



# Desert Sky Observer

Volume 38

Antelope Valley Astronomy Club Newsletter

April 2018

## Up-Coming Events

April 7: [Prime Desert Moon Walk](#)

April 13: Club Meeting\*

April 14: [Messier Marathon](#)

April 27: [College of the Canyons 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 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

Will wonders never cease? We called one right for a change. Whether you knew it or not, way back in January the AVAC Board decided to hold our Messier Marathon on the New Moon weekend in April rather than March out of concern for the weather. Of course, from an astronomical perspective, March 17 would have been the ideal weekend as far as “bagging Messier Objects” is concerned but we had reservations about the mid-March weekend and the weather that early in the month.

As it turned out we were right since the turned out to be mostly inclement at our regular observing sites. In addition to being cloudy (as was the entire state) Chuchupate was snow bound and both the Ventura County Astronomical Society (VCAS) and the Local Group Astronomy Club out of Santa Clarita canceled their Messier Marathons.

Ultimately, I finally made the call to cancel our scheduled star party at Red Cliffs (Red Rock Canyon State Park) due to clouds, wind and predicted thunderstorms. Three hours after I canceled, the Supervising Ranger for the district notified me that he was canceling all events in the park. I had loaded our motor home the night before and by the time I started to unload it was snowing here in Tehachapi.

So, we'll try it again. We have the Group Campsite at Saddleback Butte State Park reserved for the afternoon and night of Saturday April 14 into Sunday morning. Though it's not our formal picnic (that's in July) we'll light off the barbecues for kind of a “BYOM” (bring your own meat) potluck where you're free bring just enough for yourself or some extra to share. We'll have water, soda, coffee, cocoa and midnight snacks for those observing through the night. Details and directions will be sent in another email.

For those who missed it, our March meeting was a bit out of the ordinary as we incorporated it into the 20th Anniversary Celebration for the SAGE Planetarium. Festivities began at 4:30 with speeches by school and government officials and a reception with deli sandwiches, donuts and other treats in the lobby of the SAGE. I was especially fascinated, and heartened, by the stories from the original board members who had the insight to forethought to build the planetarium over twenty years ago. Though we had a few telescopes set up for both solar deep sky observing, weather conditions pretty well prevented us from observing

anything but the Orion Nebula through holes in the overcast. Still, the grateful crowd seemed to be pleased to see even that.

As was the case with the rest of the events for March, the Prime Desert Woodland Moonwalk for March was rained out. We can't complain too much about the rain and snow though since it was a bit of a "Miracle March" with the highest recorded precipitation for the month since 1991. Though still well below normal for the year, the March storms increased the Sierra Nevada snow pack to 58% of normal for April 1 and saved us from another summer of severe drought.

The April moonwalk is scheduled for Saturday April 7 at 8:00 pm and our April meeting will be on Friday April 13. Rose has speakers scheduled for both the April and May meetings as noted in her DSO article. The College of the Canyons Spring Star Party is on Friday April 27. The AVAC will have a presence at the College of the Canyons Star Party though Rose and I will not be able to attend as we will be in Lincoln City, Oregon (the se place we went for the solar eclipse) for our son's wedding. This is a fun event, with an enthusiastic crowd, and I hope we can have a decent showing of members with telescopes.

It's warming up, the skies are getting clearer, so remember to go outside and LOOK UP.



## Secretary Rose Moore

Thank you to all the members who ce out to the SAGE's 20th Anniversary celebration on March 9th. We had cloudy skies, so not much observing for us and the public, and lots of donuts!

Further info on the Mt. Wilson trip in June will be coming, where and time to meet up, carpooling, maps, etc.

Coming up in April is our Prime Desert Moon Walk with Jeremy on Saturday April 7th at 8pm. We'll need members with telescopes, or come out to enjoy the walk and talk with Jeremy! Weather permitting!

At our meeting in April we will have Alejandro Osorio, the Operations Engineer and Mission Director for the C-20 Airborne Science aircraft which supports JPL's UAVSAR program. This mission uses a modified Gulfstream aircraft using special radar, that is used to gather scientific data for geological studies on how land changes, hurricanes, climate changes in the Arctic, and changes in Earth's features after earthquakes and volcanoes. This type of radar instrumentation has been used on planetary missions such as the Venera and Magellan Venus probes, and on the Cassini probe for gathering information on Titan. This mission is a joint NASA and JPL mission.

Our Messier Marathon is coming up on Saturday, April 14th. We will be meeting at the group campsite at Saddleback State Park at a time to be announced. Bring your telescopes, or you can come and view through other member's telescopes, and enjoy the night sky. This is an overnight event for those interested. Dress warm, weather permitting!

Friday April 27th is College of the Canyons. We will need members with telescopes, or other astronomy items of interest, to show the public the night sky. Frank and I usually attend this event, but we will be out of town for our son's wedding. So we would appreciate some members to help out at this event! Further info to follow.

Our speaker at May's meeting will be Chris Butler artist, speaker, educator, and astronomer. Chris is a member of the Orange County Astronomers and the LAAS. He has been a speaker at our meetings numerous times. His topic for May's meeting is 'From Nine Planets to Nine Billion Worlds'.

Please come out and support your club at our meetings and our outreach events.

## Space Place

### Measuring the Movement of Water on Earth

By Teagan Wall

As far as we know, water is essential for every form of life. It's a simple molecule, and we know a lot about it. Water has two hydrogen atoms and one oxygen atom. It boils at 212° Fahrenheit (100° Celsius) and freezes at 32° Fahrenheit (0° Celsius). The Earth's surface is more than 70 percent covered in water.

On our planet, we find water at every stage: liquid, solid (ice), and gas (steam and vapor). Our bodies are mostly water. We use it to drink, bathe, clean, grow crops, make energy, and more. With everything it does, measuring where the water on Earth is, and how it moves, is no easy task.

The world's oceans, lakes, rivers and streams are water. However, there's also water frozen in the ice caps, glaciers, and icebergs. There's water held in the tiny spaces between rocks and soils deep underground. With so much water all over the planet—including some of it hidden where we can't see—NASA scientists have to get creative to study it all. One way that NASA will measure where all that water is and how it moves, is by launching a set of spacecraft this spring called GRACE-FO.

GRACE-FO stands for the "Gravity Recovery and Climate Experiment Follow-on." "Follow-on" means it's the second satellite mission like this—a follow-up to the original GRACE mission. GRACE-FO will use two satellites. One satellite will be about 137 miles (220 km) behind the other as they orbit the Earth. As the satellites move, the gravity of the Earth will pull on them.

Gravity isn't the same everywhere on Earth. Areas with more mass—like big mountains—have a stronger gravitational pull than areas with less mass. When the GRACE-FO satellites fly towards an area with stronger gravitational pull, the first satellite will be pulled a little faster. When the second GRACE-FO satellite reaches the stronger gravity area, it will be pulled faster, and catch up.

Scientists combine this distance between the two satellites with lots of other information to create a map of Earth's gravity field each month. The changes in that map will tell them how land and water move on our planet. For example, a melting glacier will have less water, and so less mass, as it melts. Less mass means less gravitational pull, so the GRACE-FO satellites will have less distance between them. That data can be used to help scientists figure out if the glacier is melting.

GRACE-FO will also be able to look at how Earth's overall weather changes from year to year. For example, the satellite can monitor certain regions to help us figure out how severe a drought is. These satellites will help us keep track of one of the most important things to all life on this planet: water.

You can learn more about our planet's most important molecule here: <https://spaceplace.nasa.gov/water>

*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 is Ready to Study the Heart of Mars**

InSight -- short for Interior Exploration using Seismic Investigations, Geodesy and Heat Transport -- is a stationary lander scheduled to launch as early as May 5. It will be the first mission ever dedicated to Mars' deep interior, and the first NASA mission since the Apollo moon landings to place a seismometer on the soil of another planet.

<https://www.jpl.nasa.gov/news/news.php?feature=7090>

### **Kepler Beyond Planets: Finding Exploding Star**

Stellar explosions forge and distribute materials that make up the world in which we live, and also hold clues to how fast the universe is expanding. By understanding supernovae, scientists can unlock mysteries that are key to what we are made of and the fate of our universe. But to get the full picture, scientists must observe supernovae from a variety of perspectives, especially in the first moments of the explosion. That's really difficult -- there's no telling when or where a supernova might happen next.

<https://www.jpl.nasa.gov/news/news.php?feature=7086>

### **100th Spacewalk by Space Station Expedition Crews**

Two U.S. astronauts worked outside of the International Space Station Thursday on what marked the 100th spacewalk performed by crew members living on board the orbiting laboratory. Expedition 55 crewmates Drew Feustel and Ricky Arnold, both of NASA, spent six hours and 10 minutes conducting maintenance activities on the exterior of the space station.

<https://goo.gl/EXS3ZP>

### **R Aquarii: Watching a Volatile Stellar Relationship**

In biology, "symbiosis" refers to two organisms that live close to and interact with one another. Astronomers have long studied a class of stars — called symbiotic stars — that co-exist in a similar way. Using data from NASA's Chandra X-ray Observatory and other telescopes, astronomers are gaining a better understanding of how volatile this close stellar relationship can be.

<http://chandra.si.edu/photo/2017/raqr/>

### **Ghostly Galaxy Has Almost No Dark Matter**

A unique galaxy is making the case for dark matter, even though it has very little of the mysterious substance. Astronomers have determined that the galaxy NGC 1052-DF2, or DF2 for short, has 400 times less dark matter than expected for an object of its size.

<https://www.space.com/40119-ghostly-galaxy-almost-no-dark-matter.html>

## April Sky Data

**Best time for deep sky observing this month:**  
**April 10 through April 19**

**Mercury** passes in front of the Sun (inferior conjunction) on April 1st and, rising out of the Sun's glare, reaches greatest western elongation of 27 degrees on April 29th. But it never gets more than 10 degrees above the horizon even when furthest from the Sun.

**Venus**, seen low in the west after sunset, shines at magnitude -3.3 all month. Venus rises a little higher in the sky as April progresses, initially setting around one hour and a half after the Sun but increasing to two hours by month's end as its elevation at sunset increases from 18 to 25 degrees.

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 +0.4 to -0.2 and an angular size of 8.4 increasing to 11 arc seconds so, by month's end it should be possible to spot details on its salmon-pink surface.

**Jupiter** rises about three hours after sunset at the beginning of the month and about two hour earlier by month's end. Jupiter will transit before around 3:30 in early April and by around 1:30 at its end and so will enable the giant planet to be well seen with the equatorial bands, sometimes the Great (but reducing in size) Red Spot and up to four of its Galilean moons.

**Saturn** rises at around 2:00 am at the start of the month and right at midnight at its end. With an angular size of ~16.7 arc seconds it climbs higher before dawn and so becomes easier to spot as the month progresses. The rings were at their widest a few months ago and are still, at 26 degrees to the line of sight, well open and spanning ~2.5 times the size of Saturn's globe.

The annual Lyrid **meteor shower** is active each year from about April 16 to 25. In 2018, the peak of this shower – which tends to come in a burst and usually lasts for less than a day – is expected to fall on the morning of April 22, with little or no interference from the waxing moon. All in all the Lyrid meteor shower prospects look pretty good for 2018

Last Qtr  
Apr 8

New  
Apr 15

First Qtr  
Apr 22

Full  
Apr 29



## Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
4/1/2018	20:40	07:40	06:41	19:11
4/5/2018	n/a	10:12	06:35	19:15
4/10/2018	03:30	14:19	06:29	19:18
4/15/2018	06:27	19:15	06:23	19:22
4/20/2018	10:08	n/a	06:16	19:26
4/25/2018	15:23	03:51	06:11	19:30
4/30/2018	20:27	06:47	06:05	19:33

## Planet Data

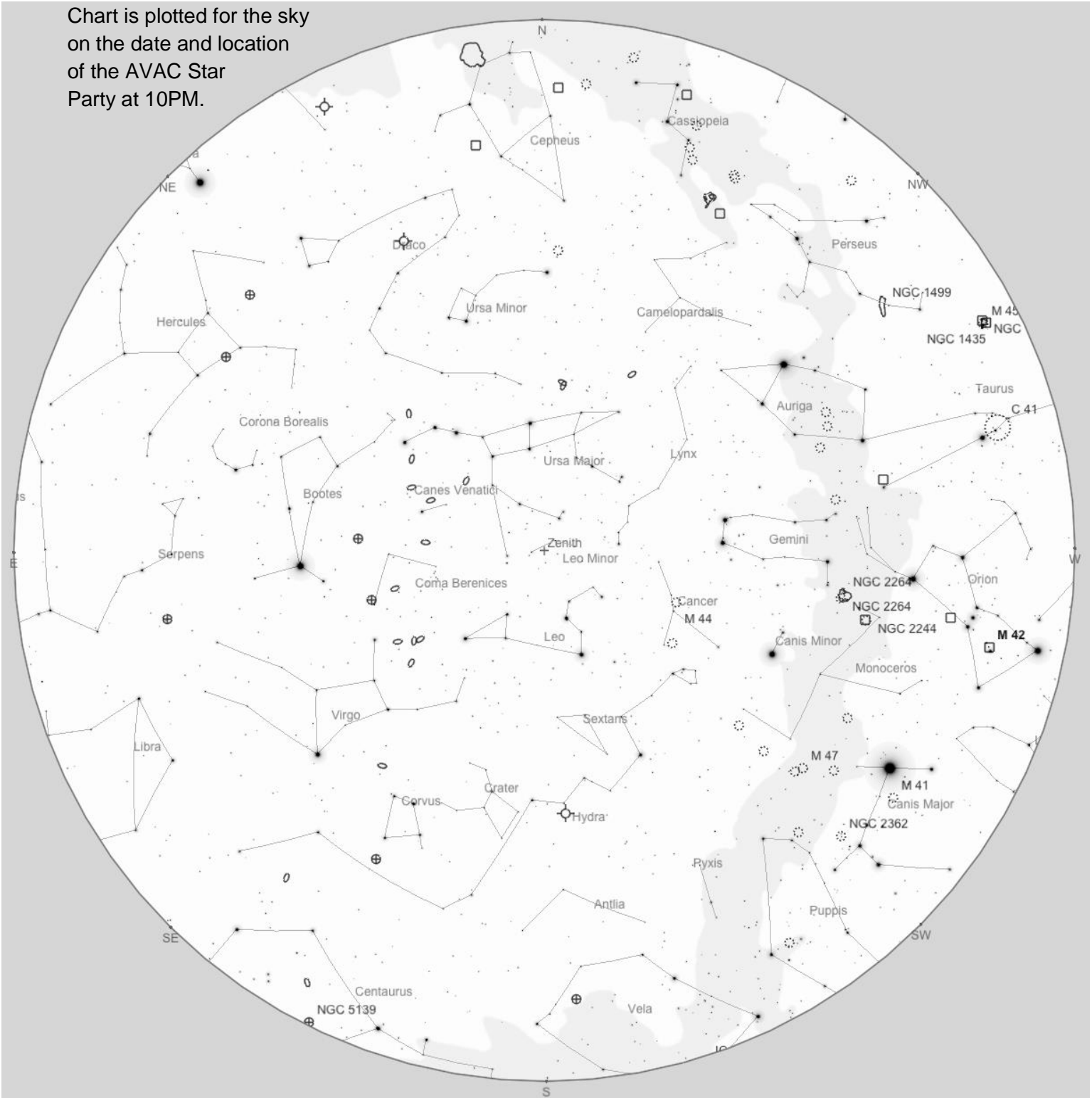
	Apr 1			
	Rise	Transit	Set	Mag
<b>Mercury</b>	06:32	12:54	19:16	3.1
<b>Venus</b>	07:40	14:15	20:50	-3.3
<b>Mars</b>	01:57	06:52	11:46	0.4
<b>Jupiter</b>	22:21	03:36	08:51	-1.9
<b>Saturn</b>	01:54	06:53	11:52	1.6

	Apr 15			
	Rise	Transit	Set	Mag
<b>Mercury</b>	05:32	11:38	17:44	1.4
<b>Venus</b>	07:34	14:26	21:19	-3.3
<b>Mars</b>	01:34	06:29	11:25	0.1
<b>Jupiter</b>	21:20	02:36	07:52	-2.0
<b>Saturn</b>	01:00	05:59	10:58	1.5

	Apr 30			
	Rise	Transit	Set	Mag
<b>Mercury</b>	05:05	11:15	17:25	0.6
<b>Venus</b>	07:35	14:42	21:50	-3.4
<b>Mars</b>	01:05	06:02	10:59	-0.2
<b>Jupiter</b>	20:12	01:30	06:47	-2.0
<b>Saturn</b>	00:00	04:59	09:58	1.4

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. Since this month is our Messier Marathon the list is the observing order for the night. You can download the order in Excel format at [http://www.avastronomyclub.org/docs/marathon\\_order.xls](http://www.avastronomyclub.org/docs/marathon_order.xls) or Adobe PDF at [http://www.avastronomyclub.org/docs/marathon\\_order.pdf](http://www.avastronomyclub.org/docs/marathon_order.pdf)

Order	Time	M #	NGC	Con	R.A.	Dec	Mag	Type	Comments
1		M 77	1068	CET	2h 43m	0° 1'	8.8	SG	
2		M 74	628	PSC	1h 37m	15° 47'	9.2	S	
3		M 33	598	TRI	1h 34m	30° 39'	5.7	SG	Pinwheel galaxy
4		M 31	224	AND	0h 43m	41° 16'	3.4	SG	Andromeda galaxy
5		M 32	221	AND	0h 43m	40° 52'	8.2	EG	
6		M 110	205	AND	0h 40m	41° 41'	8.0	EG	
7		M 52	7654	CAS	23h 24m	61° 35'	6.9	OC	
8		M 103	581	CAS	1h 33m	60° 42'	7.4	OC	
9		M 76	650	PER	1h 42m	51° 34'	11.5	PN	The Little Dumbell
11		M 34	1039	PER	2h 42m	42° 47'	5.2	OC	
11		M 45		TAU	3h 47m	24° 7'	1.2	OC	Pleiades
12		M 79	1904	LEP	5h 24m	-24° 33'	8.0	GC	
13		M 42	1976	ORI	5h 35m	-5° 27'	4.0	DN	Great Orion nebula
14		M 43	1982	ORI	5h 35m	-5° 16'	9.0	DN	
15		M 78	2068	ORI	5h 47m	0° 3'	8.0	DN	
16		M 1	1952	TAU	5h 34m	22° 1'	8.4	PN	Crab nebula
17		M 35	2168	GEM	6h 09m	24° 20'	5.1	OC	
18		M 37	2099	AUR	5h 52m	32° 33'	5.6	OC	
19		M 36	1960	AUR	5h 36m	34° 8'	6.0	OC	
20		M 38	1912	AUR	5h 29m	35° 50'	6.4	OC	
21		M 41	2287	CMA	6h 47m	-20° 44'	4.5	OC	
22		M 93	2447	PUP	7h 45m	-23° 52'	6.2	OC	
23		M 47	2422	PUP	7h 37m	-14° 30'	4.4	OC	
24		M 46	2437	PUP	7h 42m	-14° 49'	6.1	OC	
25		M 50	2323	MON	7h 03m	-8° 20'	5.9	OC	
26		M 48	2548	HYA	8h 14m	-5° 48'	5.8	OC	
27		M 44	2632	CNC	8h 40m	19° 59'	3.1	OC	Beehive Cluster
28		M 67	2682	CNC	8h 50m	11° 49'	6.9	OC	
29		M 95	3351	LEO	10h 44m	11° 42'	9.7	SG	
30		M 96	3368	LEO	10h 47m	11° 49'	9.2	SG	
31		M 105	3379	LEO	10h 48m	12° 35'	9.3	EG	
32		M 65	3623	LEO	11h 19m	13° 5'	9.3	SG	Leo's triplet
33		M 66	3627	LEO	11h 20m	12° 59'	9.0	SG	Leo's triplet
34		M 81	3031	UMA	9h 56m	69° 4'	6.8	SG	Bodes Galaxy
35		M 82	3034	UMA	9h 56m	69° 41'	8.4	IG	Cigar Galaxy
36		M 97	3587	UMA	11h 15m	55° 1'	11.2	PN	Owl Nebula
37		M 108	3556	UMA	11h 12m	55° 40'	10.0	SG	

Order	Time	M #	NGC	Con	R.A.	Dec	Mag	Type	Comments
38		M 109	3992	UMA	11h 58m	53° 23'	9.8	SG	
39		M 40		UMA	12h 22m	58° 5'	8.0	dbl	
40		M 106	4258	CVN	12h 19m	47° 18'	8.3	SG	
41		M 94	4736	CVN	12h 51m	41° 7'	8.1	SG	
42		M 63	5055	CVN	13h 16m	42° 2'	8.6	SG	Sunflower galaxy
43		M 51	5194	CVN	13h 30m	47° 12'	8.1	SG	Whirlpool galaxy
44		M 101	5457	UMA	14h 03m	54° 21'	7.7	SG	
45		M 102	5457	UMA	14h 03m	54° 21'	7.7	SG	Duplicate of M101
46		M 53	5024	COM	13h 13m	18° 10'	7.7	GC	
47		M 64	4826	COM	12h 57m	21° 41'	8.5	SG	Black eye galaxy
48		M 3	5272	CVN	13h 42m	28° 23'	6.4	GC	
49		M 98	4192	COM	12h 14m	14° 54'	10.1	SG	
50		M 85	4382	COM	12h 25m	18° 11'	9.2	EG	
51		M 99	4254	COM	12h 19m	14° 25'	9.8	SG	Pin Wheel nebula
52		M 100	4321	COM	12h 23m	15° 49'	9.4	SG	
53		M 84	4374	VIR	12h 25m	12° 53'	9.3	EG	
54		M 86	4406	VIR	12h 26m	12° 57'	9.2	EG	
55		M 87	4486	VIR	12h 31m	12° 24'	8.6	EG	
56		M 89	4552	VIR	12h 36m	12° 33'	9.8	EG	
57		M 90	4569	VIR	12h 37m	13° 10'	9.5	SG	
58		M 88	4501	COM	12h 32m	14° 25'	9.5	SG	
59		M 91	4548	COM	12h 35m	14° 30'	10.2	SG	
60		M 58	4579	VIR	12h 38m	11° 49'	9.8	SG	
61		M 59	4621	VIR	12h 42m	11° 39'	9.8	EG	
62		M 60	4649	VIR	12h 44m	11° 33'	8.8	EG	
63		M 49	4472	VIR	12h 30m	8° 0'	8.4	EG	
64		M 61	4303	VIR	12h 22m	4° 28'	9.7	SG	
65		M 104	4594	VIR	12h 40m	-11° 37'	8.3	SG	Sombrero galaxy
66		M 68	4590	HYA	12h 40m	-26° 45'	8.2	GC	
67		M 83	5236	HYA	13h 38m	-29° 52'	7.6	SG	Southern Pinwheel
68		M 5	5904	SER	15h 18m	2° 5'	5.8	GC	
69		M 13	6205	HER	16h 42m	36° 28'	5.9	GC	Hercules Cluster
70		M 92	6341	HER	17h 17m	43° 8'	6.5	GC	
71		M 57	6720	LYR	18h 54m	33° 2'	9.0	PN	Ring nebula
72		M 56	6779	LYR	19h 17m	30° 11'	8.2	GC	
73		M 29	6913	CYG	20h 23m	38° 32'	6.6	OC	
74		M 39	7092	CYG	21h 32m	48° 26'	4.6	OC	
75		M 27	6853	VUL	20h 00m	22° 43'	8.1	PN	Dumbbell nebula
76		M 71	6838	SGE	19h 54m	18° 47'	8.3	GC	
77		M 107	6171	OPH	16h 33m	-13° 3'	8.1	GC	
78		M 10	6254	OPH	16h 57m	-4° 6'	6.6	GC	
79		M 12	6218	OPH	16h 47m	-1° 57'	6.6	GC	
80		M 14	6402	OPH	17h 38m	-3° 15'	7.6	GC	
81		M 9	6333	OPH	17h 19m	-18° 31'	7.9	GC	
82		M 4	6121	SCO	16h 23m	-26° 32'	5.9	GC	



Order	Time	M #	NGC	Con	R.A.	Dec	Mag	Type	Comments
83		M 80	6093	SCO	16h 17m	-22° 59'	7.2	GC	
84		M 19	6273	OPH	17h 03m	-26° 16'	7.2	GC	
85		M 62	6266	OPH	17h 01m	-30° 7'	6.6	GC	
86		M 6	6405	SCO	17h 40m	-32° 13'	4.2	OC	Butterfly cluster
87		M 7	6475	SCO	17h 54m	-34° 49'	3.3	OC	Ptolemy's Cluster
88		M 11	6705	SCT	18h 51m	-6° 16'	5.8	OC	Wild Duck cluster
89		M 26	6694	SGR	18h 45m	-9° 24'	8.0	OC	
90		M 16	6611	SER	18h 19m	-13° 47'	6.0	DN	Eagle nebula
91		M 17	6618	SGR	18h 21m	-16° 11'	7.0	DN	Swan nebula
92		M 18	6613	SGR	18h 20m	-17° 8'	6.9	OC	
93		M 24	6603	SGR	18h 16m	-18° 29'	4.5	OC	
94		M 25		SGR	18h 32m	-19° 15'	4.6	OC	
95		M 23	6494	SGR	17h 57m	-19° 1'	5.5	OC	
96		M 21	6531	SGR	18h 05m	-22° 30'	5.9	OC	
97		M 20	6514	SGR	18h 02m	-23° 2'	8.5	DN	Trifid nebula
98		M 8	6523	SGR	18h 03m	-24° 23'	5.8	DN	Lagoon nebula
99		M 28	6626	SGR	18h 25m	-24° 52'	6.9	GC	
100		M 22	6656	SGR	18h 36m	-23° 54'	5.1	GC	
101		M 69	6637	SGR	18h 31m	-32° 21'	7.7	GC	
102		M 70	6681	SGR	18h 43m	-32° 18'	8.1	GC	
103		M 54	6715	SGR	18h 55m	-30° 29'	7.7	GC	
104		M 55	6809	SGR	19h 40m	-30° 58'	7.0	GC	
105		M 75	6864	SGR	20h 06m	-21° 55'	8.6	GC	
106		M 15	7078	PEG	21h 30m	12° 10'	6.4	GC	
107		M 2	7089	AQR	21h 33m	0° -49'	6.5	GC	
108		M 72	6981	AQR	20h 54m	-12° 32'	9.4	GC	
109		M 73	6994	AQR	20h 58m	-12° 38'		ast	
110		M 30	7099	CAP	21h 40m	-23° 11'	7.5	GC	

## 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,**  
**LANCASTER, CA 93539-8545**

Visit the Antelope Valley Astronomy Club website at [www.avastronomyclub.org/](http://www.avastronomyclub.org/)

The Antelope Valley Astronomy Club, Inc. is a 501(c)(3) Non-Profit Corporation.

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

## Board Members

### President:

Frank Moore (661) 972-4775  
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### Vice-President:

Vacant  
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### Director of Community Development:

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## Appointed Positions

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### Astronomical League Coordinator:

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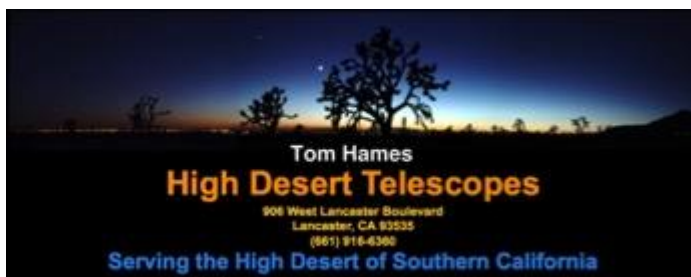


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