

Snake River Skies

The Newsletter of the Magic Valley Astronomical Society

www.mvastro.org

Membership Meeting

Saturday, March 9th 2019
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

March 2019

Colleagues,

This is the time of year that winter begins to contemplate shifting gears. Already we've started to see mornings and evenings of snow, only to watch it melt away with the mid-day rain. That also means our chances at the astronomical sights of the season are becoming fewer and fewer. The eye (Sirius) of the big dog (Canis Major) now dominates the southern sky as early as 9:30 a.m. In a month, Orion will no longer stay up with us past midnight.

One of those winter features is one we think we know a bit about, the Pleiades. Recent research, however, suggests it's worth taking a second look at this bright fuzzy in the sky, the giant among open clusters. With that in mind, we invite you to come to our meeting this month for a presentation on the Seven Sisters. Come find out how far away it really is, what's really there, and why we should treat the cluster with importance.









A couple of other functions these next few days will give us a chance to either practice what we've learned, or to merely say farewell to the Orion and its friends. First, March 30th is Earth Hour. We invite you to check in with the Herrett Center for more about its activities that evening. Secondly, April 5th is an MVAS-members star party at the Jerome Gun Club. This is ordinarily an attempt at a Messier Marathon, but this year the moon's brightness gets in the way of the best window for a shot at capturing all of the Messier catalogue. With that in mind, we had to start a little later in the year. Still, that shouldn't get in the way of a good time. If you need to borrow a telescope, contact me at mayerbrt@gmail.com or 208-312-1203 and I'll see what I can bring. If you don't want to bring a scope and just sit and watch the sky, by all means, come.

Clear Views,

Rob Mayer

Calendar

March 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5 Mardi Gras 	6 New Moon Lunation 1190 1% Visible ↓ Age: 29.38 Days 	7	8	9 MVAS Meeting at 7:00pm at the Herrett Center Public Star Party Centennial Obs. 7:30 - Midnight
10	11 Commonwealth Day Canada 	12	13	14 First Quarter 51% Visible ↑ Age: 7.45 Days 	15	16
17 St. Patrick's Day  <small>See you at O'Dunkens</small>	18	19	20	21 Full Moon 100% Visible Age: 15.27 Days Worm Moon 	22	23
24	25	26	27	28 Last Quarter Visible 48% ↓ Age: 22.43 Days 	29	30 "Earth Hour" Telescope Viewing 8:30p - 9:30p 
31						

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 newsletter, unless otherwise noted, are in the public domain and are courtesy of NASA, Wikimedia, or from MVAS File Photos. Full
 Moon names follow the traditional Algonquin First Nation history.

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

March Celestial Calendar by Dave Mitsky

All times, unless otherwise noted, are UT (subtract seven hours and, when appropriate, one calendar day for MST and six hours for MDT as of March 10th)

- 3/1 The Moon is 0.4 degree northeast of Saturn, with an occultation occurring in southern North America, Central America, most of northern Polynesia, and most of Micronesia, at 19:00
- 3/2 The Moon, Saturn, and Pluto lie within a circle with a diameter of 4.7 degrees at 3:00; the Moon is at the descending node (longitude 296.0 degrees) at 11:00; the Moon is 0.6 degree north of Pluto, with an occultation occurring in most of Mongolia, most of China, most of southern and eastern Asia, India, the Middle East, southwestern Europe, and northeastern Africa, at 20:00; the Moon is 1.2 degrees south of Venus at 21:00
- 3/4 The Moon is at apogee, subtending 29' 24" from a distance of 406,390 kilometers (252,519 miles), at 10:26
- 3/5 Asteroid 2 Pallas is stationary at 2:00; Mercury is stationary in right ascension, with retrograde motion to commence, at 5:00; Mercury is stationary in longitude, with retrograde motion to commence, at 18:00
- 3/6 New Moon (lunation 1190) occurs at 16:04; the Moon is 3.0 degrees south-southeast of Neptune at 17:00
- 3/7 Neptune is in conjunction with the Sun (latitude -0.99 degree) at 1:00; Mercury is at its northernmost latitude from the ecliptic plane (7.0 degrees) at 3:00; the Moon is 7.9 degrees south southeast of Mercury at 19:00; asteroid 4 Vesta is in conjunction with the Sun at 22:00
- 3/10 Daylight Saving Time (DST) begins today; the Moon is 4.6 degrees south-southeast of Uranus at 8:00
- 3/11 The Moon is 5.5 degrees south-southeast of Mars at 17:00
- 3/12 The Sun enters Pisces (longitude 351.6 degrees on the ecliptic) at 11:00; the Moon is 8.2 degrees south-southeast of the bright open cluster M45 (the Pleiades or Subaru) in Taurus at 17:00
- 3/13 The Moon is 1.9 degrees north of the first-magnitude star Aldebaran (Alpha Tauri) at 10:00; 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 be fully formed at 15:26
- 3/14 Jupiter is at western quadrature (90 degrees from the Sun) at 1:00; Venus is at the descending node through the ecliptic plane at 9:00; First Quarter Moon occurs at 10:26
- 3/15 Mercury is at inferior conjunction with the Sun (0.618 astronomical units from the Earth, latitude 5.7 degrees) at 2:00
- 3/16 The Moon is 6.8 degrees south of the first-magnitude star Pollux (Beta Geminorum) at 15:00; the Moon is at the ascending node (longitude 114.9 degrees) at 16:00
- 3/17 The Moon is 0.5 degree south of the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 13:00
- 3/18 A double Galilean satellite shadow transit (Europa follows Ganymede) begins at 5:33
- 3/19 The Moon is 2.5 degrees north-northeast of the first-magnitude star Regulus (Alpha Leonis) at 2:00; the Moon is at perigee, subtending 33' 15" from a distance of 359,377 kilometers (223,307 miles), at 19:48
- 3/20 The northern hemisphere vernal equinox occurs at 21:58
- 3/21 Full Moon (known as the Crow, Lenten, and Sap Moon) occurs at 1:43
- 3/22 The Moon is 7.1 degrees north-northeast of the first-magnitude star Spica (Alpha Virginis) at 17:00; spring equinox on Mars occurs at 22:00
- 3/25 A double Galilean satellite shadow transit (Europa follows Ganymede) begins at 8:06
- 3/26 The Moon is 8.1 degrees north-northeast of the first-magnitude star Antares (Alpha Scorpii) 2:00
- 3/27 The Moon is 1.9 degrees north-northeast of Jupiter at 4:00; Mercury is stationary in right ascension, with prograde (direct) motion to commence, at 12:00
- 3/28 Last Quarter Moon occurs at 4:10; Mercury is stationary in longitude and resumes prograde (direct) motion at 14:00
- 3/29 The Moon is 0.05 degree south of Saturn, with an occultation occurring in Sri Lanka, far southern India, Madagascar, southern Africa, and far eastern Brazil, at 5:00; the Moon is 0.3 degree north of Pluto, with an occultation occurring far western Africa, the Cape Verde Islands, Madeira, the northern half of South America, Central America, and southern and western Mexico, at 12:00; the Moon is at the descending node (longitude 293.7 degrees) at 13:00; the Curtiss Cross, an X-shaped clair-obscure illumination effect located between the craters Parry and Gambart, is predicted to be visible at 19:30
- 3/30 Mercury is at the descending node through the ecliptic plane at 23:00
- 3/31 Mars (magnitude +1.4) is 3.1 degrees south-southeast of M45 (the Pleiades)

Nicolas-Louis de Lacaille (1713-1762), Caroline Herschel (1750-1848), Josef von Fraunhofer (1787-1826), John Herschel (1792-1871), Percival Lowell (1855-1916), Albert Einstein (1879-1955), and Walter Baade (1893-1960) were born this month.

The zodiacal light may be visible in the western sky after sunset from dark locations after March 21st.

The Sun, the Moon, & the Planets



The Moon is 23.9 days old, is illuminated 28.0%, subtends 29.4 arc minutes, and is located in the constellation of Sagittarius at 0:00 UT on March 1st. New Moon occurs on March 6th. Full Moon occurs on March 21st. The Moon is at apogee (at a distance of 63.72 Earth-radii) on March 4th and at perigee (at a distance of 56.34 Earth-radii) on March 26th. Favorable librations occur for the following craters: Bailly (March 19th), Demonax (March 20th), Neumayer (March 21st), and Gill (March 22nd). The Moon will occult Saturn on March 1st and March 29th and Pluto on March 2nd and March 29th from certain parts of the world. Consult <http://www.lunar-occultations.com/iota/iotandx.htm> for information on lunar occultation events. Visit <http://saberdoesthestars.wordpress.com/2011/07/05/saber-does-the-stars/> for tips on spotting extreme crescent Moons. Click on http://www.calendar-12.com/moon_calendar/2019/march for a March lunar calendar. Times and dates for the lunar light rays predicted to occur this month are available at <http://www.lunar-occultations.com/rlo/rays/rays.htm>

The **Sun** is in Aquarius on March 1st at 0:00 UT. It enters Pisces on March 12th. The Sun crosses the celestial equator at 21:58 UT on March 20th, bringing spring to the northern hemisphere. At the equinox, the Sun is located in Aries and has a longitude of zero degrees.

Brightness, apparent size, illumination, distance from the Earth in astronomical units, and location data for the planets and Pluto on March 1st: Mercury (magnitude -0.2, 7.7", 39%, 0.88 a.u., Pisces), Venus (magnitude -4.1, 15.6", 72%, 1.07 a.u., Sagittarius), Mars (magnitude +1.2, 5.3", 91%, 1.77 a.u., Aries), Jupiter (magnitude -2.0, 36.2", 99%, 5.45 a.u., Ophiuchus), Saturn (magnitude +0.6, 15.6", 100% illuminated, 10.63 a.u., Sagittarius), Uranus (magnitude +5.9, 3.4", 100% illuminated, 20.66 a.u. on March 16th, Aries), Neptune (magnitude +8.0, 2.2", 100% illuminated, 30.92 a.u. on March 16th, Aquarius), and Pluto (magnitude +14.3, 0.1", 100% illuminated, 34.20 a.u. on March 16th, Sagittarius).

In the evening, Mercury, Mars, and Uranus can be seen in the west. Mercury is in the east, Venus and Saturn are in the southeast, and Jupiter is in the south in the morning sky. Venus, Saturn, and Jupiter are spaced evenly respectively on the morning of March 13th.

During March, **Mercury** dims in brightness from magnitude -0.2 to magnitude +3.6 and brightens again to magnitude +0.9 by month's end. It grows in apparent size from 7.7 to a maximum of 10.9 arc seconds and ends the month at 9.5 arc seconds. The innermost planet sets about 1.5 hours after the Sun on March 1st but by March 7th it will be so close to the horizon that it will be very difficult to see. Mercury is stationary on March 5th, reaches greatest heliocentric latitude north on March 7th, is in inferior conjunction with the Sun on March 15th, is stationary again on March 27th, and is at the descending node on March 30th. Mercury reappears low in the east shortly before sunrise in late March.

Venus drops in magnitude from -4.1 to -3.9 and decreases in angular size to 13.2 arc seconds during March. It rises around 4:30 a.m. local time. The waning crescent Moon passes 1.2 degrees north of the planet on March 2nd. By the end of March, Venus sets more than 1.5 hours after the Sun.

Mars dims to magnitude +1.4 and shrinks to a mere 4.7 arc seconds. The waxing crescent Moon passes six degrees south of Mars on March 11th. The Red Planet departs Aries and enters Taurus in late March. Mars passes three degrees south of M45 (the Pleiades) on March 31st.

Jupiter increases in brightness from magnitude -2.0 to magnitude -2.2 and grows in apparent size by 3.5 arc seconds to 39.7 arc seconds this month. It rises about 2:00 a.m. EST on March 1st. The waning gibbous Moon passes two degrees north of the planet on March 27th. Double Galilean shadow transits take place on March 18th and March 25th. Data on these and other Galilean satellite events is available online at <http://www.shallowsky.com/jupiter/> and <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> and on page 51 of the March 2019 issue of Sky & Telescope. Click on <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> or consult pages 50 and 51 of the March 2019 issue of Sky & Telescope to determine transit times of the central meridian by the Great Red Spot. Additional information on Jupiter can be found at <https://curtrenz.com/jupiter.html>

Saturn rises around 4:00 a.m. local time as the month begins. During March, Saturn's equatorial diameter measures 16 arc seconds. Its rings span 36 arc seconds and are inclined 24 degrees. Saturn is occulted by the Moon on March 1st and March 29th from certain parts of the world. Click on <https://curtrenz.com/saturn.html> for a wealth of information on Saturn. For information on the major satellites of Saturn, browse <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/>

Uranus is positioned about 30 degrees above the western horizon as darkness falls. On March 1st, Uranus is located 2.1 degrees north-northeast of the fourth-magnitude star Omicron Piscium in southeastern Pisces. The similarly bright star SAO 92659 (magnitude +5.9) is situated 12 arc minutes to the north-northwest of the planet on that date. Uranus lies 27 arc minutes due east of SAO 92659 on March 13th. The Moon passes five degrees south of the seventh planet on the night of March 9th/March 10th. See <http://www.curtrenz.com/uranep.html> for additional information on Uranus. A finder chart for Uranus can be found at <http://www.nakedeyeplanets.com/uranus.htm>

Click on <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> for JavaScript utilities that will illustrate the positions of the five brightest satellites of Uranus.

Neptune is in conjunction with the Sun on March 7th and will not be visible again until late April.

Pluto is not a viable target this month.

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

Asteroids



Asteroid 3 Juno travels northeastward from eastern Taurus into western Orion this month. The main belt asteroid passes due south of the sixth-magnitude open cluster NGC 1662 on March 12th. On March 16th, it passes just 0.1 degree north of the fifth-magnitude star Pi Orionis. Asteroids brighter than magnitude +11.0 that are at opposition this month include 64 Angelina (magnitude +10.4) in Leo on March 2nd, 385 Ilmatar (magnitude +10.6) in Leo on March 17th, and 17 Thetis (magnitude +10.7) in Virgo on March 22nd. Consult http://britastro.org/computing/charts_asteroid.html for finder charts and <http://www.curtrenz.com/asteroids.html> to learn more about a select number of asteroids.

Carbon Star



Carbon star for March: T Cancri (Cancer) Right Ascension: 08h 56m 40.139s Declination: +19°50'56.930" (Epoch 2000)

Comets



The periodic comet 46P/Wirtanen glows faintly as it heads southeastward through Ursa Major into Leo Minor. Comet C/2018 Y1 (Iwamoto) fades as it travels southwestward through Auriga into Perseus during March. Visit <http://cometchasing.skyhound.com/> and <http://www.aerith.net/comet/future-n.html> for additional information on comets visible this month.

Meteors



The major meteor showers that will occur this year are discussed at <https://www.skyandtelescope.com/observing/howers-in-2019/>

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.skyandtelescope.com/ky-at-a-glance/>

The Deep Sky



Thirty binary and multiple stars for March: Struve 1173, Struve 1181, Struve 1187, Zeta Cancri, 24 Cancri, Phi-2 Cancri, Iota-1 Cancri, Struve 1245, Iota-2 Cancri, 66 Cancri, Struve 1327 (Cancer); Struve 1270, Epsilon Hydrae, 15 Hydrae, 17 Hydrae, Theta Hydrae, 27 Hydrae, Struve 1347, Struve 1357, Struve 1365 (Hydra); 3 Leonis, Struve 1360, 6 Leonis, Omicron Leonis (Leo); Struve 1274, Struve 1282, Struve 1333, 38 Lyncis, Struve 1369 (Lynx); h4046 (Puppis)

Notable carbon star for March: T Cancri (Cancer) RA: 08h 56m 40.139s Dec: +19°50'56.930" (Epoch 2000)

Thirty-five deep-sky objects for March: M44, M67, NGC 2775 (Cancer); Abell 33, M48, NGC 2610, NGC 2642, NGC 2811, NGC 2835, NGC 2855, NGC 2935, NGC 2992, NGC 3052, NGC 3078 (Hydra); NGC 2903, NGC 2916, NGC 2964, NGC 2968, NGC 3020 (Leo); NGC 2859, NGC 3003, NGC 3021 (Leo Minor); NGC 2683 (Lynx); NGC 2567, NGC 2571 (Puppis); M81, M82, NGC 2639, NGC 2654, NGC 2681, NGC 2685, NGC 2742, NGC 2768, NGC 2787, NGC 2841, NGC 2880, NGC 2950, NGC 2976, NGC 2985 (Ursa Major)

Top ten binocular deep-sky objects for March: M44, M48, M67, M81, M82, NGC 2571, NGC 2683, NGC 2841, NGC 2903, NGC 2976 | Top ten deep-sky objects for March: M44, M48, M67, M81, M82, NGC 2654, NGC 2683, NGC 2835, NGC 2841, NGC 2903

A wealth of current information on solar system celestial bodies is posted at <http://www.curtrenz.com/astronomy.html> and <http://nineplanets.org/> | Various events taking place within our solar system are discussed at <http://www.bluewaterastronomy.info/styled-4/index.html>

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

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

The famous eclipsing variable star Algol (Beta Persei) is at a minimum, decreasing in magnitude from 2.1 to 3.4, on March 2nd, 4th, 7th, 10th, 13th, 16th, 19th, 22nd, 24th, 27th, and 30th. <http://www.skyandtelescope.com/observing/interactive-sky-watching-tools/> for the times of the eclipses. Favorable dates for observing Algol at mid-eclipse from the eastern United States include March 1st (7:19 p.m. EDT or 0:19 UT March 2nd), March 19th (1:15 a.m. EDT or 5:15 UT), and March 21st (10:04 p.m. EDT or 2:04 UT March 22nd). For more on Algol, see <http://stars.astro.illinois.edu/sow/Algol.html> and <http://www.solstation.com/stars2/algol3.htm>

Data on current supernovae can be found at <http://www.rochesterastronomy.org/snimages/>

It is possible to observe all 109 (or 110) Messier objects during a single night around the time of the vernal equinox, if the Moon phase and local latitude are favorable. For information on running a so-called Messier Marathon, browse <http://messier.seds.org/xtra/marathon/marathon.html> and <http://www.richardbell.net/marathon.html>

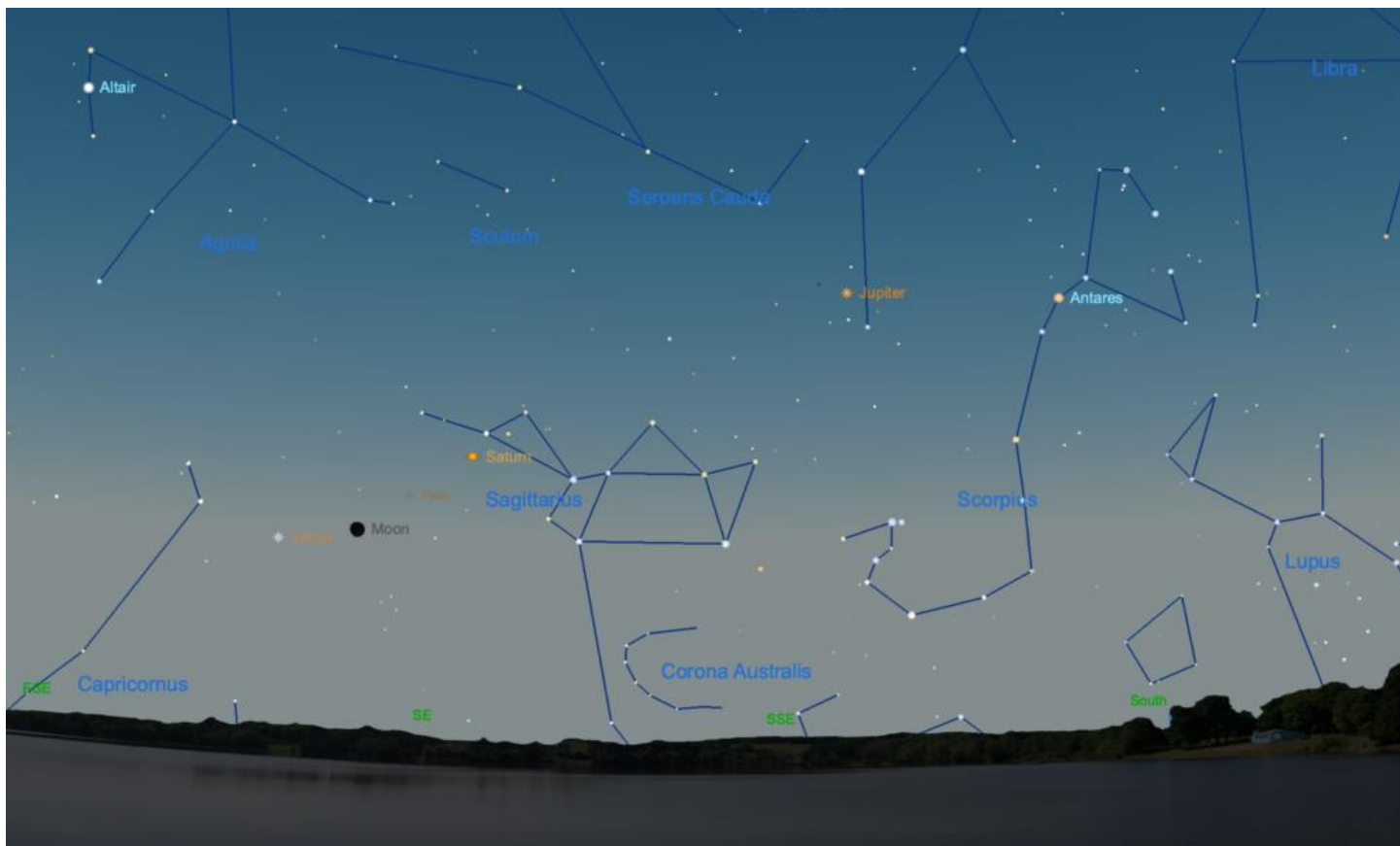
Information on observing some of the more prominent Messier galaxies is available at <http://www.cloudynights.com/topic/358295-how-to-locate-some-of-the-major-messier-galaxies-and-helpful-advice-for-novice-amateur-astronomers/>

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.org/features/turnleft/seasonal_skies_january-march.htm

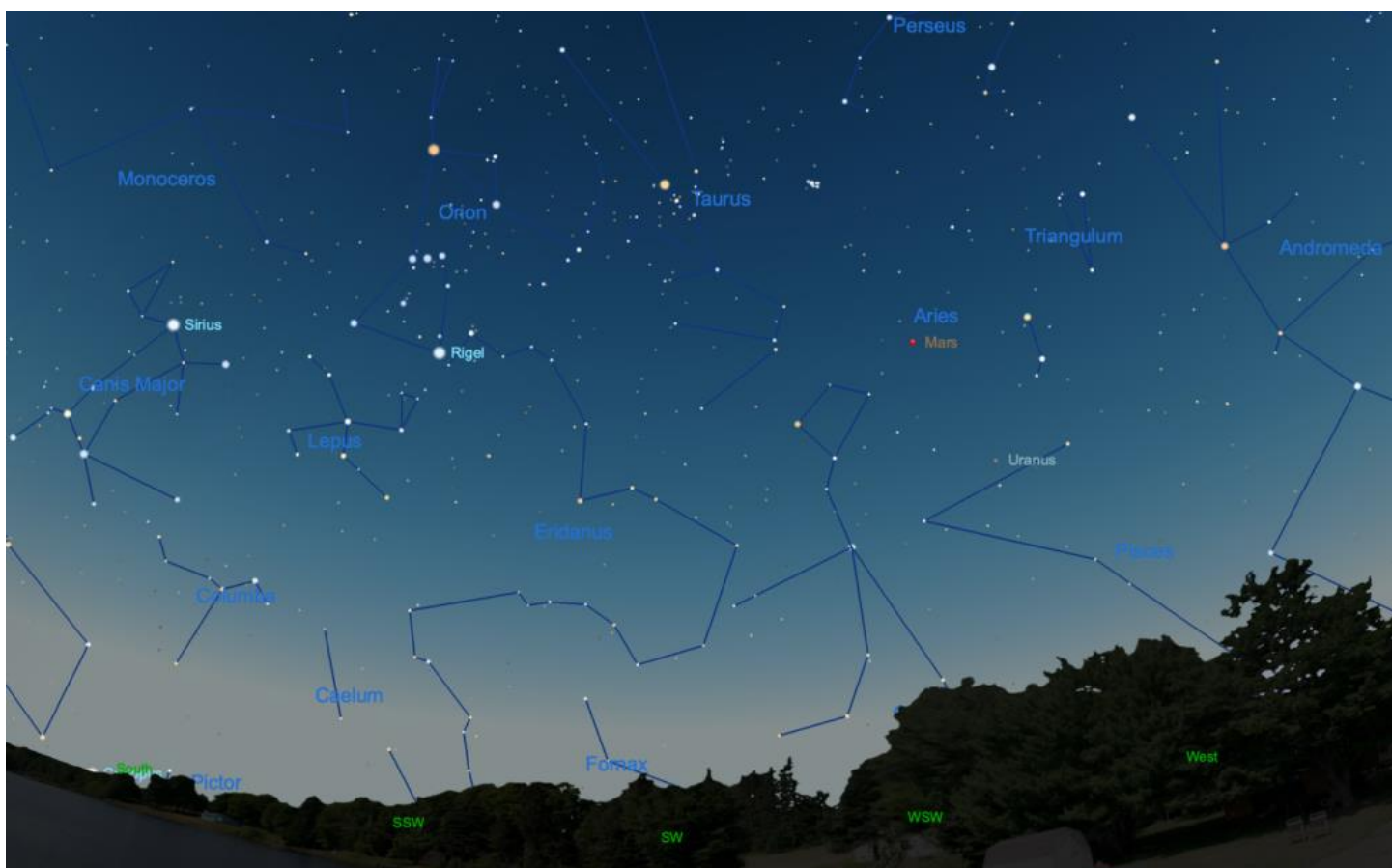
Telrad finder charts for the Messier Catalog and the SAC's 110 Best of the NGC are posted at http://www.astro-tom.com/messier/messier_finder_charts/map1.pdf and <http://www.saguaroastro.org/content/db/Book110BestNGC.pdf> respectively.

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

Free sky atlases can be downloaded at <http://www.deepskywatch.com/files/deepsky-atlas/Deep-Sky-Hunter-atlas-full.pdf> and <https://www.cloudynights.com/articles/cat/articles/observing-skills/free-mag-7-star-charts-r1021> and <https://allans-stuff.com/triatlas/>



A cascade of planets in the early-morning sky as seen in early March 2019.



Mars lies among the setting stars of northern winter in early March 2019.

Phil Harrington's Cosmic Challenge

Cosmic Challenge:

March 2019

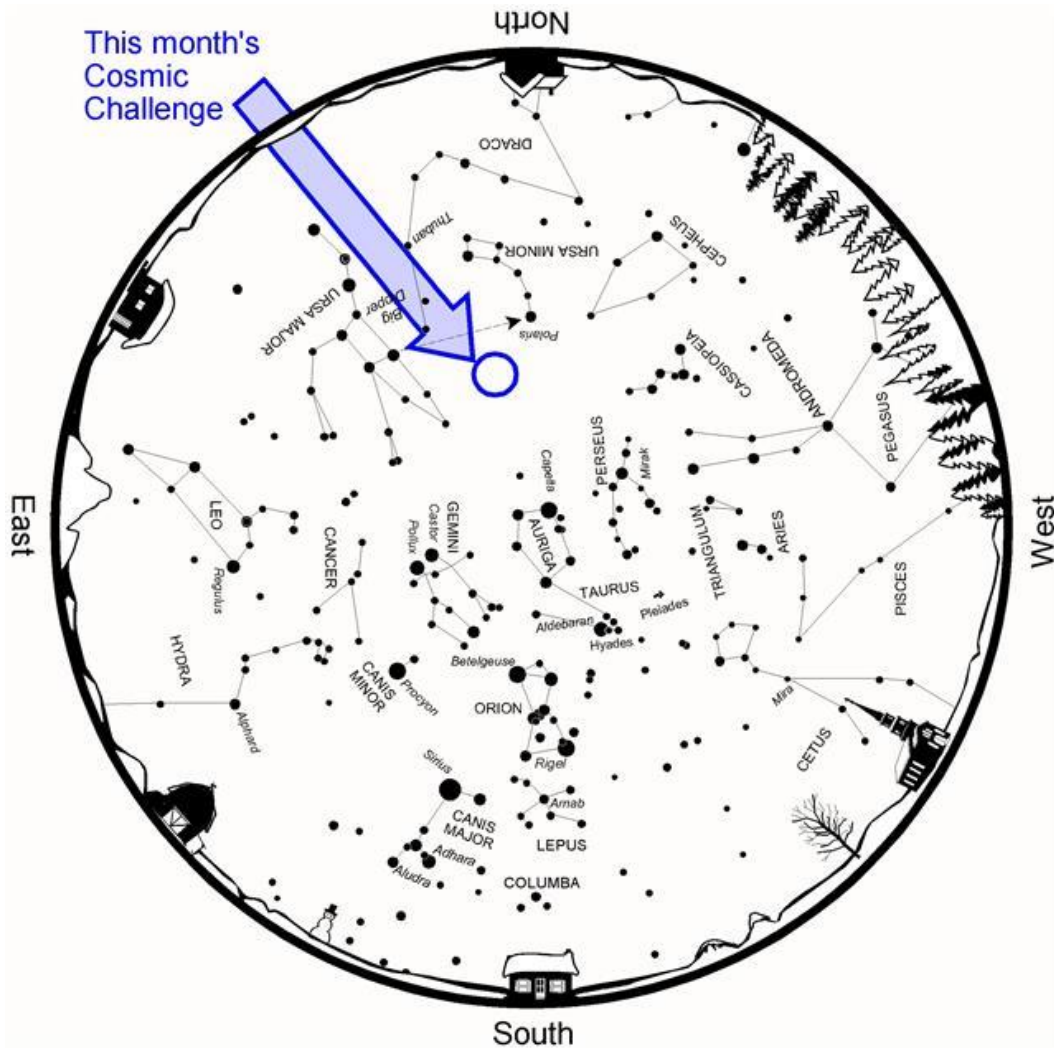
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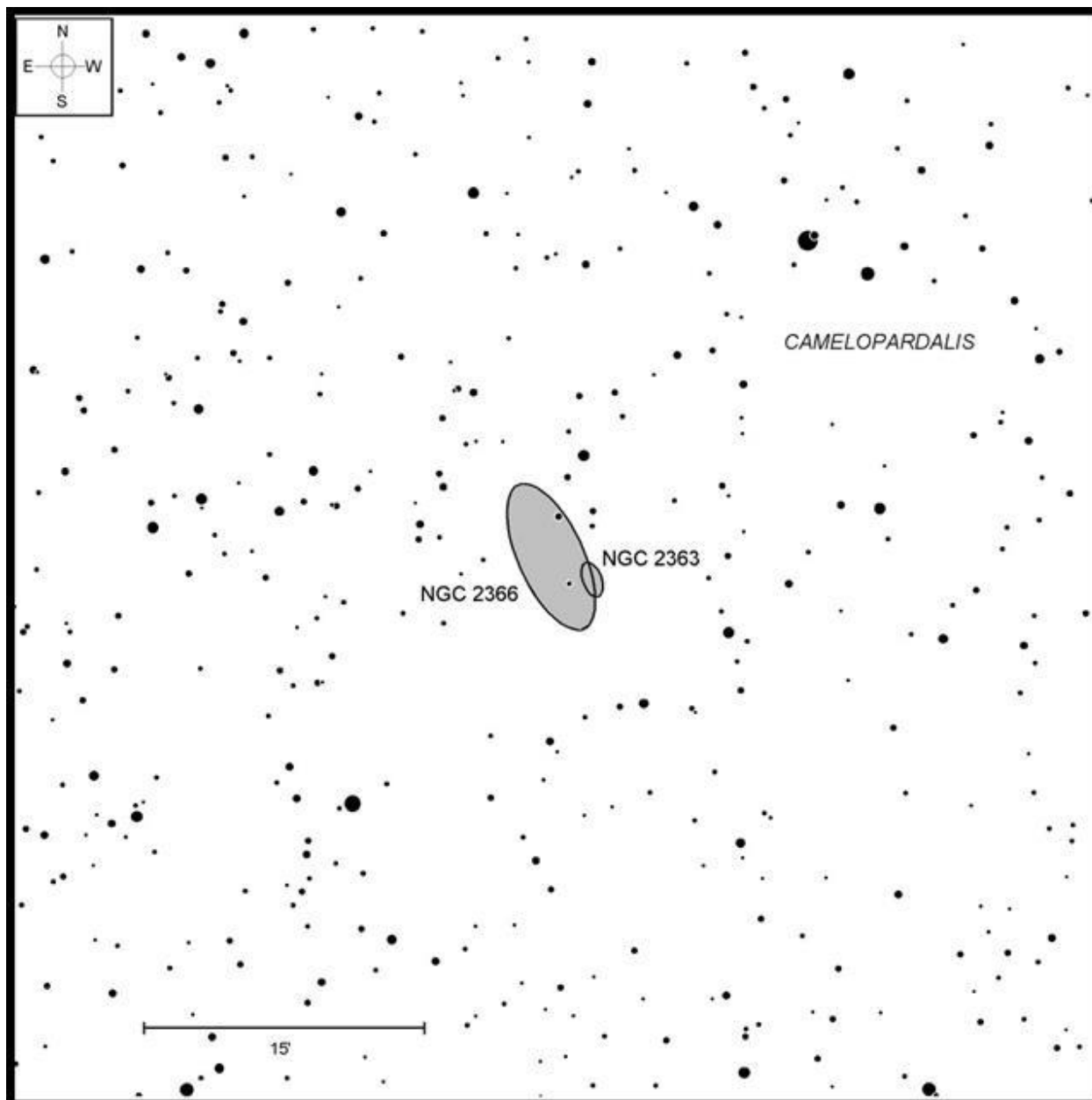
This month's suggested aperture range: 15-inch (38cm) and larger telescopes.

Target	Type	RA	DEC	Constellation	Magnitude	Size
NGC 2363	Galaxy	07 28.5	+69 11.6	Camelopardalis	13.0	1.8'x1.0'
NGC 2366	Galaxy	07 28.9	+69 12.7	Camelopardalis	11.5b	8.2'x3.3'

Will the real NGC 2363 please stand up? For years, there has been an ongoing debate over the true identity of the 2,363rd entry in the New General Catalog. Many references cite it as a huge area of ionized hydrogen (an H-II region) within NGC 2366, a dim irregular galaxy.



Above: Winter star map. Credit: Map adapted from [Star Watch](#) by Phil Harrington



Above: Finder chart for this month's [Cosmic Challenge](#). Credit: Chart adapted from [Cosmic Challenge](#) by Phil Harrington Click on the chart to open a printable PDF version in a new window

That was the explanation in the [press release](#) that accompanied a magnificent shot of the galaxy taken with the Hubble Space Telescope in 1996. In part, the release said, "Clusters of stars and a fishhook-shaped cloud of luminescent gases glow brilliantly in NGC 2363, a giant star-forming region in the galaxy NGC 2366." The press release went on to describe how the Hubble image revealed that the brightest individual star in the region is a rare example of an erupting Luminous Blue Variable. This star is thought to be between 30 and 60 times more massive than our Sun and is currently enduring a very unstable, eruptive phase of its life. The same Hubble image also shows two dense clusters of massive stars. The older cluster is about a tenth of the age as our solar system, while the other is probably less than half as old, judging by how much remnant gas and dust remains.

Recently, however, some historians have suggested that William Herschel, who is credited with discovering both NGC 2363 and NGC 2366, was describing the H-II region and the galaxy collectively when he recorded a circular patch of light with a dim protruding extension. According to Dr. Harold G. Corwin, Jr., the catalog number NGC 2366 refers to both the brighter H-II region as well as its faint home galaxy. He writes on his [web site](#), in part: *"Well, folks, it's bad news for those of us who have always identified NGC 2363 as the giant HII region in the low surface brightness irregular galaxy NGC 2366. WH's original description clearly refers to the HII region as the principal object with the bit of fuzz to the north as an incidental appendage. This view was further solidified by Ralph Copeland, observing with Lord Rosse's 72-inch reflector. Copeland identified the HII region as the center of a greatly extended object, stretching 9 or 10 arcmin to the northeast."*

If that's the case, then what is NGC 2363? Corwin's research points to an even fainter galaxy just to the southwest, which is identified as UGC 3847 in the Uppsala General Catalog of Galaxies. He contends that this second galaxy is actually NGC 2363. UGC 3847, also an irregular galaxy, shines at 13th magnitude.

Fortunately, these targets are not terribly difficult to pinpoint, as they lie 4° due north of the bright galaxy NGC 2403. To get there, begin at Omicron (o) Ursae Majoris, the 3rd-magnitude star marking the tip of the Great Bear's nose. Head 4° north to a triangular asterism created by Pi-1 (π -1), Pi-2 (π -2), and 2 Ursae Majoris, and then due west 5° to 51 Camelopardalis. NGC 2403 is just a degree west of the star and is always worth a stopover. Then, it's off to the north for 4° to a 6th-magnitude field star and our targets, which lay just a bit farther north still.

Whenever I've turned my 18-inch (46cm) reflector toward this area in the past, I could see the extragalactic H-II cloud directly using a 12-mm eyepiece (171x). I estimated it to be about 2 arc-minutes across, perhaps 12th magnitude, and with a fairly bright stellar core. Spotting the faint disk of its home galaxy, however, proved more difficult. I had to use averted vision to catch even a passing glimpse of its extended disk, which measures about $4' \times 2'$. Together, they reminded me of a faint comet, with the H-II region serving as the coma and the disk of the irregular galaxy forming a dim tail extending toward the north.

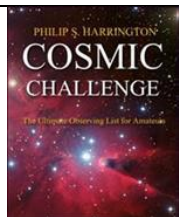


Above: NGC 2366 (and NGC 2363?) through the author's 18-inch (46cm) reflector at 171x

That same night, try as I might, I saw no sign of the second, smaller galaxy to the south of the hydrogen-II region. If the former is indeed NGC 2363, then it's a challenge that may only be met with the largest backyard telescopes.

Post your own observations and sketches in this article's discussion forum.

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.

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Space History

The Voyager Odyssey: a story in twelve parts Chapter 1: the Jupiter flyby by Loretta J Cannon

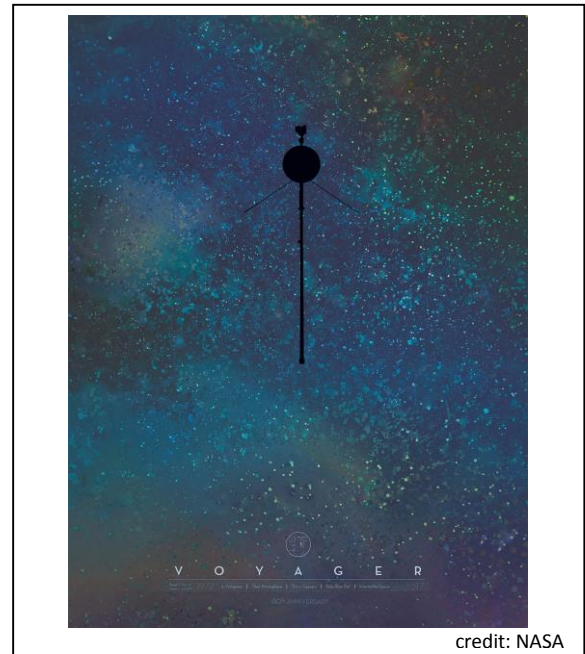
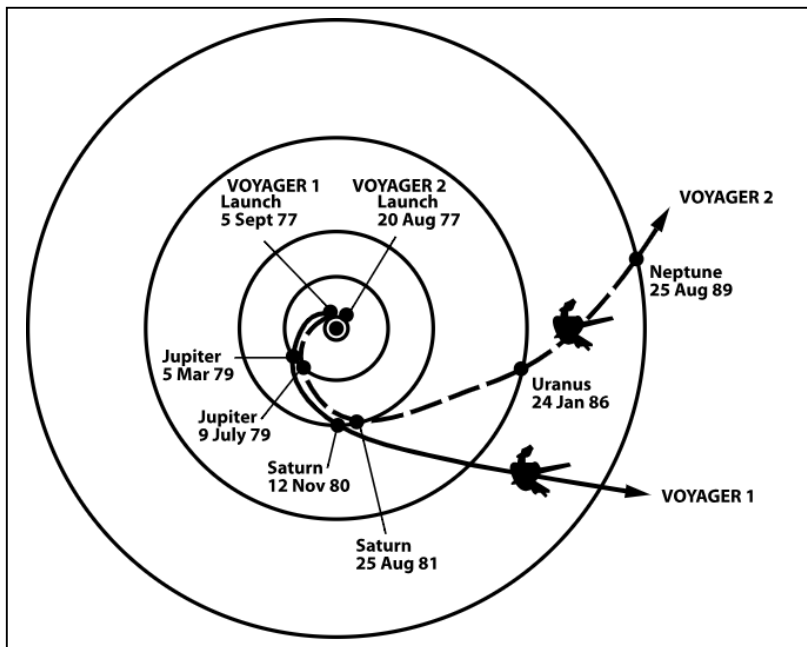
"Voyager to me was Homeric. It was years of passing across the solar system from one planet to the other. And then it was a week or two of frenzied activity and discovery and conquest, and then it was, well, back in the boats, oars in the water and then on to the next conquest."

- Carolyn C Porco, *Voyager* Imaging science: Quoted in documentary *The Farthest Voyager in Space* (2017)

Forty years ago this month, on March 5th, 1979, the Voyager 1 spacecraft made its closest approach to Jupiter, the first flyby on a tour of the four outer planets, definitively changing the course of human history and exponentially increasing our planetary science knowledge. Up until that moment, the project had involved planning, planning, planning, designing, designing, designing, construction, construction, launching, launching, and waiting. Then in March 1979 the science began. According to one investigator, Rich Terrile (Imaging science), "We called it drinking out of a firehose . . . you try to take a little sip and this torrent of data is coming out."

In the summer of 1965, a project called "The Outer Planets Grand Tour" was conceived. When approved in 1972 for only two planets, the mission became "Mariner Jupiter/Saturn 1977". By March 1977, five months before launch, it was renamed *Voyager*. The initial idea for this mission was based on calculations which confirmed a rare (once every 176 years) alignment of the outer planets that would allow a feasible tour with four planetary flybys in only twelve years rather than thirty, well, planetary alignment plus a little thing known as gravity assist.

Any *Star Trek* fan can tell you how, in the episode "Tomorrow is Yesterday", the *Enterprise* is thrown back in time to the late 1960s, then encounters and accidentally destroys an Air Force jet while rescuing the pilot. Eventually, Spock devises a method of increasing the ship's speed to create another time warp to both return the pilot and get the *Enterprise* back to the future. And *how* did they do it? By slingshot-ing around the sun! Gravity assist, science-fiction-wise. This nifty sci-fi device later allowed fans to enjoy episodes like "Assignment: Earth" (the one with Gary 7) and that delightful TOS film *Star Trek IV: A Voyage Home* (the one with the whales). But this author digresses.



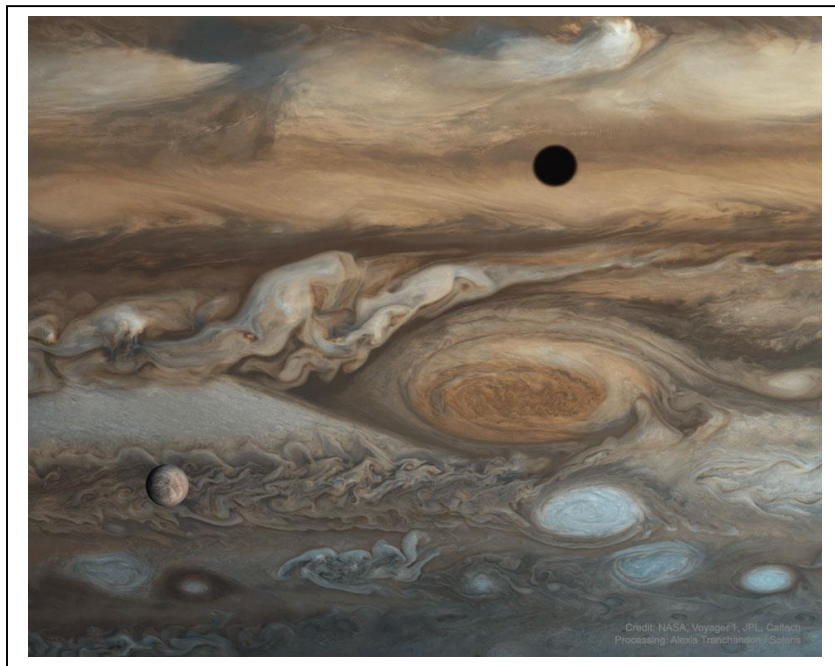
credit: NASA

Gravity assist in real life involves navigating a space-craft around a planet fairly close and picking up a bit of the planet's orbital speed while aiming for the next planet. Shown at left is a graphic [credit: NASA] of the trajectories of both Voyagers 1 and 2. *Voyager 1* visited Jupiter and Saturn. *Voyager 2* visited Jupiter, Saturn, Uranus, and Neptune. Both spacecraft are now in interstellar space (more on this in a later chapter).

Before the *Voyager* mission, planetary scientists gathered data on the outer planets from Earth-based telescopes and some initial data from *Pioneers* 10 and 11. *Pioneer 10* flew by Jupiter on December 3, 1973, obtaining the first close-up photos while mapping both the planet's intense radiation belts and strong magnetic field; this information was crucial to the *Voyagers'* designers. *Pioneer 11* flew by Jupiter on December 2, 1974, making the first observations

of its immense polar regions. And yet, no one was quite prepared for what *Voyager* identified.

Five interesting features of Jupiter were seen or heard for the first time. Among these was the first 'observation' of lightning on a non-Earth planet. Heard as whistlers, one arc was reported to have flashed a distance of almost 1,200 miles. The Great Red Spot was seen up close as a huge anticyclonic vortex with a diameter larger than 3 earths and wind speeds approaching 400 mph (in a category 5 hurricane on Earth, wind speed reaches 150 mph). While the two outer moons, Ganymede and Callisto, had the expected plethora of impact craters, the two inner moons proved interesting. Europa was discovered to be a smooth ball of ice with cracks in it, covering what was believed to be an enormous ocean, more water than is on the entire Earth, possibly the largest ocean in our solar system. And then there's Io. Mission navigator Linda Morabito's job was to identify and confirm the position and orbit of the spacecraft. On one of her images of Io, she identified "an enormous object", large enough that it should have been seen previously with Earth-based telescopes . . . but hadn't been. The umbrella-shaped plume she recorded rose over 150 miles above the surface of Io. "I found the very first evidence of active volcanism on a world beyond Earth" [quoted in documentary *The Farthest Voyager in Space* (2017)]. Lastly, what was initially assumed to be a problem with an image became the first documented evidence of Jupiter's ring, something never seen from Earth.



The photo shown here [credit: NASA] depicts the moons Europa and Io against a backdrop of Jupiter's surface featuring the Great Red Spot. Europa is in the lower left corner; Io is the shadow seen in the upper right.

As *Voyager 1* left Jupiter, it gained almost 36,000 mph from gravity assist, sending it on its way to a meeting with Saturn on November 12, 1980. *Voyager 2* reached Jupiter on July 9, 1979, adding its observations to our wealth of knowledge about this enigmatic and enormous gas giant which dominates our little corner of the local galaxy.

There are research scientists today whose work builds on the foundations laid by the *Voyager* planetary mission. In February, the guest scientist for Boise State University's First Friday Astronomy Event was Dr. Samuel Howell, with JPL, who is currently a member of the Europa Clipper Science Team. His website (<http://planetarytectonics.com/>) describes his

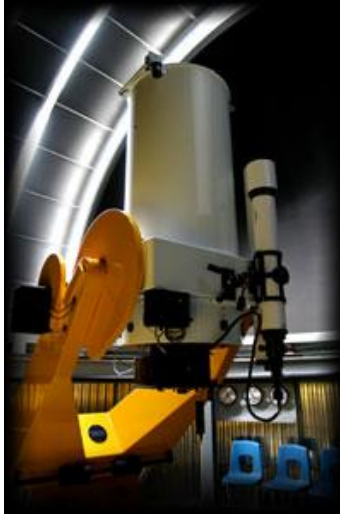
research, including a 2019 publication "Can Earth-like plate tectonics occur in ocean world ice shells?" in the journal *Icarus*, a study that investigates if cycles of "buoyantly-driven plate tectonics is possible on worlds with oceans hidden away by thick ice shells. . .". Here's a link to his article <https://www.sciencedirect.com/science/article/abs/pii/S001910351830407X>).

Next month's chapter will explore the beginnings of the *Voyager* mission. In the meantime, according to the website <https://earthsky.org> , one can view Jupiter in March as follows:

"The king planet reigns at the top of the morning lineup of three bright planets. Jupiter sits at the peak, Saturn in between, and Venus at the bottom. This procession of morning planets finds Jupiter rising first, in the wee hours after midnight, followed by Saturn a few hours later, and then Venus before daybreak. If you're up during the predawn hours, you might notice a bright ruddy star in the vicinity of Jupiter on the sky's dome. That's Antares, the brightest star in the constellation Scorpius the Scorpion. Although Jupiter shines in the vicinity of Antares all year long, Jupiter can be seen to wander relative to this "fixed" star of the zodiac. Watch for the waning crescent moon to swing by Jupiter on March 26 and 27. From mid-northern latitudes, Jupiter rises about 2 hours after midnight. By the month's end, Jupiter will rise around the midnight hour."

About the Author: Loretta J Cannon is a 3rd generation Idahoan. She earned both of her Bachelor degrees from Boise State University and her Masters from Arizona State University. After almost 20 years working for local banks, non-profits and the Federal government, she is somewhat retired and devotes her time to science writing & editing and real estate. She can be reached at LorettaJCannon@gmail.com. The article is copyright 2019 by Loretta J Cannon, excepting the referenced material; any errors are solely the author's.

Observatories and Planetarium



CSI Centennial Observatory / Faulkner Planetarium Herrett Center

Event	Place	Date	Time	Admission
Monthly Free Star Party	Centennial Observatory	Saturday, March 9 th , 2019	7:30 PM to midnight	FREE
"Earth Hour" Telescope Viewing	Centennial Observatory	Saturday, March 30 th , 2019	8:30 to 9:30 PM	FREE

College of Southern Idaho Campus Twin Falls, ID

Faulkner Planetarium / Show Times

<http://herrett.csi.edu/astronomy/planetarium/showtimes.asp>



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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.