Snake River Skies

The Newsletter of the Magic Valley Astronomical Society

www.mvastro.org

Membership Meeting

Saturday, April 13th 2019
7:00pm at the
Herrett Center for Arts & Science
College of Southern Idaho.

Public Star Party follows at the Centennial Observatory

Club Officers

Robert Mayer, President
mayerrbrt@gmail.com

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

April 2019

Colleagues,

As you read this, I hope you are in the midst of preparing for the annual attempt at the Messier Marathon. This year, we'll try for Friday, April 5th, at the Jerome Gun Club, with the next day as a back-up. We don't expect this to be a full marathon, as moon phases have shoved the viewing date out past the prime window for a marathon, but it's still a great opportunity to get together and have fun. Again, if you are in need of a scope, contact me and I'll bring one down for you. If you don't want to have a scope, we'd still love to have you there!

Later in the month, it would be a great idea to become a morning astronomer. On April 10th, Neptune will be just to the right of Venus, while April 23rd will watch the moon and Jupiter come within two degrees of each other. That should make up for the moon wash out the Lyrids this month.

This month's regular meeting will be the following week, Saturday, April 13th. Dr. Candice Wright will give us a presentation on "The General Theory of Relativity and Its Many Experimental Successes." This should offer us a great opportunity to get a better grasp on one of the fundamental theories of our field.

So, as the weather warms up, get out there if you can, and in any case, come and join us!

Clear Views,

Rob Mayer

Calendar

April 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 April Fool's Day 	2	3	4	5 New Moon Lunation 1190 1% Visible ↓ Age: 29.38 Days 	6
7	8	9	10	11	12 First Quarter 51% Visible ↑ Age: 7.45 Days 	13 MVAS Meeting at 7:00pm at the Herrett Center Public Star Party Centennial Obs. 7:30 - Midnight
14	15	16	17	18	19 Full Moon 100% Visible Age: 15.27 Days Worm Moon 	20
21 Easter 	22 Earth Day 	23	24	25	26 Last Quarter Visible 48% ↓ Age: 22.43 Days 	27
28	29	30				

Snake River Skies is the Newsletter of the Magic Valley Astronomical Society and is published electronically once a month.
 Full Moon names follow the traditional Algonquin First Nation history.

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

Astrophotography

Happy April: I was fortunate to catch the Mars-Pleiades conjunction Saturday night, despite their low position in the western sky. First checked it out with my 10x50 Binos to confirm their location.

Then pulled out a new toy acquired last Fall, an extremely lightweight tracker, the Star Adventurer. Attached a 180mm f/2.8 Nikkor lens to my D5300 Nikon and fired away. Imaged 26 light frames (used no darks, bias, or flat frames) Stacked in Deep Sky Stacker and enhanced in Photoshop. Each exposure only 8 seconds. Notice lack of nebulosity in M45 stars. Not for sure why, but length of exposure time and low position in atmosphere probably the culprit. Thanks for looking…..and prepare yourself for this weekend for the Messier Marathon, weather permitting. There are so many great things to observe and or image in the Winter-Spring sky….Beware, the Virgo Galaxies are coming!!!

Best and Clear Skies All, Gary Leavitt

April Celestial Calendar by Dave Mitsky

All times, unless otherwise noted, are UT (subtract six hours and, when appropriate, one calendar day for MDT).

4/1 The Moon is at apogee, subtending 29' 28" from a distance of 405,577 kilometers (252,014 miles), at 0:14; a double Galilean shadow transit (Europa's shadow precedes Ganymede's shadow) begins at 11:54
4/2 The Moon is 2.6 degrees south-southeast of Venus at 7:00; Mercury (magnitude +0.8) is 0.4 degree north of Neptune (magnitude +8.0) at 19:00; the Moon is 4 degrees south of Mercury at 23:00
4/3 The Moon, Mercury, and Neptune lie within a circle with a diameter 3.4 degrees at 1:00; the Moon is 3.1 degrees south-southeast of Neptune at 2:00; the Moon is 3.4 degrees south-southeast of Mercury at 2:00
4/5 New Moon (lunation 1191) occurs at 8:50; asteroid 7 Iris (magnitude +9.4) is at opposition at 9:00
4/6 The Moon is 4.5 degrees south-southeast of Uranus at 17:00
4/8 The dwarf planet/asteroid 1 Ceres is stationary at 21:00; the Moon is 8.0 degrees south-southeast of the bright open cluster M45 (the Pleiades or Subaru) in Taurus at 23:00
4/9 The Moon is 4.6 degrees south-southeast of Mars at 10:00; the Moon is 2.1 degrees north of the first-magnitude star Aldebaran (Alpha Tauri), at 16:00
4/10 Asteroid 2 Pallas (magnitude +7.9) is at opposition at 1:00; Mercury, Venus, and Neptune lie within a circle with a diameter of 5.2 degrees at 5:00; Venus (magnitude -3.9) is 0.3 degree south-southeast of Neptune (magnitude +8.0)
4/11 Mercury is at greatest western elongation (28.0 degrees) at 20:00
4/12 The Lunar X (also known as the Werner or Purbach Cross), an X-shaped clair-obscure illumination effect involving various rims and ridges between the craters La Caille, Blanchinus, and Purbach, is predicted to be fully formed at 4:10; the Moon at ascending node (longitude 112.0 degrees) at 18:00; First Quarter Moon occurs at 19:06; the Moon is 6.6 degrees south of first-magnitude star Pollux (Beta Geminorum) at 22:00
4/13 The Moon lies within the bright open cluster M44 (the Beehive Cluster or Praesepe) in Cancer at 21:00
4/14 Mars is 6.5 degrees north of Aldebaran at 1:00; the Moon is 2.6 degrees north-northeast of the first-magnitude star Regulus (Alpha Leonis) at 10:00; the equation of time equals 0 at 22:00
4/16 Mercury (magnitude +0.2) is 4.3 degrees east of Venus (magnitude -3.9) at 20:00; the Moon is at perigee, subtending 32' 49" from a distance of 364,205 kilometers (226,306 miles), at 22:05
4/18 Venus is at aphelion (0.7282 a.u. from the Sun) at 2:00
4/19 The Moon is 7.1 degrees north-northeast of the first-magnitude star Spica (Alpha Virginis), at 3:00; the Sun enters Aries (longitude 29.1 degrees on the ecliptic) at 11:00; Full Moon, known as the Egg or Grass Moon, occurs at 11:12
4/20 The Sun is at longitude 30 degrees at 9:00
4/21 The Moon is 7.9 degrees north-northeast of the first-magnitude star Antares (Alpha Scorpii) at 11:00
4/22 Uranus is in conjunction with the Sun at 23:00
4/23 The peak of the Lyrid meteor shower (20 per hour) is predicted to occur at 0:00; the Moon is 1.6 degrees north of Jupiter at 12:00
4/25 The Moon is 0.4 degree south of Saturn, with an occultation taking place in western South America, New Zealand, and eastern Australia, at 14:00; the Moon is at the descending node (longitude 290.7 degrees) at 15:00; the Moon is 0.1 degree north of Pluto, with an occultation taking place in northwestern Polynesia, southeastern Micronesia, Melanesia, Australia, Indonesia, and Sri Lanka, at 20:00
4/26 Last Quarter Moon occurs at 22:18
4/28 The Curtiss Cross, an X-shaped clair-obscure illumination effect located between the craters Parry and Gambart, is predicted to be visible at 7:57; the Moon is at apogee, subtending 29' 32" from a distance of 404,582 kilometers (251,396 miles), at 18:20
4/30 Mercury is at its greatest heliocentric latitude south today; Saturn is stationary, with retrograde (westward) motion to begin, at 2:00; the Moon is 3.3 degrees south-southeast of Neptune at 11:00

Christiaan Huygens (1629-1695) was born this month.

Charles Messier discovered the open cluster M50 in Monoceros on April 5, 1772. Charles Messier discovered the spiral galaxy M58 in Virgo on April 15, 1772. Johann Koehler discovered the elliptical galaxies M59 and M60 in Virgo on April 11, 1779. Caroline Herschel discovered C/1790 H1 (Herschel) on April 18, 1790. The first photograph of the Sun was taken on April 2, 1845. The first radar signal was bounced off of the Sun on April 7, 1959. The Hubble Space Telescope was placed in orbit on April 25, 1990. The Compton Gamma Ray Observatory achieved orbit on April 7, 1991.

The Sun, the Moon, & the Planets

The Moon is 25.2 days old, is illuminated 17.9%, subtends 29.0', and is located in Capricornus at 0:00 UT on April 1st. The Moon is at its greatest northern declination of +22.0 degrees on April 12th and its greatest southern declination of -22.1 degrees on April 25th. Longitudinal libration is at a maximum of +6.1 degrees on April 23rd and a minimum of -5.7 degrees on April 10th. Latitudinal libration is at a maximum of +6.6 degrees on April 6th and a minimum of -6.5 degrees on April 19th. The Moon is at apogee on April 1st (at a distance 63.59 Earth-radii) and April 28th (at a distance 63.43 Earth-radii) and at perigee on April 16th (at a distance of 57.10 Earth-radii). New Moon occurs on April 5th. The waning gibbous Moon occults Saturn and Pluto on April 25th from certain parts of the world. Consult http://www.lunar-occ...ota/iotandx.htm for information on occultation events. Visit http://saberdoesthes...does-the-stars/ for tips on spotting extreme crescent Moons. Click on http://www.calendar-...ndar/2019/april for an April lunar calendar. Times and dates for the lunar 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, and location data for the planets and Pluto on April 1: Mercury (0.8, 9.4", 29% illuminated, 0.72 a.u., Aquarius), Venus (-3.9, 13.1", 81% illuminated, 1.27 a.u., Aquarius), Mars (+1.4. magnitude, 4.6", 94% illuminated, 2.02 a.u., Taurus), Jupiter (-2.2 magnitude, 39.8", 99% illuminated, 4.95 a.u., Ophiuchus), Saturn (+0.6 magnitude, 16.4", 100% illuminated, 10.16 a.u., Sagittarius), Uranus (+5.9 magnitude, 3.4", 100% illuminated, 20.85 a.u. on April 16th, Aries), Neptune (+7.9 magnitude, 2.2", 100% illuminated, 30.72 a.u. on April 16th, Aquarius), and Pluto (+14.3 magnitude, 0.1", 100% illuminated, 33.72 a.u. on April 16th, Sagittarius). Mars and Uranus are located in the west in the evening. Mercury, Venus, and Neptune can be found in the east, Saturn in the southeast, and Jupiter in the south in the morning sky.

Mercury has a close conjunction with Neptune on April 2nd. The speediest planet reaches aphelion on April 10th and is at greatest western elongation on April 11th. Mercury and Venus are approximately ten degrees apart on April 1st but that distance decreases fairly rapidly. The two planets are in quasi-conjunction, a pairing with a separation of less than five degrees, on April 16th. This will be the first quasi-conjunction of Mercury and Venus in nearly three years.

On the first day of April, **Venus** rises at approximately 5:30 a.m. local daylight time. On April 2nd, the waning gibbous Moon passes three degrees to the south of the waxing gibbous Venus. Venus joins Mercury in a quasi-conjunction on April 16th.

As the month begins, **Mars** sets more than four hours after sunset. It fades from magnitude +1.4 to +1.6 and shrinks to just 4.2 arc seconds by the end of April. The Red Planet passes between the large open clusters Melotte 25 (the Hyades) and M45 (the Pleiades) during the first week of April. It lies three degrees south of M45 on April 1st. On April 8th, a waxing crescent Moon lies six degrees south of Mars and eight degrees west of Aldebaran. The Red Planet passes seven degrees north of Aldebaran on April 16th and crosses the sixth-magnitude open cluster NGC 1746 ten days later.

Jupiter increases in brightness from magnitude -2.2 to magnitude -2.4 and in apparent diameter from 39.8 to 43.4 arc seconds during April. As the month begins, Jupiter rises just before 1:30 a.m. local daylight time. On April 10th, Jupiter reaches its first stationary point. Four months of retrograde or western motion will follow. A waning gibbous Moon passes within two degrees of Jupiter on the morning of April 23rd. The Galilean satellite Io undergoes shadow transits starting at 7:25 UT on April 2nd, 9:19 UT on April 9th, 5:41 UT on April 18th, and 7:34 UT on April 25th. On April 26th, Europa's shadow first falls on Jupiter at 7:33 UT. Ganymede emerges from eclipse 22 arc minutes west-southwest of Jupiter's limb and 26 arc minutes south of Europa beginning at 8:02 UT on April 12th. Since Jupiter is currently inclined three degrees with respect to the Earth, Callisto, the most distant of the Galilean satellites, does not appear to cross the planet's disk. It is near Jupiter's South Pole on April 6th and near its north pole at dawn on April 14th. Data on other Galilean satellite events is available at http://www.skyandtel...watching-tools/ and page 51 of the April 2019 issue of Sky & Telescope. For information on transits of Jupiter's central meridian by the Great Red Spot, consult https://www.projectp...eve_grs.htm#apr or page 50 of the April 2019 issue of Sky & Telescope.

Saturn rises at approximately 3:00 a.m. local daylight time as April begins. The Ringed Planet rises by 1:15 a.m. local daylight time, brightens to magnitude +0.5, and subtends 17 arc seconds by the end of the month. At midmonth, its rings span 38 arc seconds and are tilted 24 degrees with respect to the Earth. Saturn is occulted by the Moon from some parts of the world on April 25th. The planet reaches its first stationary point and begins retrograde motion on April 30th. Titan, Saturn's brightest satellite at eighth magnitude, passes 1.1 arc minute south of the planet on April 2nd and April 18th and 1.1 arc minute north of the planet on April 10th and April 26th. Iapetus is located 1.1 arc minutes south of Saturn and shines at eleventh magnitude on April 7th. By the time this odd moon, which has a dark side and a bright side, reaches greatest elongation nine arc minutes from Saturn on April 28th, it brightens to tenth magnitude. Browse http://www.skyandtel...watching-tools/ for information on Saturn's satellites.

Uranus is in conjunction with the Sun on April 22nd and consequently is not visible after the first few days of this month.

Eighth-magnitude **Neptune** is very low in the east at dawn. Venus passes 0.3 degree south of the distant planet on the morning of April 10th. The two planets are only seven degrees in altitude 30 minutes before sunrise. The fourth-magnitude star Phi Aquarii is positioned just five arc minutes south of Neptune on that date.

The dwarf planet **Pluto** is fairly high in the sky in northwestern Sagittarius during morning twilight.

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

Asteroids

As it heads northwestward through Boötes this month, the main belt asteroid **2 Pallas** shines at eighth magnitude. The second asteroid to be discovered reaches opposition for North American observers on the night of April 9th. On April 10th, 2 Pallas passes just two arc minutes east of the third-magnitude star Muphrid (Eta Boötis) and approximately five degrees southwest of the first-magnitude star Arcturus (Alpha Boötis). A finder chart can be found on page 48 of the April 2019 issue of Sky & Telescope. Asteroid 7 Iris is visible as a ninth-magnitude object as it travels northwestward through northeastern Corvus. This main belt asteroid, which is less than half the size of 2 Pallas, reaches opposition on April 5th. A finder chart appears on page 50 of the April 2019 issue of Sky & Telescope. Other asteroids brighter than magnitude +11.0 reaching opposition this month include 405 Thia (magnitude +10.5) on April 20th in Hydra and 44 Nysa (magnitude +9.9) on April 25th in Virgo. Click on http://www.asteroido.../2019_04_si.htm for information on asteroid occultations taking place this month. See https://www.curtrenz.../asteroids.html for additional current information on a number of asteroids.

Carbon Star

Notable **carbon star** for April: V Hydrae (Hydra) Right Ascension: $10^{h}\ 51^{m}\ 37.25661^{s}$ Declination: −21° 15′ 00.3245″

Comets

Comet C/2018 Y1 (Iwamoto), at tenth magnitude and fading fast, is the brightest comet visible this month. It can be found in eastern Perseus. Visit http://cometchasing.skyhound.com/ and http://www.aerith.ne...ly/current.html for information on this month's comets.

Meteors

The **Lyrid** meteor shower peaks on the night of April 22nd/April 23rd. A typical zenithal hourly rate is about 20 meteors per hour but short outbursts have occurred occasionally. The radiant lies between the Keystone of Hercules and Lyra. Unfortunately, a bright waning gibbous Moon will compromise the Lyrids this year, reducing counts to perhaps five per hour. For more on this year's Lyrids, see https://earthsky.org/?p=4478 and https://www.skyandte...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.skyandtel...ky-at-a-glance/

The Deep Sky

Seventy-five binary and multiple stars for April: h4481 (Corvus); Aitken 1774, Gamma Crateris, Jacob 16, Struve 3072, h4456, Burnham 1078 (Crater); h4311, Burnham 219, N Hydrae, h4455, h4465 (Hydra); 31 Leonis, Alpha Leonis (Regulus), h2520, Struve 1417, 39 Leonis, Struve 1421, Gamma Leonis (Algieba), Otto Struve 216, 45 Leonis, Struve 1442, Struve 1447, 49 Leonis, Struve 1482, 54 Leonis, Struve 1506, Chi Leonis, 65 Leonis, Struve 1521, Struve 1527, Struve 1529, Iota Leonis, 81 Leonis, 83 Leonis, Tau Leonis, 88 Leonis, 90 Leonis, Struve 1565, Struve 1566, 93 Leonis, h1201, S Leonis (Leo); h2517, Struve 1405, Struve 1432, 33 Leo Minoris, Struve 1459, 40 Leo Minoris, Struve 1492 (Leo Minor); Struve 1401, Struve 1441, Struve 1456, Struve 1464, 35 Sextantis, 40 Sextantis, 41 Sextantis (Sextans); Struve 1402, Struve 1415, Struve 1427, Struve 1462, Struve 1486, Struve 1495, Struve 1510, Struve 1520, Xi Ursae Majoris, Nu Ursae Majoris, Struve 1541, 57 Ursae Majoris, Struve 1544, Struve 1553, Struve 1561, Struve 1563, 65 Ursae Majoris, Otto Struve 241 (Ursa Major)

One hundred deep-sky objects for April: NGC 4024, NGC 4027 (Corvus); NGC 3511, NGC 3513, NGC 3672, NGC 3887, NGC 3892, NGC 3955, NGC 3962, NGC 3981 (Crater); NGC 3091, NGC 3109, NGC 3145, NGC 3203, NGC 3242, NGC 3309, NGC 3585, NGC 3621, NGC 3717, NGC 3904, NGC 3936 (Hydra); M65, M66, M95, M96, M105, NGC 3098, NGC 3162, NGC 3177, NGC 3185, NGC 3190, NGC 3226, NGC 3227, NGC 3300, NGC 3346, NGC 3367, NGC 3377, NGC 3384, NGC 3389, NGC 3412, NGC 3437, NGC 3489, NGC 3495, NGC 3507, NGC 3521, NGC 3593, NGC 3607, NGC 3608, NGC 3626, NGC 3628, NGC 3630, NGC 3640, NGC 3646, NGC 3655, NGC 3681, NGC 3684, NGC 3686, NGC 3691, NGC 3810, NGC 3842, NGC 3872, NGC 3900, NGC 4008 (Leo); NGC 3245, NGC 3254, NGC 3277, NGC 3294, NGC 3344, NGC 3414, NGC 3432, NGC 3486, NGC 3504 (Leo Minor); NGC 2990, NGC 3044, NGC 3055, NGC 3115, NGC 3156, NGC 3166, NGC 3169, NGC 3246, NGC 3423 (Sextans); IC 750, M97, M108, M109, NGC 3079, NGC 3184, NGC 3198, NGC 3310, NGC 3359, NGC 3610, NGC 3665, NGC 3675, NGC 3738, NGC 3877, NGC 3898, NGC 3941, NGC 3953, NGC 3998, NGC 4026 (Ursa Major)

Top ten deep-sky objects for April: M65, M66, M95, M96, M97, M105, M108, NGC 3115, NGC 3242, NGC 3628

Top ten binocular deep-sky objects for April: M65, M66, M95, M96, M97, M105, M108, M109, NGC 3115, NGC 3242

Challenge deep-sky object for April: Leo I Right ascension: $10^{h}\ 08^{m}\ 27.4^{s}$ / Declination: +12° 18′ 27″

The objects listed above are located between 10:00 and 12:00 hours of right ascension.

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 April 2nd, 5th, 8th, 11th, 14th, 16th, 19th, 22nd, 25th, and 28th. A favorable date for observing Algol at mid-eclipse from the eastern United States is on April 10th at 11:49 p.m. EDT or 3:49 UT on April 11th. Consult http://www.skyandtel...watching-tools/ for the times of the eclipses. For more on Algol, see http://stars.astro.i.../sow/Algol.html and http://www.solstatio...rs2/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

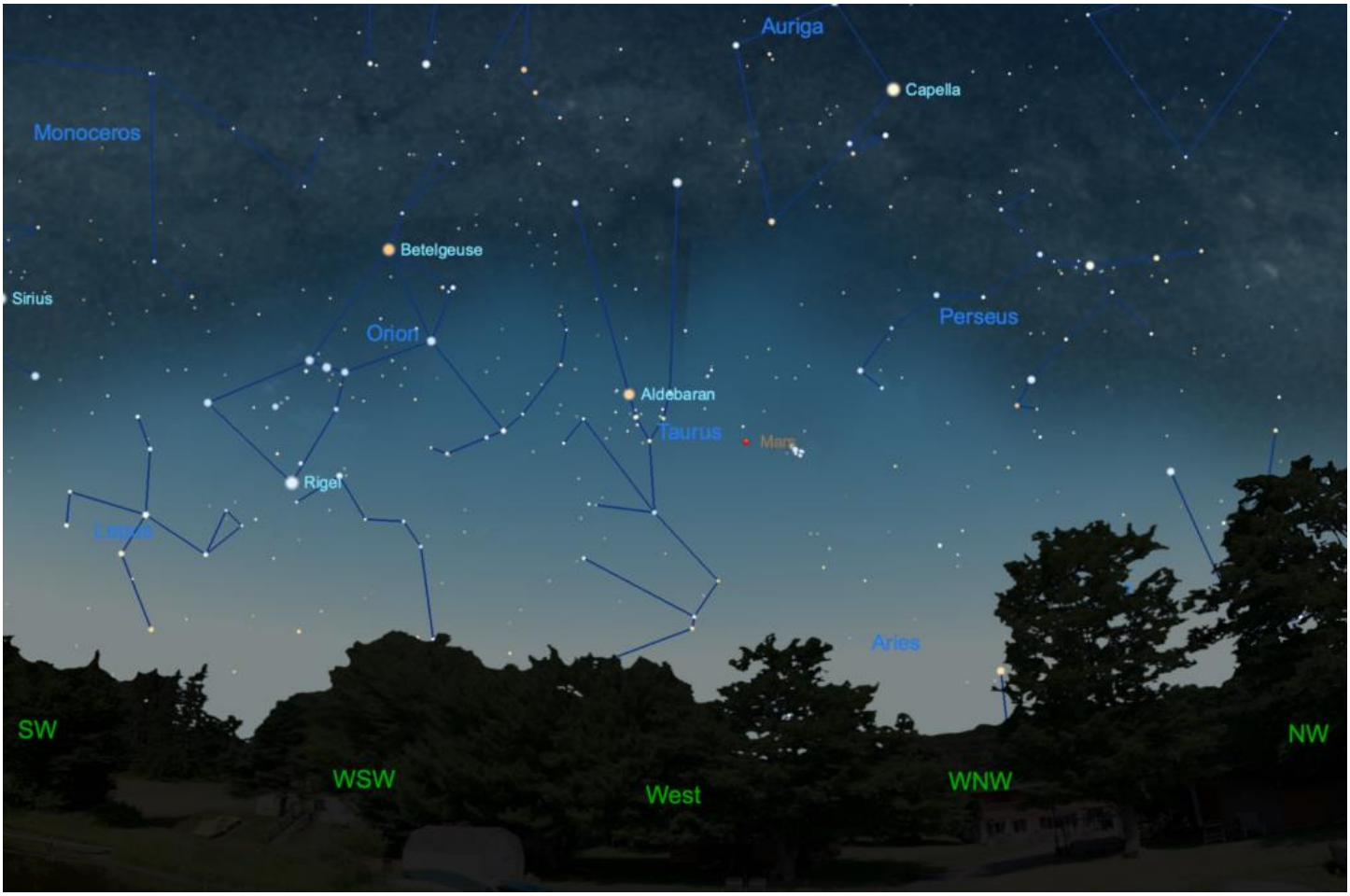
Information on observing some of the more prominent Messier galaxies is available at http://www.cloudynights.com/topic/358295-how-to-locate-some-of-the-major-messier-galaxies-and-helpful-advice-for-novice-amateur-astronomers/

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/



The planet Mars passes by the Pleiades star cluster and the stars of the constellation Taurus in early April 2019 in the western sky after sunset.

Phil Harrington's Cosmic Challenge

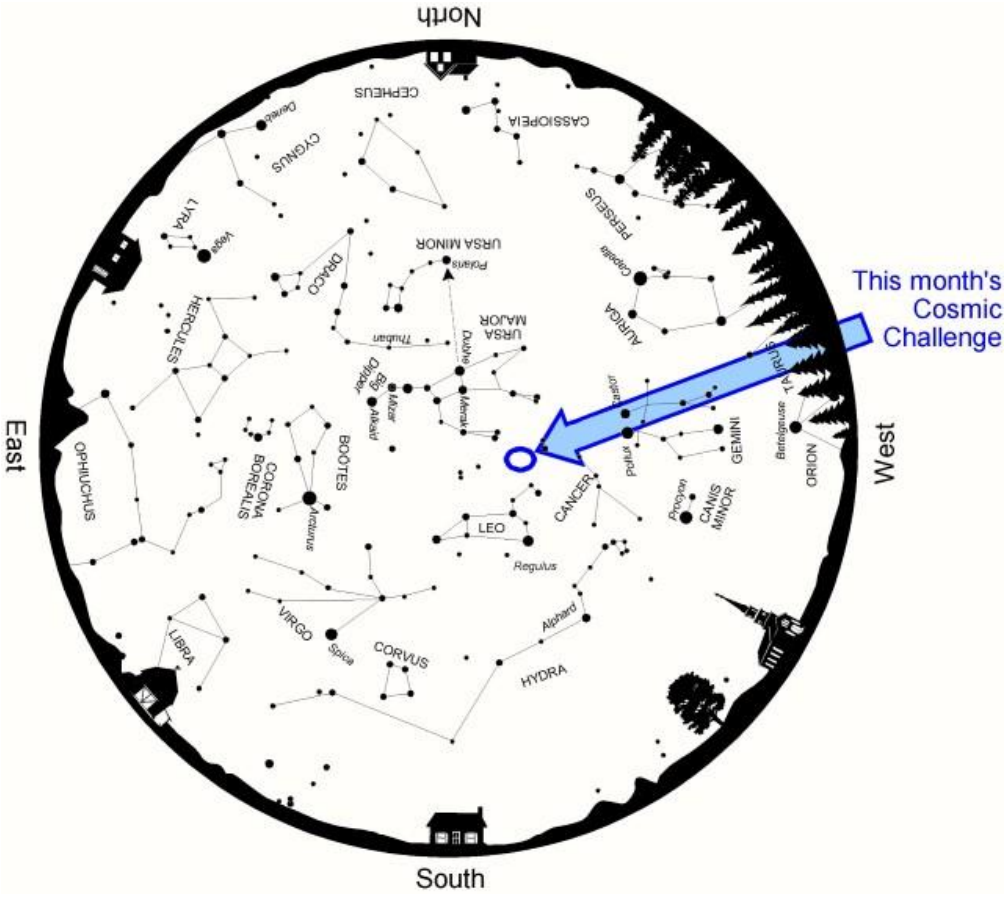
Cosmic Challenge: Leo III

April 2019

	10-inch (25cm) to 14-inch (36cm) telescopes

Target	Type	RA	DEC	Constellation	Magnitude	Size
Leo III	Galaxy	09h 59.4m	+30° 44.6	Leo	12.7	4.7' x 2.9'

A springtime rite of passage started here two years ago. It started in the April 2017 edition of this e-column, when I challenged readers to find the dwarf galaxy Leo I. Leo I is one of many dim dwarf galaxies gravitationally bound to the Milky Way. The fact that its surface brightness rates only 15th magnitude, coupled with its position just 20' north of Regulus makes Leo I a tough challenge to land.



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

Many people successfully met the challenge, however, as evidenced by all the comments left. Most amazing of all was CN member Sasa, who reported "I was able to glimpse this galaxy in a 4-inch (10cm) refractor [Sky-Watcher ED100]." And I thought I was good spotting it through my 18-inch (46cm) Dob!

Then last April, I threw down the gauntlet and challenged you to find Leo II. Leo II is another dwarf spheroidal galaxy within Leo. Most feel it's even more difficult than Leo I. After several failed attempts, I finally captured Leo II a few summers ago through my 18 inch (46cm). In last year's article, I wrote "At 171x, it appeared as a very faint, oval disk extending perhaps 6'x4', or about half of its full size in photographs."

Once again, many readers accepted the challenge, but only one posted a success story. CN'er SNH reported "I tried to see it and was successful in my 10-inch (25cm) SCT. Now I've seen Leo I, Leo II, and Leo III! Sweet."

Having set those wheels in motion, we are back this April to try for Leo III. While I categorized those first two as "Monster Scope" challenges, defined as requiring 15-inch (38cm) and larger apertures, I'm posting Leo III in the "Large Scope" category. Most who have spotted Leo III report it is easier to see than Leo II, and since SNH spotted it in a 10 inch (25cm), it makes sense to categorize it as such.

Leo I and Leo II were both discovered by astronomers Robert Harrington (no relation) and A.G. Wilson as they scanned a Palomar Sky Survey plate back in 1950. Based on that designation, wouldn't you expect that Leo III was found after the other two? I did, but I was wrong. Actually, Leo III was found in 1942 by Fritz Zwicky. The discovery was announced in his paper On the Large Scale Distribution of Matter in the Universe, which appeared in Physical Review, vol. 61, Issue 7-8, pp. 489-503.

It's likely that the sequence of discovery also led to Leo III's alter ego of Leo A. Others may prefer its catalog designations UGC 5364 or PGC 28868. For this article, however, I'll stick to referring to it as Leo III, if only to continue our tradition born two years ago.

Leo III is classified as a dwarf irregular galaxy. Like Leos I and II, it is a member of the Local Group. It lies 2.6 million light-years away, 100,000 light-years farther than M31.

Studies published in 2007 showed that Leo III has an estimated mass of 8.0 (± 2.7) × 107 solar masses. That study, Stellar Velocity Dispersion of the Leo A Dwarf Galaxy (The Astrophysical Journal. 666 (1): 231–235), went on to say that at least 80% of that mass consists of mysterious dark matter.

A second paper from 2007 also demonstrated how Leo III is unique among irregular galaxies. It's believed that most irregular galaxies are the offspring of galactic collisions, where intertwining gravity disrupts a galaxy's original structure. But Leo III is all alone. It shows no indications of any interaction or merger on a galactic scale for the past several billion years. In Leo A: A Late-blooming Survivor of the Epoch of Reionization in the Local Group (The Astrophysical Journal, Volume 659, Issue 1, pp. L17-L20), the authors stated that more than 90% of the stars in Leo III formed less than 8 billion years ago.

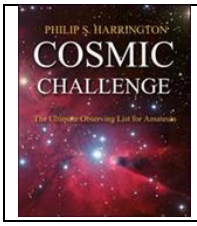
So, let's go hunting for Leo III. Not only is it isolated from other members of the Local Group, it's also isolated in the sky from any handy nearby stars. The closest naked-eye star, Rasalas [Mu (μ) Leonis], the star at the top of Leo's "Sickle," is the best launching point for starhoppers. Aim your finder its way, but then offset it to the southern edge of the field. After doing so, and depending on the size of your finder's field, you may notice that a 5th-magnitude star just crept into view along the northeastern edge. That's 20 Leo Minoris (LMi), 6.2° north-northeast of Rasalas. Leo III lies a little more than three-quarters of the way along an imaginary line running from Rasalas to 20 LMi. You'll know you're getting close when you see two close-set, orangish 8th-magnitude stars, SAO 61782 and SAO 61791. They are 12' apart from each, and form the base of an arrowhead-shaped pattern with Leo III, which lies at the tip. As a guide, look for an arc of 11th- to 14th-magnitude stars just beyond the galaxy's soft glow that collectively run parallel with Leo III's gentle curve.

To help you in your search, here are three images of Leo I, II, and III, posted in 2013 by the late CN member from the UK Nytecam (Maurice Gavin), who passed away last year. Maurice's images, on the left, were all taken through a 12-inch (30cm) Schmidt-Cassegrain, in his words "under typical LP [NELM ~3.5] skies," while those on the right are from the Sloan Digital Sky Survey. They illustrate the relative brightness of each compared to the others nicely.

When I spotted Leo III through my 18-inch (46cm) reflector some years ago, it struck me as a very faint, amorphous oval blur that softly faded into the surrounding sky. It left CN'er WeltevredenKaroo from South Africa with a different impression. In 2016, he posted that through his 8-inch (20cm) Maksutov-Newtonian, it looked like "a fuzzy thing… [that] holds steadily in averted [vision] in an obvious triangular shape, and is framed nicely by an L-shaped line of mag 8.5 to 10 stars."

And how about Leo IV? That one is FAR tougher than Leos I, I, or III. I've never been successful at ferreting that one out. Have you? If so, please send me your observations so I can feature them in the April 2020 challenge.

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

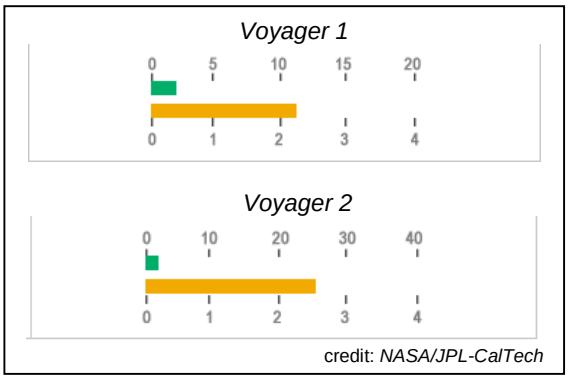


About the Author: Phil Harrington writes the monthly *Binocular Universe* column in Astronomy magazine and is the author of 9 books on astronomy. Visit his web site at www.philharrington.net to learn more.

The *Voyager* Odyssey
Chapter 2: Ringing of Interstellar Space
by Loretta J Cannon

"Every second, it goes to another place where we have never been before."
- Tom Spilker, Radio Science Team
quoted in documentary *The Farthest Voyager in Space* (2017)

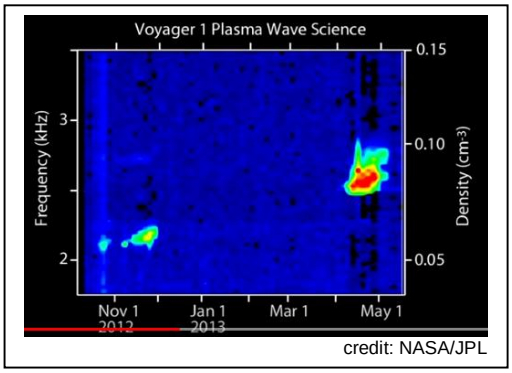
A mere six years ago this month, on April 9th, 2013, *Voyager 1* captured the *first ever* density measurement of the interstellar medium. This was possible thanks to a coronal mass ejection from our Sun that blooped out of the solar bubble, crossing the heliopause into interstellar space. The solar wind, charged particles emanating from our sun, inflates this bubble around our solar system and helps protect us from the interstellar wind (cosmic rays), charged particles emanating from interstellar objects. These charged particles are known as plasma, the density of which defines 'where' you are. Some eight months before the historic measurement, in August of 2012, NASA reported that *Voyager 1* had passed into the interstellar medium, based on cosmic ray data readings. Today, the *Voyager* spacecraft continue to communicate with Earth-based receivers, so NASA provides current *Voyager* mission data that can be found on this site: https://voyager.jpl.nasa.gov/mission/status. Shown at left is a static capture (made by this author using the Snipping tool) of the cosmic ray data at 11:55 pm MDT on March 30, 2019.



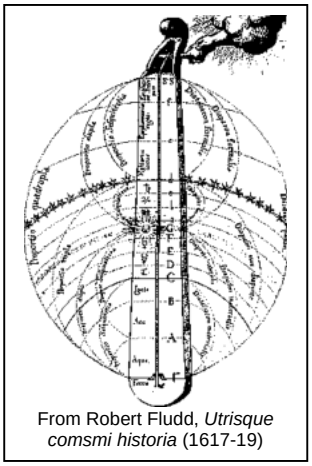
credit: *NASA/JPL-CalTech*

Early last fall, the two meters portrayed very different data than is shown here. The green bar for *Voyager 2* indicated fluctuating solar plasma readings somewhere between 5 and 10, while the orange bar indicated cosmic ray plasma readings around 0.2. *Voyager 2* was still within the solar bubble last September . . . though not now.

When the coronal mass ejection blooped into interstellar space in 2013, *Voyager 1* detected it as a sound. According to NASA, the solar plasma wave caused interstellar space to ring, and the high pitch of the ringing determined that interstellar plasma is upwards of 40 times more dense than previously thought, more dense than solar plasma – hence the solar bubble's existence. You can visualize this in a glass of vegetable oil (dense liquid) into which you can drip water (less dense liquid). Follow this link to a JPL recording of the sounds recorded by *Voyager 1* while in interstellar space https://www.youtube.com/watch?v=LIAZWb9_si4, in which you'll hear (and see, graphic on right) two instances of 'dense' plasma vibrating. The first occurred between October and November 2012, then again from April to May 2013. Remember that *Voyager 1* left the solar bubble in August 2012. This author believes that the first 'ring' is due to residual solar plasma carried out with *Voyager 1*. The second, louder ring is the coronal mass ejection plasma wave passing the spacecraft. It's just eerie. Don't listen alone!



credit: NASA/JPL

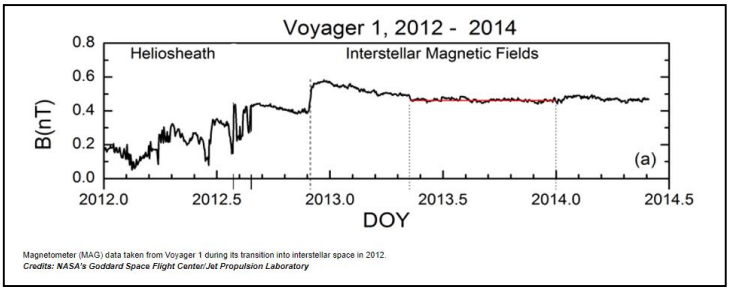

From Robert Fludd, *Utrisque comsmi historia* (1617-19)

For those of you who've forgotten your ancient Greek history, this next part will be fascinating. Pythagoras, the father of classical geometry, not only gave us $a^2 + b^2 = c^2$, but also worked out the mathematics of music, the concise relationship between the length of a plucked string and the pitch of the musical note. He took this concept that the intervals between harmonious frequencies form numerical ratios and applied it to the heavens. In his theory of the Music of the Spheres, as explained in Stanley's *History of Philosophy* (1710), the interval between the sphere of earth and the sphere of the fixed stars is a diapason – a perfect harmonic interval. For his earth-centered cosmos then, concentric spheres progressed from earth to the moon (1 tone), moon to Mercury (½ tone), Mercury to Venus (½ tone), Venus to the sun (1½ tones), sun to Mars (1 tone), Mars to Jupiter (½ tone), Jupiter to Saturn (½ tone), Saturn to fixed stars (½ tone). The sum of these intervals comprised the six whole tones of the octave. But one couldn't hear his celestial music.

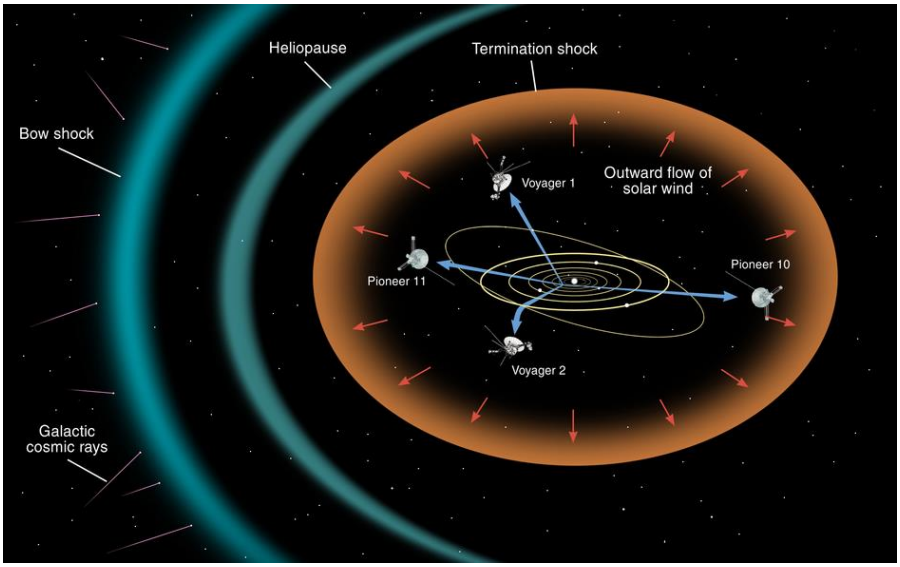
Let's listen to *Voyager 1*'s recording again, but with your eyes closed and no other sounds in the room. Do you have a musician in the family? What do they think?

Pythagoras, though woefully incorrect regarding the structure of the solar system, imagined a form of music in the heavens. And while his theory of unheard-but-harmoniously-affective music quickly fell out of favor, Plato linked music with astronomy as twin studies of sensory input – music for the ears and astronomy for the eyes, both requiring knowledge of numerical proportions [Davis, Henry, 1901. *The Republic The Statesman of Plato*. London: M. W. Dunne]. Now *Voyager* has given us back the Music of the Spheres.

Let's go back to the day that *Voyager 1* left the solar system in 2012. Quite a bit further back, in November 1980, this spacecraft angled out of the solar ecliptic, after its flyby of Saturn, and headed towards outer space. *Voyager 2* is the craft that flew on to Uranus and Neptune before it too angled out of the ecliptic to head for outer space. Mission scientists knew that *Voyager*'s crossing should be detectable by onboard instruments. But no one knew quite where the heliopause is and how long it would take to reach it. Just a few months behind, it took *Voyager 2* two years to reach Jupiter, another two years to reach Saturn, then five years to reach Uranus, and an additional three years to reach Neptune by 1989. The entire 1990s passed without any indications of the heliopause. The first decade of the new century passed. Then, in 2012, late summer, the instruments began to hiccup and then 'ploik' *Voyager 1* entered outer space; magnetometer data shown above.



Magnetometer (MAG) data taken from Voyager 1 during its transition into interstellar space in 2012.
Credits: NASA's Goddard Space Flight Center/Jet Propulsion Laboratory



credit: *NASA/JPL-CalTech*

The graphic below depicts not only the two *Voyagers*' trajectories but also the paths of the last two *Pioneer* probes. One often hears of *Voyager 1* being called the "first man-made object in outer space". But that is not entirely true. *Pioneer 10* was. Contact with this long-forgotten spacecraft was lost in 2003 when its power source died. Per NASA's web archives, *Pioneer 10* will "coast silently as a ghost ship … into interstellar space, heading … for the red star Aldebaran." At 68 light years away, the craft will take over 2 million years to get there.

This author regrets that the 'destinations' towards which the *Voyagers* are headed are unknown, so far. Please stay tuned. The information is out there and will be found.

Last month, in Chapter 1, it was stated that we'd explore the early days of the *Voyager* mission in April. That was not an April's Fool. It was simply a mistake. An effort will be made each month to address a milestone from the *Voyager* Odyssey. For May, nothing of significance has been identified, while June and July mark anniversaries of the mission's beginnings. August contains multiple milestones, including flybys of Saturn and Neptune, so we'll move our discussion of Saturn's flyby to May. In August we'll focus Neptune, and in September we'll focus on the launches. October will be devoted to the spacecraft instrumentation and design. In November, we'll learn about the Golden Record. January marks the anniversary of the Uranus flyby. The *Voyager* Odyssey will close next February with a special treat.

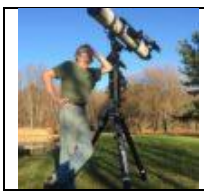
About the Author: Loretta J Cannon is a 3rd generation Idahoan. She earned both of her Bachelor degrees from Boise State University and her Masters from Arizona State University. After almost 20 years working for local banks, non-profits and the Federal government, she is somewhat retired and devotes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

An Ode to Small Telescopes

By: Joe Bergeron

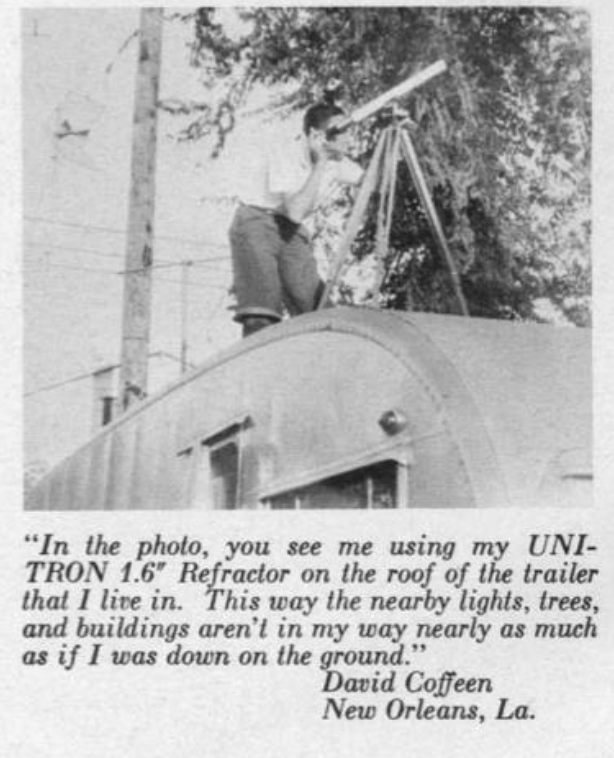
A small telescope faces the Milky Way. Image credit: Brian Ventrudo.

Sometime in 1955, Mr. David Coffeen of New Orleans, Louisiana came up with $75. In today's currency, that's about $700, a respectable sum. And what did Mr. Coffeen do with his hard-earned savings? He purchased a telescope. Which telescope? A Unitron alt-azimuth refractor with an aperture of just 40mm, less than that of most finder scopes today. It came with three eyepieces, a star diagonal, and a wooden storage case, because it was an honest astronomical instrument. Mr. Coffeen used his telescope from atop his modest trailer home. There was a lot to see with that 40mm scope: loads of lunar detail, the rings of Saturn, the Galilean moons of Jupiter and a couple of belts, hundreds of double stars, many of the Messier objects, and a lot more. He was so proud and pleased that he wrote to Unitron to show off this arrangement, and became immortalized in the image below:



About Joe Bergeron

Joe Bergeron is an amateur astronomer of 50 years' experience, a former planetarium director, a space artist, and the author of ten novels. See more of Joe's work at www.joebergeron.com.

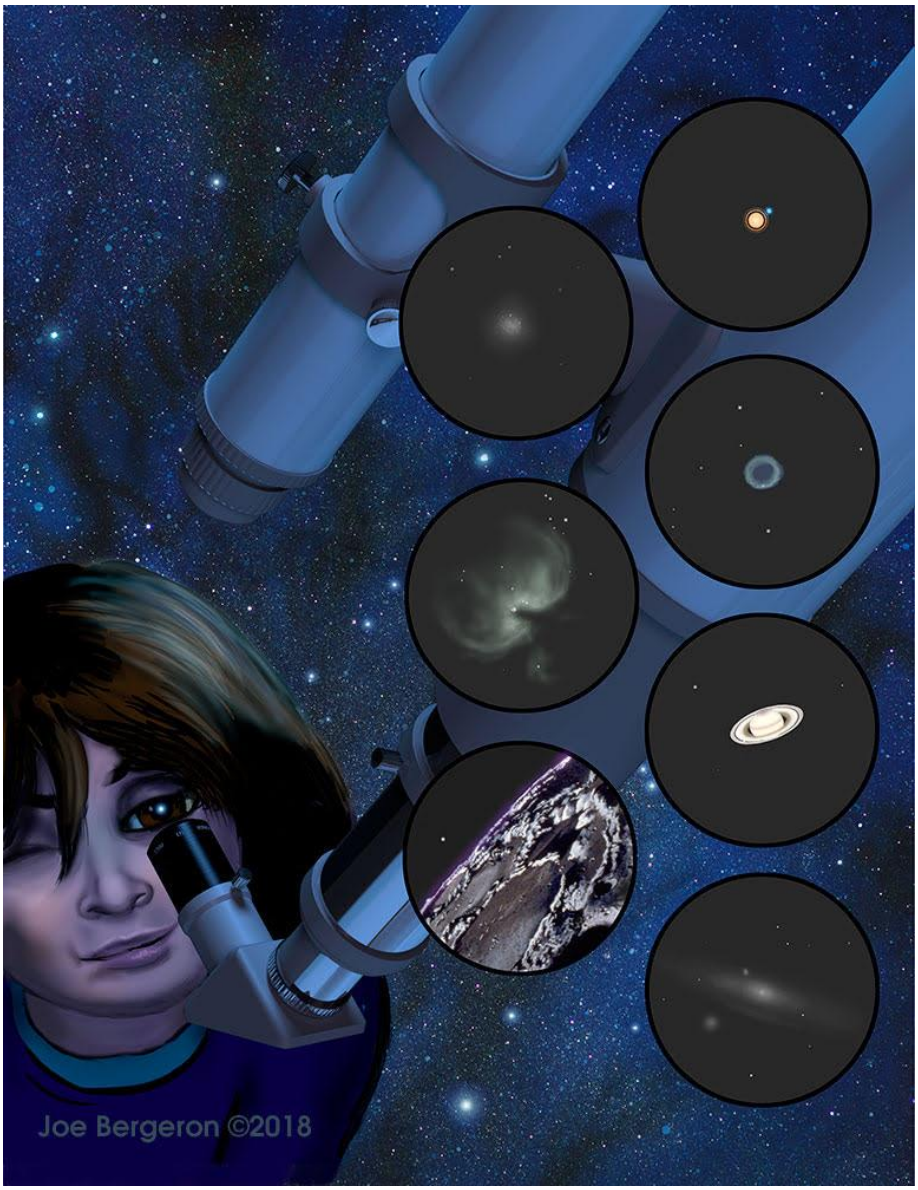


"In the photo, you see me using my UNITRON 1.6" Refractor on the roof of the trailer that I live in. This way the nearby lights, trees, and buildings aren't in my way nearly as much as if I was down on the ground."
David Coffeen
New Orleans, La.

David Coffeen with his 40mm Unitron refractor, circa 1955.

David Coffeen, I salute you. I'd like to think that in later years you were able to get your hands on a big 60mm scope, or maybe even a massive 3-incher, which would have been considered an impressive instrument!
Today, most amateur astronomers would scoff at the idea of a 40mm telescope, especially as a main (or only) instrument. Some will assure you that an 8-inch (200mm) is a "starter" telescope, and that really, nothing smaller than a 10-inch (250mm) is worth looking through.

The fact is, spending $700 today will get you a decent 10-inch reflector telescope on a Dobsonian alt-azimuth mount. Even if you insist on a refractor, which is an inherently more expensive breed of telescope, it will still get you a fair 120mm achromatic refractor on a usable equatorial mount, with enough left over for another eyepiece or two. Either is, of course, far more capable than any 40mm telescope.
But don't count out those tiny telescopes. Few of us started out with anything smaller than a 60mm refractor. That's about 10 times the aperture of the fully dilated human eyeball (depending on age and other factors). To get that same huge jump in light grasp again, someone with a 60mm scope would need to acquire a 600mm (24-inch) scope. Even today, amateur telescopes of that size or greater are not that common.
What about resolution? The smallest thing the unaided human eye can distinguish as anything other than a point of light is about 2 arc minutes across (theoretically, a 6mm telescope could resolve down to about 20 arc seconds, but our eyeballs are not optically equal to the task). A good 60mm scope will resolve to 2 arc seconds, a 60-fold improvement! To improve this by another factor of 60, you'd need a 4-meter telescope, like the Mayall reflector at Kitt Peak, and it would have to either be in space or equipped with advanced adaptive optics to overcome the seeing limitations of our turbulent atmosphere, which make it uncommon for any telescope to resolve below one half second of arc, no matter how big it is.



A young observer with a small refracting telescope, along with illustrations of what can be seen with such an instrument. Image credit and copyright: Joe Bergeron.

The point is this. For most amateur astronomers, that first decent telescope, no matter how small or humble it may be, is by far the biggest gain in observing capability they will ever see, no matter what bigger telescopes they get in the future.

If some people consider a 10-inch scope a starter instrument today, it's worth remembering that 50 years ago, a 10-inch was about as big a telescope as many amateur astronomers would ever see, let alone own. An 8-inch Newtonian was a hallowed object worthy of reverence, a truly serious telescope, and for that matter, so was a wee 3-inch refractor. To judge from the Unitron advertising of the day, a towering 4-inch refractor was really all an amateur observer needed to aspire to. Unitron claimed that a professional astronomer once said that "a 3-inch refractor will show everything that an amateur would wish to see." Well, maybe not, but they will provide decent views of at least a few examples of every major class of astronomical object.

Then in the 1980s, along came the erstwhile monk and astronomy evangelizer John Dobson, who slapped large if optically dubious mirrors into slapdash alt-azimuth mounts. Telescope makers followed his lead, and suddenly starlight was pouring into our eyepieces! After a few years a 10-inch was a medium-sized telescope, and a 15-inch was the beginning of large apertures. The images in these early Dobsonian reflectors might not have been very refined, but they sure were bright, permitting glimpses into previously unthinkable deep sky depths.

Big, bigger, biggest. A selection of early Dobsonian telescopes by Coulter Optical in the mid 1980s.
Dobsonians gradually got more sophisticated, their optics improved, and a typical amateur can now get a workable telescope of large aperture that would have been the belle of the ball and featured in *Sky & Telescope* when he was a kid. And yet, a fine small telescope remains a treasure, and a thing of wonder. It can be carried around and set up easily. It can be transported without needing a big vehicle or towing a trailer. And it can show you so much. The smallest telescope I regularly use is a short 92mm apochromatic refractor. If it was the only telescope I could own and use, I would still consider myself blessed and in touch with the sky. It provides views of planets that are better than those of many bigger telescopes of other types, it's spectacular for low-power Milky Way scanning, and when used carefully beneath a dark sky, it can show you a lifetime's worth of deep sky objects. For example, from the Mojave Desert I easily saw NGC 2419, the "Intergalactic Wanderer", a globular cluster in the constellation Lynx that lies at the astounding distance of some 300,000 light years. The faintest star I glimpsed in its vicinity was a faint magnitude 13.9.

Modern small telescopes are smaller than ever, or at least shorter. The old ones were achromats (color free) with a focal ratio of f/11-f/16, a necessity to limit residual chromatic aberration, or "false color" from the main lens. Today, the advent of newer glass types makes it practical and economical to make small apochromatic (really, really color free) refractors of short focal length. These highly refined instruments are not only fine for visual use, but they're also ideal for astrophotography, or imaging, because of their "fast" focal ratios of f/6 or f/7 and their small size that makes it feasible to use them on small mounts.
Big or small, humble or exotic, every decent astronomical telescope shares a few important qualities. One is their purity of purpose. They carry no violence, no greed, no aggression, no anger. They exist only to expand the mind and heart. They provide knowledge, and hint at truth. They are fundamentally simple things, yet precise, and perfectly adapted for their function.

No man-made object is more pure or venerable than a fine old telescope that has been gathering starlight for years or decades. This is as true of a small refractor used to contemplate the Moon from an urban balcony as it is for a big reflector hunting galaxy clusters beneath the darkest skies. If you have either or both, you are fortunate.

Mars the Wanderer By David Prosper

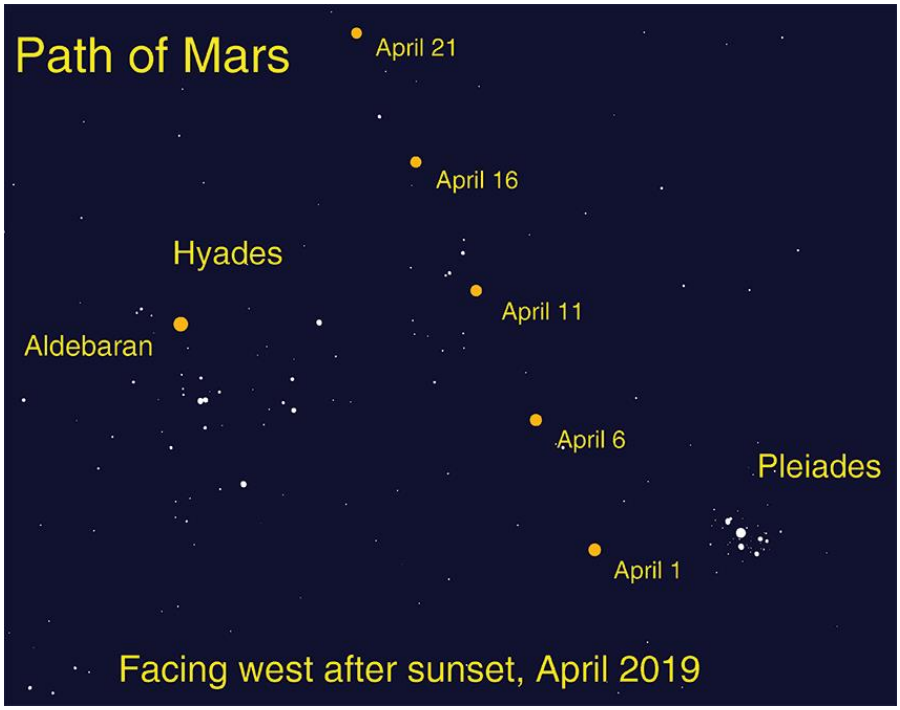
April's skies find Mars traveling between star clusters after sunset, and a great gathering of planets just before sunrise.

Mars shows stargazers exactly what the term "planet" originally meant with its rapid movement across the evening sky this month. The ancient Greeks used the term *planete,* meaning *wanderer*, to label the bright star-like objects that travelled between the constellations of the zodiac year after year.

You can watch Mars as it wanders through the sky throughout April, visible in the west for several hours after sunset. Mars travels past two of the most famous star clusters in our night sky: the **Pleiades** and **Hyades**. Look for the red planet next to the tiny but bright Pleiades on April 1st. By the second week in April, it has moved eastward in Taurus towards the larger V-shaped Hyades. Red Mars appears to the right of the slightly brighter red-orange star **Aldebaran** on April 11th. We see only the brightest stars in these clusters with our unaided eyes; how many additional stars can you observe through binoculars? Open clusters are made up of young stars born from the same "star nursery" of gas and dust. These two open clusters are roughly similar in size. The Pleiades appears much smaller as they are 444 light years away, roughly 3 times the distance of the Hyades, at 151 light years distant. Aldebaran is in the same line of sight as the Hyades, but is actually not a member of the cluster; it actually shines just 65 light years away! By comparison, Mars is practically next door to us, this month just a mere 18 light minutes from Earth - that's about almost 200 million miles. Think of the difference between how long it takes the light to travel from these bodies: 18 minutes vs. 65 years!

The rest of the bright planets rise before dawn, in a loose lineup starting from just above the eastern horizon to high above the south: **Mercury**, **Venus**, **Saturn**, and **Jupiter**. Watch this month as the apparent gap widens considerably between the gas giants and terrestrial planets. Mercury hugs the horizon all month, with Venus racing down morning after morning to join its dimmer inner solar system companion right before sunrise. In contrast, the giants Jupiter and Saturn move away from the horizon and rise earlier all month long, with Jupiter rising before midnight by the end of April.

The **Lyrids** meteor shower peaks on April 22nd, but sadly all but the brightest meteors will be washed out by the light of a bright gibbous Moon. You can catch up on all of NASA's current and future missions at nasa.gov



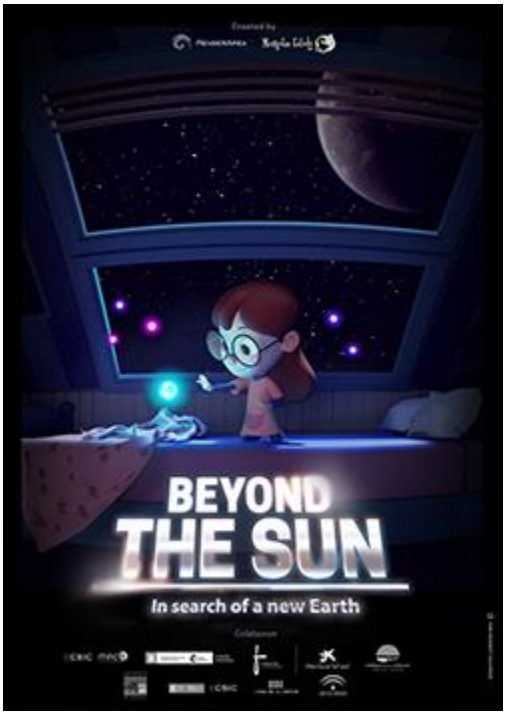
Caption: The path of Mars between the Pleiades and Hyades in April.
Image created with assistance from Stellarium.

Observatories and Planetarium

CSI Centennial Observatory / Faulkner Planetarium Herrett Center

Event	Place	Date	Time	Admission
Monthly Free Star Party	Centennial Observatory	Saturday, April 13th, 2019	8:45 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.