



# Desert Sky Observer

Volume 38

Antelope Valley Astronomy Club Newsletter

December 2018

## Up-Coming Events

December 8: [AVAC Christmas Party for Members](#)

\* 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

**Frank Moore**

“It is December, and nobody asked if I was ready.” — Sarah Kay

It looks like December is going to come in the same way November went out...wet and cold. I certainly hope we can sustain it for a while because, while it may interfere with our observing, the parched state of California certainly needs it.

In lieu of a formal star party we had several other events throughout November. First, several of us attended the Nightfall Star Party at the Palm Canyon Hotel and RV Resort in Borrego Springs from November 1-4. Rose and I setup our motorhome in the RV park (same site as last year) and, since the RV site was 70 feet long, and we have only a 32 foot RV, we had plenty of space for our telescopes and those of a few of our friends. Rod and Donna Girard stayed in a room at the Palm Canyon resort and Rod setup his Celestron CPC Deluxe Edge HD 925 SCT and (new) MallinCam imaging rig in exactly the same spot as last year. Bob and Terry Ayres were staying at another nearby resort but also setup Bob's 10" Meade SCT in our RV site.

Unfortunately, and though also we had some periods of exceptional viewing, we had scattered clouds that moved in and out on all three nights. Nighttime conditions aside, for me, the high point of Nightfall was the first use of our Daystar Quark hydrogen alpha solar filter on our old Celestron C6-R refractor. The images of both the chromosphere (apparent surface features) and detailed prominences have “ignited” a new enthusiasm for large aperture solar observing in me and gave the old C6-R a new lease on life.

We had a wonderful speaker at the November 9 meeting as Dr. Jeff Rich, post-doctoral researcher at the Carnegie Observatories, gave a talk on “Merging Galaxies” and a summary of the history and achievements of the Carnegie Observatories including the Mount Wilson and Palomar Observatories and the Las Campanas Observatory in Chile where the future Giant Magellan Telescope is being built.

Also in lieu of a traditional star party, on November 10 we setup telescopes for public viewing in support of the “Red Light Tours” at the Exotic Feline Breeding Compound in Rosamond. While the docents and volunteers led the public on tours of the big cats, all by red light for night adapted vision and so as not to disturb the nocturnal cats, we had telescopes for public viewing in a center courtyard. Though the ample trees in the facility made telescope site and object selection a bit difficult, we were still able to make it work and share sites of the cosmos with guests and EFBC employees and volunteers. Members who supported this event with telescopes included Matt Leone with his 24" dob, Rose and I with our C-11, Rod Girard with

his C-9 HD, Phil Wriedt with a 12" Meade SCT, Darrell Bennett with his 12" Meade SCT, Kevin Reilly with an 8" dob, Jim Pendleton with a 10" dob and Ellen Mahler with her 6" dob. Other members came out and took the tour of the exotic cats.

On the following Saturday, November 17, we had our regular event in support of Jeremy Amarant at the Prime Desert Woodland Moonwalk. Once again, and as is typical for this time of year, sky conditions weren't great but we still managed to pull the moon, Mars, Saturn and few deep sky objects out of the murk.

Remember, our Annual Christmas Party is on Saturday December 8 at Gino's Italian Ristorante in the Lancaster Marketplace. They did a wonderful job for our event last year and we're looking forward to their excellent food and service again. Rose has included details on the deadline to RSVP and ticket purchases and payment in her DSO submissions and in several separate emails. Make sure to let her know if you want to come.

Finally, don't forget to put the Total Lunar Eclipse of January 20, 2019 on your calendar. We'll be having a special event at the SAGE Planetarium that you won't want to miss.



## Secretary

### Rose Moore

Our Christmas Party is on Saturday Dec. 8th at 6pm! It is being held at Gino's Restaurant in the Lancaster Marketplace: 44960 Valley Central Way, Lancaster, CA 93536. This is a buffet dinner, similar to last year, and they will be serving the buffet starting at 6:30pm. If you have anything you would like to donate to the raffle, please let Frank or I know, so that we can bring extra wrapping and gift bags. The items do not have to be astronomy related, as long as it is gently used or new. Dress is casual. If any questions, please let us know!

We will be working on the AVAC schedule for the upcoming year, so stay tuned!

One event we do have planned for early next year is the Lunar Eclipse on Sunday January 20th! We will have a public outreach event at the SAGE for this event. Further info to follow.

We had our AVAC elections in October. If you were not aware, these members are your new Board: welcome Darrell Bennett as President, Matt Leone as Vice President, Rod Girard as Treasurer, Robert Lynch as Director of Community Development. The position of Secretary is empty at this time. Frank, Rod and I will be helping the Board in its transition. Please help support your new Board this coming year!

Member Duane Lewis will be selling his Celestron SCT 9.25 inch. We will have further info on this in the January's DSO!

Thank you to all the members who came out to the event at the Feline Breeding Compound in November! We had a good club turnout!

I hope everyone has a great holiday season. Merry Christmas and Happy New Year!

## Space Place

## Observe Apollo 8's Lunar Milestones

By David Prosper

December marks the 50th anniversary of NASA's Apollo 8 mission, when humans first orbited the Moon in a triumph of human engineering. The mission may be most famous for "Earthrise," the iconic photograph of Earth suspended over the rugged lunar surface. "Earthrise" inspired the imaginations of people around the world and remains one of the most famous photos ever taken. This month also brings a great potential display of the Geminids and a close approach by Comet 46P/Wirtanen.



*Earthrise, 1968. Note the phase of Earth as seen from the Moon. Nearside lunar observers see Earth go through a complete set of phases. However, only orbiting astronauts witness Earthrises; for stationary lunar observers, Earth barely moves at all. Why is that?*

*Credit: Bill Anders/NASA*

You can take note of Apollo 8's mission milestones while observing the Moon this month. Watch the nearly full Moon rise just before sunset on December 21, exactly 50 years after Apollo 8 launched; it will be near the bright orange star Aldebaran in Taurus. The following evenings watch it pass over the top of Orion and on through Gemini; on those days five decades earlier, astronauts Frank Borman, Jim Lovell, and Bill Anders sped towards the Moon in their fully crewed command module. Notice how the Moon rises later each evening, and how its phase wanes from full on Dec 22 to gibbous through the rest of the week. Can you imagine what phase Earth would appear as if you were standing on the Moon, looking back? The three brave astronauts spent 20 sleepless hours in orbit around the Moon, starting on Dec 24, 1968. During those ten orbits, they became the first humans to see with their own eyes both the far side of the Moon and an Earthrise! The crew telecast a holiday message on December 25 to a record number of Earthbound viewers as they orbited

over the lifeless lunar terrain; "Good night, good luck, a merry Christmas and God bless all of you - all of you on the good Earth." 50 years later, spot the Moon on these holiday evenings as it travels through Cancer and Leo. Just two days later the astronauts splashed down into the Pacific Ocean after achieving all the mission's test objectives, paving the way for another giant leap in space exploration the following year.

The Geminids, an excellent annual meteor shower, peaks the evening of December 13 through the morning of the 14th. They get their chance to truly shine after a waxing crescent Moon sets around 10:30 pm on the 13th. Expert Geminid observers can spot around 100 meteors per hour under ideal conditions. You'll spot quite a few meteors by avoiding bad weather and light pollution if you can, and of course make sure to bundle up and take frequent warming breaks. The Geminids have an unusual origin compared to most meteor showers, which generally spring from icy comets. The tiny particles Earth passes through these evenings come from a strange "rock comet" named asteroid 3200 Phaethon. This dusty asteroid experiences faint outbursts of fine particles of rock instead of ice.

You can also look for comet 46P/Wirtanen while you're out meteor watching. Its closest approach to Earth brings it within 7.1 million miles of us on December 16. That's 30 times the average Earth-Moon distance! While passing near enough to rank as the 10th closest cometary approach in modern times, there is no danger of this object striking our planet. Cometary brightness is hard to predict, and while there is a chance comet 46P/Wirtanen may flare up to naked eye visibility, it will likely remain visible only via binoculars or telescopes. You'll be able to see for yourself how much 46P/Wirtanen actually brightens. Some of the best nights to hunt for it will be December 15 and 16 as it passes between two prominent star clusters in Taurus: the Pleiades and the V-shaped Hyades. Happy hunting!

Catch up on all of NASA's past, current, and future missions at [nasa.gov](https://nasa.gov)

*This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit <https://spaceplace.nasa.gov/> to explore space and Earth science!*

## News Headlines

### **NASA InSight Lander Arrives on Martian Surface**

Mars has just received its newest robotic resident. NASA's Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) lander successfully touched down on the Red Planet after an almost seven-month, 300-million-mile (485-million-kilometer) journey from Earth. InSight launched from Vandenberg Air Force Base in California May 5. The lander touched down Monday, Nov. 26, near Mars' equator on the western side of a flat, smooth expanse of lava called Elysium Planitia,

<https://go.nasa.gov/2QpV0ac>

### **Meet 2018's brightest comet**

Comet Wirtanen is the brightest comet in the night sky now, visible not with the eye alone, but to astronomers with telescopes and binoculars. In December 2018, comet Wirtanen might indeed become visible to the eye, at least from dark locations. Wirtanen's closest approach to the sun will be December 12, 2018, and its closest approach to Earth is just a few days later, on December 16.

<https://earthsky.org/space/46p-wirtanen-possibly-visible-to-eye-dec-2018>

### **NASA selects nine companies for commercial lunar lander program**

NASA has picked nine companies, ranging from startups to aerospace giants, to be eligible for future contracts to deliver payloads to the surface of the moon, but with no guarantee of business for any of them. NASA announced Nov. 29 the selections as part of its Commercial Lunar Payload Services (CLPS) program, where the agency will buy space on future commercial lunar landers to carry science instruments and other payloads.

<https://spacenews.com/nasa-selects-nine-companies-for-commercial-lunar-lander-program/>

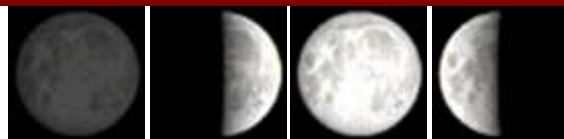
### **Parker Solar Probe Good Status After Close Solar Approach**

Parker Solar Probe is alive and well after skimming by the Sun at just 15 million miles from our star's surface. This is far closer than any spacecraft has ever gone. The previous record was set by Helios B in 1976 and broken by Parker on Oct. 29. This maneuver has exposed the spacecraft to intense heat and solar radiation in a complex solar wind environment.

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

## December Sky Data

New Dec 6      First Qtr Dec 15      Full Dec 22      Last Qtr Dec 29



## Planet Summary

**Mercury** passed between us and the Sun on the 27th of November but appears in the pre-dawn sky around the 6th of the month. It will then have a magnitude of +0.5 which increases to magnitude 0.0 by the 8th. Mercury reaches its greatest elongation (west) of the Sun on the 16th, then 21 degrees away, and rises over an hour and a half before the Sun when it is ~60% lit.

**Venus** begins December at a magnitude of -4.4. Its angular size reduces from 40.7 to 26.6 arc seconds during the month as it moves away from the Earth but, at the same time, its phase increases from 26% to 47%.

**Mars**, though fading from magnitude 0.2 to 0.6 during the month remains prominent in the southern sky. It will lie due south around 6 pm. Its angular size falls from 9.3 arc seconds to 7.5 arc seconds during the month.

**Jupiter** passed behind the Sun on November 26th and will appear low in the eastern pre-dawn sky around the 12th of the month. It will have a magnitude of ~-1.3 and a disk ~32 arc seconds across. Not a good month to observe it due to its low elevation.

**Saturn** might just be glimpsed in the first few days of December very low in the southwest around 16:45, but soon disappears into the Sun's glare as it moves towards superior conjunction on January 2nd. It will have a disk of ~15 arc seconds and a magnitude of +1.6.

The Geminid **meteor shower** – always a highlight of the meteor year – will peak in 2018 around the mornings of December 13 and 14. Geminid meteors tend to be few and far between at early evening, but intensify in number as evening deepens into late night. Observing around 2 a.m. is best. The curious rock comet called 3200 Phaethon is the parent body of this shower.

## Sun and Moon Rise and Set

Date	Moonrise	Moonsset	Sunrise	Sunset
12/1/2018	00:52	13:38	06:42	16:41
12/5/2018	05:01	15:59	06:45	16:41
12/10/2018	09:31	19:53	06:49	16:42
12/15/2018	12:29	n/a	06:52	16:43
12/20/2018	15:23	04:31	06:55	16:45
12/25/2018	21:29	10:38	06:55	16:45
12/31/2018	01:53	13:23	06:59	16:52

## Planet Data

	Dec 1			
	Rise	Transit	Set	Mag
<b>Mercury</b>	05:51	11:04	16:17	1.5
<b>Venus</b>	03:29	09:05	14:41	-4.4
<b>Mars</b>	12:23	18:01	23:39	0.2
<b>Jupiter</b>	06:22	11:26	16:31	-1.3
<b>Saturn</b>	08:50	13:47	18:44	1.6

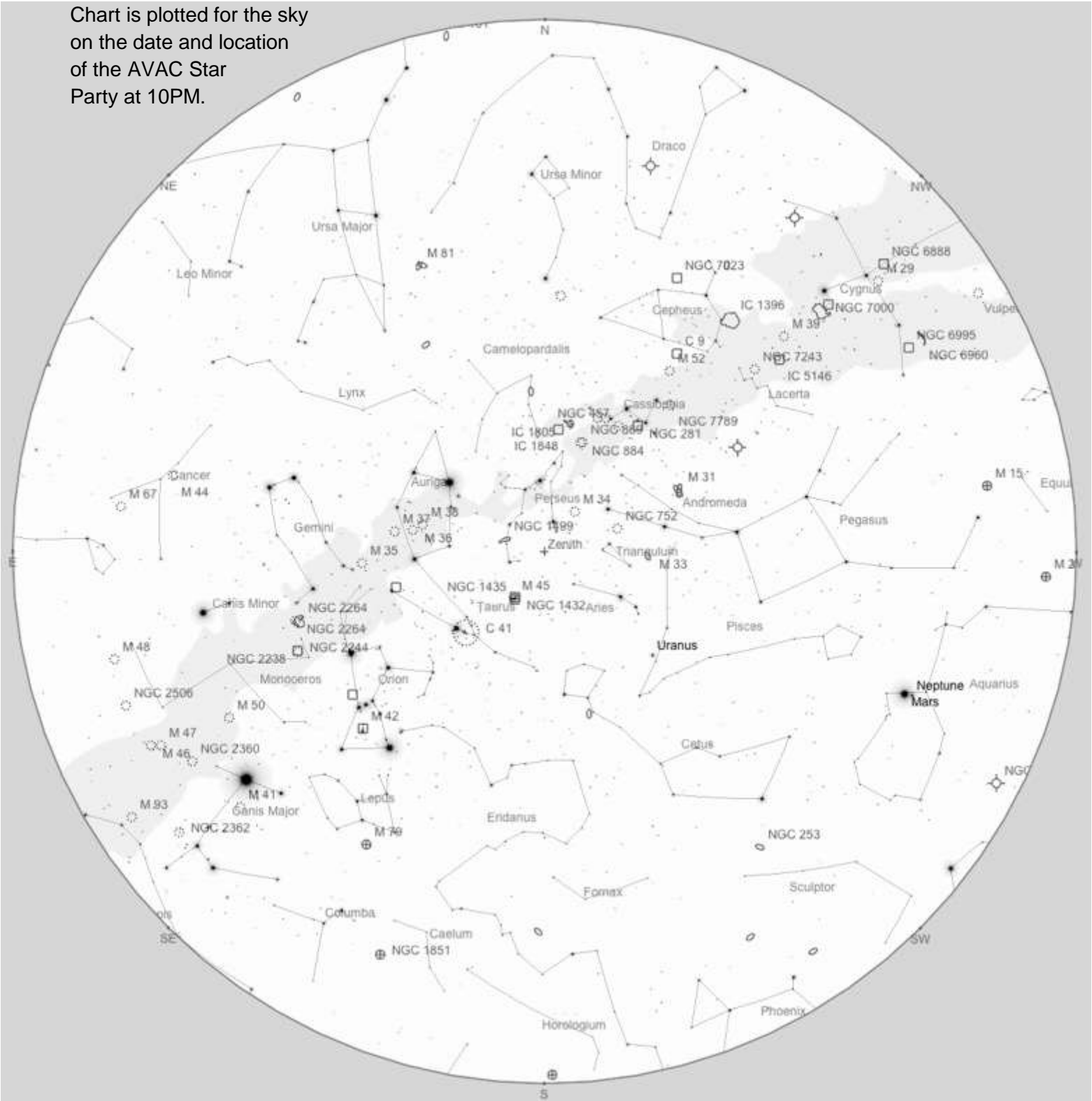
	Dec 15			
	Rise	Transit	Set	Mag
<b>Mercury</b>	05:11	10:22	15:33	-0.2
<b>Venus</b>	03:17	08:48	14:19	-4.3
<b>Mars</b>	11:50	17:39	23:28	0.4
<b>Jupiter</b>	05:41	10:44	15:47	-1.3
<b>Saturn</b>	08:01	12:59	17:56	1.6

	Dec 31			
	Rise	Transit	Set	Mag
<b>Mercury</b>	05:51	10:47	15:43	-0.3
<b>Venus</b>	03:22	08:42	14:03	-4.1
<b>Mars</b>	11:13	17:15	23:16	0.6
<b>Jupiter</b>	04:55	09:56	14:57	-1.3
<b>Saturn</b>	07:06	12:04	17:02	1.5

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, or the Saturday closest to the new moon if there is no star party scheduled. The list is sorted by the transit time of the object.

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC2071	Neb	Ori	05h 47m 07s	+00°17'39"		18:53	00:57	07:00
NGC7538	Neb	Cep	23h 13m 38s	+61°30'42"		Circum	18:23	Circum
NGC2185	Neb	Mon	06h 11m 00s	-06°13'36"		19:35	01:21	07:07
NGC2174	Neb	Ori	06h 09m 24s	+20°39'34"		18:17	01:19	08:21
NGC7822	Neb	Cep	00h 03m 36s	+67°09'00"		Circum	19:13	Circum
NGC2023	Neb	Ori	05h 41m 38s	-02°15'33"		18:55	00:51	06:48
NGC2067	Neb	Ori	05h 46m 31s	+00°07'54"		18:53	00:56	06:59
NGC1435	Neb	Tau	03h 46m 10s	+23°45'54"		15:44	22:56	06:08
NGC2182	Neb	Mon	06h 09m 31s	-06°19'35"		19:34	01:19	07:05
NGC1788	Neb	Ori	05h 06m 53s	-03°20'27"		18:23	00:17	06:10
NGC2316	Neb	Mon	06h 59m 41s	-07°46'39"		20:28	02:09	07:51
NGC1990	Neb	Ori	05h 36m 13s	-01°12'07"		18:47	00:46	06:46
NGC2359	Neb	CMa	07h 18m 30s	-13°13'36"		21:02	02:28	07:55
NGC2024	Neb	Ori	05h 41m 42s	-01°51'24"		18:54	00:52	06:49
NGC1975	Neb	Ori	05h 35m 18s	-04°41'05"		18:55	00:45	06:35
NGC1432	Neb	Tau	03h 45m 50s	+24°22'06"		15:41	22:56	06:10
M78	D Neb	Ori	05h 46m 45s	+00°04'48"	8.0	18:54	00:57	07:00
NGC2626	Neb	Vel	08h 35m 31s	-40°40'18"		00:03	03:45	07:28
NGC1977	Neb	Ori	05h 35m 16s	-04°49'15"		18:55	00:45	06:35
NGC1579	Neb	Per	04h 30m 14s	+35°16'47"		15:42	23:40	07:38
NGC1980	Neb	Ori	05h 35m 25s	-05°54'54"		18:59	00:45	06:32
NGC2261	Neb	Mon	06h 39m 10s	+08°44'40"		19:22	01:49	08:16
NGC2282	Neb	Mon	06h 46m 51s	+01°18'56"		19:50	01:57	08:03
NGC2245	Neb	Mon	06h 32m 41s	+10°09'24"		19:12	01:42	08:13
M43	D Neb	Ori	05h 35m 31s	-05°16'03"	9.0	18:57	00:45	06:34
NGC2183	Neb	Mon	06h 10m 47s	-06°12'43"		19:35	01:21	07:06
NGC2170	Neb	Mon	06h 07m 32s	-06°23'57"		19:32	01:17	07:03
NGC1491	Neb	Per	04h 03m 14s	+51°18'57"		13:14	23:13	09:12
NGC1999	Neb	Ori	05h 36m 25s	-06°42'57"		19:02	00:46	06:31
NGC1973	Neb	Ori	05h 35m 05s	-04°43'55"		18:55	00:45	06:35
NGC2064	Neb	Ori	05h 46m 18s	+00°00'21"		18:53	00:56	06:59
NGC1952	Neb	Tau	05h 34m 32s	+22°00'52"	8.4	17:38	00:44	07:51
NGC2247	Neb	Mon	06h 33m 05s	+10°19'17"		19:12	01:43	08:14
NGC1333	Neb	Per	03h 29m 20s	+31°24'56"		14:58	22:39	06:20
NGC896	Neb	Cas	02h 25m 28s	+62°01'09"		Circum	21:35	Circum
NGC2149	Neb	Mon	06h 03m 31s	-09°43'50"		19:37	01:13	06:49
NGC1499	Neb	Per	04h 03m 14s	+36°22'00"		15:10	23:13	07:16
NGC7635	Neb	Cas	23h 20m 45s	+61°12'42"		Circum	18:31	Circum



ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC7656	Gal	Aqr	23h 24m 31s	-19°03'35"	14.0	13:25	18:34	23:43
NGC1282	Gal	Per	03h 20m 12s	+41°22'01"	14.0	13:59	22:30	07:01
NGC3323	Gal	LMi	10h 39m 39s	+25°19'20"	14.0	22:32	05:49	13:07
NGC1022	Gal	Cet	02h 38m 33s	-06°40'39"	11.4	16:04	21:48	03:33
M65	Gal	Leo	11h 18m 56s	+13°05'31"	10.1	23:50	06:29	13:08
NGC2650	Gal	UMa	08h 49m 58s	+70°17'56"	14.0	Circum	04:00	Circum
NGC3550	Gal	UMa	11h 10m 39s	+28°46'04"	14.0	22:50	06:20	13:51
NGC821	Gal	Ari	02h 08m 21s	+10°59'41"	10.8	14:45	21:18	03:51
NGC274	Gal	Cet	00h 51m 02s	-07°03'26"	13.0	14:17	20:01	01:44
NGC2188	Gal	Col	06h 10m 10s	-34°06'20"	11.8	21:05	01:20	05:35
M31	Gal	And	00h 42m 44s	+41°16'08"	4.3	11:22	19:53	04:23
NGC895	Gal	Cet	02h 21m 36s	-05°31'17"	11.8	15:44	21:31	03:19
M105	Gal	Leo	10h 47m 50s	+12°34'55"	10.5	23:20	05:58	12:35
NGC720	Gal	Cet	01h 53m 00s	-13°44'19"	10.2	15:38	21:03	02:28
NGC2784	Gal	Hya	09h 12m 19s	-24°10'21"	10.1	23:30	04:22	09:15
NGC309	Gal	Cet	00h 56m 43s	-09°54'50"	11.8	14:31	20:07	01:42
NGC24	Gal	Scl	00h 09m 56s	-24°57'52"	11.5	14:30	19:20	00:10
NGC2905	Gal	Leo	09h 32m 12s	+21°31'04"	10.0	21:37	04:42	11:47
NGC2776	Gal	Lyn	09h 12m 15s	+44°57'17"	11.6	19:27	04:22	13:17
M82	Gal	UMa	09h 55m 53s	+69°40'50"	9.2	Circum	05:06	Circum
NGC404	Gal	And	01h 09m 27s	+35°43'05"	10.1	12:19	20:19	04:19
NGC578	Gal	Cet	01h 30m 29s	-22°39'59"	10.9	15:43	20:40	01:38
NGC2303	Gal	Aur	06h 56m 18s	+45°29'35"	14.0	17:07	02:06	11:05
NGC2985	Gal	UMa	09h 50m 22s	+72°16'44"	10.5	Circum	05:00	Circum
NGC7785	Gal	Psc	23h 55m 19s	+05°54'56"	11.6	12:46	19:05	01:24
NGC656	Gal	Psc	01h 42m 27s	+26°08'34"	13.0	13:32	20:52	04:13
NGC1518	Gal	Eri	04h 06m 49s	-21°10'44"	11.8	18:14	23:17	04:19
NGC982	Gal	And	02h 35m 25s	+40°52'10"	14.0	13:18	21:45	06:13
M96	Gal	Leo	10h 46m 46s	+11°49'12"	10.1	23:21	05:57	12:32
NGC3705	Gal	Leo	11h 30m 07s	+09°16'35"	11.0	00:12	06:40	13:08
NGC2986	Gal	Hya	09h 44m 16s	-21°16'43"	10.9	23:52	04:54	09:56
NGC1640	Gal	Eri	04h 42m 14s	-20°26'06"	11.7	18:47	23:52	04:57
NGC520	Gal	Psc	01h 24m 35s	+03°47'31"	11.2	14:21	20:34	02:47
M33	Gal	Tri	01h 33m 51s	+30°39'37"	6.2	13:06	20:44	04:22
NGC147	Gal	Cas	00h 33m 12s	+48°30'27"	9.3	10:17	19:43	05:09
NGC7786	Gal	Peg	23h 55m 21s	+21°35'17"	14.0	12:00	19:05	02:10
NGC3591	Gal	Crt	11h 14m 03s	-14°05'17"	14.0	01:00	06:24	11:48
NGC7541	Gal	Psc	23h 14m 44s	+04°32'02"	11.7	12:10	18:25	00:40
NGC7721	Gal	Aqr	23h 38m 49s	-06°31'05"	11.8	13:04	18:49	00:34
NGC255	Gal	Cet	00h 47m 47s	-11°28'06"	11.8	14:26	19:58	01:29
NGC3557	Gal	Cen	11h 09m 58s	-37°32'21"	10.4	02:21	06:20	10:19
NGC2685	Gal	UMa	08h 55m 35s	+58°44'02"	11.1	Circum	04:05	Circum
NGC7590	Gal	Gru	23h 18m 55s	-42°14'22"	11.6	14:55	18:29	22:02
NGC7725	Gal	Aqr	23h 39m 15s	-04°32'21"	14.0	12:59	18:49	00:40
NGC3470	Gal	UMa	10h 58m 45s	+59°30'38"	14.0	Circum	06:09	Circum

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC3377	Gal	Leo	10h 47m 42s	+13°59'07"	10.2	23:16	05:58	12:39
NGC1381	Gal	For	03h 36m 32s	-35°17'42"	12.0	18:37	22:46	02:56
NGC2300	Gal	Cep	07h 32m 21s	+85°42'31"	11.0	Circum	02:42	Circum
NGC7552	Gal	Gru	23h 16m 11s	-42°35'05"	10.7	14:55	18:26	21:57
NGC3250	Gal	Ant	10h 26m 32s	-39°56'38"	11.0	01:50	05:36	09:23
NGC55	Gal	Scl	00h 15m 08s	-39°13'12"	8.0	15:35	19:25	23:15
NGC2212	Gal	CMa	06h 18m 36s	-18°31'11"	14.0	20:18	01:28	06:39
NGC7817	Gal	Peg	00h 03m 59s	+20°45'03"	12.0	12:11	19:14	02:16
NGC7814	Gal	Peg	00h 03m 15s	+16°08'43"	10.5	12:25	19:13	02:01
M74	Gal	Psc	01h 36m 42s	+15°47'01"	9.8	14:00	20:47	03:33
NGC3227	Gal	Leo	10h 23m 31s	+19°51'54"	10.8	22:34	05:33	12:33
NGC7410	Gal	Gru	22h 55m 01s	-39°39'42"	10.4	14:17	18:05	21:53
NGC428	Gal	Cet	01h 12m 56s	+00°58'55"	11.4	14:17	20:23	02:28
NGC514	Gal	Psc	01h 24m 04s	+12°55'02"	11.9	13:55	20:34	03:12
NGC1087	Gal	Cet	02h 46m 25s	-00°29'56"	11.0	15:55	21:56	03:58
NGC857	Gal	For	02h 12m 37s	-31°56'40"	13.0	16:59	21:22	01:46
NGC718	Gal	Psc	01h 53m 13s	+04°11'43"	11.7	14:49	21:03	03:17
NGC3665	Gal	UMa	11h 24m 44s	+38°45'45"	10.8	22:19	06:35	14:50
NGC2935	Gal	Hya	09h 36m 45s	-21°07'42"	12.0	23:44	04:47	09:49
NGC3585	Gal	Hya	11h 13m 17s	-26°45'19"	10.0	01:40	06:23	11:07
NGC2268	Gal	Cam	07h 14m 18s	+84°22'55"	11.5	Circum	02:24	Circum
NGC2341	Gal	Gem	07h 09m 12s	+20°36'08"	14.0	19:17	02:19	09:21
NGC45	Gal	Cet	00h 14m 04s	-23°10'53"	10.4	14:28	19:24	00:20
NGC2583	Gal	Hya	08h 23m 08s	-05°00'09"	13.5	21:44	03:33	09:22
M77	Gal	Cet	02h 42m 41s	-00°00'48"	9.7	15:50	21:52	03:55
NGC2550	Gal	Cam	08h 24m 34s	+74°00'41"	13.0	Circum	03:34	Circum
NGC507	Gal	Psc	01h 23m 40s	+33°15'21"	11.2	12:45	20:33	04:22
NGC1094	Gal	Cet	02h 47m 28s	-00°17'06"	14.0	15:55	21:57	03:59
NGC2996	Gal	Hya	09h 46m 30s	-21°34'19"	14.0	23:55	04:56	09:57
NGC792	Gal	Ari	02h 02m 15s	+15°42'43"	14.0	14:25	21:12	03:59
NGC784	Gal	Tri	02h 01m 17s	+28°50'14"	11.8	13:40	21:11	04:42
NGC2613	Gal	Pyx	08h 33m 23s	-22°58'23"	10.4	22:47	03:43	08:40
NGC7463	Gal	Peg	23h 01m 52s	+15°58'55"	13.0	11:24	18:12	00:59
NGC288	Glob	Scl	00h 52m 45s	-26°35'01"	8.1	15:18	20:03	00:47
NGC1261	Glob	Hor	03h 12m 16s	-55°12'57"	8.4	21:11	22:22	23:33
NGC2298	Glob	Pup	06h 48m 59s	-36°00'15"	9.4	21:53	01:59	06:05
NGC7492	Glob	Aqr	23h 08m 27s	-15°36'41"	11.5	12:59	18:18	23:38
NGC2419	Glob	Lyn	07h 38m 08s	+38°52'54"	10.4	18:32	02:48	11:04
NGC3201	Glob	Vel	10h 17m 37s	-46°24'45"	6.8	02:23	05:27	08:32
NGC1851	Glob	Col	05h 14m 07s	-40°02'46"	7.3	20:38	00:24	04:10
M79	Glob	Lep	05h 24m 11s	-24°31'29"	8.5	19:43	00:34	05:25
NGC2477	Open	Pup	07h 52m 10s	-38°31'48"	5.8	23:08	03:02	06:56
NGC7790	Open	Cas	23h 58m 24s	+61°12'30"	8.5	Circum	19:08	Circum
NGC7510	Open	Cep	23h 11m 04s	+60°34'15"	7.9	Circum	18:21	Circum
NGC1724	Open	Aur	05h 03m 32s	+49°29'30"	10.0	14:37	00:13	09:50

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC1893	Open	Aur	05h 22m 45s	+33°24'42"	7.5	16:43	00:33	08:22
NGC2910	Open	Vel	09h 30m 30s	-52°55'06"	7.2	02:44	04:40	06:36
NGC2343	Open	Mon	07h 08m 06s	-10°37'00"	6.7	20:44	02:18	07:52
NGC2252	Open	Mon	06h 34m 42s	+05°22'00"	8.0	19:27	01:45	08:02
NGC1857	Open	Aur	05h 20m 05s	+39°19'30"	7.0	16:11	00:30	08:49
NGC2587	Open	Pup	08h 23m 25s	-29°30'30"	9.0	23:00	03:33	08:07
NGC2302	Open	Mon	06h 51m 55s	-07°05'00"	8.9	20:18	02:02	07:45
NGC2580	Open	Pup	08h 21m 28s	-30°18'00"	10.0	23:01	03:31	08:02
NGC884	Open	Per	02h 22m 18s	+57°08'12"	4.0	Circum	21:32	Circum
NGC381	Open	Cas	01h 08m 19s	+61°35'00"	9.0	Circum	20:18	Circum
NGC2232	Open	Mon	06h 28m 01s	-04°50'48"	3.9	19:48	01:38	07:27
NGC2264	Open	Mon	06h 40m 58s	+09°53'42"	3.9	19:21	01:51	08:21
NGC3105	Open	Vel	10h 00m 39s	-54°47'18"	9.7	03:49	05:10	06:32
NGC2659	Open	Vel	08h 42m 37s	-44°59'00"	8.6	00:37	03:52	07:08
NGC2367	Open	CMa	07h 20m 06s	-21°52'54"	7.9	21:30	02:30	07:30
NGC133	Open	Cas	00h 31m 19s	+63°21'00"	9.0	Circum	19:41	Circum
NGC1647	Open	Tau	04h 45m 55s	+19°06'54"	6.4	16:59	23:56	06:53
NGC956	Open	And	02h 32m 30s	+44°35'37"	9.0	12:50	21:42	06:35
M44	Open	Cnc	08h 40m 24s	+19°40'00"	4.0	20:51	03:50	10:49
NGC7789	Open	Cas	23h 57m 24s	+56°42'30"	6.7	Circum	19:07	Circum
NGC1245	Open	Per	03h 14m 42s	+47°14'12"	8.4	13:11	22:25	07:38
NGC2250	Open	Mon	06h 33m 49s	-05°05'06"	9.0	19:55	01:44	07:33
NGC2126	Open	Aur	06h 02m 32s	+49°52'00"	10.0	15:32	01:12	10:53
NGC2670	Open	Vel	08h 45m 30s	-48°48'00"	7.8	01:11	03:55	06:40
NGC1444	Open	Per	03h 49m 25s	+52°39'30"	6.6	12:40	22:59	09:19
NGC2129	Open	Gem	06h 01m 06s	+23°19'18"	6.7	18:00	01:11	08:22
M48	Open	Hya	08h 13m 43s	-05°45'00"	5.5	21:36	03:24	09:11
NGC2286	Open	Mon	06h 47m 40s	-03°08'54"	7.5	20:03	01:57	07:52
NGC2269	Open	Mon	06h 43m 17s	+04°37'30"	10.0	19:38	01:53	08:08
M41	Open	CMa	06h 46m 01s	-20°45'24"	5.0	20:52	01:56	06:59
NGC2243	Open	CMa	06h 29m 34s	-31°17'00"	9.4	21:13	01:39	06:06
NGC129	Open	Cas	00h 30m 00s	+60°13'06"	6.5	Circum	19:40	Circum
NGC2533	Open	Pup	08h 07m 04s	-29°53'00"	7.6	22:45	03:17	07:49
NGC2396	Open	Pup	07h 28m 00s	-11°43'00"	7.0	21:07	02:38	08:08
NGC1513	Open	Per	04h 09m 57s	+49°30'54"	8.4	13:43	23:20	08:56
NGC2112	Open	Ori	05h 53m 45s	+00°24'36"	9.0	19:00	01:04	07:07
NGC2304	Open	Gem	06h 55m 11s	+17°59'18"	10.0	19:11	02:05	08:59
NGC2355	Open	Gem	07h 16m 59s	+13°45'00"	10.0	19:46	02:27	09:08
M47	Open	Pup	07h 36m 35s	-14°29'00"	4.5	21:24	02:46	08:09
NGC869	Open	Per	02h 19m 00s	+57°07'42"	4.0	Circum	21:29	Circum
M38	Open	Aur	05h 28m 40s	+35°50'54"	7.0	16:38	00:38	08:39
NGC1502	Open	Cam	04h 07m 50s	+62°19'54"	5.7	Circum	23:18	Circum
NGC2169	Open	Ori	06h 08m 24s	+13°57'54"	5.9	18:37	01:18	08:00
NGC2546	Open	Pup	08h 12m 15s	-37°35'42"	6.3	23:23	03:22	07:21
M35	Open	Gem	06h 09m 00s	+24°21'00"	5.5	18:04	01:19	08:33

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC2509	Open	Pup	08h 00m 48s	-19°03'06"	9.0	22:02	03:11	08:20
NGC1582	Open	Per	04h 31m 53s	+43°49'00"	7.0	14:55	23:42	08:28
NGC2467	Open	Pup	07h 52m 26s	-26°26'12"	7.0	22:18	03:02	07:47
NGC752	Open	And	01h 57m 41s	+37°47'06"	5.7	12:57	21:07	05:18
NGC2281	Open	Aur	06h 48m 17s	+41°04'42"	5.4	17:29	01:58	10:27
NGC7686	Open	And	23h 30m 07s	+49°08'00"	5.6	09:08	18:40	04:12
NGC3330	Open	Vel	10h 38m 46s	-54°07'24"	7.4	04:13	05:49	07:24
NGC3680	Open	Cen	11h 25m 38s	-43°14'36"	7.6	03:08	06:35	10:02
M42	D Neb	Ori	05h 35m 16s	-05°23'25"	4.0	18:57	00:45	06:33
NGC2244	Open	Mon	06h 31m 56s	+04°56'35"	4.8	19:26	01:42	07:58
NGC2301	Open	Mon	06h 51m 45s	+00°27'36"	6.0	19:58	02:02	08:06
NGC2455	Open	Pup	07h 49m 01s	-21°18'06"	10.0	21:57	02:59	08:01
M45	Open	Tau	03h 47m 30s	+24°07'00"	1.6	15:44	22:57	06:11
NGC2972	Open	Vel	09h 40m 13s	-50°19'24"	9.9	02:21	04:50	07:19
NGC2547	Open	Vel	08h 10m 09s	-49°12'54"	4.7	00:40	03:20	06:00
NGC7788	Open	Cas	23h 56m 46s	+61°23'59"	9.0	Circum	19:07	Circum
NGC2362	Open	CMa	07h 18m 41s	-24°57'18"	4.1	21:39	02:28	07:18
NGC654	Open	Cas	01h 44m 00s	+61°53'06"	6.5	Circum	20:54	Circum
NGC2451	Open	Pup	07h 45m 15s	-37°58'00"	2.8	22:58	02:55	06:52
NGC1981	Open	Ori	05h 35m 09s	-04°25'54"	4.6	18:54	00:45	06:36
NGC2383	Open	CMa	07h 24m 40s	-20°56'54"	8.4	21:31	02:34	07:38
NGC2251	Open	Mon	06h 34m 38s	+08°22'00"	7.3	19:19	01:44	08:10
NGC2022	P Neb	Ori	05h 42m 06s	+09°05'13"	12.0	18:24	00:52	07:20
NGC7662	P Neb	And	23h 25m 54s	+42°32'06"	9.0	09:58	18:36	03:14
M76	P Neb	Per	01h 42m 18s	+51°34'15"	12.0	10:50	20:52	06:54
NGC2792	P Neb	Vel	09h 12m 27s	-42°25'41"	14.0	00:50	04:22	07:54
NGC2610	P Neb	Hya	08h 33m 23s	-16°08'57"	14.0	22:25	03:43	09:01
NGC1535	P Neb	Eri	04h 14m 16s	-12°44'22"	10.0	17:56	23:24	04:52
NGC2371	P Neb	Gem	07h 25m 34s	+29°29'17"	13.0	19:02	02:35	10:09
NGC2242	P Neb	Aur	06h 34m 07s	+44°46'38"	14.0	16:50	01:44	10:38
NGC2452	P Neb	Pup	07h 47m 26s	-27°20'07"	13.0	22:16	02:57	07:39
NGC7354	P Neb	Cep	22h 40m 20s	+61°17'07"	13.0	Circum	17:50	Circum
NGC3132	P Neb	Vel	10h 07m 02s	-40°26'11"	8.0	01:33	05:17	09:01
NGC2440	P Neb	Pup	07h 41m 55s	-18°12'31"	11.0	21:40	02:52	08:03
NGC2392	P Neb	Gem	07h 29m 11s	+20°54'42"	10.0	19:36	02:39	09:42
NGC3242	P Neb	Hya	10h 24m 46s	-18°38'34"	9.0	00:24	05:35	10:45
M97	P Neb	UMa	11h 14m 48s	+55°01'08"	12.0	19:02	06:25	17:47
NGC246	P Neb	Cet	00h 47m 03s	-11°52'19"	8.0	14:27	19:57	01:27
NGC40	P Neb	Cep	00h 13m 01s	+72°31'19"	11.0	Circum	19:23	Circum
NGC1501	P Neb	Cam	04h 06m 59s	+60°55'14"	13.0	Circum	23:17	Circum
NGC2438	P Neb	Pup	07h 41m 50s	-14°44'07"	10.0	21:30	02:52	08:14
NGC1514	P Neb	Tau	04h 09m 17s	+30°46'33"	10.0	15:41	23:19	06:58

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### AVAC

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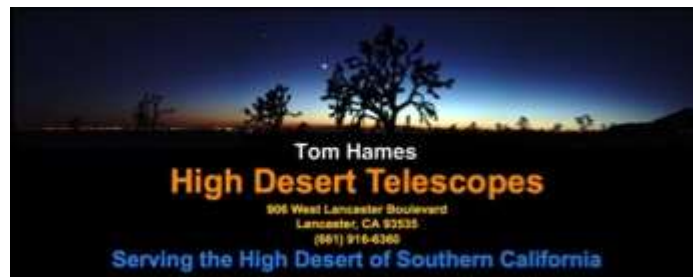


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