ANTELOPE VALLEY ASTRONOMY CLUB, INC.

Desert Sky Observer

Volume 37 *Antelope Valley Astronomy Club Newsletter* **July 2017**

Up-Coming Events

July 14: Club Meeting*
July 15: Prime Desert Moon Walk
July 22: Star-B-Que
July 28: Lunar Club

* Monthly meetings are held at the S.A.G.E. Planetarium in Palmdale, the second Friday of each month. The meeting location is at the northeast corner of Avenue R and 20th Street East. Meetings start at 7 p.m. and are open to the public. *Please note that food and drink are not allowed in the planetarium*

President

Frank Moore

Greetings members. Gosh did the due date for my DSO article ever creep up on me this time?

As I write, I've just finished unloading astronomy gear from the car following last night's "Lunar Club" event at Judy Fuentes' house in Antelope Acres. It was a wonderful event, the weather was perfect, and I was pleasantly surprised at the great turnout. Judy's house turned out to be a great venue for the event with plenty of open space while being far enough from town to escape much of the influence of city lights yet near enough to ensure that members didn't have to drive too far attend.

The "star" of the event was the 50% illuminated first quarter moon which was almost at zenith when the event started and remained high in the sky throughout. Of course, much of our attention was focused on the terminator where intersection of light and dark creates contrast highlighting the lunar features.

Our Lunar Observing Group leader, Matt Leone, had forgetting his near vision glasses leaving my wife, Rose Moore, and our endearing Frenchman Chris Cardon to gleefully pour over the lunar maps in an attempt to identify the features we were observing.

As I have found, in the past, that my 25% transmission Neutral Density filter still yielded a lunar image that was way too bright, and I was never really pleased with the lunar image yielded by a Variable Polarizing Filter, I purchased a 13% transmission dedicated Moon Filter for this event and I couldn't be more pleased with the result. The contrast and clarity was great, and there was no blinding glare, while the darkening of the surrounding sky, even at twilight, really made the moon "pop" out of the eyepiece. It certainly pays to have the right tools in your toolbox.

The previous weekend, on Saturday June 24, we held our monthly Dark Sky Star Party at the Chuchupate observing site off Lockwood Valley Road near Frazier Park. I had obtained a Special Event Permit, from California State Parks, to hold this event at the Red Cliff's Natural area but when weather forecasts called for a high of 107* there we opted to move it to the higher elevation and cooler temperatures of Chuchupate.

Since I was intending to have a day of solar observing, and to even do a bit of an equipment rehearsal for the August 21 lunar eclipse, Rose and I arrived at Chuchupate at about 11:30 in the morning but I delayed

setting up due to an overcast sky that looked more than a bit threatening. Chris Cardon arrived shortly after us. I set up my table, laid out my rugs, and put some of the gear under the table while keeping a wary eye on the sky. While eating a lunch in the motor home, I heard what I thought was a "gurgling sound" from failure of the rooftop air conditioner to drain condensation, till Rose looked out the windshield and proclaimed that it was the sound of raindrops on the roof.

We knew that weather forecasts called for a chance of thunderstorms, and there had been lighting in the three small squalls that had already passed, before and expected total clearing at about 6:00 pm so I kept stepping outside, perusing the sky, and considering if the weather had passed well enough to setup the equipment. Finally, at about 2:30 pm and right after Jim, Ann and Kennedy had arrived, the sky opened up with a heavy thunderstorm that left half an inch of water flowing across the parking lot with a real fireworks show of lighting and thunder. The rain got so heavy that I hustled out and dragged equipment out from under the table and put it under the awning of the motor home while Rose begged me to come in out of the lightning.

When that final storm cleared, we began to see patches of clear blue sky and draped our rugs over tables, chairs, and stepstools to dry them off so I could place them under the equipment later.

Chris Cardon had come up early in anticipation of doing some solar observing with me and, at his urging, I went ahead and setup the 60mm Coronado. Gosh was I glad he did since there was a huge prominence (or prominences) that made two distinct loops in which you could clearly see center two center holes. Both the Ventura County and Kern County Astronomical societies had begun to arrive and setup at the far end of the parking lot so I wandered down to tell them to come up to look at the prominences. As I told them, "I wouldn't have walked down here if it wasn't impressive," and after following me back up the hill and taking a gaze they all agreed that it was well worth the walk.

More members, from all three clubs continued to arrive throughout the evening, and it turned out to be a great night, perfectly clear, with a large crowd of observers. Besides the AVAC members already mentioned others who came to the event included Rod Girard, Ellen Mahler, Darrell Bennett, Bob Ayres, Tom Hames, and Patricia Naftel. There were also several members of the public, some with telescopes and some without, who had read about the event on our facebook page and who observed with us throughout the night.

Remember, our July 22 Dark Sky Star Party is also our annual "Star-B-Que" (picnic) and public outreach event at the Brite Lake Recreational Area near Tehachapi. Don't miss this event as it features good food, good fellowship, and most importantly DARK SKIES. We will be sending out a separate email, and will have signup sheet at the next meeting, but if you haven't yet RSVP'd please let Rose know via email, phone call, or sign up at the meeting so we will have head count and can bring the appropriate quantities of meat and other supplies. You should also notify Rose if you have items for the Silent Auction or Raffle. Rose can be contacted at secretary@avastronomyclub.org or (661) 972-1953.

Our next Prime Desert Woodland Preserve Moonwalk is on Saturday June 15, at 8:30 pm. As always we need members with telescopes to share the celestial views with the public or you can just come out, take the walk, and learn something from Jeremy Amarant. No matter what you level of participation, it's always a rewarding experience.

Secretary

Rose Moore

Special thanks to Judy Fuentes for welcoming us into her yard and home for our Lunar Club Party the end of the month!! We had a large turnout, plenty of snacks and drinks, and plenty of good views of the moon and a few other objects! Thank you Judy!! And thank you everyone for attending!!

Thank you to the members and public who turned out for Dr. Becklin's presentation for our June meeting! We enjoyed having him visit us again!

Our picnic is coming up on Saturday July 22nd. See Frank's note above. Please contact Frank or I so that we can have an approximate head count before the picnic. Members are allowed to bring a guest(s). This allows us to have time to purchase meat, drinks, and other items. Don't forget there will be a public star party after the picnic. If you have any items to donate for the silent auction or raffle, please bring them to the picnic. We will need members to help out with the BBQ, covering the tables, setting up the auction table(s), etc. Please help out if you can, so that members setting up telescopes will have sufficient time to do so before the star party.

Upcoming: We have a PDW Moon Walk on Saturday July 15th at 8:30pm, and another Lunar Club Star Party at Judy Fuentes' home on Saturday, July 29th starting at 7pm. In August we will have a PDW on Saturday, Aug. 12th at 8pm. Please come out and support your club!!

Space Place

The Shape of the Solar System

By Marcus Woo

When Stamatios (Tom) Krimigis was selected for the Voyager mission in 1971, he became the team's youngest principal investigator of an instrument, responsible for the Low Energy Charged Particles (LECP) instrument. It would measure the ions coursing around and between the planets, as well as those beyond. Little did he know, though, that more than 40 years later, both Voyager 1 and 2 still would be speeding through space, continuing to literally reshape our view of the solar system.

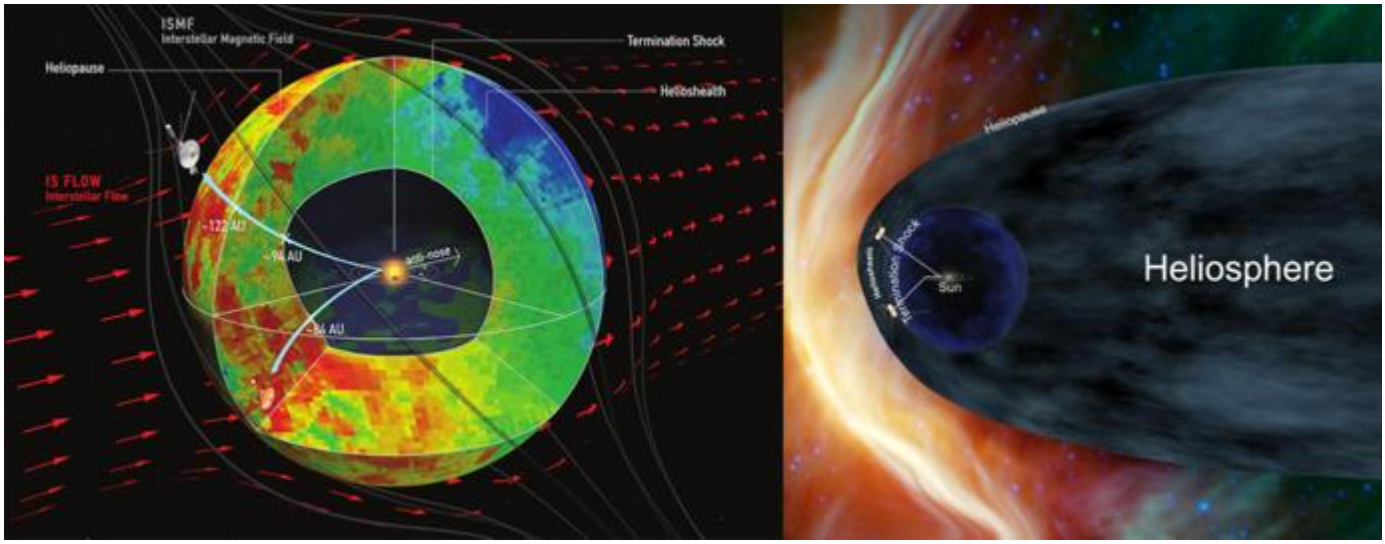
The solar system is enclosed in a vast bubble, carved out by the solar wind blowing against the gas of the interstellar medium. For more than half a century, scientists thought that as the sun moved through the galaxy, the interstellar medium would push back on the heliosphere, elongating the bubble and giving it a pointy, comet-like tail similar to the magnetospheres—bubbles formed by magnetic fields—surrounding Earth and most of the other planets

"We in the heliophysics community have lived with this picture for 55 years," said Krimigis, of The Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland. "And we did that because we didn't have any data. It was all theory."

But now, he and his colleagues have the data. New measurements from Voyager and the Cassini spacecraft suggest that the bubble isn't pointy after all. It's spherical.

Their analysis relies on measuring high-speed particles from the heliosphere boundary. There, the heated ions from the solar wind can strike neutral atoms coming from the interstellar medium and snatch away an electron. Those ions become neutral atoms, and ricochet back toward the sun and the planets, uninhibited by the interplanetary magnetic field.

Voyager is now at the edge of the heliosphere, where its LECP instrument can detect those solar-wind ions. The researchers found that the number of measured ions rise and fall with increased and decreased solar activity, matching the 11-year solar cycle, showing that the particles are indeed originating from the sun.



New data from NASA's Cassini and Voyager show that the heliosphere — the bubble of the sun's magnetic influence that surrounds the solar system — may be much more compact and rounded than previously thought. The image on the left shows a compact model of the heliosphere, supported by this latest data, while the image on the right shows an alternate model with an extended tail. The main difference is the new model's lack of a trailing, comet-like tail on one side of the heliosphere. This tail is shown in the old model in light blue. Image credits: Dialynas, et al. (left); NASA (right)

Meanwhile, Cassini, which launched 20 years after Voyager in 1997, has been measuring those neutral atoms bouncing back, using another instrument led by Krimigis, the Magnetosphere Imaging Instrument (MIMI). Between 2003 and 2014, the number of measured atoms soared and dropped in the same way as the ions, revealing that the latter begat the former. The neutral atoms must therefore come from the edge of the heliosphere.

If the heliosphere were comet-shaped, atoms from the tail would take longer to arrive at MIMI than those from the head. But the measurements from MIMI, which can detect incoming atoms from all directions, were the same everywhere. This suggests the distance to the heliosphere is the same every which way. The heliosphere, then, must be round, upending most scientists' prior assumptions.

It's a discovery more than four decades in the making. As Cassini ends its mission this year, the Voyager spacecraft will continue blazing through interstellar space, their remarkable longevity having been essential for revealing the heliosphere's shape.

"Without them," Krimigis says, "we wouldn't be able to do any of this."

To teach kids about the Voyager mission, visit the NASA Space Place:
https://spaceplace.nasa.gov/voyager-to-planets

News Headlines

How a Speck of Light Becomes an Asteroid

June 30 was International Asteroid Day. Have you ever wondered how asteroids are discovered? Here's the story.

Most asteroids are farther from the sun than Mars is -- more than 1.5 times farther from the sun than Earth's orbit is. Asteroids that come closer to the sun than about 1.3 times Earth's distance from the sun are called near-Earth asteroids. The term "near" in near-Earth asteroid is actually a bit of a misnomer, since most of these bodies do not come close to Earth at all. As of this month, more than 16,000 of them are known. Near-Earth asteroids and comets that come within the neighborhood of Earth's orbit are, together, classified as near-Earth objects, or NEOs.

https://goo.gl/TzkvYW

Earth-based Views of Jupiter to Enhance Juno Flyby

Telescopes in Hawaii have obtained new images of Jupiter and its Great Red Spot, which will assist the first-ever close-up study of the Great Red Spot, planned for July 10. On that date, NASA's Juno spacecraft will fly directly over the giant planet's most famous feature at an altitude of only about 5,600 miles (9,000 kilometers).

https://goo.gl/kXMkCB

Solar Minimum is Coming

Intense solar activity such as sunspots and solar flares subsides during solar minimum, but that doesn't mean the sun becomes dull. Solar activity simply changes form. Every 11 years or so, sunspots fade away, bringing a period of relative calm. "This is called solar minimum," says Dean Pesnell of NASA's Goddard Space Flight Center in Greenbelt, MD. "And it's a regular part of the sunspot cycle."

https://science.nasa.gov/science-news/news-articles/solar-minimum-is-coming

The Brightest Planets in July's Night Sky: How to See Them

There is only one planet that is completely out of the visibility loop this month: Mars, which is now on the far side of the sun and lost in the solar glare. In the meantime, we can be content with views of Jupiter, low in the west-southwest sky at dusk; and Saturn, reaching its highest point in the south at nightfall. For early birds, there's Venus, which rises 2.5 hours before the sun on July 1, increasing to 3 hours before dawn by month's end. Finally, there's Mercury, which is an evening object but is very difficult to see, as it lies very low to the western horizon soon after sunset all month long.

https://goo.gl/xqzLhe

July Sky Data

Best time for deep sky observing this month:
July 16 through July 25

Mercury reaches greatest elongation east, some 27 degrees from the Sun, on July 30th. It can be seen low in the west-northwest around 30 minutes after sunset. Binoculars may well be needed but please do not use them until after the Sun has set. It fades slightly during the month from -1.0 to +0.5 magnitudes.

Venus is visible in the east before dawn this month. It's magnitude dims slightly during the month from -4.1 to -4.0 as its angular diameter shrinks from 18.2 to 14.6 arc seconds. However, at the same time, its illuminated phase increases from 63 to 74%. Venus passes the Pleiades Cluster on the 5th, the Hyades on the 13/14th.

Mars is hidden in the Sun's glare all month so cannot be observed.

Now three months after opposition, **Jupiter** still dominates the low southwestern sky after nightfall. It sets at about 1 am as July begin. As the month progresses its brightness falls from -2.1 to -1.9 as its angular size falls from 37 to 34 arc seconds. It lies in Virgo some 10.5 degrees to the west of Spica, now moving eastwards again after its period of retrograde motion. It will pass Spica on September 11th on its journey towards the lower parts of the ecliptic.

Saturn came into opposition on June 11th and so will be at its highest elevation due south at around midnight as July begins but by ~10 pm at its end. It will be visible throughout most of the short night. It shines initially at magnitude 0.1 falling to +0.3 during the month and has an angular size of ~18 arc seconds. With an angle of 26.7 degrees inclination to the line of sight, the rings are virtually as open as they ever can be.

There are various minor **meteor-showers** which are active in July, mainly with radiants in the Capricorn-Aquarius area. Towards the end of the month, we may also start to see the first of the Perseids, which peak in August.

Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
7/1/2017	14:41	02:02	06:42	21:08
7/5/2017	18:18	04:18	06:44	21:08
7/10/2017	22:16	08:11	06:47	21:07
7/15/2017	------	13:02	06:50	21:05
7/20/2017	04:10	18:29	06:53	21:02
7/25/2017	09:27	22:50	06:57	20:59
7/31/2017	15:17	01:41	07:01	20:54

Planet Data

Jul 1

	Rise	Transit	Set	Mag
Mercury	06:32	13:48	21:08	-1.0
Venus	02:54	09:51	16:47	-4.1
Mars	06:10	13:29	20:47	1.7
Jupiter	13:08	19:03	00:59	-2.1
Saturn	18:37	23:40	04:44	0.1

Jul 15

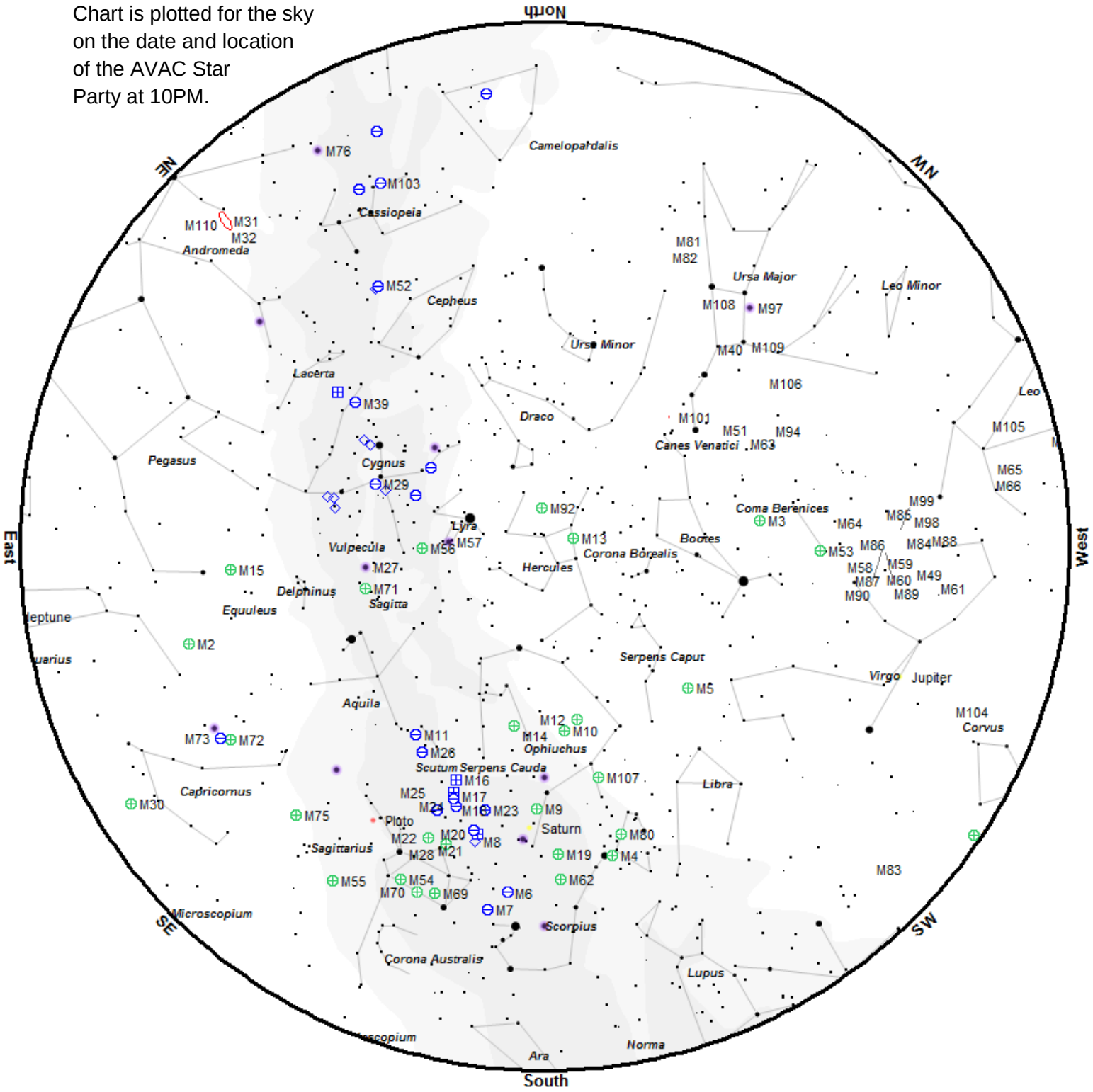
	Rise	Transit	Set	Mag
Mercury	07:39	14:33	21:30	-0.1
Venus	02:52	10:00	17:06	-4.1
Mars	05:59	13:13	20:26	1.7
Jupiter	12:19	18:13	00:06	-2.0
Saturn	17:38	22:42	03:45	0.2

Jul 31

	Rise	Transit	Set	Mag
Mercury	08:11	14:41	21:10	0.5
Venus	03:01	10:15	17:27	-4.0
Mars	05:47	12:53	19:58	1.7
Jupiter	11:22	17:17	23:08	-1.9
Saturn	16:32	21:35	02:39	0.3

Planet, Sun, and Moon data calculated for local time at Lancaster, CA

Chart is plotted for the sky on the date and location of the AVAC Star Party at 10PM.



To use the chart, go outside within an hour or so of the time listed and hold it up to the sky. Turn the chart so the direction you are looking is at the bottom of the chart. If you are looking to the south then have 'South horizon' at the lower edge.

Suggested Observing List

The list below contains objects that will be visible on the night of the AVAC Star Party. The list is sorted by the 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 83	Gal	Hya	13h37m00.8s	-29°51'56"	7.8	21:17	21:26	21:40	detectable
NGC 6167	Open	Nor	16h34m34.0s	-49°46'18"	6.6	21:21	21:34	21:51	challenging
NGC 5986	Glob	Lup	15h46m03.0s	-37°47'12"	7.6	21:21	21:37	22:07	difficult
NGC 6193	Open	Ara	16h41m20.0s	-48°45'48"	5.4	21:20	21:38	22:09	difficult
NGC 6178	Open	Sco	16h35m47.0s	-45°38'36"	7.2	21:17	21:38	22:28	detectable
NGC 6124	Open	Sco	16h25m20.0s	-40°39'12"	6.3	21:13	21:41	22:58	challenging
Col 256	Open	Com	12h25m06.0s	+26°06'00"	2.9	21:20	21:41	21:54	easy
NGC 5897	Glob	Lib	15h17m24.0s	-21°00'36"	8.4	21:26	21:42	22:16	challenging
NGC 4565	Gal	Com	12h36m20.8s	+25°59'15"	10.1	21:28	21:42	22:06	difficult
M 64	Gal	Com	12h56m43.8s	+21°41'00"	9.3	21:23	21:42	22:15	detectable
M 97	PNe	UMa	11h14m47.7s	+55°01'09"	9.7	21:27	21:44	21:47	detectable
M 81	Gal	UMa	09h55m33.1s	+69°03'56"	7.8	21:26	21:46	23:13	detectable
M 106	Gal	CVn	12h18m57.6s	+47°18'13"	9.1	21:26	21:46	22:33	detectable
M 94	Gal	CVn	12h50m53.1s	+41°07'12"	8.7	21:24	21:46	22:52	detectable
M 3	Glob	CVn	13h42m11.0s	+28°22'42"	6.3	21:22	21:46	23:15	easy
M 82	Gal	UMa	09h55m52.4s	+69°40'47"	9.0	21:25	21:47	23:23	detectable
M 5	Glob	Ser	15h18m34.0s	+02°05'00"	5.7	21:20	21:47	23:43	easy
NGC 5195	Gal	CVn	13h29m59.6s	+47°15'58"	10.5	21:26	21:48	23:11	detectable
M 51	Gal	CVn	13h29m52.3s	+47°11'40"	8.7	21:22	21:48	23:39	easy
M 80	Glob	Sco	16h17m02.0s	-22°58'30"	7.3	21:20	21:47	22:17	detectable
M 101	Gal	UMa	14h03m12.4s	+54°20'53"	8.4	21:27	21:50	23:36	detectable
M 12	Glob	Oph	16h47m14.0s	-01°56'48"	6.1	21:18	21:57	00:56	easy
M 62	Glob	Oph	17h01m13.0s	-30°06'48"	6.4	21:20	21:57	23:48	detectable
M 19	Glob	Oph	17h02m38.0s	-26°16'06"	6.8	21:22	21:59	23:48	detectable
M 13	Glob	Her	16h41m41.0s	+36°27'36"	5.8	21:19	21:59	01:58	easy
M 10	Glob	Oph	16h57m09.0s	-04°06'00"	6.6	21:21	21:59	00:36	detectable
NGC 6322	Open	Sco	17h18m25.0s	-42°56'00"	6.5	21:15	22:07	23:36	easy
M 9	Glob	Oph	17h19m12.0s	-18°31'00"	7.8	21:24	22:10	00:05	difficult
M 92	Glob	Her	17h17m07.0s	+43°08'12"	6.5	21:19	22:11	02:40	easy
NGC 6383	Open	Sco	17h34m48.0s	-32°34'00"	5.4	21:18	22:23	00:30	easy
NGC 6388	Glob	Sco	17h36m17.0s	-44°44'06"	6.8	21:39	22:24	23:12	challenging
M 14	Glob	Oph	17h37m36.0s	-03°14'48"	7.6	21:23	22:26	01:12	detectable
M 6	Open	Sco	17h40m20.0s	-32°15'12"	4.6	21:17	22:29	00:49	easy
IC 4665	Open	Oph	17h46m18.0s	+05°43'00"	5.3	21:24	22:34	01:28	detectable
M 7	Open	Sco	17h53m51.0s	-34°47'36"	3.3	21:20	22:42	00:39	detectable
M 23	Open	Sgr	17h57m04.0s	-18°59'06"	5.9	21:21	22:44	00:40	detectable
NGC 6543	PNe	Dra	17h58m33.4s	+66°37'59"	8.3	21:11	22:46	04:39	obvious
M 20	Open	Sgr	18h02m42.0s	-22°58'18"	5.2	21:38	22:50	00:03	easy

ID	Cls	Con	RA 2000	Dec 2000	Mag	Begin	Best	End	Difficulty
M 21	Open	Sgr	18h04m13.0s	-22°29'24"	7.2	21:34	22:52	00:10	detectable
M 8	Neb	Sgr	18h04m02.0s	-24°23'14"	5.0	22:04	22:52	23:40	easy
NGC 6541	Glob	CrA	18h08m02.0s	-43°42'54"	6.3	22:04	22:56	23:47	challenging
NGC 6572	PNe	Oph	18h12m06.4s	+06°51'12"	8.0	21:06	22:59	02:52	obvious
M 16	Open	Ser	18h18m48.0s	-13°48'24"	6.5	21:15	23:07	01:36	obvious
M 18	Open	Sgr	18h19m58.0s	-17°06'06"	7.5	21:18	23:08	01:16	easy
M 17	Open	Sgr	18h20m47.0s	-16°10'18"	7.3	21:30	23:09	01:11	difficult
M 28	Glob	Sgr	18h24m33.0s	-24°52'12"	6.9	22:37	23:12	23:49	detectable
NGC 6633	Open	Oph	18h27m15.0s	+06°30'30"	5.6	21:18	23:15	03:05	easy
M 25	Open	Sgr	18h31m47.0s	-19°07'00"	6.2	21:26	23:19	01:13	detectable
M 22	Glob	Sgr	18h36m24.0s	-23°54'12"	5.2	22:27	23:24	00:21	detectable
IC 4756	Open	Ser	18h39m00.0s	+05°27'00"	5.4	21:22	23:26	02:46	easy
M 70	Glob	Sgr	18h43m13.0s	-32°17'30"	7.8	21:52	23:30	01:11	detectable
M 11	Open	Sct	18h51m05.0s	-06°16'12"	6.1	21:25	23:39	02:32	detectable
M 57	PNe	Lyr	18h53m35.1s	+33°01'45"	9.4	21:18	23:41	04:18	easy
NGC 6716	Open	Sgr	18h54m34.0s	-19°54'06"	7.5	21:56	23:42	01:28	detectable
M 54	Glob	Sgr	18h55m03.0s	-30°28'42"	7.7	22:12	23:43	01:14	difficult
NGC 6723	Glob	Sgr	18h59m33.0s	-36°37'54"	6.8	22:20	23:47	01:14	detectable
M 56	Glob	Lyr	19h16m36.0s	+30°11'06"	8.4	21:29	00:04	03:29	detectable
M 55	Glob	Sgr	19h40m00.0s	-30°57'42"	6.3	22:38	00:27	02:17	detectable
NGC 6818	PNe	Sgr	19h43m57.8s	-14°09'12"	10.0	22:04	00:31	02:58	easy
M 71	Glob	Sge	19h53m46.0s	+18°46'42"	8.4	21:25	00:41	04:23	easy
M 27	PNe	Vul	19h59m36.3s	+22°43'16"	7.3	21:27	00:47	04:25	easy
NGC 6871	Open	Cyg	20h05m59.0s	+35°46'36"	5.8	21:26	00:53	04:30	easy
NGC 6910	Open	Cyg	20h23m12.0s	+40°46'42"	7.3	21:26	01:10	04:32	easy
M 29	Open	Cyg	20h23m57.0s	+38°30'30"	7.5	21:27	01:11	04:31	easy
NGC 7009	PNe	Aqr	21h04m10.9s	-11°21'48"	8.3	23:07	01:51	04:35	obvious
M 15	Glob	Peg	21h29m58.0s	+12°10'00"	6.3	22:41	02:17	04:33	easy
M 39	Open	Cyg	21h31m48.0s	+48°26'00"	5.3	21:33	02:19	04:36	easy
M 2	Glob	Aqr	21h33m27.0s	-00°49'24"	6.6	23:12	02:20	04:32	detectable
NGC 7160	Open	Cep	21h53m40.0s	+62°36'12"	6.4	21:22	02:40	04:41	obvious
IC 5146	Neb	Cyg	21h53m24.0s	+47°16'00"	10.0	21:49	02:41	04:36	challenging
NGC 7243	Open	Lac	22h15m08.0s	+49°53'54"	6.7	22:50	03:02	04:31	detectable
M 52	Open	Cas	23h24m48.0s	+61°35'36"	8.2	00:10	03:50	04:28	detectable
NGC 7790	Open	Cas	23h58m24.0s	+61°12'30"	7.2	22:44	03:57	04:39	easy
NGC 7789	Open	Cas	23h57m24.0s	+56°42'30"	7.5	00:48	03:57	04:29	detectable

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.

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

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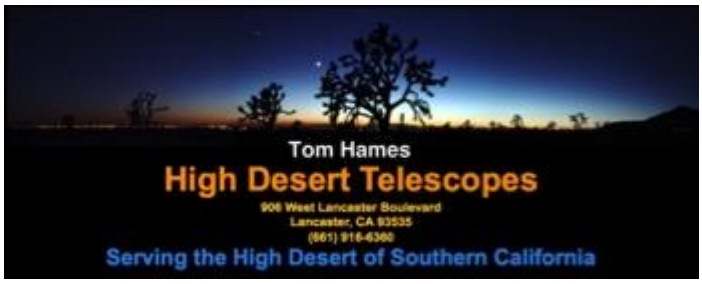

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