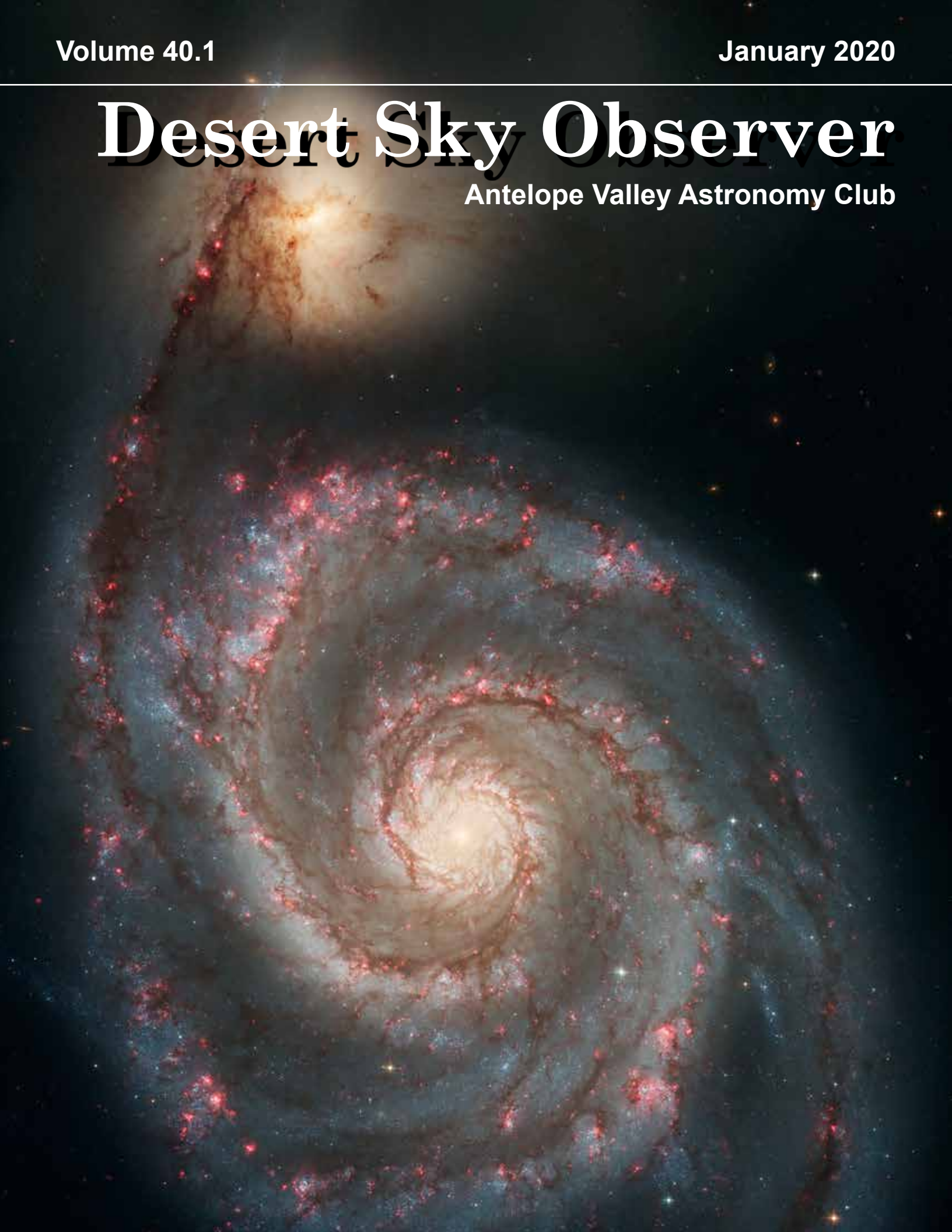


Volume 40.1

January 2020

Desert Sky Observer

Antelope Valley Astronomy Club



Desert Sky Observer

www.avastronomyclub.org

January 2020

Upcoming Events

January 10: Club Meeting

January 11: Prime Desert Woodland Moonwalk
5:30 PM

January 25: Dark Sky Star Party (maybe, TBD)



AVAC Calendar



Board Members

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

Vice-President: Darrel Bennet
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: vacant
library@avastronomyclub.org

Club Historian: Tom Koonce (661) 269-5428
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 Darrell Bennett, VP

Happy New Year, I hope everyone had a Merry Christmas or a Happy Hanukkah.

This is my 20th year as an AV Club Member and Matt's 21st year. We have seen many good people come and go throughout the years; a lot of them have moved away and a lot have just lost interest in astronomy, but a lot of us still hang in there.

On December 7th we had our Annual Christmas Party with 40 people showing up; there was great fun and a great raffle to go with it. Phil Wriedt won the Holland Fountain Award because he stepped up with the club activities like coming to Prime Desert Woodlands and taking over the club's Newsletter, the DSO.

Rose Moore won the Keith Lawson Award for being the backbone of the club, for which Matt and I could not have run the club without her. Rose is the only person to win this award for the second time. Our Grand Prize at the party was an 8 inch Dob Telescope, which Kevin Reilly won. This is the second telescope he has won at the Christmas Party. We all call it a light bucket but in Kevin's case, it's a rain bucket. (Just kidding Kevin).

On December 14th we had our monthly Prime Desert Woodlands Moon Walk. The weather wasn't that great and looked like rain. I didn't bring my scope; Rod brought his, but didn't set it up because it looked like it might rain. About 15 people showed up for the walk with Jeremy anyway. Our next Prime Desert Woodlands Moon Walk will be on January 11th at 5:30pm. I hope to see some of you there.

This month the board will be discussing this year's calendar of coming events; like speakers, star parties, Messier Marathon, Club Picnic and another Mt. Wilson trip. We will be discussing a couple of beginning classes with less classroom and more hands-on with the telescope training. We will ask Tom Hames to do a couple of art classes for us also. If anyone has any ideas for future events please let one of the board members know.

I would like to thank Steve Trotta for doing the DSO for the last 20 years. Maybe he will surprise us and show up at one of our star parties.

And remember keep looking up!

On The Cover

The graceful, winding arms of the majestic spiral galaxy M51 (NGC 5194) appear like a grand spiral staircase sweeping through space. They are actually long lanes of stars and gas laced with dust.

This sharpest-ever image, taken in January 2005 with the Advanced Camera for Surveys aboard the NASA/ESA Hubble Space Telescope, illustrates a spiral galaxy's grand design, from its curving spiral arms, where young stars reside, to its yellowish central core, a home of older stars. The galaxy is nicknamed the Whirlpool because of its swirling structure.

The Whirlpool's most striking feature is its two curving arms, a hallmark of so-called grand-design spiral galaxies. Many spiral galaxies possess numerous, loosely shaped arms that make their spiral structure less pronounced. These arms serve an important purpose in spiral galaxies. They are star-formation factories, compressing hydrogen gas and creating clusters of new stars. In the Whirlpool, the assembly line begins with the dark clouds of gas on the inner edge, then moves to bright pink star-forming regions, and ends with the brilliant blue star clusters along the outer edge.

continued on page 4

From the Secretary

By Rose Moore

I hope all our members and their families had a wonderful holiday season. Thanks to all the members who came out to the Christmas Party at Gino's! We had 40 members and their guests attend. Phil Wriedt donated the grand prize and it was won by Kevin Reilly! Thanks to all who donated prizes for our raffle. A big thank you to everyone who helped plan this event!!

Coming up for January is our first meeting of 2020 on Friday, January 10th at 7pm at the SAGE. Topic to be announced, but I think Matt Leone will be doing a presentation.

We have our first Prime Desert Moon Walk on Saturday, January 11th at 5:30pm. We'll need members with telescopes. Weather permitting, as January usually doesn't cooperate!

Other events coming up this year will be our Messier Marathon, trip to Mt. Wilson, club picnic, College of the Canyons (April 2020), and hopefully a lot of great speakers and presentations. The Mt. Wilson event can't be scheduled until we 'bid' on a date for the trip. The dates on the telescope calendar do not open until March 1st. Further information on Mt. Wilson and other events TBA.

An important reminder to renew your membership this month. If not renewed, names will be removed off the member list by February 1st.

Stay warm! Rose

On The Cover Continued from page 3

Some astronomers believe that the Whirlpool's arms are so prominent because of the effects of a close encounter with NGC 5195, the small, yellowish galaxy at the outermost tip of one of the Whirlpool's arms. At first glance, the compact galaxy appears to be tugging on the arm. Hubble's clear view, however, shows that NGC 5195 is passing behind the Whirlpool. The small galaxy has been gliding past the Whirlpool for hundreds of millions of years.

As NGC 5195 drifts by, its gravitational muscle pumps up waves within the Whirlpool's pancake-shaped disk. The waves are like ripples in a pond generated when a rock is thrown in the water. When the waves pass through orbiting gas clouds within the disk, they squeeze the gaseous material along each arm's inner edge. The dark dusty material looks like gathering storm clouds. These dense clouds collapse, creating a wake of star birth, as seen in the bright pink star-forming regions. The largest stars eventually sweep away the dusty cocoons with a torrent of radiation, hurricane-like stellar winds, and shock waves from supernova blasts. Bright blue star clusters emerge from the mayhem, illuminating the Whirlpool's arms like city streetlights.

The Whirlpool is one of astronomy's galactic darlings. Located approximately 25 million light-years away in the constellation Canes Venatici (the Hunting Dogs), the Whirlpool's beautiful face-on view and closeness to Earth allow astronomers to study a classic spiral galaxy's structure and star-forming processes.

Credit:

NASA, ESA, S. Beckwith (STScI), and The Hubble Heritage Team (STScI/AURA)

Examining the Phases of Venus By Joe Rao

Ever since it returned to the evening sky just over a month ago, our “sister planet,” as Venus is often called, has slowly become increasingly prominent in our early evening sky. As Venus travels around the sun inside the Earth’s orbit, it alternates regularly from evening to morning sky and back, spending about 9.5 months as an “evening star” and about the same length of time as a “morning star.”.... (continued at <https://www.space.com/news/examining-the-phases-of-venus>)



First interstellar comet may soon break apart as it nears the Sun By Mara Johnson-Groh

In September, astronomers announced the discovery of the first interstellar comet known to have visited our solar system. Named 2I/Borisov after its Ukrainian discoverer, the comet has an extremely extended orbit — a telltale sign that its origin is from outside our solar system, beyond the Sun’s influence. . . . (continued at <http://www.astronomy.com/news/2019/12/first-interstellar-comet-could-break-apart-as-it-nears-the-sun>)



Hubble spots a galaxy brimming with young suns By Hailey Rose McLaughlin

NASA’s Hubble Space Telescope recently captured a fresh look at NGC 3749, a spiral galaxy that sits about 135 million light-years away from Earth. The galaxy is a classic version of what astronomers call an emission line galaxy, a kind that gives off light in a way that tells astronomers it’s forming huge numbers of stars. (continued at <http://www.astronomy.com/news/2019/12/hubble-spots-a-galaxy-brimming-with-young-suns>)



New Method May Expedite Search for Exoplanets with Atmospheres By: Kate S. Petersen

Since the first confirmed discovery of an exoplanet in 1992, astronomers have scoured the skies for one that could support life as we know it: a planet that is rocky, has liquid water, and possesses an atmosphere. But their ability to investigate the 4,093 exoplanets confirmed so far is limited by available observational technology. . . . (continued at <https://www.skyandtelescope.com/astronomy-news/new-method-expedite-search-exoplanets-atmospheres/>)



Black hole or newborn stars? SOFIA finds galactic puzzle by Universities Space Research Association

Universities Space Research Association (USRA) today announced that scientists on NASA’s Stratospheric Observatory for Infrared Astronomy (SOFIA) found a strange black hole that is changing its galactic surroundings in a way that is usually associated with newborn stars. . . . (continued at <https://phys.org/news/2019-12-black-hole-newborn-stars-sofia.html>)



European Space Agency agrees record budget to meet new challenges

European Space Agency (ESA) members agreed Thursday a record 14.4 billion euros budget, promising to maintain Europe’s place at the top table as the United States and China press ahead and industry disruptors such as Elon Musk’s Space X present new challenges. . . . (continued at <https://phys.org/news/2019-11-european-space-agency.html>)



Aquatic Rover Goes for a Drive Under the Ice

A little robotic explorer will be rolling into Antarctica this month to perform a gymnastic feat - driving upside down under sea ice. BRUIE, or the Buoyant Rover for Under-Ice Exploration, is being developed for underwater exploration in extraterrestrial, icy waters by engineers at NASA's Jet Propulsion Laboratory in Pasadena, California. It will spend the next month testing its endurance at Australia's Casey research station in Antarctica (continued at <https://www.jpl.nasa.gov/news/news.php?feature=7543>)



NASA Finds Neptune Moons Locked in 'Dance of Avoidance'

Even by the wild standards of the outer solar system, the strange orbits that carry Neptune's two innermost moons are unprecedented, according to newly published research. Orbital dynamics experts are calling it a "dance of avoidance" performed by the tiny moons Naiad and Thalassa. The two are true partners, orbiting only about 1,150 miles (1,850 kilometers) apart. But they never get that close to each other; Naiad's orbit is tilted and perfectly timed. Every time it passes the slower-moving Thalassa, the two are about 2,200 miles (3,540 kilometers) apart. (continued at <https://www.jpl.nasa.gov/news/news.php?feature=7540>)



Mexico's Environmental Law Will Now Include Regulation of Light Pollution

The Senate of Mexico unanimously endorsed legislation that classifies light pollution as a form of environmental pollution this November. The new law makes light pollution subject to regulation under existing environmental laws in the country of Mexico..... (continued at <https://www.darksky.org/mexico-light-pollution-law/?eType=EmailBlastContent&eId=51048507-5ec5-4cc6-af4b-8747fe3286bf>)



Waiting for Betelgeuse: what's up with the tempestuous star?

Have you noticed that Orion the Hunter—one of the most iconic and familiar of the wintertime constellations—is looking a little... different as of late? The culprit is its upper shoulder star Alpha Orionis, aka Betelgeuse, which is looking markedly faint, the faintest it has been for the 21st century.....(continued at <https://phys.org/news/2019-12-betelgeuse-tempestuous-star.html>)



Supermassive black hole at the center of our galaxy may have a friend

Do supermassive black holes have friends? The nature of galaxy formation suggests that the answer is yes, and in fact, pairs of supermassive black holes should be common in the universe. ... (continued at <https://phys.org/news/2019-12-supermassive-black-hole-center-galaxy.html>)



Spot the Young Stars of the Hyades and Pleiades

David Prosper NASA Night Sky Network

Orion is the last of a trio of striking star patterns to rise during the late fall and early winter months, preceded by the diminutive Pleiades and larger Hyades in Taurus. All three are easily spotted rising in the east in early January evenings, and are textbook examples of stars in different stages of development.

As discussed in last month's Notes, the famous Orion Nebula (M42), found in Orion's "Sword," is a celestial nursery full of newly-born "baby stars" and still-incubating "protostars," surrounded by the gas from which they were born. Next to Orion we find the Hyades, in Taurus, with their distinctive "V" shape. The Hyades are young but mature stars, hundreds of millions of years old and widely dispersed. Imagine them as "young adult" stars venturing out from their hometown into their new galactic apartments. Bright orange Aldebaran stands out in this group, but is not actually a member; it just happens to be in between us and the Hyades. Traveling from Orion to the Hyades we then find the small, almost dipper-shaped Pleiades star cluster (M45). These are "teenage stars," younger than the Hyades, but older than the newborn stars of the Orion Nebula. These bright young stars are still relatively close together, but have dispersed their birth cocoon of stellar gas, like teenagers venturing around the neighborhood with friends and wearing their own clothes, but still remaining close to home - for now. Astronomers have studied this trio in great detail in order to learn more about stellar evolution.

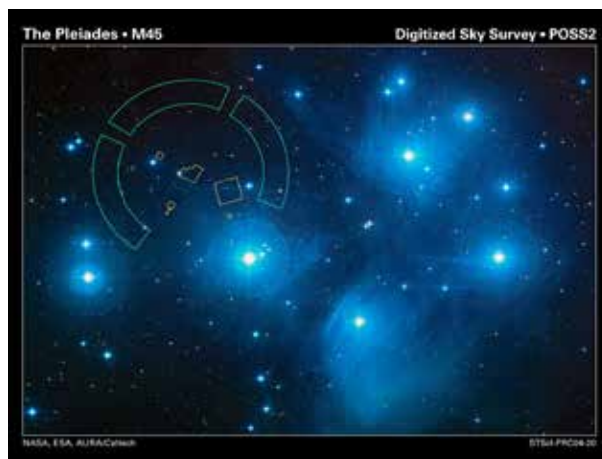
Figuring the exact distance of the Pleiades from Earth is an interesting problem in astrometry, the study of the exact positions of stars in space. Knowing their exact distance away is a necessary step in determining many other facts about the Pleiades. The European Space Agency's Hipparcos satellite determined their distance to about 392 light years away, around 43 light years closer than previous estimates. However, subsequent measurements by NASA's Hubble Space Telescope indicated a distance of 440 light years, much closer to pre-Hipparcos estimates. Then, using a powerful technique called Very Long Baseline Interferometry (VLBI), which combines the power of radio telescopes from around the world, the distance of the Pleiades was calculated to 443 light years. The ESA's Gaia satellite, a successor to Hipparcos, recently released its first two sets of data, which among other findings show the distance close to the values found by Hubble and VLBI, possibly settling the long-running "Pleiades Controversy" and helping firm up the foundation for follow-up studies about the nature of the stars of the Pleiades.

You can learn more about the Pleiades in the Universe Discovery Guide at bit.ly/UDGMarch, and find out about missions helping to measure our universe at nasa.gov.

(Continued on next page)



Caption: Locate Orion rising in the east after sunset to find the Orion Nebula in the “Sword,” below the famous “Belt” of three bright stars. Then, look above Orion to find both the Hyades and the Pleiades. Binoculars will bring out lots of extra stars and details in all three objects, but you can even spot them with your unaided eye!



Caption: Close-up of the Pleiades, with the field of view of Hubble’s Fine Guidance Sensors overlaid in the top left, which helped refine the distance to the cluster. The circumference of the field of view of these sensors is roughly the size of the full Moon. (Credit: NASA, ESA and AURA/Caltech)

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!

Planet Summary

The **Sun** starts the month in Sagittarius and moves into Capricorn by the end of the month

Mercury spends most of the month too close to the Sun to be visible, achieving superior conjunction on the 10th and emerges in evening twilight very late in the month, shining brightly at mag. -1.0 on the 31st.

Venus begins the year in Capricorn in the evening sky some 35° east of the Sun. On the 27th Venus and Neptune are in conjunction in Aquarius.

Mars begins the year visible in the morning sky 40° ahead of the Sun at mag. +1.6 in eastern Libra. Mars passes through Scorpius, Ophiuchus in the second week and then on into Sagittarius. It passes 5° north of Antares on the 17th. The waning crescent Moon passes 2° to the north on the 20th.

Jupiter begins the year in Sagittarius 4° west of the Sun. It gradually moves away from the Sun in the morning twilight by the end of the month.

Saturn starts the month in Sagittarius 11° east of the Sun and finishes the month still in Sagittarius almost 16° west of the Sun.

Uranus will spend 2020 in southern Aries at magnitude 5.76.

Neptune will spend 2020 in northeast Aquarius at mag. 7.93.

Sun and Moon Rise and Set



First Qtr
Jan 2

Full
Jan 10

Third Qtr
Jan 17

New
Jan 24

Sun and Moon Rise and Set*

Date	Moonrise	Moonset	Sunrise	Sunset
1/1/2020	11:20	23:08	6:59	16:59
1/5/2020	13:13	01:54	7:00	16:55
1/10/2020	17:07	06:58	7:00	17:00
1/15/2020	22:50	10:39	6:59	17:04
1/20/2020	03:13	13:41	6:57	17:09
1/25/2020	7:40	18:09	6:55	17:14
1/30/2020	10:15	22:48	6:52	17:19

Planet Data*

January 1

	Rise	Transit	Set	Mag	Phase%
Mercury	06:44	11:34	16:24	-0.90	99.07
Venus	09:12	14:23	19:35	-4.0	81.90
Mars	03:50	08:56	14:02	1.57	95.51
Jupiter	06:46	11:39	16:33	-1.84	100.00
Saturn	07:43	12:42	17:40	0.54	99.99

January 15

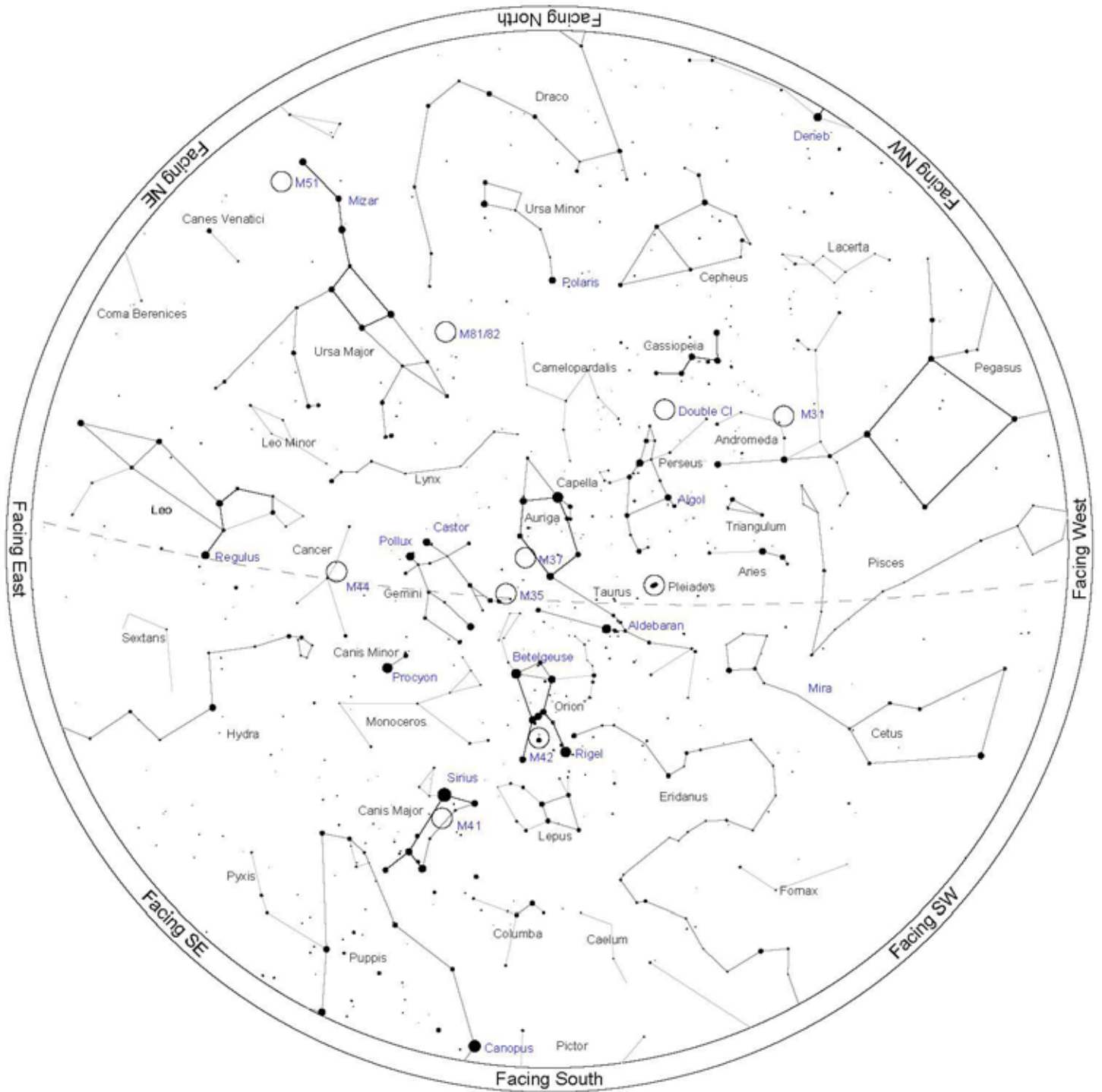
	Rise	Transit	Set	Mag	Phase%
Mercury	6:54	11:54	16:53	0.52	99.34
Venus	9:05	14:34	20:04	-4.04	78.22
Mars	3:41	8:41	13:40	1.48	94.50
Jupiter	6:04	10:58	15:52	-1.86	99.94
Saturn	6:54	11:54	16:52	0.52	100.00

January 30

	Rise	Transit	Set	Mag	Phase%
Mercury	7:41	13:02	18:24	-1.02	86.66
Venus	8:51	14:41	20:32	-4.10	73.75
Mars	3:30	8:25	13:20	1.37	93.34
Jupiter	5:18	10:13	15:08	-1.89	99.81
Saturn	6:02	11:02	16:03	0.58	99.98

*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: 2020 January 25, 21:00 (UTC -08:00)

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 January 25. The list is sorted by the transit time of the object.

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M31	Galaxy	And	00h 42m 44s	+41° 16.1'	4.3	07:46	16:20	00:54
NGC246	P Neb	Cet	00h 47m 00s	-11° 53.0'	10.9	10:55	16:25	21:54
NGC253	S Gal	Scl	00h 47m 36s	-25° 17.0'	7.1	11:38	16:25	21:12
NGC288	Globular	Scl	00h 52m 45s	-26° 35.0'	8.1	11:48	16:31	21:13
NGC584	Galaxy	Cet	01h 31m 21s	-06° 52.0'	10.4	11:25	17:09	22:53
M33	Galaxy	Tri	01h 33m 51s	+30° 39.6'	6.2	09:31	17:12	00:52
M76	P Neb	Per	01h 42m 18s	+51° 34.2'	12.0	07:08	17:20	03:32
NGC663	Open	Cas	01h 46m 00s	+61° 15.0'	7.1	Circum	17:24	Circum
NGC752	Open	And	01h 57m 48s	+37° 41.0'	5.7	09:22	17:36	01:49
NGC869	Open	Per	02h 20m 00s	+57° 08.0'	4.3	Circum	17:58	Circum
NGC884	Open	Per	02h 22m 18s	+57° 08.1'	4.0	Circum	18:00	Circum
NGC908	Galaxy	Cet	02h 23m 05s	-21° 14.0'	10.2	13:00	18:01	23:02
NGC896	Neb	Cas	02h 25m 28s	+62° 01.1'		Circum	18:03	Circum
NGC1027	Open	Cas	02h 42m 40s	+61° 35.7'	6.7	Circum	18:20	Circum
NGC1097	S Gal	For	02h 46m 18s	-30° 17.0'	9.2	13:56	18:24	22:52
HR963	Dbl	For	03h 12m 04s	-28° 59.2'	3.9	14:16	18:50	23:23
NGC1261	Globular	Hor	03h 12m 18s	-55° 13.0'	8.4	17:58	18:50	19:42
NGC1291	Galaxy	Eri	03h 17m 18s	-41° 06.4'	8.5	15:19	18:55	22:31
NGC1302	Galaxy	For	03h 19m 51s	-26° 03.6'	11.0	14:13	18:58	23:42
NGC1342	Open	Per	03h 31m 38s	+37° 22.6'	6.7	10:58	19:09	03:21
NGC1432	Neb	Tau	03h 45m 50s	+24° 22.1'		12:07	19:24	02:40
NGC1435	Neb	Tau	03h 46m 10s	+23° 45.8'		12:10	19:24	02:38
M45	Open	Tau	03h 47m 30s	+24° 07.0'	1.6	12:10	19:25	02:41
NGC1499	Neb	Per	04h 03m 14s	+36° 22.0'		11:35	19:41	03:47
NGC1502	Open	Cam	04h 07m 50s	+62° 19.8'	5.7	Circum	19:46	Circum
NGC1514	P Neb	Tau	04h 09m 17s	+30° 46.5'	10.0	12:06	19:47	03:28
NGC1535	P Neb	Eri	04h 14m 16s	-12° 44.3'	10.0	14:25	19:52	01:19
NGC1528	Open	Per	04h 15m 23s	+51° 12.9'	6.4	09:47	19:53	05:59
NGC1579	Neb	Per	04h 30m 14s	+35° 16.7'		12:07	20:08	04:09
NGC1600	Galaxy	Eri	04h 31m 40s	-05° 05.2'	11.1	14:21	20:09	01:58
NGC1662	Open	Ori	04h 48m 27s	+10° 56.1'	6.4	13:53	20:26	03:00
NGC1664	Open	Aur	04h 51m 06s	+43° 40.4'	7.6	11:39	20:29	05:19
NGC1784	Galaxy	Lep	05h 05m 27s	-11° 52.3'	11.8	15:14	20:43	02:13
NGC1778	Open	Aur	05h 08m 04s	+37° 01.4'	7.7	12:36	20:46	04:56
NGC1807	Open	Tau	05h 10m 43s	+16° 31.3'	7.0	13:58	20:48	03:39
NGC1851	Globular	Col	05h 14m 06s	-40° 03.0'	7.3	17:10	20:52	00:34
C31	BrNeb	Aur	05h 16m 12s	+34° 16.0'		12:58	20:54	04:50
NGC1893	Open	Aur	05h 22m 45s	+33° 24.7'	7.5	13:08	21:01	04:53
M79	Globular	Lep	05h 24m 11s	-24° 31.4'	8.5	16:12	21:02	01:52

Desert Sky Observer

www.avastromonyclub.org

January 2020

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
M38	Open	Aur	05h 28m 40s	+35° 50.8'	7.0	13:03	21:06	05:10
NGC1981	Open	Ori	05h 35m 09s	-04° 25.9'	4.6	15:22	21:13	03:03
NGC1977	Neb	Ori	05h 35m 16s	-04° 49.2'		15:24	21:13	03:02
NGC1976	Neb	Ori	05h 35m 16s	-05° 23.4'	4.0	15:25	21:13	03:01
NGC1975	Neb	Ori	05h 35m 18s	-04° 41.0'		15:23	21:13	03:03
NGC1980	Neb	Ori	05h 35m 25s	-05° 54.9'		15:27	21:13	03:00
M43	D Neb	Ori	05h 35m 31s	-05° 16.0'	9.0	15:25	21:13	03:01
NGC1990	Neb	Ori	05h 36m 13s	-01° 12.1'		15:15	21:14	03:13
M36	Open	Aur	05h 36m 18s	+34° 08.3'	6.5	13:18	21:14	05:10
NGC1999	Neb	Ori	05h 36m 25s	-06° 43.0'		15:30	21:14	02:58
NGC2023	Neb	Ori	05h 41m 38s	-02° 15.5'		15:23	21:19	03:16
NGC2024	Neb	Ori	05h 41m 42s	-01° 51.4'		15:22	21:19	03:17
NGC2022	P Neb	Ori	05h 42m 06s	+09° 05.2'	12.0	14:52	21:20	03:48
NGC2064	Neb	Ori	05h 46m 18s	+00° 00.3'		15:21	21:24	03:27
M37	Open	Aur	05h 52m 18s	+32° 33.1'	6.0	13:42	21:30	05:18
NGC2169	Open	Ori	06h 08m 24s	+13° 57.9'	5.9	15:04	21:46	04:29
M35	Open	Gem	06h 09m 00s	+24° 21.0'	5.5	14:31	21:47	05:03
NGC2174	Neb	Ori	06h 09m 24s	+20° 39.5'		14:44	21:47	04:51
NGC2175	Open	Ori	06h 09m 40s	+20° 29.2'	6.8	14:45	21:47	04:50
NGC2217	Galaxy	CMa	06h 21m 40s	-27° 14.0'	10.4	17:19	21:59	02:39
NGC2232	Open	Mon	06h 28m 01s	-04° 50.8'	3.9	16:16	22:06	03:55
NGC2237	BrNeb	Mon	06h 32m 18s	+05° 03.0'		15:53	22:10	04:27
NGC2244	Open	Mon	06h 32m 24s	+04° 52.0'	4.8	15:54	22:10	04:26
NGC2264	Open	Mon	06h 40m 58s	+09° 53.7'	3.9	15:48	22:19	04:49
M41	Open	CMa	06h 46m 01s	-20° 45.3'	5.0	17:21	22:24	03:26
NGC2281	Open	Aur	06h 48m 17s	+41° 04.7'	5.4	13:53	22:26	06:59
NGC2298	Globular	Pup	06h 48m 59s	-36° 00.2'	9.4	18:23	22:27	02:30
M50	Open	Mon	07h 02m 42s	-08° 23.0'	7.0	17:01	22:40	04:20
NGC2343	Open	Mon	07h 08m 06s	-10° 37.0'	6.7	17:13	22:46	04:19
NGC2362	Open	CMa	07h 18m 48s	-24° 57.0'	4.1	18:08	22:57	03:45
NGC2384	Open	CMa	07h 25m 10s	-21° 01.3'	7.4	18:01	23:03	04:04
NGC2396	Open	Pup	07h 28m 00s	-11° 43.0'	7.0	17:36	23:06	04:36
NGC2392	P Neb	Gem	07h 29m 12s	+20° 55.0'	9.2	16:03	23:07	06:11
NGC2414	Open	Pup	07h 33m 12s	-15° 27.1'	7.9	17:52	23:11	04:30
M47	Open	Pup	07h 36m 35s	-14° 29.0'	4.5	17:53	23:14	04:36
NGC2438	P Neb	Pup	07h 41m 50s	-14° 44.1'	10.0	17:59	23:20	04:41
NGC2440	P Neb	Pup	07h 41m 55s	-18° 12.5'	11.0	18:09	23:20	04:30
NGC2451	Open	Pup	07h 45m 15s	-37° 58.0'	2.8	19:29	23:23	03:17
NGC2477	Open	Pup	07h 52m 18s	-38° 33.0'	5.8	19:40	23:30	03:21
NGC2527	Open	Pup	08h 04m 58s	-28° 08.8'	6.5	19:06	23:43	04:19
NGC2547	Open	Vel	08h 10m 09s	-49° 12.9'	4.7	21:14	23:48	02:22
NGC2539	Open	Pup	08h 10m 37s	-12° 49.1'	6.5	18:22	23:48	05:15

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC2546	Open	Pup	08h 12m 15s	-37° 35.7'	6.3	19:55	23:50	03:45
M48	Open	Hya	08h 13m 43s	-05° 45.0'	5.5	18:05	23:51	05:38
NGC2541	Galaxy	Lyn	08h 14m 40s	+49° 03.7'	11.8	14:14	23:52	09:31
NGC2567	Open	Pup	08h 18m 32s	-30° 38.3'	7.4	19:29	23:56	04:23
NGC3953	Galaxy	UMa	11h 53m 49s	+52° 19.6'	10.1	17:07	03:32	13:56
C85	Open	Vel	08h 40m 12s	-53° 04.0'	2.5	22:34	00:18	02:02
M44	Open	Cnc	08h 40m 24s	+19° 40.0'	4.0	17:18	00:18	07:18
NGC2781	Galaxy	Hya	09h 11m 28s	-14° 49.0'	11.5	19:28	00:49	06:10
NGC2768	Galaxy	UMa	09h 11m 37s	+60° 02.2'	10.0	Circum	00:49	Circum
NGC2910	Open	Vel	09h 30m 30s	-52° 55.1'	7.2	23:22	01:08	02:54
NGC2968	Galaxy	Leo	09h 43m 12s	+31° 55.7'	11.8	17:35	01:21	09:07
NGC2986	Galaxy	Hya	09h 44m 16s	-21° 16.7'	10.9	20:21	01:22	06:23
NGC3132	P Neb	Vel	10h 07m 42s	-40° 26.0'	9.4	22:05	01:45	05:26
NGC3201	Globular	Vel	10h 17m 36s	-46° 25.0'	6.7	22:56	01:55	04:55
NGC3242	P Neb	Hya	10h 24m 48s	-18° 38.0'	7.8	20:53	02:03	07:12
NGC3277	Galaxy	LMi	10h 32m 55s	+28° 30.6'	11.7	18:39	02:11	09:42
NGC3330	Open	Vel	10h 38m 46s	-54° 07.3'	7.4	00:53	02:17	03:40
NGC3448	Galaxy	UMa	10h 54m 39s	+54° 18.3'	11.7	15:15	02:32	13:50
M97	P Neb	UMa	11h 14m 48s	+55° 01.1'	12.0	Circum	02:53	Circum
NGC3599	Galaxy	Leo	11h 15m 27s	+18° 06.5'	11.9	19:58	02:53	09:48
NGC3607	Galaxy	Leo	11h 16m 55s	+18° 03.0'	10.0	20:00	02:55	09:50
NGC3610	Galaxy	UMa	11h 18m 25s	+58° 47.1'	10.8	Circum	02:56	Circum
NGC3672	Galaxy	Crt	11h 25m 02s	-09° 47.7'	11.0	21:27	03:03	08:38
NGC3705	Galaxy	Leo	11h 30m 07s	+09° 16.5'	11.0	20:39	03:08	09:37
NGC4036	Galaxy	UMa	12h 01m 27s	+61° 53.7'	10.6	Circum	03:39	Circum
NGC4147	Globular	Com	12h 10m 06s	+18° 32.5'	10.3	20:51	03:48	10:44
NGC4236	S Gal	Dra	12h 16m 42s	+69° 28.0'	9.7	Circum	03:54	Circum
NGC4233	Galaxy	Vir	12h 17m 08s	+07° 37.4'	11.9	21:31	03:55	10:19
M106	Galaxy	CVn	12h 18m 58s	+47° 18.2'	9.1	18:36	03:57	13:17
NGC4274	Galaxy	Com	12h 19m 51s	+29° 36.8'	10.4	20:22	03:58	11:34
M100	Galaxy	Com	12h 22m 55s	+15° 49.3'	10.1	21:13	04:01	10:49
NGC4340	Galaxy	Com	12h 23m 35s	+16° 43.3'	11.0	21:10	04:01	10:52
NGC4361	P Neb	Crv	12h 24m 31s	-18° 47.0'	10.0	22:54	04:02	09:11
M86	Galaxy	Vir	12h 26m 12s	+12° 56.7'	9.9	21:25	04:04	10:43
M87	Galaxy	Vir	12h 30m 49s	+12° 23.4'	9.6	21:31	04:09	10:46
NGC4528	Galaxy	Vir	12h 34m 06s	+11° 19.2'	11.7	21:37	04:12	10:47
M91	Galaxy	Com	12h 35m 27s	+14° 29.7'	10.9	21:29	04:13	10:57
NGC4546	Galaxy	Vir	12h 35m 29s	-03° 47.5'	10.3	22:21	04:13	10:06
M68	Globular	Hya	12h 39m 28s	-26° 44.5'	9.0	23:35	04:17	08:59
NGC4691	Galaxy	Vir	12h 48m 14s	-03° 20.0'	11.2	22:32	04:26	10:20
NGC4753	Galaxy	Vir	12h 52m 22s	-01° 12.0'	9.9	22:31	04:30	10:30
NGC4762	Galaxy	Vir	12h 52m 56s	+11° 13.8'	10.2	21:56	04:31	11:05

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ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC4936	Galaxy	Cen	13h 04m 17s	-30° 31.5'	11.3	00:15	04:42	09:09
M53	Globular	Com	13h 12m 55s	+18° 10.1'	8.5	21:55	04:51	11:46
NGC5018	Galaxy	Vir	13h 13m 01s	-19° 31.1'	10.8	23:44	04:51	09:57
NGC5053	Globular	Com	13h 16m 27s	+17° 41.8'	9.8	22:00	04:54	11:48
NGC5139	Globular	Cen	13h 26m 48s	-47° 29.0'	3.6	02:14	05:05	07:55
HR5144	Triple	Boo	13h 40m 40s	+19° 57.3'	5.8	22:17	05:18	12:20
M3	Globular	CVn	13h 42m 11s	+28° 22.5'	7.0	21:49	05:20	12:51
NGC5286	Globular	Cen	13h 46m 24s	-51° 22.0'	7.6	03:15	05:24	07:33
NGC5307	P Neb	Cen	13h 51m 03s	-51° 12.3'	12.0	03:18	05:29	07:40
NGC5354	Galaxy	CVn	13h 53m 27s	+40° 18.1'	11.5	21:03	05:31	13:59
NGC5427	Galaxy	Vir	14h 03m 26s	-06° 01.8'	11.4	23:55	05:41	11:27
NGC5474	Galaxy	UMa	14h 05m 02s	+53° 39.7'	10.9	18:48	05:43	16:38
NGC5466	Globular	Boo	14h 05m 28s	+28° 31.9'	9.1	22:12	05:43	13:15
NGC5460	Open	Cen	14h 07m 27s	-48° 20.6'	5.6	03:03	05:45	08:28
HR5362	Dbl	Lup	14h 20m 10s	-43° 03.5'	5.6	02:34	05:58	09:22
HR5409	Triple	Vir	14h 28m 12s	-02° 13.6'	4.8	00:09	06:06	12:03
NGC5634	Globular	Vir	14h 29m 37s	-05° 58.6'	9.6	00:21	06:07	11:54
NGC5660	Galaxy	Boo	14h 29m 50s	+49° 37.3'	11.8	20:23	06:08	15:53
NGC5668	Galaxy	Vir	14h 33m 24s	+04° 27.0'	11.5	23:56	06:11	12:26
NGC5694	Globular	Hya	14h 39m 36s	-26° 32.0'	10.2	01:35	06:17	11:00
NGC5713	Galaxy	Vir	14h 40m 11s	-00° 17.4'	11.4	00:16	06:18	12:20
NGC5806	Galaxy	Vir	15h 00m 00s	+01° 53.4'	11.6	00:30	06:38	12:46
NGC5812	Galaxy	Lib	15h 00m 56s	-07° 27.4'	11.2	00:57	06:39	12:21
NGC5824	Globular	Lup	15h 03m 59s	-33° 04.1'	9.0	02:25	06:42	10:58
NGC5885	Galaxy	Lib	15h 15m 04s	-10° 05.1'	11.7	01:18	06:53	12:27
NGC5882	P Neb	Lup	15h 16m 50s	-45° 38.9'	11.0	03:49	06:55	10:00
NGC5897	Globular	Lib	15h 17m 24s	-21° 00.6'	8.6	01:54	06:55	11:57
M5	Globular	Ser	15h 18m 33s	+02° 04.9'	7.0	00:48	06:56	13:05
NGC5927	Globular	Lup	15h 28m 00s	-50° 40.3'	8.3	04:48	07:06	09:24
NGC5946	Globular	Nor	15h 35m 28s	-50° 39.5'	9.6	04:55	07:13	09:31
NGC5986	Globular	Lup	15h 46m 04s	-37° 47.1'	7.1	03:29	07:24	11:18
NGC6067	Open	Nor	16h 13m 11s	-54° 13.1'	5.6	06:30	07:51	09:12
M80	Globular	Sco	16h 17m 03s	-22° 58.5'	8.5	03:00	07:55	12:50
NGC6093	Globular	Sco	16h 17m 03s	-22° 58.5'	7.2	03:00	07:55	12:50
NGC6121	Globular	Sco	16h 23m 35s	-26° 31.5'	5.9	03:19	08:01	12:44
NGC6121	Globular	Sco	16h 23m 35s	-26° 31.5'	5.9	03:19	08:01	12:44
NGC6124	Open	Sco	16h 25m 36s	-40° 40.0'	5.8	04:25	08:03	11:42

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