



Desert Sky Observer

Volume 31

Antelope Valley Astronomy Club Newsletter

April 2011

Up-Coming Events

- April 2: Messier Marathon @ [Saddleback Butte](#)
- April 8: Club Meeting*
- April 9: [Prime Desert Woodland Moon Walk](#)
- April 11: Board meeting @ [Don's house](#)
- April 16-17: Antelope Valley Poppy Festival @ [Lancaster City Park](#)
- April 20: Acton Library Astronomy Lecture and Star Party @ [Acton Library](#)

* Monthly meetings are held at the S.A.G.E. Planetarium on the Cactus School campus 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

Don Bryden

Anybody else tired of the rain? I don't think I've had a chance to set up my scope since the January star party. I did get to see the "Supermoon" last week, between breaks in the clouds. It's funny, sometimes, being involved with astronomy, your perspective is different. The "Supermoon" made headlines on YAHOO, iGoogle and USA Today – sort of the "People Magazine" of science publications, and all my non-astro friends asked me about it. "Are you going to see the Supermoon tonight?" they asked. "Nah", I said, "too bright..." They looked puzzled. "But it's going to be the largest moon in twenty years!"

I thought about trying to explain that looking at a full moon with a telescope is usually too much pain and not enough gain. I thought about mentioning that, unless you had a full moon at apogee to compare the perigee moon to, it wouldn't really look unusually bright or large. But instead I just said, "It's supposed to rain".

Sometimes the cloudy, rainy nights of winter are comforting. You can work on your equipment in the shop, browse Cloudy Nights and Astromart, catch up on your Sky & Telescope and Astronomy reading and dream about balmy nights at Pinos in the summer. And speaking of pining for Pinos, we do have some things to look forward to starting with the Messier Marathon at Saddleback Butte. We have the group site from Saturday afternoon until Sunday. You can enjoy a free club-sponsored Bar-B-Cue and then a night of hunting for Messier Objects. There will be prizes for the top marathoner's as well.

But what I'm really looking forward to is the end of May. Once again RTMC will be over Memorial weekend. The pool will be open, the vendors will be flocking and the AVAC usual's will be circling their RV's near the showers at our favorite campsite. Think about coming out for a long weekend or even a day. Check it out at www.rtmcastronomyexpo.org for info.

Finally we arrive at June and our first trip of the season up to Mt. Pinos (although my daughter went sledding up there yesterday and the snow was so deep they could hardly climb the hill!) Luckily the star party is scheduled for the end of June!

So back to the perigee moon: it was cloudy but didn't rain. Sophie came out to my garage shop and said did I see the moon yet. So we turned off the lights and sat out on the driveway. Sure was a big bright moon...



Vice President

Rose Moore

At our meeting on April 8th, we have Dr. David Lynch coming to speak on 'Asteroid Impacts on Earth'. Dr. Lynch has a BS in Astrophysics, and a PhD in Astronomy. He is a Senior Scientist at The Aerospace Corporation where he specializes in infrared spectroscopy of comets, novae, supernovae, young and very old stars. He also works with the USGS on plate tectonics, with a focus on the San Andreas Fault.

May's meeting will be with our own Dick Hague, Shane and Karole Barker, showing us the new Night Sky Kit 'Space Rocks, Asteroids, and Meteorites'. Please come out and show your support and learn something new! Our members attended a NSN event last year to work on this new kit!

July's meeting will be Linda Morabito-Meyer, an astronomer, engineer, and astronomy professor. She has worked at JPL, the Planetary Society, and other centers, on several missions, and was the discoverer of the volcanic plume on Io. Topic to be announced.

Our summer picnic 'StarBQue' will be at Steve and Kate's home in Acton on June 4th, Saturday. Start time is 3:00 pm. Directions are on our website. Please sign up at the meetings if you will attend. This is a potluck, so please sign up for bringing some food item to share. If you would like to donate an item(s) for the raffle or silent auction, then please let one of the board members know. If you are unable to attend a meeting to sign up, please contact me via email or phone.

The Mt. Wilson trip is scheduled for Saturday, July 2nd. If you haven't signed up, please do so at one of our meetings. Even if the list is full, sometimes people will cancel. We will be posting a link soon for payment for those who are on our list, or you may pay at a meeting. More info to follow. We will also be sending out info on car pooling, times, etc., as the time gets closer! Stay tuned!

Our club has put a deposit on the Embassy Suites room for our Christmas Party in December. More info to follow later in the year.

Please come out and support your club and its activities!!

See you at the Messier Marathon!!

Rose

Space Place

GOES-R, Zombie Fighter

by Dr. Tony Phillips

On April 5, 2010, something eerie happened to the Galaxy 15 telecommunications satellite: It turned into a zombie.

The day began as usual, with industry-owned Galaxy 15 relaying TV signals to millions of viewers in North America, when suddenly the geosynchronous satellite stopped taking commands from Earth. It was brain dead! Like any good zombie, however, its body continued to function. Within days, Galaxy 15 began to meander among other satellites in geosynchronous orbit, transmitting its own signal on top of the others'. Satellite operators scrambled to deal with the interference, all the while wondering what happened?

In horror movies, zombies are usually produced by viruses.

“In this case, the culprit was probably the sun,” says Bill Denig of the National Geophysical Data Center in Boulder, Colorado. He and colleague Janet Green of NOAA’s Space Weather Prediction Center recently led a study of the Galaxy 15 anomaly, and here are their conclusions:

On April 3rd, a relatively minor solar flare launched a cloud of plasma toward Earth. Galaxy 15 had experienced many such events before, but this time there was a difference.

“Galaxy 15 was just emerging from the shadow of Earth when the cloud arrived and triggered a geomagnetic storm,” explains Denig. Suddenly exposed to sunlight and the ongoing storm, “the spacecraft began to heat up and charge [up].”

Electrons swirling around Galaxy 15 stuck to and penetrated the spacecraft’s surface. As more and more charged particles accumulated, voltages began to rise, and—zap!—an electrostatic discharge occurred. A zombie was born.

“At least, this is what we suspect happened based on data collected by GOES satellites in the vicinity,” he says. “We’ll be able to diagnose events like this much better, however, after GOES-R is launched by NASA in 2015.”

GOES-R is NOAA’s next-generation Geostationary Operational Environmental Satellite. One of the instruments it will carry, a low-energy electron counter, is crucial to “zombie fighting.” Low energy-electrons are the ones most likely to stick to a spacecraft’s surface and cause brain-frying discharges. By monitoring these particles in Earth orbit, GOES-R will provide better post-mortems for future zombie outbreaks. This could help satellite designers figure out how to build spacecraft less susceptible to discharges. Also, GOES-R will be able to issue alerts when dangerous electrons appear. Satellite operators could then take protective action—for example, putting their birds in “safe mode”—to keep the zombie population at bay.

Meanwhile, Galaxy 15 is a zombie no more. In late December 2010, after 9 months of terrorizing nearby spacecraft, the comsat was re-booted, and began responding to commands from Earth again.

All’s well that ends well? True zombie fighters know better than to relax. Says Denig, “we’re looking forward to GOES-R.”

You and the kids in your life can learn about space weather at <http://scijinks.gov/space-weather-and-us>.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Tips on Participating in a Messier Marathon

by John Barra, Peoria Astronomical Society
Edited to reflect the Antelope Valley Astronomy Club's observing sites.

1. BE PREPARED:

The Boy's Scout motto is a good one for the marathon that is twelve hours long. Have a good plan of attack. Included at the end of this article is one suggested order to follow. Get the star charts you are going to use and study them.

Do not forget to bring the extras you will need such as a red flashlight, extra batteries for your Telrad or other battery-operated equipment, and a dew zapper. You will have dew in the spring. If you don't have one, bring a hair dryer and a long extension cord.

2. GET THERE EARLY:

Get to the site as early as you can, at least by 6:30 pm. The first object viewable will be M45, the Pleiades, at 6:45. If you are set up by then you can get a few of the brighter objects out of the way fast, even if they are actually listed lower on the list.

3. HAVE A PLAN ON THE TOUGH EARLY OBJECTS:

Try the suggested Messier Marathon order.

You will not have much time between the first signs of darkness, around 7 pm., and the time several of the first tough objects on your list will set in the west. You must be prepared for them. M74 and M77 will be particularly hard to locate. M74, a faint galaxy in Pisces, will undoubtedly be the toughest to find all night. I have trouble finding it when it is high in the sky if seeing conditions are not excellent. It has a low surface brightness. You will need to find a target nearby star and be able to find it fairly quickly after 7 pm. M77, a galaxy in Cetus, is a little easier and you can locate it first because it is brighter.

4. VIEW AS MANY AS YOU CAN AS EARLY AS YOU CAN:

Once you completed the first ten, you can slow your pace a little. However, since you have the most energy early, you need to move across the sky at a fairly good pace. You may need the extra time on the dreaded Virgo Cluster. You should be able to get through the first 48 by 10:30 or 11 pm. By then the Virgo Cluster will be in a good position in the sky to attack.

5. TAKE A BREAK BEFORE THE VIRGO CLUSTER.

Now is a good time to take a break. Have some coffee. Go inside. Rest your feet. Have a snack. After 15 minutes or half an hour, you will be ready to go again.

6. PREPARE FOR VIRGO CLUSTER:

You will need a good plan to wind your way through the Virgo Cluster, comprised of 14 galaxies in Virgo and Coma Berenices. I recommend you follow the path suggested in the chart on pages 42 and 43 of the May 1994 issue of *Sky & Telescope*. (See this link for the Messier Marathon Order.) It starts in the eastern edge at Epsilon Virginis and goes toward the west rather than following the west to east, right ascension order from the list below that works well with most of the other objects. If you have *Uranometria 2000*, copy the charts on pages 192 and 193 and highlight the path suggested in the article. That night if you get halfway through and get lost, don't panic. Start over again and the second time you will be able to quickly get back to the last galaxy you had observed.

7. VIEW ALL THE OBJECTS DOWN TO THE EASTERN HORIZON:

Continue to view as many objects as you can now as you cross the sky at a leisurely pace to the eastern horizon. If you have been successful so far, by about 1:30 am you should have completed 90 of the 110 objects. No more will be high enough above the eastern horizon to view now.

8. TAKE A LONG BREAK OR NAP:

At this time there is a natural break in the marathon. Rather than waiting outside for a few objects to rise, you might as well rest for an hour-and-a half or two while you wait for a larger number to rise sufficiently above the horizon. You may even want to try to take a nap someplace warm. Make sure however you have someone to wake you at 3 or 3:30. You don't want to oversleep and miss the end.

9. GO AT A LEISURELY PACE DOWN THE STRETCH:

You will have a couple of hours to locate the next fifteen objects, so take extra time to view these objects. Enjoy the beauty of the Lagoon and Swan Nebulae. You're almost done.

10. HAVE A PLAN FOR THE LAST TOUGH OBJECTS:

Just as you had to hurry at the beginning to catch the early objects before they set, you will have to hurry to catch the last few objects when they rise shortly before dawn. M72, a faint globular cluster, and M73, a faint four-star asterism, are both in late-rising Aquarius and will be difficult to find. Have your route carefully marked on your chart. If the marathon is later in the month, M30 may be visible but M74 and M77 may not be. If we are delayed to the late April dates, 5 or 6 objects at the beginning of our list may not be visible.

11. PRACTICE AHEAD OF THE TIME:

If you have the time and the weather permits, you might want to try a dry run on the tough twilight objects and the Virgo Cluster. Practice might make the difference on whether or not you view all those objects during the marathon. I won't be so presumptuous to suggest that you do a dry run on the early morning objects. Even I won't go out at 4:30 a.m. to do that.

12. HAVE FUN:

Last and most important, have fun. You don't have to view them all. The competition is friendly. Messier Marathons, while a challenge, are designed to improve your viewing skills rather than being an end in themselves. Finally, if you do come after sunset, don't forget to turn on your parking lights and then turn off your headlights when you drive up.

News Headlines

Getting into Mercury orbit

After almost five years in development and more than six and a half years in cruise toward its destination, NASA's MErcury Surface, Space ENvironment, GEOchemistry, and Ranging (MESSENGER) spacecraft will execute a 15-minute maneuver that will place it into orbit about Mercury, making it the first craft ever to do so, and initiating a one-year science campaign to understand the innermost planet.

http://messenger.jhuapl.edu/orbit_insertion/stationkeeping.htm

NASA's Hubble Rules Out One Alternative to Dark Energy

It looks like dark energy may be here to stay. In refining the expansion rate of the universe to unprecedented accuracy, astronomers using NASA's Hubble Space Telescope have also ruled out an alternative to this mysterious, invisible source of repulsive gravity, which makes the universe appear to expand ever faster.

<http://hubblesite.org/newscenter/archive/releases/2011/08/full/>

The Most Distant Mature Galaxy Cluster

Astronomers have used an armada of telescopes on the ground and in space, including the Very Large Telescope at ESO's Paranal Observatory in Chile to discover and measure the distance to the most remote mature cluster of galaxies yet found. Although this cluster is seen when the Universe was less than one quarter of its current age it looks surprisingly similar to galaxy clusters in the current Universe.

<http://www.eso.org/public/news/eso1108/>

Buckyballs, Largest Known Molecules, More Common in Space Than Thought

Observations made with NASA's Spitzer Space Telescope have provided surprises concerning the presence of buckminsterfullerenes, or "buckyballs," the largest known molecules in space. A study of R Coronae Borealis stars by David L. Lambert, Director of The University of Texas at Austin's McDonald Observatory, and colleagues shows that buckyballs are more common in space than previously thought.

<http://mcdonaldobservatory.org/news/releases/2011/0302.html>

Oxygen Isotope Variation in Meteorite Provides Insight Into Planet Formation

NASA research on a meteorite has provided new evidence that the inner planets formed from materials spread far and wide in the early solar system, and not just from nearby matter. Oxygen isotopic measurements in the core and outer rim of a calcium-aluminum-rich inclusion contained in the Allende meteorite record the entire range of oxygen isotopic composition previously measured in all solids in the solar system.

<http://www.spaceref.com/news/viewpr.html?pid=32898>

A Very Cool Pair of Brown Dwarfs

Observations with the European Southern Observatory's Very Large Telescope, along with two other telescopes, have shown that there is a new candidate for the coldest known star: a brown dwarf in a double system with about the same temperature as a freshly made cup of tea — hot in human terms, but extraordinarily cold for the surface of a star. This object is cool enough to begin crossing the blurred line dividing small cold stars from big hot planets.

<http://www.eso.org/public/news/eso1110/>

April Sky Data

Best time for deep sky observing this month:
April 1 - April 5 and April 23 - April 30

Mercury is at inferior conjunction (almost directly in front of the Sun) on April 9th. We are unlikely to see it this month.

At the start of April, **Venus** is rising less than an hour before sunrise, so the “Morning Star”, brilliant though it is, will be very difficult to see. By the end of the month we will lose sight of it completely.

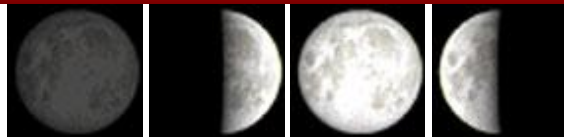
Mars rises only a few minutes before the Sun throughout April. We won't be seeing the “Red Planet” this month.

Jupiter is at conjunction (this time, almost directly behind the Sun) on April 6th. So the giant planet, too will be invisible this month.

Saturn, in contrast, is in opposition (to the Sun) on April 4th. So it rises as the Sun sets, shines all night, and sets as the Sun is rising. Relative to the stars, Saturn is moving very slowly north-westwards in the constellation of Virgo, drawing upwards away from the bright star Spica. Saturn is a little brighter than Spica, and it shines with a steadier light. On the night of Sunday April 17th, our own almost-Full Moon will be to the lower right of Saturn; the following night, the Moon will appear well below and left of the planet.

The Lyrid **meteor-shower** is active during the third week of April, peaking probably around midnight on Friday April 22nd. The meteors seem to radiate outwards from a point in the constellation of Lyra, close to the bright star Vega, which is high in the south-east after midnight. The best time to look is in the early hours of the morning, before the sky grows bright towards dawn; near the peak, on the night of the 22nd-23rd, we might expect to see one Lyrid every 10 minutes or so, and there shouldn't be too much interference from the Moon.

New Apr 3 First Qtr Apr 11 Full Apr 17 Last Qtr Apr 24



Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
4/1/2011	05:24	17:51	06:38	19:13
4/5/2011	07:22	21:34	06:33	19:16
4/10/2011	11:24	01:10	06:26	19:20
4/15/2011	17:01	04:25	06:20	19:24
4/20/2011	22:55	08:00	06:13	19:28
4/25/2011	01:59	12:58	06:08	19:32
4/30/2011	04:21	17:35	06:02	19:36

Planet Data

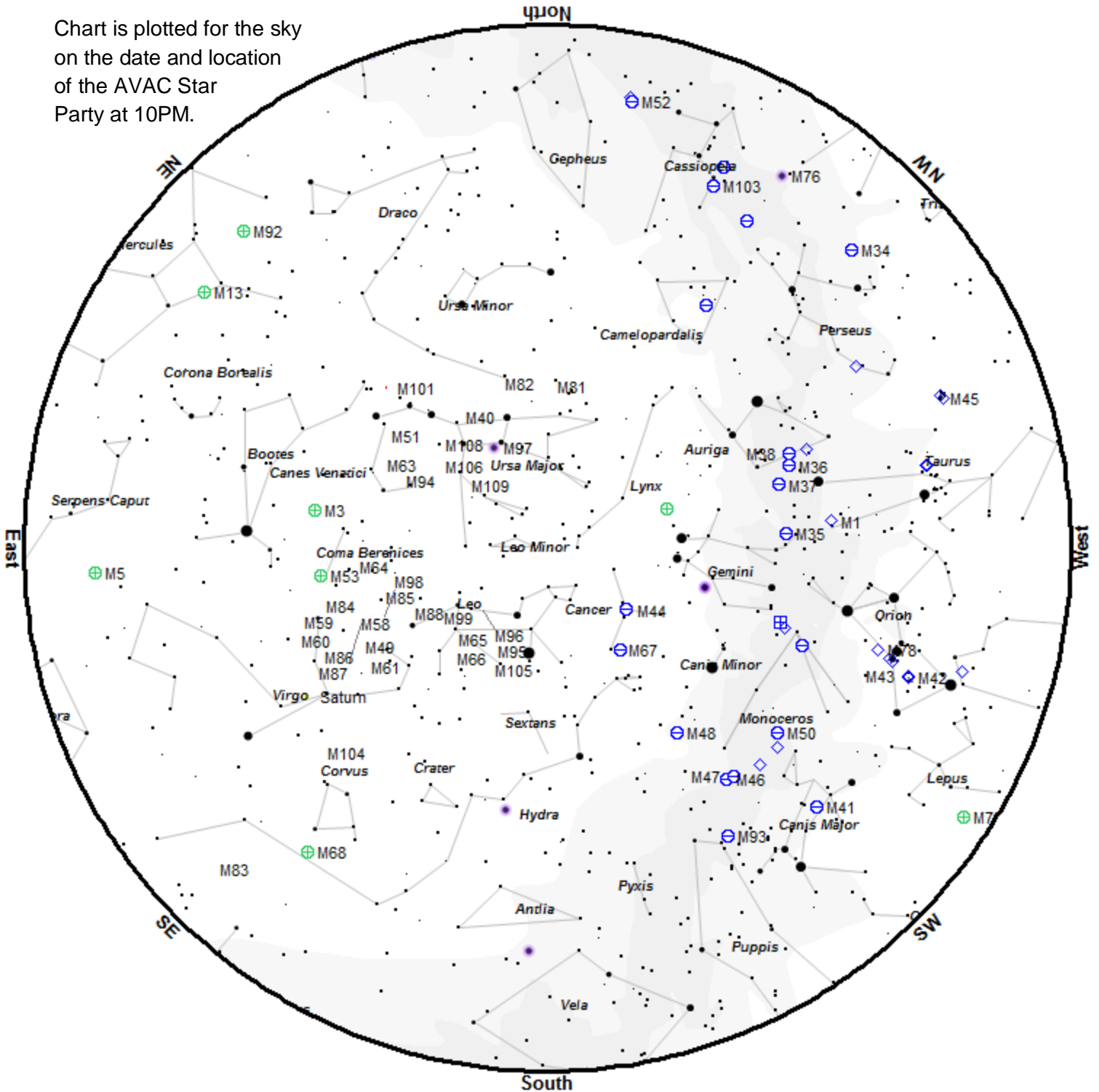
	Apr 1			
	Rise	Transit	Set	Mag
Mercury	06:55	13:38	20:16	2.4
Venus	05:11	10:49	16:26	-4.0
Mars	06:10	12:14	18:16	1.2
Jupiter	06:50	13:11	19:29	-2.1
Saturn	19:12	01:07	07:03	0.4

	Apr 15			
	Rise	Transit	Set	Mag
Mercury	05:47	12:13	18:35	3.5
Venus	05:02	10:57	16:51	-3.9
Mars	05:43	11:57	18:13	1.2
Jupiter	06:04	12:29	18:50	-2.1
Saturn	18:12	00:08	06:05	0.4

	Apr 31			
	Rise	Transit	Set	Mag
Mercury	05:02	11:17	17:33	0.9
Venus	04:51	11:05	17:18	-3.9
Mars	05:14	11:41	18:09	1.2
Jupiter	05:15	11:40	18:09	-2.1
Saturn	17:08	23:05	05:03	0.5

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.



Star Magnitudes	Galaxy	Nebula
● ● ● ● ●	⊕ Open Cluster	◇ Bright Nebula
0 1 2 3 4 5	⊕ Globular Cluster	◇ Planetary Nebula
	⊕ Cluster+Nebosity	

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 or Adobe PDF at 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**

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Don Bryden (661) 270-0627
president@avastronomyclub.org

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vice-president@avastronomyclub.org

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secretary@avastronomyclub.org

Treasurer:

Virginia Reed (661) 824-3932
treasurer@avastronomyclub.org

Director of Community Development:

Robert Lynch (661) 433-9030
community@avastronomyclub.org

Appointed Positions

Newsletter Editor:

Steve Trotta (661) 269-5428
newsletter@avastronomyclub.org

Equipment & Library:

Karol Barker (661) 940-3312
library@avastronomyclub.org

Club Historian:

Tom Koonce (661) 943-8200
history@avastronomyclub.org

Webmaster:

Steve Trotta (661) 269-5428
webmaster@avastronomyclub.org

Astronomical League Coordinator:

Steve Trotta (661) 269-5428
al@avastronomyclub.org

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