 15th. The Moon attains its greatest northern declination (+18.3 degrees) for the month on January 22nd and its greatest southern declination (-18.4 degrees) on January 9th. Longitudinal libration is at a maximum of +4.9 degrees on January 24th and a minimum of -5.1 degrees on January 8th. Latitudinal libration is at a maximum of +6.6 degrees on January 21st and a minimum of -6.6 degrees on January 8th. The Moon, Mars, and Spica form a close triangle on the morning of January 3rd. At 4:00 UT on January 7th, the Moon, Venus, and Saturn lie within a 3.6-degree diameter circle, thus forming a trio. The 82%-illuminated waxing gibbous Moon occults Aldebaran on the evening of January 19th in North America.

With the exception of June, Aldebaran is occulted by the Moon from at least some location on Earth every month in 2016.

Omicron2 (40) Eridani is a fourth-magnitude triple star system consisting of three dwarf stars: a type K1V yellow-orange dwarf (A) known as Keid, a type DA4 white dwarf (B), and a type M4.5e red dwarf ©. Omicron is located about 16 light years from the Earth at 4h15m16.32s, -7°39′10.34″. Ninth-magnitude Omicron B is the most easily visible white dwarf star and can be seen with an aperture of six inches.

The famous eclipsing variable star Algol (Beta Persei) is at a minimum, decreasing in magnitude from 2.1 to 3.4, on January 1st, 4th, 7th, 10th, 12th, 15th, 18th, 21st, 24th, 27th, and 30th.

The Planets



Mercury is visible during both evening twilight and morning twilight this month. From January 1st to January 9th, it is well-positioned in the evening sky. Mercury appears in the morning sky from January 20th to the end of the month. The speediest planet is at the ascending node on January 1st and is stationary on January 5th, with retrograde (westward) motion commencing, and January 25th, with direct (eastward) motion resuming. Perihelion occurs on January 8th. Mercury is in inferior conjunction on January 14th and attains greatest latitude north of the ecliptic plane on January 18th.

Venus shines brightly at magnitude -4.0 for most of the month. Venus lies three degrees south of the Moon on January 7th. The gap between Venus and Saturn decreases rapidly in early January. Venus is just 17 arc minutes away from the 63-times-fainter Saturn (magnitude +0.5) as the two planets rise in eastern North America on the morning of January 9th. Venus moves rapidly eastward during January, beginning the month slightly more than one degree from Acrab (Beta Scorpii) and ending it north of the Teapot's handle in Sagittarius.

Earth is 0.983 a.u. distant from the Sun at perihelion on January 2nd. On that date, it's about 3% (5.0 million kilometers or 3.1 million miles) closer to the Sun than at aphelion in July.

Mars increases 1.2 arc seconds in size and brightens by a half magnitude this month. It is 1.5 degrees south of the Moon on January 3rd. The Red Planet departs Capricornus and enters Aquarius on January 9th.

Jupiter's disk increases in size by 3.4 arc seconds to 42.4 arc seconds. It brightens from magnitude -2.2 to magnitude -2.4. Jupiter commences retrograde motion through eastern Leo on January 8th. The waning gibbous Moon passes 1.4 degrees south of Jupiter on the evening of January 27th (January 28th UT). Click on http://www.skyandtel...watching-tools/ or consult page 50 of the January issue of Sky & Telescope to determine transit times of the central meridian by the Great Red Spot.

Saturn's rings is visible again this year. The rings are tilted within one degree of 26 degrees throughout 2016. During January, the planet's disk subtends over 15 arc seconds and its rings span 35 arc seconds. (Saturn's rings are 2.27 times larger in extent than the planet's equatorial diameter.) Saturn is three degrees south of the Moon on January 7th. Saturn and Venus are at their closest in a decade on the morning of January 9th. For information on the satellites of Saturn, browse http://www.skyandtel...watching-tools/

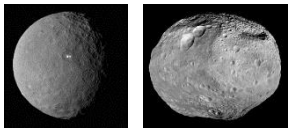
Uranus can be found two degrees south of the fourth-magnitude star Epsilon Piscium in southern Pisces.

Neptune is located in the southwestern sky at sunset. It lies about four degrees southwest of the fourth-magnitude star Lambda Aquarii. The eighth planet passes thirteen arc minutes due west of the seventh-magnitude star SAO 146230, which is situated between Lambda Aquarii and the fifth-magnitude star Sigma Aquarii, on January 19th, and five arc minutes due north of that star on January 26th.

The dwarf planet **Pluto** is in conjunction with the Sun on January 6th UT.

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

Asteroids



Asteroid **5 Astraea** shines at ninth magnitude as it treks northwestward through Leo during January. It passes one degree due south of the first magnitude star Regulus (Alpha Leonis) and about the same distance north of the fourth-magnitude star 31 Leonis on January 25th. A number of asteroid occultations visible from North America take place this month. Asteroid 1173 Anchises occults an 8.8-magnitude star in southern Gemini on the night of January 1st-January 2nd. Asteroid 115 Thyra occults a 9.0-magnitude star in northern Gemini on the night of January 21st-January 22nd. Thyra (magnitude +9.9) is at opposition on January 22nd. Asteroid 866 Fatme occults a 9.5-magnitude star in central Gemini on the evening of January 23rd (January 24th UT). Asteroid 329 Svea occults a 9.5-magnitude star on the border of Orion and Monoceros late on the evening of January 27th (January 28th UT).

Comets

Comet C/2013 US10 (Catalina) travels northward at more than two degrees per day through Boötes, Canes Venatici, and Ursa Major this month. The comet comes within half a degree of the first-magnitude star Arcturus (Alpha Boötis) on the morning of January 1st. It passes to the east of the spiral galaxy M51 in Canes Venatici on January 14th and just to the west of the spiral galaxy M101 in Ursa Major on January 16th and January 17th. A finder chart appears on page 45 of the December issue of Sky & Telescope. See comet Catalina map on the next page.

Meteors

The Quadrantid meteor shower peaks on January 4th. The short-lived peak is predicted to occur during the early morning. A waning crescent Moon will be present but should not interfere greatly with watching the shower. This shower can sometimes reach zenithal hourly rates of more than 100 meteors per hour. The radiant of the Quadrantids lies at the junction of the constellations of Boötes, Hercules, and Draco, in what was once called Quadrans Muralis. The near-Earth asteroid 2003 EH1, which may be an extinct comet, is believed to be the source of these meteors.

Carbon Star

Hind's Crimson Star - R Leporis; is a well-known variable star in the constellation Lepus, near its border with Eridanus.
Coordinates: RA $04^h\ 59^m\ 36.3487^s$ Dec. −14° 48′ 22.518″

The Deep Sky

Top ten binocular deep-sky objects for January: Cr65, Kemble 1, M36, M37, M38, M42, NGC 1528, NGC 1647, NGC 1746, NGC 1981

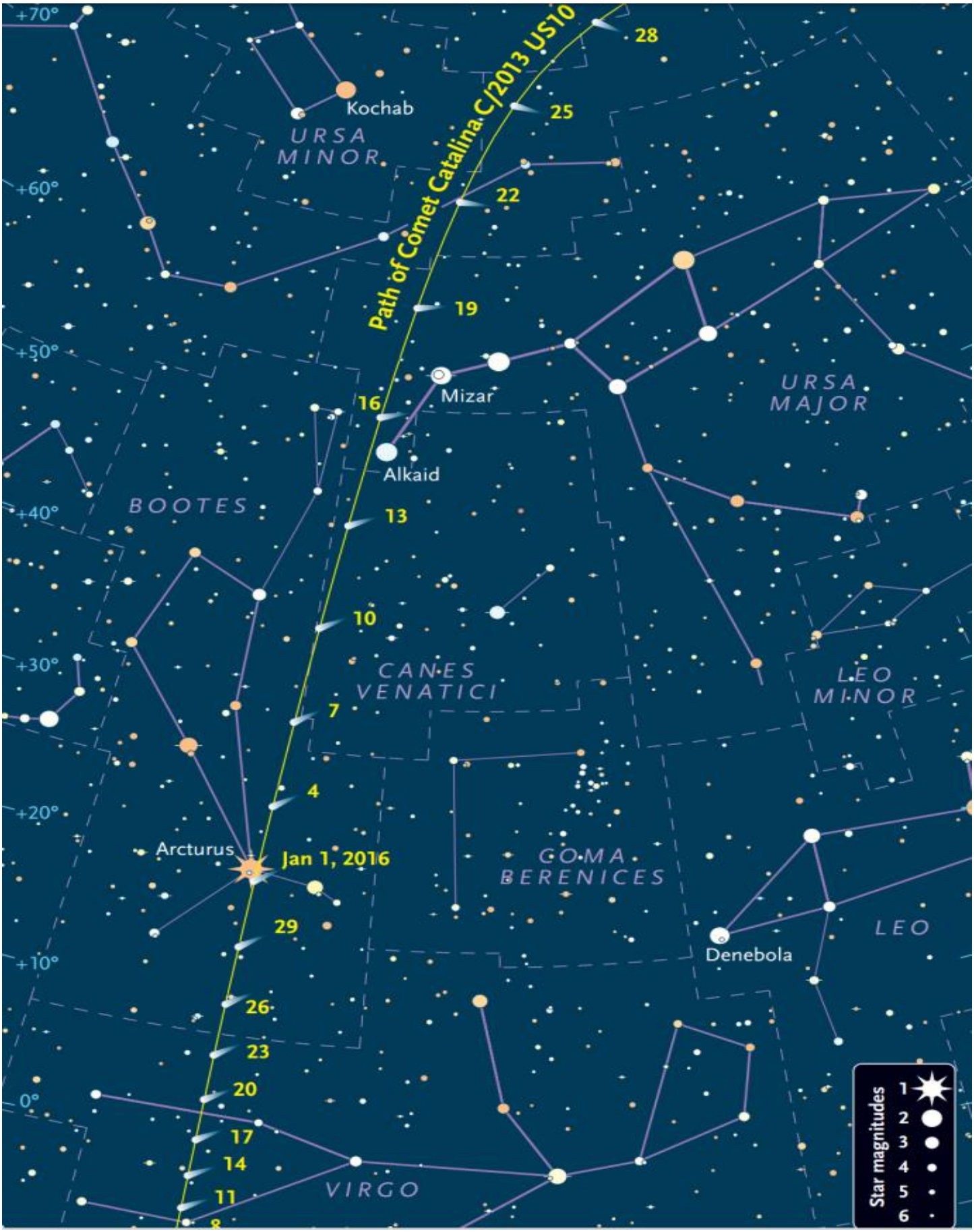
Top ten deep-sky objects for January: M1, M36, M37, M38, M42, M43, M78, M79, NGC 1501, NGC 2024

Challenge deep-sky object for January: IC 2118 (Eridanus) Coordinates: RA $05^h\ 02^m\ 00.00^s$ Dec. −07° 54′ 00″

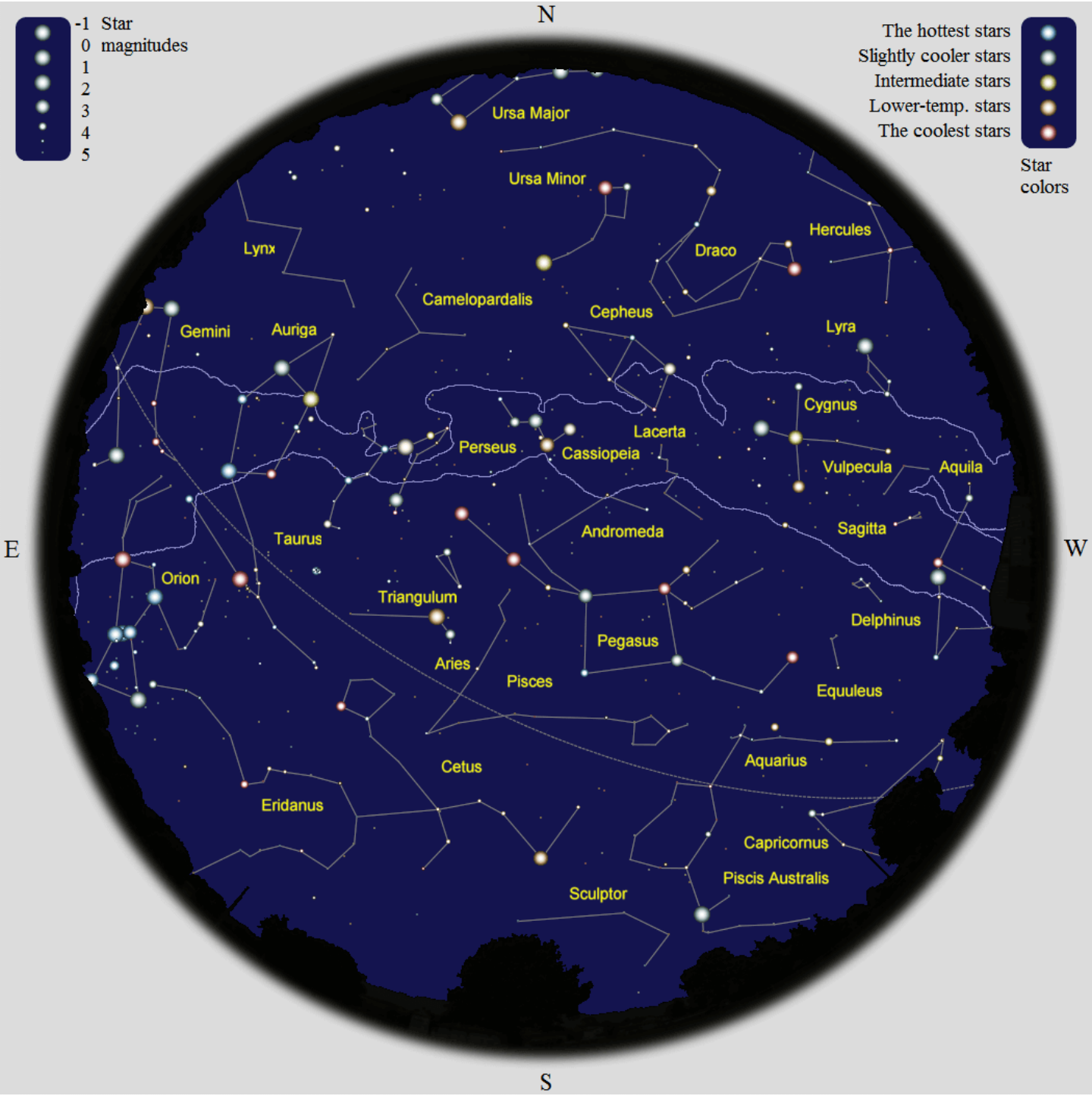
The objects listed above are located between 4:00 and 6:00 hours of right ascension.

Information on Iridium flares and passes of the ISS, the Tiangong-1, the X-37B, the HST, and other satellites can be found at http://www.heavens-above.com/

Comet Catalina Map



Planisphere for January

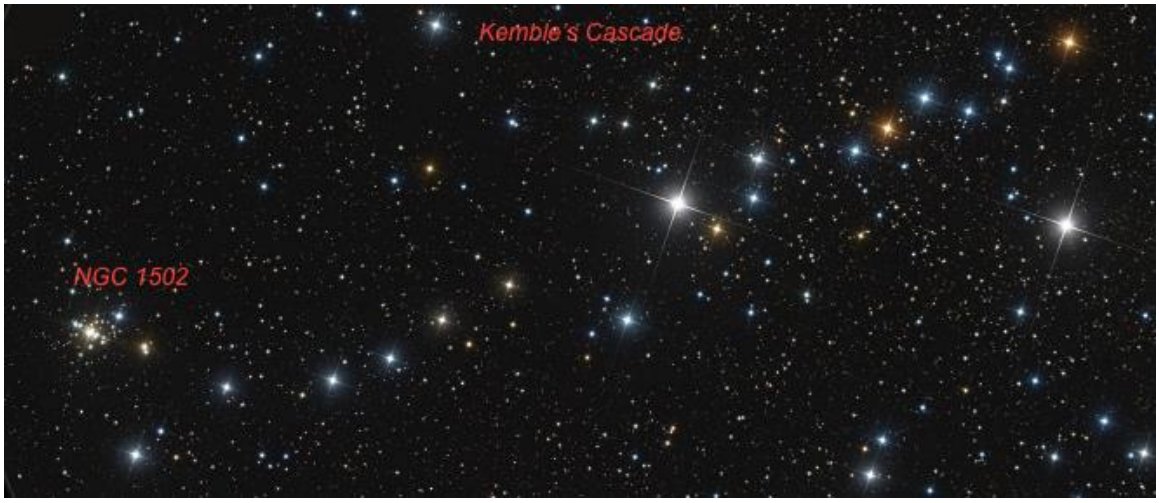


Be Safe – Get Out There – Explore Your Universe

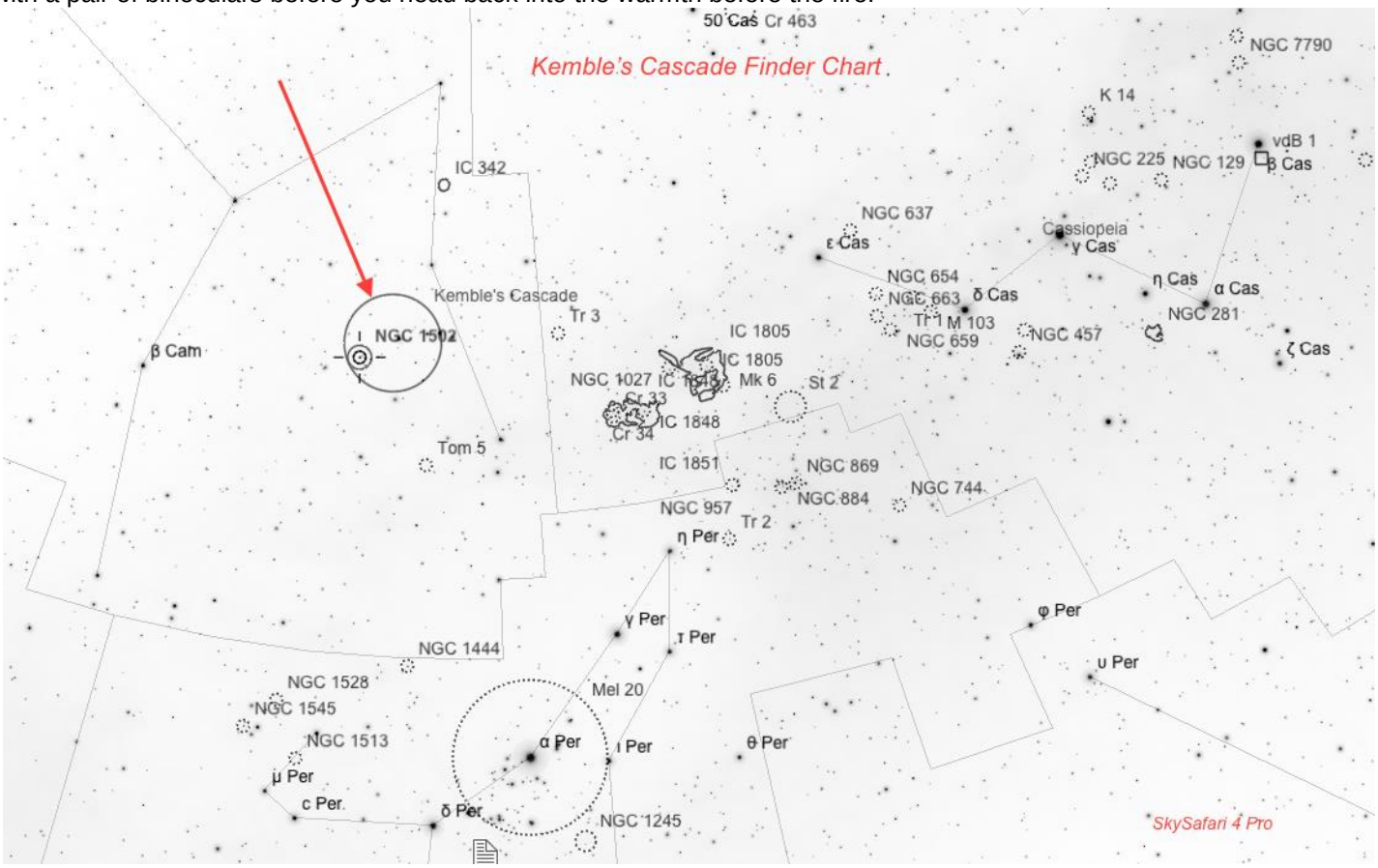
Looking Through the Eyepiece – Kemble's Cascade

Article Written by Steve Bell, Boise Astronomical Society

Kemble's Cascade was named for Father Lucian Kemble, a Franciscan friar and amateur astronomer in 1980 by Walter Scott Houston in *Sky and Telescope's* Deep Sky Wonders column. It is an asterism (a chance alignment of stars from an Earth perspective) and appears to be "pouring into" open cluster NGC 1502. It is a very nice binocular object for cold winter nights and brief openings in the "Boise grey" winter cloud cover. Kemble's Cascade is some two and a half degrees in extent, so it is definitely a binocular or small wide-field telescope object. During January evenings it is almost overhead in Camelopardalis, an admittedly dim area of the sky that can be located using Cassiopeia and Perseus.

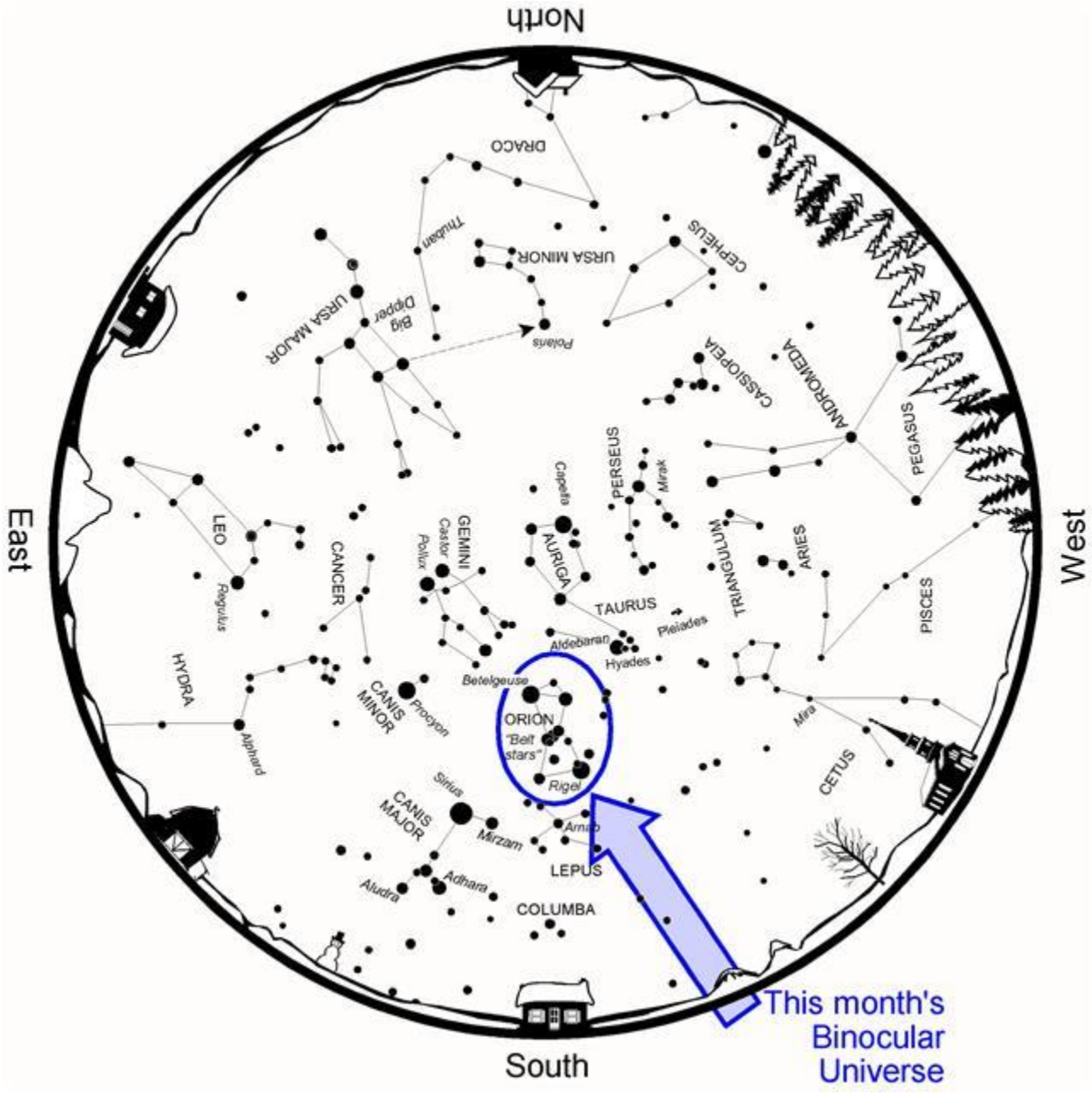


NGC 1502 is a "real" open cluster discovered by William Herschel in 1787. It lies about 2700 light years from the sun, is 20 arcmin in diameter and is fairly bright at magnitude 6.9. This is a worthy target for a fifteen minute observing session with a pair of binoculars before you head back into the warmth before the fire.

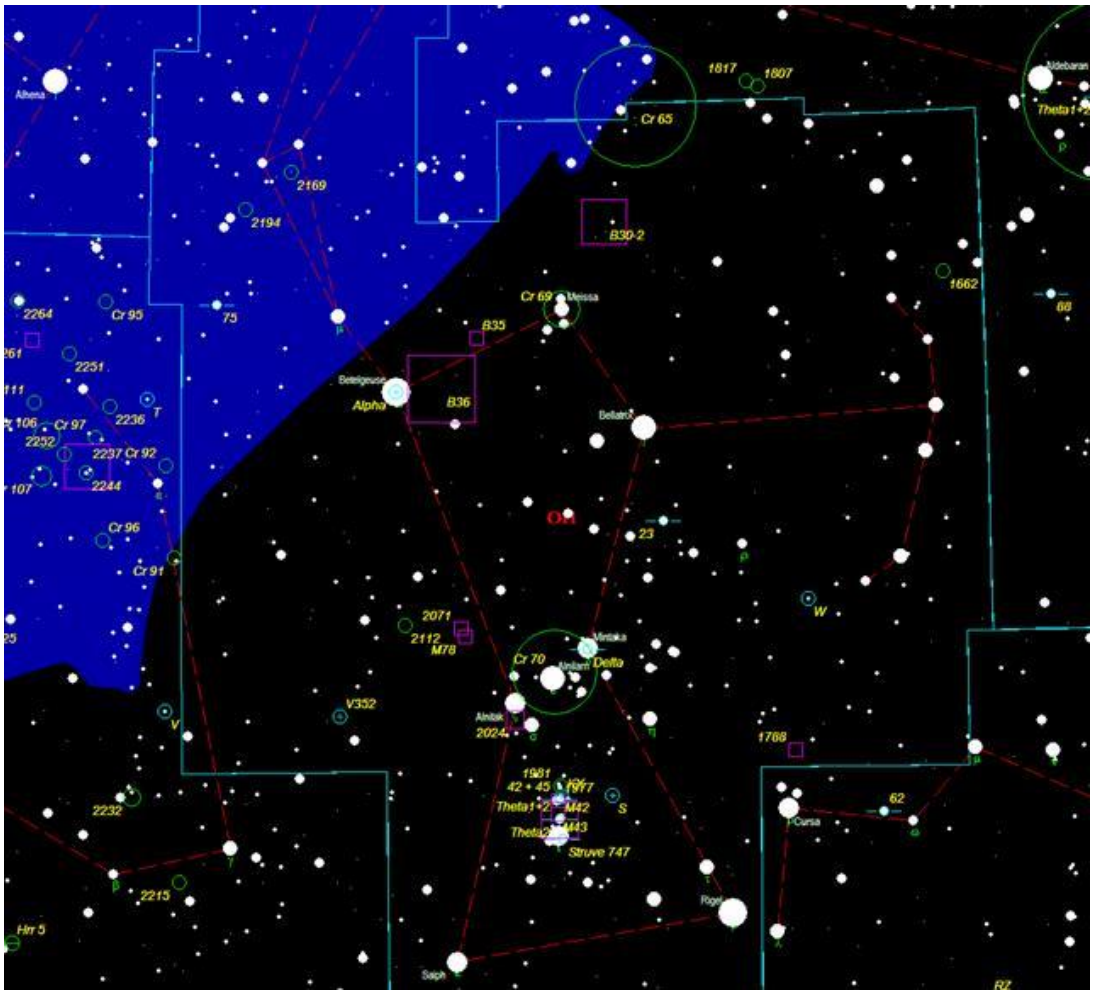


Binocular Universe: Hunting Big Game!

Each academic semester, I teach a different undergraduate astronomy course at Suffolk County Community College here on Long Island. Often, when I am teaching the “Astronomy of Stars and Galaxies” course, a student will come up to me before the first class and ask me "so, what's this class all about?" My answer is always the same: "Orion!"



Above: Winter star map from Star Watch by Phil Harrington..



Above: Finder chart for this month's Binocular Universe. Chart adapted from **Touring the Universe through Binoculars Atlas** *(TUBA) Click the chart to open a printable PDF version in a new window.*

One of the key objectives in that course is for students to understand stellar evolution. I can think of no better way to illustrate the process from start to finish than with Orion, the Hunter. That entire topic can be condensed into that single constellation. There are bright stars and dim stars, hot stars and cool stars, and young stars and old stars. Orion is a "mine of wonders; this great constellation embraces almost every variety of interesting phenomena that the heavens contain," according to Garrett Serviss in his classic 1888 book Astronomy with an Opera Glass. (Follow the link to view and download the full text from the U.S. Library of Congress.)

If you want to see star birth in action, look no further than the middle star in Orion's sword. That "star" is not a single sun at all, but rather a glowing cloud known as the **Orion Nebula, M42**, one of the sky's busiest delivery rooms. What may look like a dim, shapeless blur at first glance displays a wealth of subtle detail if you brace your binoculars against a rigid support to steady the view. The overall shape always reminds me of a cupped hand seen from the side that is seemingly grasping at two stars, Theta-1 and Theta-2 Orionis.
Theta-1 is actually a family of four young suns neatly gathered in a trapezoid, called the **Trapezium**. Spotting all four stars through binoculars is a fun test. But be forewarned, magnification and aperture are key here. The Trapezium's stars are designated with letters (A, B, C, and D), ordered according to their location. The system's primary star, the brightest of the bunch at magnitude 5.1, is known as Theta-1C and marks the trapezoid's southern corner. The western star (Theta-1A) and the northern star (Theta-1B) are both known to be eclipsing binaries, with a smaller companion star alternately passing in front of and behind the larger primary star. These eclipses cause both stars to vary slightly in brightness, though they usually shine at magnitude 6.7 and 7.9, respectively. Theta-1D also shines at magnitude 6.7.
Also look for a dark, cigar-shaped cloud nicknamed the **Fish's Mouth** protruding against the brighter background clouds, just north of Theta-2 and east of Theta-1. There is also a little "bump" protruding off the north edge of the Orion Nebula. Although part of the same complex, Charles Messier cataloged it separately as **M43**.

M42 is just the tip of a huge nebulous "iceberg" known as the **Orion Molecular Cloud** that engulfs nearly the entire constellation. The cloud is between 1,500 and 1,600 light-years away, and is spread over hundreds of light-years. In addition to M42 and M43, the Orion Molecular Cloud also includes:

- IC 434
- Barnard 33 (Horsehead Nebula)
- Barnard's Loop
- M78
- NGC 2024 (Flame Nebula)
- Sh2-264 (Lambda Orionis molecular ring)
- Orion OB1 Stellar Association, which can be further broken down into four parts:
- Orion OB1a (the group of stars northwest of the Orion Belt stars, including 25 Orionis)
- Orion OB1b (also known as Collinder 70, discussed below)
- Orion OB1c (the stars in Orion's Sword)
- Orion OB1d (the youngest stars in M42 and M43)

As this cloud wafts through the region from northwest to southeast, it leaves behind pockets of newly formed stars in its wake. The wave is currently cresting near the sword, but to the north, the clouds have parted to reveal a thriving open cluster of stars known as **Collinder 70**. All three of Orion's belt stars, along with another hundred or so fainter suns, belong to that cluster. The Belt Cluster was not recognized as such until research conducted by the Swedish astronomer Per Collinder (1890-1974) showed that the stars were all moving in the same direction through our galaxy.

Most of the stars in the Orion Belt Cluster shine brighter than 9th magnitude, bringing them within range of 50mm binoculars from suburban skies. When you look their way, consider that those stars are probably less than 10 million years old. That's very young compared to our 4.5-billion-year old Sun, but much older than the stars in the Orion Nebula, which date back no more than 300,000 years. Overall, Collinder 70 looks football-shaped, with the three Belt stars marking the ball's length. There is also a distinctive S-shaped chain of 11 faint stars that snakes from Mintaka, the Belt's western star, to Alnilam at its center.
Mintaka itself is a wide double star that, despite its large separation, can be a challenge to resolve with binoculars. That's because the bright component -- the star we see naked eye --shines at magnitude 2.2. But its companion is only magnitude 6.8, making it appear nearly 70 times fainter. So, despite the fact that they are separated by 53 arc-seconds, splitting the pair is tough due to glare. As a hint, look for the companion due north of the dominant star. Both appear pure white.

Mintaka, Alnilam, and many of the other stars within Collider 70 are either spectral class O or B stars. Astronomers use spectral classes (or spectral types, if you prefer) to sort stars according to temperature, size, and luminosity. Luminosity is a measure of how bright a star really is, while its temperature is a measure of the temperature of its visible surface. Knowing these two parameters, astronomers can classify stars according to spectral classifications. Stars are arranged from hottest to coolest using letters of the alphabet: O, B, A, F, G, K, and M.

Each class can be further subdivided into 10 sub-classes, numbered 0 through 9. By convention, the lower the number, the hotter the star in that particular grouping. For example, our Sun is classified as a G2 star. All class G stars share common spectral characteristics, yet a G1 star would a little hotter than our Sun, while a G3 (and G4, etc., all the way to G9) would be cooler.

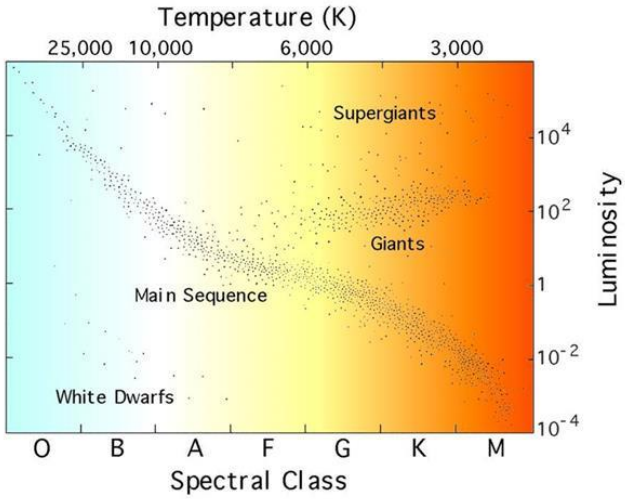
The table here shows the spectral classes and visual magnitudes for the brightest stars in Orion.

Star	Spectral class	Magnitude
Betelgeuse (Alpha)	M2	0.45
Saiph (Kappa)	B0	2.07
Bellatrix (Gamma)	B2	1.64
Rigel (Beta)	B8	0.18
Alnitak (Zeta)	O9	1.82
Alnilam (Epsilon)	B0	1.69
Mintaka (Delta)	O9	2.41

Back in the early 1900's, Danish astronomer Enjar Hertzsprung and American astronomer Henry Russell independently began to look at these characteristics for a variety of stars across the sky. Specifically, they compared the stars' temperatures with their luminosities. Both astronomers plotted the star data on a graph.

The graph's vertical axis (the Y-axis) was a measure of luminosity, while the horizontal axis (the X-axis) plotted the stars' spectral classes. Today, this graph is known as the Hertzsprung - Russell diagram, or more simply, the H-R Diagram.

At first, they probably expected to find no correlation between a star's temperature and its luminosity, but in reality, there is a very distinct relationship. More than 90% of all stars lie along a curved line that stretches from the diagram's upper left corner to the lower right. This wide swath is called the "Main Sequence." Comparatively few stars are found in the other two corners of the H-R Diagram. Those that fall toward the upper right (that is, stars that have high luminous but are red in color, and therefore, quite cool) are called red giants or red supergiants. In the opposite corner are white dwarfs, stars that are extremely hot, but are not very luminous because of their small size.



Let's follow the trail of star formation northward to the Hunter's tiny, triangular head. The triangle's top star, Meissa (Lambda Orionis), is a Class O8 blue-white giant star that would appear in the upper left corner of the H-R Diagram. Its surface temperature is estimated to be 35,000 K, making it one of the hottest stars in Orion visible to the naked eye. Meissa, along with several dozen fainter suns within about 1°, all belong to the star cluster **Collinder 69**. Most binoculars reveal between 15 and 20 stars ranging in brightness from 5th to 9th magnitude. Studies also show that Collinder 69 is probably no more than 5 million years old.

A third Collinder cluster, Collinder 65, is large enough that some of its stars cross the border into adjacent Taurus. By adding a few non-cluster stars to the east and north, I imagine this cluster as a spear that Orion is about to heave at the Bull. "Orion's Spear" measures about 8° tip to tip, which makes it perfect for 7x and 8x binoculars.

So far, we have examined star birth and adolescence. What about the other end of the scale? For that, we need look no further than brilliant **Betelgeuse**, spectral class M2. While many of Orion's stars are quite young, happily fusing hydrogen into helium within their cores, Betelgeuse has been there, done that. The hydrogen supply in its core was exhausted long ago, causing the star to swell into an enormous red supergiant. Today, as heavier elements are undergoing fusion in its core, Betelgeuse is found in the upper right corner of the H-R Diagram, well off the Main Sequence. Eventually, that process will end and Betelgeuse will go out in an all-consuming burst of glory as a type II supernova. For now, enjoy its brilliant ruby red color, which indicates a surface temperature of about 3,500 Kelvin.

Contrast that to Rigel, which is a Class B8 blue-white supergiant star. Rigel has exhausted all of the hydrogen fuel in its core, causing it to leave the Main Sequence. Rigel's surface temperature is estimated to be an incredible 12,000 Kelvin, which places it along the top of the HR Diagram. Rigel will continue to expand and brighten as it continues to slowly creep toward the upper right corner. Ultimately, it will also detonate as a type II supernova.

Indeed, Orion has it all. Your homework assignment this month is to view these objects on the next clear night. If you are looking for some extra credit, here are many more targets in this month's Binocular Universe to ponder. As you view these targets, consider what is going on behind the scenes of each. And always remember that two eyes are better than one. Class dismissed.

About the Author: Phil Harrington is a contributing editor to Astronomy magazine and author of 9 books on astronomy. Last month, his first book, Touring the Universe Through Binoculars, just marked 25 years in print. Visit his web site at www.philharrington.net to learn more. This article was reprinted with permission of the author.

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

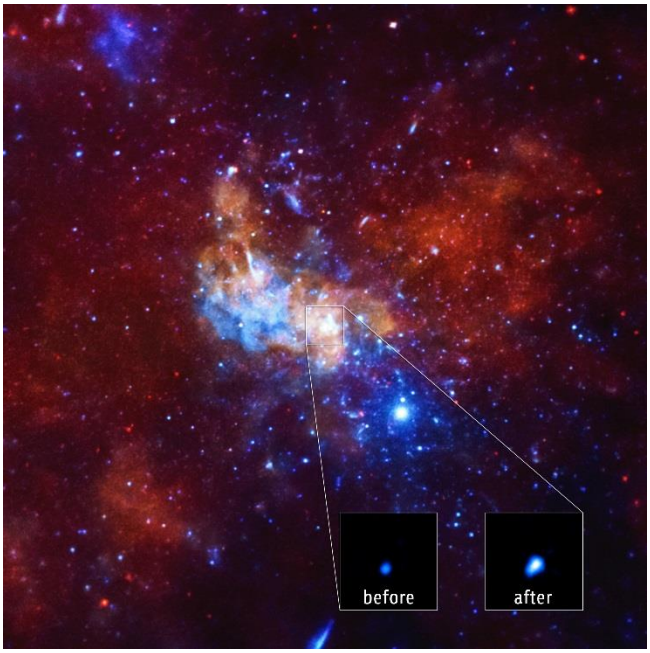
By Ethan Siegel

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!



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. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit **spaceplace.nasa.gov** to explore space and Earth science!

Observatories and Planetariums

Bruneau Dunes Observatory – Bruneau, ID

The observatory is now officially closed for the winter.

Herrett Telescope / Centennial Observatory
Herrett Center for Arts and Science
College of Southern Idaho
Twin Falls, Idaho, USA

CSI Centennial Observatory Twin Falls, ID

Event	Place	Date	Time	Admission
Cabin Fever Day Solar Viewing	Centennial Observatory	Saturday, January 9th, 2016	11:00 AM to 2:00 PM	FREE
Monthly Free Star Party	Centennial Observatory	Saturday, January 9th, 2016	6:30 PM to 12:00 AM	FREE
Telescope Tuesday	Centennial Observatory	Tuesday, January 12th, 2016	6:30 to 9:00 PM	$1.50 or free with Faulkner Planetarium admission
Telescope Tuesday	Centennial Observatory	Tuesday, January 26nd, 2016	6:45 to 9:00 PM	$1.50 or free with Faulkner Planetarium admission

Faulkner Planetarium Show Times (through Memorial Day)	
Tuesdays	7:00 PM
Fridays	7:00 PM 8:00 PM
Saturdays	1:30 PM 2:30 PM 3:30 PM 4:30 PM 7:00 PM 8:00 PM
Now Showing	

About the Magic Valley Astronomical Society

Magic Valley Astronomical Society
P.O. Box 445
Kimberly, ID, USA 83341

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, $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 circa 1980.