



# Desert Sky Observer

Volume 39

Antelope Valley Astronomy Club Newsletter

June 2019

## Up-Coming Events

- June 1: [Dark Sky Star Party](#)
- June 8: [Prime Desert Moon Walk](#)
- June 14: Club Meeting\*
- June 20: [Star Party EAFB/Private Event](#)

\* Monthly meetings are held at the S.A.G.E. Planetarium in Palmdale, the second Friday of each month. 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*

## President

### Darrell Bennett

Well, May started out looking great. On May 3 we were at the College of the Canyons Star Party, in Santa Clarita. When I arrived Frank and Rose Moore, Rod Girard and Ellen were already there setting up. There was not much to look at because of all the lights around.

Frank put his scope on Mars, which was very low in the sky, it didn't look very impressive. Frank did have a very long line of people wanting to see it. After the line had gone down, he moved over to M3. It too was still kind of low in the sky and not very bright. Just when it got high enough in the sky and started to brighten up, the school turned on the parking lights.

On May 10 we had our Club Meeting at the SAGE Planetarium, our speaker was Ben Zuckerman from UCLA. On May 18 the wacky weather came back and spoiled our monthly Star Party at Prime Desert Woodland Preserve. It was cloudy and cold but 17 people still showed up including Rod and Donna Girard. Even with bad weather, Jeremy still had a lot to talk about. There was a break in the clouds enough to see the International Space Station go by.

On May 24 we had a public event at Red Rock Canyon State Park. Frank, Rose Matt and Michael had gotten there on Friday to set up. They did some solar viewing Friday and Saturday. On Saturday afternoon the weather started to get wacky again, thunderheads started to build and the winds started to pick up, we thought it was going to rain. As the sun began to go down the clouds and the winds started to dissipate.

Frank gave a great presentation at the open amphitheater on Charles Messier and showed the public what Messier Objects were up that night. After Frank's presentation, the public came over to our campsite for the Star Party. We had about 50 to 60 people show up for it. We called it a night about 1am. When the weather is cooperating Red Rock and Red Cliffs are two of my favorite places to go for looking at the night sky.

On Saturday June 1 we will have our next Star Party at Chuchupate/Lockwood Valley near Frazier Park. Jeremy Amarant from the SAGE will be giving an astronomy talk about the night sky. You do not want to miss this one.

Our next club meeting will be on June 14 at the SAGE Planetarium, our speaker will be Tim Thompson from the Los Angeles Astronomical Society. Tim will be talking about black holes. I hope to see all of you there.

## Secretary

### Rose Moore

I would like to thank all the club members who turned out for the College of the Canyon Star Party. Our club had a good turnout! I'm not sure how many people we had coming to the telescopes, but we had lines most of the evening. Some of the objects shown were Mars, galaxies, globular clusters and open clusters.

Saturday, June 1st is our dark sky star party at Chuchupate. There will be an email next week, along with directions for the newer members who want to attend

June 8th, Saturday, is a Prime Desert Moon Walk with Jeremy. We'll need members with telescopes. Weather permitting. Start time is 8:30pm. Set up time is approximately an hour before.

Our club meeting on Friday June 14 will have a speaker: Tim Thompson. Mr. Thompson is a former JPL scientist and member of the Mt. Wilson Board of Trustees. He is a member of the LAAS. His topic for the meeting will be 'Black Holes'.

On Thursday June 20th, a group of members from the AVAC will be giving a star party to approximately 65 CAP cadets teens and 15 staff at Edwards AFB. Those who are coming to this event have already provided their information for security clearance. We'll fill members in after the event!

Our trip to Mt. Wilson is scheduled for Friday July 5th. We have a full list of people attending. Rod has mailed our check in to the Mt. Wilson Institute. We should be hearing from our Session Director about 2 weeks before the trip with information about the time we should arrive and any instructions. We can then decide on a meeting time for the Park and Ride to carpool up to Mt. Wilson. Email will be sent out at that time.

Here's hoping for clear skies...and no rain!

Rose

## Space Place

### Jupiter Shines in June

By David Prosper

Jupiter stakes its claim as the king of the planets in June, shining bright all night. Saturn trails behind Jupiter, and the Moon passes by both planets mid-month. Mercury puts on its best evening appearance in 2019 late in the month, outshining nearby Mars at sunset.

Jupiter is visible almost the entire evening this month. Earth will be between Jupiter and the Sun on June 10, meaning Jupiter is at opposition. On that date, Jupiter rises in the east as the Sun sets in the west, remaining visible the entire night. Jupiter will be one of the brightest objects in the night sky, shining at magnitude -2.6. Its four largest moons and cloud bands are easily spotted with even a small telescope.

What if your sky is cloudy or you don't have a telescope? See far more of Jupiter than we can observe from Earth with NASA's Juno mission! Juno has been orbiting Jupiter since 2016, swooping mere thousands of miles above its cloud tops in its extremely elliptical polar orbits, which take the probe over 5 million miles away at its furthest point! These extreme orbits minimize Juno's exposure to Jupiter's powerful radiation as it studies the gas giant's internal structure, especially its intense magnetic fields. Juno's hardy JunoCam instrument takes incredible photos of Jupiter's raging storms during its flybys. All of the images are available to the public, and citizen scientists are doing amazing things with them. You can too! Find out more at [bit.ly/JunoCam](http://bit.ly/JunoCam)

Saturn rises about two hours after Jupiter and is visible before midnight. The ringed planet rises earlier each evening as its own opposition approaches in July. The Moon appears near both gas giants mid-month. The Moon's tour begins on June 16 as it approaches Jupiter, and its visit ends on June 19 after swinging past Saturn.

Mercury is back in evening skies and will be highest after sunset on June 23, just two days after the summer solstice! Spot it low in the western horizon, close to the much dimmer and redder Mars. This is your best chance this year to spot Mercury in the evening, and nearly your last chance to see Mars, too! The two smallest planets of our solar system pass close to each other the evenings of June 17-18, coming within just  $\frac{1}{4}$  degree, or half the width of a full Moon, making for a potentially great landscape photo at twilight.

Discover more about NASA's current and future missions at [nasa.gov](http://nasa.gov)

***This article is distributed by NASA Night Sky Network***

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*A giant storm in Jupiter's north polar region, captured by JunoCam on February 4, 2019. Image processing performed by citizen scientists Gerald Eichstädt and Seán Doran.*

Source: [bit.ly/JupiterSpiral](http://bit.ly/JupiterSpiral)

## News Headlines

### **Mars 2020 Is Coming Together**

For the past few months, the clean room floor in High Bay 1 at NASA's Jet Propulsion Laboratory in Pasadena, California, has been covered in parts, components and test equipment for the Mars 2020 spacecraft, scheduled for launch toward the Red Planet in July of 2020. But over the past few weeks, some of these components — the spacecraft-rocket-laden landing system and even the stand-in for the rover (christened "surrogate-rover") — have seemingly disappeared.

In reality, they are still there, tucked neatly into the entry capsule...

<https://go.nasa.gov/2HuyQyl>

### **New Horizons Team Publishes Kuiper Belt Flyby Science Results**

NASA's New Horizons mission team has published the first profile of the farthest world ever explored, a planetary building block and Kuiper Belt object called 2014 MU69. Analyzing just the first sets of data gathered during the New Horizons spacecraft's New Year's 2019 flyby of MU69 (nicknamed Ultima Thule) the mission team quickly discovered an object far more complex than expected. The team publishes the first peer-reviewed scientific results and interpretations – just four months after the flyby – in the May 17 issue of the journal Science.

<http://pluto.jhuapl.edu/News-Center/News-Article.php?page=20190516>

### **Planet-Hunter CubeSat Images Los Angeles**

The images, taken March 29, reveal a massive grid of illuminated city streets and freeways. A bright spot near the center of the first image marks the location of Dodger Stadium. (The Dodgers played the Arizona Diamondbacks at home that night.) To the northeast, near the darkness of the San Gabriel Mountains, is NASA's Jet Propulsion Laboratory in Pasadena, California, which built and operates ASTERIA, and the nearby Rose Bowl Stadium

<https://go.nasa.gov/2YD7wnd>

### **Virgin Galactic poised for NM landing**

SANTA FE – Virgin Galactic is moving its spaceships and about 100 of its employees to Spaceport America (from Mojave, Kern County and the AV) this summer to prepare for launch of the world's first space tourism operation. About 100 Virgin Galactic employees will immediately begin relocating to New Mexico to join about 45 who are already here, bringing the company's total local workforce to about 150 by the end of the summer,

<https://bit.ly/2VTPeBa>

## June Sky Data

New Jun 3      First Qtr Jun 9      Full Jun 17      Last Qtr Jun 25



## Planet Summary

**Mercury** is visible low in the north-west after sunset. As it moves towards greatest elongation east on June 23rd it rises higher in the sky after sunset, however though starting the month at magnitude -1.0, this falls to magnitude +0.2 by the 17th and falls to +1.1 by month's end.

**Venus**, with a magnitude of -3.3, rises just one hour before the Sun this month. With its angular size reducing from 10.5 to 9.9 arc seconds during the month as it moves away from the Earth. However, at the same time, the percentage its phase increases from 94% to 98% - which is why the brightness remains constant at -3.3 magnitudes.

**Mars** remains at magnitude +2.0 magnitude all month and is still visible in the south western sky after sunset. Initially in Gemin, it moves into Cancer on the 28th of the month. Mars sets some two hours after the Sun at the start of June but less than one hour by month's end. Its angular size falls from 3.9 arc seconds to 3.7 arc seconds during the month so one will not be able to spot any details on its salmon-pink surface.

**Jupiter** reaches opposition on June 10th and is thus visible throughout the night. Its angular size is 46 arc seconds across. Jupiter lies in the southernmost part of Ophiuchus up and to the left of Antares in Scorpius. Sadly it is heading towards the southernmost part of the ecliptic so, as it crosses the meridian, it will only have an elevation of ~14 degrees.

**Saturn** rises around 22:00 UT at the beginning of June so crosses the meridian in the early hours of the morning. By month's end it rises around 21:00. Its disk is ~18 arc seconds across and its rings, which are still nicely tilted from the line of sight, spanning some 40 arc seconds across. Sadly, it is at the lowest point of the ecliptic and will only reach an elevation of ~14 degrees.

There are no significant **meteor-showers** in June.

## Sun and Moon Rise and Set

| Date      | Moonrise | Moonset | Sunrise | Sunset |
|-----------|----------|---------|---------|--------|
| 6/1/2019  | 04:42    | 18:25   | 05:44   | 19:56  |
| 6/5/2019  | 07:52    | 22:33   | 05:43   | 19:59  |
| 6/10/2019 | 13:22    | 01:33   | 05:42   | 20:01  |
| 6/15/2019 | 18:42    | 04:33   | 05:42   | 20:03  |
| 6/20/2019 | 22:59    | 08:40   | 05:43   | 20:05  |
| 6/25/2019 | 01:08    | 13:16   | 05:44   | 20:06  |
| 6/30/2019 | 03:55    | 18:14   | 05:46   | 20:06  |

## Planet Data

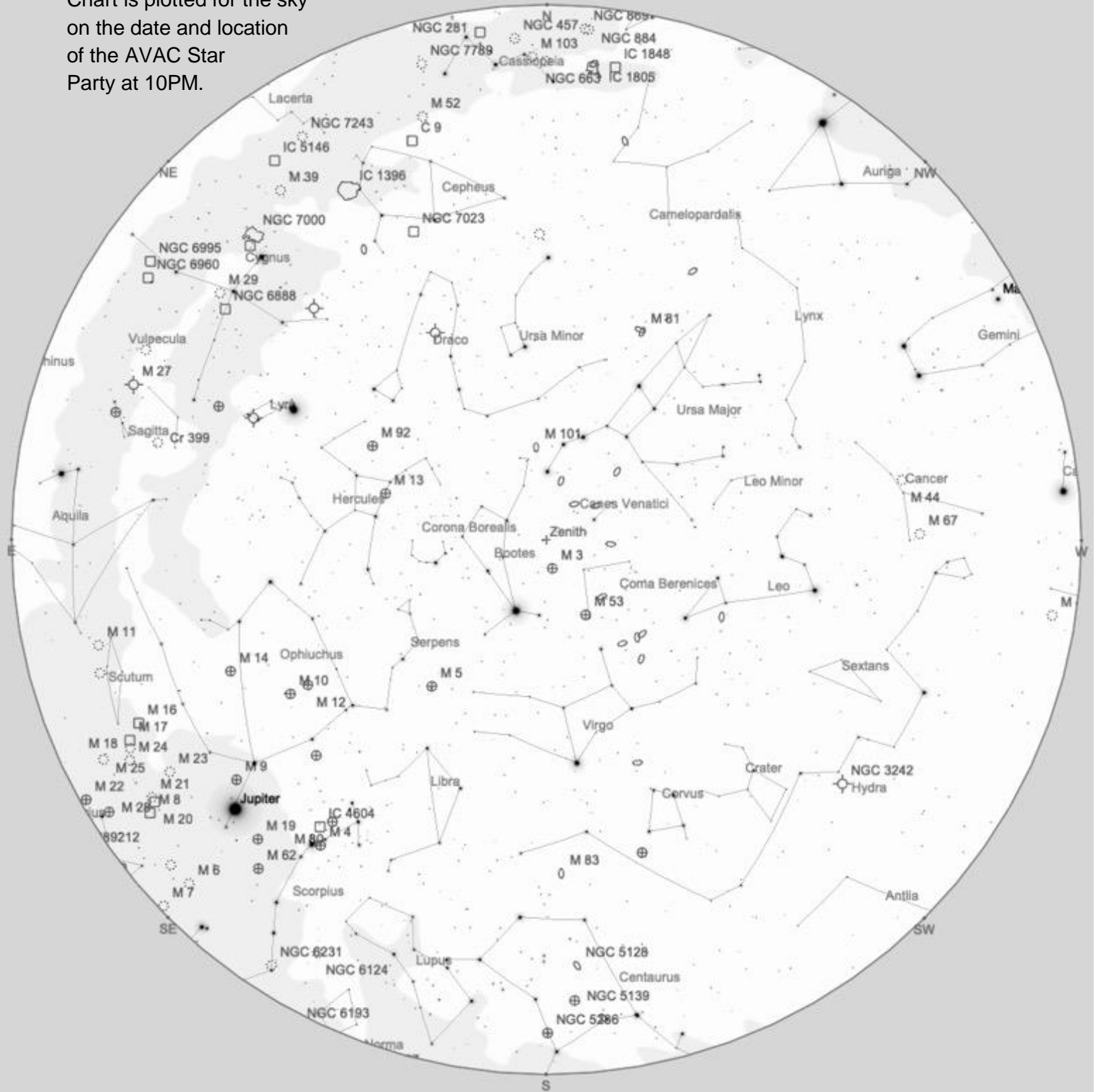
|                | Jun 1 |         |       |      |
|----------------|-------|---------|-------|------|
|                | Rise  | Transit | Set   | Mag  |
| <b>Mercury</b> | 06:30 | 13:47   | 21:04 | -1.0 |
| <b>Venus</b>   | 04:40 | 11:30   | 18:20 | -3.3 |
| <b>Mars</b>    | 07:48 | 15:01   | 22:15 | 2.0  |
| <b>Jupiter</b> | 20:36 | 01:34   | 06:33 | -2.1 |
| <b>Saturn</b>  | 22:39 | 03:40   | 08:41 | 1.3  |

|                | Jun 15 |         |       |      |
|----------------|--------|---------|-------|------|
|                | Rise   | Transit | Set   | Mag  |
| <b>Mercury</b> | 07:23  | 14:36   | 21:50 | 0.2  |
| <b>Venus</b>   | 04:42  | 11:45   | 18:47 | -3.3 |
| <b>Mars</b>    | 07:35  | 14:45   | 21:56 | 2.0  |
| <b>Jupiter</b> | 19:33  | 00:32   | 05:30 | -2.1 |
| <b>Saturn</b>  | 21:41  | 02:42   | 07:42 | 1.2  |

|                | Jun 30 |         |       |      |
|----------------|--------|---------|-------|------|
|                | Rise   | Transit | Set   | Mag  |
| <b>Mercury</b> | 07:42  | 14:38   | 21:35 | 1.1  |
| <b>Venus</b>   | 04:54  | 12:04   | 19:14 | -3.3 |
| <b>Mars</b>    | 07:22  | 14:27   | 21:32 | 2.0  |
| <b>Jupiter</b> | 18:26  | 23:25   | 04:24 | -2.1 |
| <b>Saturn</b>  | 20:38  | 01:38   | 06:38 | 1.1  |

Planet, Sun, and Moon data calculated for local time at Lancaster, CA

Chart is plotted for the sky on the date and location of the AVAC Star Party at 10PM.



To use the chart, go outside within an hour or so of the time listed and hold it up to the sky. Turn the chart so the direction you are looking is at the bottom of the chart. If you are looking to the south then have 'South horizon' at the lower edge.



## Suggested Observing List

The list below contains objects that will be visible on the night of the AVAC Star Party. The list is sorted by the transit time of the object.

| ID      | Type | Const | RA          | Dec        | Mag  | Rise  | Transit | Set   |
|---------|------|-------|-------------|------------|------|-------|---------|-------|
| M49     | Gal  | Vir   | 12h 29m 47s | +08°00'01" | 9.3  | 14:45 | 21:10   | 03:34 |
| NGC4487 | Gal  | Vir   | 12h 31m 04s | -08°03'14" | 11.0 | 15:30 | 21:11   | 02:52 |
| NGC4525 | Gal  | Com   | 12h 33m 51s | +30°16'40" | 13.0 | 13:37 | 21:14   | 04:50 |
| NGC4532 | Gal  | Vir   | 12h 34m 19s | +06°28'09" | 11.9 | 14:54 | 21:14   | 03:35 |
| NGC4535 | Gal  | Vir   | 12h 34m 20s | +08°11'52" | 9.8  | 14:49 | 21:14   | 03:39 |
| NGC4536 | Gal  | Vir   | 12h 34m 27s | +02°11'15" | 10.4 | 15:06 | 21:14   | 03:23 |
| NGC4551 | Gal  | Vir   | 12h 35m 38s | +12°15'50" | 11.9 | 14:39 | 21:15   | 03:52 |
| NGC4565 | Gal  | Com   | 12h 36m 21s | +25°59'16" | 9.6  | 13:56 | 21:16   | 04:36 |
| NGC4586 | Gal  | Vir   | 12h 38m 28s | +04°19'07" | 11.6 | 15:04 | 21:18   | 03:33 |
| NGC4596 | Gal  | Vir   | 12h 39m 56s | +10°10'33" | 10.5 | 14:49 | 21:20   | 03:50 |
| M104    | Gal  | Vir   | 12h 39m 59s | -11°37'23" | 9.2  | 15:49 | 21:20   | 02:51 |
| NGC4625 | Gal  | CVn   | 12h 41m 53s | +41°16'25" | 12.3 | 12:52 | 21:22   | 05:52 |
| M59     | Gal  | Vir   | 12h 42m 02s | +11°38'48" | 10.7 | 14:47 | 21:22   | 03:57 |
| NGC4628 | Gal  | Vir   | 12h 42m 25s | -06°58'16" | 14.0 | 15:38 | 21:22   | 03:06 |
| NGC4638 | Gal  | Vir   | 12h 42m 47s | +11°26'31" | 11.3 | 14:48 | 21:23   | 03:57 |
| NGC4643 | Gal  | Vir   | 12h 43m 20s | +01°58'40" | 10.6 | 15:15 | 21:23   | 03:31 |
| NGC4647 | Gal  | Vir   | 12h 43m 32s | +11°34'56" | 11.4 | 14:49 | 21:23   | 03:58 |
| NGC4651 | Gal  | Com   | 12h 43m 43s | +16°23'36" | 10.7 | 14:35 | 21:24   | 04:12 |
| NGC4654 | Gal  | Vir   | 12h 43m 57s | +13°07'34" | 10.5 | 14:45 | 21:24   | 04:03 |
| NGC4656 | Gal  | CVn   | 12h 43m 58s | +32°10'17" | 10.4 | 13:40 | 21:24   | 05:08 |
| NGC4691 | Gal  | Vir   | 12h 48m 14s | -03°19'59" | 11.2 | 15:34 | 21:28   | 03:22 |
| NGC4697 | Gal  | Vir   | 12h 48m 36s | -05°48'02" | 9.3  | 15:41 | 21:28   | 03:15 |
| NGC4699 | Gal  | Vir   | 12h 49m 02s | -08°39'53" | 9.6  | 15:50 | 21:29   | 03:08 |
| NGC4725 | Gal  | Com   | 12h 50m 27s | +25°30'03" | 9.2  | 14:12 | 21:30   | 04:49 |
| NGC4731 | Gal  | Vir   | 12h 51m 01s | -06°23'33" | 11.0 | 15:45 | 21:31   | 03:16 |
| NGC4762 | Gal  | Vir   | 12h 52m 56s | +11°13'49" | 10.2 | 14:59 | 21:33   | 04:06 |
| NGC4765 | Gal  | Vir   | 12h 53m 15s | +04°27'48" | 13.0 | 15:18 | 21:33   | 03:48 |
| NGC4782 | Gal  | Crv   | 12h 54m 36s | -12°34'08" | 11.7 | 16:06 | 21:34   | 03:03 |
| M64     | Gal  | Com   | 12h 56m 44s | +21°40'58" | 9.3  | 14:31 | 21:37   | 04:42 |
| NGC4843 | Gal  | Vir   | 12h 58m 01s | -03°37'18" | 14.0 | 15:45 | 21:38   | 03:31 |
| NGC4873 | Gal  | Com   | 12h 59m 33s | +27°58'59" | 14.2 | 14:12 | 21:39   | 05:07 |
| NGC4914 | Gal  | CVn   | 13h 00m 43s | +37°18'55" | 12.0 | 13:33 | 21:41   | 05:49 |
| NGC4987 | Gal  | CVn   | 13h 07m 59s | +51°55'45" | 14.0 | 11:40 | 21:48   | 07:55 |
| NGC4976 | Gal  | Cen   | 13h 08m 37s | -49°30'22" | 10.2 | 19:11 | 21:48   | 00:26 |
| NGC4993 | Gal  | Hya   | 13h 09m 48s | -23°23'03" | 14.0 | 16:55 | 21:50   | 02:45 |
| NGC5005 | Gal  | CVn   | 13h 10m 56s | +37°03'30" | 9.8  | 13:44 | 21:51   | 05:58 |
| M63     | Gal  | CVn   | 13h 15m 49s | +42°01'46" | 9.3  | 13:21 | 21:56   | 06:30 |
| NGC5054 | Gal  | Vir   | 13h 16m 58s | -16°38'05" | 11.0 | 16:41 | 21:57   | 03:13 |
| NGC5068 | Gal  | Vir   | 13h 18m 55s | -21°02'20" | 11.0 | 16:56 | 21:59   | 03:02 |

| ID      | Type  | Const | RA          | Dec        | Mag  | Rise   | Transit | Set    |
|---------|-------|-------|-------------|------------|------|--------|---------|--------|
| NGC5139 | Glob  | Cen   | 13h 26m 47s | -47°28'53" | 3.7  | 19:11  | 22:07   | 01:03  |
| NGC5253 | Gal   | Cen   | 13h 39m 56s | -31°38'26" | 10.6 | 17:55  | 22:20   | 02:45  |
| M3      | Glob  | CVn   | 13h 42m 11s | +28°22'35" | 7.0  | 14:53  | 22:22   | 05:51  |
| NGC5289 | Gal   | CVn   | 13h 45m 09s | +41°30'12" | 14.0 | 13:54  | 22:25   | 06:57  |
| NGC5286 | Glob  | Cen   | 13h 46m 27s | -51°22'30" | 7.6  | 20:09  | 22:26   | 00:43  |
| NGC5308 | Gal   | UMa   | 13h 47m 00s | +60°58'23" | 11.3 | Circum | 22:27   | Circum |
| NGC5303 | Gal   | CVn   | 13h 47m 45s | +38°18'17" | 13.0 | 14:14  | 22:28   | 06:41  |
| NGC5322 | Gal   | UMa   | 13h 49m 15s | +60°11'26" | 10.0 | Circum | 22:29   | Circum |
| NGC5307 | P Neb | Cen   | 13h 51m 03s | -51°12'20" | 12.0 | 20:12  | 22:31   | 00:50  |
| NGC5412 | Gal   | UMi   | 13h 57m 13s | +73°36'59" | 14.0 | Circum | 22:37   | Circum |
| NGC5367 | Neb   | Cen   | 13h 57m 43s | -39°58'42" |      | 18:51  | 22:38   | 02:24  |
| M101    | Gal   | UMa   | 14h 03m 13s | +54°20'56" | 8.2  | 11:46  | 22:43   | 09:40  |
| NGC5473 | Gal   | UMa   | 14h 04m 43s | +54°53'33" | 11.4 | 11:28  | 22:45   | 10:01  |
| NGC5474 | Gal   | UMa   | 14h 05m 02s | +53°39'45" | 10.9 | 12:05  | 22:45   | 09:24  |
| NGC5466 | Glob  | Boo   | 14h 05m 28s | +28°31'57" | 9.1  | 15:16  | 22:45   | 06:15  |
| NGC5485 | Gal   | UMa   | 14h 07m 11s | +55°00'05" | 11.5 | 11:25  | 22:47   | 10:09  |
| NGC5460 | Open  | Cen   | 14h 07m 27s | -48°20'36" | 5.6  | 19:59  | 22:47   | 01:36  |
| NGC5557 | Gal   | Boo   | 14h 18m 26s | +36°29'37" | 11.1 | 14:54  | 22:58   | 07:02  |
| NGC5574 | Gal   | Vir   | 14h 20m 56s | +03°14'17" | 12.4 | 16:49  | 23:01   | 05:12  |
| NGC5597 | Gal   | Lib   | 14h 24m 27s | -16°45'47" | 12.1 | 17:48  | 23:04   | 04:20  |
| NGC5630 | Gal   | Boo   | 14h 27m 37s | +41°15'27" | 14.0 | 14:37  | 23:07   | 07:37  |
| NGC5634 | Glob  | Vir   | 14h 29m 37s | -05°58'37" | 9.6  | 17:23  | 23:09   | 04:56  |
| NGC5660 | Gal   | Boo   | 14h 29m 50s | +49°37'22" | 11.8 | 13:32  | 23:10   | 08:47  |
| NGC5675 | Gal   | Boo   | 14h 32m 40s | +36°18'08" | 14.0 | 15:10  | 23:13   | 07:16  |
| NGC5643 | Gal   | Lup   | 14h 32m 41s | -44°10'26" | 11.0 | 19:52  | 23:13   | 02:33  |
| NGC5682 | Gal   | Boo   | 14h 34m 45s | +48°40'14" | 14.0 | 13:47  | 23:15   | 08:42  |
| NGC5698 | Gal   | Boo   | 14h 37m 15s | +38°27'16" | 14.0 | 15:03  | 23:17   | 07:31  |
| NGC5713 | Gal   | Vir   | 14h 40m 11s | -00°17'25" | 11.4 | 17:18  | 23:20   | 05:22  |
| NGC5728 | Gal   | Lib   | 14h 42m 24s | -17°15'12" | 11.3 | 18:08  | 23:22   | 04:37  |
| NGC5749 | Open  | Lup   | 14h 48m 53s | -54°29'54" | 9.0  | 22:01  | 23:29   | 00:57  |
| NGC5766 | Gal   | Lib   | 14h 53m 09s | -21°23'38" | 14.0 | 18:31  | 23:33   | 04:35  |
| NGC5813 | Gal   | Vir   | 15h 01m 11s | +01°42'07" | 10.7 | 17:34  | 23:41   | 05:48  |
| NGC5822 | Open  | Lup   | 15h 04m 21s | -54°23'48" | 7.0  | 22:14  | 23:44   | 01:15  |
| NGC5873 | P Neb | Lup   | 15h 12m 51s | -38°07'30" | 13.0 | 19:57  | 23:53   | 03:49  |
| NGC5899 | Gal   | Boo   | 15h 15m 03s | +42°02'57" | 11.8 | 15:20  | 23:55   | 08:30  |
| NGC5908 | Gal   | Dra   | 15h 16m 43s | +55°24'35" | 11.9 | Circum | 23:57   | Circum |
| NGC5882 | P Neb | Lup   | 15h 16m 50s | -45°38'56" | 11.0 | 20:46  | 23:57   | 03:07  |
| NGC5898 | Gal   | Lib   | 15h 18m 14s | -24°05'51" | 11.5 | 19:05  | 23:58   | 04:51  |
| M5      | Glob  | Ser   | 15h 18m 33s | +02°04'57" | 7.0  | 17:50  | 23:58   | 06:07  |
| NGC5946 | Glob  | Nor   | 15h 35m 28s | -50°39'33" | 9.6  | 21:50  | 00:15   | 02:41  |
| NGC5986 | Glob  | Lup   | 15h 46m 04s | -37°47'08" | 7.1  | 20:28  | 00:26   | 04:24  |
| NGC6058 | P Neb | Her   | 16h 04m 27s | +40°40'59" | 13.0 | 16:18  | 00:44   | 09:11  |
| NGC6045 | Gal   | Her   | 16h 05m 08s | +17°45'26" | 14.2 | 17:52  | 00:45   | 07:38  |
| NGC6062 | Gal   | Her   | 16h 06m 23s | +19°46'39" | 14.0 | 17:47  | 00:46   | 07:45  |
| NGC6072 | P Neb | Sco   | 16h 12m 58s | -36°13'47" | 14.0 | 20:48  | 00:53   | 04:58  |



| ID      | Type  | Const | RA          | Dec        | Mag  | Rise   | Transit | Set    |
|---------|-------|-------|-------------|------------|------|--------|---------|--------|
| NGC6067 | Open  | Nor   | 16h 13m 11s | -54°13'06" | 5.6  | 23:19  | 00:53   | 02:27  |
| NGC6103 | Gal   | CrB   | 16h 15m 45s | +31°57'50" | 14.0 | 17:12  | 00:56   | 08:39  |
| M80     | Glob  | Sco   | 16h 17m 03s | -22°58'32" | 8.5  | 20:00  | 00:57   | 05:53  |
| M4      | Glob  | Sco   | 16h 23m 35s | -26°31'35" | 7.5  | 20:19  | 01:03   | 05:48  |
| NGC6124 | Open  | Sco   | 16h 25m 20s | -40°39'12" | 5.8  | 21:23  | 01:05   | 04:48  |
| NGC6139 | Glob  | Sco   | 16h 27m 40s | -38°50'57" | 9.2  | 21:15  | 01:08   | 05:00  |
| NGC6134 | Open  | Nor   | 16h 27m 46s | -49°09'06" | 7.2  | 22:27  | 01:08   | 03:49  |
| NGC6153 | P Neb | Sco   | 16h 31m 31s | -40°15'13" | 12.0 | 21:27  | 01:11   | 04:56  |
| NGC6217 | Gal   | UMi   | 16h 32m 39s | +78°11'53" | 11.2 | Circum | 01:13   | Circum |
| NGC6152 | Open  | Nor   | 16h 32m 45s | -52°38'36" | 8.0  | 23:12  | 01:13   | 03:13  |
| NGC6169 | Open  | Nor   | 16h 34m 04s | -44°02'42" | 7.0  | 21:52  | 01:14   | 04:36  |
| NGC6167 | Open  | Nor   | 16h 34m 34s | -49°46'18" | 6.7  | 22:40  | 01:14   | 03:49  |
| NGC6178 | Open  | Sco   | 16h 35m 47s | -45°38'36" | 7.2  | 22:05  | 01:16   | 04:26  |
| NGC6188 | Neb   | Ara   | 16h 40m 05s | -48°39'42" |      | 22:34  | 01:20   | 04:06  |
| NGC6192 | Open  | Sco   | 16h 40m 23s | -43°22'00" | 9.0  | 21:54  | 01:20   | 04:46  |
| NGC6193 | Open  | Ara   | 16h 41m 20s | -48°45'48" | 5.2  | 22:37  | 01:21   | 04:06  |
| M13     | Glob  | Her   | 16h 41m 41s | +36°27'35" | 7.0  | 17:18  | 01:22   | 09:25  |
| NGC6207 | Gal   | Her   | 16h 43m 04s | +36°49'56" | 11.6 | 17:17  | 01:23   | 09:29  |
| NGC6200 | Open  | Ara   | 16h 44m 07s | -47°27'48" | 7.4  | 22:28  | 01:24   | 04:20  |
| NGC6210 | P Neb | Her   | 16h 44m 30s | +23°47'59" | 9.0  | 18:12  | 01:24   | 08:37  |
| NGC6216 | Open  | Sco   | 16h 49m 24s | -44°43'42" | 10.0 | 22:12  | 01:29   | 04:46  |
| NGC6208 | Open  | Ara   | 16h 49m 28s | -53°43'42" | 7.2  | 23:46  | 01:29   | 03:12  |
| NGC6231 | Open  | Sco   | 16h 54m 10s | -41°49'30" | 2.6  | 21:58  | 01:34   | 05:10  |
| NGC6242 | Open  | Sco   | 16h 55m 33s | -39°27'42" | 6.4  | 21:46  | 01:35   | 05:24  |
| M10     | Glob  | Oph   | 16h 57m 09s | -04°05'56" | 7.5  | 19:45  | 01:37   | 07:29  |
| NGC6249 | Open  | Sco   | 16h 57m 41s | -44°48'42" | 8.2  | 22:21  | 01:38   | 04:54  |
| NGC6250 | Open  | Ara   | 16h 57m 56s | -45°56'12" | 5.9  | 22:30  | 01:38   | 04:46  |
| NGC6253 | Open  | Ara   | 16h 59m 05s | -52°42'30" | 10.0 | 23:40  | 01:39   | 03:38  |
| NGC6259 | Open  | Sco   | 17h 00m 45s | -44°39'18" | 8.0  | 22:23  | 01:41   | 04:58  |
| NGC6268 | Open  | Sco   | 17h 02m 10s | -39°43'42" | 10.0 | 21:54  | 01:42   | 05:30  |
| M19     | Glob  | Oph   | 17h 02m 38s | -26°16'04" | 8.5  | 20:57  | 01:42   | 06:28  |
| NGC6284 | Glob  | Oph   | 17h 04m 29s | -24°45'51" | 9.0  | 20:54  | 01:44   | 06:35  |
| NGC6281 | Open  | Sco   | 17h 04m 41s | -37°59'06" | 5.4  | 21:48  | 01:45   | 05:41  |
| NGC6293 | Glob  | Oph   | 17h 10m 10s | -26°34'56" | 8.2  | 21:06  | 01:50   | 06:34  |
| NGC6302 | P Neb | Sco   | 17h 13m 44s | -37°06'12" | 13.0 | 21:53  | 01:54   | 05:55  |
| NGC6309 | P Neb | Oph   | 17h 14m 04s | -12°54'38" | 11.0 | 20:27  | 01:54   | 07:21  |
| NGC6304 | Glob  | Oph   | 17h 14m 32s | -29°27'43" | 8.4  | 21:21  | 01:54   | 06:28  |
| M92     | Glob  | Her   | 17h 17m 07s | +43°08'11" | 7.5  | 17:15  | 01:57   | 10:39  |
| NGC6325 | Glob  | Oph   | 17h 17m 59s | -23°45'57" | 10.7 | 21:04  | 01:58   | 06:52  |
| NGC6322 | Open  | Sco   | 17h 18m 25s | -42°56'00" | 6.0  | 22:29  | 01:58   | 05:27  |
| NGC6326 | P Neb | Ara   | 17h 20m 46s | -51°45'17" | 12.0 | 23:48  | 02:01   | 04:13  |
| NGC6334 | Neb   | Sco   | 17h 20m 49s | -36°06'12" |      | 21:55  | 02:01   | 06:06  |
| NGC6342 | Glob  | Oph   | 17h 21m 10s | -19°35'14" | 9.9  | 20:54  | 02:01   | 07:08  |
| NGC6373 | Gal   | Dra   | 17h 24m 08s | +58°59'43" | 14.0 | Circum | 02:04   | Circum |
| NGC6357 | Neb   | Sco   | 17h 24m 43s | -34°12'06" |      | 21:50  | 02:05   | 06:19  |

| ID      | Type  | Const | RA          | Dec        | Mag  | Rise   | Transit | Set    |
|---------|-------|-------|-------------|------------|------|--------|---------|--------|
| NGC6352 | Glob  | Ara   | 17h 25m 29s | -48°25'21" | 8.2  | 23:18  | 02:05   | 04:53  |
| NGC6369 | P Neb | Oph   | 17h 29m 21s | -23°45'34" | 13.0 | 21:15  | 02:09   | 07:03  |
| NGC6388 | Glob  | Sco   | 17h 36m 17s | -44°44'08" | 6.9  | 22:59  | 02:16   | 05:33  |
| NGC6396 | Open  | Sco   | 17h 37m 36s | -35°01'36" | 8.5  | 22:07  | 02:17   | 06:28  |
| M14     | Glob  | Oph   | 17h 37m 36s | -03°14'43" | 9.5  | 20:24  | 02:17   | 08:11  |
| NGC6401 | Glob  | Oph   | 17h 38m 37s | -23°54'33" | 9.5  | 21:25  | 02:18   | 07:12  |
| NGC6400 | Open  | Sco   | 17h 40m 12s | -36°56'54" | 9.0  | 22:18  | 02:20   | 06:22  |
| M6      | Open  | Sco   | 17h 40m 20s | -32°15'12" | 4.5  | 21:58  | 02:20   | 06:43  |
| NGC6397 | Glob  | Ara   | 17h 40m 42s | -53°40'26" | 5.7  | 00:37  | 02:21   | 04:04  |
| NGC6417 | Gal   | Her   | 17h 41m 48s | +23°40'18" | 14.0 | 19:10  | 02:22   | 09:34  |
| NGC6416 | Open  | Sco   | 17h 44m 19s | -32°21'42" | 5.7  | 22:02  | 02:24   | 06:46  |
| NGC6426 | Glob  | Oph   | 17h 44m 55s | +03°10'11" | 11.2 | 20:13  | 02:25   | 08:36  |
| NGC6425 | Open  | Sco   | 17h 47m 01s | -31°31'48" | 7.2  | 22:01  | 02:27   | 06:52  |
| NGC6439 | P Neb | Sgr   | 17h 48m 20s | -16°28'44" | 14.0 | 21:11  | 02:28   | 07:45  |
| NGC6440 | Glob  | Sgr   | 17h 48m 53s | -20°21'39" | 9.7  | 21:24  | 02:29   | 07:34  |
| NGC6445 | P Neb | Sgr   | 17h 49m 15s | -20°00'36" | 13.0 | 21:23  | 02:29   | 07:35  |
| NGC6441 | Glob  | Sco   | 17h 50m 13s | -37°03'03" | 7.4  | 22:29  | 02:30   | 06:31  |
| NGC6451 | Open  | Sco   | 17h 50m 41s | -30°12'36" | 8.0  | 22:00  | 02:31   | 07:01  |
| M7      | Open  | Sco   | 17h 53m 51s | -34°47'36" | 3.5  | 22:22  | 02:34   | 06:45  |
| M23     | Open  | Sgr   | 17h 57m 04s | -18°59'06" | 6.0  | 21:28  | 02:37   | 07:46  |
| NGC6543 | P Neb | Dra   | 17h 58m 33s | +66°37'59" | 9.0  | Circum | 02:38   | Circum |
| M20     | D Neb | Sgr   | 18h 02m 42s | -22°58'18" | 5.0  | 21:46  | 02:43   | 07:39  |
| M8      | D Neb | Sgr   | 18h 03m 41s | -24°22'48" | 5.0  | 21:52  | 02:44   | 07:35  |
| NGC6535 | Glob  | Ser   | 18h 03m 51s | -00°17'51" | 10.6 | 20:42  | 02:44   | 08:46  |
| NGC6526 | Neb   | Sgr   | 18h 04m 06s | -24°26'30" |      | 21:52  | 02:44   | 07:36  |
| M21     | Open  | Sgr   | 18h 04m 13s | -22°29'24" | 7.0  | 21:46  | 02:44   | 07:42  |
| NGC6530 | Open  | Sgr   | 18h 04m 31s | -24°21'30" | 4.6  | 21:52  | 02:44   | 07:36  |
| NGC6528 | Glob  | Sgr   | 18h 04m 50s | -30°03'21" | 9.5  | 22:13  | 02:45   | 07:16  |
| NGC6539 | Glob  | Ser   | 18h 04m 50s | -07°35'11" | 9.6  | 21:03  | 02:45   | 08:27  |
| NGC6537 | P Neb | Sgr   | 18h 05m 13s | -19°50'35" | 13.0 | 21:39  | 02:45   | 07:52  |
| NGC6541 | Glob  | CrA   | 18h 08m 02s | -43°42'57" | 6.6  | 23:24  | 02:48   | 06:12  |
| NGC6559 | Neb   | Sgr   | 18h 09m 57s | -24°06'23" |      | 21:57  | 02:50   | 07:43  |
| NGC6565 | P Neb | Sgr   | 18h 11m 53s | -28°10'41" | 13.0 | 22:13  | 02:52   | 07:30  |
| NGC6563 | P Neb | Sgr   | 18h 12m 03s | -33°52'07" | 14.0 | 22:36  | 02:52   | 07:08  |
| NGC6572 | P Neb | Oph   | 18h 12m 06s | +06°51'13" | 9.0  | 20:31  | 02:52   | 09:13  |
| NGC6568 | Open  | Sgr   | 18h 12m 44s | -21°36'18" | 9.0  | 21:52  | 02:53   | 07:54  |
| NGC6569 | Glob  | Sgr   | 18h 13m 39s | -31°49'35" | 8.7  | 22:29  | 02:54   | 07:18  |
| NGC6567 | P Neb | Sgr   | 18h 13m 45s | -19°04'34" | 12.0 | 21:45  | 02:54   | 08:03  |
| NGC6583 | Open  | Sgr   | 18h 15m 49s | -22°08'12" | 10.0 | 21:56  | 02:56   | 07:55  |
| NGC6578 | P Neb | Sgr   | 18h 16m 16s | -20°27'03" | 13.0 | 21:52  | 02:56   | 08:01  |
| NGC6605 | Open  | Ser   | 18h 16m 24s | -15°00'00" | 6.0  | 21:35  | 02:56   | 08:17  |
| NGC6595 | Open  | Sgr   | 18h 17m 05s | -19°51'57" | 7.0  | 21:50  | 02:57   | 08:03  |
| M24     | Open  | Sgr   | 18h 18m 26s | -18°24'24" | 4.5  | 21:47  | 02:58   | 08:09  |
| M16     | D Neb | Ser   | 18h 18m 48s | -13°48'24" | 6.5  | 21:34  | 02:59   | 08:23  |
| M18     | Open  | Sgr   | 18h 19m 58s | -17°06'07" | 8.0  | 21:45  | 03:00   | 08:15  |

| ID      | Type  | Const | RA          | Dec        | Mag  | Rise  | Transit | Set   |
|---------|-------|-------|-------------|------------|------|-------|---------|-------|
| NGC6625 | Open  | Sct   | 18h 23m 01s | -12°01'24" | 9.0  | 21:33 | 03:03   | 08:33 |
| NGC6624 | Glob  | Sgr   | 18h 23m 41s | -30°21'40" | 8.3  | 22:33 | 03:04   | 07:34 |
| NGC6629 | P Neb | Sgr   | 18h 25m 42s | -23°12'10" | 12.0 | 22:10 | 03:06   | 08:01 |
| NGC6633 | Open  | Oph   | 18h 27m 15s | +06°30'30" | 4.6  | 20:47 | 03:07   | 09:28 |
| M69     | Glob  | Sgr   | 18h 31m 23s | -32°20'51" | 9.0  | 22:49 | 03:11   | 07:33 |
| M25     | Open  | Sgr   | 18h 31m 42s | -19°07'00" | 6.5  | 22:03 | 03:12   | 08:20 |
| NGC6644 | P Neb | Sgr   | 18h 32m 35s | -25°07'44" | 12.0 | 22:23 | 03:12   | 08:02 |
| M22     | Glob  | Sgr   | 18h 36m 24s | -23°54'17" | 6.5  | 22:23 | 03:16   | 08:10 |
| NGC6664 | Open  | Sct   | 18h 36m 33s | -08°13'12" | 7.8  | 21:36 | 03:16   | 08:57 |
| NGC6683 | Open  | Sct   | 18h 42m 13s | -06°12'42" | 10.0 | 21:36 | 03:22   | 09:08 |
| M70     | Glob  | Sgr   | 18h 43m 12s | -32°17'27" | 9.0  | 23:01 | 03:23   | 07:45 |
| M26     | Open  | Sct   | 18h 45m 18s | -09°23'00" | 9.5  | 21:48 | 03:25   | 09:02 |
| NGC6704 | Open  | Sct   | 18h 50m 45s | -05°12'18" | 9.2  | 21:42 | 03:31   | 09:19 |
| NGC6709 | Open  | Aql   | 18h 51m 18s | +10°19'06" | 6.7  | 21:00 | 03:31   | 10:02 |
| M57     | P Neb | Lyr   | 18h 53m 35s | +33°01'44" | 9.5  | 19:46 | 03:33   | 11:21 |
| NGC6723 | Glob  | Sgr   | 18h 59m 33s | -36°37'54" | 7.3  | 23:36 | 03:39   | 07:43 |
| NGC6726 | Neb   | CrA   | 19h 01m 39s | -36°53'30" |      | 23:39 | 03:42   | 07:44 |
| NGC6729 | Neb   | CrA   | 19h 01m 55s | -36°57'30" |      | 23:40 | 03:42   | 07:43 |
| NGC6741 | P Neb | Aql   | 19h 02m 37s | -00°26'57" | 11.0 | 21:41 | 03:42   | 09:44 |
| NGC6749 | Glob  | Aql   | 19h 05m 15s | +01°54'02" | 11.1 | 21:37 | 03:45   | 09:53 |
| NGC6751 | P Neb | Aql   | 19h 05m 56s | -05°59'31" | 13.0 | 21:59 | 03:46   | 09:32 |
| NGC6760 | Glob  | Aql   | 19h 11m 12s | +01°01'50" | 9.1  | 21:46 | 03:51   | 09:57 |
| NGC6772 | P Neb | Aql   | 19h 14m 36s | -02°42'24" | 14.0 | 21:59 | 03:54   | 09:50 |
| M56     | Glob  | Lyr   | 19h 16m 36s | +30°11'02" | 9.5  | 20:20 | 03:56   | 11:32 |
| NGC6778 | P Neb | Aql   | 19h 18m 25s | -01°35'48" | 13.0 | 22:00 | 03:58   | 09:57 |
| NGC6781 | P Neb | Aql   | 19h 18m 28s | +06°32'20" | 12.0 | 21:38 | 03:58   | 10:19 |
| NGC6790 | P Neb | Aql   | 19h 22m 57s | +01°30'48" | 10.0 | 21:56 | 04:03   | 10:10 |
| NGC6802 | Open  | Vul   | 19h 30m 35s | +20°15'42" | 8.8  | 21:10 | 04:10   | 11:11 |
| NGC6803 | P Neb | Aql   | 19h 31m 16s | +10°03'23" | 11.0 | 21:41 | 04:11   | 10:41 |
| NGC6804 | P Neb | Aql   | 19h 31m 35s | +09°13'31" | 12.0 | 21:43 | 04:11   | 10:39 |
| NGC6807 | P Neb | Aql   | 19h 34m 34s | +05°41'03" | 14.0 | 21:56 | 04:14   | 10:33 |
| NGC6811 | Open  | Cyg   | 19h 37m 17s | +46°23'18" | 6.8  | 19:11 | 04:17   | 13:24 |
| M55     | Glob  | Sgr   | 19h 40m 00s | -30°57'44" | 7.0  | 23:52 | 04:20   | 08:48 |
| NGC6813 | Neb   | Vul   | 19h 40m 22s | +27°18'34" |      | 20:55 | 04:20   | 11:45 |
| NGC6819 | Open  | Cyg   | 19h 41m 18s | +40°11'12" | 7.3  | 19:58 | 04:21   | 12:45 |
| NGC6820 | Neb   | Vul   | 19h 42m 28s | +23°05'17" |      | 21:12 | 04:22   | 11:32 |
| NGC6823 | Open  | Vul   | 19h 43m 09s | +23°18'00" | 7.1  | 21:12 | 04:23   | 11:34 |
| NGC6818 | P Neb | Sgr   | 19h 43m 58s | -14°09'10" | 10.0 | 23:00 | 04:24   | 09:47 |
| NGC6826 | P Neb | Cyg   | 19h 44m 48s | +50°31'30" | 10.0 | 18:36 | 04:25   | 14:13 |
| NGC6833 | P Neb | Cyg   | 19h 49m 47s | +48°57'40" | 14.0 | 18:59 | 04:30   | 14:00 |
| NGC6830 | Open  | Vul   | 19h 50m 59s | +23°06'00" | 7.9  | 21:21 | 04:31   | 11:41 |
| NGC6842 | P Neb | Vul   | 19h 55m 02s | +29°17'20" | 14.0 | 21:02 | 04:35   | 12:07 |
| M27     | P Neb | Vul   | 19h 59m 36s | +22°43'15" | 7.5  | 21:31 | 04:39   | 11:48 |
| NGC6866 | Open  | Cyg   | 20h 03m 55s | +44°09'30" | 7.6  | 19:55 | 04:44   | 13:33 |
| NGC6871 | Open  | Cyg   | 20h 05m 59s | +35°46'38" | 5.2  | 20:45 | 04:46   | 12:46 |

| ID      | Type  | Const | RA          | Dec        | Mag  | Rise   | Transit | Set    |
|---------|-------|-------|-------------|------------|------|--------|---------|--------|
| M75     | Glob  | Sgr   | 20h 06m 05s | -21°55'19" | 9.5  | 23:46  | 04:46   | 09:46  |
| NGC6861 | Gal   | Tel   | 20h 07m 19s | -48°22'12" | 11.1 | 01:59  | 04:47   | 07:35  |
| NGC6884 | P Neb | Cyg   | 20h 10m 24s | +46°27'39" | 13.0 | 19:43  | 04:50   | 13:57  |
| NGC6879 | P Neb | Sge   | 20h 10m 27s | +16°55'22" | 13.0 | 22:00  | 04:50   | 11:41  |
| NGC6881 | P Neb | Cyg   | 20h 10m 52s | +37°24'42" | 14.0 | 20:42  | 04:51   | 12:59  |
| NGC6883 | Open  | Cyg   | 20h 11m 20s | +35°49'55" | 8.0  | 20:50  | 04:51   | 12:52  |
| NGC6888 | Neb   | Cyg   | 20h 12m 06s | +38°21'17" |      | 20:38  | 04:52   | 13:05  |
| NGC6886 | P Neb | Sge   | 20h 12m 43s | +19°59'22" | 12.0 | 21:53  | 04:53   | 11:53  |
| NGC6891 | P Neb | Del   | 20h 15m 09s | +12°42'16" | 12.0 | 22:17  | 04:55   | 11:33  |
| NGC6894 | P Neb | Cyg   | 20h 16m 24s | +30°33'55" | 14.0 | 21:19  | 04:56   | 12:34  |
| NGC6905 | P Neb | Del   | 20h 22m 23s | +20°06'16" | 12.0 | 22:02  | 05:02   | 12:03  |
| NGC6910 | Open  | Cyg   | 20h 23m 12s | +40°46'42" | 7.4  | 20:36  | 05:03   | 13:30  |
| NGC6903 | Gal   | Cap   | 20h 23m 45s | -19°19'31" | 13.0 | 23:55  | 05:04   | 10:12  |
| NGC6914 | Neb   | Cyg   | 20h 24m 43s | +42°28'57" |      | 20:27  | 05:05   | 13:42  |
| NGC6946 | Gal   | Cyg   | 20h 34m 52s | +60°09'14" | 8.9  | Circum | 05:15   | Circum |
| NGC6960 | Neb   | Cyg   | 20h 45m 58s | +30°35'42" |      | 21:48  | 05:26   | 13:04  |

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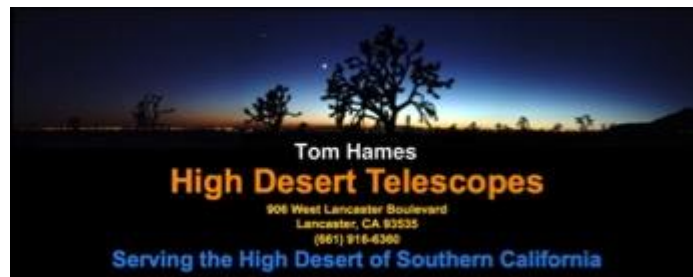


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