



Desert Sky Observer

Volume 34

Antelope Valley Astronomy Club Newsletter

April 2014

Up-Coming Events

- April 4: Scouts @ [Devils Punchbowl](#)
- April 4: [Public Night at the SAGE](#)
- April 5: [Prime Desert Moon Walk](#)
- April 9: [Board Meeting](#)
- April 11: Club Meeting*
- April 26-27: Poppy Festival

* 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 Frank Moore

Yes folks, I know, “Here he goes talking about the weather again.”

Rose and I have just finished unloading the cars after the Messier Marathon at Saddleback Butte State Park yesterday. Yes...CARS, plural, as it took two cars to haul two telescopes and all of the picnic supplies to the event. Of course, the irony is that due to the weather, we never set the telescopes up.

Some of you may have been scared away by the weather, and while we had some winds and later the clouds closed in on the star party, we still had a fantastic barbeque with the most succulent and tasty burgers and dogs. (OK...I’m biased because I was the BBQ chef.) Half a dozen members of the Local Group Astronomy Club, out of the Santa Clarita Valley, also came to the event as our invited guests and we were able to discuss future events with both clubs.

Since the event was also planned as a public star party for the Save Saddleback Butte State Park Committee, we also had visits from Margaret Rhyne of the Poppy Reserve Mojave Desert Interpretive Association (PRMDIA), and Mark Faul who is a retired state park ranger who is affiliated with half a dozen Kern and Los Angeles county nature and open space groups. With the skies clouded over, we really had the time to talk and lay the groundwork for a few stargazing sites we may be able to try in the future. One is an equestrian staging center on the eastern side of the Saddleback Butte, but within the state park, which means we would be more shielded from the lights of Lancaster/Palmdale and Lake Los Angeles. We plan on making an appointment to go look at it sometime in the near future.

The weather scared most of the public outreach crowd away but we had a few carloads show up and, with Matt Leone’s 16” dob set up we were able to share views of Jupiter, the Orion Nebula, the Andromeda Galaxy, and a few other deep sky objects with them through holes in the clouds. By the time Rose and I got home to Tehachapi, it was just beginning to rain so it seems we left just in time. We barely had time to get the cars unloaded before it started getting wet outside.

We have some big events coming up in April so keep your calendars open for stargazing adventures. We have an education and outreach event for Brownie Scouts at Devils Punchbowl on April 4. We will be having an event in the parking lot of the SAGE Planetarium for the lunar eclipse on the the night of April 14 and into the morning of April 15. Of course, we have our biggest outreach of the year, the California Poppy Festival on April 26 and 27, where we will be having our booth and solar outreach both days. We always need help at this event so volunteer if you can only spend a few hours manning the booth, helping with the telescopes, and sharing your enthusiasm for astronomy with the public. There really isn't much that's more satisfying than the, "Oooh", "Ahhh" and "Oh my gosh" you get when you share the sun, moon, planets, and stars with the public. Plus, they'll think you're really smart. (Fooled 'em again didn't we.)

We'll have detailed announcements about these events as they get closer.

Remember, help preserve dark skies. Turn out unnecessary outdoor lights, use dark sky friendly fixtures, and consciously think about your "light footprint". If you're aware of what you do, you can always make a difference.



Vice President

Rose Moore

Spring is here, and that means warmer weather is coming!

We have speakers lined up till July. Our next speaker for April's meeting is Dr. Luisa Rebull, research astronomer/scientist from the Spitzer Science Center. Topic to be announced. Also coming up is Chris Estrada for May, topic will be on his double star research at Mt. Wilson. And Jeff Lagrange joins us in June for a talk on the Goldstone Radio Telescope, and Diana Darus from JPL for July!

Our summer picnic will be at Brite Lake again this year, on Saturday August 23rd! We'll be posting a potluck sign up sheet and more info as we get closer to summer. After our picnic, we will be having a public star party. Our Christmas Party will be on Saturday December 6th, at Julianni's Restaurant in Lancaster. This will be a buffet this year, and menu and other info to be announced.

Check out Don's announcements below, and come on out to support your club! We guarantee you will also have fun while you're participating!!

Clear skies,

Rose



Director of Community Development

Don Bryden

Has everyone recovered from the Messier Marathon? I hope so for we have several outreach events coming up! I hope this reaches you before the 4th because that weekend will be a busy one. First, come out to Devil's Punchbowl and share your view of the night sky with the Acton Girl Scouts. Ranger Dave Numer will have the visitor's center open late and we'll get together around 7pm for a short discussion of the constellations then as night falls we'll move to the scopes and take a look.

Of course the next night is another Prime Desert Moonwalk. We've had good attendance so far this year so I expect a big crowd if the skies are nice. Come out to set up between 7 to 7:30 and the walk will start around 8pm.

You won't want to miss this next event as the night of the 14th and into the morning of the 15th we'll meet at the SAGE Planetarium for the first of two total lunar eclipses for 2014. Jeremy will have the SAGE open for viewing and comfort and we'll have a number of scopes set up out in the parking lot to watch the event. By the way, on the 14th before the eclipse, Mars will be just past opposition and at its closest approach to the Earth since 2008 (no, it will NOT be as big as the moon!). Still, it will look as big and as bright as ever so come early to see Mars and stay late for the eclipse.

Finally, it's almost time for the Annual Antelope Valley Poppy Festival! Stop by our booth and say hi or come and help out by running the solar scopes, Sunspotter or running the booth. If you want to help set up or if you have a scope to bring out please let me or Rose know and we'll be sure to get you a badge and parking pass. We'll be there all weekend from April 26th through the 27th so come on out!

Space Place

Old Tool, New Use: GPS and the Terrestrial Reference Frame

By Alex H. Kasprak

Flying over 1300 kilometers above Earth, the Jason 2 satellite knows its distance from the ocean down to a matter of centimeters, allowing for the creation of detailed maps of the ocean's surface. This information is invaluable to oceanographers and climate scientists. By understanding the ocean's complex topography—its barely perceptible hills and troughs—these scientists can monitor the pace of sea level rise, unravel the intricacies of ocean currents, and project the effects of future climate change.

But these measurements would be useless if there were not some frame of reference to put them in context. A terrestrial reference frame, ratified by an international group of scientists, serves that purpose. "It's a lot like air," says JPL scientist Jan Weiss. "It's all around us and is vitally important, but people don't really think about it." Creating such a frame of reference is more of a challenge than you might think, though. No point on the surface of Earth is truly fixed.

To create a terrestrial reference frame, you need to know the distance between as many points as possible. Two methods help achieve that goal. Very-long baseline interferometry uses multiple radio antennas to monitor the signal from something very far away in space, like a quasar. The distance between the antennas can be calculated based on tiny changes in the time it takes the signal to reach them. Satellite

laser ranging, the second method, bounces lasers off of satellites and measures the two-way travel time to calculate distance between ground stations.



Artist's interpretation of the Jason 2 satellite. To do its job properly, satellites like Jason 2 require as accurate a terrestrial reference frame as possible. Image courtesy: NASA/JPL-Caltech.

geospatially. This could be good news for missions like Jason 2. Slight errors in the terrestrial reference frame can create significant errors where precise measurements are required. GPS stations could prove to be a vital and untapped resource in the quest to create the most accurate terrestrial reference frame possible. “The thing about GPS,” says Weiss, “is that you are just so data rich when compared to these other techniques.”

You can learn more about NASA’s efforts to create an accurate terrestrial reference frame here: <http://space-geodesy.nasa.gov/>.

Kids can learn all about GPS by visiting <http://spaceplace.nasa.gov/gps> and watching a fun animation about finding pizza here: <http://spaceplace.nasa.gov/gps-pizza>.

Weiss and his colleagues would like to add a third method into the mix—GPS. At the moment, GPS measurements are used only to tie together the points created by very long baseline interferometry and satellite laser ranging together, not to directly calculate a terrestrial reference frame.

“There hasn’t been a whole lot of serious effort to include GPS directly,” says Weiss. His goal is to show that GPS can be used to create a terrestrial reference frame on its own. “The thing about GPS that’s different from very-long baseline interferometry and satellite laser ranging is that you don’t need complex and expensive infrastructure and can deploy many stations all around the world.”

Feeding GPS data directly into the calculation of a terrestrial reference frame could lead to an even more accurate and cost effective way to reference points

Astrophoto of The Month



2007 Lunar Eclipse by Don Bryden

Composite of images taken from first contact to last with a Nikon D300 piggybacked on a Schaefer Mount.

April Sky Data

First Qtr
Apr 7

Full
Apr 15

Last Qtr
Apr 22

New
Apr 28



**Best time for deep sky observing this month:
April 20 through April 30**

Mercury might just be spotted low above the horizon near sunrise at the beginning of the month but, as it passes through superior conjunction with the Sun on the 26th of April will not be visible for the remainder of the month.

As April begins, **Venus** rises just before the onset of morning twilight but is still at less than 10 degrees elevation at sunrise. But, shining with a magnitude of -4.4, will still be easy to spot given a good low eastern horizon. During the month it moves nearer to the Sun, its magnitude drops to -4.2 whilst its angular diameter shrinks from 22 to 17 arc seconds.

Mars, lying in Virgo, reaches opposition on April 8th, so is visible from dusk to dawn and is due south around 2am at the start of the month and ~11pm at its end. Its brightness reaches a maximum of magnitude -1.5 in the second week of the month - matching that of Sirius. Mars is actually closest to us on the 14th April when its angular size reaches 15.16 arc seconds and it remains greater than 14.5 arc seconds throughout the remainder of the month.

This month **Jupiter** is a little past its best and should be viewed soon after night fall when it is closest to the meridian and so highest in the sky. Shining at magnitude -2.2 (falling to magnitude -2 during the month) it is visible for much of the evening.

Saturn rises at about 10:30 at the start of the month and at about 8:30 pm at its end. Lying in Libra, it is shining with a magnitude of +0.1 by late April. The rings (with a diameter of ~40 arc seconds) have now opened to around 22 degrees from the line of sight so presenting a magnificent view.

The Lyrid **meteor shower** lasts from about April 16 to 25. Lyrid meteors tend to be bright and often leave trails. About 10-20 meteors per hour can be expected at their peak. The radiant for this shower is near the bright star Vega in the constellation Lyra which rises in the northeast at about 10 p.m. on April evenings. The peak morning is April 22, but you might also see meteors before and after that date.

Sun and Moon Rise and Set

| Date | Moonrise | Moonset | Sunrise | Sunset |
|-----------|----------|---------|---------|--------|
| 4/1/2014 | 07:50 | 21:34 | 06:38 | 19:13 |
| 4/5/2014 | 10:53 | 00:20 | 06:33 | 19:16 |
| 4/10/2014 | 16:18 | 04:41 | 07:26 | 20:20 |
| 4/15/2014 | 21:07 | 07:31 | 07:19 | 20:24 |
| 4/20/2014 | 01:07 | 11:43 | 07:13 | 20:28 |
| 4/25/2014 | 04:49 | 17:07 | 07:07 | 20:32 |
| 4/30/2014 | 08:08 | 22:16 | 07:02 | 20:36 |

Planet Data

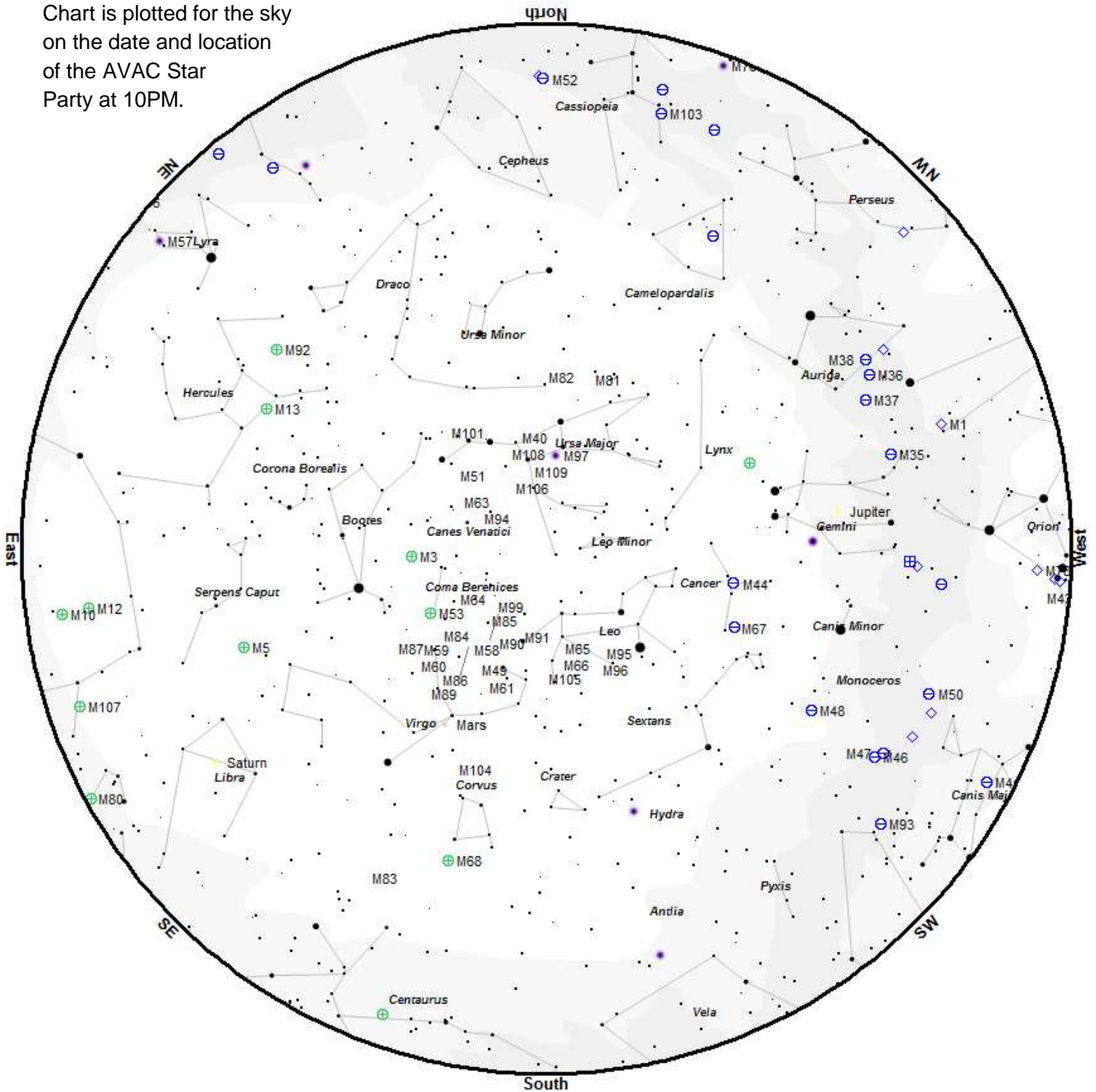
| | Apr 1 | | | |
|----------------|-------|---------|-------|------|
| | Rise | Transit | Set | Mag |
| Mercury | 05:48 | 11:41 | 17:32 | -0.2 |
| Venus | 04:27 | 10:02 | 15:36 | -4.3 |
| Mars | 19:42 | 01:32 | 07:22 | -1.4 |
| Jupiter | 11:40 | 19:00 | 02:17 | -2.2 |
| Saturn | 22:10 | 03:32 | 08:53 | 0.3 |

| | Apr 15 | | | |
|----------------|--------|---------|-------|------|
| | Rise | Transit | Set | Mag |
| Mercury | 05:54 | 12:13 | 18:34 | -1.0 |
| Venus | 04:19 | 10:05 | 15:52 | -4.2 |
| Mars | 18:22 | 00:17 | 06:11 | -1.4 |
| Jupiter | 10:51 | 18:11 | 01:28 | -2.2 |
| Saturn | 21:11 | 02:33 | 07:56 | 0.2 |

| | Apr 31 | | | |
|----------------|--------|---------|-------|------|
| | Rise | Transit | Set | Mag |
| Mercury | 06:14 | 13:10 | 20:09 | -1.8 |
| Venus | 04:07 | 10:10 | 16:11 | -4.1 |
| Mars | 17:01 | 22:59 | 04:58 | -1.2 |
| Jupiter | 10:02 | 17:21 | 00:37 | -2.1 |
| Saturn | 20:07 | 01:30 | 06:53 | 0.1 |

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

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



| | | | | | | | |
|-----------------|---|---|---|---|---|--------------------|------------------|
| Star Magnitudes | | | | | | Galaxy | Nebula |
| 0 | 1 | 2 | 3 | 4 | 5 | | |
| | | | | | | 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 | Con | RA 2000 | Dec 2000 | Mag | Begin | Best | End | Difficulty |
|----------|------|-----|-------------|------------|------|-------|-------|-------|-------------|
| NGC 2477 | Open | Pup | 07h52m10.0s | -38°31'48" | 5.7 | 20:40 | 20:50 | 21:04 | easy |
| NGC 2451 | Open | Pup | 07h45m23.0s | -37°57'21" | 3.7 | 20:40 | 20:50 | 21:04 | easy |
| NGC 2546 | Open | Pup | 08h12m15.0s | -37°35'42" | 5.2 | 20:39 | 20:54 | 21:24 | difficult |
| M 41 | Open | CMA | 06h46m01.0s | -20°45'24" | 5.0 | 20:44 | 20:55 | 21:10 | easy |
| NGC 2439 | Open | Pup | 07h40m45.0s | -31°41'36" | 7.1 | 20:42 | 20:55 | 21:14 | detectable |
| M 93 | Open | Pup | 07h44m30.0s | -23°51'24" | 6.5 | 20:43 | 20:59 | 21:39 | easy |
| NGC 3228 | Open | Vel | 10h21m22.0s | -51°43'42" | 6.4 | 20:37 | 20:59 | 21:39 | challenging |
| NGC 2571 | Open | Pup | 08h18m56.0s | -29°45'00" | 7.4 | 20:44 | 20:59 | 21:38 | detectable |
| NGC 2360 | Open | CMA | 07h17m43.0s | -15°38'30" | 9.1 | 20:43 | 21:01 | 21:45 | challenging |
| M 50 | Open | Mon | 07h02m42.0s | -08°23'00" | 7.2 | 20:47 | 21:01 | 21:34 | detectable |
| NGC 2440 | PNe | Pup | 07h41m55.4s | -18°12'31" | 11.5 | 20:49 | 21:01 | 21:25 | difficult |
| NGC 2353 | Open | Mon | 07h14m30.0s | -10°16'00" | 5.2 | 20:42 | 21:02 | 21:53 | easy |
| NGC 2423 | Open | Pup | 07h37m06.0s | -13°52'18" | 7.0 | 20:45 | 21:02 | 21:48 | easy |
| M 46 | Open | Pup | 07h41m46.0s | -14°48'36" | 6.6 | 20:46 | 21:02 | 21:42 | detectable |
| M 47 | Open | Pup | 07h36m35.0s | -14°29'00" | 4.3 | 20:43 | 21:03 | 22:02 | obvious |
| NGC 2237 | Neb | Mon | 06h32m02.0s | +04°59'10" | 5.5 | 20:44 | 21:03 | 21:53 | challenging |
| NGC 2301 | Open | Mon | 06h51m45.0s | +00°27'36" | 6.3 | 20:46 | 21:03 | 21:51 | easy |
| NGC 2506 | Open | Mon | 08h00m01.0s | -10°46'12" | 8.9 | 20:52 | 21:04 | 21:18 | difficult |
| NGC 3201 | Glob | Vel | 10h17m37.0s | -46°24'42" | 6.9 | 20:41 | 21:04 | 22:03 | not visible |
| NGC 2264 | Open | Mon | 06h40m58.0s | +09°53'42" | 4.1 | 20:45 | 21:05 | 21:15 | easy |
| NGC 2129 | Open | Gem | 06h01m07.0s | +23°19'20" | 7.0 | 20:44 | 21:05 | 21:08 | obvious |
| NGC 3132 | PNe | Vel | 10h07m01.8s | -40°26'11" | 8.2 | 20:40 | 21:05 | 22:25 | easy |
| NGC 3132 | PNe | Vel | 10h07m01.8s | -40°26'11" | 8.2 | 20:40 | 21:05 | 22:25 | easy |
| M 36 | Open | Aur | 05h36m18.0s | +34°08'24" | 6.5 | 20:46 | 21:06 | 21:06 | easy |
| M 35 | Open | Gem | 06h09m00.0s | +24°21'00" | 5.6 | 20:48 | 21:06 | 21:18 | easy |
| NGC 2175 | Open | Ori | 06h09m39.0s | +20°29'12" | 6.8 | 20:50 | 21:06 | 21:10 | detectable |
| M 37 | Open | Aur | 05h52m18.0s | +32°33'12" | 6.2 | 20:47 | 21:07 | 21:21 | easy |
| NGC 2355 | Open | Gem | 07h16m59.0s | +13°45'00" | 9.7 | 20:53 | 21:07 | 21:41 | difficult |
| NGC 1502 | Open | Cam | 04h07m50.0s | +62°19'54" | 4.1 | 20:40 | 21:08 | 23:40 | obvious |
| NGC 2392 | PNe | Gem | 07h29m10.8s | +20°54'42" | 8.6 | 20:41 | 21:08 | 22:30 | obvious |
| NGC 2393 | Gal | Gem | 07h30m04.6s | +34°01'40" | 14.6 | 20:44 | 21:09 | 23:00 | not visible |
| M 67 | Open | Cnc | 08h51m18.0s | +11°48'00" | 7.4 | 20:50 | 21:11 | 22:38 | detectable |
| M 44 | Open | Cnc | 08h40m24.0s | +19°40'00" | 3.9 | 20:45 | 21:12 | 23:32 | easy |
| NGC 3242 | PNe | Hya | 10h24m46.1s | -18°38'32" | 8.6 | 20:37 | 21:15 | 22:52 | obvious |
| NGC 3227 | Gal | Leo | 10h23m30.6s | +19°51'54" | 11.5 | 20:49 | 21:20 | 23:59 | difficult |
| M 82 | Gal | UMa | 09h55m52.4s | +69°40'47" | 9.0 | 20:48 | 21:22 | 02:33 | detectable |
| M 81 | Gal | UMa | 09h55m33.1s | +69°03'56" | 7.8 | 20:48 | 21:22 | 02:14 | detectable |
| M 97 | PNe | UMa | 11h14m47.7s | +55°01'09" | 9.7 | 20:48 | 21:47 | 02:07 | detectable |

| ID | Cls | Con | RA 2000 | Dec 2000 | Mag | Begin | Best | End | Difficulty |
|----------|------|-----|-------------|------------|------|-------|-------|-------|-------------|
| M 65 | Gal | Leo | 11h18m55.7s | +13°05'32" | 10.1 | 20:46 | 21:51 | 01:13 | detectable |
| M 66 | Gal | Leo | 11h20m14.9s | +12°59'30" | 9.7 | 20:47 | 21:52 | 01:13 | detectable |
| M 106 | Gal | CVn | 12h18m57.6s | +47°18'13" | 9.1 | 20:51 | 22:50 | 02:49 | detectable |
| Col 256 | Open | Com | 12h25m06.0s | +26°06'00" | 2.9 | 20:46 | 22:56 | 03:12 | easy |
| M 84 | Gal | Vir | 12h25m03.9s | +12°53'12" | 10.1 | 20:50 | 22:56 | 02:11 | detectable |
| M 86 | Gal | Vir | 12h26m12.2s | +12°56'44" | 9.8 | 20:53 | 22:57 | 01:55 | detectable |
| M 49 | Gal | Vir | 12h29m46.8s | +08°00'01" | 9.3 | 20:49 | 23:01 | 02:13 | detectable |
| M 87 | Gal | Vir | 12h30m49.2s | +12°23'29" | 9.6 | 20:50 | 23:03 | 02:17 | detectable |
| NGC 4565 | Gal | Com | 12h36m20.8s | +25°59'15" | 10.1 | 20:52 | 23:08 | 02:20 | difficult |
| M 68 | Glob | Hya | 12h39m28.0s | -26°44'36" | 7.3 | 21:12 | 23:11 | 01:12 | detectable |
| M 104 | Gal | Vir | 12h39m59.3s | -11°37'22" | 9.1 | 20:52 | 23:11 | 01:52 | detectable |
| M 94 | Gal | CVn | 12h50m53.1s | +41°07'12" | 8.7 | 20:47 | 23:22 | 03:45 | detectable |
| M 64 | Gal | Com | 12h56m43.8s | +21°41'00" | 9.3 | 20:50 | 23:28 | 03:10 | detectable |
| NGC 5128 | Gal | Cen | 13h25m27.7s | -43°01'07" | 7.8 | 22:26 | 23:57 | 01:26 | challenging |
| NGC 5139 | Glob | Cen | 13h26m46.0s | -47°28'36" | 3.9 | 23:27 | 23:58 | 00:29 | challenging |
| NGC 5195 | Gal | CVn | 13h29m59.6s | +47°15'58" | 10.5 | 20:54 | 00:01 | 03:58 | detectable |
| M 51 | Gal | CVn | 13h29m52.3s | +47°11'40" | 8.7 | 20:49 | 00:02 | 04:34 | easy |
| M 83 | Gal | Hya | 13h37m00.8s | -29°51'56" | 7.8 | 22:06 | 00:09 | 02:12 | detectable |
| M 3 | Glob | CVn | 13h42m11.0s | +28°22'42" | 6.3 | 20:51 | 00:13 | 04:18 | easy |
| M 101 | Gal | UMa | 14h03m12.4s | +54°20'53" | 8.4 | 21:00 | 00:34 | 04:30 | detectable |
| NGC 5460 | Open | Cen | 14h07m27.0s | -48°20'36" | 6.1 | 23:36 | 00:39 | 01:42 | not visible |
| M 5 | Glob | Ser | 15h18m34.0s | +02°05'00" | 5.7 | 22:26 | 01:49 | 04:46 | easy |
| NGC 5897 | Glob | Lib | 15h17m24.0s | -21°00'36" | 8.4 | 00:14 | 01:49 | 03:24 | challenging |
| NGC 5986 | Glob | Lup | 15h46m03.0s | -37°47'12" | 7.6 | 01:03 | 02:17 | 03:31 | difficult |
| M 80 | Glob | Sco | 16h17m02.0s | -22°58'30" | 7.3 | 01:36 | 02:48 | 03:58 | detectable |
| M 13 | Glob | Her | 16h41m41.0s | +36°27'36" | 5.8 | 22:41 | 03:12 | 04:53 | easy |
| M 12 | Glob | Oph | 16h47m14.0s | -01°56'48" | 6.1 | 23:56 | 03:18 | 04:53 | easy |
| M 10 | Glob | Oph | 16h57m09.0s | -04°06'00" | 6.6 | 00:36 | 03:28 | 04:49 | detectable |
| M 92 | Glob | Her | 17h17m07.0s | +43°08'12" | 6.5 | 23:09 | 03:47 | 04:52 | easy |
| NGC 6543 | PNe | Dra | 17h58m33.4s | +66°37'59" | 8.3 | 22:13 | 04:10 | 05:02 | obvious |

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

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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.

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