ANTELOPE VALLEY ASTRONOMY CLUB, INC.

Desert Sky Observer

Volume 32 *Antelope Valley Astronomy Club Newsletter* **January 2012**

Up-Coming Events

January 13: Club Meeting*
January 16: Executive Board Meeting @ Don's house
January 21: Messier Club & Star Party @ Two Goats Observatory

* 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

Happy New Year! And happy it will be with all the events coming up. We'll start off with a close-to-home Messier Club star party at Two Goats on January 21st. In February, if Ranger Dave and the Devil's Punchbowl Telescope program is back on, we'll join them on the 18th.

Things really get going on the 24th of March with our annual Messier Marathon. We will be in the group site at Saddleback Butte all night. Come early for a little bar-b-cue and stay late for bacon and the globular clusters of Ophiuchus and Sagittarius. The bacon gets you through the difficult Virgo cluster and the globulars are the reward for staying up all night!

The new moon in April falls on the weekend of the Poppy Festival. We're planning on a larger, East-facing booth and some nicer displays. Since we'll be occupied with the festival, we're planning on having a Messier Club the weekend before on the 14th.

May has a rare treat as the new moon on the 20th will be an annular eclipse. We'll be a bit too far south to see a perfect ring but it'll still be a show. Or travel just up to Reno to see the full effect. Of course May also means RTMC. We'll be at the usual spot in full force and hopefully the vendors won't get blown away again. Come enjoy the clear, dark skies at night and do a little shopping and browsing during the day. The waxing moon will interfere a bit but the folks who run the show have decided to keep RTMC over Memorial weekend whenever possible so come join the fun.

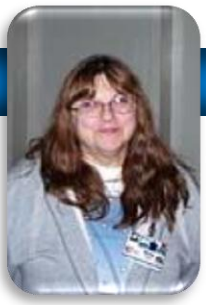
June should be our first trip back to Mt. Pinos on the 16th. But an even bigger event will happen on the afternoon of the 5th, a once-in-a-lifetime event at that – the Transit of Venus. Historically, astronomers used observations of the transit from different locations to determine the distance from the Earth to the Sun and subsequently, the size of our solar system. These types of near-perfect alignments happen all the time (and, no, the world will not be ending because of it) but in this case, this will be our last chance to see a Venus transit as the next time it will occur will be in 2117. The AVAC will offer public viewings at the SAGE planetarium so mark your calendars, whether they be Julian, Gregorian or Mayan!

Vice President

Doug Drake

On January 13 our speakers will be Ryan Dorcey and Dr. Steven Levin. Ryan is the Manager of Global Operations for the Lewis Center for Educational Research. Steven is the PI for the GAVRT program (which allows students to operate a 34 meter telescope from the classroom!) and Mission Specialist for JUNO, recently launched on a 5 year mission to Jupiter!

This New Year (2012) should provide us opportunities to observe new objects in the sky. One of the most treasures to observe is Mars! Mars will be at opposition on March 3 of this year. This will be the choice time to observe Mars, start looking for Mars in February. Astronomy magazine and Sky & Telescope will have the details soon. Also note that Venus will be our evening star to wish upon in the western sunset sky. Latter in the year Venus shall transit the Sun's face on June 5/6. This event will not happen again until 2117!



Director of Community Development

Rose Moore

Please welcome back Doug Drake into the VP position! Doug will be arranging our speakers this year, as well as our picnic and Christmas party for 2012!

I have arranged for the first 2 speakers for the year. We have Ryan Dorcey and Steve Levin from the Lewis Center for Educational Research/Radio astronomy for January, and Dr. Daniel Barth will be returning for February.

We'll be having some public outreach events coming up in the next month or two, and I'll keep you all posted...I hope some of you will consider coming out to help out fellow club members!

We will be handing out our Night Sky Network outreach pins probably at the February meeting for those who participated in at least 5 events this year...these are public outreach events in which we used NSN tools, or handed out NSN educational handouts to the public.

Clear skies, stay warm!

Secretary

Frank Moore

Happy New Year! I hope you all had pleasant holidays. Are you all ready for another busy year, full of club activities, outreach events, and long nights of stargazing?

In 2011, we had a few notable events in local governments that should make the prospect of dark skies more promising than ever.

First, and as I've mentioned before, the Kern County Board of Supervisors approved the new Kern County Outdoor Lighting ordinance for the unincorporated rural areas of Kern County. It took over five years from the initial proposal to approval by the Board of Supervisors. Though the ordinance is still in need of a bit of fine tuning, it's good start. The new ordinance went into effect with the new year.

Second, on November 9, 2011, the Los Angeles Regional Planning Commission approved the "Rural Outdoor Lighting District Ordinance" for rural areas of Los Angeles County. As part of the approval process, many areas that were previously classified as Lighting Zone 3/Urban (LZ3), have been reclassified as LZ2/Rural. This includes many areas of the northern Los Angeles County including large parts of the Antelope Valley, Santa Clarita Valley, and the Acton/Aqua Dulce Area. It is expected that the Los Angeles County Board of Supervisors will approve the ordinance in early 2012 with it taking effect approximately 6 months later.

Though it is expected that the ordinance will breeze through the approval process unscathed, it certainly wouldn't hurt to write to the Board of Supervisors encouraging it's approval. News and information regarding the ordinance and the approval process can be found here: http://planning.lacounty.gov/view/rural_outdoor_lighting_district_ordinance/

Your board is working on many positive initiatives to make club resources like books, equipment and telescopes more accessible as well as many exciting events like star parties, the Messier and Lunar Club, and special events like the Transit of Venus. I encourage you all to participate in all the club has to offer and to make this the most exciting year yet.

May you all enjoy dark skies.

Space Place

Dawn Takes a Closer Look

By Dr. Marc Rayman

This full view of the giant asteroid Vesta was taken by NASA's Dawn spacecraft, as part of a rotation characterization sequence on July 24, 2011, at a distance of 5,200 kilometers (3,200 miles). Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Dawn is the first space mission with an itinerary that includes orbiting two separate solar system destinations. It is also the only spacecraft ever to orbit an object in the main asteroid belt between Mars and Jupiter. The spacecraft accomplishes this feat using ion propulsion, a technology first proven in space on the highly successful Deep Space 1 mission, part of NASA's New Millennium program.

Launched in September 2007, Dawn arrived at protoplanet Vesta in July 2011. It will orbit and study Vesta until July 2012, when it will leave orbit for dwarf planet Ceres, also in the asteroid belt.

Dawn can maneuver to the orbit best suited for conducting each of its scientific observations. After months mapping this alien world from higher altitudes, Dawn spiraled closer to Vesta to attain a low altitude orbit, the better to study Vesta's composition and map its complicated gravity field.

Changing and refining Dawn's orbit of this massive, irregular, heterogeneous body is one of the most complicated parts of the

mission. In addition, to meet all the scientific objectives, the orientation of this orbit needs to change.

These differing orientations are a crucial element of the strategy for gathering the most scientifically valuable data on Vesta. It generally requires a great deal of maneuvering to change the plane of a spacecraft's orbit. The ion propulsion system allows the probe to fly from one orbit to another without the penalty of carrying a massive supply of propellant. Indeed, one of the reasons that traveling from Earth to Vesta (and later Ceres) requires ion propulsion is the challenge of tilting the orbit around the sun.

Although the ion propulsion system accomplishes the majority of the orbit change, Dawn's navigators are enlisting Vesta itself. Some of the ion thrusting was designed in part to put the spacecraft in certain locations from which Vesta would twist its orbit toward the target angle for the low-altitude orbit. As Dawn rotates and the world underneath it revolves, the spacecraft feels a changing pull. There is always a tug downward, but because of Vesta's heterogeneous interior structure, sometimes there is also a slight force to one side or another. With their knowledge of the gravity field, the mission team plotted a course that took advantage of these variations to get a free ride.

The flight plan is a complex affair of carefully timed thrusting and coasting. Very far from home, the spacecraft is making excellent progress in its expedition at a fascinating world that, until a few months ago, had never seen a probe from Earth.

Keep up with Dawn's progress by following the Chief Engineer's (yours truly's) journal at http://dawn.jpl.nasa.gov/mission/journal.asp. And check out the illustrated story in verse of "Professor Starr's Dream Trip: Or, how a little technology goes a long way," at http://spaceplace.nasa.gov/story-prof-starr.

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

Tycho Brahe, an Unlikely Revolutionary by Paul Derrick

December 14 is the 465th birthday of Danish astronomer Tycho Brahe (1546-1601), one of five key players in the 150-year long Copernican revolution – a revolution he didn't even fully support.

Up to their time, it was believed the Earth was the center of all creation, a view called the geocentric theory. In the 1530s, Nicolaus Copernicus (1473-1543) postulated that the Sun was at the center, called the heliocentric theory – but he had no observational evidence to support his radical theory. With the newly invented telescope, Galileo Galilei (1564-1642) began finding supporting evidence in 1610, but using the then-prevailing view that planetary orbits are circular, the heliocentric theory still wasn't convincing.

About this same time, Johannes Kepler (1571-1634) discovered that planetary orbits are elliptical, not circular, and when this was applied to Copernicus' heliocentric view, things fell into place – although ironically Galileo was never convinced of elliptical orbits. The fifth player, Isaac Newton (1642-1727), in the 1680s discovered and set forth the laws of gravity to further explain planetary motions. So where did Tycho Brahe come in? He furnished the data without which mathematician Kepler would never have discovered elliptical orbits.

The son of a prominent Danish nobleman, Tycho's life was both colorful and full of ironies. At age 2 he was kidnapped and raised by an uncle and aunt. Before his birth his parents promised him to his father's brother and wife as they were unable to have children, however after his birth, his parents began to have second thoughts – so he was kidnapped. Apparently, no hard feelings resulted as the families remained close.

Tycho received an education befitting a nobleman, but he also had a brash tempestuousness about him that he came to regret on occasions. At age 20, he got into a duel and suffered a disfiguring injury when his rival's sword removed the bridge of his nose. Being a resourceful chap, he fashioned a prosthetic nose-piece of silver and gold which he affixed with a wax paste and wore the rest of his life.

At the age of 25 he fell in love with Kirstin, a Lutheran minister's daughter. Since she was a commoner and he a nobleman they couldn't officially marry, so they lived together as husband and wife, establishing a common-law marriage. It lasted 30 years until Tycho's death, and produced eight children, six of whom lived to adulthood.

His family intended that he go into law, but being star-struck at age 13 by a solar eclipse, he began his own personal astronomical studies along with his other formal studies. He quickly recognized the imprecision and inconsistencies of the astronomical books and charts of the day, and at age 17, set forth his life goal when he wrote:

"I've studied all available charts of the planets and stars and none of them match the others. There are just as many measurements and methods as there are astronomers and all of them disagree. What's needed is a long term project with the aim of mapping the heavens conducted from a single location over a period of several years." Truly remarkable for a renaissance teenager.

In 1573, he wrote De Stella Nova about a "new star" he had observed the previous year – now known as Supernova 1572.

In 1576, at age 29, Tycho was given, by the king of Denmark, the small island of Hven and funds for the construction of an observatory. Here he spent much of the next 20 years making the observations for which he is famous.

He constructed many of his own astronomical instruments and invented others. Born with exceptional eyesight, he became one of the great observers in astronomical history. Ironically he died eight years before the invention of the telescope – the instrument that revolutionized observational astronomy.

Wood carving depicting Tycho in his observatory with his mural (wall) quadrant.

With remarkable precision, he charted the locations of 777 stars and compiled tables of motions of the then-known five planets. Shortly before his death, Tycho was joined by the 29-year old mathematician Johannes Kepler in what proved to be a scientifically fateful collaboration. They worked together only a year or so, but following Tycho's death, Kepler used Tycho's 20 years of measurements of the positions of Mars to discover the elliptical nature of planetary orbits – an enormously significant contribution to the Copernican revolution.

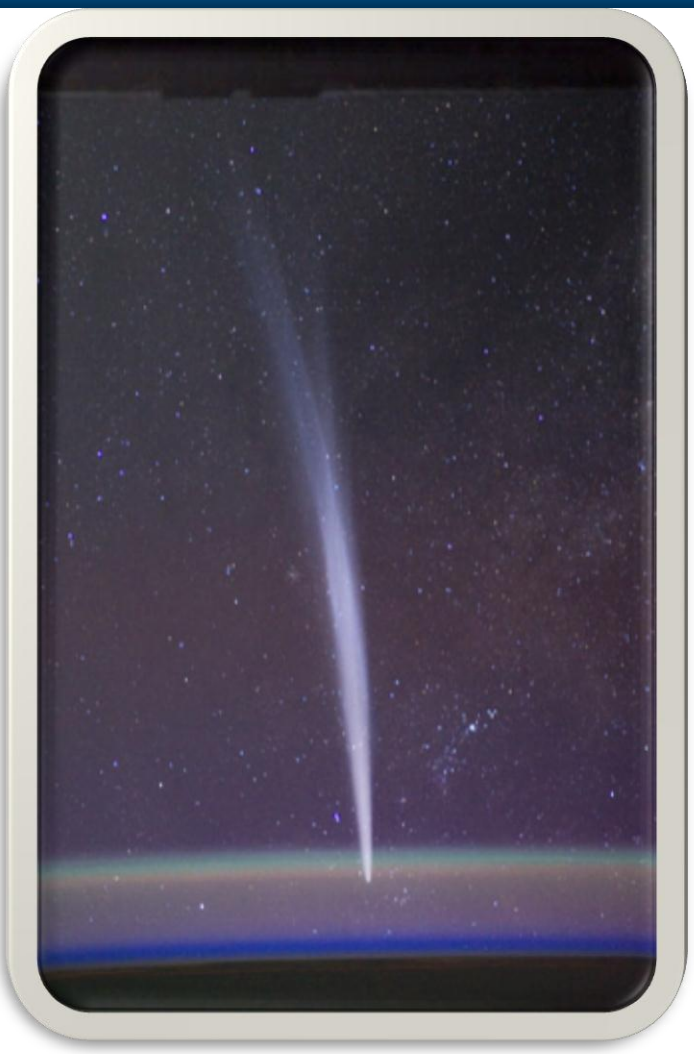
Ironically, although Tycho was a contemporary of Galileo, there is no indication they ever met. In fact, Galileo, 18 years younger, was a mathematics professor who didn't get into astronomy seriously until after Tycho's death.

While Tycho reportedly admired Copernicus, he never knew him, having been born three years after Copernicus died. Furthermore, he never came to agree with Copernicus' heliocentric theory, and even came up with his own theory, known as the Tychonic system, which enjoyed favor for a time. Yet, it was his accurate and meticulously recorded observations that doomed his own theory and led to the eventual acceptance of Copernicus'.

Tycho Brahe died rather suddenly at the age of 54, and the cause of his death is still a mystery. Initially attributed to kidney stone complications, his body was exhumed in 1901 and when no stones were found, the cause of death was cited as uremia. Later studies found toxic levels of mercury in his body – he also dabbled in alchemy – and it is now believed he died from mercury poisoning.

Eduard Ender painting believed to be Tycho demonstrating a celestial globe to his last benefactor Emperor Rudolph II in Prague.

Astrophoto of The Month



ISS030-E-015472 (22 Dec. 2011) --- Comet Lovejoy is visible near Earth's horizon in this nighttime image photographed by NASA astronaut Dan Burbank, Expedition 30 commander, onboard the International Space Station on Dec. 22, 2011.

News Headlines

First Habitable-Zone Super-Earth Discovered
NASA's Kepler Mission has discovered the first super-Earth orbiting in the habitable zone of a star similar to the Sun. A team of researchers, including Carnegie's Alan Boss, has discovered what could be a large, rocky planet with a surface temperature of about 22 degrees Celsius (72 degrees Fahrenheit), comparable to a comfortable spring day on Earth.
http://www.sciencedaily.com/releases/2011/12/111205140525.htm

Monster Black Holes Are Most Massive Ever Discovered
Scientists have discovered the largest black holes yet, and they're far bigger than researchers expected based on the galaxies in which they were found. The discovery suggests we have much to learn about how monster black holes grow, scientists said.
http://www.space.com/13819-black-holes-largest-massive.html

Comet Lovejoy Plunges into the Sun and Survives
This morning, an armada of spacecraft witnessed something that many experts thought impossible. Comet Lovejoy flew through the hot atmosphere of the sun and emerged intact. "It's absolutely astounding," says Karl Battams of the Naval Research Lab in Washington DC.
http://science.nasa.gov/science-news/science-at-nasa/2011/16dec_cometlovejoy/

Voyagers Detect Missing Signal
Thirty-four years after their 1977 launches, we're still hearing about discoveries made by NASA's Voyager spacecraft. To the tally that includes Jupiter's faint ring, active volcanoes on Io, and Neptune's Great Dark Spot — not to mention the ongoing mission to find the outer limit of the Sun's magnetic influence — add another first: the detection of a particular kind of hydrogen signal called Lyman-alpha emission from the Milky Way itself.
http://www.skyandtelescope.com/news/Voyagers-Detect-Missing-Signal-134918938.html

Evidence for Complex Molecules on Pluto's surface
The new and highly sensitive Cosmic Origins Spectrograph aboard the Hubble Space Telescope has discovered a strong ultraviolet-wavelength absorber on Pluto's surface, providing new evidence that points to the possibility of complex hydrocarbon and/or nitrile molecules lying on the surface.
http://astrobio.net/pressrelease/4413/evidence-for-complex-molecules-on-plutos-surface

Dawn Obtains First Low Altitude Images of Vesta
NASA's Dawn spacecraft has sent back the first images of the giant asteroid Vesta from its low-altitude mapping orbit. The images, obtained by the framing camera, show the stippled and lumpy surface in detail never seen before, piquing the curiosity of scientists who are studying Vesta for clues about the solar system's early history.
http://www.jpl.nasa.gov/news/news.cfm?release=2011-391

Discovery of A Vigorous Star-Forming Galaxy at Cosmic Dawn
An international team of astronomers led by Masami Ouchi at the University of Tokyo has discovered a vigorous, star-forming galaxy that existed about 750 million years after the Big Bang. This galaxy, named GN-108036, was a remarkable source of star formation at the so-called "cosmic dawn", a very early time in cosmic history; it was generating an exceptionally large amount of stars in the calm, dark cosmos.
http://www.spaceref.com/news/viewpr.html?pid=35611

January Sky Data

Best time for deep sky observing this month:
January 14 through January 24

Mercury is rising in the south-east just before sunrise, but it won't be easy to see this elusive little planet in dawn sky. It draws closer to the Sun each day, and will disappear behind the Sun in early February; after that, we will have a better chance to find Mercury in the evening sky.

Venus is a brilliant "Evening Star" this month. It can be seen low in the south-western sky immediately after sunset; at the start of January it sets before 7 pm, but by the end of the month it stays up until after 8:30 pm.

Mars is rising in the east in the late evening, and it's high in the southern sky around 4 a.m. Relative to the stars, the "Red Planet" is moving slowly south-eastwards out of the constellation of Leo and into Virgo.

Jupiter is well up in the south-eastern sky at dusk. Relative to the stars, it is moving very slowly westwards out of Pisces, crossing into Aries on January 8th. It doesn't set in the west until the early hours of the morning.

Saturn is rising in the east after midnight, and it's well up in the southern sky at dawn. Relative to the stars, Saturn is in the constellation of Virgo, close to the upper left of its brightest star Spica, and moving gradually further left. Saturn appears a little brighter than Spica, and it shines with a steadier light.

The Quadrantid **meteor shower** produces a good display of meteors every year during the first week of January. The radiant point for this shower is in the now-disused constellation of Quadrans Muralis, between the bright star Vega and the "handle" of the Plough; it's low in the north at midnight, but climbs high in the east towards dawn. This year the peak is expected in the early hours of Wednesday January 4th. The Moon will be setting in the north-west, so it shouldn't cause too much interference

Sun and Moon Rise and Set

Date	Moonrise	Moonset	Sunrise	Sunset
1/1/2012	11:34	00:07	06:58	16:51
1/5/2012	14:02	03:48	06:59	16:54
1/10/2012	18:50	07:45	06:59	16:59
1/15/2012	------	10:38	06:58	17:03
1/20/2012	04:35	14:47	06:57	17:08
1/25/2012	08:05	20:01	06:54	17:13
1/31/2012	11:15	00:41	06:50	17:19

Planet Data

Jan 1

	Rise	Transit	Set	Mag
Mercury	05:28	10:30	15:31	-0.4
Venus	09:03	14:19	19:36	-4.0
Mars	22:10	04:35	11:00	0.2
Jupiter	12:26	19:02	01:38	-2.6
Saturn	01:11	06:54	12:40	0.7

Jan 15

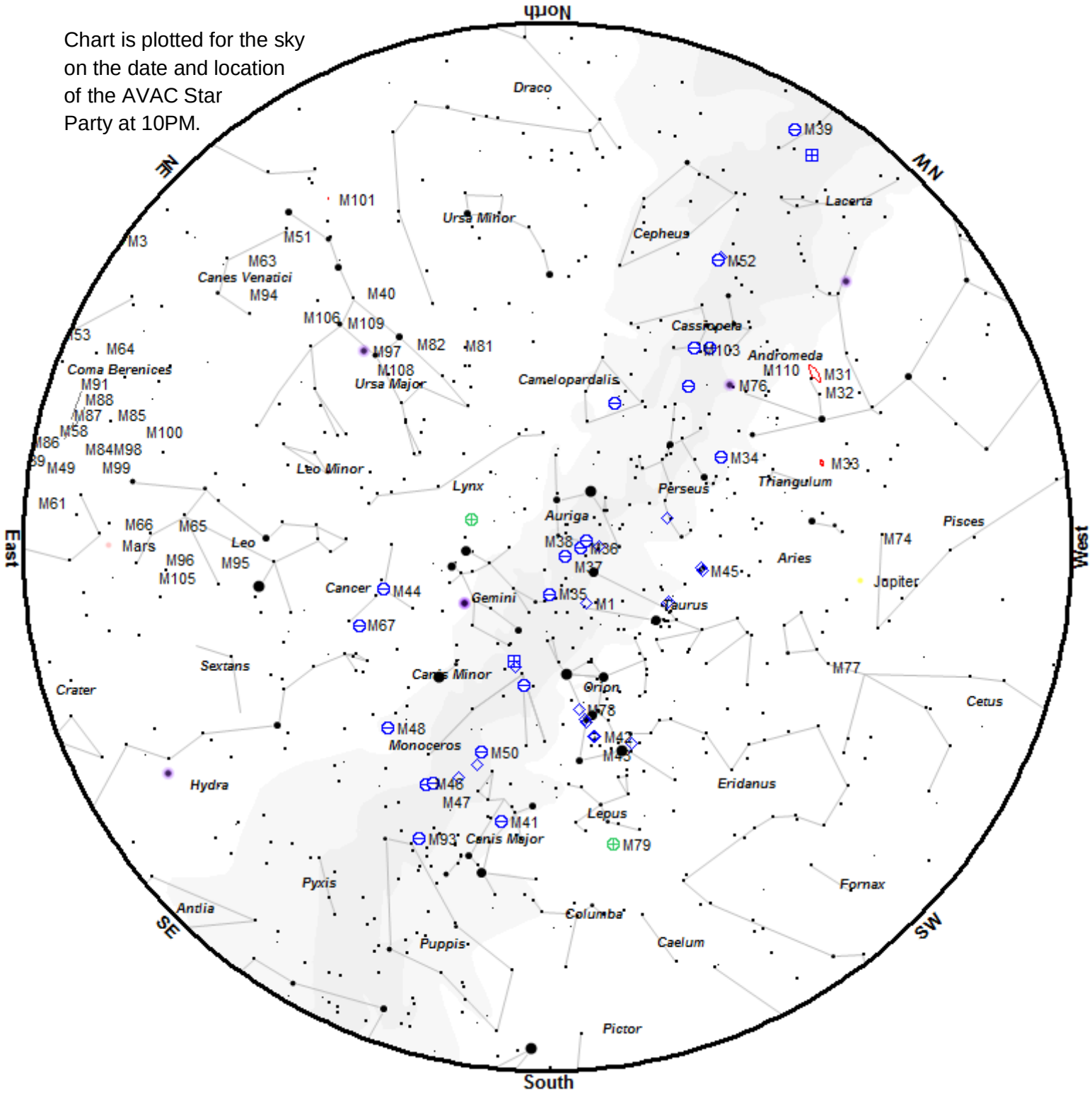
	Rise	Transit	Set	Mag
Mercury	06:06	11:04	16:00	-0.5
Venus	08:57	14:31	20:05	-4.0
Mars	21:25	03:49	10:12	-0.2
Jupiter	11:28	18:09	00:46	-2.5
Saturn	00:19	06:01	11:43	0.6

Jan 31

	Rise	Transit	Set	Mag
Mercury	06:41	11:51	16:57	-1.1
Venus	08:42	14:39	20:35	-4.1
Mars	20:22	02:46	09:11	-0.6
Jupiter	10:29	17:12	23:51	-2.4
Saturn	23:18	05:00	10:42	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.



Star Magnitudes								
0	1	2	3	4	5	Galaxy	Nebula
						Open Cluster	Bright Nebula
						Globular Cluster	Planetary Nebula
						Cluster+Nebulosity	

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	Mag	Con	RA 2000	Dec 2000	Begin	Best	End	Difficulty
NGC 253	Gal	7.9	Scl	00h47m33.1s	-25°17'20"	18:17	18:33	19:21	detectable
M 39	Open	5.3	Cyg	21h31m48.0s	+48°26'00"	18:16	18:34	18:48	easy
NGC 288	Glob	8.1	Scl	00h52m45.0s	-26°35'00"	18:24	18:34	18:56	difficult
Cocoon Neb	Neb	10.0	Cyg	21h53m24.0s	+47°16'00"	18:15	18:35	19:08	challenging
IC 1396	Neb		Cep	21h39m06.0s	+57°30'00"	18:14	18:36	19:18	challenging
NGC 7243	Open	6.7	Lac	22h15m08.0s	+49°53'54"	18:20	18:36	19:35	detectable
NGC 7160	Open	6.4	Cep	21h53m40.0s	+62°36'12"	18:11	18:37	19:45	obvious
M 52	Open	8.2	Cas	23h24m48.0s	+61°35'36"	18:19	18:39	20:19	detectable
NGC 7790	Open	7.2	Cas	23h58m24.0s	+61°12'30"	18:13	18:40	21:47	obvious
NGC 7789	Open	7.5	Cas	23h57m24.0s	+56°42'30"	18:20	18:40	20:20	detectable
M 110	Gal	8.9	And	00h40m22.3s	+41°41'09"	18:18	18:40	20:43	detectable
M 31	Gal	4.3	And	00h42m44.3s	+41°16'07"	18:15	18:40	21:26	easy
M 32	Gal	8.9	And	00h42m41.8s	+40°51'58"	18:15	18:40	21:24	easy
NGC 457	Open	5.1	Cas	01h19m35.0s	+58°17'12"	18:13	18:42	23:00	obvious
M 33	Gal	6.4	Tri	01h33m50.9s	+30°39'36"	18:17	18:42	21:21	detectable
NGC 559	Open	7.4	Cas	01h29m31.0s	+63°18'24"	18:12	18:43	23:24	easy
M 103	Open	6.9	Cas	01h33m23.0s	+60°39'00"	18:11	18:43	23:20	obvious
M 76	PNe	10.1	Per	01h42m19.9s	+51°34'31"	18:18	18:43	21:50	detectable
NGC 752	Open	6.6	And	01h57m41.0s	+37°47'06"	18:24	18:43	20:18	challenging
NGC 637	Open	7.3	Cas	01h43m04.0s	+64°02'24"	18:10	18:44	23:38	obvious
NGC 663	Open	6.4	Cas	01h46m09.0s	+61°14'06"	18:13	18:44	23:32	easy
NGC 869	Open	4.3	Per	02h19m00.0s	+57°07'42"	18:10	18:47	23:55	obvious
NGC 884	Open	4.4	Per	02h22m18.0s	+57°08'12"	18:11	18:47	00:00	obvious
M 77	Gal	9.7	Cet	02h42m40.8s	-00°00'48"	18:17	18:48	21:37	detectable
Heart Neb	Neb	6.5	Cas	02h33m52.0s	+61°26'50"	18:14	18:49	00:12	challenging
NGC 957	Open	7.2	Per	02h33m21.0s	+57°33'36"	18:14	18:49	23:52	easy
M 34	Open	5.8	Per	02h42m05.0s	+42°45'42"	18:15	18:50	22:57	easy
NGC 1027	Open	7.4	Cas	02h42m40.0s	+61°35'42"	18:18	18:51	23:03	detectable
NGC 1245	Open	7.7	Per	03h14m42.0s	+47°14'12"	18:26	19:04	21:20	challenging
NGC 1342	Open	7.2	Per	03h31m38.0s	+37°22'36"	18:15	19:20	23:36	easy
M 45	Open	1.5	Tau	03h47m00.0s	+24°07'00"	18:12	19:35	00:12	obvious
NGC 1444	Open	6.4	Per	03h49m25.0s	+52°39'30"	18:09	19:38	01:15	obvious
NGC 1502	Open	4.1	Cam	04h07m50.0s	+62°19'54"	18:07	19:57	01:58	obvious
NGC 1528	Open	6.4	Per	04h15m23.0s	+51°12'54"	18:14	20:04	01:14	easy
Hyades	Open	0.8	Tau	04h26m54.0s	+15°52'00"	18:14	20:15	00:29	easy
NGC 1647	Open	6.2	Tau	04h45m55.0s	+19°06'54"	18:20	20:34	23:55	detectable
NGC 1664	Open	7.2	Aur	04h51m06.0s	+43°40'30"	18:15	20:40	01:37	easy
NGC 1746	Open	6.1	Tau	05h03m50.0s	+23°46'12"	18:21	20:52	00:21	detectable

ID	Cls	Mag	Con	RA 2000	Dec 2000	Begin	Best	End	Difficulty
NGC 1851	Glob	7.1	Col	05h14m06.0s	-40°02'48"	19:49	21:02	22:14	detectable
M 38	Open	6.8	Aur	05h28m40.0s	+35°50'54"	18:18	21:17	01:28	detectable
M 1	Neb	8.4	Tau	05h34m30.0s	+22°01'00"	19:25	21:22	23:20	challenging
M 43	Neb	9.0	Ori	05h35m30.0s	-05°16'00"	18:21	21:24	00:34	challenging
M 42	Neb	4.0	Ori	05h35m18.0s	-05°23'00"	18:19	21:24	00:32	easy
M 36	Open	6.5	Aur	05h36m18.0s	+34°08'24"	18:14	21:24	02:18	easy
IC 434	Neb	11.0	Ori	05h41m00.0s	-02°27'00"	18:21	21:29	00:51	challenging
M 78	Neb	8.0	Ori	05h46m48.0s	+00°05'00"	18:21	21:35	01:06	challenging
M 37	Open	6.2	Aur	05h52m18.0s	+32°33'12"	18:15	21:40	02:24	easy
NGC 2129	Open	7.0	Gem	06h01m07.0s	+23°19'20"	18:14	21:49	02:24	obvious
NGC 2169	Open	7.0	Ori	06h08m24.0s	+13°57'54"	18:16	21:57	02:07	obvious
NGC 2175	Open	6.8	Ori	06h09m39.0s	+20°29'12"	18:28	21:57	01:37	detectable
M 35	Open	5.6	Gem	06h09m00.0s	+24°21'00"	18:19	21:57	02:15	easy
NGC 2237	Neb	5.5	Mon	06h32m02.0s	+04°59'10"	18:37	22:20	02:04	challenging
NGC 2264	Open	4.1	Mon	06h40m58.0s	+09°53'42"	18:30	22:29	02:30	obvious
M 41	Open	5.0	CMa	06h46m01.0s	-20°45'24"	20:57	22:34	00:10	easy
NGC 2301	Open	6.3	Mon	06h51m45.0s	+00°27'36"	19:08	22:39	02:10	easy
M 50	Open	7.2	Mon	07h02m42.0s	-08°23'00"	19:53	22:50	01:48	detectable
NGC 2353	Open	5.2	Mon	07h14m30.0s	-10°16'00"	20:14	23:02	01:50	easy
NGC 2355	Open	9.7	Gem	07h16m59.0s	+13°45'00"	20:22	23:05	01:47	difficult
NGC 2360	Open	9.1	CMa	07h17m43.0s	-15°38'30"	21:40	23:05	00:31	challenging
NGC 2393	Gal	14.6	Gem	07h30m04.6s	+34°01'40"	18:28	23:18	04:13	not visible
NGC 2392	PNe	8.6	Gem	07h29m10.8s	+20°54'42"	18:48	23:17	03:45	obvious
M 47	Open	4.3	Pup	07h36m35.0s	-14°29'00"	21:01	23:24	01:49	obvious
NGC 2423	Open	7.0	Pup	07h37m06.0s	-13°52'18"	20:56	23:25	01:52	easy
NGC 2439	Open	7.1	Pup	07h40m45.0s	-31°41'36"	21:18	23:28	01:39	easy
M 46	Open	6.6	Pup	07h41m46.0s	-14°48'36"	21:08	23:29	01:51	detectable
NGC 2440	PNe	11.5	Pup	07h41m55.4s	-18°12'31"	21:31	23:30	01:29	detectable
M 93	Open	6.5	Pup	07h44m30.0s	-23°51'24"	22:37	23:32	00:28	easy
NGC 2451	Open	3.7	Pup	07h45m23.0s	-37°57'21"	21:42	23:33	01:25	easy
NGC 2477	Open	5.7	Pup	07h52m10.0s	-38°31'48"	21:50	23:39	01:29	easy
NGC 2506	Open	8.9	Mon	08h00m01.0s	-10°46'12"	21:51	23:48	01:45	difficult
NGC 2547	Open	5.0	Vel	08h10m09.0s	-49°12'54"	23:21	23:57	00:34	detectable
NGC 2546	Open	5.2	Pup	08h12m15.0s	-37°35'42"	22:55	00:00	01:04	difficult
NGC 2571	Open	7.4	Pup	08h18m56.0s	-29°45'00"	21:51	00:07	02:23	easy
M 44	Open	3.9	Cnc	08h40m24.0s	+19°40'00"	20:23	00:28	04:33	easy
IC 2391	Open	2.6	Vel	08h40m32.0s	-53°02'00"	23:38	00:28	01:18	detectable
IC 2395	Open	4.6	Vel	08h42m30.0s	-48°06'48"	23:31	00:30	01:29	easy
M 67	Open	7.4	Cnc	08h51m18.0s	+11°48'00"	21:47	00:39	03:31	detectable
M 82	Gal	9.0	UMa	09h55m52.4s	+69°40'47"	19:39	01:43	05:48	easy
M 81	Gal	7.8	UMa	09h55m33.1s	+69°03'56"	19:54	01:43	05:46	detectable
NGC 3132	PNe	8.2	Vel	10h07m01.8s	-40°26'11"	00:05	01:54	03:44	easy
NGC 3132	PNe	8.2	Vel	10h07m01.8s	-40°26'11"	00:05	01:54	03:44	easy
NGC 3201	Glob	6.9	Vel	10h17m37.0s	-46°24'42"	00:45	02:05	03:24	challenging
NGC 3228	Open	6.4	Vel	10h21m22.0s	-51°43'42"	01:31	02:08	02:45	easy

ID	Cls	Mag	Con	RA 2000	Dec 2000	Begin	Best	End	Difficulty
NGC 3227	Gal	11.5	Leo	10h23m30.6s	+19°51'54"	23:13	02:11	05:10	difficult
NGC 3242	PNe	8.6	Hya	10h24m46.1s	-18°38'32"	00:17	02:12	04:07	obvious
M 97	PNe	11.0	UMa	11h14m47.7s	+55°01'09"	00:28	03:02	05:29	challenging
M 65	Gal	10.1	Leo	11h18m55.7s	+13°05'32"	23:46	03:06	05:44	detectable
M 66	Gal	9.7	Leo	11h20m14.9s	+12°59'30"	23:44	03:07	05:46	detectable
M 106	Gal	9.1	CVn	12h18m57.6s	+47°18'13"	00:03	04:06	05:46	detectable
M 84	Gal	10.1	Vir	12h25m03.9s	+12°53'12"	00:56	04:12	05:47	detectable
M 86	Gal	9.8	Vir	12h26m12.2s	+12°56'44"	01:12	04:13	05:46	detectable
3C 273.0	QSO	12.8	Vir	12h29m06.7s	+02°03'08"	01:17	04:16	05:49	difficult
3C 273.0	QSO	12.8	Vir	12h29m06.7s	+02°03'08"	01:17	04:16	05:49	difficult
M 49	Gal	9.3	Vir	12h29m46.8s	+08°00'01"	01:01	04:17	05:48	detectable
M 87	Gal	9.6	Vir	12h30m49.2s	+12°23'29"	01:00	04:18	05:47	detectable
NGC 4565	Gal	10.1	Com	12h36m20.8s	+25°59'15"	01:15	04:23	05:45	difficult
M 104	Gal	9.1	Vir	12h39m59.3s	-11°37'22"	01:47	04:27	05:48	detectable
M 68	Glob	7.3	Hya	12h39m28.0s	-26°44'36"	02:22	04:27	05:44	detectable
M 94	Gal	8.7	CVn	12h50m53.1s	+41°07'12"	00:11	04:38	05:50	easy
M 64	Gal	9.3	Com	12h56m43.8s	+21°41'00"	00:59	04:44	05:48	detectable
NGC 5195	Gal	10.5	CVn	13h29m59.6s	+47°15'58"	01:18	05:09	05:48	detectable
M 51	Gal	8.7	CVn	13h29m52.3s	+47°11'40"	00:33	05:10	05:50	easy
NGC 5128	Gal	7.8	Cen	13h25m27.7s	-43°01'07"	03:35	05:11	05:52	difficult
NGC 5139	Glob	3.9	Cen	13h26m46.0s	-47°28'36"	04:34	05:13	05:42	detectable
M 3	Glob	6.3	CVn	13h42m11.0s	+28°22'42"	01:24	05:15	05:50	easy
M 101	Gal	8.4	UMa	14h03m12.4s	+54°20'53"	01:48	05:17	05:46	detectable
M 83	Gal	7.8	Hya	13h37m00.8s	-29°51'56"	03:18	05:17	05:48	detectable
M 5	Glob	5.7	Ser	15h18m34.0s	+02°05'00"	03:28	05:26	05:49	easy
M 13	Glob	5.8	Her	16h41m41.0s	+36°27'36"	03:26	05:27	05:48	easy
M 92	Glob	6.5	Her	17h17m07.0s	+43°08'12"	03:45	05:28	05:49	easy
NGC 6543	PNe	8.3	Dra	17h58m33.4s	+66°37'59"	03:30	05:29	05:58	obvious
NGC 5897	Glob	8.4	Lib	15h17m24.0s	-21°00'36"	04:50	05:29	05:43	difficult
M 12	Glob	6.1	Oph	16h47m14.0s	-01°56'48"	05:10	05:30	05:48	easy
M 10	Glob	6.6	Oph	16h57m09.0s	-04°06'00"	05:29	05:30	05:44	detectable
M 80	Glob	7.3	Sco	16h17m02.0s	-22°58'30"	04:58	05:32	05:46	detectable
NGC 5460	Open	6.1	Cen	14h07m27.0s	-48°20'36"	04:41	05:34	05:54	challenging
NGC 5986	Glob	7.6	Lup	15h46m03.0s	-37°47'12"	05:23	05:37	05:46	detectable

A.V.A.C. Information

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The Club has three categories of membership.

- Family membership at $30.00 per year.
- Individual membership at $25.00 per year.
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