



Desert Sky Observer

Volume 29

Antelope Valley Astronomy Club Newsletter

March 2009

Up-Coming Events

March 13: Club meeting*

March 16: Executive Board Meeting

March 18: Leona Valley Science Fair

March 28: Messier Marathon @ [Poppy Reserve](#)

* 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

Hello! And get ready for an exciting month for the AVAC, starting with a Lunar club/SAGE event on Saturday the 5th. Join Matt Leone, Jeremy Amarant and the club for a special presentation on the moon at SAGE followed by a Lunar club event under a waxing gibbous moon. While you're at it, take a look to Saturn in the East. While it is just shy of opposition, its rings will be nearly edge on – a rare site!

The next weekend on the 13th is our monthly meeting. We will be treated to a special DVD and talk by Jeremy and Jeff Riechmann about the NASA LCROSS mission. After the presentation, there will be a short discussion for planning a lunar crash party! We're tentatively hoping to host such an event at the Poppy Reserve. NASA estimates that telescopes on the West coast, 9" or larger, should be able to observe the impact.

If deep space is your thing then you won't want to miss our annual Messier Marathon hosted by the AVAC and the California State Parks Department on March 28th at the Antelope Valley Poppy Reserve. Come early and enjoy the preserve. With the wet winter we're having the poppies should be abundant (let's hope the stars are too).

One last event I'd like to mention actually doesn't happen in March but as it's just at the beginning of April I thought I'd tell you about it. It's the IYA 100 Hours of Astronomy and will be the 2nd through 5th. (not sure where the last four hours are coming from...) It should be great outreach event and a way to promote the club and the International Year of Astronomy. Look for more information from Terry, our IYA chairman, in the coming month.

Lastly, I would like to thank Duane Lewis for accepting the nomination and being elected by the executive board as Awards chairman for 2009. Way to go, Duane!

Clear Skies!

Don Bryden



Vice President

Rose Moore

We have Chris Butler confirmed for our club meeting in July, speaking on 'Under the Southern Stars'. This promises to be a wonderful presentation about the Southern Hemisphere skies. Chris now has made a trip to the Southern Hemisphere and can also talk about his personal experiences!

I have made contact with Gary Peterson, and will be setting a date for him to come to speak to our club. The presentation will be 'Why Is Mars Red?' Further info will be coming.

Our own Jeff Riechmann will be doing a presentation for our upcoming March club meeting on LCROSS. There is a video that will be presented.

LCROSS (website: lcross.arc.nasa.gov/) is a satellite that will be launched in April 2009, and begin the search for possible water on the moon, as well as other operations.

When it lands on the northern hemisphere of the Moon in August of this year, the small plume it creates will (hopefully) be visible to astronomers here on Earth. It may be visualized best by those of us on the west coast.

Come out to the meeting and find out from Jeff how we can participate in this event!

Also upcoming events will be a Messier talk and planetarium presentation with our own Matt Leone and Jeremy Amarant later in the year, and also a possible talk from our Doug Drake on cosmology! And TBA will be a Night Sky presentation!

Clear skies!



Director of Community Development

Karole Barker

March 7th there will be a Lunar event at the Sage Planetarium from 4:30 p.m. to 7:00 p.m., this a part of the International Year of Astronomy. If you have any questions, please contact Matt Leone, Your Looney Leader, at 661-948-1521. Jeremy is going to do a presentation in the planetarium. We will be viewing thru scopes before and after the presentation. Terry, Matt, Shane & Karole will be attending the event, so please come out and support our club.

The Leona Valley Science Fair is on Wednesday March 18th at 6:00 p.m. We're looking for club members to set up scopes at the school for some evening viewing for the students. If you can come out, please contact Tom Koonce or myself.

On March 28 our annual Messier Marathon will be held at the Poppy Reserve.

The Poppy Festival is going to be held on April 25th & 26th. More information at next month's meeting.

I have confirmation that our club is scheduled for a 1/2 night session on the 60-inch telescope for Saturday, September 19, 2009 at Mt. Wilson. I'll have more details as the year goes on this year.

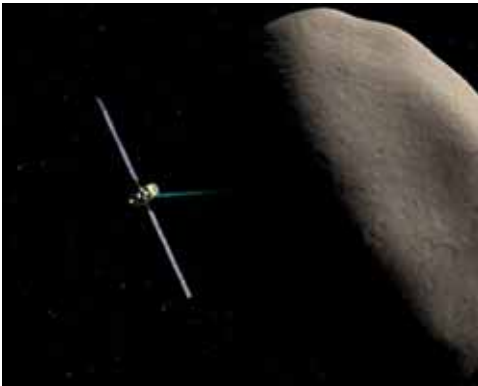
Clear skies.

Space Place

Where did all these gadgets come from?!

Ion propulsion. Artificial intelligence. Hyper-spectral imagers. It sounds like science fiction, but all these technologies are now flying around the solar system on real-life NASA missions. How did they get there? Answer: the New Millennium Program (NMP). NMP is a special NASA program that flight tests wild and far-out technologies. And if they pass the test, they can be used on real space missions.

The list of probes that have benefited from technologies incubated by NMP reads like the Who's Who of cutting-edge space exploration: Spirit and Opportunity (the phenomenally successful rovers exploring Mars), the Spitzer Space Telescope, the New Horizons mission to Pluto, the Dawn asteroid-exploration mission, the comet-smashing probe Deep Impact, and others. Some missions were merely enhanced by NMP technologies; others would have been impossible without them.



Dawn will be the first spacecraft to establish orbits around two separate target bodies during its mission—thanks to ion propulsion validated by Deep Space 1.

"In order to assess the impact of NMP technologies, NASA has developed a scorecard to keep track of all the places our technologies are being used," says New Millennium Program manager Christopher Stevens of the Jet Propulsion Laboratory.

For example, ion propulsion technology flight-tested on the NMP mission Deep Space 1, launched in October 1998, is now flying aboard the Dawn mission. Dawn will be the first probe to orbit an asteroid (Vesta) and then travel to and orbit a dwarf planet (Ceres). The highly efficient ion engine is vital to the success of the 3 billion mile, 8 year journey. The mission could not have been flown using conventional chemical propulsion; launching the enormous amount of fuel required would have broken the project's budget. "Ion propulsion was the only practical way," says Stevens.

In total, 10 technologies tested by Deep Space 1 have been adopted by more than 20 robotic probes. One, the Small Deep Space Transponder, has become the standard system for Earth communications for all deep-space missions.

And Deep Space 1 is just one of NMP's missions. About a half-dozen others have flown or will fly, and their advanced technologies are only beginning to be adopted. That's because it takes years to design probes that use these technologies, but Stevens says experience shows that "if you validate experimental technologies in space, and reduce the risk of using them, missions will pick them up."

Stevens knew many of these technologies when they were just a glimmer in an engineer's eye. Now they're "all grown up" and flying around the solar system. It's enough to make a program manager proud!

The results of all NMP's technology validations are online and the list is impressive: nmp.nasa.gov/TECHNOLOGY/scorecard/scorecard_results.cfm. For kids, the rhyming storybook, "Professor Starr's Dream Trip: Or, How a Little Technology Goes a Long Way" at spaceplace.nasa.gov/en/kids/nmp/starr gives a scientist's perspective on the technology that makes possible the Dawn mission.

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

Observing in the Daytime by Tom Koonce

Warning: *Even a brief glimpse of the Sun during daytime observations through an unprotected pair of binoculars or a telescope will cause permanent eye damage. Always use the proper solar filter when observing the Sun. If you are not absolutely positive what the proper filter is and when to use it, do not attempt to make daytime observations. Don't take chances with your eyes!*

Children interested in astronomy often recall waiting anxiously during the summertime dusk for the stars to “come out”. Do you remember going out just after sunset and watching as star after star appeared out of the gathering darkness? Did you ever ask yourself, “Where do stars go to during the daytime?” The answer, of course, is “nowhere”.

The stars are there all day and night long as the Earth turns on its axis, making the stars appear to slowly rise and set. During the day the sky itself becomes brighter from the refracted sunlight through water molecules and dust particles suspended in the atmosphere. If the daylight sky brightness is within a couple of magnitudes of the celestial object that you're searching for, the contrast will be too low and it will be extremely difficult. Fortunately for us there are several objects which are bright enough to observe during good conditions and there are a few tricks that you can use to better your odds of finding elusive daylight targets.

There is a surprisingly varied list of daytime objects that you can log. First is our nearest star, the Sun. It is obviously the preeminent daylight object, but with a solar filter on your telescope, the Sun is a great object to observe and never ceases to hold my interest. I will save further comments for later this Spring when it will be the International Year of Astronomy's May Monthly theme.



Venus in the Daytime, by John Walker, 3/13/1988

The Moon is easy to find during the day during its first and third quarter phases. Observations of the Moon during the daytime are best done in the morning three or four hours after sunrise and up to three hours before sunset. Observations from late morning to the early afternoon usually get washed out with excessive sky brightness. A great time to show the crescent Moon to young school kids is in the morning about a week after its Full phase. Everyone is awake and you can still get good contrast on the northern and southern hemisphere's craters. You can also show

them how the Sun illuminates the Moon from the East and creates the Moon's crescent shape pointing away from the Sun.

A daylight observation of Venus is harder and will likely take preparation ahead of time. I have used my home planetarium computer software at night to figure out that if I stand in a particular place on my patio, then I can use the corner of my roof to line up with a particular spot in the sky. I use the corner of the roof as a pointer to a particular place in the sky. Then I use the same trick during the daytime (remembering the spot where I stood on the patio) to get in close proximity of Venus. Making SURE that the Sun can't be directly viewed from the location, I pre-focus my binoculars at infinity and scan the immediate area around Venus' expected location. I find that it helps to Focus and re-focus your eyes to infinity and look carefully for a low-contrast bright dot against the blue sky. When you finally see it, it will be tough to miss. It will snap into view. That's Venus! All of this get's much easier if you have a "Go-To" telescope and have set it up ahead of time and left it running. I like the fun of finding the object by myself though. The best time to view Venus in the daytime is when it's near *greatest elongation*—at the greatest angular distance from the Sun as seen from Earth.

I know that several of you have seen Venus in the daylight. Have you seen Jupiter during the day? You can find it in the same way as you found Venus, but it has lower contrast with the surrounding daytime sky. Jupiter and Venus observations are best when the objects are at their greatest angular separation from the Sun, and when the sky is exceptionally transparent. If you log Jupiter, you can feel particularly proud of your efforts.

Magazines have reported that Saturn is sometimes visible in the daylight with binoculars. I have spotted it during the mid-morning hours, but only with the help of a Go-To telescope and some patience. It is a challenging object. Seeing the rings during the day is a very memorable experience, as is seeing the rings at night!

It is possible to see at least five of the brightest stars during the daylight hours including Sirius, Albireo, Vega, Arcturus, and Altair. I have successfully logged the first three. Even the faintest cloud cover will erase your chance of spotting these during the day. I can also vouch that playing chase with light cloud cover while trying to see the stars of the Summer Triangle during daylight on the same day can be very, very annoying.

The Sun, Moon, stars, and planets... That's a lot to see during the daytime, but I've saved the real fun for last. It is possible to see satellites during the daylight! Specifically, you can see reflections of sunlight off of Iridium communications satellites' solar panels. These "Iridium Flares" as their called can be precisely predicted for your exact viewing location and time. First go to: <http://www.heavens-above.com/> then click on the link titled, "Daytime flares for 7 days". Enter in your location as accurately as you can, and using your GPS location is the best. If the listing shows a daylight visible flare within the next week you have a better than even chance of seeing it. Use the corner-of-the-house trick described previously and an accurate watch. If the chart tells you that the brief flash reflection will happen at a particular time, you can expect that it will be no more than a few seconds off of that schedule. If you are two minutes past the time, you have definitely missed it and will have to try again to see another flare. If you get to see one, you'll be surprised that it is so bright and may look like a glint off of an airplane.

Remember, the amount of haze can dramatically affect your view of the daytime sky. Moisture, combined with bright reflections off of buildings, car windshields or bodies of water can wash out the apparent brightness of the objects you're looking for.

Watch out for the Sun, but I know you'll enjoy honing your skills as a daytime observer!

Clear Skies,
Tom

Aerospace Committee Report Jeff Riechmann and Roswell – Co-Chairbeings

Vandenberg Launch Schedule (as of 14 February 2009):

Date	Launch Time/Window (PST/PDT)	Vehicle	Pad/Silo
MAY 5	To be announced	Delta II	SLC-2W
Payload is the Missile Defense Agency's STSS ATRR			
JUL	~09:12	Atlas V	SLC-3
Payload is the DMSP F18 military weather satellite.			
JUL	To be announced	Delta II	SLC-2W
Payload is the WorldView 2 commercial reconnaissance satellite			

Spacecraft to Crash Into Moon

On 25 April 2009, NASA will launch the LCROSS mission from Cape Canaveral. This mission is the controlled impact of a spacecraft into one of the polar regions of the moon. Various earth-based telescopes as well as in-space assets (Hubble Space Telescope) will be observing the resultant debris plume in an attempt to determine if there is hidden water in this particular region. Impact is slated to occur on the night of 1 -2 August 2009, also recognized by the International Year of Astronomy *National Observe the Moon Night*.

NASA states that this event should be able to be observed by amateur astronomers with 10 to 12 inch telescopes, especially in the western United States. In fact, NASA is asking that any amateur astronomers photo the event and send their images to a special NASA website. These images will be useful in determining the visible morphology of the plume and how this changes over time. This could provide valuable insights as to the nature of the surface that NASA impacts (e.g. flat surface or slope, solid rock or mixed regolith). These observations will be limited to observers within locations facing the Moon at night at the time of impact.

Prior to impact, but after launch, amateurs should be able to track and image the combined Centaur and Shepherding Spacecraft.

In the information that I received from NASA, the following was also stated: During the months leading up to the launch, amateur astronomers are encouraged to image the north and south poles of the moon. The goal is to obtain images that determine the scale of recognizable features observed in the wider field of view on amateur telescopes when compared the higher spatial resolution near-infrared IRTF images. A secondary goal is to compare the dynamic range of images that allow the verification of detection of subtle variations in topography and albedo. This exercise also may help amateurs to prepare for obtaining images of the impact plumes. The impact plumes will occur in shadowed regions, but these shadowed regions likely will be adjacent to lit regions of the moon.

To learn more about the mission and the involvement of amateur astronomers, go to http://groups.google.com/group/lcross_observation.

[ROSWELL'S REPORT: Roswell says "Hey!"](#)

International Year of Astronomy

Observing at Night... and in the Day

The telescope that Galileo first used to look out into the universe was very small by today's standards. But he did have one advantage when he started stargazing – dark skies. For most of human history and up until about 50 years ago, most people could step outside and see countless stars at night. But these days how many we see depends a lot on where we're standing. What can you find when you look up at night? In a bright city many people only see a few of the brightest objects.

The difference between a dark and bright sky is the amount of [light pollution](#). This means the extra light that escapes skyward from our streetlights, and porch lights, and other bright places. This light pollution makes stargazing harder, but it also disrupts the breeding and migration cycles of many wild things. And all of the light that escapes upward is just energy being wasted.

Luckily, there is something we can do about it. By making smart lighting choices we can reduce our impact on the night sky and the environment and save energy while we're at it. A great place to start this month is to become part of the [GLOBE at Night](#) citizen science project, from March 16-28, 2009. Join a worldwide campaign to record the light pollution where you are by observing the stars in the night sky. Then be sure to follow up with recommendations in the attached handout and ideas from the [International Dark-Sky Association](#).



Speaking of stars, what is the brightest star in the sky? Be careful, it's a trick question. It's our Sun, the closest and most important star to Earth. NASA has many missions dedicated to studying the Sun such as [SOHO](#), [Hinode](#), and [STEREO](#) that are giving us great 3D images of the surface activity. [Sun-Earth Day](#) is an annual celebration of the Sun and its effects on Earth. Register to receive updates and Sun-Earth Packets. Celebrations include podcasts and vodcasts, educational materials, museum programs, and [Solar Week](#).

Bit of humor...

Released by the news services:

Backward green comet makes one-time only visit

By SETH BORENSTEIN, AP Science Writer – Tue Feb 17, 3:23 pm ET

WASHINGTON – An odd, greenish backward-flying comet is zipping by Earth this month, as it takes its only trip toward the sun from the farthest edges of the solar system...

By the way, which way is 'backward' on a slowly rotating comet? ...How fast is 'zipping'? This was from an Associated Press science writer. My fellow amateur astronomers, we have much work to do...

Tom

News Headlines

Dark Energy to Erase Big Bang's Fading Signal

When astronomers in the distant future cast their eyes around the cosmos, they will come to the conclusion that our galaxy is alone in the universe. Even with the most sensitive detectors, future scientists will not be able to observe the leftover radiation from the Big Bang explosion, study the motion of distant galaxies to conclude that space is expanding or even see distant objects.

<http://dsc.discovery.com/news/2009/02/23/dark-energy-universe.html>

New recipe for dwarf galaxies: start with leftover gas

There is more than one way to make a dwarf galaxy, and NASA's Galaxy Evolution Explorer has found a new recipe. It has, for the first time, identified dwarf galaxies forming out of nothing more than pristine gas likely leftover from the early universe.

<http://www.astronomy.com/asy/default.aspx?c=a&id=7946>

Most Powerful Gamma-Ray Burst Ever

Observations from NASA's Fermi Gamma-ray Space Telescope are hinting that the highest-energy gamma rays travel through empty space at a little less than the speed of light — unlike any other form of electromagnetic radiation. If future observations bear this out, it will rock the foundations of modern physics and perhaps point the way to a "theory of everything" that would help unify the twin pillars of 20th-century physics: Einstein's general theory of relativity and quantum mechanics.

<http://www.skyandtelescope.com/news/39867717.html>

NASA Loses Carbon-Measuring Satellite

A satellite that was launched Tuesday morning, February 24, to measure carbon dioxide in the atmosphere ended up in the ocean instead of in orbit. NASA's Orbiting Carbon Observatory was launched from Vandenberg Air Force Base in California shortly before 2 a.m. Pacific time, but something went wrong with the rocket that was supposed to carry it into space.

<http://www.npr.org/templates/story/story.php?storyId=101102724&ft=1&f=1026>

Otherworldly Solar Eclipse

For the first time, a spacecraft from Earth has captured hi-resolution images of a solar eclipse while orbiting another world. Japan's Kaguya lunar orbiter accomplished the feat on Feb. 9, 2009, when the Sun, Earth and Moon lined up in a nearly perfect row. From Kaguya's point of view, Earth moved in front of the Sun, producing an otherworldly "diamond-ring" eclipse.

http://science.nasa.gov/headlines/y2009/25feb_kaguyaecclipse.htm

Excitement Builds for Kepler Planet-Hunting Mission

Four centuries after Johannes Kepler first described how planets orbit the Sun, NASA's Kepler mission launches in search of Earth-size planets around distant stars. Kepler will seek evidence of planets by observing more than 100,000 stars continuously, looking for the tiny dip in brightness caused by a planetary transit.

<http://www.space.com/searchforlife/090226-seti-kepler.html>

Astrophoto of the Month



M51 (M51a & b) by Don Bryden

The Whirlpool Galaxy (NGC 5194, [star chart](#)) is an interacting, grand-design, spiral galaxy located at a distance of approximately 23 million light-years in the constellation Canes Venatici. ([see wiki](#))

Taken at [Two Goats](#) Observatory, April 7th, 2008. Sixty 25" stacked exposures with a SBIG ST2000XCM and a Stellarvur SV-105.

March Sky Data

**Best time for deep sky observing this month:
March 16 through March 28**

Throughout March, **Mercury** is rising only minutes before the Sun; it's at superior conjunction (almost directly behind the Sun) on March 31st. We're very unlikely to see this elusive little planet this month.

Venus is now coming to the end of its splendid appearance as the "Evening Star". Relative to the stars, it is tracing out a looped path in Pisces – moving north at first, then more rapidly south-westwards. At the start of March, it's well up in the western sky at sunset, and doesn't set till 9:30 pm. But every night it appears a little lower, and sets a little earlier. This month Venus appears like the very new crescent Moon. Unlike the waxing Moon, the phase of Venus decreases during the month, from 20% to only 1% illuminated, while the disc grows from 45 to 60 arc-seconds across.

This month, **Mars** is still rising only a few minutes before sunrise. We won't be getting good views of the "Red Planet" until after the summer.

Jupiter, like Mars, rises less than an hour before the Sun this month. In theory, we could look for it towards the end of March, very low in the south-east just before sunrise; but it won't be easy to see. Again, we won't be getting good views of this giant planet until after the summer.

Saturn is very well placed for viewing this month. It's at opposition to the Sun on March 8th; so it is rising as the Sun sets, it's due south at midnight, and it doesn't set until sunrise. In the telescope, Saturn's rings appear as a very narrow oval, 45 arc-seconds wide and only 2 arc-seconds high; if the air is unsteady, the rings may seem to disappear altogether.

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. Sporadic meteors, which don't belong to any shower, may be seen on any night and in any direction.

First Qtr
Mar 3

Full
Mar 10

Last Qtr
Mar 17

New
Mar 26



Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
3/1/2009	08:31	22:59	06:20	17:48
3/5/2009	12:01	02:16	06:15	17:51
3/10/2009	18:53	06:41	07:08	18:55
3/15/2009	-----	09:19	07:02	18:59
3/20/2009	03:32	13:31	06:55	19:03
3/25/2009	06:02	18:30	06:47	19:07
3/31/2009	09:52	00:07	06:39	19:12

Planet Data

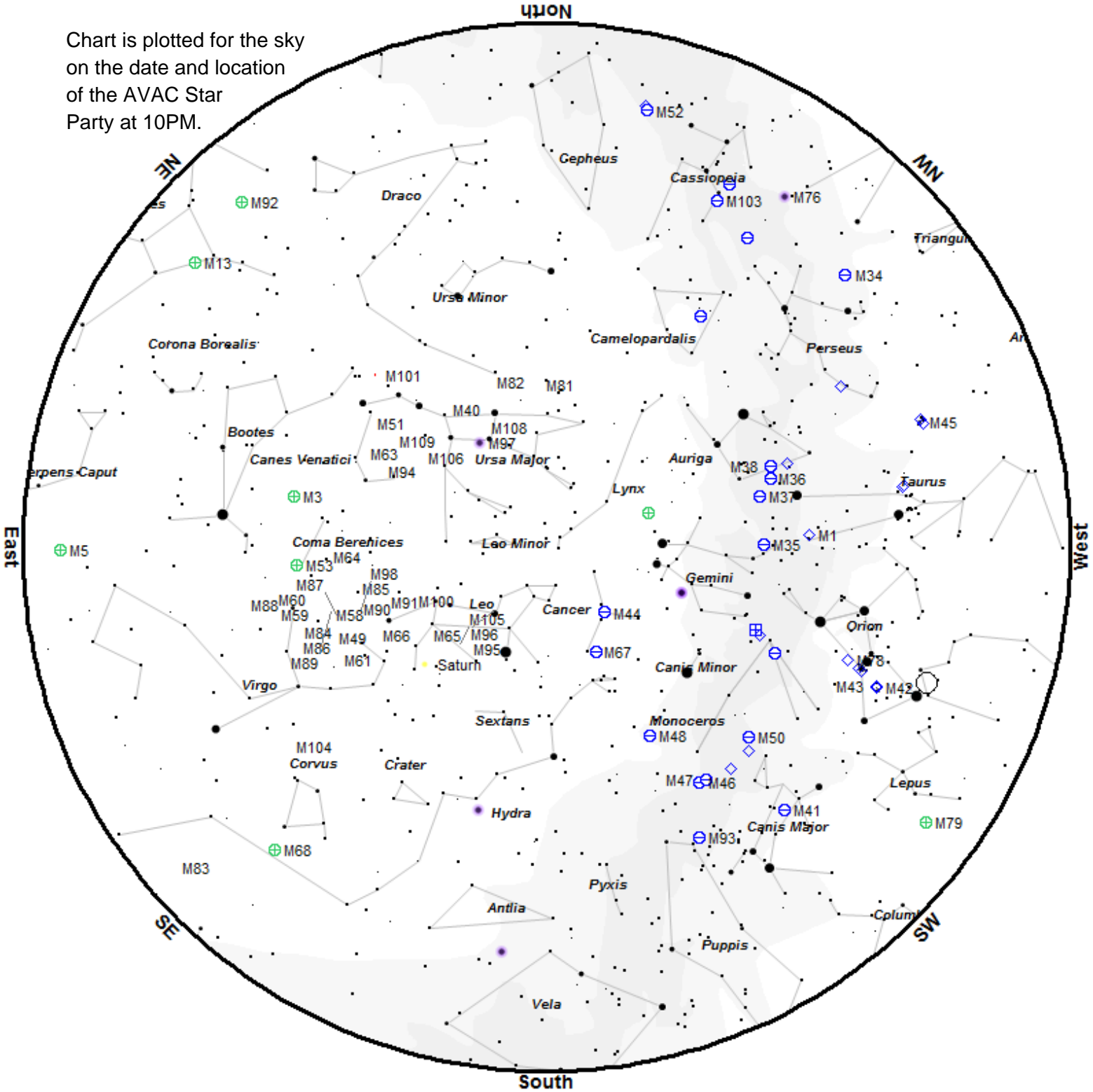
	Mar 1			
	Rise	Transit	Set	Mag
Mercury	05:24	10:45	16:04	-0.2
Venus	07:16	13:59	20:39	-4.6
Mars	05:20	10:43	16:06	1.2
Jupiter	04:56	10:13	15:33	-2.0
Saturn	18:10	00:35	06:59	0.5

	Mar 15			
	Rise	Transit	Set	Mag
Mercury	06:34	12:15	17:57	-0.6
Venus	07:08	13:56	20:39	-4.3
Mars	05:57	11:30	17:04	1.2
Jupiter	05:11	10:30	15:53	-2.0
Saturn	18:10	00:36	07:02	0.5

	Mar 31			
	Rise	Transit	Set	Mag
Mercury	06:44	13:01	19:21	-2.0
Venus	05:45	12:21	18:52	-4.1
Mars	05:28	11:14	17:01	1.2
Jupiter	04:17	09:40	15:05	-2.1
Saturn	17:01	23:28	05:56	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+Nebulosity</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

This month's star party is our annual Messier Marathon so rather than a suggested observing list, this month's list is the observing order for the Marathon. The list can also be downloaded from the club website at http://www.avastronomyclub.org/observing/messier/marathon_order.htm

Order	Time	M #	Con	R.A.	Deg	Sec	Mag	Type*	Comments
1		M 77	CET	2:43	0	1	8.8	SG	
2		M 74	PSC	1:37	15	47	9.2	S	
3		M 33	TRI	1:34	30	39	5.7	SG	Pinwheel galaxy
4		M 31	AND	0:43	41	16	3.4	SG	Andromeda galaxy
5		M 32	AND	0:43	40	52	8.2	EG	Satellite of M31
6		M 110	AND	0:40	41	41	8.0	EG	Satellite of M31
7		M 52	CAS	23:24	61	35	6.9	OC	
8		M 103	CAS	1:33	60	42	7.4	OC	
9		M 76	PER	1:42	51	34	11.5	PN	Little Dumbbell
11		M 34	PER	2:42	42	47	5.2	OC	
11		M 45	TAU	3:47	24	7	1.2	OC	Pleiades,
12		M 79	LEP	5:24	-24	33	8.0	GC	
13		M 42	ORI	5:35	-5	27	4.0	DN	Great Orion nebula
14		M 43	ORI	5:35	-5	16	9.0	DN	
15		M 78	ORI	5:47	0	3	8.0	DN	
16		M 1	TAU	5:34	22	1	8.4	PN	Crab nebula
17		M 35	GEM	6:09	24	20	5.1	OC	
18		M 37	AUR	5:52	32	33	5.6	OC	
19		M 36	AUR	5:36	34	8	6.0	OC	
20		M 38	AUR	5:29	35	50	6.4	OC	
21		M 41	CMA	6:47	-20	44	4.5	OC	
22		M 93	PUP	7:45	-23	52	6.2	OC	
23		M 47	PUP	7:37	-14	30	4.4	OC	
24		M 46	PUP	7:42	-14	49	6.1	OC	
25		M 50	MON	7:03	-8	20	5.9	OC	
26		M 48	HYA	8:14	-5	48	5.8	OC	
27		M 44	CNC	8:40	19	59	3.1	OC	Beehive Cluster
28		M 67	CNC	8:50	11	49	6.9	OC	
29		M 95	LEO	10:44	11	42	9.7	SG	
30		M 96	LEO	10:47	11	49	9.2	SG	
31		M 105	LEO	10:48	12	35	9.3	EG	
32		M 65	LEO	11:19	13	5	9.3	SG	Leo's triplet
33		M 66	LEO	11:20	12	59	9.0	SG	Leo's triplet
34		M 81	UMA	9:56	69	4	6.8	SG	Bode's nebula
35		M 82	UMA	9:56	69	41	8.4	IG	Cigar Galaxy
36		M 97	UMA	11:15	55	1	11.2	PN	Owl nebula
37		M 108	UMA	11:12	55	40	10.0	SG	
38		M 109	UMA	11:58	53	23	9.8	SG	

Order	Time	M #	Con	R.A.	Deg	Sec	Mag	Type*	Comments
39		M 40	UMA	12:22	58	5	8.0	dbl	
40		M 106	CVN	12:19	47	18	8.3	SG	
41		M 94	CVN	12:51	41	7	8.1	SG	
42		M 63	CVN	13:16	42	2	8.6	SG	Sunflower galaxy
43		M 51	CVN	13:30	47	12	8.1	SG	Whirlpool galaxy
44		M 101	UMA	14:03	54	21	7.7	SG	
45		M 102	UMA	14:03	54	21	7.7	SG	Duplicate of M101
46		M 53	COM	13:13	18	10	7.7	GC	
47		M 64	COM	12:57	21	41	8.5	SG	Black eye galaxy
48		M 3	CVN	13:42	28	23	6.4	GC	
49		M 98	COM	12:14	14	54	10.1	SG	
50		M 85	COM	12:25	18	11	9.2	EG	
50		M 99	COM	12:19	14	25	9.8	SG	Pin Wheel nebula
51		M 100	COM	12:23	15	49	9.4	SG	
53		M 84	VIR	12:25	12	53	9.3	EG	Lenticular galaxy
54		M 86	VIR	12:26	12	57	9.2	EG	Lenticular galaxy
55		M 87	VIR	12:31	12	24	8.6	EG	Virgo A
56		M 89	VIR	12:36	12	33	9.8	EG	
57		M 90	VIR	12:37	13	10	9.5	SG	
58		M 88	COM	12:32	14	25	9.5	SG	
59		M 91	COM	12:35	14	30	10.2	SG	
60		M 58	VIR	12:38	11	49	9.8	SG	
61		M 59	VIR	12:42	11	39	9.8	EG	
62		M 60	VIR	12:44	11	33	8.8	EG	
63		M 49	VIR	12:30	8	0	8.4	EG	
64		M 61	VIR	12:22	4	28	9.7	SG	
65		M 104	VIR	12:40	-11	37	8.3	SG	Sombrero galaxy
66		M 68	HYA	12:40	-26	45	8.2	GC	
67		M 83	HYA	13:38	-29	52	7.6	SG	Southern Pinwheel
68		M 5	SER	15:18	2	5	5.8	GC	
69		M 13	HER	16:42	36	28	5.9	GC	Hercules Cluster.
70		M 92	HER	17:17	43	8	6.5	GC	
71		M 57	LYR	18:54	33	2	9.0	PN	Ring nebula.
72		M 56	LYR	19:17	30	11	8.2	GC	
73		M 29	CYG	20:23	38	32	6.6	OC	
74		M 39	CYG	21:32	48	26	4.6	OC	
75		M 27	VUL	20:00	22	43	8.1	PN	Dumbbell nebula
76		M 71	SGE	19:54	18	47	8.3	GC	
77		M 107	OPH	16:33	-13	3	8.1	GC	
78		M 10	OPH	16:57	-4	6	6.6	GC	
79		M 12	OPH	16:47	-1	57	6.6	GC	
80		M 14	OPH	17:38	-3	15	7.6	GC	
81		M 9	OPH	17:19	-18	31	7.9	GC	
82		M 4	SCO	16:23	-26	32	5.9	GC	
83		M 80	SCO	16:17	-22	59	7.2	GC	

Order	Time	M #	Con	R.A.	Deg	Sec	Mag	Type*	Comments
84		M 19	OPH	17:03	-26	16	7.2	GC	
85		M 62	OPH	17:01	-30	7	6.6	GC	
86		M 6	SCO	17:40	-32	13	4.2	OC	Butterfly cluster
87		M 7	SCO	17:54	-34	49	3.3	OC	Ptolemy's Cluster
88		M 11	SCT	18:51	-6	16	5.8	OC	Wild Duck cluster
89		M 26	SGR	18:45	-9	24	8.0	OC	
90		M 16	SER	18:19	-13	47	6.0	DN	Eagle nebula
91		M 17	SGR	18:21	-16	11	7.0	DN	Swan
92		M 18	SGR	18:20	-17	8	6.9	OC	
93		M 24	SGR	18:16	-18	29	4.5	OC	
94		M 25	SGR	18:32	-19	15	4.6	OC	
95		M 23	SGR	17:57	-19	1	5.5	OC	
96		M 21	SGR	18:05	-22	30	5.9	OC	
97		M 20	SGR	18:02	-23	2	8.5	DN	Trifid nebula
98		M 8	SGR	18:03	-24	23	5.8	DN	Lagoon nebula
99		M 28	SGR	18:25	-24	52	6.9	GC	
100		M 22	SGR	18:36	-23	54	5.1	GC	.
101		M 69	SGR	18:31	-32	21	7.7	GC	
102		M 70	SGR	18:43	-32	18	8.1	GC	
103		M 54	SGR	18:55	-30	29	7.7	GC	
104		M 55	SGR	19:40	-30	58	7.0	GC	
105		M 75	SGR	20:06	-21	55	8.6	GC	
106		M 15	PEG	21:30	12	10	6.4	GC	
107		M 2	AQR	21:33	0	-49	6.5	GC	
108		M 72	AQR	20:54	-12	32	9.4	GC	
109		M 73	AQR	20:58	-12	38		ast	
110		M 30	CAP	21:40	-23	11	7.5	GC	

* Object types:

- PN Planetary nebula
 DN Dark, Diffuse nebula
 GC Globular cluster
 OC Open cluster
 SG Spiral galaxy
 EG Elliptical galaxy
 IR Irregular galaxy

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.

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- 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.

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