



# Desert Sky Observer

Volume 36

Antelope Valley Astronomy Club Newsletter

October 2016

## Up-Coming Events

- October 14: Club Meeting\*
- October 16: [Quarterly Board Meeting](#)
- October 21: [College of the Canyons Star Party](#)
- October 22: [Prime Desert Moonwalk](#)
- October 27-30: [Nightfall](#)

\* 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

Howdy folks. Let's see if I can keep all of this together in my head long enough to write it down. We've had a busy slate of events since our last DSO.

Tim Thompson was our speaker at the September AVAC meeting at the SAGE Planetarium on Friday September 9 and he blew our minds with his talk on The Size of The Universe. Just defining the units of measure was a chore unto itself as he worked his way up from terrestrial sizes and distances, to solar system sizes and distances, to the relative sizes of various stars and finally up to the really big numbers. It was a fantastic presentation that left us all VERY wide eyed, full of wonder, and full of even more questions.

The following weekend, on Saturday September 17, we had 9 members help 141 people observe a variety of planets, the moon, and deep sky objects through 5 telescopes at the monthly Prime Desert Woodland Moonwalk. The almost full moon made deep sky objects a little elusive, and the lights from the stadium at Antelope Valley College didn't help, but we still managed to pull some of the brighter clusters out of the soup for the public. My thanks to all of the members who helped with the event.

On Friday September 23 we made our annual pilgrimage to the Mount Wilson Observatory where a lively group of members observed through the 60" telescope. We observed a variety of objects including planetary nebulae, interesting stars (carbon stars), globular clusters, double stars, and the planets Neptune and Uranus. I want to offer my personal thanks to those members who provided rides for those who otherwise would have been unable to go.

This past weekend, on Saturday October 1st, our monthly Dark Sky Star Party was held at the Chuchupate site off Lockwood Valley Road near Frazier Park. Though the sky got a little "soft" at times, with some high clouds to the south, for the most part it was clear and crisp with the Milky Way twinkling beautifully overhead. When I retired at about 2:00 PM, after observing the Orion Nebula, it was 34\* F outside. Some members who had bedded down earlier, got back up later to observe Orion and then stayed up to pack up at dawn. It was a bit brisk as the thermometer hit 28\* just before dawn though neither dew or frost ever became an issue. Ellen Mahler wins the award for the most festive looking accommodations as

she had a tent decorated with red LED lights for she and her dog. I commented that it looked like a big, red, jelly fish in the middle of the parking lot.

Events coming up in October include the College of the Canyons Fall Star Party on Friday October 21. This is a wonderful event and details will be sent out later via email. The October Prime Desert Woodland Preserve Moonwalk will be held at 7:30 PM on Saturday October 22. Finally, the annual "Nightfall" star party at the Palm Canyon Resort in Borrego Springs will be held on October 27-30. Rose and I have wanted to attend this event for years and we are finally going to make it.

Finally, and as I've mentioned several times before, the AVAC meeting on Friday October 14 is our Annual Business Meeting and Board Election. Please come out and participate in the governance of YOUR organization. Please consider serving the organization as a Board Member. Many of the current board members have been serving for a very long time and none of them have expressed an interest, or willingness, to serve for another term. It's time for some new blood and, as I've said before, we'll even throw in FREE lessons on the duties of the various board positions. What a deal !! Not intending to flog a dead horse, but you will be receiving one more reminder about the board meeting, five days from the date, as is required by our constitution and bylaws.



## **Secretary**

### **Rose Moore**

Many thanks for those members who attended the Mt. Wilson trip on Sept. 23rd! Thank you all for making this such an enjoyable trip! I enjoyed having time to speak to Shelley Bonus, our coordinator for the night. Shelley went back to college at age 40 to get her BS and MS in Astronomy. She currently teaches at a local college, as well as working at Mt. Wilson 3-4 nights per week. She also mentors 4 kids in China on Astronomy, using Skype! John was our telescope operator. He set up his iPad with information on each object, using Sky Safari Pro 4, placing it on a ledge so anyone could access the information. We looked at 10-11 objects via the 60 inch. My personal favorites were the globulars, Albireo, and the Cat's Eye nebula.

Our next club meeting is our Annual Business Meeting. We encourage members to come out to nominate, and vote on your next group of Board members. Those of us currently serving on the Board, will not be accepting positions for next year. This is also a good time to discuss any topics concerning the operation of the club, or any new ideas you would like to share with other members.

We have a few upcoming events for October. Our Dark Sky Star Party is at Chuchupate the first weekend in October. On Friday October 21st, we will be participating at the College of the Canyons Star Party. We'll be posting further info on our website, as well as at the club meeting this month. We will need members with telescopes. Also on Saturday, Oct. 22nd at 6:30pm is a Prime Desert Moon Walk with Jeremy. We will also need members with telescopes for supporting this event. Weather permitting for these events.

Our club Christmas Party is on Saturday, Dec. 3rd starting at 6pm at Domingo's Restaurant in Lancaster. Sign up sheets will be available at October's meeting. If you can't make the meetings to sign up, please email me. This is open to members and their guest.

## Space Place

### One Incredible Galaxy Cluster Yields Two Types of Gravitational Lenses

By Ethan Siegel

There is this great idea that if you look hard enough and long enough at any region of space, your line of sight will eventually run into a luminous object: a star, a galaxy or a cluster of galaxies. In reality, the universe is finite in age, so this isn't quite the case. There are objects that emit light from the past 13.7 billion years—99 percent of the age of the universe—but none before that. Even in theory, there are no stars or galaxies to see beyond that time, as light is limited by the amount of time it has to travel.

But with the advent of large, powerful space telescopes that can collect data for the equivalent of millions of seconds of observing time, in both visible light and infrared wavelengths, we can see nearly to the edge of all that's accessible to us.

The most massive compact, bound structures in the universe are galaxy clusters that are hundreds or even thousands of times the mass of the Milky Way. One of them, Abell S1063, was the target of a recent set of Hubble Space Telescope observations as part of the Frontier Fields program. While the Advanced Camera for Surveys instrument imaged the cluster, another instrument, the Wide Field Camera 3, used an optical trick to image a parallel field, offset by just a few arc minutes. Then the technique was reversed, giving us an unprecedentedly deep view of two closely aligned fields simultaneously, with wavelengths ranging from 435 to 1600 nanometers.

With a huge, towering galaxy cluster in one field and no comparably massive objects in the other, the effects of both weak and strong gravitational lensing are readily apparent. The galaxy cluster—over 100 trillion times the mass of our sun—warps the fabric of space. This causes background light to bend around it, converging on our eyes another four billion light years away. From behind the cluster, the light from distant galaxies is stretched, magnified, distorted, and bent into arcs and multiple images: a classic example of strong gravitational lensing. But in a subtler fashion, the less optimally aligned galaxies are distorted as well; they are stretched into elliptical shapes along concentric circles surrounding the cluster.

A visual inspection yields more of these tangential alignments than radial ones in the cluster field, while the parallel field exhibits no such shape distortion. This effect, known as weak gravitational lensing, is a very powerful technique for obtaining galaxy cluster masses independent of any other conditions. In this serendipitous image, both types of lensing can be discerned by the naked eye. When the James Webb Space Telescope launches in 2018, gravitational lensing may well empower us to see all the way back to the very first stars and galaxies.

If you're interested in teaching kids about how these large telescopes "see," be sure to see our article on this topic at the NASA Space Place: <http://spaceplace.nasa.gov/telescope-mirrors/en/>

## News Headlines

### **NASA's Curiosity Rover Begins Next Mars Chapter**

After collecting drilled rock powder in arguably the most scenic landscape yet visited by a Mars rover, NASA's Curiosity mobile laboratory is driving toward uphill destinations as part of its two-year mission extension that commenced Oct 1. The destinations include a ridge capped with material rich in the iron-oxide mineral hematite, about a mile-and-a-half (two-and-a-half kilometers) ahead, and an exposure of clay-rich bedrock beyond that.

<https://goo.gl/Su7b3m>

### **Mission Complete: Rosetta's Journey Ends in Daring Descent to Comet**

30 September 2016 ESA's historic Rosetta mission has concluded as planned, with the controlled impact onto the comet it had been investigating for more than two years.

The descent gave Rosetta the opportunity to study the comet's gas, dust and plasma environment very close to its surface, as well as take very high-resolution images.

<https://goo.gl/Jkzwc3>

### **Astronomers find a treasure trove of strange brown dwarfs**

The new find adds to the population of "failed stars" and makes them even weirder than we thought. Stars that didn't quite make it to full blazing glory are a lot more common than we thought. A new survey found not just more brown dwarfs, but an entire population of ultracool brown dwarfs that aren't identified by standard sky surveys.

<http://www.astronomy.com/news/2016/10/astronomers-find-a-treasure-trove-of-strange-brown-dwarfs>

### **Possible water plumes spotted above Europa**

The Hubble Space Telescope has again spotted what appear to be towering plumes of water vapor erupting from Jupiter's moon Europa, hinting that future spacecraft may be able to sample the hidden sea, a possible abode of life, without having to drill through miles of rock-hard ice, researchers said Monday. "Today's results increase our confidence that water and other materials from Europa's hidden ocean might be on the surface and available for us to study," said Paul Hertz, director of astrophysics at NASA Headquarters in Washington.

<http://spaceflightnow.com/2016/09/26/possible-water-plumes-spotted-above-europa/>

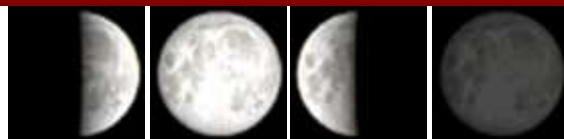
### **Spiral arms: Protoplanetary disk around a young star exhibits spiral structure**

Astronomers have found a distinct structure involving spiral arms in the reservoir of gas and dust disk surrounding the young star Elias 2-27. While spiral features have been observed on the surfaces of protoplanetary disks, these new observations, from the ALMA observatory in Chile, are the first to reveal that such spirals occur at the disk midplane, the region where planet formation takes place. This is of importance for planet formation: structures such as these could either indicate the presence of a newly formed planet, or else create the necessary conditions for a planet to form. As such, these results are a crucial step towards a better understanding how planetary systems like our Solar system came into being.

<http://phys.org/news/2016-09-spiral-arms-embrace-young-star.html>

## October Sky Data

First Qtr Oct 8      Full Oct 15      Last Qtr Oct 22      New Oct 30



**Best time for deep sky observing this month:**  
**October 21 through October 31**

**Mercury** is just past the peak of its best morning apparition, shining at magnitude  $-0.8$  some 8 degrees above the eastern horizon 45 minutes before sunrise. On the 11th it will lie just 0.8 degrees to the left of Jupiter. It will appear lower each morning becoming lost in the Sun's glare by mid month.

**Venus** can be viewed low in the southwest after sunset with a magnitude of  $-3.9$ . During the month, its angular size increases from 12 to 14 arc seconds whilst the illuminated percentage of its disk falls from 86% to 78%.

**Mars** reaches its lowest declination ( $-25$  degrees) on October 3rd and so will be seen some 9 degrees above the south-southwestern horizon as twilight ends. Fading from magnitude  $+0.1$  to  $+0.4$  during October, with a disk shrinking to just 8 arc seconds across during the month it will only appear as a featureless salmon-pink object. It lies closest to the Sun on the 29th.

**Jupiter** will appear low above the eastern horizon around the 8th of October. On the 11th, at magnitude  $-1.7$ , it lies close to Mercury but they will only be  $\sim 5$  degrees above the horizon 30 minutes before sunrise. As the month progresses, Jupiter rises a little earlier so that by month's end and still at magnitude  $-1.7$ , it rises some two and a half hours before the Sun.

On September 11th, **Saturn**, was just 6 degrees above, and a little to the left, of Antares in Scorpius. It is moving slowly eastwards. Saturn's brightness stays constant during the month at  $+0.6$  while its angular size drops slightly from 15.9 to 15.4 arc seconds. The rings are almost at their most open at 26 degrees so still make a magnificent sight.

The Orionid **meteor shower** will reach its maximum rate of activity on 21 October 2016. Some shooting stars associated with the shower are expected to be visible each night from 16 Oct to 30 Oct. The Moon will be 20 days old at the time of peak activity, and so will present significant interference in the pre-dawn sky.

## Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
10/1/2016	08:19	20:15	07:46	19:34
10/5/2016	11:53	22:38	07:49	19:29
10/10/2016	15:56	01:54	07:53	19:22
10/15/2016	19:21	07:15	07:57	19:16
10/20/2016	23:32	12:54	08:02	19:10
10/25/2016	03:28	16:39	08:06	19:04
10/31/2016	07:55	18:58	07:12	17:58

## Planet Data

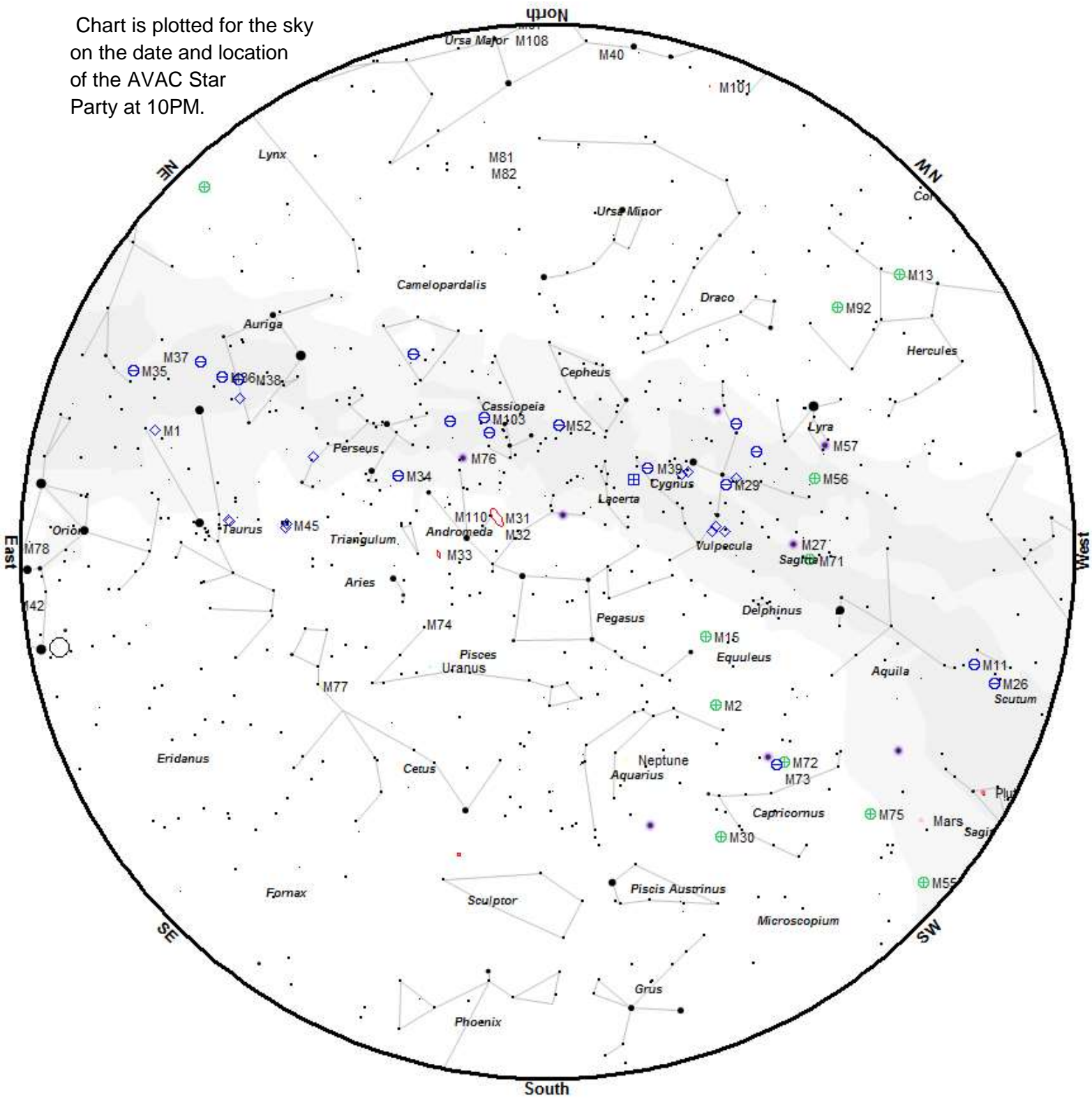
	Oct 1			
	Rise	Transit	Set	Mag
<b>Mercury</b>	05:20	11:41	18:01	$-0.8$
<b>Venus</b>	09:14	14:38	20:03	$-3.9$
<b>Mars</b>	13:29	18:20	23:11	0.1
<b>Jupiter</b>	06:19	12:27	18:31	$-1.7$
<b>Saturn</b>	11:37	16:48	21:55	0.6

	Oct 15			
	Rise	Transit	Set	Mag
<b>Mercury</b>	06:15	12:08	18:05	$-1.2$
<b>Venus</b>	09:43	14:50	19:59	$-4.0$
<b>Mars</b>	13:14	18:07	23:01	0.2
<b>Jupiter</b>	05:38	11:40	17:44	$-1.7$
<b>Saturn</b>	10:48	15:58	21:05	0.6

	Oct 31			
	Rise	Transit	Set	Mag
<b>Mercury</b>	07:23	12:45	18:10	$-1.1$
<b>Venus</b>	10:15	15:09	20:05	$-4.0$
<b>Mars</b>	12:54	17:53	22:53	0.4
<b>Jupiter</b>	04:51	10:49	16:50	$-1.7$
<b>Saturn</b>	09:52	15:02	20:08	0.6

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.



<p>Star Magnitudes</p> <p>● ● ● ● ● ●</p> <p>0 1 2 3 4 5</p>	<p>◻ Galaxy</p> <p>⊕ Open Cluster</p> <p>⊕ Globular Cluster</p> <p>⊕ Cluster+Nebosity</p>	<p>◇ Nebula</p> <p>◇ Bright Nebula</p> <p>◇ Planetary Nebula</p>
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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 best time to observe the object. The difficulty column describes how difficult it is to observe the object from the current location on a perfect night in a 6 inch Newtonian telescope.

ID	Cls	Con	RA 2000	Dec 2000	Mag	Begin	Best	End	Difficulty
M 7	Open	Sco	17h53m51.0s	-34°47'36"	3.3	19:06	19:15	19:25	detectable
M 9	Glob	Oph	17h19m12.0s	-18°31'00"	7.8	19:06	19:20	19:47	difficult
NGC 6723	Glob	Sgr	18h59m33.0s	-36°37'54"	6.8	19:10	19:20	19:40	detectable
M 70	Glob	Sgr	18h43m13.0s	-32°17'30"	7.8	19:11	19:21	19:41	detectable
M 8	Neb	Sgr	18h04m02.0s	-24°23'14"	5.0	19:10	19:22	19:49	easy
M 21	Open	Sgr	18h04m13.0s	-22°29'24"	7.2	19:11	19:23	19:47	detectable
M 20	Open	Sgr	18h02m42.0s	-22°58'18"	5.2	19:09	19:23	19:52	easy
M 54	Glob	Sgr	18h55m03.0s	-30°28'42"	7.7	19:13	19:24	19:43	difficult
M 28	Glob	Sgr	18h24m33.0s	-24°52'12"	6.9	19:12	19:24	19:49	detectable
M 23	Open	Sgr	17h57m04.0s	-18°59'06"	5.9	19:12	19:24	19:52	detectable
M 22	Glob	Sgr	18h36m24.0s	-23°54'12"	5.2	19:11	19:25	20:03	detectable
M 17	Open	Sgr	18h20m47.0s	-16°10'18"	7.3	19:15	19:26	19:51	difficult
M 18	Open	Sgr	18h19m58.0s	-17°06'06"	7.5	19:08	19:26	20:21	easy
M 25	Open	Sgr	18h31m47.0s	-19°07'00"	6.2	19:11	19:26	20:06	detectable
M 14	Glob	Oph	17h37m36.0s	-03°14'48"	7.6	19:13	19:27	19:59	detectable
M 16	Open	Ser	18h18m48.0s	-13°48'24"	6.5	19:07	19:27	20:35	obvious
NGC 6716	Open	Sgr	18h54m34.0s	-19°54'06"	7.5	19:11	19:27	20:22	detectable
M 55	Glob	Sgr	19h40m00.0s	-30°57'42"	6.3	19:12	19:26	20:14	detectable
NGC 6572	PNe	Oph	18h12m06.4s	+06°51'12"	8.0	19:00	19:28	20:21	obvious
IC 4665	Open	Oph	17h46m18.0s	+05°43'00"	5.3	19:14	19:28	19:53	detectable
M 13	Glob	Her	16h41m41.0s	+36°27'36"	5.8	19:11	19:29	20:02	easy
NGC 6818	PNe	Sgr	19h43m57.8s	-14°09'12"	10.0	19:04	19:29	20:28	easy
M 92	Glob	Her	17h17m07.0s	+43°08'12"	6.5	19:10	19:30	20:52	easy
NGC 6633	Open	Oph	18h27m15.0s	+06°30'30"	5.6	19:08	19:30	20:37	easy
IC 4756	Open	Ser	18h39m00.0s	+05°27'00"	5.4	19:10	19:30	20:44	easy
M 11	Open	Sct	18h51m05.0s	-06°16'12"	6.1	19:12	19:30	20:14	detectable
NGC 6543	PNe	Dra	17h58m33.4s	+66°37'59"	8.3	18:59	19:32	22:31	obvious
M 57	PNe	Lyr	18h53m35.1s	+33°01'45"	9.4	19:07	19:32	22:07	easy
M 56	Glob	Lyr	19h16m36.0s	+30°11'06"	8.4	19:12	19:33	21:27	detectable
M 71	Glob	Sge	19h53m46.0s	+18°46'42"	8.4	19:08	19:33	22:23	easy
M 27	PNe	Vul	19h59m36.3s	+22°43'16"	7.3	19:07	19:34	22:32	easy
NGC 6871	Open	Cyg	20h05m59.0s	+35°46'36"	5.8	19:08	19:36	22:59	easy
NGC 6910	Open	Cyg	20h23m12.0s	+40°46'42"	7.3	19:08	19:37	23:28	easy
M 29	Open	Cyg	20h23m57.0s	+38°30'30"	7.5	19:08	19:37	23:17	easy
NGC 7009	PNe	Aqr	21h04m10.9s	-11°21'48"	8.3	19:00	19:39	22:04	obvious
M 15	Glob	Peg	21h29m58.0s	+12°10'00"	6.3	19:08	19:50	23:28	easy
M 39	Open	Cyg	21h31m48.0s	+48°26'00"	5.3	19:06	19:52	01:03	easy
M 2	Glob	Aqr	21h33m27.0s	-00°49'24"	6.6	19:10	19:52	23:06	detectable

ID	Cls	Con	RA 2000	Dec 2000	Mag	Begin	Best	End	Difficulty
IC 1396	Neb	Cep	21h39m06.0s	+57°30'00"		19:09	19:57	01:11	challenging
M 30	Glob	Cap	21h40m22.0s	-23°10'42"	6.9	19:10	19:58	21:08	detectable
NGC 7160	Open	Cep	21h53m40.0s	+62°36'12"	6.4	19:03	20:10	02:13	obvious
IC 5146	Neb	Cyg	21h53m24.0s	+47°16'00"	10.0	19:07	20:10	01:13	challenging
NGC 7243	Open	Lac	22h15m08.0s	+49°53'54"	6.7	19:10	20:32	00:51	detectable
NGC 7293	PNe	Aqr	22h29m38.5s	-20°50'14"	6.3	19:11	20:46	22:24	detectable
M 52	Open	Cas	23h24m48.0s	+61°35'36"	8.2	19:14	21:41	01:51	detectable
NGC 7789	Open	Cas	23h57m24.0s	+56°42'30"	7.5	19:16	22:13	02:12	detectable
NGC 7790	Open	Cas	23h58m24.0s	+61°12'30"	7.2	19:06	22:15	04:14	easy
NGC 55	Gal	Scl	00h15m08.4s	-39°13'13"	8.5	21:27	22:31	23:38	challenging
M 110	Gal	And	00h40m22.3s	+41°41'09"	8.9	19:20	22:57	02:47	detectable
M 31	Gal	And	00h42m44.3s	+41°16'07"	4.3	19:13	22:59	03:32	easy
M 32	Gal	And	00h42m41.8s	+40°51'58"	8.9	19:11	22:59	03:38	easy
NGC 253	Gal	Scl	00h47m33.1s	-25°17'20"	7.9	22:40	23:04	23:27	detectable
NGC 288	Glob	Scl	00h52m45.0s	-26°35'00"	8.1	21:38	23:09	00:38	challenging
NGC 457	Open	Cas	01h19m35.0s	+58°17'12"	5.1	19:08	23:36	05:27	obvious
NGC 559	Open	Cas	01h29m31.0s	+63°18'24"	7.4	19:09	23:46	05:52	easy
M 103	Open	Cas	01h33m23.0s	+60°39'00"	6.9	19:08	23:50	05:47	obvious
M 33	Gal	Tri	01h33m50.9s	+30°39'36"	6.4	20:01	23:51	03:40	detectable
M 76	PNe	Per	01h42m19.9s	+51°34'31"	10.1	19:39	23:58	04:18	detectable
NGC 637	Open	Cas	01h43m04.0s	+64°02'24"	7.3	19:07	00:00	06:01	obvious
NGC 663	Open	Cas	01h46m09.0s	+61°14'06"	6.4	19:13	00:02	05:48	easy
NGC 752	Open	And	01h57m41.0s	+37°47'06"	6.6	21:50	00:14	02:37	challenging
NGC 869	Open	Per	02h19m00.0s	+57°07'42"	4.3	19:08	00:36	06:01	obvious
NGC 884	Open	Per	02h22m18.0s	+57°08'12"	4.4	19:10	00:39	06:00	obvious
Heart Neb	Neb	Cas	02h33m52.0s	+61°26'50"	6.5	21:51	00:50	03:49	challenging
NGC 957	Open	Per	02h33m21.0s	+57°33'36"	7.2	19:25	00:50	05:55	easy
M 34	Open	Per	02h42m05.0s	+42°45'42"	5.8	20:36	00:58	05:21	easy
M 77	Gal	Cet	02h42m40.8s	-00°00'48"	9.7	21:50	00:58	04:07	detectable
NGC 1027	Open	Cas	02h42m40.0s	+61°35'42"	7.4	20:19	00:59	05:37	detectable
NGC 1245	Open	Per	03h14m42.0s	+47°14'12"	7.7	23:09	01:31	03:53	challenging
NGC 1342	Open	Per	03h31m38.0s	+37°22'36"	7.2	21:32	01:48	05:51	detectable
M 45	Open	Tau	03h47m00.0s	+24°07'00"	1.5	21:26	02:03	06:02	obvious
NGC 1444	Open	Per	03h49m25.0s	+52°39'30"	6.4	20:27	02:06	06:07	obvious
NGC 1502	Open	Cam	04h07m50.0s	+62°19'54"	4.1	20:21	02:24	06:08	obvious
NGC 1528	Open	Per	04h15m23.0s	+51°12'54"	6.4	21:19	02:32	06:01	easy
Hyades	Open	Tau	04h26m54.0s	+15°52'00"	0.8	22:33	02:43	05:59	obvious
NGC 1647	Open	Tau	04h45m55.0s	+19°06'54"	6.2	23:40	03:02	05:53	detectable
NGC 1664	Open	Aur	04h51m06.0s	+43°40'30"	7.2	22:06	03:07	06:02	easy
NGC 1746	Open	Tau	05h03m50.0s	+23°46'12"	6.1	23:50	03:19	05:56	detectable
M 38	Open	Aur	05h28m40.0s	+35°50'54"	6.8	23:28	03:44	06:00	detectable
M 36	Open	Aur	05h36m18.0s	+34°08'24"	6.5	22:56	03:49	06:05	easy
M 1	Neb	Tau	05h34m30.0s	+22°01'00"	8.4	01:08	03:51	05:53	difficult
M 37	Open	Aur	05h52m18.0s	+32°33'12"	6.2	23:24	04:08	06:03	easy



## 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.
- To borrow club equipment, books, videos and other items.

### AVAC

**P.O. BOX 8545,  
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Visit the Antelope Valley Astronomy Club website at [www.avastronomyclub.org/](http://www.avastronomyclub.org/)

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The A.V.A.C. is a Sustaining Member of The Astronomical League and the International Dark-Sky Association.

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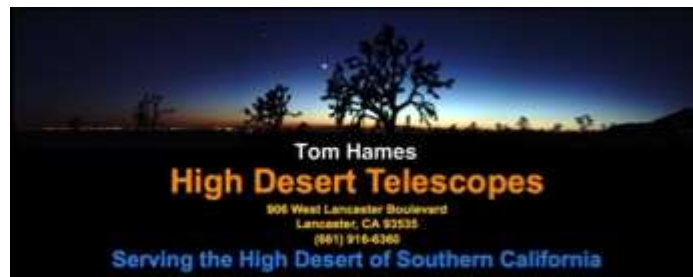


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