ANTELOPE VALLEY ASTRONOMY CLUB, INC.

Desert Sky Observer

Volume 35 *Antelope Valley Astronomy Club Newsletter* **June 2015**

Up-Coming Events

June 6: Prime Desert Moon Walk
June 12: Club Meeting*
June 20: Dark Sky Star Party @ Mt. Pinos

* 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 fellow star huggers.

It's been a bit of an unusual month for the Antelope Valley Astronomy club with members, and events, scattered all over the map.

Our month started on May 1 with the College Of The Canyons Star Party at the Canyon Country campus. The AVAC was well represented with a broad spectrum of telescope types and sizes. SAGE Planetarium Director Jeremy Amarant had his big ol' Unitron refractor through which he mostly shared planetary views. Bob Ayers had his 10" Meade SCT on his Orion Atlas mount. While Bob was setting up and working on his polar alignment, and just had Polaris in the eyepiece, people kept wanting to take a look so he just left it there, bumped up the power, and "split the double". Kris Chase had her 12" Meade Lightbridge through which she shared views of Jupiter, the moon, and maybe some deep sky objects as well. Bill Schebeck had his 16" dobsonian reflector with newly recoated mirror. Rose and I had our trusty old C-11 on the new Losmandy G-11 mount. (BTW, the G-11 works better when you plug the RA and DEC cables into the right slots.) After searching for deep sky objects that might yield satisfactory views in light polluted skies and with an almost full moon, we settled on M-13, the Hercules Cluster which though dim at first still thrilled the large crowd. It got better and better as it got higher in the sky. There were a lot clubs in attendance and, once again, it was a well -attended and successful event.

Dr. David Lynch made his fourth appearance as guest speaker at our meeting on Friday May 8. His presentation, on the San Andreas Fault, was very timely in light of the recent release of the movie by the same name. Some members have already used his book "Field Guide To The San Andreas Fault" to check out some of the features about which he spoke.

There were 65 members of the public present at the Prime Desert Woodlan Preserve Moonwalk on Saturday May 9. I want to thank those members who filled in for Rose and I at the event so we could get ready to travel to Tucson for our daughter Hannah's graduation from the University of Arizona.

We normally don't schedule a star party in May since the annual Riverside Telescope Maker's Conference (RTMC) kind of fills that role. However, at the last meeting, several members told me that they were going up to Chuchupate near the Lockwood Valley so we made an announcement and posted

directions to that observing site. Since Rose and I were in Tucson, I really can't tell you how that turned out nor can I give you much of a report on RTMC. Maybe some of the other members can give us a report on those events.

On the subject of Chuchupate, our June Dark Sky Star Party and Lunar Observing event will be held there on the weekend of Saturday June 20. Some of us will be going up as early as Thursday June 18 or Friday June 19 and staying through Sunday. On Friday, June 19, Mark Brewer from the High Desert Research Initiative, who was the speaker at our April meeting, will be giving us a hands-on workshop on measuring double stars. It should be a fun an informative event where we expect to do "real science". We will also have a waxing crescent moon that weekend, 7% illuminated and setting at 9:52 pm on Thursday 6/18, 13% illuminated and setting at 10:32 on Friday 6/19, and 20% illuminated and setting at 11:08 pm on Saturday 6/20 and Matt Leone will be leading us in lunar observing. Directions to Chuchupate and details about this event will be available at the June meeting and sent in a separate email. This should be a great event and I hope to see many of you there.

Other June events include a Prime Desert Woodland Moonwalk on Saturday June 6 at 8:30 pm and our Monthly meeting at the SAGE Planetarium on Friday June 12.

Vice President

Don Bryden

Jeremy is still working on a speaker or program for June so stay tuned. If nothing else we'll have a great full dome show and some good raffles. Don't forget about the Double Star Workshop on Friday, June 19th at Chuchupate (see http://www.2goats.org/_-!Chuchupate-Trailhead/c6in/BasicPostsItem1_hrhda4gt4_1 for directions). We'll be working on double star astrometry with Mark Brewer, Research Technician for Caltech/JPL Light Detection and Ranging, Table Mountain Facility. Then stay for Saturday night for the club star party and Lunar Club. Some members also plan on arriving as early as Thursday so come on out and enjoy the dark skies.

Finally, the annual Summer Star-B-Que is fast approaching. We will be heading up to Brite Lake in Tehachapi on Saturday, July 11th for our picnic and star party. Start thinking about donating to the club for the silent auction and raffle. Items need not be astronomy related so clean out those attics and garages and lets have a great Star-B-Cue!

Space Place

The "G" in GOES Is What Makes It Go

By Ethan Siegel

Going up into space is the best way to view the universe, eliminating all the distortionary effects of weather, clouds, temperature variations and the atmosphere's airflow all in one swoop. It's also the best way, so long as you're up at high enough altitudes, to view an entire 50 percent of Earth all at once. And if you place your observatory at just the right location, you can observe the same hemisphere of Earth continuously, tracking the changes and behavior of our atmosphere for many years.

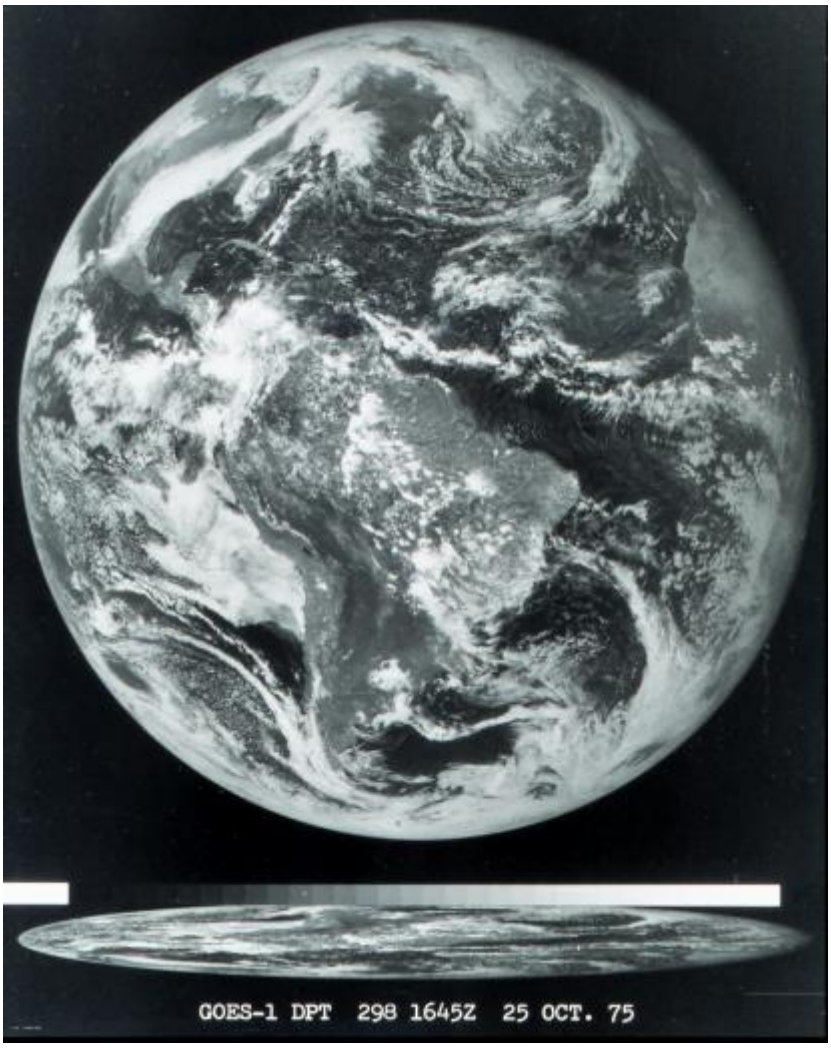


Image credit: National Oceanic and Atmospheric Administration, of the first image ever obtained from a GOES satellite. This image was taken from over 22,000 miles (35,000 km) above the Earth's surface on October 25, 1975.

The trick, believe it or not, was worked out by Kepler some 400 years ago! The same scientist who discovered that planets orbit the sun in ellipses also figured out the relationship between how distant an object needs to be from a much more massive one in order to have a certain orbital period. All you need to know is the period and distance of one satellite for any given body, and you can figure out the necessary distance to have any desired period. Luckily for us, planet Earth has a natural satellite—the moon—and just from that information, we can figure out how distant an artificial satellite would need to be to have an orbital period that exactly matches the length of a day and the rotational speed of Earth. For our world, that means an orbital distance of 42,164 km (26,199 miles) from Earth's center, or 35,786 km (22,236 miles) above mean sea level.

We call that orbit geosynchronous or geostationary, meaning that a satellite at that distance always remains above the exact same location on our world. Other effects—like solar wind, radiation pressure and the moon—require onboard thrusters to maintain the satellite's precisely desired position above any given point on Earth's surface. While geostationary satellites have been in use since 1963, it was only in 1974 that the Synchronous Meteorological Satellite (SMS) program began to monitor Earth's weather with them, growing into the Geostationary Operational Environmental Satellite (GOES) program the next year. For 40 years now, GOES satellites have monitored the Earth's weather continuously, with a total of 16 satellites having been launched as part of the program. To the delight of NASA (and Ghostbusters) fans everywhere, GOES-R series will launch in 2016, with thrice the spectral information, four times the spatial resolution and five times the coverage speed of its predecessors, with many other improved capabilities. Yet it's the simplicity of gravity and the geostationary "G" in GOES that gives us the power to observe our hemisphere all at once, continuously, and for as long as we like!

News Headlines

Hubble video shows shock collision inside black hole jet
When you're blasting though space at more than 98 percent of the speed of light, you may need driver's insurance. Astronomers have discovered for the first time a rear-end collision between two high-speed knots of ejected matter from a supermassive black hole. This discovery was made while piecing together a time-lapse movie of a plasma jet blasted from a supermassive black hole inside a galaxy located 260 million light-years from Earth.
http://www.astronomy.com/news/2015/05/hubble-video-shows-shock-collision-inside-black-hole-jet

Europa Mission to Probe Magnetic Field and Chemistry
NASA announced the selection of nine instruments for a future Europa mission on May 27, including two led by JPL researchers. Two powerful science investigations will help unravel the mystery of whether Jupiter's icy moon Europa might have the right conditions for life.
http://www.jpl.nasa.gov/news/news.php?feature=4602

New Horizons Sees More Detail as It Draws Closer to Pluto
What a difference 20 million miles makes! Images of Pluto from NASA's New Horizons spacecraft are growing in scale as the spacecraft approaches its mysterious target. The new images, taken May 8-12 using a powerful telescopic camera and downlinked last week, reveal more detail about Pluto's complex and high-contrast surface.
http://pluto.jhuapl.edu/News-Center/News-Article.php?page=20150527

Coronal Loops Over a Sunspot Group
The Atmospheric Imaging Assembly (AIA) instrument aboard NASA's Solar Dynamics Observatory (SDO) images the solar atmosphere in multiple wavelengths to link changes in the surface to interior changes. Its data includes images of the sun in 10 wavelengths every 10 seconds. When AIA images are sharpened a bit, such as this AIA 171Å channel image, the magnetic field can be readily visualized through the bright, thin strands that are called "coronal loops".
http://www.nasa.gov/image-feature/coronal-loops-over-a-sunspot-group

LightSail Solar Sail Test Flight Stalled by Software Glitch
A tiny solar-sailing spacecraft has gone silent in Earth orbit, apparently victimized by a software glitch. LightSail, a CubeSat designed and built by the nonprofit Planetary Society, stopped beaming data on Friday (May 22), just two days after it blasted off along with the United States Air Force's robotic X-37B space plane. "LightSail is likley now frozen, not unlike the way a desktop computer suddenly stops responding,"
http://www.space.com/29502-lightsail-solar-sail-software-glitch.html

NASA's Journey to Mars Ramps Up with InSight, Key Tests Pave Path to 2016 Lander Launch
NASA's 'Journey to Mars' is ramping up significantly with 'InSight' – as the agency's next Red Planet lander has now been assembled into its flight configuration and begun a comprehensive series of rigorous and critical environmental stress tests that will pave the path to launch in 2016 on a mission to unlock the riddles of the Martian core.
http://www.universetoday.com/120518/nasas-journey-to-mars-ramps-up-with-insight-key-tests-pave-path-to-2016-lander-launch/

June Sky Data

Best time for deep sky observing this month:
June 6 through June 21

Mercury was at inferior conjunction on the 30th May and then climbs slowly into the pre-dawn sky. It reaches greatest elongation west on the 24th June and will then be at magnitude +0.5 and have a phase of 35%. It should be visible with binoculars low above the east-northeast horizon as dawn breaks.

Venus dominates the western sky after sunset all month. It will reach greatest elongation from the Sun on June 6th. At the start of June it will be visible abut half an hour after sunset and be ~29 degrees above the western horizon. Following greatest elongation, it becomes an increasingly narrow crescent with its phase decreasing from 53 to 35%. By the end of June, its elevation above the horizon at sunset will have dropped to 19 degrees and it will set at around 2242.

Mars passes behind the Sun (superior conjunction) on June 14th, so is not visible this month.

Jupiter is now well past its best, but still stands out in the South to South-west at nightfall Its brightness falls slightly from magnitude -1.9 to -1.8 while its angular size drops from 35 to 32.5 arc seconds. Jupiter has a conjunction with Venus on the 30th, when they come just 21 arc minutes from each other. Interestingly, both planets will then have the same angular diameter of 32 arc seconds, but while Jupiter sports an almost fully illuminated disk, that of Venus will be a thin crescent just 34% illuminated.

Saturn, having reached opposition, will be visible in the southeast at nightfall and will not set until dawn the following morning. This is a good time to observe Saturn whose globe is ~18 arcs seconds across and whose rings span some 41 arc seconds across. They make a beautiful sight as are tilted 24 degrees from the line of sight - almost as open as they can be.

There are no significant **meteor-showers** in June.

Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
6/1/2015	20:11	06:07	06:40	20:59
6/5/2015	23:45	09:40	06:39	21:01
6/10/2015	02:31	15:02	06:38	21:04
6/15/2015	06:06	20:19	06:38	21:06
6/20/2015	10:40	00:06	06:39	21:07
6/25/2015	15:09	02:15	06:40	21:08
6/30/2015	19:52	05:34	06:42	21:08

Planet Data

Jun 1

	Rise	Transit	Set	Mag
Mercury	05:30	12:37	19:39	5.1
Venus	08:48	16:07	23:25	-4.3
Mars	05:45	13:04	20:21	1.5
Jupiter	10:30	17:29	00:24	-2.0
Saturn	18:51	00:06	05:21	0.1

Jun 15

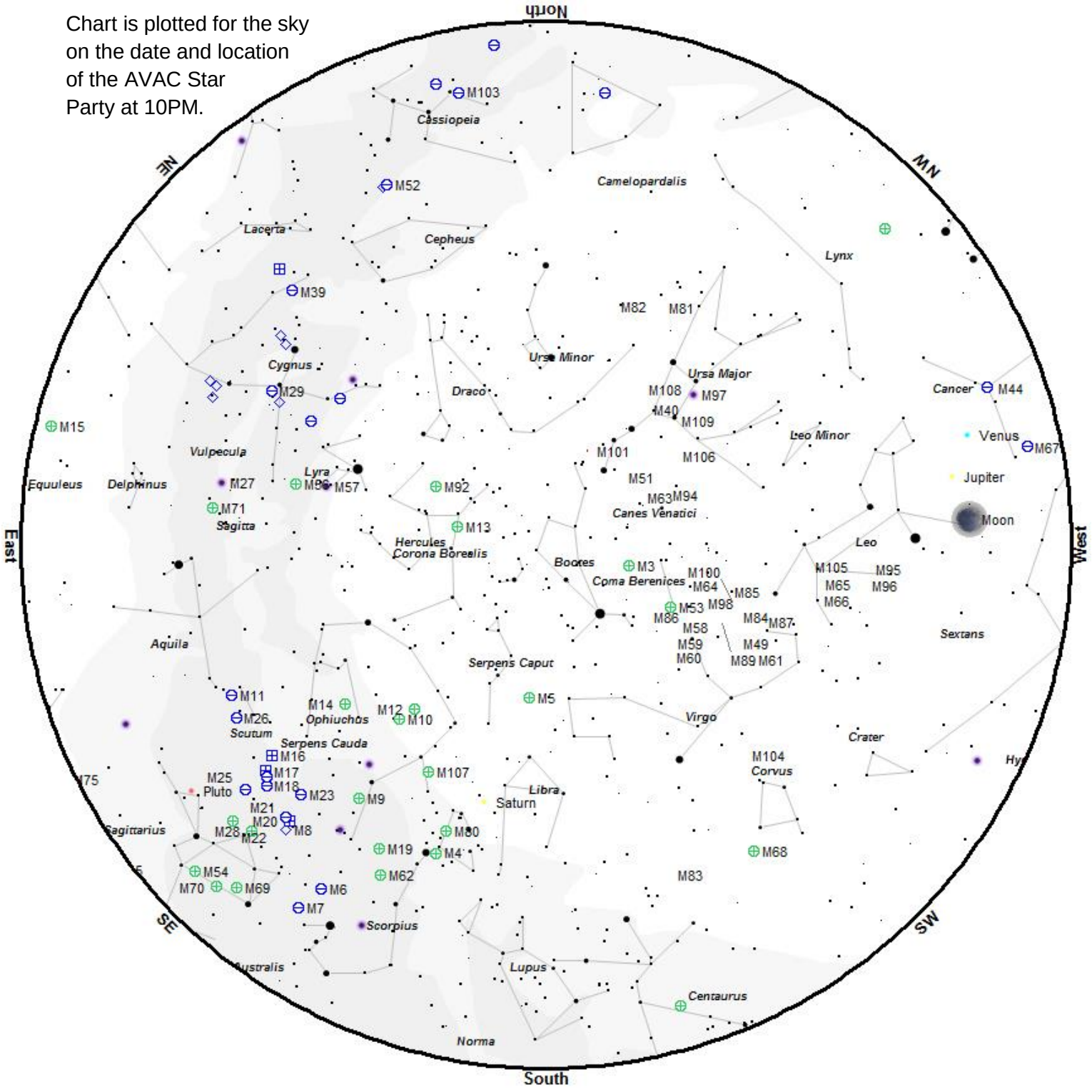
	Rise	Transit	Set	Mag
Mercury	04:33	11:30	18:29	1.6
Venus	09:00	16:06	23:12	-4.4
Mars	05:29	12:50	20:11	1.5
Jupiter	09:46	16:42	23:35	-1.9
Saturn	17:52	23:07	04:23	0.2

Jun 31

	Rise	Transit	Set	Mag
Mercury	04:15	11:26	18:33	-0.1
Venus	09:01	15:52	22:42	-4.4
Mars	05:13	12:36	19:57	1.6
Jupiter	09:00	15:53	22:44	-1.8
Saturn	16:49	22:05	03:21	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
NGC 5139	Glob	Cen	13h26m46.0s	-47°28'36"	3.9	21:17	21:33	21:58	challenging
NGC 5128	Gal	Cen	13h25m27.7s	-43°01'07"	7.8	21:20	21:40	22:16	challenging
M 68	Glob	Hya	12h39m28.0s	-26°44'36"	7.3	21:30	21:46	22:17	detectable
M 83	Gal	Hya	13h37m00.8s	-29°51'56"	7.8	21:29	21:50	22:49	detectable
M 104	Gal	Vir	12h39m59.3s	-11°37'22"	9.1	21:30	21:52	22:17	detectable
M 65	Gal	Leo	11h18m55.7s	+13°05'32"	10.1	21:34	21:52	22:25	detectable
M 66	Gal	Leo	11h20m14.9s	+12°59'30"	9.7	21:34	21:52	22:25	detectable
M 49	Gal	Vir	12h29m46.8s	+08°00'01"	9.3	21:32	21:56	23:19	detectable
M 86	Gal	Vir	12h26m12.2s	+12°56'44"	9.8	21:35	21:57	22:59	detectable
M 84	Gal	Vir	12h25m03.9s	+12°53'12"	10.1	21:33	21:57	23:20	detectable
M 87	Gal	Vir	12h30m49.2s	+12°23'29"	9.6	21:33	21:57	23:26	detectable
NGC 4565	Gal	Com	12h36m20.8s	+25°59'15"	10.1	21:36	21:58	23:31	difficult
Coll 256	Open	Com	12h25m06.0s	+26°06'00"	2.9	21:30	21:59	00:02	easy
M 64	Gal	Com	12h56m43.8s	+21°41'00"	9.3	21:32	21:59	00:04	detectable
M 97	PNe	UMa	11h14m47.7s	+55°01'09"	9.7	21:37	22:00	23:44	detectable
M 81	Gal	UMa	09h55m33.1s	+69°03'56"	7.8	21:35	22:01	23:17	detectable
M 82	Gal	UMa	09h55m52.4s	+69°40'47"	9.0	21:34	22:01	23:21	detectable
M 106	Gal	CVn	12h18m57.6s	+47°18'13"	9.1	21:36	22:01	00:04	detectable
M 94	Gal	CVn	12h50m53.1s	+41°07'12"	8.7	21:31	22:02	00:41	detectable
M 3	Glob	CVn	13h42m11.0s	+28°22'42"	6.3	21:30	22:03	01:00	easy
NGC 5195	Gal	CVn	13h29m59.6s	+47°15'58"	10.5	21:35	22:04	00:50	detectable
M 51	Gal	CVn	13h29m52.3s	+47°11'40"	8.7	21:32	22:04	01:26	easy
M 101	Gal	UMa	14h03m12.4s	+54°20'53"	8.4	21:37	23:10	01:21	detectable
NGC 5897	Glob	Lib	15h17m24.0s	-21°00'36"	8.4	21:39	23:10	23:48	challenging
M 5	Glob	Ser	15h18m34.0s	+02°05'00"	5.7	21:30	23:11	01:42	easy
NGC 5986	Glob	Lup	15h46m03.0s	-37°47'12"	7.6	21:46	23:11	23:57	difficult
M 80	Glob	Sco	16h17m02.0s	-22°58'30"	7.3	22:01	23:13	00:23	detectable
NGC 6124	Open	Sco	16h25m20.0s	-40°39'12"	6.3	21:47	23:22	01:02	challenging
NGC 6167	Open	Nor	16h34m34.0s	-49°46'18"	6.6	23:09	23:31	23:54	challenging
NGC 6178	Open	Sco	16h35m47.0s	-45°38'36"	7.2	22:36	23:32	00:33	detectable
M 13	Glob	Her	16h41m41.0s	+36°27'36"	5.8	21:32	23:37	03:57	easy
NGC 6193	Open	Ara	16h41m20.0s	-48°45'48"	5.4	23:07	23:38	00:14	difficult
M 12	Glob	Oph	16h47m14.0s	-01°56'48"	6.1	21:34	23:43	03:02	easy
M 10	Glob	Oph	16h57m09.0s	-04°06'00"	6.6	21:40	23:53	02:42	detectable
M 62	Glob	Oph	17h01m13.0s	-30°06'48"	6.4	22:09	23:57	01:54	detectable
M 19	Glob	Oph	17h02m38.0s	-26°16'06"	6.8	22:16	23:59	01:54	detectable
M 92	Glob	Her	17h17m07.0s	+43°08'12"	6.5	21:34	00:12	04:06	easy
M 9	Glob	Oph	17h19m12.0s	-18°31'00"	7.8	22:29	00:15	02:12	difficult

ID	Cls	Con	RA 2000	Dec 2000	Mag	Begin	Best	End	Difficulty
NGC 6322	Open	Sco	17h18m25.0s	-42°56'00"	6.5	22:49	00:15	01:44	easy
NGC 6383	Open	Sco	17h34m48.0s	-32°34'00"	5.4	22:33	00:30	02:37	easy
NGC 6388	Glob	Sco	17h36m17.0s	-44°44'06"	6.8	23:44	00:32	01:20	challenging
M 14	Glob	Oph	17h37m36.0s	-03°14'48"	7.6	22:02	00:33	03:21	detectable
M 6	Open	Sco	17h40m20.0s	-32°15'12"	4.6	22:23	00:35	02:55	easy
IC 4665	Open	Oph	17h46m18.0s	+05°43'00"	5.3	22:11	00:42	03:34	detectable
M 7	Open	Sco	17h53m51.0s	-34°47'36"	3.3	23:02	00:50	02:45	detectable
M 23	Open	Sgr	17h57m04.0s	-18°59'06"	5.9	22:59	00:52	02:47	detectable
NGC 6543	PNe	Dra	17h58m33.4s	+66°37'59"	8.3	21:22	00:53	04:24	obvious
M 20	Open	Sgr	18h02m42.0s	-22°58'18"	5.2	23:46	00:58	02:10	easy
M 21	Open	Sgr	18h04m13.0s	-22°29'24"	7.2	23:42	01:00	02:17	detectable
M 8	Neb	Sgr	18h04m02.0s	-24°23'14"	5.0	00:12	01:00	01:48	easy
NGC 6541	Glob	CrA	18h08m02.0s	-43°42'54"	6.3	00:14	01:04	01:53	challenging
NGC 6572	PNe	Oph	18h12m06.4s	+06°51'12"	8.0	21:21	01:07	04:26	obvious
M 16	Open	Ser	18h18m48.0s	-13°48'24"	6.5	22:45	01:14	03:43	obvious
M 18	Open	Sgr	18h19m58.0s	-17°06'06"	7.5	23:07	01:16	03:24	easy
M 17	Open	Sgr	18h20m47.0s	-16°10'18"	7.3	23:13	01:16	03:19	difficult
M 28	Glob	Sgr	18h24m33.0s	-24°52'12"	6.9	00:45	01:20	01:56	detectable
NGC 6633	Open	Oph	18h27m15.0s	+06°30'30"	5.6	21:48	01:23	04:14	easy
M 25	Open	Sgr	18h31m47.0s	-19°07'00"	6.2	23:34	01:27	03:20	detectable
M 22	Glob	Sgr	18h36m24.0s	-23°54'12"	5.2	00:34	01:32	02:29	detectable
IC 4756	Open	Ser	18h39m00.0s	+05°27'00"	5.4	22:26	01:34	04:09	easy
M 70	Glob	Sgr	18h43m13.0s	-32°17'30"	7.8	00:00	01:38	03:19	detectable
M 11	Open	Sct	18h51m05.0s	-06°16'12"	6.1	23:08	01:47	04:08	detectable
M 57	PNe	Lyr	18h53m35.1s	+33°01'45"	9.4	21:40	01:49	04:16	easy
NGC 6716	Open	Sgr	18h54m34.0s	-19°54'06"	7.5	00:04	01:50	03:36	detectable
M 54	Glob	Sgr	18h55m03.0s	-30°28'42"	7.7	00:21	01:51	03:20	difficult
NGC 6723	Glob	Sgr	18h59m33.0s	-36°37'54"	6.8	00:29	01:55	03:22	detectable
M 56	Glob	Lyr	19h16m36.0s	+30°11'06"	8.4	23:11	02:12	04:09	detectable
M 55	Glob	Sgr	19h40m00.0s	-30°57'42"	6.3	00:47	02:35	04:06	detectable
NGC 6818	PNe	Sgr	19h43m57.8s	-14°09'12"	10.0	00:12	02:39	04:23	easy
M 71	Glob	Sge	19h53m46.0s	+18°46'42"	8.4	23:05	02:49	04:16	easy
M 27	PNe	Vul	19h59m36.3s	+22°43'16"	7.3	23:09	02:55	04:16	easy
NGC 6871	Open	Cyg	20h05m59.0s	+35°46'36"	5.8	22:55	03:00	04:16	easy
NGC 6910	Open	Cyg	20h23m12.0s	+40°46'42"	7.3	22:57	03:15	04:16	easy
M 29	Open	Cyg	20h23m57.0s	+38°30'30"	7.5	23:10	03:15	04:16	easy
IC 1396	Neb	Cep	21h39m06.0s	+57°30'00"		23:17	03:33	04:14	challenging
M 39	Open	Cyg	21h31m48.0s	+48°26'00"	5.3	23:19	03:35	04:15	easy
NGC 7160	Open	Cep	21h53m40.0s	+62°36'12"	6.4	22:44	03:36	04:20	obvious
IC 5146	Neb	Cyg	21h53m24.0s	+47°16'00"	10.0	23:46	03:38	04:16	challenging
NGC 7243	Open	Lac	22h15m08.0s	+49°53'54"	6.7	00:48	03:39	04:10	detectable
M 52	Open	Cas	23h24m48.0s	+61°35'36"	8.2	01:43	03:40	04:07	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.

AVAC
P.O. BOX 8545,
LANCASTER, CA 93539-8545

Visit the Antelope Valley Astronomy Club website at 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
president@avastronomyclub.org

Vice-President:
Don Bryden (661) 270-0627
vice-president@avastronomyclub.org

Secretary:
Rose Moore (661) 972-1953
secretary@avastronomyclub.org

Treasurer:
Virgina Reed (661) 824-3932
treasurer@avastronomyclub.org

Director of Community Development:
Robert Lynch, Jr.
community@avastronomyclub.org

Appointed Positions

Newsletter Editor:
Steve Trotta (661) 269-5428
dso@avastronomyclub.org

Equipment & Library:
Bill Grove
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:
Don Bryden (661) 270-0627
al@avastronomyclub.org

Our Sponsors

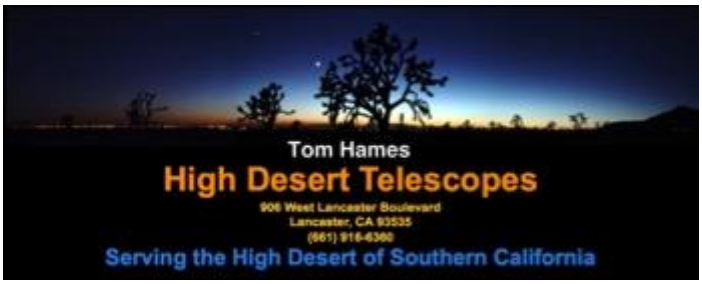
Thank you to our sponsors for your generous support!

Cosmos Level Sponsors

LOCKHEED MARTIN
We never forget who we're working for™

Woodland Hills Camera
5348 Topanga Canyon Blvd., Woodland Hills
888-427-8766.
www.telescopes.net

Universe Level Sponsors



Galaxy Level Sponsors

ASTRO-TOM.COM

ActonAstro

Al's Vacuum and Sewing
904 West Lancaster Blvd., Lancaster
(661) 948-1521