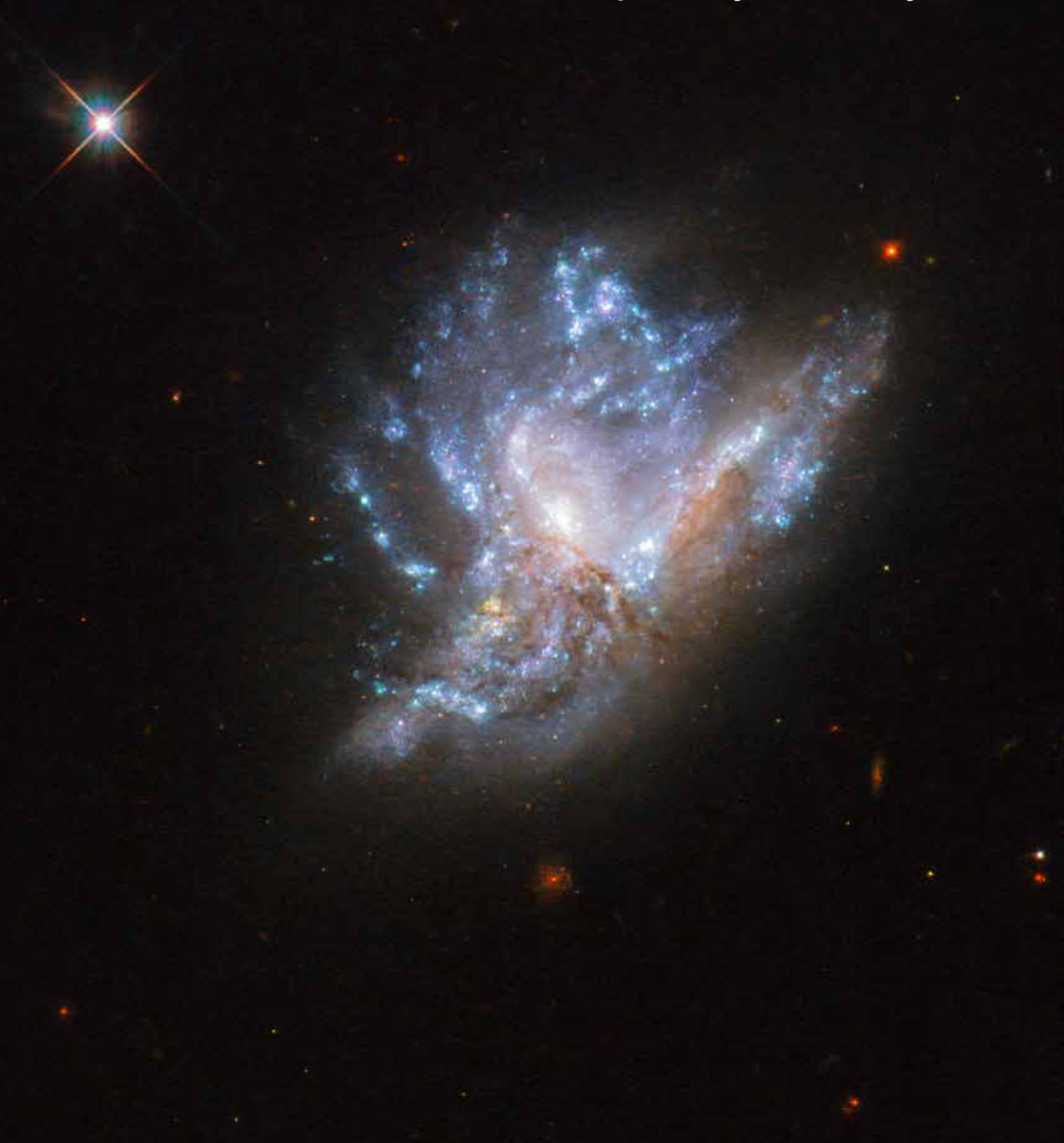


Volume 40.7

July 2020

Desert Sky Observer

Antelope Valley Astronomy Club



Desert Sky Observer

www.avastronomyclub.org

July 2020

Upcoming Events

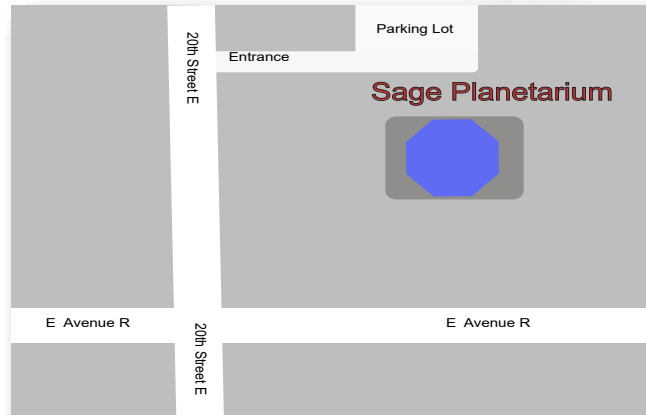
July 10: Club Meeting Ahhh. . . Maybe
July 18: DSSP at Mt Pinos or ?
July 25: PDW Moonwalk . . Ahh Maybe . ?

Any night without clouds: Personal Star Party

August 8: PDW Moonwalk . . . Maybe
August 14: Club Meeting. . . Maybe
August 15: DSSP at . . . Mt Pinos
August 22: Mt Wilson Trip. . . Maybe



AVAC Calendar



Board Members

President: Darrel Bennet (661) 220-0122
president@avastronomyclub.org

Vice-President: Matt Leone (661) 713-1894
vice-president@avastronomyclub.org

Secretary: Rose Moore (661) 972-1953
secretary@avastronomyclub.org

Treasurer: Rod Girard (661) 803-7838
treasurer@avastronomyclub.org

Appointed Positions

Newsletter Editor: Phil Wriedt (661) 917-4874
dso@avastronomyclub.org

Equipment & Library:
John Van Evera 661-754-1819
library@avastronomyclub.org

Club Historian: vacant
history@avastronomyclub.org

Webmaster: Steve Trotta (661) 269-5428
webmaster@avastronomyclub.org

Astronomical League Coordinator:
Frank Moore (661) 972-4775
al@avastronomyclub.org



Monthly Meetings

Monthly meetings are held at the **S.A.G.E. Planetarium** in Palmdale, the second Friday of each month except December. The meeting location is at the northeast corner of Avenue R and 20th Street East. Meetings start at 7 p.m. and are open to the public. *Please note that food and drink are not allowed in the planetarium.*

Membership

Membership in the Antelope Valley Astronomy Club is open to any individual or family.

The Club has three categories of membership.

- Family membership at \$30.00 per year.
- Individual membership at \$25.00 per year.
- Junior membership at \$15.00 per year.

Membership entitles you to ...

- The Desert Sky Observer -- monthly newsletter
- The Reflector -- the publication of the Astronomical League.
- The AVAC Membership Manual.
- To borrow club equipment, books, videos, and other items.

AVAC

PO Box 8545

Lancaster, CA 93539-8545

Visit the Antelope Valley Astronomy Club website at www.avastronomyclub.org/.



www.avastronomyclub.org

The Antelope Valley Astronomy Club, Inc. is a §503(c)(3) Non-Profit Corporation.

The AVAC is a Sustaining Member of The Astronomical League and the International Dark-Sky Association

President's Message

By Darrel Bennet

Well, as we are entering our fourth month of quarantine there is still no word as to when we can start having our regular meeting at the SAGE. I am still waiting for Jeremy's phone call. I did talk to him last month and still no word from his boss about it. He did say that they were in the process of putting in a new system for the planetarium.

We had a board meeting at my house last month to discuss upcoming events. Rose will be looking into our Mt. Wilson trip on August 22 to see if it is still on. We also spoke about the Christmas party in December.

Last month on June 20 we had a dark sky party at Chuchupate. There were a lot of people there just like last month the Kern county club, the Ventura club, and a few from the Los Angeles club showed up; But only 3 people from our club showed up; I don't know if the virus is keeping people away or the lack of interest.

Our next two dark sky parties will both be at Mt. Pinos on July 18 and on August 15. I hope to see some of you there but I understand if you can't make it because of the altitude at 8300 feet.

As soon as we know about the next club meeting and the Mt. Wilson trip we will let you know.

Until then keep looking up.



Chuchupate 6/20/2020

On The Cover

Located in the constellation of Hercules, about 230 million light-years away, NGC 6052 is a pair of colliding galaxies. They were first discovered in 1784 by William Herschel and were originally classified as a single irregular galaxy because of their odd shape. However, we now know that NGC 6052 actually consists of two galaxies that are in the process of colliding. This particular image of NGC 6052 was taken using the Wide Field Camera 3 on the NASA/ESA Hubble Space Telescope.

A long time ago gravity drew the two galaxies together into the chaotic state we now observe. Stars from within both of the original galaxies now follow new trajectories caused by the new gravitational effects. However, actual collisions between stars themselves are very rare as stars are very small relative to the distances between them (most of a galaxy is empty space). Eventually things will settle down and one day the two galaxies will have fully merged to form a single, stable galaxy.

Our own galaxy, the Milky Way, will undergo a similar collision in the future with our nearest galactic neighbour, the Andromeda Galaxy. Although this is not expected to happen for around 4 billion years so there is nothing to worry about just yet.

This object was previously observed by Hubble with its old WFPC2 camera. That image was released in 2015.

Credit: ESA/Hubble & NASA, A. Adamo et al

From the Secretary

By Rose Moore

We had a club star party in June at Chuchupate. See Darrell's note above. On Saturday July 18th, we have a dark sky star party scheduled for Mt. Pinos. I just spoke with one of the Rangers and Mt. Pinos is open to amateur astronomers for overnight observing. She said there are no restrictions at this time. An email with directions and map will be sent out the week prior to the event.

Please check your emails for the following upcoming events: our club meeting is scheduled for Friday July 10th at 7pm; and a Prime Desert Woodland Moon Walk with Jeremy Amarant scheduled for Saturday July 25th at 8:30pm.

I am waiting for an email back from our Mt. Wilson coordinator about our scheduled trip to the 60 inch on Saturday August 22nd. It doesn't look good. At this time all of Mt. Wilson and its facilities are closed. The only thing open now are the hiking trails, from 10am to 5pm.

We would like to schedule our Christmas Party at Ginos for December. However, we are waiting for a sign that the restaurant restrictions will be lifted, before we give them a deposit.

The AVAC Board was able to hold a brief meeting at President Darrell's home in June. We discussed Club activities canceled and those still scheduled, upcoming dark sky star parties, and possible events for the fall (if allowed).

For those observing at home in July: Planets up will be Neptune, Jupiter, Saturn, and Pluto by about 10-11pm. New Moon is on Monday July 20th. A new comet will (hopefully) be visible for viewing. Comet NEOWISE (C/2020 F3) is now near Orion, but will be in Ursa Major in mid July. It's magnitude is 2.2. For those that have done any observing, let us know what's up!!

Be safe, stay healthy!

Member Scope for Sale

Member Duane Lewis is selling his 9.25 inch Celestron CGEM OTA with the tripod, CGE mount, counterweights, one 1.25" 20mm Plossl eyepiece, a 1.25" diagonal and a 2" diagonal, telrad mount, and a Denkmeir (unknown model) binocular viewer. The OTA was tuned up by member Don Bryden before he moved. It has not been used since. Price is \$1200. Duane is unable to have this set up for viewing because of lack of space. So arrangements will have to be made for viewing the scope and accessories. For more info please contact Duane by email only: gurba1826@gmail.com -- or contact Rose by email: rmorion@bak.rr.com

Mars's Latest Visitor: NASA's Perseverance Rover

David Prosper, NASA Night Sky Network

NASA's latest Mars rover, Perseverance, is launching later this month! This amazing robot explorer will scout the surface of Mars for possible signs of ancient life and collect soil samples for return to Earth by future missions. It will even carry the first off-planet helicopter: Ingenuity. Not coincidentally, Perseverance will be on its way to the red planet just as Mars dramatically increases in brightness and visibility to eager stargazers as our planets race towards their closest approach in October of this year.

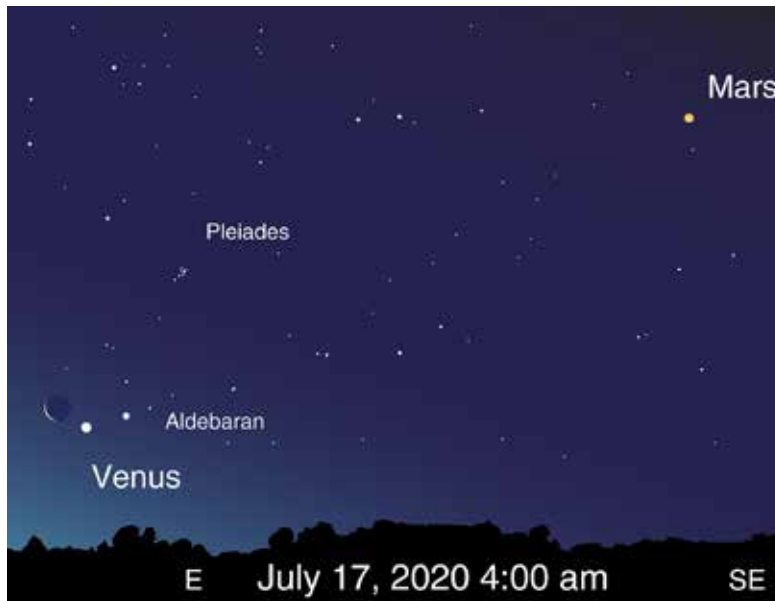
Perseverance's engineers built upon the success of its engineering cousin, Curiosity, and its design features many unique upgrades for a new science mission! In February of 2021, Perseverance will land at the site of an ancient river delta inside of Jezero Crater and ready its suite of seven primary scientific instruments. The rover will search for traces of past life, including possible Martian fossils, with WATSON and SHERLOC, two advanced cameras capable of seeing tiny details. The rover also carries an amazing instrument, SuperCam, to blast rocks and soil outside of the rover's reach with lasers to determine their chemical makeup with its onboard suite of cameras and spectrometers. Perseverance will also take core samples of some of the most promising rocks and soil, storing them for later study with its unique caching system. Future missions will retrieve these samples from the rover and return them for detailed study by scientists on Earth. Perseverance also carries two microphones so we can hear the sounds of Mars and the noises of its instruments at work. It will even launch a small helicopter - Ingenuity - into the Martian atmosphere as a trial for future aerial exploration!

Would you like to contribute to Mars mission science? You can help NASA's rover drivers safely navigate the Martian surface by contributing to the AI4Mars project! Use this tool to label terrain features on photos taken of the Martian surface by NASA missions to help train an artificial intelligence algorithm to better read their surrounding landscape: bit.ly/AI4Mars

The launch of Mars Perseverance is, as of this writing, scheduled for July 20, 2020 at 9:15am EDT. More details, updates, and livestreams of the event are available on NASA's official launch page: bit.ly/Mars2020Launch . Dig deep into the science of the Mars 2020 mission and the Perseverance rover at: mars.nasa.gov/mars2020/ . Find out even more about past, present, and future Mars missions at nasa.gov.



Perseverance inspects a cluster of interesting Martian rocks with its instruments in this artist rendering by NASA JPL/Caltech



Observe Mars yourself over the next few months! Mars can be found in early morning skies throughout July, and by the end of the month will rise before midnight. Mars gradually brightens every night until the close approach of Mars in October. The pre-dawn skies of July 17 present an especially nice view, as the waning crescent Moon will appear near Venus and Aldebaran.

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach.

Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

A Partial Penumbral Lunar Eclipse on July 4th will start about 8:30pm and lasts till about 10:30pm. Only about 1/4 of the northern Moon will be covered by the penumbra so really, it's just going to get dim.

Space News

News from around the Net

Comet NEOWISE May Get so Bright It Is Visible With Naked Eye in July

A recently discovered comet known as NEOWISE (C/2020 F3) is speeding towards the sun in its orbit around our star, and some astronomers are predicting it may become visible to the naked eye by early July. The comet, which was first spotted by NASA's NEOWISE space telescope on March 27, 2020, is currently more than 138 million miles from Earth and is set to make its closest approach to the sun on July 3. . . . (continued at <https://www.newsweek.com/comet-neowise-visible-naked-eye-july-1511692>)



All black holes should sport light rings

Theoretical astrophysicists predict that a glowing halo just outside the event horizon should surround all black holes. When the black hole Gargantuan first appeared onscreen in the 2014 blockbuster "Interstellar," nobody had seen a black hole yet. Without a real-life image for reference, the visual effects artists who worked on the movie collaborated with astrophysicists to ensure their onscreen creation would look close to what the universe has in store for us. (continued at <https://astronomy.com/news/2020/06/all-black-holes-should-sport-light-rings>)



NASA expects to cover JWST launch slip with budget reserves

NASA hopes to keep the costs of additional delays in the James Webb Space Telescope within the program's existing reserves and thus avoid asking Congress for additional funding. At a June 24 meeting of NASA's Astrophysics Advisory Committee, Eric Smith, program scientist for JWST at NASA Headquarters, said that while a new target launch date for the giant space telescope hasn't been determined yet, the agency expected that the costs associated with that slip will be covered by existing budgetary reserves. . . . (continued at <https://spacenews.com/nasa-expects-to-cover-jwst-launch-slip-with-budget-reserves/>)



NASA's Hunt for Lunar Water Intensifies

The space agency's plans for sustainable lunar outposts could hinge on finding - and using - what may be the moon's most precious resource . NASA's Artemis program has been called ambitious for its goal of returning humans to Earth's moon as early as 2024. But its most audacious aspiration is something else entirely: a plan to usher in an era of sustainable lunar operations by mining the moon's reserves of water ice. . . (continued at <https://www.scientificamerican.com/article/nasas-hunt-for-lunar-water-intensifies/>)



Quasars are the Biggest Particle Accelerators in the Universe

We puny humans think we can accelerate particles? Look how proud we are of the Large Hadron Collider. But any particle accelerator we build will pale in comparison to Quasars, nature's champion accelerators. Those things are beasts. The term quasar is a contraction—albeit a clumsy one—of "quasi-stellar radio source." When they were first discovered in the 1950s, it was because of their unexplained radio emissions. . . . (continued at <https://www.universetoday.com/146632/quasars-are-the-biggest-particle-accelerators-in-the-universe/>)



Space News

News from around the Net. . .continued

Hubble Watches the “Flapping” of Cosmic Bat Shadow

The young star HBC 672 is known by its nickname of Bat Shadow because of its wing-like shadow feature. The NASA/ESA Hubble Space Telescope has now observed a curious “flapping” motion in the shadow of the star’s disc for the first time. The star resides in a stellar nursery called the Serpens Nebula, about 1300 light-years away. (continued at <https://www.spacetelescope.org/news/heic2012/?lang>)



Milky Way Photographer Of The Year: 25 Mesmerizing Images Of Our Night Sky

We live in the Orion Arm of a spiral galaxy called the Milky Way and sometimes, just sometimes, we can see deep into our galaxy’s center, around 25,000 light years distant. More and more landscape photographers are discovering an irresistible urge to image our home galaxy as it arcs across a dark night sky, as highlighted by this week’s “25 most inspiring Milky Way pictures” post by travel photography blog Capture The Atlas. (continued at <https://www.forbes.com/sites/jamiecartereurope/2020/06/22/milky-way-photographer-of-the-year-25-mesmerizing-images-of-our-night-sky/#762645333bc0>)



What the SUN looks like over 10 years (NASA time lapse)

Check out this one hour time lapse imagery of the sun recorded over the course of 10 years by NASA’s Goddard Space Flight Center/SDO. Each second represents a day, and it takes over an hour to travel across time from June 2, 2010 to June 1, 2020. (video at <https://www.youtube.com/watch?v=9ITrcSe-Hc>)



Newfound ‘super-Earth’ exoplanets bear clues about atmospheres of alien worlds

The brightest red dwarf star in the sky may be the best chance astronomers have yet to analyze the atmospheres of alien worlds — and perhaps detect whether those worlds have life, a new study finds. Scientists focused on the red dwarf star GJ 887, also known as Gliese 887. (Red dwarfs are the most common kind of star in the galaxy, and weigh between 7.5% and 50% the mass of the sun.) At a distance of about 10.7 light-years from Earth, Gliese 887 is the twelfth-closest star. . . . (continued at <https://www.space.com/gliese-887-super-earth-exoplanet-atmospheres.html>)



Launch of NASA’s next Mars rover delayed again by ‘contamination concern’ on the ground

The launch of NASA’s next Mars rover has been delayed to no earlier than July 22 due to a contamination issue with ground support equipment, the space agency said today (June 24). NASA’s Mars rover Perseverance was scheduled to launch toward the Red Planet on July 20 from a pad at the Cape Canaveral Air Force Station in Florida. But a problem cropped up as engineers worked to encapsulate the rover in the nosecone of its Atlas V rocket, which was built by United Launch Alliance. . . . (continued at <https://www.space.com/nasa-mars-rover-perseverance-launch-delay-july-22.html>)



Space News

News from around the Net. . .continued

BLACK HOLE COLLISION MAY HAVE CAUSED BURST OF LIGHT

Astronomers think they've detected a flash created by the merger of two black holes. Black holes don't emit light — that goes without saying. Furthermore, in “normal” situations, stellar-mass black holes should have rid themselves of their tutus of hot gas long before they collide, removing that source of light, too. But for the event S190521g, the normal rules may not apply. . . . (continued at <https://skyandtelescope.org/astronomy-news/black-hole-collision-may-have-caused-burst-of-light/>)



GRAVITATIONAL WAVE DETECTORS FIND MYSTERY “MASS GAP” OBJECT

Astronomers have caught a black hole colliding with a mysterious companion that might be either one of the most massive neutron stars or the smallest black hole ever detected. How small can a black hole be? Astronomers aren't sure. But the gravitational waves from a peculiar collision some 780 million light-years away may hold the beginning of an answer. . . . (continued at <https://skyandtelescope.org/astronomy-news/black-holes/gravitational-wave-detectors-find-mystery-mass-gap-object/>)



Super-Earths discovered orbiting nearby red dwarf

The nearest exoplanets to us provide the best opportunities for detailed study, including searching for evidence of life outside the solar system. In research led by the University of Göttingen, the RedDots team of astronomers has detected a system of super-Earth planets orbiting the nearby star Gliese 887, the brightest red dwarf star in the sky. Super-Earths are planets which have a mass higher than the Earth's but substantially below those of our local ice giants, Uranus and Neptune. . . . (continued at <https://phys.org/news/2020-06-super-earths-orbiting-nearby-red-dwarf.html>)



Scientists provide new explanation for the strange asymmetry of the moon

The Earth-moon system's history remains mysterious. Scientists believe the system formed when a Mars-sized body collided with the proto-Earth. Earth ended up being the larger daughter of this collision and retained enough heat to become tectonically active. The moon, being smaller, likely cooled down faster and geologically froze. The apparent early dynamism of the moon challenges this idea. . . . (continued at <https://phys.org/news/2020-06-scientists-explanation-strange-asymmetry-moon.html>)



NASA's IBEX charts 11 years of change at boundary to interstellar space

Far, far beyond the orbits of the planets lie the hazy contours of the magnetic bubble in space that we call home. This is the heliosphere, the vast bubble that is generated by the Sun's magnetic field and envelops all the planets. The borders of this cosmic bubble are not fixed. In response to the Sun's gasps and sighs, they shrink and stretch over the years. Now, for the first time, scientists have used an entire solar cycle of data from NASA's IBEX spacecraft to study how the heliosphere changes over time. . . . (continued at <https://www.sciencedaily.com/releases/2020/06/200617174814.htm>)



Dark Sky Observing Sites

The Chuchupate parking lot is a half a mile beyond the Mt Pinos ranger station (on some maps The Chuchupate Ranger Sta., the parking lot is also called Frazier Mountain trailhead).

To get there, take the Frazier Mountain Park RD east about 7 miles from I-5, to Lake Of The Woods, Turn left on Lockwood Valley Rd. (If you see Mike’s Pizza on your left you missed the turn) In less than a mile there is a road to the left, go past the ranger station, the parking lot is on the right. The Club gathers in the upper end of the lot. The Elevation is 5430 feet. There is a vault toilet.



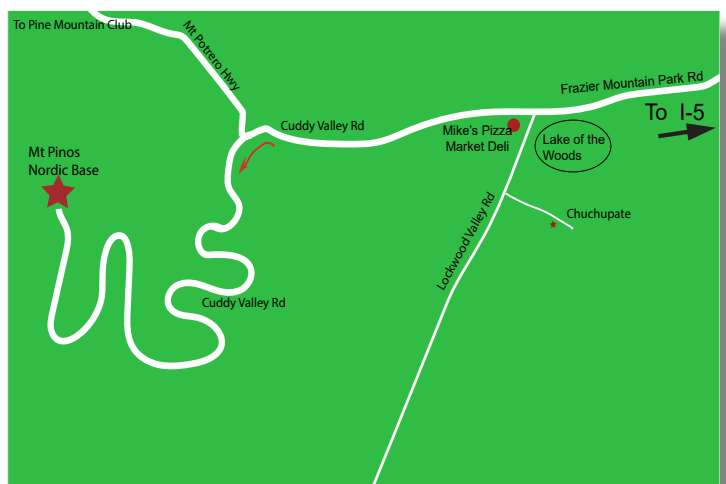
The Red Cliffs Natural Area is part of **Red Rock Canyon State Park** is a day use area and is not for use by the public after dark. The Club gets a special permit for a star party and pays a fee.

To get there: Take the CA-14 north 25 miles past Mojave. You will see giant red cliffs on the right side and a small sign that says “Red Cliffs Natural Area” and a dirt road. (If you see the large sign for the Ricardo campground, you drove a mile too far). Follow the road to the large parking lot (that hasn’t been graded in a long time). Elevation is 2410 feet. There is a vault toilet.

Mt Pinos is a parking lot at 8350 feet for the “Mt Pinos Nordic Base.” There is a vault toilet 300 yds to the east in the Chula Vista campground.

To get there: From I-5, get off at Frazier Mountain Park Rd and drive west about 7 miles to Mike’s Pizza/Market Deli at Lockwood Valley Rd. Keep on the main roadway (don’t turn left to go to Chuchupate). Continue past Mike’s Pizza on Cuddy Valley Rd (the road’s new name) about 5 miles. Continue straight (do not turn right on to Mil Potrero Hwy) for another 8 1/2 miles to the parking area.

Note: The entire drive is uphill



Planet Summary

The **Sun** starts July in Gemini and crosses into Cancer by the 20th of the month

Mercury achieves inferior conjunction on the 1st and gradually emerges in the morning sky. It achieves greatest elongation west (GEW) of 20° on the 22nd with a mag of +0.3. By month end it brightens to -0.8 and is some 17° west of the morning Sun

Venus just a month after inferior conjunction, is once again prominent in the morning sky, rising more than 2 hours before the Sun. It reaches its greatest illuminated extent (GIE) on the 10th at mag -4.7. Venus spends the first half of the month crawling through the Hyades passing by Aldebaran on the 12th with a separation of just 1°. The Moon passes 2.5° north the late afternoon of the 16th.

Mars starts the month in Pisces, passes through Cetus and ends in Pisces. As it does it brightens from -0.5 to -1.0. The Moon passes by to the south on the 11th and 12th.

Jupiter spends the next 2 months in Sagittarius heading west away from Saturn. Jupiter is in opposition on the 14th when it is 35 light-mins (4.14 au) from Earth, at mag -2.8. The full Moon passes 2° to the south on the 5th.

Saturn spends the month heading west in Sagittarius chasing Jupiter. On the 20th, Saturn is in opposition just 75 light-minutes (8.995 au) away at mag +0.1. The rings will span nearly 42". On the morning of the 6th the Moon passes 3° to the south.

Uranus will spend 2020 in southern Aries at magnitude 5+. The 16% waning Moon will pass by early evening on the 16th.

Neptune will spend the month stationary in northeast Aquarius at mag. 7.8. The Moon will pass 5° south on the morning of the 10th.

Pluto starts the month 1/5° south of Jupiter in Sagittarius at mag 14, and ends the month halfway between Jupiter and Saturn.

Sun and Moon Rise and Set



First Qtr July 27 Full July 4 Third Qtr July 12 New July 20

Sun and Moon Rise and Set*

Date	Moonrise	Moonset	Sunrise	Sunset
7/1/2020	16:51	02:47	05:54	20:10
7/5/2020	21:01	06:05	05:56	20:09
7/10/2020	23:59	11:04	05:48	20:08
7/15/2020	01:50	15:43	05:51	20:06
7/20/2020	05:42	20:28	05:55	20:03
7/25/2020	11:20	23:39	05:58	20:00
7/30/2020	16:55	02:10	06:02	19:56

Planet Data*

July 1

	Rise	Transit	Set	Mag	Phase%
Mercury	05:56	12:51	19:45	4.91	0.93
Venus	03:40	10:32	17:23	-4.46	19.84
Mars	00:26	06:25	12:22	-0.52	84.47
Jupiter	20:54	01:52	06:55	-2.74	99.95
Saturn	21:15	02:18	07:25	0.21	99.97

July 15

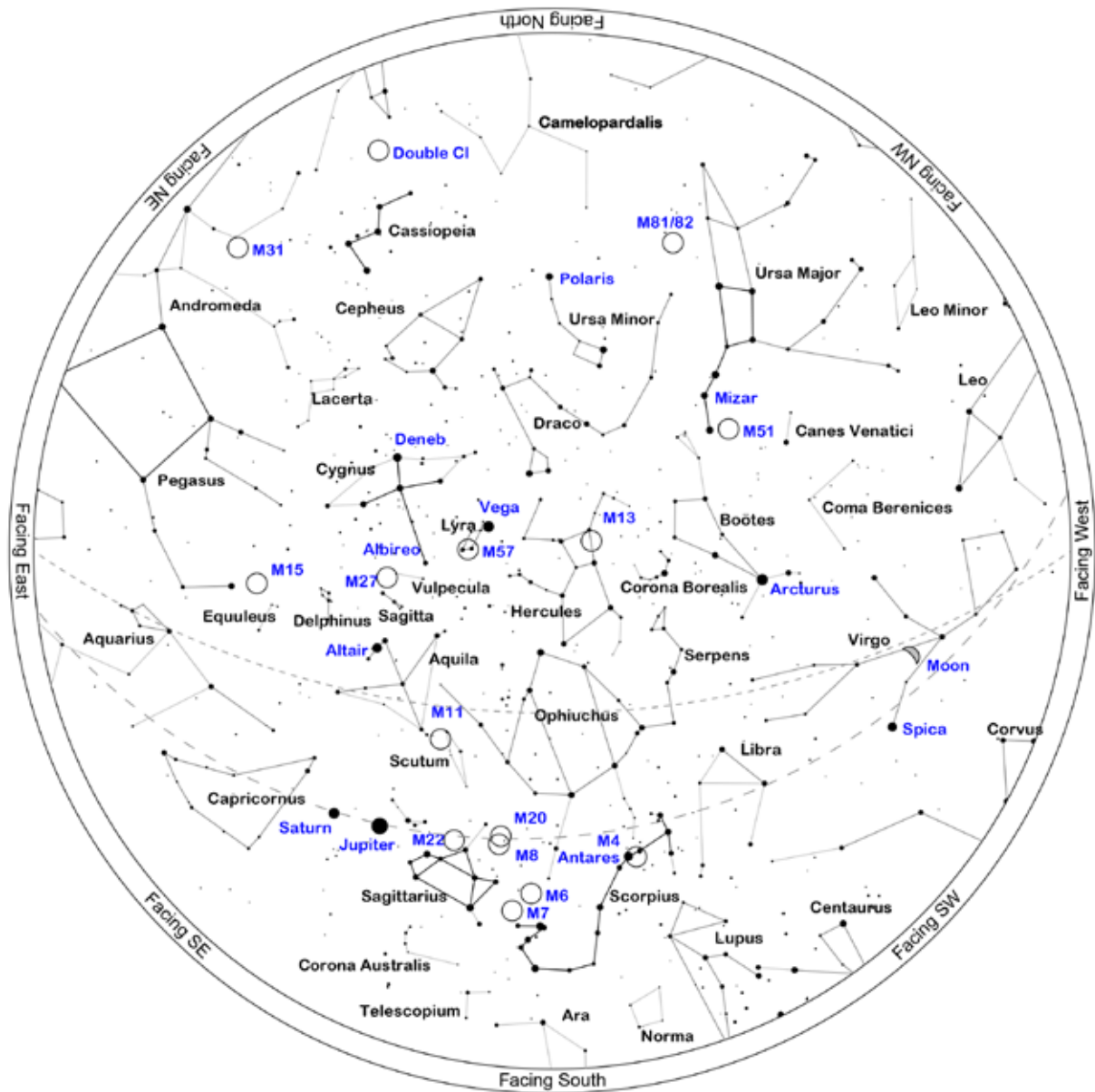
	Rise	Transit	Set	Mag	Phase%
Mercury	04:43	11:42	18:41	1.35	20.53
Venus	03:08	10:02	16:56	-4.46	31.91
Mars	23:53	06:00	12:04	-0.77	85.03
Jupiter	19:52	00:50	05:51	-2.75	100.0
Saturn	20:17	01:19	06:25	0.13	100.0

July 30

	Rise	Transit	Set	Mag	Phase%
Mercury	04:39	11:46	18:53	-0.73	67.08
Venus	02:50	09:48	16:47	-4.38	42.55
Mars	23:15	05:29	11:40	-1.07	86.29
Jupiter	18:47	23:43	04:44	-2.74	99.90
Saturn	19:14	00:15	05:21	0.15	99.99

*Sun, Moon and Planetary date based on Quartz Hill, CA

Sky Chart



Location: Set from geolocation service
Latitude: 34° 43' N, longitude: 118° 09' W
Time: 2020 July 25, 22:00 (UTC -07:00)

Powered by: Heavens-Above.com

Desert Sky Observer

www.avastronomyclub.org

July 2020

Suggested Observing List

The list below contains objects that will be visible on the night of the AVAC Deep Sky Star Party or the Saturday nearest the New Moon, in this case July 25, 2020. The list is sorted by the transit time of the object.

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M81	Galaxy	UMa	09h 55m 33s	+69° 03.9'	7.8	Circum	14:36	Circum
M82	Galaxy	UMa	09h 55m 53s	+69° 40.8'	9.2	Circum	14:36	Circum
M95	Galaxy	Leo	10h 43m 58s	+11° 42.2'	10.6	08:48	15:24	22:00
M96	Galaxy	Leo	10h 46m 46s	+11° 49.2'	10.1	08:51	15:27	22:03
M105	Galaxy	Leo	10h 47m 50s	+12° 34.9'	10.5	08:50	15:28	22:06
M108	Galaxy	UMa	11h 11m 31s	+55° 40.4'	10.6	Circum	15:52	Circum
M97	P Neb	UMa	11h 14m 48s	+55° 01.1'	12.0	Circum	15:55	Circum
M65	Galaxy	Leo	11h 18m 56s	+13° 05.5'	10.1	09:19	15:59	22:39
M66	Galaxy	Leo	11h 20m 15s	+12° 59.4'	9.7	09:21	16:00	22:40
M109	Galaxy	UMa	11h 57m 36s	+53° 22.4'	10.6	05:51	16:38	03:25
M98	Galaxy	Com	12h 13m 48s	+14° 54.0'	10.9	10:09	16:54	23:39
M99	Galaxy	Com	12h 18m 50s	+14° 25.0'	10.4	10:15	16:59	23:43
M106	Galaxy	CVn	12h 18m 58s	+47° 18.2'	9.1	07:39	16:59	02:19
M61	Galaxy	Vir	12h 21m 55s	+04° 28.3'	10.1	10:47	17:02	23:17
M40	Dbl	UMa	12h 22m 12s	+58° 05.0'	8.7	Circum	17:02	Circum
M100	Galaxy	Com	12h 22m 55s	+15° 49.3'	10.1	10:15	17:03	23:51
M84	Galaxy	Vir	12h 25m 04s	+12° 53.2'	10.2	10:26	17:05	23:45
M85	Galaxy	Com	12h 25m 24s	+18° 11.4'	10.0	10:10	17:06	00:01
M86	Galaxy	Vir	12h 26m 12s	+12° 56.7'	9.9	10:27	17:06	23:46
M49	Galaxy	Vir	12h 29m 47s	+08° 00.0'	9.3	10:45	17:10	23:35
M87	Galaxy	Vir	12h 30m 49s	+12° 23.4'	9.6	10:33	17:11	23:49
M88	Galaxy	Com	12h 31m 59s	+14° 25.2'	10.2	10:28	17:12	23:56
M91	Galaxy	Com	12h 35m 27s	+14° 29.7'	10.9	10:32	17:16	00:00
M89	Galaxy	Vir	12h 35m 40s	+12° 33.3'	10.9	10:38	17:16	23:54
M90	Galaxy	Vir	12h 36m 50s	+13° 09.7'	10.2	10:37	17:17	23:57
M58	Galaxy	Vir	12h 37m 44s	+11° 49.1'	10.4	10:42	17:18	23:54
M68	Globular	Hya	12h 39m 28s	-26° 44.5'	9.0	12:38	17:20	22:01
M104	Galaxy	Vir	12h 39m 59s	-11° 37.3'	9.2	11:50	17:20	22:50
M59	Galaxy	Vir	12h 42m 02s	+11° 38.7'	10.7	10:47	17:22	23:58
M60	Galaxy	Vir	12h 43m 40s	+11° 33.1'	9.8	10:49	17:24	23:59
M94	Galaxy	CVn	12h 50m 53s	+41° 07.1'	8.9	08:58	17:31	02:04
M64	Galaxy	Com	12h 56m 44s	+21° 41.0'	9.3	10:30	17:37	00:44
M53	Globular	Com	13h 12m 55s	+18° 10.1'	8.5	10:58	17:53	00:49
M63	Galaxy	CVn	13h 15m 49s	+42° 01.7'	9.3	09:17	17:56	02:35
Baily955	Globular	Cen	13h 26m 47s	-47° 28.8'	3.7	15:17	18:07	20:57
NGC5139	Globular	Cen	13h 26m 48s	-47° 29.0'	3.6	15:17	18:07	20:57

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC5169	Galaxy	CVn	13h 28m 10s	+46° 40.3'	14.0	08:54	18:08	03:23
NGC5204	Galaxy	UMa	13h 29m 36s	+58° 25.1'	11.3	Circum	18:10	Circum
M51	Galaxy	CVn	13h 29m 52s	+47° 11.7'	8.9	08:51	18:10	03:29
Arp85	Galaxy	CVn	13h 29m 58s	+47° 16.0'	9.6	08:50	18:10	03:30
NGC5182	Galaxy	Hya	13h 30m 41s	-28° 09.0'	13.0	13:34	18:11	22:47
NGC5214	Galaxy	CVn	13h 32m 49s	+41° 52.3'	14.0	09:35	18:13	02:51
M83	Galaxy	Hya	13h 37m 00s	-29° 51.8'	8.0	13:47	18:17	22:47
HR5144	Triple	Boo	13h 40m 40s	+19° 57.3'	5.8	11:20	18:21	01:22
NGC5283	Galaxy	Dra	13h 41m 06s	+67° 40.3'	14.0	Circum	18:21	Circum
M3	Globular	CVn	13h 42m 11s	+28° 22.5'	7.0	10:51	18:22	01:53
NGC5286	Globular	Cen	13h 46m 24s	-51° 22.0'	7.6	16:18	18:27	20:36
NGC5292	Galaxy	Cen	13h 47m 40s	-30° 56.4'	14.0	14:02	18:28	22:53
NGC5356	Galaxy	Vir	13h 54m 59s	+05° 20.0'	14.0	12:18	18:35	00:53
NGC5363	Galaxy	Vir	13h 56m 07s	+05° 15.2'	10.2	12:19	18:36	00:54
NGC5447	Neb	UMa	14h 02m 29s	+54° 16.3'		07:27	18:43	05:58
M101	Galaxy	UMa	14h 03m 13s	+54° 20.9'	8.2	07:24	18:43	06:03
NGC5461	Neb	UMa	14h 03m 42s	+54° 19.0'		07:26	18:44	06:02
NGC5485	Galaxy	UMa	14h 07m 11s	+55° 00.0'	11.5	Circum	18:47	Circum
NGC5460	Open	Cen	14h 07m 27s	-48° 20.6'	5.6	16:05	18:48	21:30
NGC5500	Galaxy	Boo	14h 10m 15s	+48° 32.7'	14.0	09:18	18:50	04:23
IC991	Galaxy	Vir	14h 17m 48s	-13° 52.3'	13.0	13:34	18:58	00:22
HR5362	DbI	Lup	14h 20m 10s	-43° 03.5'	5.6	15:36	19:00	22:24
IC4406	P Neb	Lup	14h 22m 26s	-44° 09.0'	11.0	15:46	19:03	22:19
HR5409	Triple	Vir	14h 28m 12s	-02° 13.6'	4.8	13:12	19:08	01:05
NGC5669	Galaxy	Boo	14h 32m 44s	+09° 53.4'	12.0	12:42	19:13	01:43
NGC5689	Galaxy	Boo	14h 35m 30s	+48° 44.5'	11.9	09:41	19:16	04:51
M102	Galaxy	Dra	15h 06m 30s	+55° 45.7'	10.8	Circum	19:47	Circum
NGC5875	Galaxy	Boo	15h 09m 13s	+52° 31.6'	13.0	09:21	19:49	06:18
NGC5907	Galaxy	Dra	15h 15m 54s	+56° 19.7'	11.4	Circum	19:56	Circum
NGC5882	P Neb	Lup	15h 16m 50s	-45° 38.9'	11.0	16:51	19:57	23:03
NGC5897	Globular	Lib	15h 17m 24s	-21° 00.6'	8.6	14:56	19:58	00:59
M5	Globular	Ser	15h 18m 33s	+02° 04.9'	7.0	13:50	19:59	02:07
Barnard228	DkNeb	Lup	15h 44m 00s	-34° 30.0'		16:14	20:24	00:35
IC4593	P Neb	Her	16h 11m 44s	+12° 04.3'	11.0	14:15	20:52	03:29
IC4592	Neb	Sco	16h 11m 59s	-19° 27.4'		15:46	20:52	01:59
M80	Globular	Sco	16h 17m 03s	-22° 58.5'	8.5	16:02	20:57	01:52
IC4601	Neb	Sco	16h 20m 18s	-20° 04.9'		15:56	21:01	02:05
Abell38	P Neb	Sco	16h 23m 17s	-31° 44.9'	11.7	16:41	21:03	01:26
M4	Globular	Sco	16h 23m 35s	-26° 31.5'	7.5	16:21	21:04	01:46

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
IC4603	Neb	Oph	16h 25m 24s	-24° 28.0'		16:16	21:06	01:55
IC4604	Neb	Oph	16h 25m 33s	-23° 26.5'		16:12	21:06	01:59
NGC6124	Open	Sco	16h 25m 36s	-40° 40.0'	5.8	17:27	21:06	00:45
Abell39	P Neb	Her	16h 27m 33s	+27° 54.5'	12.9	13:39	21:08	04:37
IC4605	Neb	Sco	16h 30m 12s	-25° 06.8'		16:23	21:10	01:58
NGC6153	P Neb	Sco	16h 31m 31s	-40° 15.2'	12.0	17:31	21:12	00:53
NGC6181	Galaxy	Her	16h 32m 21s	+19° 49.5'	11.9	14:12	21:13	04:13
NGC6171	Globular	Oph	16h 32m 32s	-13° 03.1'	8.1	15:47	21:13	02:39
NGC6178	Open	Sco	16h 35m 47s	-45° 38.6'	7.2	18:10	21:16	00:22
NGC6193	Open	Ara	16h 41m 18s	-48° 46.0'	5.2	18:43	21:22	00:00
NGC6205	Globular	Her	16h 41m 41s	+36° 27.5'	5.9	13:15	21:22	05:29
M13	Globular	Her	16h 41m 41s	+36° 27.5'	7.0	13:15	21:22	05:29
NGC6210	P Neb	Her	16h 44m 30s	+23° 48.0'	9.0	14:11	21:25	04:39
Barnard44a	DkNeb	Sco	16h 44m 45s	-40° 20.0'		17:44	21:25	01:06
NGC6204	Open	Ara	16h 46m 09s	-47° 01.0'	8.2	18:32	21:26	00:21
M12	Globular	Oph	16h 47m 14s	-01° 56.8'	8.0	15:30	21:27	03:25
NGC6231	Open	Sco	16h 54m 00s	-41° 48.0'	2.6	18:02	21:34	01:06
IC4628	Neb	Sco	16h 56m 58s	-40° 27.3'		17:57	21:37	01:17
NGC6254	Globular	Oph	16h 57m 09s	-04° 05.9'	6.6	15:46	21:37	03:29
Barnard47	DkNeb	Oph	16h 59m 42s	-22° 38.0'		16:44	21:40	02:36
M62	Globular	Oph	17h 01m 13s	-30° 06.7'	8.0	17:12	21:41	02:10
NGC6273	Globular	Oph	17h 02m 38s	-26° 16.0'	7.2	16:59	21:43	02:26
M19	Globular	Oph	17h 02m 38s	-26° 16.0'	8.5	16:59	21:43	02:26
Barnard51	DkNeb	Oph	17h 04m 44s	-22° 15.0'		16:48	21:45	02:42
IC4637	P Neb	Sco	17h 05m 10s	-40° 53.1'	14.0	18:08	21:45	01:23
Barnard56	DkNeb	Sco	17h 08m 48s	-32° 05.0'		17:28	21:49	02:10
Barnard59	DkNeb	Oph	17h 11m 23s	-27° 29.0'		17:13	21:52	02:31
NGC6302	P Neb	Sco	17h 13m 42s	-37° 06.0'	9.6	17:56	21:54	01:52
Barnard251	DkNeb	Oph	17h 13m 48s	-20° 09.0'		16:50	21:54	02:58
Barnard63	DkNeb	Oph	17h 16m 00s	-21° 28.0'		16:56	21:56	02:56
M92	Globular	Her	17h 17m 07s	+43° 08.1'	7.5	13:11	21:57	06:44
M9	Globular	Oph	17h 19m 12s	-18° 31.0'	9.0	16:50	21:59	03:09
NGC6326	P Neb	Ara	17h 20m 46s	-51° 45.2'	12.0	19:57	22:01	00:05
Barnard256	DkNeb	Oph	17h 22m 12s	-28° 49.0'		17:28	22:02	02:36
Barnard67a	DkNeb	Oph	17h 22m 30s	-21° 53.0'		17:04	22:03	03:01
Barnard71	DkNeb	Oph	17h 23m 02s	-24° 00.0'		17:12	22:03	02:55
NGC6357	Neb	Sco	17h 24m 43s	-34° 12.1'		17:53	22:05	02:17
IC4651	Open	Ara	17h 24m 52s	-49° 56.5'	6.9	19:39	22:05	00:31

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Abell41	P Neb	Ser	17h 29m 04s	-15° 13.3'	13.9	16:50	22:09	03:29
Abell42	P Neb	Oph	17h 31m 31s	-08° 19.1'	14.6	16:32	22:12	03:51
Barnard78	DkNeb	Oph	17h 32m 00s	-25° 35.0'		17:26	22:12	02:58
NGC6388	Globular	Sco	17h 36m 17s	-44° 44.1'	6.9	19:04	22:16	01:29
M14	Globular	Oph	17h 37m 36s	-03° 14.7'	9.5	16:24	22:18	04:12
M14	Globular	Oph	17h 37m 36s	-03° 14.7'	9.5	16:24	22:18	04:12
Barnard276	DkNeb	Oph	17h 39m 39s	-19° 49.0'		17:15	22:20	03:25
NGC6405	Open	Sco	17h 40m 20s	-32° 15.2'	4.2	18:00	22:21	02:41
M6	Open	Sco	17h 40m 20s	-32° 15.2'	4.5	18:00	22:21	02:41
NGC6397	Globular	Ara	17h 40m 42s	-53° 40.0'	5.6	20:48	22:21	23:54
NGC6426	Globular	Oph	17h 44m 55s	+03° 10.1'	11.2	16:14	22:25	04:37
Barnard83a	DkNeb	Sgr	17h 45m 18s	-20° 00.0'		17:21	22:26	03:30
IC4665	Open	Oph	17h 46m 30s	+05° 39.0'	4.2	16:08	22:27	04:45
NGC6445	P Neb	Sgr	17h 49m 15s	-20° 00.6'	13.0	17:25	22:29	03:34
NGC6503	Galaxy	Dra	17h 49m 27s	+70° 08.6'	10.2	Circum	22:30	Circum
NGC6441	Globular	Sco	17h 50m 13s	-37° 03.0'	7.4	18:32	22:30	02:29
Barnard283	DkNeb	Sco	17h 51m 00s	-33° 52.0'		18:18	22:31	02:44
Barnard285	DkNeb	Ser	17h 51m 32s	-12° 52.0'		17:05	22:32	03:58
M7	Open	Sco	17h 53m 51s	-34° 47.6'	3.5	18:25	22:34	02:43
M7	Open	Sco	17h 53m 51s	-34° 47.6'	3.5	18:25	22:34	02:43
IC4670	Neb	Sgr	17h 55m 07s	-21° 44.6'		17:36	22:35	03:34
NGC6501	Galaxy	Her	17h 56m 04s	+18° 22.3'	12.3	15:40	22:36	05:32
M23	Open	Sgr	17h 57m 04s	-18° 59.1'	6.0	17:29	22:37	03:45
NGC6543	P Neb	Dra	17h 58m 36s	+66° 38.0'	8.1	Circum	22:39	Circum
NGC6496	Globular	Sco	17h 59m 04s	-44° 16.0'	9.2	19:24	22:39	01:55
Barnard291	DkNeb	Sgr	17h 59m 43s	-33° 53.0'		18:27	22:40	02:53
Barnard292	DkNeb	Sgr	18h 00m 34s	-33° 20.0'		18:25	22:41	02:56
Barnard293	DkNeb	Sgr	18h 01m 12s	-35° 20.0'		18:35	22:41	02:48
M20	Open+D Neb	Sgr	18h 02m 42s	-22° 58.2'	5.0	17:48	22:43	03:38
M8	Open+D Neb	Sgr	18h 03m 41s	-24° 22.7'	5.0	17:54	22:44	03:34
Barnard295	DkNeb	Sgr	18h 04m 05s	-31° 09.0'		18:20	22:44	03:09
M21	Open	Sgr	18h 04m 13s	-22° 29.3'	7.0	17:48	22:44	03:41
NGC6530	Open	Sgr	18h 04m 31s	-24° 21.5'	4.6	17:54	22:45	03:35
NGC6528	Globular	Sgr	18h 04m 50s	-30° 03.3'	9.5	18:16	22:45	03:14
IC4684	Neb	Sgr	18h 09m 08s	-23° 26.1'		17:56	22:49	03:43
IC4685	Neb	Sgr	18h 09m 18s	-23° 59.2'		17:58	22:49	03:41
Barnard303	DkNeb	Sgr	18h 09m 28s	-23° 59.0'		17:58	22:50	03:41
IC1274	Neb	Sgr	18h 09m 51s	-23° 38.8'		17:57	22:50	03:43
IC1275	Neb	Sgr	18h 10m 07s	-23° 45.7'		17:58	22:50	03:43
NGC6572	P Neb	Oph	18h 12m 06s	+06° 51.2'	9.0	16:30	22:52	05:14
NGC6567	P Neb	Sgr	18h 13m 45s	-19° 04.5'	12.0	17:46	22:54	04:02
IC4701	Neb	Sgr	18h 16m 36s	-16° 38.0'		17:42	22:57	04:12
Barnard93	DkNeb	Sgr	18h 16m 53s	-18° 03.0'		17:46	22:57	04:08
IC1284	Neb	Sgr	18h 17m 39s	-19° 40.3'		17:52	22:58	04:04

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M24	Open	Sgr	18h 18m 26s	-18° 24.3'	4.5	17:49	22:59	04:08
M16	Open+D Neb	Ser	18h 18m 48s	-13° 48.3'	6.5	17:35	22:59	04:23
Barnard308	DkNeb	Sgr	18h 19m 08s	-22° 14.0'		18:02	22:59	03:57
M18	Open	Sgr	18h 19m 58s	-17° 06.1'	8.0	17:46	23:00	04:14
M17	Open+D Neb	Sgr	18h 20m 47s	-16° 10.3'	7.0	17:44	23:01	04:18
HR6923	Mult	Dra	18h 23m 54s	+58° 48.0'	5.0	Circum	23:04	Circum
NGC6626	Globular	Sgr	18h 24m 33s	-24° 52.1'	6.9	18:16	23:05	03:53
M28	Globular	Sgr	18h 24m 33s	-24° 52.1'	8.5	18:16	23:05	03:53
Barnard95	DkNeb	Sct	18h 25m 35s	-11° 44.0'		17:36	23:06	04:36
Barnard97	DkNeb	Sct	18h 29m 05s	-09° 55.0'		17:34	23:09	04:44
Abell44	P Neb	Sgr	18h 30m 11s	-16° 45.4'	12.6	17:56	23:10	04:25
NGC6637	Globular	Sgr	18h 31m 23s	-32° 20.8'	7.7	18:52	23:12	03:31
IC1287	Neb	Sct	18h 31m 26s	-10° 47.7'		17:39	23:12	04:44
M25	Open	Sgr	18h 31m 42s	-19° 07.0'	6.5	18:04	23:12	04:19
IC4725	Open	Sgr	18h 31m 48s	-19° 06.7'	4.6	18:04	23:12	04:20
NGC6642	Globular	Sgr	18h 31m 54s	-23° 28.5'	8.8	18:19	23:12	04:05
NGC6644	P Neb	Sgr	18h 32m 35s	-25° 07.7'	12.0	18:25	23:13	04:00
NGC6647	Open	Sgr	18h 32m 49s	-17° 13.6'	8.0	18:00	23:13	04:26
IC4732	P Neb	Sgr	18h 33m 55s	-22° 38.6'	13.0	18:18	23:14	04:10
M22	Globular	Sgr	18h 36m 24s	-23° 54.2'	6.5	18:25	23:17	04:08
NGC6656	Globular	Sgr	18h 36m 24s	-23° 54.2'	5.1	18:25	23:17	04:08
IC4756	Open	Ser	18h 38m 54s	+05° 27.0'	5.0	17:01	23:19	05:37
NGC6681	Globular	Sgr	18h 43m 12s	-32° 17.4'	8.1	19:03	23:23	03:43
NGC6694	Open	Sct	18h 45m 18s	-09° 23.0'	8.0	17:49	23:26	05:02
IC4776	P Neb	Sgr	18h 45m 51s	-33° 20.5'	12.0	19:11	23:26	03:42
Barnard318	DkNeb	Sct	18h 49m 42s	-06° 23.0'		17:45	23:30	05:15
M11	Open	Sct	18h 51m 05s	-06° 16.2'	7.0	17:46	23:31	05:17
M11	Open	Sct	18h 51m 05s	-06° 16.1'	7.0	17:46	23:31	05:17
M57	P Neb	Lyr	18h 53m 35s	+33° 01.7'	9.5	15:43	23:34	07:24
M57	P Neb	Lyr	18h 53m 35s	+33° 01.7'	9.5	15:43	23:34	07:24
Barnard117	DkNeb	Sct	18h 53m 43s	-07° 24.0'		17:52	23:34	05:16
NGC6715	Globular	Sgr	18h 55m 03s	-30° 28.7'	7.7	19:08	23:35	04:03
NGC6717	Globular	Sgr	18h 55m 06s	-22° 42.0'	9.2	18:39	23:35	04:31
Barnard122	DkNeb	Sct	18h 56m 48s	-04° 45.0'		17:47	23:37	05:27
Barnard123	DkNeb	Sct	18h 57m 39s	-04° 43.0'		17:48	23:38	05:28
NGC6723	Globular	Sgr	18h 59m 33s	-36° 37.9'	7.3	19:39	23:40	03:40
Barnard128	DkNeb	Aql	19h 01m 40s	-04° 34.0'		17:52	23:42	05:32
NGC6729	BrNeb	CrA	19h 01m 54s	-36° 57.0'		19:43	23:42	03:41
Barnard326	DkNeb	Aql	19h 03m 00s	-00° 23.0'		17:42	23:43	05:45
NGC6749	Globular	Aql	19h 05m 15s	+01° 54.0'	11.1	17:37	23:45	05:53

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