



Desert Sky Observer

Volume 38

Antelope Valley Astronomy Club Newsletter

March 2018

Up-Coming Events

March 9: Club Meeting*

March 10: [Prime Desert Woodland Moon Walk](#)

March 17: [Dark Sky Star Party](#)

* 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 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*



President

Frank Moore

Well folks, the winter astronomy season persists with some great objects up during reasonable observing hours if you can catch them on a clear night or in “sucker holes” between clouds. The whole Orion complex, and its dozen or so deep sky objects, are front and center in the sky at about 8:00 pm if weather permits you to see them. It looks impressive through even the most modest of telescopes or binoculars so get out there and take a gander.

Such was the case at the Prime Desert Woodland Moonwalk on Saturday March 9. As Rose and I descended into the Antelope Valley from Tehachapi the sky was totally overcast and it looked like the evening was going to be a total bust. To top it off, and as we began to setup at PDW, the wind was blowing with such intensity that it blew one of my equipment cases off the table and, fortunately, nothing was damaged. Though we were tempted to pack it all in, we continued with our setup and we were soon joined by Rod Girard and Michael Roberson, setting up telescopes, and Darrell Bennet who helped with the public’s questions. Members Ann Coleal and Jeff Buetemeister took in the “Moon Walk” with Jeremy.

Peering up into what looked like a totally overcast sky, I was totally surprised when I was still able to find Polaris in the Polar Alignment Scope and get a good polar alignment. Then, just enough of the right stars came out for me to achieve a good model of the sky and I was good to go with spot-on GoTo alignments. Still, there wasn’t much to look at through the murky skies so we I settled in on M31, the Andromeda Galaxy with the old C-6R, Rod Girard stayed locked on Orion (M42) with his 9.25 inch Celestron SCT and Michael Roberson kept one of the club’s 10” dobs on the Pleiades (M45). The night turned out surprisingly well and we were able to share some sites and knowledge with the public.

On the following Saturday, February 17, Rod Girard and I braved the early morning COLD (it was 24 when I left Tehachapi) to setup an AVAC booth at the Los Angeles County Science Olympiad at Antelope Valley College. Rose followed a few hours later in a separate car, with our brochures, and Darrell Bennett and Ann Coleal also came out to help us out. We had two hydrogen-alpha telescopes, my Daystar Quark and the club’s 60mm Coronado, side-by-side on our Orion Atlas mount and the C-6R on the Losmandy G-11. We tracked the 3.5% illuminated waxing crescent moon with the C-6R while the h-alpha scopes showed views of a few great prominences and detail of the sun’s chromosphere. Our display board was fully updated with information about the current night (and day) sky as well as information on some of our

upcoming events. This would have also been the night of a monthly star party but, with this event going on all day, we decided it would have been too much for some of us and it just wouldn't work out. I was told to not feel too guilty over having no star party since the nighttime temperatures at many of our observing sites were in the teens and low twenties that night and Chuchupate was inaccessible due to snow.

Our Saturday, March 17 Dark Sky Star Party will be held at the Red Cliffs Natural Area (in Red Rock Canyon State Park). Our Annual Messier Marathon will be held on Saturday April 14 at Saddleback Butte State Park. Watch for emails with further details.

Also, remember to clear your calendars because we are fully confirmed, with reservations and approvals in hand for Saturday July 14, to have our annual "Star-B-Que", with member's picnic and public star party, at the Brite Lake Aquatic Recreation Area near Tehachapi. Once again, the Tehachapi Valley Recreation and Parks District has waived all fees for us. I picked up one of their glossy brochures and "Program Catalogs" on my way out of the office and was surprised to see our Annual Star Party listed as one of the "amenities" of the Brite Lake Recreation Area. No wonder they waive the fees, we're now part of the program.

There will be a 20th Anniversary Celebration for the SAGE Planetarium preceding our monthly meeting on Friday March 9. Events are expected to begin at about 4:30 pm with presentations and speeches by dignitaries. We will have telescopes and displays setup outside the SAGE Planetarium before and during the event. In lieu of a speaker, and as part of our monthly meeting, we will have a public star party in the parking lot of the SAGE. Remember to bring your telescopes, binoculars and other equipment or just come out and look through the equipment brought by other members. Though no planets will be up, with the moon not rising till about midnight, we should be able to share some deep sky objects with members and the public. Details will follow in a separate email.



Secretary

Rose Moore

Many thanks to all that attended our last club meeting and were able to enjoy a presentation by Dr. Patel on Exoplanets! Our next meeting on Friday March 9th will be a little different. Jeremy and the SAGE will be celebrating 20 years of the SAGE Planetarium that afternoon. We are not sure what festivities are planned at this time, and are waiting to hear from Jeremy about them. Frank and I are planning to be there, and will email the members as soon as we hear what is the plan for the late afternoon.

Instead of a regular meeting that evening, we will be having a star party for members and the public out front of the SAGE starting at 7pm. We may have a brief business meeting and announcements before. Email to follow as soon as plans are in place.

On Saturday March 10th at 6:30pm we have a Prime Desert Moon Walk. Bring out your telescope or come and take the walk. Weather permitting.

We have a dark sky star party on Saturday March 17th, see Frank's note above. More details to follow. Weather permitting.

In April we have a PDW Moon Walk (April 7th at 8pm), our DSSP will be our Messier Marathon (April 14th weekend), and the College of the Canyons Star Party (April 27th). So come on out and support your club and meet with fellow members!

Space Place

What Is the Ionosphere?

By Linda Hermans-Killiam

High above Earth is a very active part of our upper atmosphere called the ionosphere. The ionosphere gets its name from ions—tiny charged particles that blow around in this layer of the atmosphere.

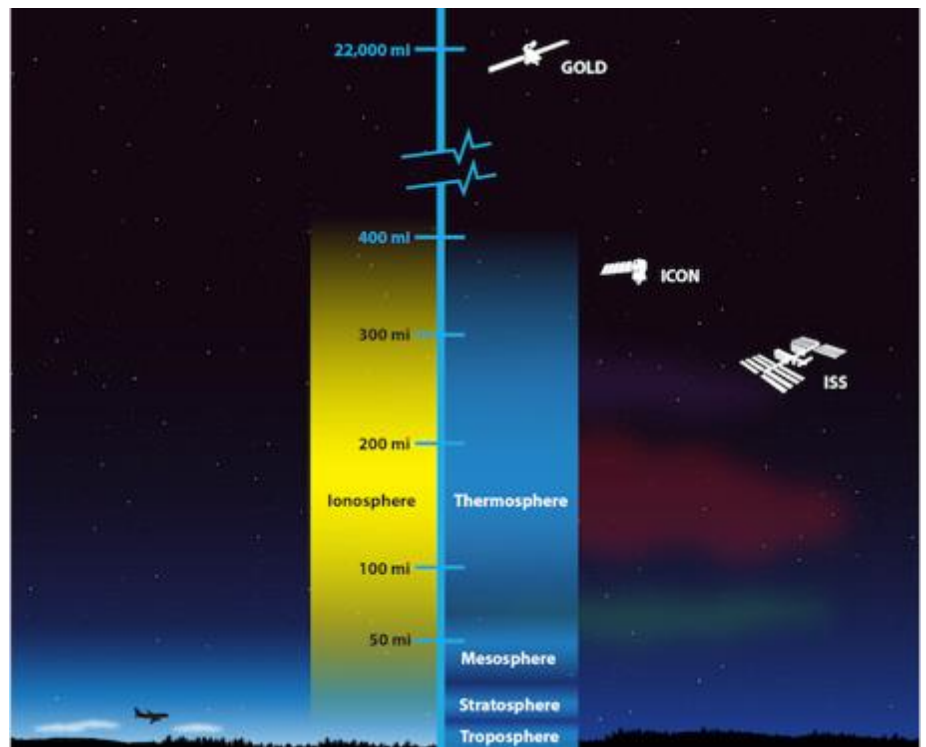
How did all those ions get there? They were made by energy from the Sun!

Everything in the universe that takes up space is made up of matter, and matter is made of tiny particles called atoms. At the ionosphere, atoms from the Earth's atmosphere meet up with energy from the Sun. This energy, called radiation, strips away parts of the atom. What's left is a positively or negatively charged atom, called an ion.

The ionosphere is filled with ions. These particles move about in a giant wind. However, conditions in the ionosphere change all the time. Earth's seasons and weather can cause changes in the ionosphere, as well as radiation and particles from the Sun—called space weather.

These changes in the ionosphere can cause problems for humans. For example, they can interfere with radio signals between Earth and satellites. This could make it difficult to use many of the tools we take for granted here on Earth, such as GPS. Radio signals also allow us to communicate with astronauts on board the International Space Station, which orbits Earth within the ionosphere. Learning more about this region of our atmosphere may help us improve forecasts about when these radio signals could be distorted and help keep humans safe.

In 2018, NASA has plans to launch two missions that will work together to study the ionosphere. NASA's GOLD (Global-scale Observations of the Limb and Disk) mission launched in January 2018. GOLD will orbit 22,000 miles above Earth. From way up there, it will be able to create a map of the ionosphere over the Americas every half hour. It will measure the temperature and makeup of gases in the ionosphere. GOLD will also study bubbles of charged gas that are known to cause communication problems.



This illustration shows the layers of Earth's atmosphere. NASA's GOLD and ICON missions will work together to study the ionosphere, a region of charged particles in Earth's upper atmosphere. Changes in the ionosphere can interfere with the radio waves used to communicate with satellites and astronauts in the International Space Station (ISS). Credit: NASA's Goddard Space Flight Center/Duberstein (modified)

A second NASA mission, called ICON, short for Ionospheric Connection Explorer, will launch later in 2018. It will be placed in an orbit just 350 miles above Earth—through the ionosphere. This means it will have a close-up view of the upper atmosphere to pair with GOLD's wider view. ICON will study the forces that shape this part of the upper atmosphere.

Both missions will study how the ionosphere is affected by Earth and space weather. Together, they will give us better observations of this part of our atmosphere than we have ever had before.

To learn more about the ionosphere, check out NASA Space Place:

<https://spaceplace.nasa.gov/ionosphere>

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!

The Twilight Saga or “When is dusk, anyway?”

By Don Bryden

I don't imagine there's anyone among us who hasn't uttered the words “twilight” or “dusk” or “night”, and for most of us the concept of “sunset” or “dawn” seems like a no-brainer – as different as night and day!

Hold on, there! What about nautical twilight? Or astronomical dawn? And what do we really mean by dusk? The solar day can be divided up into three main parts: day, twilight and night. But when does twilight start? When does it end?

Simply stated, sunset is when the upper limb of the sun passes below the horizon (i.e. The sun's disk is completely out of sight – disregarding any refraction). This is the beginning of twilight. Twilight ends at dusk and night begins. Dawn is the end of night and the start of twilight which then ends at sunrise. Sunrise is when the upper limb of the sun just begins to rise above the horizon. (fig. 1)

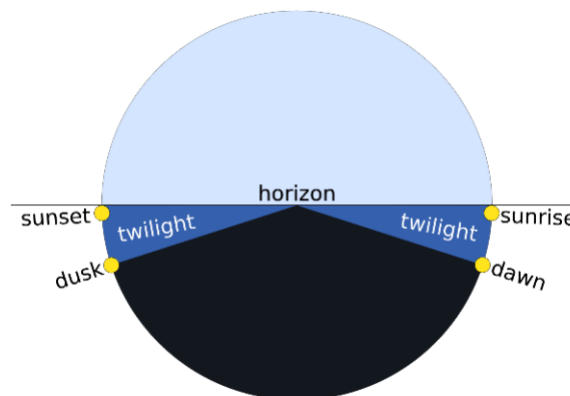


Figure 1

So far so good! Did you notice on Figure 1 that dusk and dawn are indicated by the center of the sun's disk rather than the top or bottom limb? Besides sunset and sunrise all remaining measurements are referenced to the center of the sun's disk. Um, what other measurements, you ask? Well, twilight is divided into three sub-categories: civil twilight, nautical twilight and astronomical twilight.

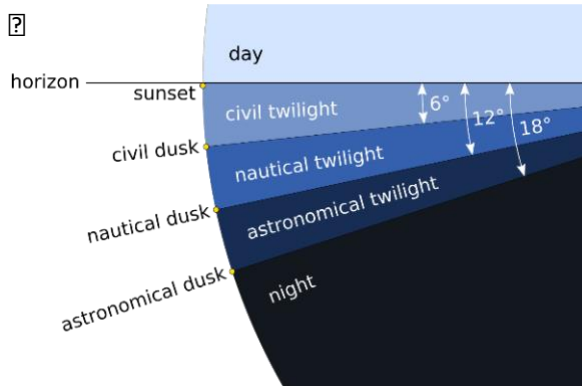


Figure 2

Civil Twilight This is what most people think of when we say “twilight” or “dusk”. Terrestrial objects can be easily defined by the naked eye during civil twilight. Many municipalities and lawmakers will reference civil dawn and dusk for such things as when drivers must switch on headlights or when other public activities may be restricted. By definition, civil dawn or dusk is when the center of the Sun's disk is 6° below the horizon. Since terms like “dusk” or “dawn” can be open to interpretation and your average citizen may not know how many degrees below the horizon the center of the Sun's disk is

(or even where the horizon is, for that matter), most have used time to define these terms. Now dusk and dawn can vary throughout the year, but a good approximation is that dusk is thirty minutes after sunset and dawn is thirty minutes before sunrise. When we are having a star party, civil twilight is when we expect to finish setting up our scopes and begin waiting for the alignment stars to show up.

Nautical Twilight This is the period from civil dusk to nautical dusk and from nautical dawn to civil dawn. Nautical dusk (or nautical dawn) is when the center of the Sun is 12° below the horizon. During this time, sailors can see outlines of objects and navigate by the horizon. They can also begin to take reliable star sightings of well known “guidepost” stars. Nautical dusk is about sixty minutes after sunset while nautical dawn begins about sixty minutes before sunrise. Nautical twilight is when Duane begins setting up his scope and Frank begins his second attempt at alignment.

Astronomical Twilight is that time between nautical dusk and astronomical dusk or from astronomical dawn to nautical dawn. More precisely, from when the center of the Sun is between 12° and 18° below the horizon. After astronomical dusk and before astronomical dawn, the sky is truly dark – not illuminated by the Sun at all. Astronomical dusk is about ninety minutes after sunset while astronomical dawn is about ninety minutes before sunrise. At this time, Duane has forgotten to set up his Telrad, Frank is more precisely aligned than the Hubble telescope and Rose has gone to bed. If it’s summertime up on Piños, Matt has just started cooking bacon.

I should mention one other post-sunset or pre-sunrise phenomenon – the Zodiacal Light. Sometimes called the false dawn, this triangular pillar of light can be seen just after sunset or just before sunrise when



Zodiacal Light at La Silla (ESO/José Francisco)



The old moon in the arms of the new with comet C2011 L4 just at sunset

the sun illuminates dust particles present in our solar system’s disk that mainly lies along the ecliptic. This zodiacal cloud can most easily be seen in very dark locations especially in the spring and fall when the ecliptic is at near right angles to the horizon.

So next time someone asks when the star party is starting, you don’t need to consult the club calendar. Just say, “We plan on being set up before the end of civil twilight. If you arrive after astronomical dusk, please be sure to dim your headlights!” And if they stare at you like a deer in the headlights during nautical twilight, just tell them to check out <https://www.timeanddate.com/sun/> and get there before sunset! ^{1,2}

¹ Figures are by TWCarleson. “Moon & Comet” by Don Bryden

² Loosely based on info from the US Naval Observatory, http://aa.usno.navy.mil/faq/docs/RST_defs.php

News Headlines

Why Didn't Voyager Explore the Kuiper Belt?

But, perhaps most important is the question: could Voyager have flown by a small KBO as New Horizons will do this December and January? Again, regrettably, the answer is no, for a number of reasons.... even after its repair, the Hubble wasn't sensitive enough to detect KBOs as small and common as MU69, so there would have been no way to find a flyby target—that capability only came in 2009, when a more advanced and sensitive wide-field camera was placed aboard the Hubble during a servicing mission.
<https://goo.gl/HAj4vp>

Seven Ways Mars InSight is Different

NASA's Mars InSight lander team is preparing to ship the spacecraft from Lockheed Martin Space in Denver, where it was built and tested, to Vandenberg Air Force Base in California, where it will become the first interplanetary mission to launch from the West Coast. The project is led by NASA's Jet Propulsion Laboratory in Pasadena, California.
<https://goo.gl/rZqf9H>

Track Elon Musk's Tesla Roadster in space with this website

Elon Musk launched his now-famous red Tesla Roadster into space, [atop the first Falcon Heavy rocket](#). Cameras mounted on the car [live-streamed the Starman's journey for a few hours](#), giving us some unforgettable shots of Earth before going black. But if you want to know where the first car cruising our Solar System is right now, there's a website for that — aptly called [Whereisroadster.com](#)

Star is confirmed single and ready to test Einstein's theory

Astronomers determined the star S0-2, which will test Einstein's Theory of General Relativity when it swings by our galaxy's supermassive black hole later this year, does not have a significant binary companion.
<https://goo.gl/xrU4WE>

The World's Largest Plane in Action

The private spaceflight company Stratolaunch is building the world's largest aircraft for future rocket launches from the sky. See photos from the first taxi tests of the Stratolaunch carrier aircraft the Roc here.
<https://goo.gl/AK2DQm>

Unprecedentedly wide and sharp dark matter map

A research team released an unprecedentedly wide and sharp dark matter map based on the newly obtained imaging data by Hyper Suprime-Cam on the Subaru Telescope. The dark matter distribution is estimated by the weak gravitational lensing technique. The team found indications that the number of dark matter halos could be inconsistent with what the simplest cosmological model suggests. This could be a new clue to understanding why the expansion of the universe is accelerating.
<https://www.sciencedaily.com/releases/2018/03/180302101807.htm>

March Sky Data

Best time for deep sky observing this month:
March 10 through March 21

Mercury gives us its best evening apparition this month when it reaches its peak height above the western horizon on March 15th when, at greatest elongation, it lies some 18 degrees east of the Sun. However, by this time its magnitude has dropped from -1.2 at the beginning of March to 0.0 magnitude.

Venus shines at about magnitude -3.3 all month with an angular size of ~10.3 arc seconds. Venus rises a little higher in the sky as March progresses, initially setting around one hour after the Sun but increasing to an hour and a half by month's end.

Now a morning object, **Mars** rises at around 2 am at the start of the month. During the month, Mars has a magnitude which increases from +1.0 to +0.5 and an angular size of just 7, increasing to 8.5, arc seconds so it will be hard to spot details on its surface. It will only reach an elevation of ~14 degrees before dawn at the start of the month and just 12 degrees by month's end.

Jupiter rises just before midnight at the beginning of the month and about one hour earlier by month's end. Initially shining at a magnitude of -1.7 but, as the month progresses, it brightens to magnitude -1.9. Jupiter will transit before dawn and so will enable the giant planet to be seen with the equatorial bands, sometimes the Great Red Spot and up to four of its Galilean moons visible in a small telescope.

Saturn rises at around 3 am at the start of the month and around 2 am at its end. The rings were at their widest a few months ago and are still, at 26 degrees to the line of sight, well open. Saturn, lying in Sagittarius, is just 3 degrees above the topmost star of the 'teapot'. Sadly, even when at opposition later in the year it will only reach an elevation of just over 15 degrees above the horizon when crossing the meridian.

There are no major **meteor-showers** in March, but we may see a handful of meteors from the Virginid shower, which is usually active during March and April; they appear to radiate outwards from the constellation of Virgo.

Full Mar 1 Last Qtr Mar 9 New Mar 17 First Qtr Mar 24



Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
3/1/2018	5:45pm	6:15am	6:23am	5:48pm
3/5/2018	9:57pm	8:44am	6:16am	5:51pm
3/10/2018	1:36am	12:02pm	6:11am	5:55pm
3/15/2018	6:12am	5:29pm	7:03am	6:59pm
3/20/2018	9:06am	10:30pm	6:57am	7:03pm
3/25/2018	1:12pm	2:40am	6:50am	7:07pm
3/31/2018	7:40pm	7:04am	6:43am	7:11pm

Planet Data

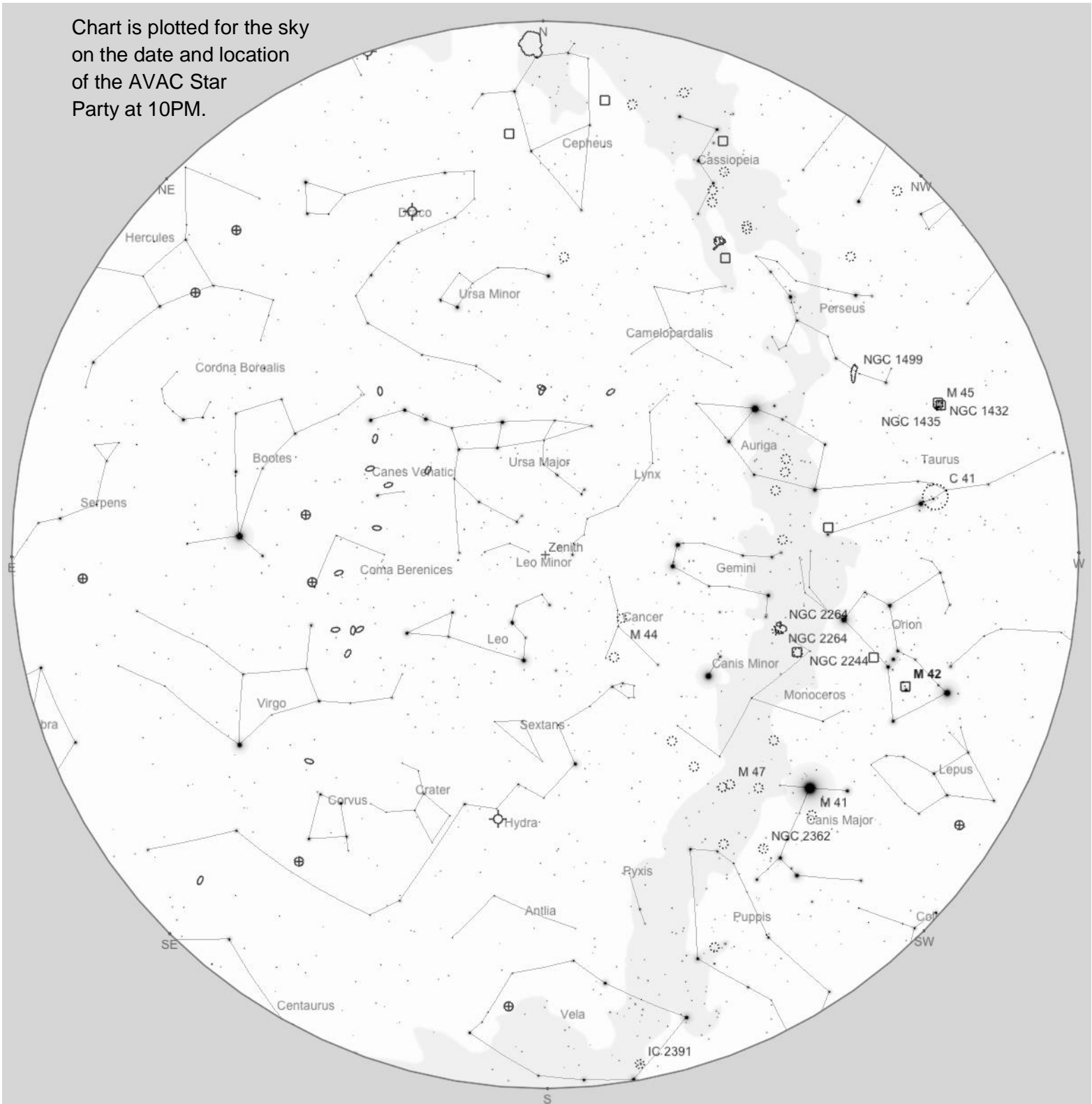
	Mar 1			
	Rise	Transit	Set	Mag
Mercury	6:56am	12:48pm	6:40pm	-1.2
Venus	7:03am	12:55pm	6:47pm	-3.4
Mars	7:39am	6:36am	11:33pm	1.0
Jupiter	11:26pm	4:41am	9:55am	-1.7
Saturn	2:50am	7:48am	12:47pm	1.6

	Mar 15			
	Rise	Transit	Set	Mag
Mercury	7:45am	2:07pm	8:30pm	0.0
Venus	7:52am	2:03pm	8:15pm	-3.3
Mars	2:21am	7:16am	12:11pm	0.7
Jupiter	11:31pm	4:46am	10:00am	-1.8
Saturn	2:58am	7:57am	12:56pm	1.6

	Mar 31			
	Rise	Transit	Set	Mag
Mercury	6:37am	1:00pm	7:24pm	3.0
Venus	7:40am	2:13pm	8:47pm	-3.3
Mars	1:58am	6:53am	11:47am	0.5
Jupiter	10:25pm	3:40am	8:55am	-1.9
Saturn	1:58am	6:57am	11:55am	1.6

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
NGC2232	Open	Mon	06h 28m 01s	-04°50'48"	3.9	1:48 PM	7:38 PM	1:27 AM
NGC2243	Open	CMa	06h 29m 34s	-31°17'00"	9.4	3:13 PM	7:39 PM	12:06 AM
NGC2244	Open	Mon	06h 31m 56s	+04°56'35"	4.8	1:25 PM	7:42 PM	1:58 AM
NGC2245	Neb	Mon	06h 32m 41s	+10°09'24"		1:12 PM	7:42 PM	2:13 AM
NGC2247	Neb	Mon	06h 33m 05s	+10°19'17"		1:12 PM	7:43 PM	2:14 AM
NGC2250	Open	Mon	06h 33m 49s	-05°05'06"	9.0	1:54 PM	7:43 PM	1:32 AM
NGC2242	P Neb	Aur	06h 34m 07s	+44°46'38"	14.0	10:50 AM	7:44 PM	4:37 AM
NGC2251	Open	Mon	06h 34m 38s	+08°22'00"	7.3	1:19 PM	7:44 PM	2:10 AM
NGC2252	Open	Mon	06h 34m 42s	+05°22'00"	8.0	1:27 PM	7:44 PM	2:02 AM
NGC2261	Neb	Mon	06h 39m 10s	+08°44'40"		1:22 PM	7:49 PM	2:15 AM
NGC2264	Open	Mon	06h 40m 58s	+09°53'42"	3.9	1:21 PM	7:51 PM	2:20 AM
NGC2269	Open	Mon	06h 43m 17s	+04°37'30"	10.0	1:38 PM	7:53 PM	2:08 AM
NGC2266	Open	Gem	06h 43m 19s	+26°58'12"	10.0	12:29 PM	7:53 PM	3:17 AM
M41	Open	CMa	06h 46m 01s	-20°45'24"	5.0	2:52 PM	7:56 PM	12:59 AM
NGC2282	Neb	Mon	06h 46m 51s	+01°18'56"		1:50 PM	7:56 PM	2:03 AM
NGC2281	Open	Aur	06h 48m 17s	+41°04'42"	5.4	11:29 AM	7:58 PM	4:27 AM
NGC2302	Open	Mon	06h 51m 55s	-07°05'00"	8.9	2:18 PM	8:01 PM	1:45 AM
NGC2311	Open	Mon	06h 57m 47s	-04°36'42"	10.0	2:17 PM	8:07 PM	1:58 AM
NGC2316	Neb	Mon	06h 59m 41s	-07°46'39"		2:28 PM	8:09 PM	1:51 AM
NGC2335	Open	Mon	07h 06m 49s	-10°01'42"	7.2	2:41 PM	8:16 PM	1:52 AM
NGC2331	Open	Gem	07h 06m 59s	+27°15'42"	9.0	12:52 PM	8:17 PM	3:41 AM
NGC2360	Open	CMa	07h 17m 43s	-15°38'30"	7.2	3:08 PM	8:27 PM	1:47 AM
NGC2359	Neb	CMa	07h 18m 30s	-13°13'36"		3:02 PM	8:28 PM	1:54 AM
NGC2362	Open	CMa	07h 18m 41s	-24°57'18"	4.1	3:38 PM	8:28 PM	1:18 AM
NGC2374	Open	CMa	07h 23m 56s	-13°15'48"	8.0	3:07 PM	8:34 PM	2:00 AM
NGC2371	P Neb	Gem	07h 25m 34s	+29°29'17"	13.0	1:02 PM	8:35 PM	4:08 AM
NGC2395	Open	Gem	07h 27m 12s	+13°36'30"	8.0	1:56 PM	8:37 PM	3:17 AM
NGC2396	Open	Pup	07h 28m 00s	-11°43'00"	7.0	3:07 PM	8:38 PM	2:08 AM
NGC2392	P Neb	Gem	07h 29m 11s	+20°54'42"	10.0	1:36 PM	8:39 PM	3:42 AM
NGC2414	Open	Pup	07h 33m 12s	-15°27'12"	7.9	3:23 PM	8:43 PM	2:03 AM
M47	Open	Pup	07h 36m 35s	-14°29'00"	4.5	3:24 PM	8:46 PM	2:09 AM
NGC2419	Glob	Lyn	07h 38m 08s	+38°52'54"	10.4	12:31 PM	8:48 PM	5:04 AM
NGC2420	Open	Gem	07h 38m 23s	+21°34'24"	8.3	1:43 PM	8:48 PM	3:53 AM
NGC2439	Open	Pup	07h 40m 45s	-31°41'36"	6.9	4:25 PM	8:50 PM	1:15 AM
NGC2438	P Neb	Pup	07h 41m 50s	-14°44'07"	10.0	3:30 PM	8:51 PM	2:13 AM
NGC2440	P Neb	Pup	07h 41m 55s	-18°12'31"	11.0	3:40 PM	8:52 PM	2:03 AM
NGC2451	Open	Pup	07h 45m 15s	-37°58'00"	2.8	4:58 PM	8:55 PM	12:52 AM
NGC2452	P Neb	Pup	07h 47m 26s	-27°20'07"	13.0	4:16 PM	8:57 PM	1:39 AM
NGC2455	Open	Pup	07h 49m 01s	-21°18'06"	10.0	3:57 PM	8:59 PM	2:01 AM

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC2477	Open	Pup	07h 52m 10s	-38°31'48"	5.8	5:08 PM	9:02 PM	12:56 AM
NGC2489	Open	Pup	07h 56m 15s	-30°03'48"	7.9	4:35 PM	9:06 PM	1:37 AM
NGC2509	Open	Pup	08h 00m 48s	-19°03'06"	9.0	4:01 PM	9:10 PM	2:19 AM
NGC2527	Open	Pup	08h 04m 58s	-28°08'48"	6.5	4:36 PM	9:15 PM	1:53 AM
NGC2533	Open	Pup	08h 07m 04s	-29°53'00"	7.6	4:45 PM	9:17 PM	1:49 AM
NGC2547	Open	Vel	08h 10m 09s	-49°12'54"	4.7	6:39 PM	9:20 PM	12:00 AM
M48	Open	Hya	08h 13m 43s	-05°45'00"	5.5	3:36 PM	9:23 PM	3:10 AM
NGC2567	Open	Pup	08h 18m 32s	-30°38'24"	7.4	4:59 PM	9:28 PM	1:57 AM
NGC2571	Open	Pup	08h 18m 56s	-29°45'00"	7.0	4:56 PM	9:29 PM	2:01 AM
NGC2580	Open	Pup	08h 21m 28s	-30°18'00"	10.0	5:01 PM	9:31 PM	2:01 AM
NGC2587	Open	Pup	08h 23m 25s	-29°30'30"	9.0	5:00 PM	9:33 PM	2:06 AM
NGC2610	P Neb	Hya	08h 33m 23s	-16°08'57"	14.0	4:25 PM	9:43 PM	3:01 AM
NGC2626	Neb	Vel	08h 35m 31s	-40°40'18"		6:03 PM	9:45 PM	1:27 AM
NGC2627	Open	Pyx	08h 37m 15s	-29°57'18"	8.0	5:15 PM	9:47 PM	2:19 AM
M44	Open	Cnc	08h 40m 24s	+19°40'00"	4.0	2:51 PM	9:50 PM	4:49 AM
NGC2660	Open	Vel	08h 42m 38s	-47°12'00"	8.8	6:54 PM	9:52 PM	12:51 AM
NGC2658	Open	Pyx	08h 43m 27s	-32°39'30"	9.0	5:32 PM	9:53 PM	2:14 AM
NGC2669	Open	Vel	08h 46m 22s	-52°56'54"	6.1	8:00 PM	9:56 PM	11:52 PM
NGC2792	P Neb	Vel	09h 12m 27s	-42°25'41"	14.0	6:50 PM	10:22 PM	1:54 AM
NGC2818	Open	Pyx	09h 16m 01s	-36°37'37"	8.2	6:22 PM	10:26 PM	2:29 AM
NGC2799	Gal	Lyn	09h 17m 31s	+41°59'38"	14.0	1:53 PM	10:27 PM	7:02 AM
NGC2872	Gal	Leo	09h 25m 43s	+11°25'56"	13.0	4:01 PM	10:35 PM	5:10 AM
NGC2925	Open	Vel	09h 33m 11s	-53°23'54"	8.0	8:54 PM	10:43 PM	12:31 AM
NGC2974	Gal	Sex	09h 42m 33s	-03°41'56"	10.8	4:59 PM	10:52 PM	4:45 AM
NGC3065	Gal	UMa	10h 01m 54s	+72°10'12"	12.0	Circum	11:11 PM	Circum
NGC3132	P Neb	Vel	10h 07m 02s	-40°26'11"	8.0	7:33 PM	11:17 PM	3:00 AM
NGC3158	Gal	LMi	10h 13m 51s	+38°45'53"	11.8	3:08 PM	11:23 PM	7:39 AM
NGC3175	Gal	Ant	10h 14m 42s	-28°52'18"	11.3	6:48 PM	11:24 PM	4:00 AM
NGC3201	Glob	Vel	10h 17m 37s	-46°24'45"	6.8	8:23 PM	11:27 PM	2:32 AM
NGC3184	Gal	UMa	10h 18m 17s	+41°25'27"	9.8	2:57 PM	11:28 PM	7:59 AM
NGC3193	Gal	Leo	10h 18m 25s	+21°53'38"	10.9	4:22 PM	11:28 PM	6:34 AM
NGC3228	Open	Vel	10h 21m 22s	-51°43'42"	6.0	9:18 PM	11:31 PM	1:43 AM
NGC3242	P Neb	Hya	10h 24m 46s	-18°38'34"	9.0	6:24 PM	11:34 PM	4:45 AM
NGC3330	Open	Vel	10h 38m 46s	-54°07'24"	7.4	10:13 PM	11:48 PM	1:24 AM
NGC3359	Gal	UMa	10h 46m 37s	+63°13'25"	10.5	Circum	11:56 PM	Circum
NGC3405	Gal	Leo	10h 49m 44s	+16°14'31"	14.0	5:11 PM	11:59 PM	6:48 AM
NGC3432	Gal	LMi	10h 52m 31s	+36°37'10"	11.3	3:58 PM	12:02 AM	8:07 AM
NGC3488	Gal	UMa	11h 01m 24s	+57°40'38"	14.0	Circum	12:11 AM	Circum
M97	P Neb	UMa	11h 14m 48s	+55°01'08"	12.0	1:02 PM	12:24 AM	11:47 AM
NGC3629	Gal	Leo	11h 20m 32s	+26°57'46"	13.0	5:06 PM	12:30 AM	7:54 AM
NGC3718	Gal	UMa	11h 32m 35s	+53°04'04"	10.5	2:15 PM	12:42 AM	11:09 AM
NGC3731	Gal	Leo	11h 34m 12s	+12°30'43"	14.0	6:06 PM	12:44 AM	7:21 AM
NGC3773	Gal	Leo	11h 38m 13s	+12°06'44"	13.0	6:12 PM	12:48 AM	7:24 AM
NGC3813	Gal	UMa	11h 41m 18s	+36°32'48"	11.7	4:47 PM	12:51 AM	8:55 AM
NGC3879	Gal	Dra	11h 46m 49s	+69°22'58"	13.0	Circum	12:56 AM	Circum

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC4027	Gal	Crv	11h 59m 30s	-19°15'59"	11.1	8:01 PM	1:09 AM	6:17 AM
NGC4064	Gal	Com	12h 04m 11s	+18°26'35"	11.5	6:19 PM	1:14 AM	8:09 AM
NGC4204	Gal	Com	12h 15m 14s	+20°39'33"	13.0	6:23 PM	1:25 AM	8:27 AM
NGC4214	Gal	CVn	12h 15m 39s	+36°19'38"	9.7	5:22 PM	1:25 AM	9:28 AM
M106	Gal	CVn	12h 18m 58s	+47°18'16"	9.1	4:14 PM	1:29 AM	10:43 AM
NGC4273	Gal	Vir	12h 19m 56s	+05°20'36"	11.9	7:12 PM	1:30 AM	7:47 AM
NGC4293	Gal	Com	12h 21m 13s	+18°22'58"	11.0	6:36 PM	1:31 AM	8:26 AM
NGC4344	Gal	Com	12h 23m 38s	+17°32'28"	13.0	6:41 PM	1:33 AM	8:25 AM
NGC4361	P Neb	Crv	12h 24m 31s	-18°47'06"	10.0	8:24 PM	1:34 AM	6:44 AM
NGC4377	Gal	Com	12h 25m 12s	+14°45'45"	11.8	6:51 PM	1:35 AM	8:19 AM
NGC4429	Gal	Vir	12h 27m 27s	+11°06'27"	10.2	7:04 PM	1:37 AM	8:10 AM
NGC4450	Gal	Com	12h 28m 29s	+17°05'06"	10.1	6:47 PM	1:38 AM	8:29 AM
NGC4477	Gal	Com	12h 30m 02s	+13°38'11"	10.4	6:59 PM	1:40 AM	8:20 AM
NGC4514	Gal	Com	12h 32m 43s	+29°42'44"	14.0	6:08 PM	1:42 AM	9:16 AM
NGC4527	Gal	Vir	12h 34m 08s	+02°39'11"	10.4	7:34 PM	1:44 AM	7:54 AM
M91	Gal	Com	12h 35m 27s	+14°29'47"	10.9	7:02 PM	1:45 AM	8:28 AM
NGC4546	Gal	Vir	12h 35m 29s	-03°47'35"	10.3	7:53 PM	1:45 AM	7:38 AM
M90	Gal	Vir	12h 36m 50s	+13°09'48"	10.2	7:07 PM	1:46 AM	8:26 AM
NGC4571	Gal	Com	12h 36m 52s	+14°13'02"	11.3	7:04 PM	1:46 AM	8:29 AM
M68	Glob	Hya	12h 39m 28s	-26°44'32"	9.0	9:05 PM	1:49 AM	6:33 AM
NGC4605	Gal	UMa	12h 40m 00s	+61°36'30"	11.0	Circum	1:50 AM	Circum
NGC4651	Gal	Com	12h 43m 43s	+16°23'36"	10.7	7:05 PM	1:53 AM	8:42 AM
NGC4666	Gal	Vir	12h 45m 08s	-00°27'45"	10.8	7:53 PM	1:55 AM	7:56 AM
NGC4710	Gal	Com	12h 49m 39s	+15°09'53"	11.0	7:14 PM	1:59 AM	8:44 AM
NGC4920	Gal	Vir	13h 02m 04s	-11°22'42"	14.0	8:40 PM	2:12 AM	7:43 AM
M53	Glob	Com	13h 12m 55s	+18°10'07"	8.5	7:28 PM	2:23 AM	9:17 AM
NGC5053	Glob	Com	13h 16m 27s	+17°41'52"	9.8	7:33 PM	2:26 AM	9:19 AM
NGC5102	Gal	Cen	13h 21m 58s	-36°37'51"	9.7	10:28 PM	2:32 AM	6:35 AM
NGC5134	Gal	Vir	13h 25m 19s	-21°08'03"	12.0	9:32 PM	2:35 AM	7:37 AM
NGC5139	Glob	Cen	13h 26m 47s	-47°28'53"	3.7	11:40 PM	2:36 AM	5:32 AM
NGC5166	Gal	CVn	13h 28m 15s	+32°01'55"	14.0	6:54 PM	2:38 AM	10:21 AM
NGC5204	Gal	UMa	13h 29m 36s	+58°25'09"	11.3	Circum	2:39 AM	Circum
NGC5184	Gal	Vir	13h 30m 11s	-01°39'47"	13.0	8:42 PM	2:40 AM	8:38 AM
NGC5247	Gal	Vir	13h 38m 03s	-17°53'04"	10.5	9:35 PM	2:48 AM	8:00 AM
M3	Glob	CVn	13h 42m 11s	+28°22'35"	7.0	7:23 PM	2:52 AM	10:21 AM
NGC5286	Glob	Cen	13h 46m 27s	-51°22'30"	7.6	12:39 AM	2:56 AM	5:13 AM
NGC5322	Gal	UMa	13h 49m 15s	+60°11'26"	10.0	Circum	2:59 AM	Circum
NGC5307	P Neb	Cen	13h 51m 03s	-51°12'20"	12.0	12:42 AM	3:01 AM	5:20 AM
NGC5354	Gal	CVn	13h 53m 27s	+40°18'09"	11.5	6:39 PM	3:03 AM	11:27 AM
NGC5364	Gal	Vir	13h 56m 12s	+05°00'55"	10.4	8:49 PM	3:06 AM	9:22 AM
NGC5367	Neb	Cen	13h 57m 43s	-39°58'42"		11:21 PM	3:07 AM	6:54 AM
NGC5395	Gal	CVn	13h 58m 38s	+37°25'30"	11.6	7:00 PM	3:08 AM	11:17 AM
NGC5444	Gal	CVn	14h 03m 24s	+35°07'55"	13.0	7:16 PM	3:13 AM	11:10 AM
NGC5466	Glob	Boo	14h 05m 28s	+28°31'57"	9.1	7:45 PM	3:15 AM	10:45 AM
NGC5460	Open	Cen	14h 07m 27s	-48°20'36"	5.6	12:29 AM	3:17 AM	6:06 AM

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC5526	Gal	UMa	14h 13m 53s	+57°46'19"	14.0	Circum	3:23 AM	Circum
NGC5585	Gal	UMa	14h 19m 48s	+56°43'45"	10.9	Circum	3:29 AM	Circum
NGC5566	Gal	Vir	14h 20m 20s	+03°56'00"	10.5	9:17 PM	3:30 AM	9:43 AM
NGC5603	Gal	Boo	14h 23m 02s	+40°22'39"	14.0	7:08 PM	3:33 AM	11:57 AM
NGC5614	Gal	Boo	14h 24m 08s	+34°51'33"	11.7	7:38 PM	3:34 AM	11:30 AM
NGC5605	Gal	Lib	14h 25m 08s	-13°09'50"	13.0	10:08 PM	3:35 AM	9:01 AM
NGC5634	Glob	Vir	14h 29m 37s	-05°58'37"	9.6	9:53 PM	3:39 AM	9:26 AM
NGC5638	Gal	Vir	14h 29m 40s	+03°14'00"	11.3	9:28 PM	3:39 AM	9:51 AM
NGC5694	Glob	Hya	14h 39m 37s	-26°32'18"	10.2	11:05 PM	3:49 AM	8:34 AM
NGC5713	Gal	Vir	14h 40m 11s	-00°17'25"	11.4	9:48 PM	3:50 AM	9:52 AM
NGC5740	Gal	Vir	14h 44m 25s	+01°40'47"	11.9	9:47 PM	3:54 AM	10:01 AM
NGC5749	Open	Lup	14h 48m 53s	-54°29'54"	9.0	2:30 AM	3:58 AM	5:27 AM
NGC5812	Gal	Lib	15h 00m 56s	-07°27'28"	11.2	10:28 PM	4:11 AM	9:53 AM
NGC5822	Open	Lup	15h 04m 21s	-54°23'48"	7.0	2:44 AM	4:14 AM	5:44 AM
NGC5861	Gal	Lib	15h 09m 16s	-11°19'20"	12.0	10:47 PM	4:19 AM	9:51 AM
NGC5873	P Neb	Lup	15h 12m 51s	-38°07'30"	13.0	12:26 AM	4:22 AM	8:18 AM
NGC5908	Gal	Dra	15h 16m 43s	+55°24'35"	11.9	Circum	4:26 AM	Circum
NGC5882	P Neb	Lup	15h 16m 50s	-45°38'56"	11.0	1:16 AM	4:26 AM	7:37 AM
NGC5897	Glob	Lib	15h 17m 24s	-21°00'37"	8.6	11:24 PM	4:27 AM	9:30 AM
M5	Glob	Ser	15h 18m 33s	+02°04'57"	7.0	10:20 PM	4:28 AM	10:37 AM
NGC5903	Gal	Lib	15h 18m 36s	-24°04'06"	11.5	11:35 PM	4:28 AM	9:21 AM
NGC5921	Gal	Ser	15h 21m 56s	+05°04'12"	10.8	10:15 PM	4:32 AM	10:48 AM
NGC5927	Glob	Lup	15h 28m 00s	-50°40'23"	8.3	2:12 AM	4:38 AM	7:03 AM
NGC5962	Gal	Ser	15h 36m 32s	+16°36'28"	11.4	9:57 PM	4:46 AM	11:36 AM
NGC5986	Glob	Lup	15h 46m 04s	-37°47'08"	7.1	12:58 AM	4:56 AM	8:53 AM
NGC5996	Gal	Ser	15h 46m 59s	+17°53'02"	13.0	10:03 PM	4:57 AM	11:50 AM
NGC6058	P Neb	Her	16h 04m 27s	+40°40'59"	13.0	8:47 PM	5:14 AM	1:41 PM
NGC6072	P Neb	Sco	16h 12m 58s	-36°13'47"	14.0	1:17 AM	5:23 AM	9:28 AM
NGC6067	Open	Nor	16h 13m 11s	-54°13'06"	5.6	3:49 AM	5:23 AM	6:57 AM
NGC6137	Gal	CrB	16h 23m 03s	+37°55'21"	14.0	9:21 PM	5:33 AM	1:44 PM
M4	Glob	Sco	16h 23m 35s	-26°31'35"	7.5	12:49 AM	5:33 AM	10:18 AM
NGC6124	Open	Sco	16h 25m 20s	-40°39'12"	5.8	1:52 AM	5:35 AM	9:17 AM
NGC6144	Glob	Sco	16h 27m 14s	-26°01'26"	9.1	12:51 AM	5:37 AM	10:23 AM
NGC6134	Open	Nor	16h 27m 46s	-49°09'06"	7.2	2:56 AM	5:37 AM	8:18 AM
NGC6153	P Neb	Sco	16h 31m 31s	-40°15'13"	12.0	1:56 AM	5:41 AM	9:26 AM
NGC6181	Gal	Her	16h 32m 21s	+19°49'32"	11.9	10:43 PM	5:42 AM	12:41 PM
NGC6169	Open	Nor	16h 34m 04s	-44°02'42"	7.0	2:22 AM	5:44 AM	9:05 AM
NGC6186	Gal	Her	16h 34m 25s	+21°32'26"	14.0	10:39 PM	5:44 AM	12:49 PM
NGC6178	Open	Sco	16h 35m 47s	-45°38'36"	7.2	2:35 AM	5:45 AM	8:56 AM
NGC6188	Neb	Ara	16h 40m 05s	-48°39'42"		3:04 AM	5:50 AM	8:35 AM
NGC6192	Open	Sco	16h 40m 23s	-43°22'00"	9.0	2:24 AM	5:50 AM	9:16 AM
NGC6193	Open	Ara	16h 41m 20s	-48°45'48"	5.2	3:06 AM	5:51 AM	8:36 AM
M13	Glob	Her	16h 41m 41s	+36°27'35"	7.0	9:47 PM	5:51 AM	1:55 PM
NGC6200	Open	Ara	16h 44m 07s	-47°27'48"	7.4	2:58 AM	5:54 AM	8:50 AM
NGC6210	P Neb	Her	16h 44m 30s	+23°47'59"	9.0	10:42 PM	5:54 AM	1:07 PM

ID	Type	Const	RA	Dec	Mag	Rise	Transit	Set
NGC6216	Open	Sco	16h 49m 24s	-44°43'42"	10.0	2:42 AM	5:59 AM	9:16 AM
NGC6208	Open	Ara	16h 49m 28s	-53°43'42"	7.2	4:16 AM	5:59 AM	7:42 AM
NGC6235	Glob	Oph	16h 53m 25s	-22°10'34"	10.2	1:04 AM	6:03 AM	11:02 AM
NGC6231	Open	Sco	16h 54m 10s	-41°49'30"	2.6	2:28 AM	6:04 AM	9:39 AM
M10	Glob	Oph	16h 57m 09s	-04°05'56"	7.5	12:15 AM	6:07 AM	11:58 AM
NGC6249	Open	Sco	16h 57m 41s	-44°48'42"	8.2	2:51 AM	6:07 AM	9:24 AM
NGC6250	Open	Ara	16h 57m 56s	-45°56'12"	5.9	2:59 AM	6:08 AM	9:16 AM
NGC6268	Open	Sco	17h 02m 10s	-39°43'42"	10.0	2:24 AM	6:12 AM	9:59 AM
M19	Glob	Oph	17h 02m 38s	-26°16'04"	8.5	1:27 AM	6:12 AM	10:57 AM
NGC6281	Open	Sco	17h 04m 41s	-37°59'06"	5.4	2:18 AM	6:14 AM	10:11 AM
NGC6287	Glob	Oph	17h 05m 09s	-22°42'25"	9.2	1:17 AM	6:15 AM	11:12 AM
NGC6293	Glob	Oph	17h 10m 10s	-26°34'56"	8.2	1:36 AM	6:20 AM	11:04 AM
NGC6302	P Neb	Sco	17h 13m 44s	-37°06'12"	13.0	2:22 AM	6:23 AM	10:24 AM
NGC6309	P Neb	Oph	17h 14m 04s	-12°54'38"	11.0	12:56 AM	6:24 AM	11:51 AM
NGC6304	Glob	Oph	17h 14m 32s	-29°27'43"	8.4	1:51 AM	6:24 AM	10:58 AM
M92	Glob	Her	17h 17m 07s	+43°08'11"	7.5	9:45 PM	6:27 AM	3:09 PM
NGC6325	Glob	Oph	17h 17m 59s	-23°45'57"	10.7	1:34 AM	6:28 AM	11:21 AM
NGC6322	Open	Sco	17h 18m 25s	-42°56'00"	6.0	2:59 AM	6:28 AM	9:57 AM
NGC6326	P Neb	Ara	17h 20m 46s	-51°45'17"	12.0	4:18 AM	6:30 AM	8:43 AM
NGC6334	Neb	Sco	17h 20m 49s	-36°06'12"		2:25 AM	6:30 AM	10:36 AM
NGC6342	Glob	Oph	17h 21m 10s	-19°35'14"	9.9	1:23 AM	6:31 AM	11:38 AM
NGC6356	Glob	Oph	17h 23m 35s	-17°48'52"	8.4	1:20 AM	6:33 AM	11:46 AM
NGC6355	Glob	Oph	17h 23m 59s	-26°21'10"	9.6	1:49 AM	6:34 AM	11:19 AM
NGC6357	Neb	Sco	17h 24m 43s	-34°12'06"		2:20 AM	6:34 AM	10:49 AM
NGC6352	Glob	Ara	17h 25m 29s	-48°25'21"	8.2	3:47 AM	6:35 AM	9:23 AM
NGC6368	Gal	Oph	17h 27m 11s	+11°32'34"	13.0	12:02 AM	6:37 AM	1:11 PM
NGC6366	Glob	Oph	17h 27m 44s	-05°04'36"	10.0	12:48 AM	6:37 AM	12:26 PM
NGC6369	P Neb	Oph	17h 29m 21s	-23°45'34"	13.0	1:45 AM	6:39 AM	11:33 AM
NGC6412	Gal	Dra	17h 29m 37s	+75°42'14"	11.8	Circum	6:39 AM	Circum

A.V.A.C. Information

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...

- Desert Sky Observer—monthly newsletter.
- The Reflector – the publication of the Astronomical League.
- The A.V.A.C. Membership Manual.
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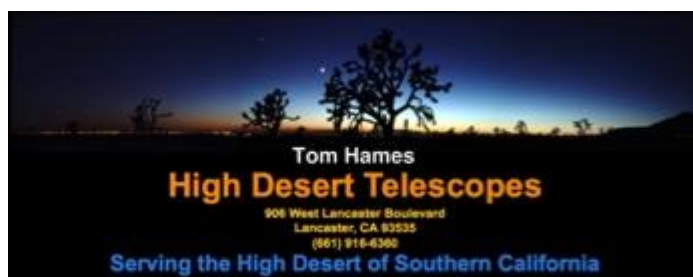


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