Snake River Skies

The Newsletter of the Magic Valley Astronomical Society

www.mvastro.org

Membership Meeting

Saturday, December 8th 2018
7:00pm at the
Herrett Center for Arts & Science
College of Southern Idaho.

Public Star Party follows at the Centennial Observatory

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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

December 2018

Colleagues,

The Wednesday before Thanksgiving Tim Frazier unhitched the MVAS trailer on the concrete RV pad in my backyard. In a way, it's a symbolic passing of the torch from Tim back to me, and to mix metaphors, there are some big shoes to fill. In his time as president, Tim not only landed the grant for the trailer, brought more exposure to the club, and invited a wide variety of fascinating speakers to the second Saturday evening meetings, but he brought a great sense of energy to our proceedings. If we are able to manage to maintain half of his energy, we'll be fine. And of course, Tim will still be able to help us out. The next time you see him, tell him thank you for all he's done.

The next time you see him might be the next time you see all of us. On Saturday, Dec. 8, we'll meet for our annual Christmas Party. Please bring an appetizer or a treat as well as a $10 astronomy-related gift for the exchange. As usual, we'll also have a game or two to play related to astronomy. MVAS will cover beverages.

In case you missed the November meeting, we presented not only the Year in Pictures, but also elected officers. I've stepped back into the position of president, while Gary Leavitt takes on the vice-presidency and Jay Hartwell steps into the secretary post. Jim Tubbs will remain treasurer. We want to thank Gary, Jay, and Jim for their willingness to help us out.

In other news, we will no longer be doing the Pomerelle Star Party in the summer. Both sides agreed the event had run its course, and now it's time for us to move on. We'll continue our focus on the Hagerman and City of Rocks Star Parties as well as other activities.

As we approach the New Year, please feel free to give me ideas as to what else we can do. We look forward to each other's ideas and assistance.

And of course, we always welcome your reports and your photos.

Sincerely,
Rob Mayer

Calendar

December 2018

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7 New Moon Lunation 1186 1% Visible ↓ 	8 MVAS Meeting at 7:00pm at the Herrett Center Faulkner Planetarium Public Star Centennial Obs.
9	10	11	12	13	14	15 First Quarter 49% Visible ↑ Age: 7.28 Days 
16	17	18	19	20	21 Winter Solstice Jól 	22 Full Moon 100% Visible Beaver Moon 
23	24	25 Christmas 	26	27	28	29
30	31 New Year's Eve 					

Celestial Calendar

All times, unless otherwise noted, are UT (subtract seven hours and, when appropriate, one calendar day for MST)

12/1 The Curtiss Cross, an X-shaped clair-obscure illumination effect located between the craters Parry and Gambart, is predicted to be visible at 10:13
12/2 Venus is at its greatest illuminated extent at 0:00
12/3 Mars is at eastern quadrature at 1:00; the Moon is 7.2 degrees north-northeast of the first-magnitude star Spica (Alpha Virginis) at 9:00; the Moon is 3.4 degrees north-northeast of Venus at 21:00
12/4 The earliest end of evening twilight at 40 degrees north takes place today; the Moon is 1.5 degrees south-southwest of the dwarf planet/asteroid 1 Ceres at 13:13
12/5 The Moon is 1.8 degrees north-northeast of Mercury at 22:00
12/6 The Moon is 3.4 degrees north-northeast of Jupiter at 15:00; Mercury is stationary in right ascension, with direct (eastward) motion to resume, at 20:00; Mercury is stationary in longitude at 21:00; the Moon is 8.4 degrees north-northeast of the first-magnitude star Antares (Alpha Scorpii) at 23:00
12/7 The earliest sunset at latitude 40 degrees north occurs today; New Moon (lunation 1187) occurs at 7:20; Mars (magnitude +0.1) is 0.04 degree north-northwest of Neptune (magnitude +7.9) at 14:00; asteroid 433 Eros (magnitude +9.7) is at opposition at 16:00
12/8 Asteroid 40 Harmonia (magnitude +9.4) is at opposition at 18:00
12/9 The Moon is 1.1 degrees north of Saturn, with an occultation taking place in far northern China and southeastern Russia, at 5:00; the Moon is at its southernmost declination (-1.54 degrees) for the year at 12:00; Mercury is at its greatest latitude north of the ecliptic plane (7.0 degrees) at 14:00
12/10 The Moon is 0.73 degree north of Pluto, with an occultation taking place in the Aleutian Islands, northern Micronesia, eastern and southeastern Russia, Japan, eastern Mongolia, and northeastern China at 3:00; the Moon is at the descending node (longitude 297.2 degrees) at 18:00
12/12 The Moon is at apogee, subtending 29' 29" from a distance of 405,177 kilometers (251,765 miles), at 11:25
12/13 Mars and Uranus are at heliocentric conjunction (a heliocentric longitude of 31.2 degrees) at 20:00
12/14 The peak of the Geminid meteor shower (100 to 120 per hour) occurs at 13:00; the Moon is 2.8 degrees south-southeast of Neptune at 16:00; the Moon, Mars, and Neptune lie within a circle of diameter 4.89 degrees at 20:00; the Lunar X (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 occur at 22:40
12/15 The Moon is 3.4 degrees south-southeast of Mars at 2:00; sunrise takes place at the isolated lunar mountain Mons Pico at 2:23; Mercury is at greatest elongation western elongation (21.0 degrees) at 12:00; First Quarter Moon occurs at 11:49; sunrise takes place at the isolated lunar mountain Mons Piton at 17:30
12/18 The Moon is 4.7 degrees south-southeast of Uranus at 7:00; the Sun enters the constellation of Sagittarius (ecliptic longitude 266.60 degrees) at 14:00
12/20 Jupiter is 5.0 degrees north of Antares at 2:00; the Moon is 8.4 degrees south-southeast of the bright open cluster M45 (the Pleiades or Subaru) in Taurus at 16:00
12/21 The Moon is 1.6 degrees north-northwest of the first-magnitude star Aldebaran (Alpha Tauri), at 7:00; Mercury (magnitude -0.4) is 0.83 degree north-northeast of Jupiter (magnitude -1.8) at 20:00; the Sun's longitude is 270 degrees and winter solstice in the northern hemisphere occurs at 22:23
12/22 Mercury (magnitude -0.4) is 6.0 degrees north-northeast of Antares at 13:00; Full Moon (known as the Before Yule, Cold, Long Nights, and Oak Moon) occurs at 17:49; the Moon is 3.1 degrees south of the bright open cluster M35 in Gemini at 21:00
12/23 The Moon is at its northernmost declination for the year at 12:00; Jupiter is 5.2 degrees north of Antares at 19:00
12/24 The Moon is 10.6 degrees south of the first-magnitude star Castor (Alpha Geminorum) at 3:00; the Moon is 7.0 degrees south of the first-magnitude star Pollux (Beta Geminorum) at 7:00; the Moon is at perigee, subtending 33' 06" from a distance of 361,062 kilometers (224,353 miles), at 9:49; the Moon is at the ascending node (longitude 116.9 degrees) at 11:55
12/25 The Moon is 0.33 degree south-southwest of the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 5:00; the equation of time equals 0 (i.e., mean solar time equals apparent solar time) at 10:00
12/26 Venus is at perihelion (0.7185 astronomical units from the Sun) at 16:00; the Moon is 2.4 degrees north-northeast of the first-magnitude star Regulus (Alpha Leonis) at 18:00
12/27 Asteroid 3 Juno is stationary at 15:00; Venus (magnitude -4.5) is 3.0 degrees south-southwest of the dwarf planet/asteroid 1 Ceres (magnitude +8.9) at 10:30
12/28 Asteroid 6 Hebe (magnitude +8.4) is at opposition at 2:00
12/30 The Moon is 7.3 degrees north-northeast of Spica at 15:00
12/31 The Curtiss Cross, an X-shaped clair-obscure illumination effect located between the craters Parry and Gambart, is predicted to be visible at 0:51

The Sun, the Moon, & the Planets

The **Sun** is located in Ophiuchus, a non-traditional constellation of the zodiac, on December 1st. Sol enters Sagittarius on December 18th. Winter solstice for the northern hemisphere occurs when the Sun is farthest south for the year on December 21st. It is the shortest "day" of the year (9 hours and 20 minutes) at latitude 40 degrees north.

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During the evening, Mars and Neptune can be found in the south, Saturn in the southwest, Uranus in the southeast. Uranus is in the west at midnight. In the morning, Mercury, Venus, and Jupiter are located in the southeast.

Memorable conjunctions of Mars and Neptune and Jupiter and Mercury occur this month on December 7th and December 21st respectively.

The Moon is 23.1 days old, is illuminated 48.4.0%, subtends 31.5 arc minutes, and is located in Cetus on December 1st at 0:00 UT. Due to the position of the ecliptic, the Moon reaches its highest point in the sky for the year in December. It attains its greatest northern declination (+21.4 degrees) for the month on December 23rd and greatest southern declination (-21.5 degrees) on December 9th. Longitudinal libration is at a maximum of +5.4 degrees on December 5th and a maximum of +6.5 on December 31st. It's at a minimum of -6.7 degrees on December 19th. Latitudinal libration is at a maximum of +6.8 degrees on December 18th and a minimum of -6.6 degrees on December 3rd. New Moon occurs on December 7th. The Moon is at apogee (a distance of 63.53 Earth-radii) on December 13th and at perigee (a distance of 56.61 Earth-radii) on December 24th. The Moon occults Saturn on December 8th and Pluto on December 9th from certain parts of the world. Consult http://www.lunar-occ...ota/iotandx.htm for more on these events. Visit http://saberdoesthes...does-the-stars/ for tips on spotting extreme crescent Moons and http://www.curtrenz.com/moon.html for Full Moon data. Browse http://www.cambridge...ft/the_moon.htm and http://www.shallowsky.com/moon/ for information on various lunar features. 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

Brightness, apparent size, illumination, distance from the Earth in astronomical units (a.u.), and location data for the planets and Pluto on December 1st: Mercury (magnitude +3.0, 9.6", 6% illuminated, 0.70 a.u., Libra), Venus (magnitude -4.9, 40.7", 26% illuminated, 0.41 a.u., Virgo), Mars (magnitude 0.0, 9.3", 86% illuminated, 1.01 a.u., Aquarius), Jupiter (magnitude -1.7, 31.1", 100% illuminated, 6.34 a.u., Scorpius), Saturn (magnitude +0.5, 15.2", 100% illuminated, 10.91 a.u., Sagittarius), Uranus (magnitude +5.7, 3.7", 100% illuminated, 19.29 a.u. on December 16th, Aries), Neptune (magnitude +7.9, 2.3", 100% illuminated, 30.10 a.u. on December 16th, Aquarius), and Pluto (magnitude +14.3, 0.1", 100% illuminated, 34.58 a.u. on December 16th, Sagittarius).

Mercury returns to the morning sky in a somewhat favorable apparition for observers in the northern hemisphere. Mercury has an angular diameter of nine arc seconds and is one-quarter illuminated on December 5th. It spans just seven arc seconds and is almost 50% illuminated on December 11th. Mercury is stationary in right ascension and in longitude on December 6th, is at its greatest heliocentric latitude north on December 9th, and is at greatest elongation west on December 15th. During the second half of the month, Mercury sinks farther into morning twilight. The speediest planet is located 0.9 degree north of Jupiter on the morning of December 21st, when it is just six arc seconds in apparent size and 76% illuminated, and six degrees north of Antares on December 22nd.

Venus reaches its greatest illuminated extent on December 2nd and shines brilliantly at magnitude -4.9. On the morning of December 3rd, the waning crescent Moon passes about five degrees to the north of the planet. Spica lies about seven degrees to the right of the pair. Venus departs Virgo and enters Libra on December 13th. On December 26th, the brightest planet is at perihelion. Venus fades slightly to magnitude -4.6 and shrinks to an angular diameter of 26.6 arc seconds but increases in illumination to 47% by December 31st.

Mars begins the month at a brightness of 0.0 magnitude and a rather tiny 9.3 arc seconds in apparent size. The Red Planet and Neptune come to an unusually close conjunction on December 7th. Mars is four degrees south of the nearly First Quarter Moon on the night of December 14th. It moves from Aquarius into Pisces on December 21st. As the year ends, Mars sets shortly before midnight local time and is located a few degrees southeast of the Circlet of Pisces asterism. It shines at magnitude +0.4, subtends 7.5 arc seconds, is illuminated 87%, and lies at a distance of 1.25 astronomical units.

Jupiter rises about one hour before the Sun on December 12th. It enters Ophiuchus at mid-month and passes five degrees from Antares on December 20th. Jupiter and Mercury are in conjunction on December 21st. Click on http://www.skyandtel...watching-tools/ to determine transit times of the central meridian by the Great Red Spot. Data on Galilean satellite positions and events is available online at http://www.skyandtel...watching-tools/ and http://www.nakedeyep...er.htm#jupmoons

Saturn lies about ten degrees above the southwestern horizon forty-five after sunset on December 1st. On December 8th, Saturn is just seven degrees in altitude at that time. A two-day old waxing crescent Moon is located three degrees to the lower right of the Ringed Planet on that evening. Saturn disappears into the glare of the Sun by mid-December on its way to solar conjunction in early January.

Uranus exits Aries and enters Pisces on December 3rd. It sets after midnight local time. In early December, Uranus is positioned 1.6 degrees north-northeast of the fourth-magnitude star Omicron Piscium. The seventh planet lies 1.3 degrees north of that star at the end of the month. Uranus is 4.3 degrees north-northwest of the Moon on December 27th. Browse http://www.bluewater...anus_2018_1.pdf for a finder chart.

Neptune sets in the late evening. Neptune and Mars undergo an extremely close conjunction on December 7th. The two planets are separated by 3.6 degrees on December 1st. That distance decreases by approximately 0.6 degree daily. Neptune is positioned 23 arc minutes east-northeast of Mars on the evening of December 6th. At 9:08 a.m. EST on December 7th, Mars is just 2.2 arc minutes north of Neptune. On the evening of December 7th, Neptune lies 16 arc minutes southwest of the Red Planet. The sixth-magnitude star 81 Aquarii is 12 arc minutes to the north of Mars. The Moon passes three degrees south of the eighth planet on December 14th. Neptune passes 15 arc minutes due south of 81 Aquarii on the evening of December 24th. A finder chart is posted http://www.bluewater...tune_2018_1.pdf Additional online finder charts for Uranus and Neptune can be found at http://www.nakedeyep....com/uranus.htm and http://www.nakedeyep...com/neptune.htm and also at https://www.skyandte...EB_UrNep18.pdf and on pages 48 and 49 of the September 2018 issue of Sky & Telescope.

The dwarf planet **Pluto** will not be visible again until next year.

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

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

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

Asteroids

Asteroid **3 Juno** glides northwestward the constellation of Eridanus this month. The main belt asteroid dims from magnitude +7.6 to magnitude +8.2 during December. Juno is a bit unusual in that its orbit is inclined 13 degrees to the ecliptic. Asteroid 6 Hebe makes its closest approach to the Earth on December 20th and shines at magnitude +8.4 when it reaches opposition on December 28th. The fifth brightest asteroid passes south of the open cluster NGC 2244 in Monoceros on December 20th and northeast of the binary star 8 Monocerotis on December 25th. A finder chart is featured on page 50 of the December 2018 issue of Sky & Telescope. Other bright asteroids reaching opposition this month include **433 Eros** (magnitude +9.7) on December 7th in Camelopardalis and **40 Harmonia** (magnitude +9.4) on December 8th in Taurus. For information on this year's bright asteroids and upcoming asteroid occultation events, consult http://www.curtrenz.com/asteroids.html and http://asteroidoccultation.com/ respectively.

Carbon Star

Notable carbon star for December: U Camelopardalis Right Ascension: $03^{h}\ 41^{m}\ 48.17393^{s}$ Declination: +62° 38′ 54.3906″

Comets

Comet 46P/Wirtanen heads northeastward through Eridanus, Taurus, and Auriga during December. It will pass within 7.2 million miles of the Earth on December 16th and may reach a brightness of fourth magnitude, making it potentially visible to the unaided eye from a dark site. At the time of its closest approach, the periodic comet will be located between the bright open clusters Melotte 25 (the Hyades) and M45 (the Pleiades). Finder charts can be found online at http://www.cometwatc...t-46p-wirtanen/ and http://wirtanen.astr...s/Full_view.png and on page 50 of the November 2018 issue of Sky & Telescope. Comet 38P/Stephan-Oterma is situated approximately ten degrees from Castor and Pollux during the first half of the month. This periodic comet is closest to the Earth on December 17th and may reach ninth magnitude. Click on http://www.cometwatc...18/10/38p_2.jpg for a finder chart. Visit http://cometchasing.skyhound.com/ and http://www.aerith.ne...t/future-n.html for information on comets that are visible this month.

https://www.skyandtelescope.com/astronomy-news/comet-46p-wirtanen-approaches-earth/

A list of the closest approaches of comets to Earth is posted at http://www.cometogra.../nearcomet.html

Meteors

The peak of **Geminid** meteor shower occurs on the morning of December 14th and is not adversely affected by moonlight from a slim waning crescent Moon. The Geminids, which are associated with the Palladian asteroid, or possible cometary nucleus, 3200 Phaethon, have become the most reliable meteor shower of the year. Geminid meteors appear to originate from a radiant that's just northwest of Castor (Alpha Geminorum). That radiant lies almost at the zenith at 2:00 a.m. local time. Geminid meteors travel at a relatively slow speed of 35 kilometers per second (22 miles per second). An article on this year's Geminids can be found on pages 48 and 49 of the December 2018 issue of Sky & Telescope. The Ursids, a normally minor meteor shower, peak on the morning of December 22nd but are severely compromised by a Full Moon. The radiant is located close to Kochab (Beta Ursa Minoris), some 15 degrees from the north celestial pole. See http://earthsky.org/...-guide#geminids and https://www.imo.net/...urces/calendar/ for additional information on the Geminids and https://earthsky.org...winter-solstice and https://www.imo.net/...urces/calendar/ for more on the Ursids

Orbiting Earth

Information on Iridium flares and passes of the ISS, the Tiangong-2, the USAF's X-37B, the HST, and other satellites can be found at http://www.heavens-above.com/. Satellite information with ISS Live HD streaming https://www.n2yo.com

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

The Deep Sky

The famous eclipsing variable star Algol (Beta Persei) is at a minimum, decreasing in magnitude from +2.1 to +3.4, on December 3rd, 5th, 8th, 11th, 14th, 17th, 20th, 23rd, 26th, 28th, and 31st (UT dates). Algol is at minimum brightness for approximately two hours and is well-placed for observers in North America on the nights of December 2nd (centered at 9:53 p.m. EST), December 5th (centered at 6:42 p.m. EST), and December 22nd (centered at 11:36 p.m. EST). Consult page 51 of the December 2018 issue of Sky & Telescope for the times of the eclipses. For more on Algol, see http://stars.astro.i.../sow/Algol.html and http://www.solstatio...ars2/algol3.htm

One hundred and five binary and multiple stars for December: Gamma Andromedae, 59 Andromedae, Struve 245 (Andromeda); Struve 362, Struve 374, Struve 384, Struve 390, Struve 396, Struve 400, Struve 19, Otto Struve 67 (Camelopardalis); Struve 191, Struve Iota Cassiopeiae, Struve 263, Otto Struve 50, Struve 283, Struve 284 (Cassiopeia); 61 Ceti, Struve 218, Omicron Ceti, Struve 274, Nu Ceti, h3511, 84 Ceti, h3524, Lambda Ceti, Struve 330 (Cetus); h3527, h3533, Theta Eridani, Rho Eridani, Struve 341, h3548, h3565, Tau-4 Eridani, Struve 408, Struve 411, h3589, h3601, 30 Eridani, 32 Eridani (Eridanus); h3478, h3504, Omega Fornacis, Eta-2 Fornacis, Alpha Fornacis, See 25, Xi-3 Fornacis, h3596 (Fornax); Struve 268, Struve 270, h1123, Otto Struve 44, h2155, Nu Persei, Struve 297, Struve 301, Struve 304, Eta Persei, Struve 314, Otto Struve 48, Tau Persei, Struve 331, Struve 336, Es588, Struve 352, Struve 360, Struve 369, Struve 382, Struve 388, Struve 392, Struve 410, Struve 413, Struve 425, Otto Struve 59, Struve 426, 40 Persei, Struve 434, Struve 448, Es277, Zeta Persei, Struve 469, Epsilon Persei, Es878 (Perseus); Struve 399, Struve 406, Struve 401, Struve 422, Struve 430, Struve 427, Struve 435, 30 Tauri (Taurus); Epsilon Trianguli, Struve 219, Iota Trianguli, Struve 232, Struve 239, Struve 246, 10 Trianguli, Struve 269, h653, 15 Trianguli, Struve 285, Struve 286, Struve 310 (Triangulum)

One hundred deep-sky objects for December: NGC 891 (Andromeda); IC 342, K6, St23, Tom 5 (Camelopardalis); Be65, IC 1848, K4, Mel15, NGC 896, NGC 1027, St2, Tr3 (Cassiopeia); M77, NGC 788, NGC 835, NGC 864, NGC 908, NGC 936, NGC 955, NGC 958, NGC 1015, NGC 1016, NGC 1022, NGC 1042, NGC 1052, NGC 1055, NGC 1087, NGC 1094 (Cetus); IC 2006, NGC 1084, NGC 1140, NGC 1187, NGC 1199, NGC 1209, NGC 1232, NGC 1291, NGC 1300, NGC 1309, NGC 1332, NGC 1337, NGC 1353, NGC 1357, NGC 1395, NGC 1400, NGC 1407, NGC 1421, NGC 1426, NGC 1440, NGC 1452, NGC 1453, NGC 1461 (Eridanus); NGC 1079, NGC 1097, NGC 1201, NGC 1292, NGC 1316 (Fornax I Galaxy Cluster), NGC 1317, NGC 1326, NGC 1344, NGC 1350, NGC 1360, NGC 1365, NGC 1371, NGC 1374, NGC 1379, NGC 1380, NGC 1381, NGC 1387, NGC 1398, NGC 1404, NGC 1406, NGC 1425 (Fornax); Bas10, Cz8, IC 351, IC 2003, K5, Mel 20, M34, NGC 869, NGC 884, NGC 957, NGC 1023, NGC 1058, NGC 1161, NGC 1245, NGC 1275 (Perseus I Galaxy Cluster), NGC 1333, NGC 1342, NGC 1444, Tr2 (Perseus); M45 (Taurus); NGC 777, NGC 784, NGC 890, NGC 925, NGC 949, NGC 959, NGC 978A/B (Triangulum)

Top ten binocular deep-sky objects for December: M34, M45, Mel15, Mel20, NGC 869, NGC 884, NGC 1027, NGC 1232, St2, St23

Top ten deep-sky objects for December: M34, M45, M77, NGC 869, NGC 884, NGC 891, NGC 1023, NGC 1232, NGC 1332, NGC 1360

Challenge deep-sky object for December: Van Den Bergh VdB 14 & 15 Right Ascension (J2000): 03h 30m 13s Declination (J2000): +59 degrees 19' 14" Position Angle: minus 89 degrees (Pinpoint) Description: This beautiful pair of reflection nebulae are a small part of a large dust cloud in Camelopardalis. http://www.starrywonders.com/vdb14.html

Free star charts for the month can be downloaded at http://www.skymaps.com/downloads.html and https://www.telescop...thly-Star-Chart and http://whatsouttonight.com/

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

Finder charts for the Messier objects and other deep-sky objects are posted at https://freestarcharts.com/messier and https://freestarcharts.com/ngc-ic and http://www.cambridge...y-september.htm

Telrad finder charts for the Messier Catalog and the SAC's 110 Best of the NGC are posted at http://www.astro-tom...charts/map1.pdf and http://sao64.free.fr...ataloguesac.pdf respectively.

Information pertaining to observing some of the more prominent Messier galaxies can be found at http://www.cloudynig...ur-astronomers/

Author Phil Harrington offers an excellent freeware planetarium program for binocular observers known as TUBA (Touring the Universe through Binoculars Atlas), which also includes information on purchasing binoculars, at http://www.philharrington.net/tuba.htm
Stellarium and Cartes du Ciel are useful freeware planetarium programs that are available at http://stellarium.org/ and https://www.ap-i.net/skychart/en/start

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

Freeware sky atlases can be downloaded at http://www.deepskywa...-atlas-full.pdf and http://astro.mxd120....ee-star-atlases.

NASA Night Sky Network

This article is distributed by NASA Night Sky Network
The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

NASA Night Sky Notes: Observe Apollo 8's Lunar Milestones

By David Prosper

December marks the 50th anniversary of NASA's Apollo 8 mission, when humans first orbited the Moon in a triumph of human engineering. The mission may be most famous for "Earthrise," the iconic photograph of Earth suspended over the rugged lunar surface. "Earthrise" inspired the imaginations of people around the world and remains one of the most famous photos ever taken. This month also brings a great potential display of the Geminids and a close approach by Comet 46P/Wirtanen

You can take note of Apollo 8's mission milestones while observing the Moon this month. Watch the nearly full Moon rise just before sunset on December 21, exactly 50 years after Apollo 8 launched; it will be near the bright orange star Aldebaran in Taurus. The following evenings watch it pass over the top of Orion and on through Gemini; on those days five decades earlier, astronauts Frank Borman, Jim Lovell, and Bill Anders sped towards the Moon in their fully crewed command module. Notice how the Moon rises later each evening, and how its phase wanes from full on Dec 22 to gibbous through the rest of the week. Can you imagine what phase Earth would appear as if you were standing on the Moon, looking back? The three brave astronauts spent 20 sleepless hours in orbit around the Moon, starting on Dec 24, 1968. During those ten orbits they became the first humans to see with their own eyes both the far side of the Moon and an Earthrise! The crew telecast a holiday message on December 25 to a record number of Earthbound viewers as they orbited over the lifeless lunar terrain; "Good night, good luck, a merry Christmas and God bless all of you - all of you on the good Earth." 50 years later, spot the Moon on these holiday evenings as it travels through Cancer and Leo. Just two days later the astronauts splashed down into the Pacific Ocean after achieving all the mission's test objectives, paving the way for another giant leap in space exploration the following year.

Catch up on all of NASA's past, current, and future missions at nasa.gov

Caption: Earthrise, 1968. Note the phase of Earth as seen from the Moon. Nearside lunar observers see Earth go through a complete set of phases. However, only orbiting astronauts witness Earthrises; for stationary lunar observers, Earth barely moves at all. Why is that? Credit: Bill Anders/NASA

NASA Space Place Gazette

What's new at NASA Space Place? What Are the Different Types of Full Moons?

Sometimes, the Moon may appear to glow red. Other times, the Moon may appear larger than usual in our night sky. The Moon itself is not changing colors or sizes. Its changes in appearance are usually due to its position in relation to the Sun and Earth. Click the image below to learn more:

Tycho Brahe, Johannes Kepler, Isaac Newton, E. E. Barnard, and Arthur Eddington were born in December.

Giovanni Cassini discovered the Saturnian satellite Rhea on December 23, 1672.

Nicolas Louis de Lacaille discovered NGC 2070 (the Tarantula Nebula) on December 5, 1751.

The bright spiral galaxies M81 and M82 in Ursa Major were discovered by Johann Bode on December 31, 1774.

William Herschel discovered the galaxy pair NGC 3166 and NGC 3169 in Sextans on December 19, 1783. Caroline Herschel discovered Comet 35P/Herschel-Rigoliet on December 21, 1788. Caroline Herschel discovered Comet C/1791 X1 (Herschel) on December 15, 1791.

The Jovian satellite Himalia was discovered by Charles Perrine on December 3, 1905. Audouin Dolfus discovered the Saturnian satellite Janus on December 15, 1966. The Saturnian satellite Epimetheus was discovered by Richard Walker on December 18, 1966.

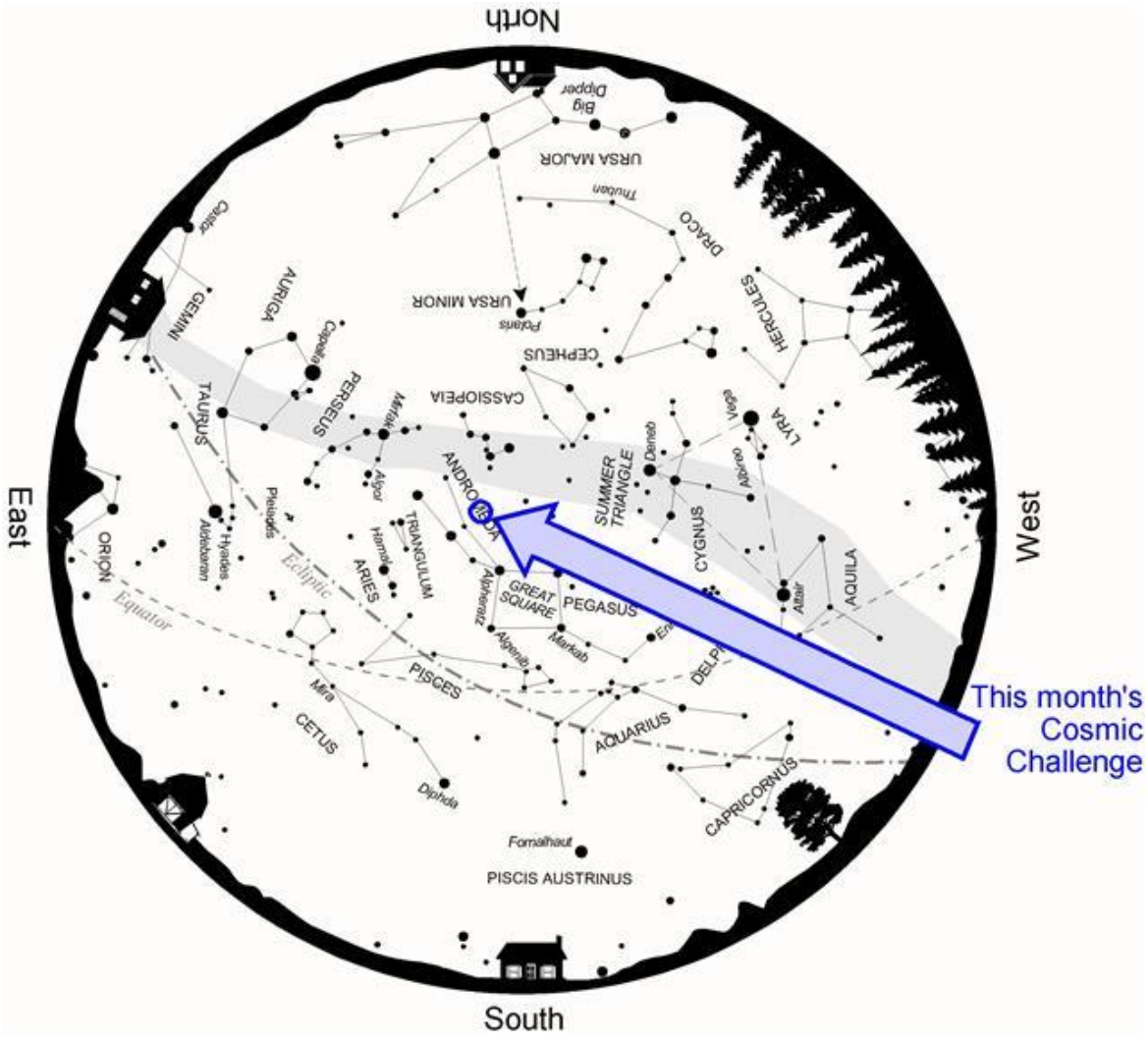
Phil Harrington's Cosmic Challenge

Cosmic Challenge: Globular clusters in M31
December 2018

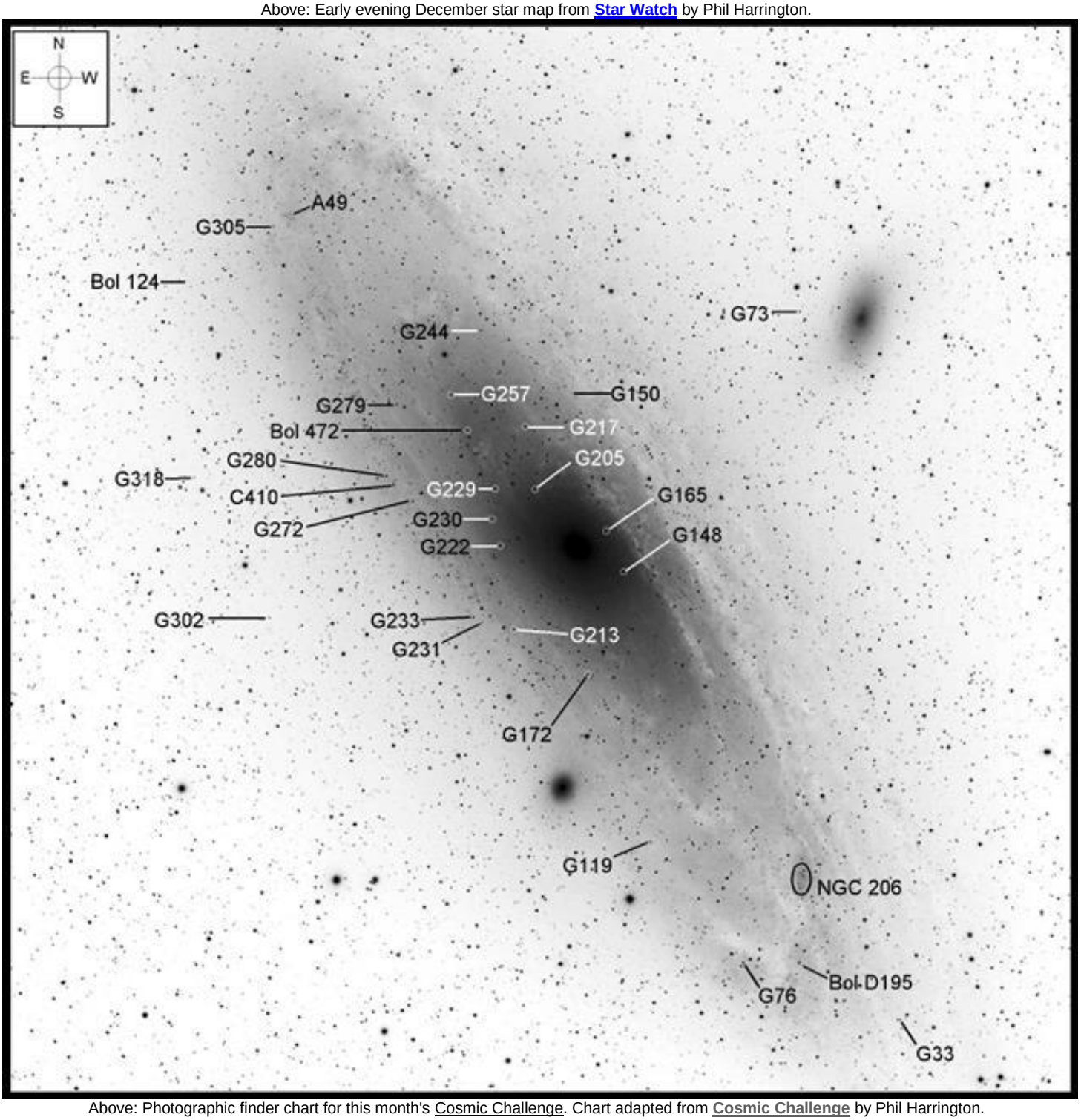
This months suggested aperture range: Monster Scopes 15" (38cm)+ or ask to have Centennial Observatory Manager, Chris Anderson, help you with the Herrett Telescope.

Target	RA	DEC	Constellation	Magnitude	Size
Globular clusters in M31	see table below	see table below	Andromeda	see table below	see table below

The Andromeda Galaxy, M31, was probably one of the first galaxies you ever saw first-hand. It was mine. That was all way back in 1969. Since then, I have grown to appreciate it as far more than just the ill-defined oval blur I drew in my logbook. But in 1969, the thought of looking for individual objects within M31 never crossed my mind.



Above: Early evening December star map from **Star Watch** by Phil Harrington.



Above: Photographic finder chart for this month's Cosmic Challenge. Chart adapted from **Cosmic Challenge** by Phil Harrington.
Image of M31 by Kevin Dixon, www.magnificentheavens.com.
Click on the chart to open a printable PDF version in a new window.

That changed in 1984, when Arizona astronomer Brian Skiff penned an article in the Fall '84 Deep Sky magazine. His article, simply titled "All About M31," included details for viewing many of that galaxy's open and globular star clusters. Skiff noted that a total of 355 globular clusters were identified as gravitationally bound to M31 in Paul Hodge's seminal work Atlas of the Andromeda Galaxy. Published three years earlier by the University of Washington Press, the atlas is long out of print. Thanks to the Internet and the charitable graces of its author, however, it remains available today via the NASA/IPAC Extragalactic Database (NED).

In the ensuing years, another 150-plus members have been added to the M31 globular family. In this challenge, we will look at some of the brightest. The table below, listing most that are brighter than magnitude 15.5, makes a good jumping-off point for the task at hand.

Globular Clusters in M31 Brighter than Magnitude 15.5 (Highlighted entries are discussed below)				
Name*	R.A.	Dec.	Apparent magnitude	Size (')
G001	**00 32.8**	**+39 34.7**	**13.8**	**30**
G033	00 39.6	+40 31.2	15.4	2.3
G064	00 40.5	+41 21.7	15.1	2.3
Bol D195	00 40.5	+40 36.3	15.2	
G073	00 40.9	+41 41.4	14.9	
G072	**00 40.9**	**+41 18.9**	**14.9**	**2.2**
G078	**00 41.0**	**+41 13.8**	**14.2**	**3.2**
G076	**00 41.0**	**+40 35.8**	**14.2**	**3.6**
G119	00 41.9	+40 47.2	15.0	2.7
G148	00 42.3	+41 14.0	15.2	2.9
G150	00 42.4	+41 32.2	15.4	2.7
G165	00 42.5	+41 18.0	15.2	2.9
G172	00 42.6	+41 03.4	15.3	2.4
G213	**00 43.2**	**+41 07.4**	**14.7**	**2.5**
G205	00 43.2	+41 21.6	14.8	2.9
G217	00 43.3	+41 27.8	15.0	2.6
G222	00 43.4	+41 15.6	15.3	3.2
G229	00 43.5	+41 21.3	15.0	3.4
G230	00 43.5	+41 18.2	15.4	2.9
G231	00 43.5	+41 07.9	16.0	2.5
G233	00 43.6	+41 08.2	15.4	2.6
Bol 472	00 43.8	+41 26.9	15.2	
G244	00 43.8	+41 37.0	15.3	2.6
G257	00 44.0	+41 30.3	15.1	3.2
G272	**00 44.2**	**+41 19.3**	**14.8**	**3.4**
G280	**00 44.5**	**+41 21.6**	**14.2**	**2.7**
G279	00 44.5	+41 28.8	15.4	4.9
G302	00 45.4	+41 06.4	15.2	2.5
G318	00 46.2	+41 19.7	15.3	
G351	00 49.7	+41 35.5	15.2	
Note: "G" numbers are from the Hodge atlas. "Bol" refers to entries in the Revised Bologna Catalogue of M31 Globular Clusters and Candidates.				

Of the globulars in the table, the brightest and largest by far is **G001**. Also known as Mayall II, G001 lies more than 2½° southwest of M31's central core. That proves a real blessing, since it removes its delicate glow from the galaxy's bright spiral-arm disk.

Here's a great PDF chart for anyone starhopping their way to G001. First, locate 5.3-magnitude 32 Andromedae, which is 4° south-southwest of M31 and 1.6° due east of the cluster. Center on 32 Andromedae and then follow a crooked trail of six 7th- to 9th-magnitude stars westward to SAO 53990. G001 lies 13' further west, just south of a slender triangle of 13th-magnitude suns field stars. Two fainter stars stand guard on either side of the globular, one to the northwest and the other to the southwest. At first glance, it is easy to mistake all three for a tight triple star, but the globular is easily identifiable as nonstellar at magnifications above 250x. If you own a 10-inch (25cm) or larger scope, be sure to give it a go!

The remaining clusters in the table are far smaller than G001 and are superimposed somewhere on M31's disk, and so are difficult to see because of the low contrast. All require at least a 15-inch (38cm) and 300x before they appear nonstellar. Anything less and they remain as just faint anonymous "stars."

Above: A sketch of G001 through the author's 18-inch (46cm) reflector.

Working eastward from G001, the next stop is **G076**. To find it, center on 7th-magnitude SAO 36585, positioned 14' southwest of M32. Sliding southwestward 13' puts a flattened obtuse triangle of 11th- and 12th-magnitude stars in view. G076 is just 40" southeast of the triangle's southernmost star, but take care not to confuse it for a faint Milky Way star that is settled a little farther southeast.

G078 is about half a degree north of G076 and half a degree west of M31's bright core. Look for a slightly fuzzy, 14th-magnitude point 2' east-north of a north-south pair of 12th-magnitude stars. If you have success with G078, then try for G072, which is another 5.4' to the north-northwest. It's about half a magnitude fainter, however, so expect it to be a tougher catch.

Some of the most challenging of M31's globulars nearly overlap the galaxy's central core. For instance, **G213** is just 10' southeast of the core and is very nearly superimposed on the edge of the galaxy's halo. It lies just 1' west of an 11.5-magnitude star, but to isolate it from the bright surroundings, use the highest power you can muster.

If G213 proves a little too tough, then try these next two. Although they also suffer the effects of the bright spiral-arm halo, both are better isolated for improved contrast. **G272** lies just 1.3' southeast of an 11th-magnitude star that marks the pointy apex of an isosceles triangle of 9th- and 11th-magnitude stars 20' east-northeast of the galactic core. G280 is 4' east-northeast of the apex star. Do you also notice a very soft, elongated glow just to the southwest of **G280**? That's another bonus object, a large open cluster of stars listed as **C410** in Hodge's atlas. The overall magnitude of this difficult object is 16.1, but its brightest stars are far too faint for amateur observation. Once you've picked off these highlighted globulars, why not go for even bigger game? Use the table and photographic chart to find as many those listed as you can. And then branch out. There have been several informative threads in the Cloudy Night forums over the years. Here are but three: one, two, and three. Have a favorite challenge object of your own? I'd love to hear about it, as well as how you did with this month's test. Post your thoughts in this e-column's discussion forum or contact me through my web site.

The Cat's Eye Nebula
By Brian Ventrudo

An image of the Cat's Eye Nebula captured with the Hubble Space Telescope. Image credit: NASA.

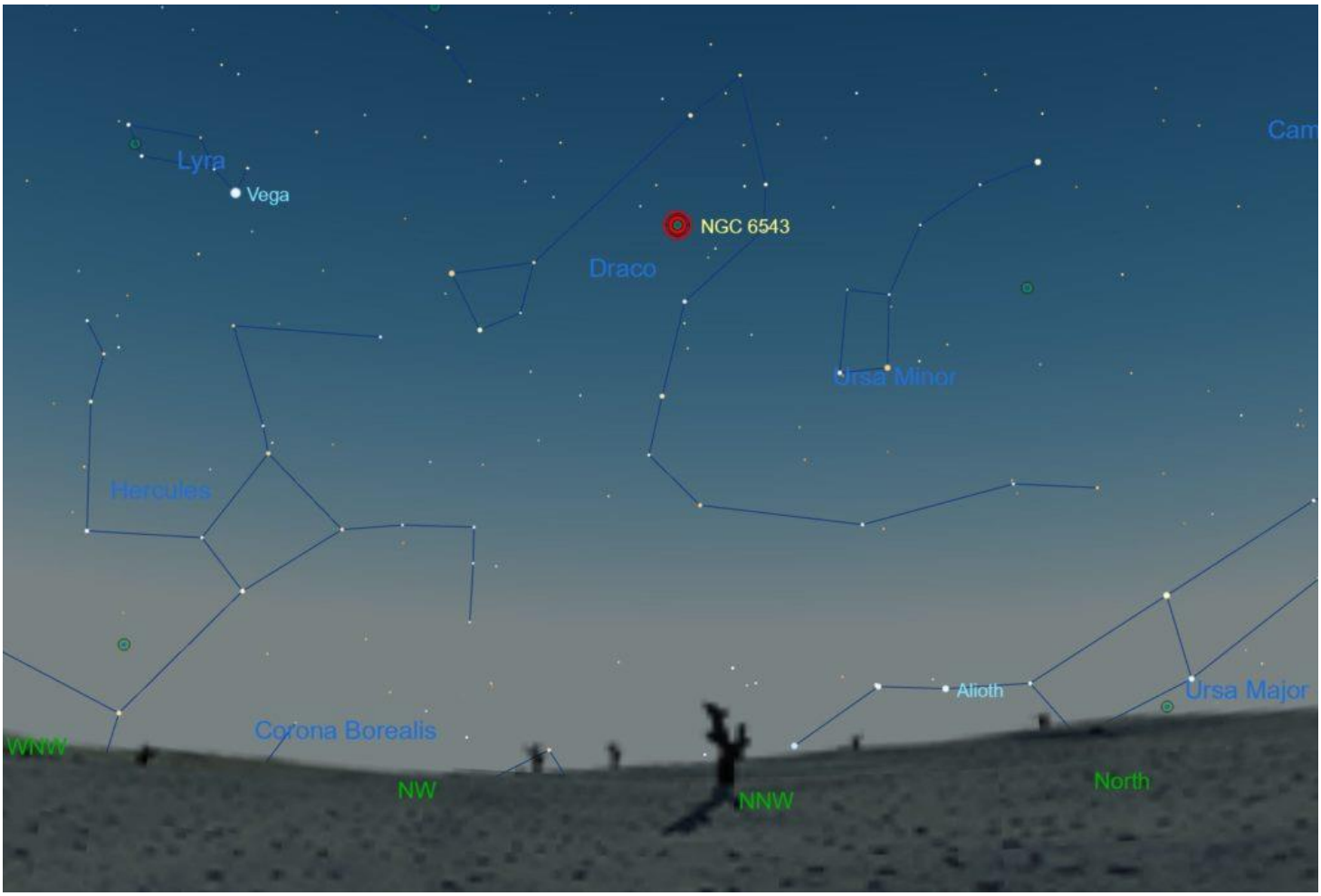
Unlike galaxies and star clusters and even emission nebulae, the class of objects known as planetary nebulae exist on a scale of space and time that's comprehensible, relevant, and compelling to most humans.

Comprehensible because these tenuous exhalations of dying stars are roughly the size of a solar system, which means light can pass from one end of the nebula to the other in just a few hours, and even our current spacecraft could cross some of these nebulae in a matter of years.

Relevant because our own Sun will expire after creating its own planetary nebula in a few billion years when our star's inner core boils off its outer layers in an intermittent nuclear frenzy. And compelling because as you observe these objects with your telescope, you may be witnessing the death of other solar systems which once harbored intelligent civilizations that long ago passed into oblivion, or perhaps learned to travel elsewhere in the galaxy before it was too late. Amateur astronomy is, after all, a pastime of the imagination.

Most stars will eventually become planetary nebulae, if just for a few tens of thousands of years out of their billion-year life spans. About 3,000 planetary nebulae exist in our galaxy, and perhaps a hundred are visible to determined backyard stargazers with a small telescope. The "showpiece" planetaries like the Ring, the Blue Snowball, and the Dumbbell Nebulae are favorite targets of even beginning stargazers. Not much further down the list of accessible planetaries is the famous Cat's Eye Nebula (NGC 6543). It's one of the newest such nebulae, just a thousand years old, and one of the easiest to see because of its high surface brightness.

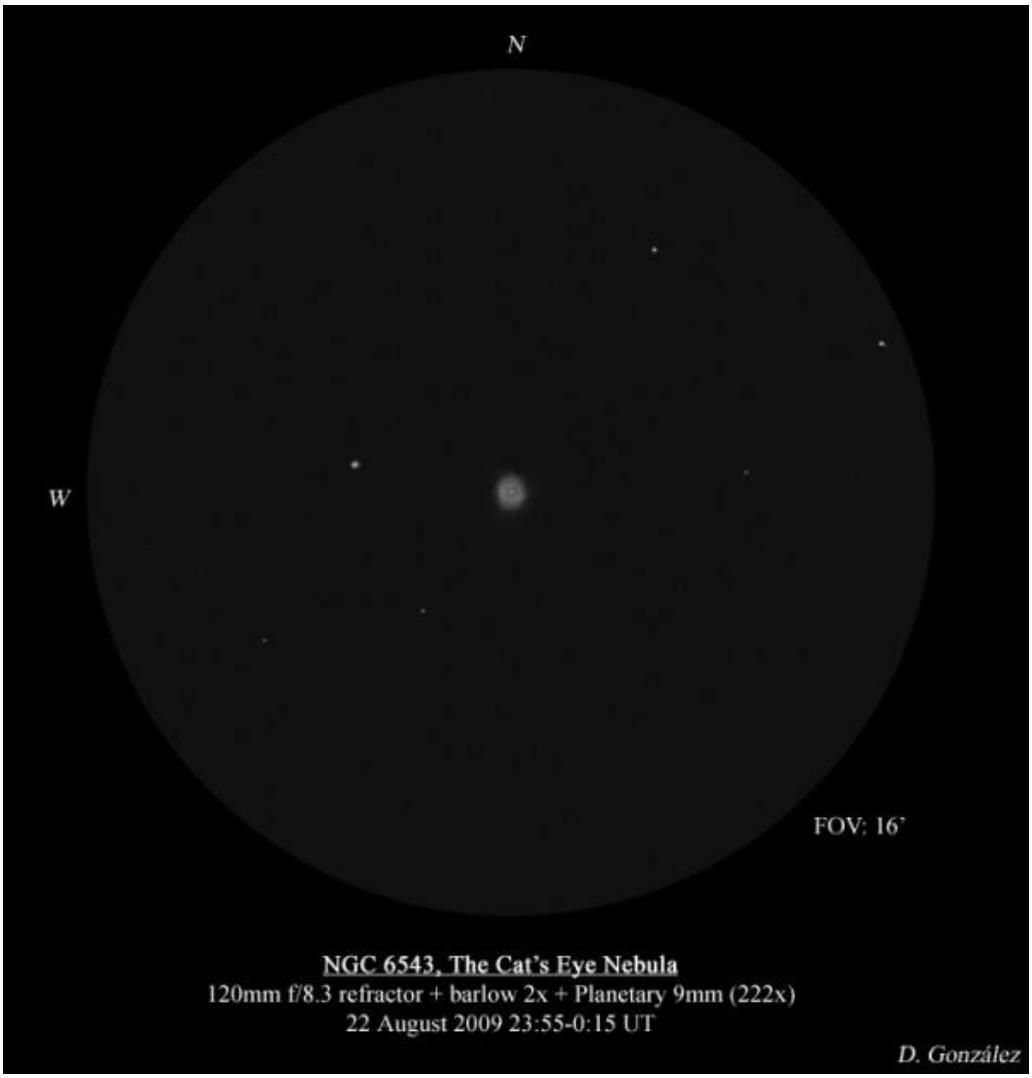
The Cat's Eye is the only planetary nebula among the winding stars of the constellation Draco which lies between the Big and Little Dippers. The 8th-magnitude nebula is located about halfway between the stars delta (δ) and zeta (ζ) Draconis. For northern stargazers, the nebula (and Draco) are visible before midnight from May through November, more or less. These stars are not visible from the deep-southern hemisphere.



The location of the Cat's Eye Nebula (NGC 6543) in the constellation Draco.

Unlike larger planetaries like the Helix Nebula, the Cat's Eye is tiny, some 16″ across, and has a relatively high surface brightness which makes it easier to see in light-polluted skies. With a 4-inch or larger telescope at 30x to 40x, you'll just be able to discern the nebula from the surrounding stars. It may look slightly fuzzy, with perhaps a greenish or turquoise color. The trick is distinguishing it from a star. That's where more magnification will help, at least 100x and preferably more, to give it some size. If you thread a nebula (or light pollution) filter into your eyepiece, it will also help increase the contrast of the nebula compared to the stars and the background sky.

The central star of NGC 6543, the old star that's casting off the nebula itself, is fairly bright and most telescopes reveal it easily with modest magnification. At 150x or more, the nebula shows some texture, including somewhat darker inner region and a brighter ring around the outside. The shape is slightly oval, and the color is quite pleasing compared to the whitish stars in the background. Like most small planetary nebulae, the Cat's Eye responds well to high magnification if the sky is steady. In larger telescopes at 200x or more, you may see a glimmer of the intricate shape that lends the nebula its name.



A sketch of the Cat's Eye Nebula (NGC 6543) made with a 120mm refractor at 222x. Credit: Diego Gonzalez.

In the 18th and 19th centuries, many astronomers thought planetary nebulae were patches of unresolved stars, which was not an unreasonable hypothesis. After all, as telescopes improved, once-unresolved star clusters were revealed to be tightly-packed groups of individual stars. Others thought nebulae were made of a shining "celestial fluid". The debate was solved in 1864 by William Huggins, a self-taught British amateur astronomer and wealthy silk merchant who sold his business at age 30 to concentrate on astronomy full time. Huggins was the first to attach a laboratory spectroscope to a telescope to try to figure out the composition of celestial objects. When he turned a spectroscope to the Cat's Eye, he found its spectrum was completely different from any star. He attributed the strange spectrum to an undiscovered element he called "nebulium". Decades later, spectroscopists determined "nebulium" was really a form of ionized oxygen that exists only in the rarified vacuum of space. This type of oxygen ion is called OIII ("oh-three"). Huggins subsequent studies of stars and nebulae determined that celestial objects were made of many of the same atoms as the Earth. "A common chemistry exists through the galaxy", he wrote.

While the Cat's Eye is modest in a backyard telescope, it is dazzling in long-exposure photographs. A splendid image from the Hubble Telescope made this nebula famous nearly two decades ago. Here's an updated image from Hubble. The twists and turns in the nebula are a matter of current study, but they are likely the result of the complex interplay of a companion star with the dying star, intermittent energy production in the dying star, and stellar magnetic fields coupled with stellar rotation. The size and expansion rate of the Cat's Eye suggest the nebula is just 1,000 years old. The central star will continue to expand for another 10,000 years, give or take, just a tiny fraction of its total lifespan, until the central star runs out of atmosphere. The ejected gas and sooty dust from the outer and inner parts of the star will quickly cool and drift freely in interstellar space for millions of years. Some of this material may one day coalesce in dense clouds that will collapse and form new star systems. A planetary nebula is but one instance of the complex ecology of the Milky Way as old stars recycle themselves into new stars and planetary systems.

Author's Note: The Cat's Eye Nebula is one of more than 400 celestial objects you can see for yourself with the help of *What to See in a Small Telescope*, a series of online courses exclusively available to subscribers of CosmicPursuits.com.

Observatories and Planetarium

CSI Centennial Observatory / Faulkner Planetarium Herrett Center

Event	Place	Date	Time	Admission
Monthly Free Star Party	Centennial Observatory	Saturday, December 8th, 2018	6:00 PM to midnight	FREE

College of Southern Idaho Campus Twin Falls, ID
Faulkner Planetarium / Show Times
http://herrett.csi.edu/astronomy/planetarium/showtimes.asp

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.