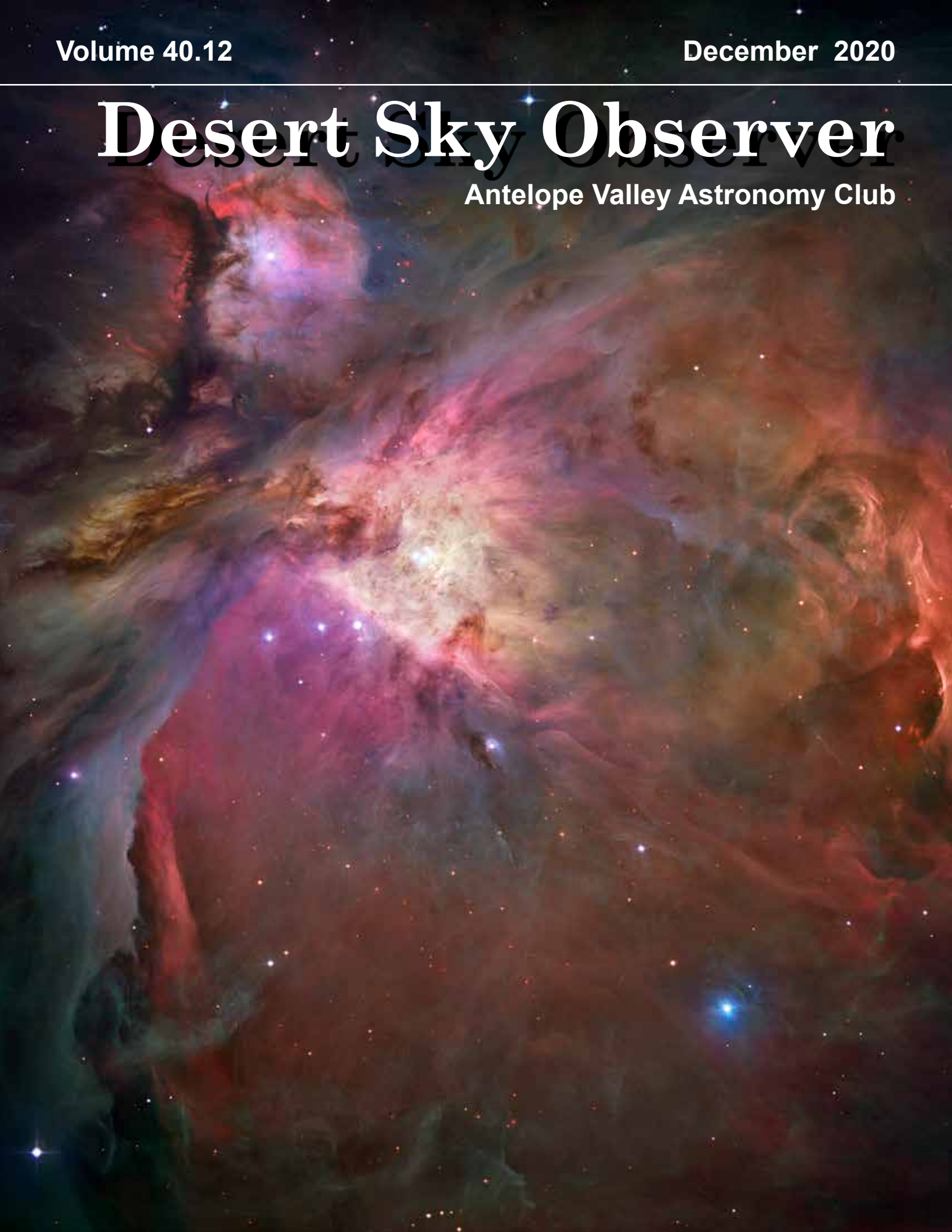


Volume 40.12

December 2020

# Desert Sky Observer

Antelope Valley Astronomy Club



# Desert Sky Observer

www.avastronomyclub.org

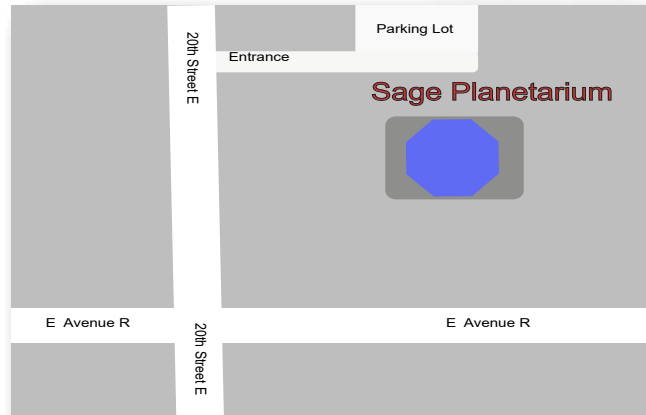
December 2020

## Upcoming Events

- December 11: Club Meeting .... Nope  
December 12: Xmas Party-- Canceled  
December 21: Saturn & Jupiter Conjunction  
at sunset  
Any clear night: Personal Star Party  
January 8: Club Meeting . . probably not



AVAC Calendar



## Board Members

**President:** Darrel Bennet (661) 220-0122  
[president@avastronomyclub.org](mailto:president@avastronomyclub.org)

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

**Secretary:** Rose Moore (661) 972-1953  
[secretary@avastronomyclub.org](mailto:secretary@avastronomyclub.org)

**Treasurer:** Rod Girard (661) 803-7838  
[treasurer@avastronomyclub.org](mailto:treasurer@avastronomyclub.org)

## Appointed Positions

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

**Equipment & Library:**  
John Van Evera 661-754-1819  
[library@avastronomyclub.org](mailto:library@avastronomyclub.org)

**Club Historian:** vacant  
[history@avastronomyclub.org](mailto:history@avastronomyclub.org)

**Webmaster:** Steve Trotta (661) 269-5428  
[webmaster@avastronomyclub.org](mailto:webmaster@avastronomyclub.org)

**Astronomical League Coordinator:**  
Frank Moore (661) 972-4775  
[al@avastronomyclub.org](mailto: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 20<sup>th</sup> 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/](http://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,

First, I would like to send my condolences to Pam Grove, her husband, Bill, passed away last month. I have always enjoyed seeing and talking with them at the meetings. Bill will truly be missed at the club events.

I hope everyone is doing well. Hoping this virus will be over soon so we can get back to the business of our club.

Next month we will have an executive board meeting to discuss the upcoming calendar year. If anyone has any ideas or suggestions on what you would like the club to do when we start back up, please let one of the board members know.

There are no planned star parties because of the cold weather. The next star party will probably be next March for the Messier Marathon.

On the cold nights I only go out to do any observing when something special is happening in the night sky, such as meteor showers or comets. While my observing has slowed down, the lobster season has started up. Hoping to catch a lot of lobster and crab this season.

I do hope everyone had a great Thanksgiving last month and will have a great Christmas.

Last month my email was hacked and Yahoo closed it. I have a new email: [darrell195367@yahoo.com](mailto:darrell195367@yahoo.com)

Until next month keep looking up, don't get too cold.

## Vice President's Corner

By Matt Leone

We wish everyone a Merry Christmas, clear skies, and a Happy New Year – may 2021 bring COVID-19 relief and we can get back to some form of normal. We also wish that everyone is healthy and safe!

## On The Cover

This dramatic image offers a peek inside a cavern of roiling dust and gas where thousands of stars are forming. The image, taken by the Advanced Camera for Surveys (ACS) aboard NASA/ESA Hubble Space Telescope, represents the sharpest view ever taken of this region, called the Orion Nebula. More than 3,000 stars of various sizes appear in this image. Some of them have never been seen in visible light. These stars reside in a dramatic dust-and-gas landscape of plateaus, mountains, and valleys that are reminiscent of the Grand Canyon.

Continued on next page

## From the Secretary

By Rose Moore

Members:

It's the end of the year, and right now there is no end in sight of the Covid virus. The media is talking about the vaccines that may be coming out soon, but there is no definite dates, and it looks like those on the front line (health care workers, law enforcement, first responders, etc) will be getting it first; also, there is some talk of those in places like nursing homes.

When will we be able to have an astronomy meeting? No one is sure at this point. But our first meeting will be Tom Hames' painting class! We probably won't be having any star parties the first couple of months due to the cooler weather, but check your emails and the club website.

There will be a great conjunction of Saturn and Jupiter on December 21st. See the article listed below for details!

Wishing all of you a very Happy Holiday Season! Merry Christmas and Happy New Year! Be safe out there!!

Rose

This past year has been as close to the definition of a disaster as anyone can imagine. With determination and perseverance we will all get through to put our lives back on track in the new year. Stay safe, watch out for each other and your neighbors. Rejoice in the New Year and have a Happy Holiday Season. .... Editor

## On The Cover

Continued from previous page

The Orion Nebula is a picture book of star formation, from the massive, young stars that are shaping the nebula to the pillars of dense gas that may be the homes of budding stars. The bright central region is the home of the four heftiest stars in the nebula. The stars are called the Trapezium because they are arranged in a trapezoid pattern. Ultraviolet light unleashed by these stars is carving a cavity in the nebula and disrupting the growth of hundreds of smaller stars. Located near the Trapezium stars are stars still young enough to have disks of material encircling them. These disks are called protoplanetary disks or "proplyds" and are too small to see clearly in this image. The disks are the building blocks of solar systems.

The bright glow at upper left is from M43, a small region being shaped by a massive, young star's ultraviolet light. Astronomers call the region a miniature Orion Nebula because only one star is sculpting the landscape. The Orion Nebula has four such stars. Next to M43 are dense, dark pillars of dust and gas that point toward the Trapezium. These pillars are resisting erosion from the Trapezium's intense ultraviolet light. The glowing region on the right reveals arcs and bubbles formed when stellar winds - streams of charged particles ejected from the Trapezium stars - collide with material.

The faint red stars near the bottom are the myriad brown dwarfs that Hubble spied for the first time in the nebula in visible light. Sometimes called "failed stars," brown dwarfs are cool objects that are too small to be ordinary stars because they cannot sustain nuclear fusion in their cores the way our Sun does. The dark red column, below, left, shows an illuminated edge of the cavity wall.

The Orion Nebula is 1,500 light-years away, the nearest star-forming region to Earth. Astronomers used 520 Hubble images, taken in five colours, to make this picture. They also added ground-based photos to fill out the nebula. The ACS mosaic covers approximately the apparent angular size of the full moon.

The Orion observations were taken between 2004 and 2005.

Credit:

NASA, ESA, M. Robberto ( Space Telescope Science Institute/ESA) and the Hubble Space Telescope Orion Treasury Project Team

## Visitors to Both Jupiter and Saturn

by David Prosper

Have you observed Jupiter and Saturn moving closer to each other over the past few months? On December 21, the two worlds will be at their closest, around 1/5 of a full Moon apart! While the two gas giants may appear close, in reality they are hundreds of millions of miles apart. Despite this vast distance, a select few missions have visited both worlds by using a gravity assist from giant Jupiter to slingshot them towards Saturn, saving time and fuel. Pioneer 11 was the first mission to visit both worlds! Launched in 1973, the probe flew past Jupiter in late 1974, passing just 26,4000 miles above its stormy clouds. In 1979, it became the first spacecraft to encounter Saturn. Pioneer 11 took the first up-close photos of Saturn and its satellites, and made many exciting discoveries, including the detections of its magnetic field and a faint “F” ring, before departing Saturn and eventually, the solar system. The Voyager missions quickly followed up, taking a “Grand Tour” of the four largest and most distant planets in our solar system. Both probes were launched within two weeks of each other in 1977. Voyager 1 flew past Jupiter in March 1979, discovering Jupiter’s faint ring and two new moons, along with active volcanoes on Io’s surface! The probe then flew past Saturn in November 1980, discovering five new moons, a new “G” ring, mysterious ring “spokes,” and “shepherd moons” shaping the rings. After a brief encounter with Titan revealed evidence of complex organic chemistry and liquid on the moon’s frigid surface, Voyager 1 was flung out of the plane of the solar system. Following close behind, Voyager 2 took detailed photos of Jupiter’s moons and cloud tops in July 1979. Flying past Saturn in August 1981, Voyager 2 measured the thickness of Saturn’s rings and took detailed photos of many of its moons. This second explorer then captured images of Uranus and Neptune before leaving our solar system.

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

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



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

## **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](http://nightsky.jpl.nasa.gov) to find local clubs, events, and more!

### 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...

### 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](mailto:gurba1826@gmail.com) -- or contact Rose by email: [rmorion@bak.rr.com](mailto:rmorion@bak.rr.com)

## Space News

News from around the Net

### **NSF begins planning for decommissioning of Arecibo Observatory's 305-meter telescope due to safety concerns**

Following a review of engineering assessments that found damage to the Arecibo Observatory cannot be stabilized without risk to construction workers and staff at the facility, the U.S. National Science Foundation will begin plans to decommission the 305-meter telescope, which for 57 years has served as a world-class resource for radio astronomy, planetary, solar system and geospace research. . . . (continued at [https://www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=301674](https://www.nsf.gov/news/news_summ.jsp?cntn_id=301674) )



### **Water may be naturally occurring on all rocky planets**

The emergence of life is a mystery. Nevertheless, researchers agree that water is a precondition for life. The first cell emerged in water and then evolved to form multicellular organism. The oldest known single-cell organism on Earth is about 3.5 billion years old. So far, so good. But if life emerged in water, where did the water come from? . . . (continued at <https://www.sciencedaily.com/releases/2020/11/201109110228.htm> )



### **Get ready for the 'Great Conjunction' of Jupiter and Saturn**

In their closest encounter since 1623, Jupiter and Saturn appear as a single star in the evening sky next month. All through the summer and into the fall, the two gas giants of the solar system, Jupiter and Saturn, have been calling attention to themselves in the southern evening sky. Jupiter of course, always appears brilliant and is usually one of the brightest nighttime objects, but in recent months it has stood out even more than usual because of the presence of bright Saturn trailing just off to its left (east). . . . (continued at <https://www.space.com/jupiter-saturn-great-conjunction-2020> )



### **Telescope eyepieces: a beginner's guide**

The importance of eyepieces to your telescope can take a long time to realise. To say an eyepiece can make or break an astronomer is going too far, but when you look through a good eyepiece for the first time you realise that what you've been observing for all those years could have looked much clearer. Some astronomers are glad they went through the years of wrestling with low-quality eyepieces, as it gives them an appreciation of what it takes to see the night sky properly. . . . (continued at <https://www.skyatnightmagazine.com/advice/skills/eyepieces-the-basics/> )



### **For the geeks out there,**

that like sci-fi movies, here is a link to a video on YouTube that compares the sizes of many star ships that you may have seen in movies, TV shows, or even in video games. [https://www.youtube.com/watch?v=aTPwbVqU6lc&fbclid=IwAR0DadjBRtknPI89zC9xngih01gl-LAi3PbcAaoXRTq\\_pM9cIEcRQPrx6ayw](https://www.youtube.com/watch?v=aTPwbVqU6lc&fbclid=IwAR0DadjBRtknPI89zC9xngih01gl-LAi3PbcAaoXRTq_pM9cIEcRQPrx6ayw)



## Space News

News from around the Net. . .continued

### **BRIGHTENING COMET ERASMUS:**

Every 2000 years or so, Comet Erasmus (C/2020 S3) visits the inner Solar System. News Flash: It's back. Discovered on Sept. 17, 2020, by South African astronomer Nicolas Erasmus, the dirty snowball is plunging toward the sun for a close encounter inside the orbit of Mercury on Dec. 12th. This is what it looks like: (continued at <https://spaceweather.com/archive.php?view=1&day=22&month=11&year=2020&fbclid=IwAR2S-LeBfQ9L1W5wJLk2uaSSG0yO2Ts3RKVu2szG1cEUVwZSg99neEIL8-U> )



### **New Hubble Data Explains Missing Dark Matter**

New data from the NASA/ESA Hubble Space Telescope provides further evidence for tidal disruption in the galaxy NGC 1052-DF4. This result explains a previous finding that this galaxy is missing most of its dark matter. By studying the galaxy's light and globular cluster distribution, astronomers have concluded that the gravity forces of the neighbouring galaxy NGC 1035 stripped the dark matter from NGC 1052-DF4 and are now tearing the galaxy apart. . ( continued at <https://www.spacetelescope.org/news/heic2019/?lang> )



### **Astronomers Dim Street Lights To Home In On Light Pollution**

Street lights contribute to light pollution, but they are far from the only culprits — and fixing street lights is far from the only solution. Millions of artificial lamps brighten our cities every night — but only part of their light is used to actually illuminate streets, sidewalks or billboards. The rest is lost, emitted above the horizon and serving no other purpose than to brighten the night sky. (continued at <https://skyandtelescope.org/astronomy-news/street-light-pollution/> )



### **Meet Capella, The Goat Star**

Capella is the sixth-brightest star in the sky — and it's more than one star. The main two stars in the system are near-twins, bright yellow giants. Capella is one of the brightest stars in the sky and the crown jewel of Auriga, the Charioteer. Like many other stars, Capella appears to be a single object but is actually a multi-star system. The primary members are two yellow giant stars, designated Capella Aa and Ab. (continued at <https://skyandtelescope.org/astronomy-news/meet-capella-goat-star/> )



### **Milky Way family tree -- Astrophysicists reconstruct the galaxy merger history of our home galaxy**

Galaxies like the Milky Way formed by the merging of smaller progenitor galaxies. An international team of astrophysicists led by Dr Diederik Kruijssen from the Centre for Astronomy at Heidelberg University has succeeded in reconstructing the merger history of our home galaxy, creating a complete family tree. To achieve this, the researchers analysed the properties of globular clusters orbiting the Milky Way with artificial intelligence. (continued at <https://www.sciencedaily.com/releases/2020/11/201123112442.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.



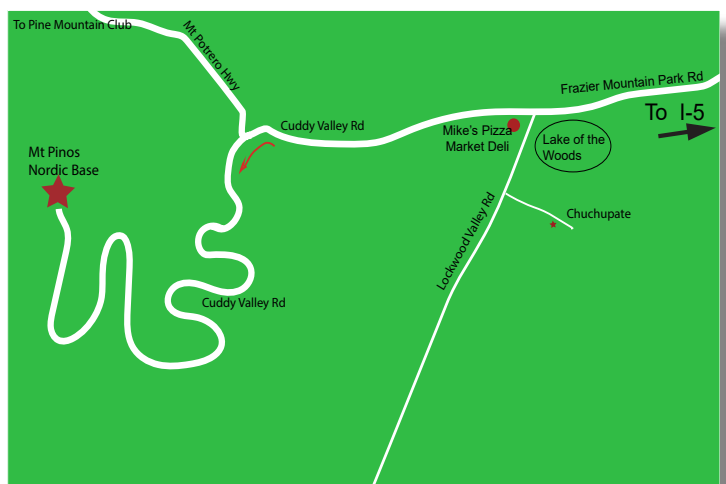
**The Red Cliffs Natural Area** is part of **Red Rock Canyon State Park** is a day use area and is not for use by the public after dark. The Club gets a special permit for a star party and pays a fee.

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 December in Ophiuchus and crosses into Sagittarius at the end of the month.

**Mercury** is in Sagittarius too close to the Sun to be seen all of December. Superior conjunction is achieved on the 20th.

**Venus** starts the month in Libra falling toward the Sun, ending the month in southern Ophiuchus at a mag of -3.94.

**Mars** is visible at zenith at Sunset in Pieces. It continues to dim from mag. -1.1 on the 1st to -0.2 on the 31st. The waxing gibbous Moon slides past 6° to the south on the 23rd.

**Jupiter & Saturn** will achieve conjunction on the 21st, their first meetup since 2000. From the 12th through the 29th they will be within 1° of each other. At the closest on the 21st, they will be about 6', their closest conjunction since **1623**. The pair will set on the 21st at about 19:03

**Uranus** will spend 2020 in southern Aries at magnitude 5.7.

**Neptune** will spend the month stationary in northeast Aquarius at mag 7.8. The Moon will pass 5.5° south on the 20th.

**Pluto** spends the month in Sagittarius at mag 14. The Moon slides past in the early morning of the 16th, but is probably too close to the glare of the Sun to be seen.

## Sun and Moon Rise and Set



## Sun and Moon Rise and Set\*

Date	Moonrise	Moonset	Sunrise	Sunset
12/1/2020	17:52	07:53	06:42	16:42
12/5/2020	21:43	11:12	06:45	16:42
12/10/2020	02:07	14:01	06:49	16:42
12/15/2020	08:02	17:56	06:53	16:44
12/20/2020	11:41	23:08	06:56	16:46
12/25/2020	13:56	02:50	06:58	16:48
12/30/2020	18:31	08:26	07:00	16:53

## Planet Data\*

	Dec 1				
	Rise	Transit	Set	Mag	Phase%
Mercury	05:53	11:00	16:06	-0.75	95.75
Venus	04:28	09:51	15:14	-3.97	88.74
Mars	13:50	20:11	02:34	-1.12	92.33
Jupiter	10:01	15:01	20:00	-2.06	99.51
Saturn	10:09	15:10	20:11	0.64	99.86
	Dec 15				
	Rise	Transit	Set	Mag	Phase%
Mercury	06:46	11:38	16:29	-1.05	99.72
Venus	04:58	10:06	15:14	-3.95	91.42
Mars	13:03	19:29	01:58	-0.69	90.41
Jupiter	09:17	14:18	19:19	-2.01	99.69
Saturn	09:19	14:21	19:23	0.64	99.92
	Dec 30				
	Rise	Transit	Set	Mag	Phase%
Mercury	07:34	12:24	17:14	-0.98	98.47
Venus	05:28	10:26	15:24	-3.94	93.82
Mars	12:18	18:52	01:27	-0.28	89.15
Jupiter	08:29	13:33	18:36	-1.98	99.85
Saturn	08:25	13:29	18:32	0.62	99.97

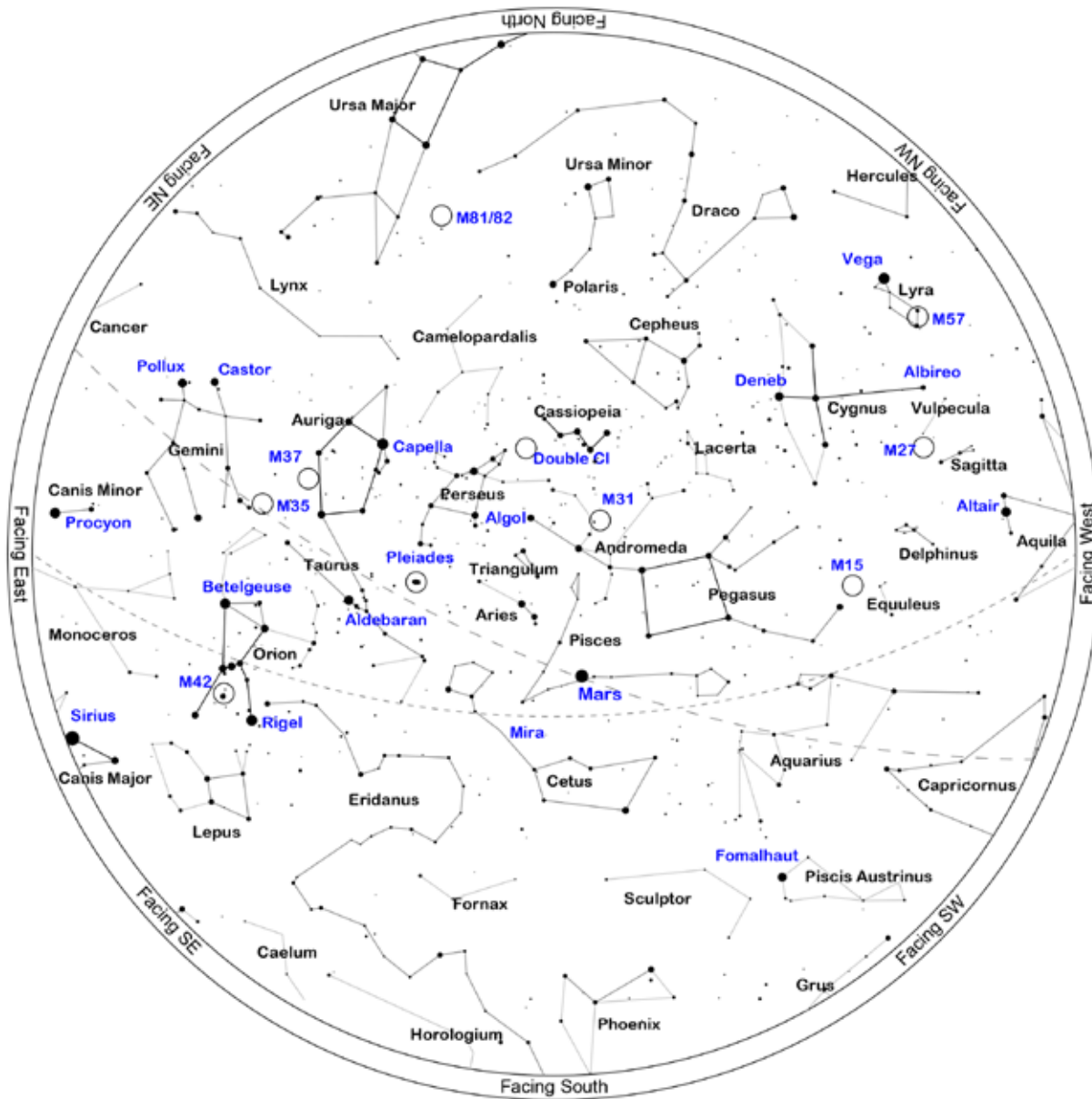
\*Sun, Moon and Planetary date based on Quartz Hill, CA

# Desert Sky Observer

www.avastronomyclub.org

December 2020

## Sky Chart



Location: Palmdale, CA 93551

Latitude: 34° 36' N, longitude: 118° 11' W

Time: 2020 December 12, 20:00 (UTC -08:00)

Powered by: Heavens-Above.com

# Desert Sky Observer

www.avastronomyclub.org

December 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 December 12, 2020. The list is sorted by the transit time (this month in inverse order) of the object.

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M38	Open	Aur	05h 28m 40s	+35° 50.8'	7.0	15:53	23:57	08:01
M79	Globular	Lep	05h 24m 11s	-24° 31.4'	8.5	19:03	23:52	04:42
IC405	Neb	Aur	05h 16m 29s	+34° 21.3'		15:48	23:45	07:41
NGC1851	Globular	Col	05h 14m 06s	-40° 03.0'	7.3	20:00	23:42	03:25
IC2118	Neb	Eri	05h 04m 54s	-07° 15.0'		17:51	23:33	05:16
NGC1647	Open	Tau	04h 45m 55s	+19° 06.8'	6.4	16:16	23:14	06:13
NGC1640	Galaxy	Eri	04h 42m 14s	-20° 26.0'	11.7	18:07	23:10	04:14
NGC1624	Open	Per	04h 40m 36s	+50° 27.6'	10.4	13:13	23:09	09:04
Barnard23	DkNeb	Tau	04h 40m 33s	+29° 52.0'		15:32	23:09	06:46
IC2087	Neb	Tau	04h 40m 00s	+25° 44.5'		15:47	23:08	06:29
Barnard14	DkNeb	Tau	04h 39m 59s	+25° 44.0'		15:47	23:08	06:29
Barnard22	DkNeb	Tau	04h 38m 00s	+26° 03.0'		15:44	23:06	06:28
Barnard20	DkNeb	Per	04h 37m 04s	+50° 58.0'		13:03	23:05	09:08
Barnard19	DkNeb	Tau	04h 33m 00s	+26° 16.0'		15:38	23:01	06:24
NGC1560	Galaxy	Cam	04h 32m 48s	+71° 52.7'	11.5	Circum	23:01	Circum
NGC1582	Open	Per	04h 31m 53s	+43° 49.0'	7.0	14:09	23:00	07:51
Barnard18	DkNeb	Tau	04h 31m 13s	+24° 21.0'		15:43	22:59	06:16
NGC1569	Galaxy	Cam	04h 30m 49s	+64° 50.8'	11.2	Circum	22:59	Circum
NGC1545	Open	Per	04h 20m 57s	+50° 15.2'	6.2	12:56	22:49	08:42
Barnard10	DkNeb	Tau	04h 18m 41s	+28° 16.0'		15:16	22:47	06:18
NGC1535	P Neb	Eri	04h 14m 16s	-12° 44.3'	10.0	17:16	22:43	04:09
IC359	Neb	Tau	04h 12m 28s	+27° 42.1'		15:12	22:41	06:09
NGC1513	Open	Per	04h 09m 57s	+49° 30.8'	8.4	12:55	22:38	08:22
NGC1514	P Neb	Tau	04h 09m 17s	+30° 46.5'	10.0	14:57	22:38	06:18
IC360	Neb	Tau	04h 09m 00s	+26° 06.0'		15:15	22:37	06:00
NGC1502	Open	Cam	04h 07m 50s	+62° 19.8'	5.7	Circum	22:36	Circum
NGC1496	Open	Per	04h 04m 32s	+52° 39.7'	10.0	12:02	22:33	09:04
NGC1515	Galaxy	Dor	04h 04m 03s	-54° 06.0'	11.0	21:09	22:32	23:56
NGC1499	Neb	Per	04h 03m 14s	+36° 22.0'		14:25	22:31	06:38
IC2003	P Neb	Per	03h 56m 22s	+33° 52.5'	13.0	14:30	22:25	06:19
IC353	Neb	Tau	03h 53m 00s	+25° 48.0'		15:00	22:21	05:43
NGC1461	Galaxy	Eri	03h 48m 27s	-16° 23.5'	11.7	17:01	22:17	03:33
Barnard5	DkNeb	Per	03h 47m 53s	+32° 53.0'		14:26	22:16	06:06
M45	Open	Tau	03h 47m 30s	+24° 07.0'	1.6	15:00	22:16	05:31
IC348	Open	Per	03h 44m 34s	+32° 09.7'	7.3	14:26	22:13	05:59
NGC1448	Galaxy	Hor	03h 44m 32s	-44° 38.6'	11.0	19:00	22:13	01:26

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
IC347	Galaxy	Eri	03h 42m 32s	-04° 17.9'	13.0	16:20	22:11	04:02
NGC1407	Galaxy	Eri	03h 40m 12s	-18° 34.8'	9.8	16:59	22:08	03:18
Barnard3	DkNeb	Per	03h 40m 01s	+31° 58.0'		14:22	22:08	05:54
Barnard2	DkNeb	Per	03h 33m 31s	+32° 19.0'		14:14	22:02	05:49
Barnard1	DkNeb	Per	03h 32m 57s	+31° 09.0'		14:19	22:01	05:44
NGC1350	Galaxy	For	03h 31m 08s	-33° 37.7'	10.5	17:45	21:59	02:14
Barnard204	DkNeb	Ari	03h 28m 29s	+30° 11.0'		14:18	21:57	05:35
Barnard202	DkNeb	Ari	03h 25m 38s	+30° 16.0'		14:15	21:54	05:33
NGC1316	Galaxy	For	03h 22m 42s	-37° 12.4'	8.9	17:54	21:51	01:48
HR963	Dbl	For	03h 12m 04s	-28° 59.2'	3.9	17:07	21:40	02:14
NGC1175	Galaxy	Per	03h 04m 32s	+42° 20.3'	12.8	12:52	21:33	06:14
NGC1201	Galaxy	For	03h 04m 08s	-26° 04.1'	10.6	16:48	21:32	02:17
NGC1156	Galaxy	Ari	02h 59m 42s	+25° 14.2'	11.7	14:09	21:28	04:47
IC1848	Open	Cas	02h 51m 18s	+60° 24.4'	6.5	Circum	21:20	Circum
NGC1084	Galaxy	Eri	02h 46m 00s	-07° 34.6'	10.6	15:33	21:14	02:56
M77	Galaxy	Cet	02h 42m 41s	-00° 00.8'	9.7	15:08	21:11	03:14
M34	Open	Per	02h 42m 05s	+42° 45.6'	6.0	12:26	21:10	05:54
NGC1052	Galaxy	Cet	02h 41m 05s	-08° 15.3'	10.6	15:30	21:09	02:49
IC1805	Open	Cas	02h 32m 47s	+61° 27.6'	6.5	Circum	21:01	Circum
NGC956	Open	And	02h 32m 30s	+44° 35.6'	9.0	12:04	21:01	05:58
NGC943	Galaxy	Cet	02h 29m 09s	-10° 49.0'	11.4	15:25	20:57	02:30
NGC936	Galaxy	Cet	02h 27m 37s	-01° 09.3'	10.1	14:56	20:56	02:55
IC1795	Neb	Cas	02h 26m 32s	+62° 02.4'		Circum	20:55	Circum
Baily191	Open	Per	02h 22m 18s	+57° 08.1'	4.0	Circum	20:51	Circum
NGC821	Galaxy	Ari	02h 08m 21s	+10° 59.6'	10.8	14:03	20:37	03:10
NGC784	Galaxy	Tri	02h 01m 17s	+28° 50.2'	11.8	12:57	20:30	04:02
NGC780	Galaxy	Tri	02h 00m 35s	+28° 13.5'	14.0	12:58	20:29	03:59
NGC720	Galaxy	Cet	01h 53m 00s	-13° 44.3'	10.2	14:57	20:21	01:45
NGC654	Open	Cas	01h 44m 00s	+61° 53.0'	6.5	Circum	20:12	Circum
NGC637	Open	Cas	01h 43m 04s	+64° 02.4'	8.2	Circum	20:11	Circum
NGC651	P Neb	Per	01h 42m 21s	+51° 34.1'	12.2	09:59	20:11	06:22
M76	P Neb	Per	01h 42m 18s	+51° 34.2'	12.0	09:59	20:11	06:22
M74	Galaxy	Psc	01h 36m 42s	+15° 47.0'	9.8	13:17	20:05	02:53
NGC604	Neb	Tri	01h 34m 33s	+30° 47.0'		12:22	20:03	03:44
NGC598	Galaxy	Tri	01h 33m 51s	+30° 39.6'	5.7	12:22	20:02	03:42
M103	Open	Cas	01h 33m 23s	+60° 39.0'	7.0	Circum	20:02	Circum
NGC485	Galaxy	Psc	01h 21m 28s	+07° 01.0'	14.0	13:27	19:50	02:12
NGC474	Galaxy	Psc	01h 20m 07s	+03° 24.9'	11.1	13:36	19:48	02:01
C51	IrrGal	Cet	01h 04m 48s	+02° 07.0'	9.3	13:24	19:33	01:42
IC63	Neb	Cas	00h 59m 29s	+60° 54.7'		Circum	19:28	Circum
IC59	Neb	Cas	00h 57m 29s	+61° 08.6'		Circum	19:26	Circum

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC281	Open	Cas	00h 52m 54s	+56° 37.4'	7.0	Circum	19:21	Circum
NGC288	Globular	Scl	00h 52m 45s	-26° 35.0'	8.1	14:39	19:21	00:03
NGC254	Galaxy	Scl	00h 47m 28s	-31° 25.2'	11.8	14:52	19:16	23:39
NGC246	P Neb	Cet	00h 47m 00s	-11° 53.0'	10.9	13:46	19:15	00:45
M31	Galaxy	And	00h 42m 44s	+41° 16.1'	4.3	10:37	19:11	03:45
M32	Galaxy	And	00h 42m 42s	+40° 51.9'	9.1	10:39	19:11	03:42
Arp168	Galaxy	And	00h 42m 41s	+40° 51.0'	9.0	10:40	19:11	03:42
NGC206	Neb	And	00h 40m 36s	+40° 44.0'		10:38	19:09	03:40
NGC210	Galaxy	Cet	00h 40m 35s	-13° 52.3'	10.9	13:45	19:09	00:32
M110	Galaxy	And	00h 40m 22s	+41° 41.1'	8.9	10:32	19:09	03:45
NGC190	Galaxy	Psc	00h 38m 55s	+07° 03.7'	14.0	12:45	19:07	01:30
NGC147	E Gal	Cas	00h 33m 12s	+48° 30.0'	9.3	09:29	19:01	04:34
NGC146	Open	Cas	00h 33m 03s	+63° 18.0'	9.1	Circum	19:01	Circum
NGC133	Open	Cas	00h 31m 19s	+63° 21.0'	9.0	Circum	19:00	Circum
NGC129	Open	Cas	00h 30m 00s	+60° 13.1'	6.5	Circum	18:58	Circum
NGC55	S Gal	Scl	00h 14m 54s	-39° 11.0'	7.9	14:56	18:43	22:30
NGC7822	Neb	Cep	00h 03m 36s	+67° 09.0'		Circum	18:32	Circum
HR9071	Triple	Cas	23h 59m 01s	+55° 45.3'	4.9	Circum	18:27	Circum
NGC7785	Galaxy	Psc	23h 55m 19s	+05° 54.9'	11.6	12:04	18:24	00:43
IC5332	Galaxy	Scl	23h 34m 27s	-36° 06.0'	10.6	14:00	18:03	22:06
NGC7686	Open	And	23h 30m 07s	+49° 08.0'	5.6	08:19	17:58	03:38
NGC7662	P Neb	And	23h 25m 54s	+42° 33.0'	8.3	09:12	17:54	02:37
M52	Open	Cas	23h 24m 48s	+61° 35.6'	8.0	Circum	17:53	Circum
IC5308	Galaxy	Gru	23h 19m 21s	-42° 15.4'	12.0	14:18	17:48	21:17
HR8872	Triple	Cep	23h 18m 38s	+68° 06.6'	4.8	Circum	17:47	Circum
NGC7492	Globular	Aqr	23h 08m 27s	-15° 36.6'	11.5	12:18	17:37	22:55
IC1470	Neb	Cep	23h 05m 10s	+60° 14.6'		Circum	17:33	Circum
C9	BrNeb	Cep	22h 56m 48s	+62° 37.0'		Circum	17:25	Circum
NGC7380	Open	Cep	22h 47m 21s	+58° 07.9'	7.2	Circum	17:16	Circum
NGC7293	P Neb	Aqr	22h 29m 36s	-20° 48.0'	7.3	11:56	16:58	22:00
NGC7261	Open	Cep	22h 20m 06s	+58° 03.0'	8.4	Circum	16:48	Circum
NGC7232	Galaxy	Gru	22h 15m 38s	-45° 51.0'	13.0	13:40	16:44	19:48
NGC7245	Open	Lac	22h 15m 11s	+54° 20.6'	9.2	05:24	16:43	04:02
IC1434	Open	Lac	22h 10m 42s	+52° 51.0'	9.0	06:04	16:39	03:14
IC5146	Open	Cyg	21h 53m 29s	+47° 16.0'	7.2	07:02	16:22	01:42
Barnard168	DkNeb	Cyg	21h 53m 20s	+47° 16.0'		07:02	16:22	01:41
Barnard166	DkNeb	Cep	21h 51m 05s	+60° 05.0'		Circum	16:19	Circum
NGC7139	P Neb	Cep	21h 46m 08s	+63° 47.5'	13.3	Circum	16:14	Circum
NGC7142	Open	Cep	21h 45m 09s	+65° 46.5'	9.3	Circum	16:13	Circum
NGC7128	Open	Cyg	21h 43m 57s	+53° 42.9'	9.7	05:16	16:12	03:09

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC7099	Globular	Cap	21h 40m 22s	-23° 10.7'	7.5	11:14	16:09	21:03
IC1396	Open	Cep	21h 38m 58s	+57° 29.3'	3.5	Circum	16:07	Circum
NGC7090	Galaxy	Ind	21h 36m 28s	-54° 33.4'	11.0	14:52	16:05	17:17
M2	Globular	Aqr	21h 33m 27s	-00° 49.3'	7.5	10:01	16:02	22:02
M39	Open	Cyg	21h 31m 42s	+48° 25.0'	5.5	06:29	16:00	01:31
NGC7078	Globular	Peg	21h 29m 58s	+12° 10.0'	6.4	09:21	15:58	22:35
NGC7076	Neb	Cep	21h 26m 24s	+62° 53.5'		Circum	15:55	Circum
Barnard153	DkNeb	Cep	21h 21m 03s	+56° 26.0'		Circum	15:49	Circum
IC1369	Open	Cyg	21h 12m 09s	+47° 46.1'	6.8	06:16	15:40	01:05
Barnard151	DkNeb	Cep	21h 08m 13s	+56° 19.0'		Circum	15:36	Circum
NGC7027	P Neb	Cyg	21h 07m 02s	+42° 14.1'	10.0	06:55	15:35	00:16
NGC7009	P Neb	Aqr	21h 04m 12s	-11° 22.0'	8.0	10:02	15:32	21:03
NGC7006	Globular	Del	21h 01m 30s	+16° 11.0'	10.6	08:41	15:30	22:19
M73	Open+Asterism	Aqr	20h 58m 56s	-12° 38.1'	9.0	10:00	15:27	20:54
NGC7000	BrNeb	Cyg	20h 58m 48s	+44° 20.0'		06:32	15:27	00:22
Barnard354	DkNeb	Cep	20h 58m 00s	+58° 09.0'		Circum	15:26	Circum
Barnard352	DkNeb	Cyg	20h 57m 10s	+45° 53.0'		06:18	15:25	00:33
NGC6997	Open	Cyg	20h 56m 39s	+44° 37.9'	10.0	06:27	15:25	00:22
NGC6996	Open	Cyg	20h 56m 30s	+44° 38.0'	10.0	06:27	15:25	00:22
NGC6992	Neb	Cyg	20h 56m 19s	+31° 44.6'		07:40	15:25	23:09
IC1340	Neb	Cyg	20h 56m 08s	+31° 02.8'		07:42	15:24	23:06
IC5076	Neb	Cyg	20h 55m 33s	+47° 23.7'		06:03	15:24	00:45
NGC6981	Globular	Aqr	20h 53m 28s	-12° 32.2'	9.4	09:54	15:22	20:49
NGC6979	Neb	Cyg	20h 51m 00s	+32° 09.0'	11.0	07:33	15:19	23:06
IC5070	Neb	Cyg	20h 51m 00s	+44° 24.1'		06:24	15:19	00:15
IC5068	Neb	Cyg	20h 50m 29s	+42° 28.6'		06:37	15:19	00:01
NGC6960	Neb	Cyg	20h 45m 58s	+30° 35.6'		07:34	15:14	22:54
NGC6940	Open	Vul	20h 34m 26s	+28° 17.0'	6.3	07:32	15:03	22:33
Barnard348	DkNeb	Cyg	20h 34m 00s	+42° 05.0'		06:23	15:02	23:42
Abell70	P Neb	Aql	20h 31m 33s	-07° 05.3'	14.3	09:17	15:00	20:43
NGC6913	Open	Cyg	20h 23m 57s	+38° 30.5'	6.6	06:35	14:52	23:10
Barnard345	DkNeb	Cyg	20h 21m 00s	+46° 33.0'		05:36	14:49	00:03
IC4997	P Neb	Sge	20h 20m 09s	+16° 43.9'	12.0	07:57	14:48	21:39
NGC6894	P Neb	Cyg	20h 16m 24s	+30° 33.9'	14.0	07:05	14:45	22:25
NGC6891	P Neb	Del	20h 15m 09s	+12° 42.2'	12.0	08:05	14:43	21:22
NGC6885	Open	Vul	20h 12m 00s	+26° 29.0'	5.9	07:16	14:40	22:04
Barnard342	DkNeb	Cyg	20h 09m 30s	+41° 12.0'		06:04	14:38	23:11
M75	Globular	Sgr	20h 06m 05s	-21° 55.3'	9.5	09:36	14:34	19:33
IC4954	Neb	Vul	20h 04m 45s	+29° 15.1'		06:58	14:33	22:08

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