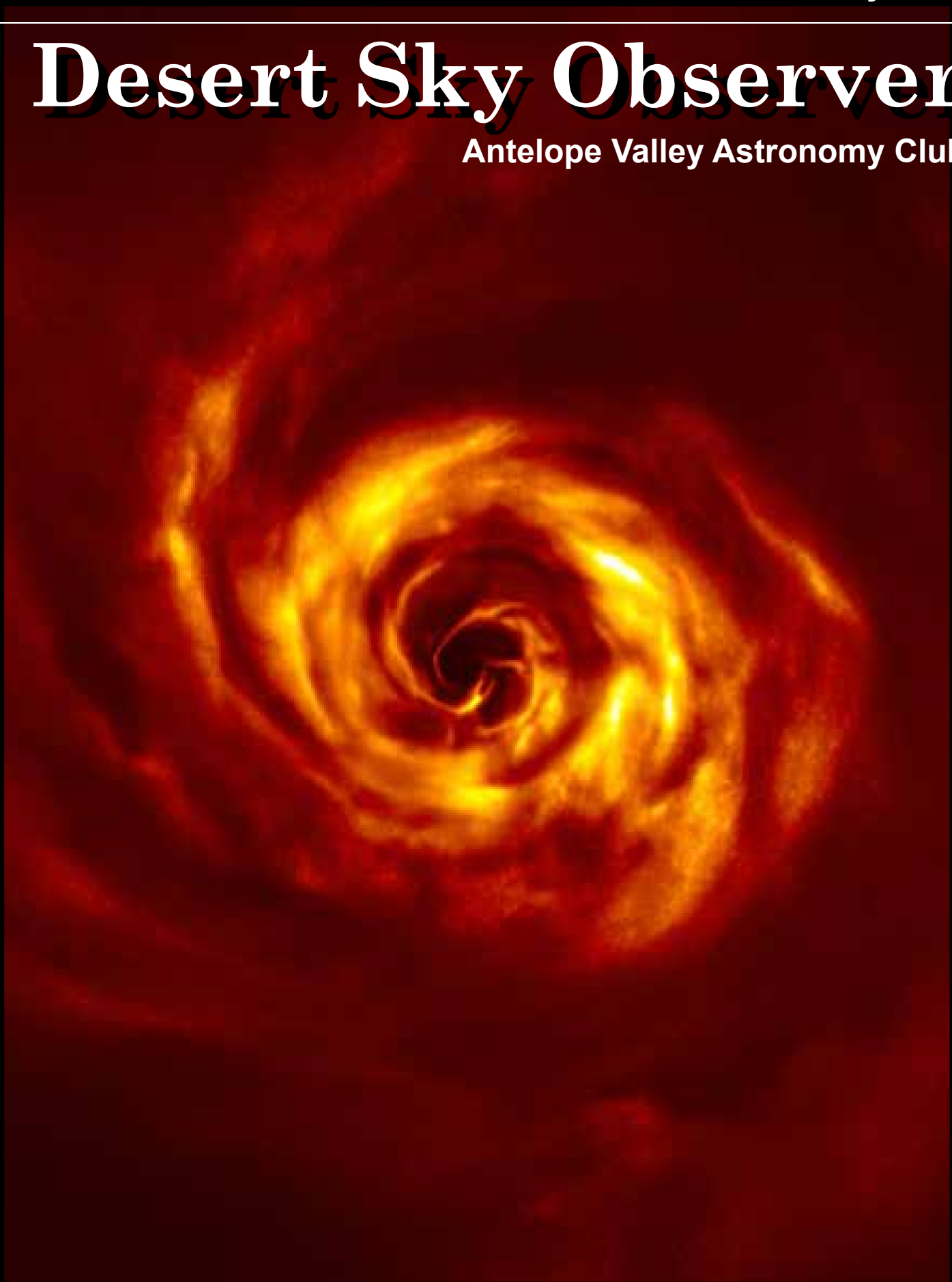
Volume 41.5 May 2021

Desert Sky Observer

Antelope Valley Astronomy Club



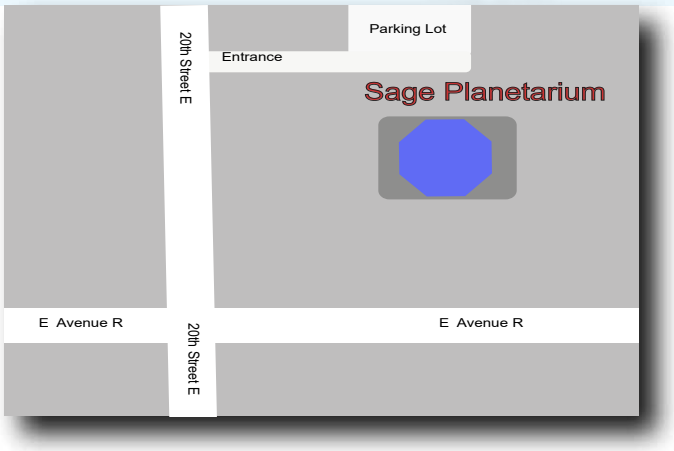
Upcoming Events

May 8: Deep Sky Star Party
May 14: Club Meeting -- Zoom
May 15: Lunar Club
May 26: Lunar Eclipse

Any clear night: Personal Star Party

June 11: Club Meeting -- Zoom?
June 12 Deep Sky Star Party

AVAC Calendar



Board Members

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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

www.avastronomyclub.org
ANTELOPE VALLEY
ASTRONOMY CLUB, INC.

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

Hello Everyone,

Well, it's May and the weather is getting warmer but there is still a lot of wind and it is not worth setting up my telescope in my backyard. I want to get in at least one more observation of one of my favorite objects, M42 in the constellation Orion, before it's gone.

In April, we had our Messier Marathon at Chuchupate. I got there early to set up my telescope, table and put the club banner on my truck. About 7 club members showed up and the place was empty. Usually the parking lot is full of people from other clubs, but not this time. We had the entire place to ourselves; maybe because the weather wasn't that great. A lot of high clouds and a little cold after the sun went down. Most of us left around 11:00pm.

On May 8th we will be back at Chuchupate for our Dark Sky Party, hoping the weather will be much better. On May 15th we will be doing our Lunar Star Party at Judy's house in Antelope Acres. This is a club member event only. Unfortunately, I will not be there. I'll be in Texas for my granddaughter's first birthday.

I am still waiting to hear back from the State Parks about Saddleback Butte group campsite for June 12th. I sent Caroline a second email about it. As soon as I hear back we will send out an email with details.

Hope to see you at Chuchupate for the next Dark Sky Party.

Until then, keep looking up and if you see any UFO's call Matt.

Darrell

On The Cover

This image shows the disc around the young AB Aurigae star, where ESO's Very Large Telescope (VLT) has spotted signs of planet birth. Close to the centre of the image, in the inner region of the disc, we see the 'twist' (in very bright yellow) that scientists believe marks the spot where a planet is forming. This twist lies at about the same distance from the AB Aurigae star as Neptune from the Sun.

The image was obtained with the VLT's SPHERE instrument in polarised light.

Credit: ESO/Boccaletti et al.

[Ed. AB Aurigae is aka HIP22910, HD31293]

From the Secretary

By Rose Moore

Members:

Our first event for May will be our dark sky star party on Saturday May 8th. This event will be held at Chuchupate, and you can arrive any time on Saturday. More information will be in an email a few days before the event. Weather permitting.

Friday May 14th will be a club Zoom meeting. We will let everyone know what is being planned, if we have a speaker, and information for accessing the meeting.

We will be having a Lunar Club meeting at Judy Fuentes' home on Saturday May 15th. The Moon will be a waxing crescent of about 15%, and will be up till 11:40pm. Sunset is at 7:50pm. You may arrive anytime after 6:30pm. Further info and directions will be sent out in an email. Weather permitting.

A total lunar eclipse is occurring on May 26th, Wednesday. We do not have an event scheduled for this due to the time of the eclipse. The penumbra begins at 1:47am, partial eclipse begins at 2:44am, totality begins at 4:11am, maximum is at 4:18am. If you are going to observe this, and want to write about it for the DSO, please submit it to our Editor, Phil, for June's DSO. You may also submit pictures.

Clear skies! Rose

AVAC Membership Renewal

Please remember that when we are able to have our monthly meetings again that our meetings are open to the public and all will be welcome. So, if for any reason you are unable to renew your membership you are still welcome to attend and we look forward to seeing you all again.

The easiest way to renew your membership is through the AVAC website via our PayPal account. But you can still renew using a check via the club's Post Office Box:

Antelope Valley Astronomy Club
PO BOX 8545
Lancaster, CA 93539-8545

Club's Trailer For Sale

The Executive Board has decided that the Club's trailer is no longer needed. The last active use for the trailer was to store members scopes overnight at the Poppy Festival, and lately has been storing a few boxes of club records. It's believed to be a 6x10 single axle cargo van. Contact Darrel for more info...

The Astronomical League - Lunar Observing Program

The original and complete program is described at:
https://www.astroleague.org/al/obsclubs/lunar/lunar1.html

Introduction

Welcome to the Astronomical League's Lunar Program. The Lunar Program introduces amateur astronomers to that object in the sky that most of us take for granted, and which deep sky observers have come to loathe. But even though deep sky observers search for dark skies (when the moon is down), this program gives them something to do when the moon is up. In other words, it gives us something to observe the rest of the month, and we all know that the sky is always clear when the moon is up.

The Lunar Program also allows amateurs in heavily light polluted areas to participate in an observing program of their own. This program is well suited for the young, inexperienced observer as well as the older observer just getting into our hobby since no special observing skills are required. It is well balanced because it develops naked eye, binocular, and telescopic observing skills. Finally, the Lunar Program was created as a project that can easily be done by schools and school children, especially those in the inner city

Quick View of Requirements Lunar Observing Program	
Tools Used (Eyes (E), Binoculars (B), Telescopes (T))	E / B / T
Manual (M) / Device Aided (DA)	M
Remote Telescopes Allowed	No
Visual (V) / Imaging (I)	V / I
Number of Levels	1
Number of Observations	100
Must be an AL Member	Yes
Recommended Minimum Instrument Size	2 inch
Date Deadline for Submission	No
Special Equipment Required	No
Equipment Must Be Constructed	No
Observations Must Be Submitted to an On-Line Database	No

Lunar Binocular Certification: There is a partial certification available for the Lunar Observing Program. For those completing the Naked-Eye and Binocular requirements a certificate is available. It is suitable to meet the requirements of the Binocular Master Observer Award. No telescope observations may be included in the Binocular Lunar Certification.

Lunar Imaging Certification: It is also now possible to earn your Lunar certification through imaging. The list of requirements is the same. You need to use the log to record dates and times when you imaged the features. The images can be submitted, but it is preferred that you post them on a website and include the website address in your submission. The images should include information on the exposures and the number of images that were stacked. Each image should indicate the specific feature(s). More than one feature may be included on the same image as long as they are all clearly visible and indicated. You may do this certification both ways and receive two certificates, but only one pin will be awarded.

Requirements and Rules

This certification is available to members of the Astronomical League, either through their local astronomical society or as members at large. If you are not a member and would like to become one, check with your local astronomical society, search for a local society on the Astronomical League Website, or join as a member-at-large.

To qualify for the AL's Lunar Observing Program certificate and pin, observe 100 features on the moon. These 100 features are broken down into three groups: 18 naked eye, 46 binocular, and 36 telescopic features. Any pair of binoculars and any telescope may be used for this program. As a matter of fact, to prove that the Lunar Program could be done with small apertures, we used 7x35 binoculars and a 60mm refractor. So, as you can see, this program does not require expensive equipment. Also, if you have problems with observing the features at one level, you may go up to the next higher level. In other words, if you have trouble with any of the naked eye objects, you may jump up to binoculars. If you have trouble with any of the binocular objects, then you may move up to a telescope. But if you have trouble with any of the telescopic objects, you are on your own. You will have to arrange your own time on the Hubble Space Telescope. Before moving up to the next higher level, please try to get as many objects as you can with the instrument required at that level. Finally, when using binoculars, we recommend that you tripod mount them for stability.

Observation Requirements	
Lunar Observing Program	
Object Name/Number	Yes
Observer's Latitude	Yes
Observer's Longitude	Yes
Date of Observation (LT or UT)	Yes
Time of Observation (LT or UT)	Yes
For Visual Observations:	
Seeing	Yes
Transparency	Yes
For Imaging Observations:	
Camera Used	Yes
Image Details	Yes
Image of Object	Yes

Logging Your Observations

We have made it as simple as possible to log your observations. Just list the instruments that you used where requested at the top of pages of the checklist, check off the features as you observe them in the "CHK" column, and then list the date, time, seeing, transparency, latitude, and longitude for when you observed the feature in the columns on the right-hand side of the checklist. That is all there is to it.

For information on which lunar features to observe, review the Lunar Observing Program (pdf file or Excel file).

For those of you that still may have some trouble observing the 100 original features of the program, we have included 10 optional activities on the last page of the checkist. Each one optional activity counts as two of the standard observations , and may be substituted for those observations.

If you would like a good recommendation for a lunar map to use with this program, we suggest, for those of you on a budget, "Moon Map" (#59198X) by Sky Publishing Corp.. Sky Publishing Corp. can be reached at (888) 253-0230.

Lunar Observing Program Observation log (pdf file)

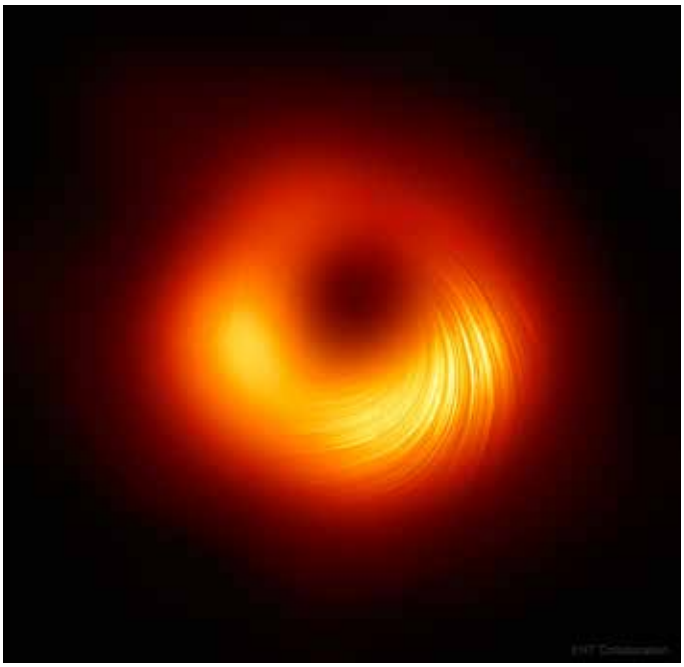
Virgo's Galactic Harvest by David Prosper, NASA Night Sky Network

May is a good month for fans of galaxies, since the constellation Virgo is up after sunset and for most of the night, following Leo across the night sky. Featured in some ancient societies as a goddess of agriculture and fertility, Virgo offers a bounty of galaxies as its celestial harvest for curious stargazers and professional astronomers alike.

Virgo is the second-largest constellation and largest in the Zodiac, and easily spotted once you know how to spot Spica, its brightest star. How can you find it? Look to the North and start with the Big Dipper! Follow the general curve of the Dipper's handle away from its "ladle" and towards the bright orange-red star Arcturus, in Boötes – and from there continue straight until you meet the next bright star, Spica! This particular star-hopping trick is summed up by the famous phrase, "arc to Arcturus, and spike to Spica."

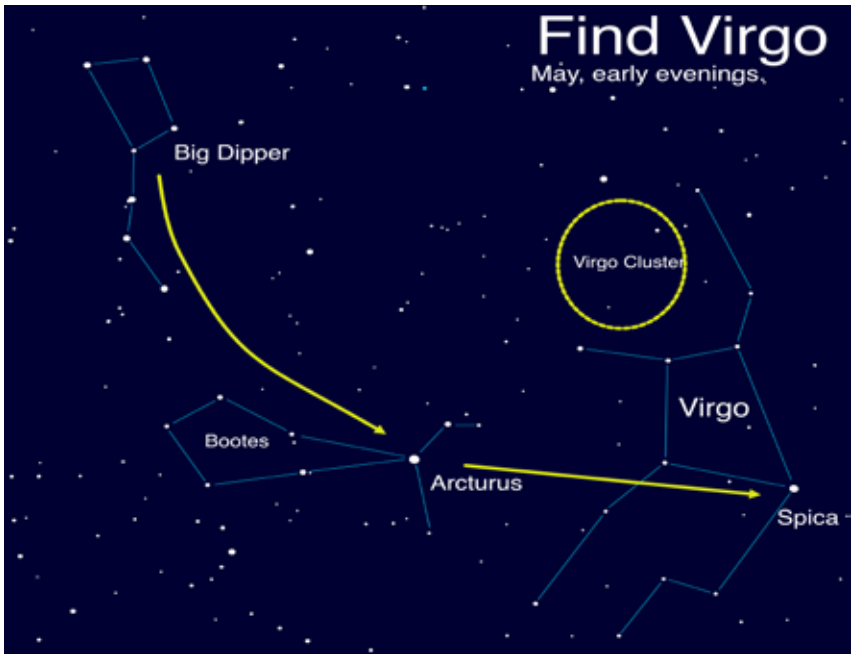
This large constellation is home to the Virgo Cluster, a massive group of galaxies. While the individual stars in Virgo are a part of our own galaxy, known as the Milky Way, the Virgo Cluster's members exist far beyond our own galaxy's borders. Teeming with around 2,000 known members, this massive group of galaxies are all gravitationally bound to each other, and are themselves members of the even larger Virgo Supercluster of galaxies, a sort of "super-group" made up of groups of galaxies. Our own Milky Way is a member of the "Local Group" of galaxies, which in turn is also a member of the Virgo Supercluster! In a sense, when we gaze upon the galaxies of the Virgo Cluster, we are looking at some of our most distant cosmic neighbors. At an average distance of over 65 million light years away, the light from these galaxies first started towards our planet when the dinosaurs were enjoying their last moments as Earth's dominant land animals! Dark clear skies and a telescope with a mirror of six inches or more will reveal many of the cluster's brightest and largest members, and it lends itself well to stunning astrophotos.

Virgo is naturally host to numerous studies of galaxies and cosmological research, which have revealed much about the structure of our universe and the evolution of stars and galaxies. The "Universe of Galaxies" activity can help you visualize the scale of the universe, starting with our home in the Milky Way Galaxy before heading out to the Local Group, Virgo Cluster and well beyond! You can find it at bit.ly/universeofgalaxies. You can further explore the science of galaxies across the Universe, along with the latest discoveries and mission news, at nasa.gov.



The first image of a black hole's event horizon was taken in the center of one of the most prominent galaxies in Virgo, M87! This follow up image, created by further study of the EHT data, reveals polarization in the radiation around the black hole. Mapping the polarization unveils new insights into how matter flows around and into the black hole - and even hints at how some matter escapes! More details: apod.nasa.gov/apod/ap210331.html

Credit: Event Horizon Telescope Collaboration



Find Virgo by "arcing to Arcturus, then spiking on to Spica." Please note that in this illustration, the location of the Virgo Cluster is approximate - the borders are not exact.

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!

Space News

News from around the Net

China Launches First Section Of Its New Space Station

A Long March 5B rocket roared to life over the Wenchang Space Launch Centre late last night, carrying the core module, named Tianhe (meaning "harmony in the heavens" in Chinese), for China's modular Tiangong 3 space station. The launch occurred at 11: 23 p.m. EDT / 3:23 Universal Time (UT). China later confirmed that the 22.5-ton Tianhe module had successfully reached orbit. . . .. (continued at https://skyandtelescope.org/astronomy-news/china-launches-first-section-space-station-tiangong/)

7 Easy Things To See On The "Supermoon"

The night of April 26th will feature a full Moon. You may hear it called a "supermoon," though that's not a technical term, just a common expression to describe when a full Moon coincides with perigee, when the Moon comes nearest Earth in its nearly round orbit. Whether the effect is noticeable is debatable, but why not take advantage of it? To get you started, here's a list of seven fun — and easy — targets to explore. . . continued at https://skyandtelescope.org/observing/7-easy-things-to-see-on-the-supermoon/)

Blue Origin will start selling seats on its New Shepard spacecraft next week

Blue Origin is about to start selling seats on its New Shepard suborbital spacecraft. "It's time. You can buy the very first seat on #NewShepard. Sign up to learn how at http://blueorigin.com. Details coming May 5th. #GradatimFerociter," the company, which is run by Amazon.com founder Jeff Bezos, said via Twitter today (April 29). ("Gradatim Ferociter" is Blue Origin's motto. It means "step by step, ferociously.") . . . .(continued at https://www.space.com/blue-origin-new-shepard-spaceflight-ticket-sales)

Mars helicopter Ingenuity misses takeoff for 4th flight on Red Planet

NASA's Mars helicopter Ingenuity was supposed to get a real workout this morning (April 29), but things didn't go as planned. The 4-lb. (1.8 kilograms) chopper was scheduled to lift off from the floor of Mars' Jezero Crater today around 10:12 a.m. EDT (1412 GMT), kicking off its fourth flight on the Red Planet. That didn't happen. "Aim high, and fly, fly again. (continued at https://www.space.com/mars-helicopter-ingenuity-fourth-flight-glitch)

Hubble Celebrates 31st Birthday with Giant Star on the Edge of Destruction

n celebration of the 31st anniversary of the launching of the NASA/ESA Hubble Space Telescope, astronomers aimed the celebrated observatory at one of the brightest stars seen in our galaxy to capture its beauty. The giant star featured in this latest Hubble Space Telescope anniversary image is waging a tug-of-war between gravity and radiation to avoid self-destruction. The star, called AG Carinae, is surrounded by an expanding shell of gas and dust — a nebula — that is shaped by the powerful winds of the star. The nebula is about five light-years wide, which equals the distance from here to our nearest star, Alpha Centauri. (continued at https://esahubble.org/news/heic2105/)

Space News

News from around the Net

Black Hole Pairs Found in Distant Merging Galaxies

Astronomers have found two close pairs of quasars in the distant Universe. Follow-up observations with Gemini North spectroscopically resolved one of the distant quasar pairs, after their discovery with the Hubble Space Telescope and Gaia spacecraft. These quasars are closer together than any pair of quasars found so far away, providing strong evidence for the existence of supermassive black hole pairs as well as crucial insight into galaxy mergers in the early Universe. The quasars in each of the two pairs are separated by just over 10,000 light-years, ...(continued at https://noirlab.edu/public/news/noirlab2113/?lang)

New telescope at ESO's La Silla joins effort to protect Earth from risky asteroids

Part of the world-wide effort to scan and identify near-Earth objects, the European Space Agency's Test-Bed Telescope 2 (TBT2), a technology demonstrator hosted at ESO's La Silla Observatory in Chile, has now started operating. Working alongside its northern-hemisphere partner telescope, TBT2 will keep a close eye on the sky for asteroids that could pose a risk to Earth, testing hardware and software for a future telescope network. . . . (continued at https://www.eso.org/public/news/eso2107/)

Black hole-neutron star collisions may help settle dispute over Universe's expansion

Studying the violent collisions of black holes and neutron stars may soon provide a new measurement of the Universe's expansion rate, helping to resolve a long-standing dispute, suggests a new simulation study led by researchers at UCL (University College London). Our two current best ways of estimating the Universe's rate of expansion - measuring the brightness and speed of pulsating and exploding stars, and looking at fluctuations in radiation from the early Universe - give very different answers, suggesting our theory of the Universe may be wrong. . . . (continued at https://www.sciencedaily.com/releases/2021/04/210428102421.htm)

Proxima Centauri Releases Powerful Flare

Proxima Centauri b may be the closest planet outside our solar system, but it's probably an unpleasant place to visit. Red dwarf stars like the host star of this system are active in their youth — and not in a good way. High-energy particles and radiation from Proxima Centauri likely stripped the planet of its atmosphere long ago. But Proxima Centauri defies expectations even for red dwarfs. Even though the star is nearing middle age, it's still acting the spring chicken, literally radiating with the energy of youth. . . . (continued at https://skyandtelescope.org/astronomy-news/proxima-centauri-releases-powerful-flare/)

Millions Of Lonely Black Holes Are In Our Galaxy. Here's How We'll Find Some Of Them.

How many black holes are there in our galaxy? We don't know. But we can make a decent guess: We know the kinds of stars that make black holes (massive stars that explode at the ends of their lives), we know how many of those kinds of stars are born over time, and we know how old the galaxy is. Putting that all together and doing the math, you get that the galaxy may have ten million black holes in it.. . . (continued at https://www.syfy.com/syfywire/millions-of-lonely-black-holes-are-in-our-galaxy-heres-how-well-find-some-of-them)

Dark Sky Observing Sites

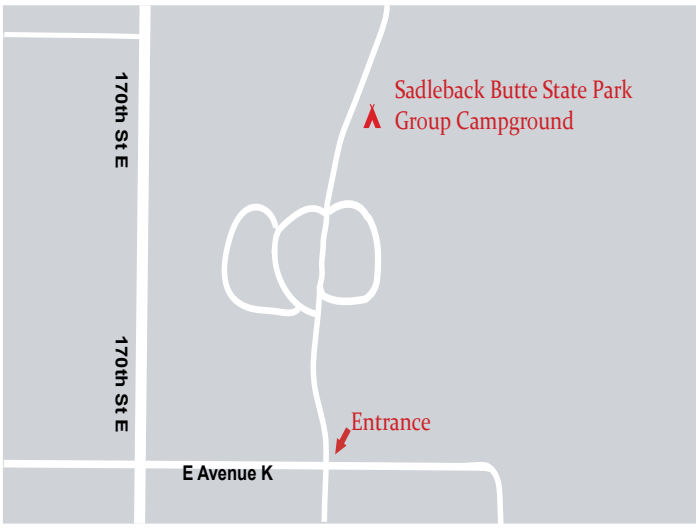
The Chuchupate parking lot is a half a mile beyond the Mt Pinos ranger station (on some maps The Chuchupate Ranger Sta., the parking lot is also called Frazier Mountain trailhead).

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.

Saddleback Butte State Park is east of 170th Street East between Avenue I and Avenue K. Elevation 3651 feet. Temperatures in summer average 95° with a high of 115,° winter average lows are 33° with occasional snow. There are 37 individual campsites and one group campsite. When the club has a star party there the group campsite is used. Individual campsites cost $20 per night. Enter off Avenue K.



Planet Summary

The **Sun** starts May in Aries and crosses into Taurus by the end of the month.

Mercury starts the month separating itself each evening from the Sun, achieving its greatest eastern elongation of 22° on the 17th. On the evening of the 28th a close conjunction with Venus, just 0.4°'of separation. On the evening of the 13th the 4% waxing Moon slips 2° to the south.

Venus starts the month in Aries spending the evenings slowly increasing its elongation from the Sun, ending the month at the eastern edge of Taurus at a mag of -3.91. On the evening of the 12th the 1.5% waxing Moon will pass 1.5° south-east.

Mars spends the month in Gemini slowly moving east. Later in the month it forms a temporary triplet along with Pollux and Castor. On the 15th the 17% waxing Moon passes 1° north.

Jupiter continues its prograde motion among the stars of western Aquarius. The 42% waning Moon passes 5° to the south in the early morning of the 4th and 5th.

Saturn spends the month among the stars of Capricorn. On the 23rd Saturn reaches its first stationary point, after which it begins its 4+ month retrograde motion. The 55% Moon passes almost 7° south in the early morning of the 3rd, and once again the 78 % Moon passes 10° on the 30th.

Uranus starts the month rising before the Sun following its Solar conjunction on April 30. The almost new Moon flies past mid-morning of the 11th. Uranus continues moving east in central Aries for the next several months.

Neptune will spend the month moving east in northeast Aquarius at mag 7.9. The 6% waning Moon will pass 5° south the morning of the 3th.

Pluto spends the month slowing moving west in Sagittarius at mag 14.3.

Sun and Moon Rise and Set

First Qtr May 19 | Full May 26 | Third Qtr May 3 | New May 11

Sun and Moon Rise and Set*

Date	Moonrise	Moonset	Sunrise	Sunset
5/1/2021	00:12	10:00	06:02	19:37
5/5/2021	03:13	14:15	05:58	19:41
5/10/2021	05:28	18:58	05:53	19:45
5/15/2021	08:32	23:37	05:49	19:48
5/20/2021	13:32	02:20	05:46	19:52
5/25/2021	19:24	05:07	05:43	19:56
5/30/2021	23:35	09:55	05:41	19:59

Planet Data*

May 1

	Rise	Transit	Set	Mag	Phase%
Mercury	06:41	13:45	20:51	-1.05	80.1
Venus	06:34	13:28	20:23	-3.91	98.6
Mars	09:18	16:35	23:52	1.56	93.5
Jupiter	02:51	08:17	13:44	-2.27	99.0
Saturn	02:05	07:17	12:29	0.70	99.7

May 15

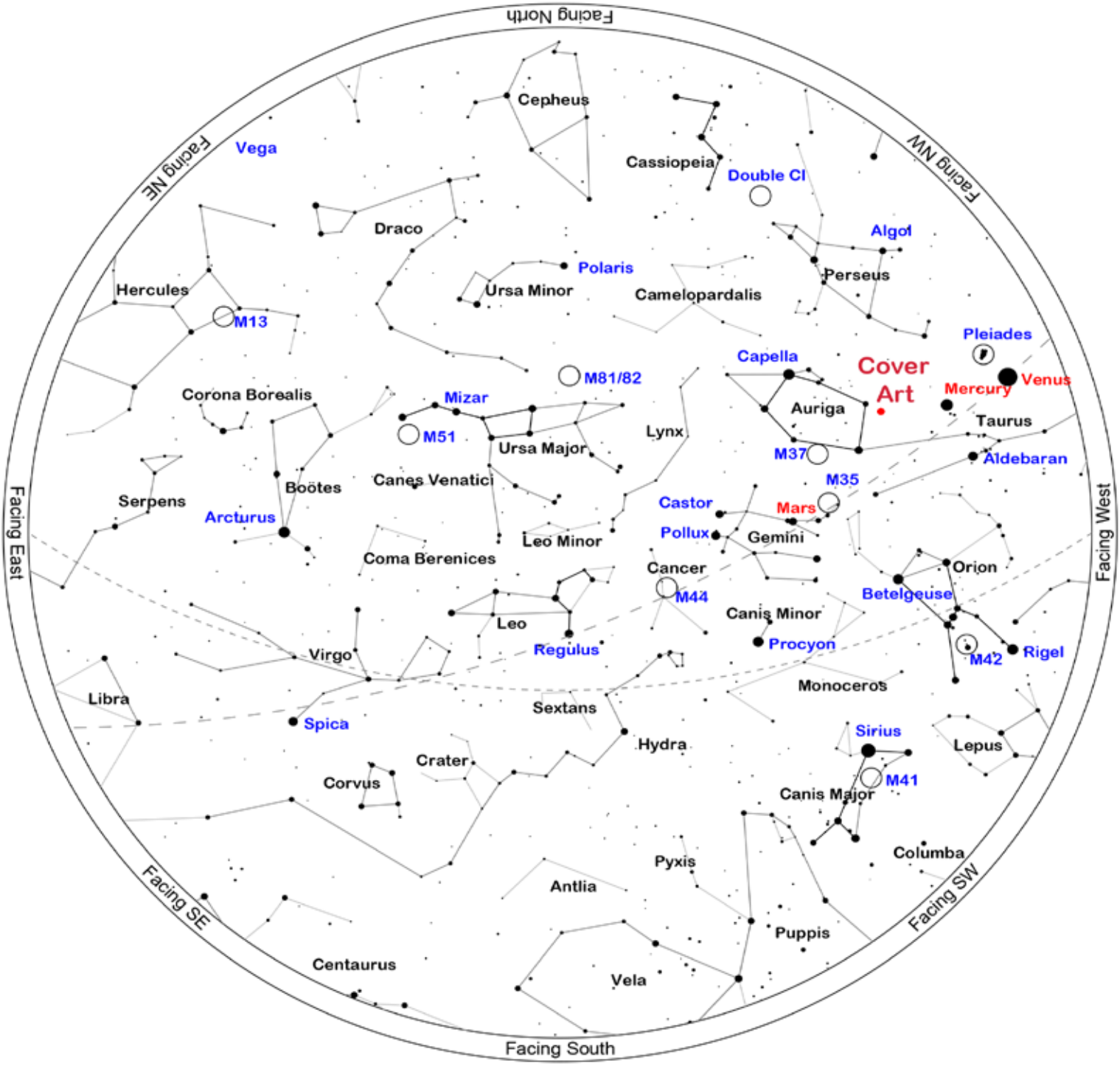
	Rise	Transit	Set	Mag	Phase%
Mercury	07:01	14:20	21:40	0.34	39.5
Venus	06:36	13:44	20:54	-3.91	97.3
Mars	09:03	16:17	23:32	1.63	94.4
Jupiter	02:01	07:29	12:57	-2.37	99.0
Saturn	01:11	06:23	11:35	0.65	99.7

May 30

	Rise	Transit	Set	Mag	Phase%
Mercury	06:44	13:55	21:06	2.67	8.92
Venus	06:48	14:04	21:20	-3.91	95.4
Mars	08:47	15:58	23:08	1.73	95.4
Jupiter	01:02	06:31	12:04	-2.47	99.0
Saturn	00:08	05:20	10:36	0.57	99.7.

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

Sky Chart



Location: Palmdale, CA 93551
Latitude: 34° 36' N, longitude: 118° 11' W
Time: 2021 May 8, 20:00 (UTC -07:00)

Powered by: Heavens-Above.com

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 May 8, 2021. The list is sorted by the transit time of the object.

ID	Type		RA	Dec	Mag	Rise	Transit	Set
Barnard1	DkNeb	Per	03h 32m 57s	+31° 09.0'		05:42	13:25	21:08
Barnard2	DkNeb	Per	03h 33m 31s	+32° 19.0'		05:37	13:25	21:13
Barnard3	DkNeb	Per	03h 40m 01s	+31° 58.0'		05:45	13:32	21:18
NGC1407	Galaxy	Eri	03h 40m 12s	-18° 34.8'	9.8	08:23	13:32	18:41
IC347	Galaxy	Eri	03h 42m 32s	-04° 17.9'	13.0	07:44	13:34	19:25
NGC1448	Galaxy	Hor	03h 44m 32s	-44° 38.6'	11.0	10:25	13:36	16:48
IC348	Open	Per	03h 44m 34s	+32° 09.7'	7.3	05:49	13:36	21:24
M45	Open	Tau	03h 47m 30s	+24° 07.0'	1.6	06:24	13:39	20:55
Barnard5	DkNeb	Per	03h 47m 53s	+32° 53.0'		05:49	13:40	21:30
NGC1461	Galaxy	Eri	03h 48m 27s	-16° 23.5'	11.7	08:25	13:40	18:56
IC353	Neb	Tau	03h 53m 00s	+25° 48.0'		06:23	13:45	21:07
IC2003	P Neb	Per	03h 56m 22s	+33° 52.5'	13.0	05:53	13:48	21:43
NGC1499	Neb	Per	04h 03m 14s	+36° 22.0'		05:48	13:55	22:02
NGC1515	Galaxy	Dor	04h 04m 03s	-54° 06.0'	11.0	12:36	13:56	15:16
NGC1496	Open	Per	04h 04m 32s	+52° 39.7'	10.0	03:22	13:56	00:31
NGC1502	Open	Cam	04h 07m 50s	+62° 19.8'	5.7	Circum	14:00	Circum
IC360	Neb	Tau	04h 09m 00s	+26° 06.0'		06:38	14:01	21:24
NGC1514	P Neb	Tau	04h 09m 17s	+30° 46.5'	10.0	06:20	14:01	21:42
NGC1513	Open	Per	04h 09m 57s	+49° 30.8'	8.4	04:16	14:02	23:47
IC359	Neb	Tau	04h 12m 28s	+27° 42.1'		06:35	14:04	21:33
NGC1535	P Neb	Eri	04h 14m 16s	-12° 44.3'	10.0	08:39	14:06	19:33
Barnard10	DkNeb	Tau	04h 18m 41s	+28° 16.0'		06:39	14:11	21:42
NGC1545	Open	Per	04h 20m 57s	+50° 15.2'	6.2	04:18	14:13	00:08
NGC1569	Galaxy	Cam	04h 30m 49s	+64° 50.8'	11.2	Circum	14:23	Circum
Barnard18	DkNeb	Tau	04h 31m 13s	+24° 21.0'		07:07	14:23	21:40
NGC1582	Open	Per	04h 31m 53s	+43° 49.0'	7.0	05:31	14:24	23:16
NGC1560	Galaxy	Cam	04h 32m 48s	+71° 52.7'	11.5	Circum	14:25	Circum
Barnard19	DkNeb	Tau	04h 33m 00s	+26° 16.0'		07:01	14:25	21:48
Barnard20	DkNeb	Per	04h 37m 04s	+50° 58.0'		04:24	14:29	00:34
Barnard22	DkNeb	Tau	04h 38m 00s	+26° 03.0'		07:07	14:30	21:53
Barnard14	DkNeb	Tau	04h 39m 59s	+25° 44.0'		07:10	14:32	21:53
IC2087	Neb	Tau	04h 40m 00s	+25° 44.5'		07:10	14:32	21:53
Barnard23	DkNeb	Tau	04h 40m 33s	+29° 52.0'		06:55	14:32	22:10
NGC1624	Open	Per	04h 40m 36s	+50° 27.6'	10.4	04:35	14:32	00:30
NGC1640	Galaxy	Eri	04h 42m 14s	-20° 26.0'	11.7	09:31	14:34	19:37
NGC1647	Open	Tau	04h 45m 55s	+19° 06.8'	6.4	07:39	14:38	21:37

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
IC2118	Neb	Eri	05h 04m 54s	-07° 15.0'		09:14	14:57	20:39
NGC1851	Globular	Col	05h 14m 06s	-40° 03.0'	7.3	11:25	15:06	18:47
IC405	Neb	Aur	05h 16m 29s	+34° 21.3'		07:11	15:08	23:06
M79	Globular	Lep	05h 24m 11s	-24° 31.4'	8.5	10:27	15:16	20:05
M38	Open	Aur	05h 28m 40s	+35° 50.8'	7.0	07:16	15:21	23:25
M1	SNR	Tau	05h 34m 32s	+22° 00.8'	8.4	08:18	15:26	22:35
M42	Open+DNeb	Ori	05h 35m 16s	-05° 23.4'	4.0	09:39	15:27	21:15
M43	D Neb	Ori	05h 35m 31s	-05° 16.0'	9.0	09:39	15:27	21:15
M36	Open	Aur	05h 36m 18s	+34° 08.3'	6.5	07:32	15:28	23:24
M78	D Neb	Ori	05h 46m 45s	+00° 04.8'	8.0	09:36	15:39	21:42
M37	Open	Aur	05h 52m 18s	+32° 33.2'	6.0	07:55	15:44	23:33
M35	Open	Gem	06h 09m 00s	+24° 21.0'	5.5	08:44	16:01	23:17
M41	Open	CMa	06h 46m 01s	-20° 45.3'	5.0	11:36	16:38	21:40
M50	Open	Mon	07h 02m 42s	-08° 23.0'	7.0	11:15	16:55	22:34
M47	Open	Pup	07h 36m 35s	-14° 29.0'	4.5	12:07	17:28	22:50
M46	Open	Pup	07h 41m 46s	-14° 48.6'	6.5	12:13	17:34	22:54
M93	Open	Pup	07h 44m 30s	-23° 51.4'	6.5	12:45	17:36	22:28
M48	Open	Hya	08h 13m 43s	-05° 45.0'	5.5	12:19	18:06	23:52
M44	Open	Cnc	08h 40m 24s	+19° 40.0'	4.0	11:32	18:32	01:33
M67	Open	Cnc	08h 51m 18s	+11° 48.0'	7.5	12:07	18:43	01:19
M81	Galaxy	UMa	09h 55m 33s	+69° 03.9'	7.8	Circum	19:47	Circum
M82	Galaxy	UMa	09h 55m 53s	+69° 40.8'	9.2	Circum	19:48	Circum
M95	Galaxy	Leo	10h 43m 58s	+11° 42.2'	10.6	14:00	20:36	03:12
M96	Galaxy	Leo	10h 46m 46s	+11° 49.2'	10.1	14:02	20:39	03:15
M105	Galaxy	Leo	10h 47m 50s	+12° 34.9'	10.5	14:01	20:40	03:18
M108	Galaxy	UMa	11h 11m 31s	+55° 40.4'	10.6	Circum	21:03	Circum
M97	P Neb	UMa	11h 14m 48s	+55° 01.1'	12.0	Circum	21:07	Circum
M65	Galaxy	Leo	11h 18m 56s	+13° 05.5'	10.1	14:31	21:11	03:51
M66	Galaxy	Leo	11h 20m 15s	+12° 59.4'	9.7	14:32	21:12	03:52
M109	Galaxy	UMa	11h 57m 36s	+53° 22.4'	10.6	10:58	21:49	08:41
M98	Galaxy	Com	12h 13m 48s	+14° 54.0'	10.9	15:20	22:06	04:51
M99	Galaxy	Com	12h 18m 50s	+14° 25.0'	10.4	15:27	22:11	04:55
M106	Galaxy	CVn	12h 18m 58s	+47° 18.2'	9.1	12:49	22:11	07:33
M61	Galaxy	Vir	12h 21m 55s	+04° 28.3'	10.1	15:59	22:14	04:29
M40	Dbl+Asterism	UMa	12h 22m 12s	+58° 05.0'	8.7	Circum	22:14	Circum
M100	Galaxy	Com	12h 22m 55s	+15° 49.3'	10.1	15:26	22:15	05:03
M84	Galaxy	Vir	12h 25m 04s	+12° 53.2'	10.2	15:37	22:17	04:56
M85	Galaxy	Com	12h 25m 24s	+18° 11.4'	10.0	15:21	22:17	05:13
M86	Galaxy	Vir	12h 26m 12s	+12° 56.7'	9.9	15:38	22:18	04:58
M49	Galaxy	Vir	12h 29m 47s	+08° 00.0'	9.3	15:56	22:22	04:47

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M87	Galaxy	Vir	12h 30m 49s	+12° 23.4'	9.6	15:45	22:23	05:01
M88	G alaxy	Com	12h 31m 59s	+14° 25.2'	10.2	15:40	22:24	05:08
M91	Galaxy	Com	12h 35m 27s	+14° 29.7'	10.9	15:43	22:27	05:12
M89	Galaxy	Vir	12h 35m 40s	+12° 33.3'	10.9	15:49	22:28	05:06
M90	Galaxy	Vir	12h 36m 50s	+13° 09.7'	10.2	15:48	22:29	05:09
M58	Galaxy	Vir	12h 37m 44s	+11° 49.1'	10.4	15:53	22:30	05:06
M68	Globular	Hya	12h 39m 28s	-26° 44.5'	9.0	17:50	22:31	03:13
M104	Galaxy	Vir	12h 39m 59s	-11° 37.3'	9.2	17:02	22:32	04:02
M59	Galaxy	Vir	12h 42m 02s	+11° 38.7'	10.7	15:58	22:34	05:10
M60	Galaxy	Vir	12h 43m 40s	+11° 33.1'	9.8	16:00	22:36	05:11
M94	Galaxy	CVn	12h 50m 53s	+41° 07.1'	8.9	14:09	22:43	07:17
M64	Galaxy	Com	12h 56m 44s	+21° 41.0'	9.3	15:41	22:49	05:56
M53	Globular	Com	13h 12m 55s	+18° 10.1'	8.5	16:09	23:05	06:01
M63	Galaxy	CVn	13h 15m 49s	+42° 01.7'	9.3	14:28	23:08	07:48
NGC5139	Globular	Cen	13h 26m 48s	-47° 29.0'	3.6	20:30	23:19	02:08
NGC5169	Galaxy	CVn	13h 28m 10s	+46° 40.3'	14.0	14:04	23:20	08:36
NGC5204	Galaxy	UMa	13h 29m 36s	+58° 25.1'	11.3	Circum	23:21	Circum
M51	Galaxy	CVn	13h 29m 52s	+47° 11.7'	8.9	14:01	23:22	08:43
Arp85	Galaxy	CVn	13h 29m 58s	+47° 16.0'	9.6	14:00	23:22	08:43
NGC5182	Galaxy	Hya	13h 30m 41s	-28° 09.0'	13.0	18:47	23:23	03:59
NGC5214	Galaxy	CVn	13h 32m 49s	+41° 52.3'	14.0	14:46	23:25	08:04
M83	Galaxy	Hya	13h 37m 00s	-29° 51.8'	8.0	18:59	23:29	03:58
HR5144	Triple	Boo	13h 40m 40s	+19° 57.3'	5.8	16:31	23:33	06:34
NGC5283	Galaxy	Dra	13h 41m 06s	+67° 40.3'	14.0	Circum	23:33	Circum
M3	Globular	CVn	13h 42m 11s	+28° 22.5'	7.0	16:02	23:34	07:06
NGC5286	Globular	Cen	13h 46m 24s	-51° 22.0'	7.6	21:31	23:38	01:45
NGC5292	Galaxy	Cen	13h 47m 40s	-30° 56.4'	14.0	19:14	23:40	04:05
NGC5356	Galaxy	Vir	13h 54m 59s	+05° 20.0'	14.0	17:29	23:47	06:04
NGC5363	Galaxy	Vir	13h 56m 07s	+05° 15.2'	10.2	17:31	23:48	06:05
NGC5447	Neb	UMa	14h 02m 29s	+54° 16.3'		12:31	23:54	11:17
M101	Galaxy	UMa	14h 03m 13s	+54° 20.9'	8.2	12:28	23:55	11:22
NGC5461	Neb	UMa	14h 03m 42s	+54° 19.0'		12:30	23:56	11:21
NGC5485	Galaxy	UMa	14h 07m 11s	+55° 00.0'	11.5	Circum	23:59	Circum
NGC5460	Open	Cen	14h 07m 27s	-48° 20.6'	5.6	21:18	23:59	02:40
NGC5500	Galaxy	Boo	14h 10m 15s	+48° 32.7'	14.0	14:28	00:02	09:37
IC991	Galaxy	Vir	14h 17m 48s	-13° 52.3'	13.0	18:46	00:10	05:33
HR5362	Dbl	Lup	14h 20m 10s	-43° 03.5'	5.6	20:49	00:12	03:35
IC4406	P Neb	Lup	14h 22m 26s	-44° 09.0'	11.0	20:59	00:14	03:30
HR5409	Triple	Vir	14h 28m 12s	-02° 13.6'	4.8	18:23	00:20	06:17

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC5669	Galaxy	Boo	14h 32m 44s	+09° 53.4'	12.0	17:54	00:25	06:55
NGC5689	Galaxy	Boo	14h 35m 30s	+48° 44.5'	11.9	14:51	00:27	10:04
M102	Galaxy	Dra	15h 06m 30s	+55° 45.7'	10.8	Circum	00:58	Circum
NGC5875	Galaxy	Boo	15h 09m 13s	+52° 31.6'	13.0	14:29	01:01	11:33
NGC5907	Galaxy	Dra	15h 15m 54s	+56° 19.7'	11.4	Circum	01:08	Circum
NGC5882	P Neb	Lup	15h 16m 50s	-45° 38.9'	11.0	22:04	01:09	04:13
NGC5897	Globular	Lib	15h 17m 24s	-21° 00.6'	8.6	20:08	01:09	06:10
M5	Globular	Ser	15h 18m 33s	+02° 04.9'	7.0	19:02	01:10	07:19
Barnard228	DkNeb	Lup	15h 44m 00s	-34° 30.0'		21:26	01:36	05:46
IC4593	P Neb	Her	16h 11m 44s	+12° 04.3'	11.0	19:27	02:04	08:41
IC4592	Neb	Sco	16h 11m 59s	-19° 27.4'		20:58	02:04	07:10
M80	Globular	Sco	16h 17m 03s	-22° 58.5'	8.5	21:14	02:09	07:03
IC4601	Neb	Sco	16h 20m 18s	-20° 04.9'		21:08	02:12	07:16
Abell38	P Neb	Sco	16h 23m 17s	-31° 44.9'	11.7	21:53	02:15	06:37
M4	Globular	Sco	16h 23m 35s	-26° 31.5'	7.5	21:33	02:15	06:58
IC4603	Neb	Oph	16h 25m 24s	-24° 28.0'		21:28	02:17	07:07
IC4604	Neb	Oph	16h 25m 33s	-23° 26.5'		21:24	02:17	07:10
NGC6124	Open	Sco	16h 25m 36s	-40° 40.0'	5.8	22:40	02:17	05:55
Abell39	P Neb	Her	16h 27m 33s	+27° 54.5'	12.9	18:50	02:19	09:49
IC4605	Neb	Sco	16h 30m 12s	-25° 06.8'		21:35	02:22	07:09
NGC6153	P Neb	Sco	16h 31m 31s	-40° 15.2'	12.0	22:43	02:23	06:04
NGC6181	Galaxy	Her	16h 32m 21s	+19° 49.5'	11.9	19:23	02:24	09:25
NGC6171	Globular	Oph	16h 32m 32s	-13° 03.1'	8.1	20:59	02:24	07:50
NGC6178	Open	Sco	16h 35m 47s	-45° 38.6'	7.2	23:23	02:28	05:32
NGC6193	Open	Ara	16h 41m 18s	-48° 46.0'	5.2	23:56	02:33	05:10
M13	Globular	Her	16h 41m 41s	+36° 27.5'	7.0	18:26	02:34	10:41
NGC6210	P Neb	Her	16h 44m 30s	+23° 48.0'	9.0	19:22	02:36	09:51
Barnard44a	DkNeb	Sco	16h 44m 45s	-40° 20.0'		22:57	02:37	06:16
NGC6204	Open	Ara	16h 46m 09s	-47° 01.0'	8.2	23:45	02:38	05:31
M12	Globular	Oph	16h 47m 14s	-01° 56.8'	8.0	20:42	02:39	08:36
NGC6231	Open	Sco	16h 54m 00s	-41° 48.0'	2.6	23:15	02:46	06:17
IC4628	Neb	Sco	16h 56m 58s	-40° 27.3'		23:10	02:49	06:28
NGC6254	Globular	Oph	16h 57m 09s	-04° 05.9'	6.6	20:58	02:49	08:40
Barnard47	DkNeb	Oph	16h 59m 42s	-22° 38.0'		21:56	02:52	07:47
M62	Globular	Oph	17h 01m 13s	-30° 06.7'	8.0	22:25	02:53	07:21
M19	Globular	Oph	17h 02m 38s	-26° 16.0'	8.5	22:11	02:54	07:37
Barnard51	DkNeb	Oph	17h 04m 44s	-22° 15.0'		22:00	02:57	07:54
IC4637	P Neb	Sco	17h 05m 10s	-40° 53.1'	14.0	23:20	02:57	06:34
Barnard56	DkNeb	Sco	17h 08m 48s	-32° 05.0'		22:40	03:01	07:21

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