Snake River Skies

The Newsletter of the Magic Valley Astronomical Society

December 2020

Membership Meeting
See President's Message for December

Centennial Observatory
Due to the need to maintain social distance during the Covid-19 pandemic, access to the observatory dome is one small group at a time.

Faulkner Planetarium
See inside for Details

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

Colleagues,

Winter is settling in, but I hope you are bracing for one more winter activity. On Monday December 21st; Saturn and Jupiter will reach a spectacular conjunction as they pass within a tenth (.1°) of a degree of each other. This marks the first conjunction of these planets since 2000 and the closest since 1623 (nineteen years and four days before the birth of Isaac Newton) and close enough to pick up in the eyepiece of a small telescope. Please check out the notes in this newsletter issue to get further ideas. This should be an astrophotographer's dream, so we look forward to the images you'll provide.

As for meeting, that's still a challenge. Ordinarily, we would have a Christmas party with food and gifts, but that's not to be. We would ask, however, that you keep your eyes open. I am working with Chris Anderson to see if we can do the game online, while at this point, other activities such as an online gift exchange still face some feasibility issues. I wish I could offer more, but I would ask you for your patience. If we can pull that off, it will be Saturday, Dec. 12, at 7 p.m.

Having written this, I still feel optimistic about the next year. As we did the Year-In-Pictures online last month, it became clear that despite being unable to meet and to go out to our public outreach activities, we still came up with many great pictures and experiences. In addition, Chris Anderson pulled off three occultations in one week at the end of November, and early tests suggest one of us doing a live show over YouTube is possible, so it's clear that we can find ways to continue despite the challenges we face.

And I know we can.

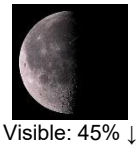
Until then,

Clear Views

Rob Mayer, President
MVAS

Calendar

December 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4 BSU 1st Friday Astronomy See page 3 for details	5
6	7 Last Quarter Moon on the 8th  Visible: 45% ↓ Age: 22.65 Days	8 Centennial Observatory Tuesday 5:45-9:00pm 	9	10	11	12 MVAS General Meeting see president's msg. for details Centennial Observatory Public Star Party 6p - 9p
13	14 New Moon  Geminid Meteor Shower Peak	15	16	17	18	19
20 First Quarter Moon on the 21st  Visible 45% ↑ Age: 6.93 Days	21 Centennial Observatory Jupiter Saturn Conjunction 5:00 to 5:45pm 	22 Centennial Observatory Tuesday 5:00-9:00pm 	23 Ursid Meteor Shower Peak 	24	25 Christmas Day 	26
27	28	29	30 Cold Moon 8:30 pm  Visible 100% Age: 15.10 Days	31		

Be Careful – Be Safe – Get Out There – Explore Your Universe

Boise State Physics
First Friday Astronomy

Friday, Dec 4th

NASA's Lucy Mission:
1 Spacecraft,
7 Trojan Asteroids,
12 years

Dr. Cathy Olkin
Southwest Research Institute

Online lecture begins 7:30pm MT

http://www.astrojack.com/ffa-lucy-mission

Donate at **give.boisestate.edu/astronomy**

November Celestial Calendar by Dave Mitsky

All times, unless otherwise noted, are UT (subtract 7 hours and, when appropriate, 1 calendar day for MST)

12/1 The Moon is at the ascending node (longitude 79.9 degrees) at 8:00
12/2 Mars is at the ascending node through the ecliptic plane at 3:00; the Moon is 0.2 degrees north of the bright open cluster M35 in Gemini at 8:00
12/3 The Moon is at its northernmost declination of the year (24.9 degrees) at 1:00; the Moon is 7.4 degrees south of the first-magnitude star Castor (Alpha Geminorum) at 21:00
12/4 The earliest end of evening twilight at 40 degrees north takes place today; the Moon is 3.7 degrees south of the first-magnitude star Pollux (Beta Geminorum) at 2:00
12/5 The Moon is 2.6 degrees north-northeast of the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 4:00; Mercury is at the descending node through the ecliptic plane at 18:00
12/6 The Moon is 4.5 degrees north-northeast of the first-magnitude star Regulus (Alpha Leonis) at 20:00
12/7 The earliest sunset at latitude 40 degrees north occurs today; asteroid 16 Psyche (magnitude +9.5) is at opposition in Taurus at 20:00; the Moon is 0.5 degrees north of asteroid 4 Vesta, with an occultation taking place in Micronesia, the northern Philippines, Japan, most of China, most of Russia, and most of eastern and northern Europe, at 22:00
12/8 Last Quarter Moon occurs at 0:37; Mercury is 4.3 degrees north-northeast of the first magnitude star Antares (Alpha Scorpii) at 11:00; the Curtiss Cross, an X-shaped clair-obscure illumination effect located between the craters Parry and Gambart, is predicted to be visible at 16:32
12/12 The Moon is at perigee, subtending 33' 02" from a distance of 361,773 kilometers (224,795 miles), at 20:42; the Moon is 0.8 degrees north of Venus, with an occultation taking place in western North America, Alaska, Hawaii, and far eastern Russia, at 21:00
12/14 The peak of the Geminid meteor shower (a zenithal hourly rate of 100 to 120 per hour) occurs at 1:00; the Moon is at the descending node (longitude 260.0 degrees) at 11:00; the Moon is 1.0 degrees north-northeast of Mercury at 12:00; a total solar eclipse visible from the South Pacific, southern South America, Antarctica, the South Atlantic, and southwestern Africa, begins at 14:33 UT1 and ends at 17:54 UT1; New Moon (lunation 1212) occurs at 16:16
12/15 The Moon is at its southernmost declination for the year (-24.9 degrees) at 22:00
12/16 Mercury is at aphelion (0.4667 astronomical units from the Sun) at 3:00
12/17 The Moon is 2.9 degrees south of Jupiter at 6:00; the Moon, Jupiter, and Saturn lie within a circle with a diameter of 3.0 degrees at 6:00; the Moon is 3.0 degrees southeast of Saturn at 7:00
12/18 The Sun enters the constellation of Sagittarius (ecliptic longitude 266.6 degrees) at 2:00
12/20 Mercury is at superior conjunction with the Sun (1.447 astronomical units from the Earth; latitude -4.5 degrees) at 3:00
12/21 The Moon is 4.2 degrees southeast of Neptune at 0:00; the Sun is at a longitude of 270 degrees at 10:02; the northern hemisphere winter solstice occurs at 10:02; Jupiter is 0.1 degrees south of Saturn at 14:00; First Quarter Moon occurs at 23:41
12/22 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 be fully formed at 4:33; the peak of the Ursid meteor shower (a zenithal hourly rate of 5 to 10 per hour) occurs at 9:00
12/23 Venus is 5.6 degrees north of Antares at 21:00
12/24 The Moon is 5.1 degrees southeast of Mars at 0:00; Mercury is at its southernmost declination (-25.1 degrees) at 7:00; the Moon is at apogee, subtending 29' 30" from a distance of 405,011 kilometers (251,663 miles), at 16:31; the equation of time is equal to zero at 22:00
12/25 The Moon is 3.2 degrees southeast of Uranus at 2:00
12/27 The Moon is 5.8 degrees southeast of the Pleiades at 2:00; the Moon is 4.6 degrees north of the first-magnitude star Aldebaran (Alpha Tauri) at 20:00
12/28 The Moon is at the ascending node (longitude 80.0 degrees) at 15:00
12/29 The Moon is 0.2 degrees north of M35 at 15:00
12/30 Full Moon (known as the Before Yule, Cold, Long Nights, and Oak Moon) occurs at 3:28
12/31 The Moon is 7.4 degrees south of Castor at 3:00; the Moon is 3.8 degrees south of Pollux at 8:00

The Sun, the Moon, & the Planets

The Moon is 15.6 days old, is illuminated 99.8%, subtends 30.1 arc minutes, and is located in Taurus 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 for the month on December 3rd (+24.8 degrees) and December 30th (+24.8 degrees) and greatest southern declination (-24.9 degrees) on December 16th. Longitudinal libration is at a maximum of +6.5 degrees on December 19th. It's at a minimum of -6.3 degrees on December 6th. Latitudinal libration is at a maximum of +6.9 degrees on December 21st and a minimum of -6.8 degrees on December 8th. Favorable librations for the following lunar features occur on the indicated dates: Crater Rydberg on December 6th, Crater Andersson on December 8th, Crater Vashakidze on December 18th, and Crater Compton on December 20th. New Moon occurs on December 14th. The Moon, Jupiter, and Saturn lie within a circle with a diameter of 3.0 degrees on December 17th. The Moon is at perigee (a distance of 56.72 Earth-radii) on December 12th and at apogee (a distance of 63.50 Earth-radii) on December 24th. The Moon occults asteroid 4 Vesta on December 7th and Venus on December 12th from certain parts of the world. Consult http://www.lunar-occultations.com/iota/iotandx.htm for information on lunar occultation events. Visit https://saberdoesthestars.wordpress.com/2011/07/05/saber-does-the-stars/ for tips on spotting extreme crescent Moons and http://www.curtrenz.com/moon06.html for Full Moon data. Consult http://time.unitarium.com/moon/where.html or download http://www.ap-i.net/avl/en/start for current information on the Moon. Visit https://www.fourmilab.ch/earthview/lunarform/maria.html?fbclid=IwAR0L-CYMauWi6Hhc09wUanCBQeDKNEw3gVJBHRwr0QEcodMJtNWK1OLMxYk for a list of lunar maria and https://upload.wikimedia.org/wikipedia/commons/thumb/3/36/Moon_names.jpg/600px-Moon_names.jpg?fbclid=IwAR1zUN--tW5jgxQPVOfp_6PpRtvXjprmsdrR531bAAjotCZImsof8HUNAKI for a simple map of the Moon showing the most prominent maria. See https://svs.gsfc.nasa.gov/4768 for a lunar phase and libration calculator and https://quickmap.lroc.asu.edu/?extent=-90,-27.218173,90,27.218173&proj=10&layers=NrBsFYBoAZIRnpEBmZcAsjYIHYFcAbAyAbwF8BdJUTBbSfI0yq8iioA for the Lunar Reconnaissance Orbiter Camera (LROC) Quickmap. Click on https://www.calendar-12.com/moon_calendar/2020/december 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-occultations.com/rlo/rays/rays.htm

The Sun is located in Scorpius 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. A total solar eclipse occurs in the southern hemisphere on December 14th. It's the 23rd eclipse of Saros 142. Greatest eclipse takes place in southern Argentina at 16:13:29 UT1 and has a duration of 2 minutes 14 seconds. For more on this event, consult http://www.eclipsewise.com/oh/ec2020.html#SE2020JDec14T or pages 48 and 49 of the December 2020 issue of Sky & Telescope.

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 -0.8, 4.9", 96% illuminated, 1.37 a.u., Libra), Venus (magnitude -3.9, 11.7", 89% illuminated, 1.43 a.u., Libra), Mars (magnitude -1.1, 14.6", 92% illuminated, 0.64 a.u., Pisces), Jupiter (magnitude -2.0, 34.4", 100% illuminated, 5.73 a.u., Sagittarius), Saturn (magnitude +0.6, 15.7", 100% illuminated, 10.61 a.u., Sagittarius), Uranus (magnitude +5.7, 3.7", 100% illuminated, 19.10 a.u. on December 16th, Aries), Neptune (magnitude +7.9, 2.3", 100% illuminated, 30.02 a.u. on December 16th, Aquarius), and Pluto (magnitude +14.3, 0.1", 100% illuminated, 34.87 a.u. on December 16th, Sagittarius).

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

Mercury heads sunward and is not visible after early December. It's at aphelion on December 16th. The speediest planet achieves superior conjunction on December 20th.

Venus rises less than 90 minutes before the Sun by the end of the month. The separation between the planet and the Sun is 20 degrees on December 31st. A waning crescent Moon passes less than a degree north of Venus on December 12th. A daytime occultation of the planet that is discussed on page 50 of the December 2020 issue of Sky & Telescope takes place in some locations. Venus passes just 10 arc minutes north of the third-magnitude binary star Graffias (Beta Scorpii) on the morning of December 18th. The brightest planet enters Ophiuchus on December 22nd and lies 5.6 degrees north of Antares on the morning of December 23rd.

During December, Mars decreases in brightness from magnitude -1.1 to magnitude -0.3, in angular size from 14.6 arc seconds to 10.5 arc seconds, and in illumination from 92% to 89%. It culminates around 9:00 p.m. local time on December 1st and an hour earlier on December 31st. The Red Planet is at its ascending node on December 1st, crossing from south to north of the ecliptic. At 10:00 p.m. EST, Valles Marineris and the volcanoes of the Tharsis Ridge are well placed during the first part of the month. Followed by Sinus Sabaeus, Syrtis Major, and the Hellas basin during the middle of December. At month's end, Mare Cimmerium is centered on the Martian disk. The waxing gibbous Moon passes 5.1 degrees southeast of Mars on the evening of December 23rd.

Jupiter and Saturn are 2.1 degrees apart as December begins and lie within one degree of one another from December 12th through December 29th. During the first week of December, the two planets set by 8:30 p.m. local time. A waxing crescent Moon passes three degrees south of Jupiter and Saturn on the evening of December 16th. On December 21st, the two gas giants are separated by just six arc minutes less 45 minutes after sunset and are positioned about 14 degrees above the southwestern horizon some 30 degrees east of the Sun. On that date, Jupiter shines at magnitude -2.0 and subtends 33.3 arc seconds. Saturn's brightness is magnitude +0.6, its disk has an apparent diameter of 15.4 arc seconds, and its rings span some 35 arc seconds. This is the first conjunction of the two planets since 2000 and the closest conjunction since 1623. The last observable conjunction in which Jupiter and Saturn were closer occurred in 1226. During the conjunction, Ganymede will transit Jupiter. Saturn's satellites Enceladus, Tethys, Dione, and Titan will be to the west of the planet and Rhea and Mimas to the east. For additional information on this Great Conjunction, see https://earthsky.org/astronomy-essentials/great-jupiter-saturn-conjunction-dec-21-2020 and https://earthsky.org/astronomy-essentials/jupiter-saturn-conjunction-telescopic-magnified-dec-2020 and https://www.timeanddate.com/astronomy/planets/great-conjunction

Uranus lies a few degrees southeast of the sixth-magnitude star 19 Arietis in southern Aries and transits the meridian in the early evening. Uranus lies five degrees northwest of the waxing gibbous Moon on December 24th. Visit http://www.nakedeyeplanets.com/uranus.htm or consult page 51 of the October 2020 issue of Sky & Telescope October for finder charts.

Neptune is located about three quarters of a degree northeast of the fourth-magnitude star Phi Aquarii during the early part of the month. As December ends, Neptune lies one degree from the star. The waxing crescent Moon passes four degrees south of Neptune on 20th. Neptune culminates during evening twilight and sets before midnight by the middle of the month. Browse http://www.nakedeyeplanets.com/neptune.htm or see page 48 of the September 2020 issue of Sky & Telescope for finder charts.

Finder charts for Uranus and Neptune are also available at https://skyandtelescope.org/wp-content/uploads/UranusNeptune2020_BW_WebFinder.pdf and an article on observing the ice giants is posted at https://skyandtelescope.org/observing/ice-giants-neptune-and-uranus/

Click on https://skyandtelescope.org/observing/interactive-sky-watching-tools/ for JavaScript utilities that will illustrate the positions of the five brightest satellites of Uranus and the position of Triton, Neptune's brightest satellite.

Pluto will not be readily visible again until next year.

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

The graphic at https://www.timeanddate.com/astronomy/planets/distance displays the apparent and comparative sizes of the planets, along with their magnitudes and distances, for a given date and time.

Asteroids

Asteroid 1 Ceres heads northeastward through Aquarius during December, passing close to the eleventh-magnitude globular cluster NGC 7492 at the end of the month. Asteroids brighter than magnitude +11.0 reaching opposition this month include 16 Psyche (magnitude +9.5) on December 7th, 79 Eurynome (magnitude +9.9) on December 11th, 13 Egeria (magnitude +10.0) on December 20th, 39 Laetitia (magnitude +9.9) on December 21st, 52 Europa (magnitude +10.2) on December 28th, and 356 Liguria (magnitude +10.9) on December 31st. For information on this year's bright asteroids and upcoming asteroid occultation events respectively, consult https://curtrenz.com/asteroids.html and http://asteroidoccultation.com/

Comets

The periodic comet 88P/Howell shines at approximately tenth magnitude as it heads northeastward through Capricornus this month. The comet passes about four degrees north of the seventh-magnitude globular cluster M30 on December 18th and approximately one degree southeast of Deneb Algedi (Delta Capricorni) on December 21st. For additional information on comets visible this month, browse http://cometchasing.skyhound.com/ and http://www.aerith.net/comet/future-n.html

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

---

Meteor Showers

The peak of Geminid meteor shower occurs on the morning of December 14th and is not adversely affected by moonlight. 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. 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 14 through 19 of the December 2020 issue of Sky & Telescope. The Ursids, a normally minor meteor shower with a maximum zenithal hourly rate of 10 per hour, peak on the morning of December 23rd and are somewhat affected by the First Quarter Moon. The radiant is located close to Kochab (Beta Ursa Minoris), some 15 degrees from the north celestial pole. See https://earthsky.org/space/everything-you-need-to-know-geminid-meteor-shower for additional information on the Geminids and page 49 of the December 2020 issue of Sky & Telescope and https://earthsky.org/?p=2976 for more on the Ursids.

Earth & Miscellaneous

Information on passes of the ISS, the USAF's X-37B, the HST, and many other satellites can be found at http://www.heavens-above.com/

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

Information on the celestial events transpiring each week can be found at https://stardate.org/nightsky and http://astronomy.com/skythisweek and http://www.skyandtelescope.com/observing/sky-at-a-glance/

Free star maps for November can be downloaded at http://www.skymaps.com/downloads.html and https://www.telescope.com/content.jsp?pageName=Monthly-Star-Chart

Data on current supernovae can be found at http://www.rochesterastronomy.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 https://www.cambridge.org/turnleft/seasonal_skies_october-december

Telrad finder charts for the Messier Catalog and the SAC's 110 Best of the NGC are posted at http://www.custerobservatory.org/docs/messier2.pdf and http://sao64.free.fr/observations/catalogues/cataloguesac.pdf respectively.

Information pertaining to observing some of the more prominent Messier galaxies can be found at http://www.cloudynights.com/topic/358295-how-to-locate-some-of-the-major-messier-galaxies-and-helpful-advice-for-novice-amateur-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://telescopius.com/

Freeware sky atlases of varying "depth" can be downloaded at http://www.deepskywatch.com/deep-sky-hunter-atlas.html and http://www.olle-eriksson.com/night-sky-maps/ and https://allans-stuff.com/takis-8-5-magnitude-star-atlas/

Deep Sky

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

The objects listed above are located between 2:00 and 4:00 hours of right ascension.

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!

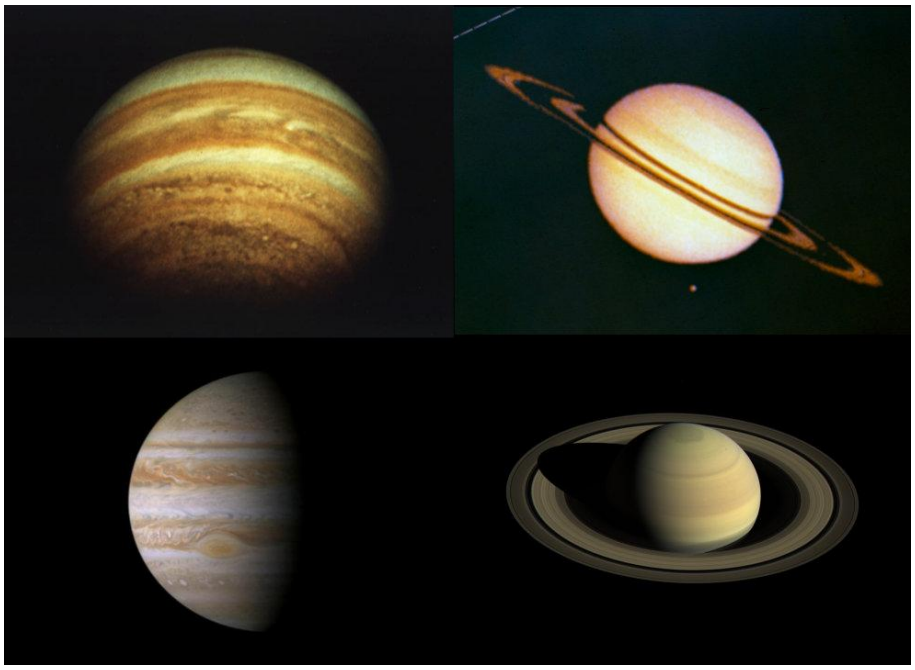
Visitors to Both Jupiter and Saturn

by David Prosper

Have you observed Jupiter and Saturn moving closer to each other over the past few months? On December 21, the two worlds will be at their closest, around 1/5 of a full Moon apart! While the two gas giants may *appear* close, in reality they are hundreds of millions of miles apart. Despite this vast distance, a select few missions have visited both worlds by using a gravity assist from giant Jupiter to slingshot them towards Saturn, saving time and fuel.

Pioneer 11 was the first mission to visit both worlds! Launched in 1973, the probe flew past Jupiter in late 1974, passing just 26,400 miles above its stormy clouds. In 1979, it became the first spacecraft to encounter Saturn. Pioneer 11 took the first up-close photos of Saturn and its satellites, and made many exciting discoveries, including the detections of its magnetic field and a faint “F” ring, before departing Saturn and eventually, the solar system.

The Voyager missions quickly followed up, taking a “Grand Tour” of the four largest and most distant planets in our solar system. Both probes were launched within two weeks of each other in 1977. Voyager 1 flew past Jupiter in March 1979, discovering Jupiter’s faint ring and two new moons, along with active volcanoes on Io’s surface! The probe then flew past Saturn in November 1980, discovering five new moons, a new “G” ring, mysterious ring “spokes,” and “shepherd moons” shaping the rings. After a brief encounter with Titan revealed evidence of complex organic chemistry and liquid on the moon’s frigid surface, Voyager 1 was flung out of the plane of the solar system. Following close behind, Voyager 2 took detailed photos of Jupiter’s moons and cloud tops in July 1979. Flying past Saturn in August 1981, Voyager 2 measured the thickness of Saturn’s rings and took detailed photos of many of its moons. This second explorer then captured images of Uranus and Neptune before leaving our solar system.



At Left: The difference in technology between generations of space probes can be stunning! The top two photos of Jupiter and Saturn were taken by Pioneer 11 in 1974 (Jupiter) and 1979 (Saturn); the bottom two were taken by Cassini in 2000 (Jupiter) and 2016 (Saturn). What kinds of photos await us from future generations of deep space explorers?

Cassini-Huygens was the last mission to visit both worlds. Launched in 1997, the mission flew past Jupiter in late 2000 and took incredibly detailed photos of its stormy atmosphere and faint rings. Cassini entered into Saturn’s orbit on July 1, 2004. The Huygens probe separated from Cassini, landing on Titan to become the first probe in the outer solar system. Cassini discovered geysers on Enceladus, fine details in Saturn’s rings, many more moons and “moonlets,” the changing oceans of Titan, and seasonal changes on Saturn itself. After revolutionizing our understanding of the Saturnian system, Cassini’s mission ended with a fiery plunge into its atmosphere on September 15, 2017.

What’s next for the exploration of the outer worlds of our solar system? While Juno is currently in orbit around Jupiter, there are more missions in development to study the moons of Jupiter and Saturn. Discover more about future NASA missions to the outer worlds of our solar system at nasa.gov.

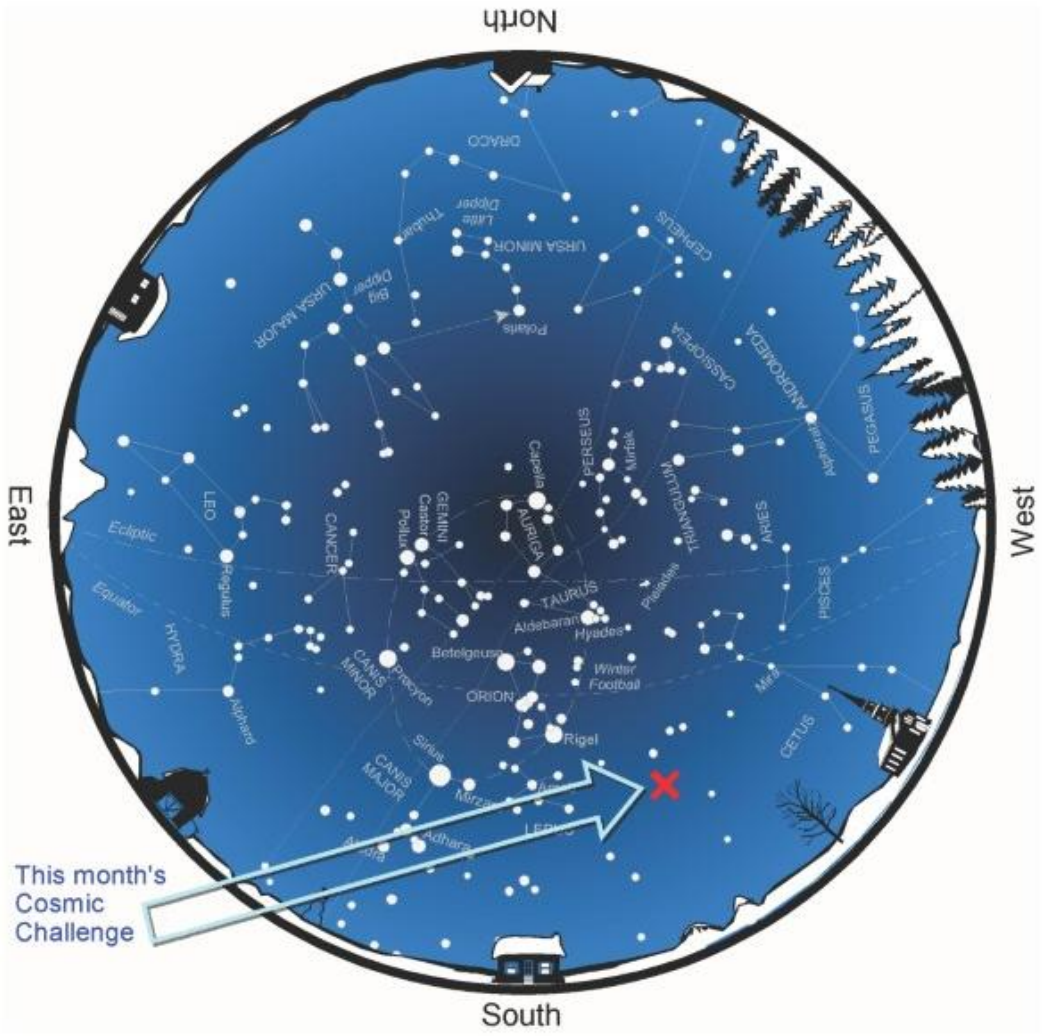
NGC 1360

	Giant binoculars and small telescopes

Target	Type	RA	DEC	Constellation	Mag	Size
NGC 1360	Planetary nebula	03h 33.3m	-25° 52.2'	Fornax	9.6p	6.4'

Many stargazers consider Fornax, the Furnace, to be a constellation of the deep south, and therefore invisible from mid-northern latitudes. While it is true that Fornax scrapes the southern horizon on early winter evenings, it does so at much the same altitude as Scorpius does during the summer. If you can see Scorpius from your observing site in July, you can see Fornax in December. Assuming it's clear, of course!

The real reason so few of us take notice of Fornax is not because of its southerly location, but rather its lack of luster. The constellation's brightest star, Alpha (α) Fornacis, shines at a relatively dim magnitude 3.9. The two other primary stars that contribute to the constellation's formal pattern, Beta (β) and Nu (ν) Fornacis are both below 4th magnitude. To most of us, those few dim stars are not much to look at, but to the inventive eye of Nicolas Louis de Lacaille, they formed a furnace. Lacaille's furnace was not the type you would use to heat your house, however. To him, this was Fornax Chemica, a small heating unit used by the chemists of his day to heat chemicals during experiments.



At Left: December evening star map, adapted from Star Watch by Phil Harrington

Admittedly, the furnace may not look so hot to naked-eye stargazers. It does, however, hold many amazing deep-sky sights, including one of the most unusual planetary nebulae in the sky. Shortly after it was discovered in 1857 by the American comet hunter Lewis Swift, that nebula, NGC 1360, became an object of mystery and intrigue to those trying to classify it. Some suggested it was an unusual emission nebula, while others felt it was a planetary nebula. Even after decisive studies were conducted in the 1940s by Rudolph Minkowski at Mount Wilson Observatory in California, many still found it a curiosity.

Part of that curiosity likely stemmed from NGC 1360's odd appearance. The internal structure displayed by most planetary nebulae is the result of strong, swirling streams of charged particles from their embedded white dwarf progenitor stars. These stellar winds hollow out the central portion of the nebula and create denser outer levels, or shells.

NGC 1360 does not show a characteristic central void. Instead, it appears all mixed up, as evident in the image below. The October 2004 issue of the *Astronomical Journal* includes a paper entitled Physical Structure of Planetary Nebulae. III. The Large and Evolved NGC 1360 that reported on the research results conducted by Daniel Goldman and his colleagues of the Department of Astronomy, University of Illinois at Urbana-Champaign. Their studies found: “There exist planetary nebulae that do not possess morphological features that suggest the presence of wind-wind interactions. NGC 1360 is such a planetary nebula. Its surface brightness does not dip deeply at the center or rise steeply at the limb to indicate a hollow-shell structure.”

They concluded that the lack of a sharp internal edge to NGC 1360 is due to the absence of fast stellar winds.

A later study, The Planetary Nebula NGC 1360: A Test Case of Magnetic Collimation and Evolution after the Fast Wind, published in the March 20, 2008 *Astrophysical Journal* by M. T. Garcia-Diaz and others from the Instituto de Astronomia, Universidad Nacional Autonoma de Mexico concluded that the "fast stellar wind from the central star [in NGC 1360] has died away at least a few thousand years ago and a back-filling process has modified its structure producing a smooth, nearly featureless and elongated high excitation nebula."

One reason for this appearance undoubtedly has to do with the central stars. That's right, *star**s***. The central star had been suspected to be binary as far back as 1977, but it took 40 years to finally prove it. A study made with the Southern African Large Telescope (SALT) and published in January 2018 entitled SALT HRS discovery of a long-period double-degenerate binary in the planetary nebula NGC 1360 (*Monthly Notices of the Royal Astronomical Society*. 473 (2): 2275) confirmed that the odd binary system consists of low-mass O-type star and a white dwarf. As the study noted, "Around 50 short-period binary central stars (periods ~ 1 day) are known, but only four with measured orbital periods over 10 days" are known. The binary system in NGC 1360 shows an orbital period of 142 days.

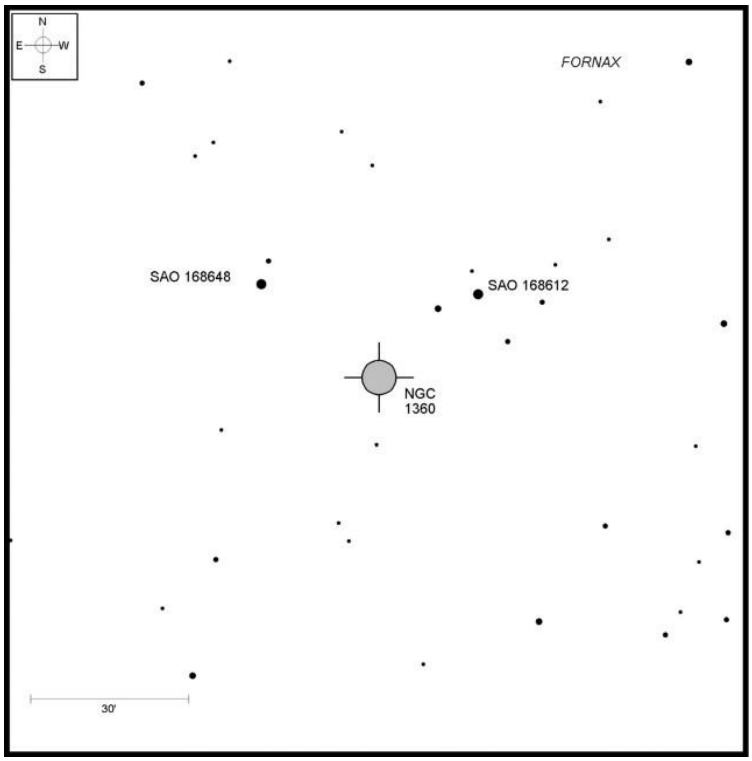
Clearly, these discoveries will continue to intrigue stellar astronomers, just as they intrigue us, if for different reasons. While NGC 1360 is bright enough to be seen through large binoculars and small telescopes with relative ease, pinpointing its location in the emptiness of the early winter sky can be difficult. Therefore, our challenge is not to understand why NGC 1360 looks like it does. Our challenge is to find this unusual egg-shaped cloud in the first place.

Of course, one way to overcome this challenge is simply to use a Go-To telescope. Punch in "NGC 1360" and you're there without any fuss or muss. But what challenge is there in that? Therefore, I challenge you to find NGC 1360 without any aid whatsoever save for your finderscope and a star atlas; that is, a star atlas other than the second edition of Sky Atlas 2000.0. NGC 1360 was omitted from chart #18, where it should be plotted. But don't worry, we'll find it together.

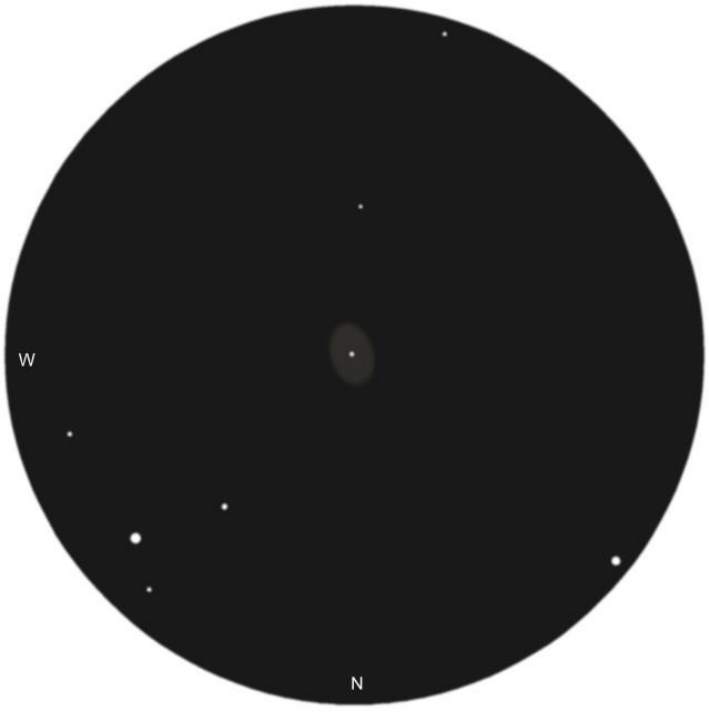
I prefer to start at Lepus, the Hare, just south of mighty Orion. Extend a line from Delta (δ) to Epsilon (ε) Leporis and follow it toward the west for about 17°. Through your finderscope or binoculars, look for a trapezoidal pattern formed from Tau-6 (τ6), Tau-7 (τ7), Tau-8 (τ8), and Tau-9 (τ9) Eridani. Once there, extend a line from Tau-9 through Tau-8, continuing for about 4° westward to a close-set pair of 6th-magnitude stars, SAO 168612 and SAO 168648. NGC 1360 lies just south of the halfway point between those two stars. In fact, all three may just squeeze into a low-power field.

Keep in mind that you are not looking for a small disk of light, but rather a large glowing cloud. To put things in perspective, the largest, brightest planetary nebula north of the celestial equator is M27, the Dumbbell Nebula in Vulpecula. M27 shines at magnitude 7.4 and measures 8'x6'. By contrast, NGC 1360 spans 9'x5', nearly identical in apparent size. At 9th magnitude, however, it is also four times fainter.

Through my 4-inch refractor, NGC 1360 looks like an unusually symmetrical oval cloud of faintly greenish light resembling a cosmic egg -- hence it's nickname, the Robin's Egg Nebula. The central star, shining at 11th magnitude, is just visible in this aperture, but is quite prominent in larger instruments. It's clear in my 10-inch (25cm) Newtonian. At first glance, the cloud will look perfectly uniform. Take a closer look, however, and a very subtle, almost spiral-like structure becomes evident. A narrowband filter helps to bring this out, but unless the eye is trained to spot delicate details -- a talent only gained by years of experience -- then this will probably pass undetected.



At Right: Finder chart adapted from Cosmic Challenge: The Ultimate Observing List for Amateurs by Phil Harrington.



At Left: NGC 1360 as seen through the author's 10-inch (25cm) reflector.

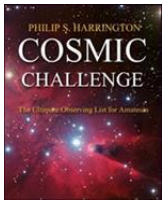
Good luck! And be sure to post your results in this column's online discussion forum (Phil Harrington's December cosmic challenge forum).

Have a favorite challenge object of your own? I'd love to hear about it. Contact me through my web site or post to this month's discussion forum.

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

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. Contact me through my web site or post to this month's discussion forum.

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.

A revised, second printing of Cosmic Challenge: The Ultimate Observing List for Amateurs is now available with updated data tables and charts for finding various solar system objects, such as Pluto and Vesta, as well as improved renditions of the many eyepiece sketches that accompany each of the 187 challenges encompassing more than 500 individual objects. The book is available from Amazon.com.

Observatory and Planetarium

The Herrett Center has re-opened, with COVID-19 safety protocols for your protection. Check out our reopening video message and we hope to see you soon!

Centennial Observatory Upcoming Events

Event	Place	Date	Time	Admission
Telescope Tuesday	Centennial Observatory	Tuesday, December 8th, 2020	5:45 to 9:00 PM	$1.50 or free with Faulkner Planetarium admission
Monthly Free Star Party	Herrett Center front lawn, with limited access to observatory	Saturday, December 12th, 2020	5:45 PM to 1:00 AM	FREE
Great Conjunction of Jupiter and Saturn	Centennial Observatory	Monday, December 21st, 2020	5:00 to 5:45 PM	FREE
Telescope Tuesday	Centennial Observatory	Tuesday, December 22nd, 2020	5:00 to 9:00 PM	$1.50 or free with Faulkner Planetarium admission

Due to the need to maintain social distance during the Covid-19 pandemic, access to the observatory dome is one small group at a time.

Faulkner Planetarium
Now Showing!

Visit the Herrett Center Video Vault

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.