Nightfall

Monthly publication of the Huachuca Astronomy Club

MARCH 2015

President's Notes

Orion Setting, Leo Well Up: the "Realm of the Galaxies" Beckons

Hope you are all well rested because it's April and we are going to get busy. The nighttime temperatures are getting comfortable to stay out and view more than just that one special object and run back inside, and that is a good thing because there are a lot objects out there waiting to share their photons with us. I hope that you have had a nice warm-up when you did the Messier Marathon in late March. That introduction to faint fuzzies will really help when you begin looking for all of the deep-sky objects available to even a modest telescope in the constellations of Leo, Virgo, and Coma Berenices.

If you have tried the marathon before with a small telescope, you know you didn't have a long time to linger in that neighborhood because you needed the time to find 25 of the those little ovals of light in the otherwise guide-star-free areas of space. If you were running the marathon with a big scope, you know that the problem was that there are so many galaxies in the area it can be hard to pinpoint the Messier objects from amongst the multitude of other NGC galaxies. I'm sure there is a happy middle ground for scope size with which to do a marathon, but that is not the point here, and we would never reach an agreement anyway. Either way or whether you went through the marathon or not, now is the time to become a vagrant in the vicinity of Virgo.

Park yourself around M86, slap in a nice wide field, medium-low power eyepiece, and slowly work your way southeast from there, stopping anytime you have a hint there may be something else right at the limit of your vision. Maybe draw the field stars and put a little oval where you have a hunch. You will probably nail one of the Mag 11.xx, galaxies that eluded Messier; congrats! Now repeat those actions till you get over to M60, and take a count. You have just done a Virgo Cluster mini-marathon.

Speaking of vagrancy, we have a lot of outreach opportunities in April and we would love it if you came to them for at least two reasons. First, I think you would really love to come to these star parties, and secondly, in this club we hardly see each other unless it is during a general meeting, and then I know I don't get to talk to people one on one, so I'm thinking that happens to you as well. During April, we will have both daytime and nighttime events, so everyone's interests should be met. So, come on out.

April Meeting Note

The April meeting of the Huachuca Astronomy Club will be held in the Cochise College library main lobby at 7PM on April 3, 2015. Our guest speaker is Rob Zellem and his talk is entitled: “Exoplanets: Finding the Next Earth”

We will treat Rob to dinner at the Outback Steakhouse at 5pm. Everyone is invited to join us for dinner. Please RSVP to Ted Forte (tedforte511 at gmail dot com) if you will attend the dinner so we can reserve the proper size table.

Rob is a 5th year PhD candidate at the University of Arizona's Lunar and Planetary Laboratory, set to graduate in May. His love for astronomy and planetary science began at a very early age with multiple viewings of Star Wars and when he would look up to the night sky and wonder "are we alone?” In order to find extraterrestrial life, he received his Bachelor of Science in Astronomy & Astrophysics from Villanova University in 2008 and his Masters of Science in Space Science from University College London in 2009. Since 2010, he has been studying transiting exoplanets at the Lunar and Planetary Laboratory. Using observations from both ground and space-based platforms, he determines the thermal structure and molecular abundances of these extrasolar planets. After graduating with his PhD in May of 2015, he aims to work at a NASA center to help develop future space missions to better characterize these interesting objects.

Welcome our new members

Joining at the March meeting we welcome Tina and Joseph Hagy and Charles and Maisha Aulbach. We also welcome Hollis McCray and Ligeah Balmer who joined at the Kartchner Star Party. Welcome to the club, we are glad you joined.

Patterson Observatory Update

The patio area at the Patterson Observatory has been enlarged to give us more room for conducting public events. The existing pedestal lights are being replaced with receptacles so that we can plug in telescopes without tripping over cords.

David Roemer is working out the requirements for adapting the new Alpy 600 Spectrometer to the 20-inch. Once he identifies the best available options for the cameras we need, we will be asking the Foundation to make the purchases of the camera, software and the necessary adapters to get the spectrometer ready to use.

We are also working on mounting an optical tube onto the main telescope to serve as a platform for video presentation. In the near future, we should be displaying video for our guests so they can see where the main telescope is aimed while waiting in line.

The long awaited restroom extension is also in the works. Hopefully, a contract to construct a lavatory will be approved this year.

The Patterson Observatory is owned by the University South Foundation and operated by HAC volunteers. We are always happy to have new volunteers. All you have to do to get on the team is show up.

HAC’s “Outreach Stars” recognized

At the March meeting, Night Sky Network certificates and pins were awarded to our 2014 outreach stars. Congratulations to Rick Burke, Ken Duncan, Ted Forte, Bob Gent, Gary Grue, Nancy Hannaford, Bob Hoover, Bert Kelher, Cindy Lund and David Roemer. Thanks for all you do to bring astronomy to the public.

Letter from the Cochise County Association of Astronomical Observatories to the Sierra Vista City Council

Written by Gary Grue and Bob Gent
Cochise County Association of Astronomical Observatories
5515 E. Lantana Drive,
Sierra Vista AZ 85650

March 11, 2015

Mayor and City Council
City of Sierra Vista
1101 N. Coronado Avenue
Sierra Vista Arizona, 85635

Dear Honorable Mayor Mueller and Honorable City Council Members,

We applaud the Sierra Vista AZ Planning and Zoning Commission along with Planning and Zoning Department for all their efforts in the proposed outdoor lighting ordinances within the city of Sierra Vista. We also strongly agree with the recommendations made by the Planning and Zoning Commission on holding the LED digital signage to a maximum of 100 nits at night. We urge the Sierra Vista City Council to support this commission recommendation.

We may be the first city in the country to adopt such a standard in restricting LED signage brightness, and this will greatly help preserve our wonderful dark night skies. We also support the recommendations to add new residential shielding requirements, to lower lumen density, and to add a maximum correlated color temperature.

The Cochise County Association of Astronomical Observatories (CCAAO) is a consortium of more than 50 privately owned astronomical observatories throughout Cochise County and nearby bordering observatories. Many of our observatories are located near and inside Sierra Vista.

We contribute significantly to the science of astronomy. For example, our members have discovered more than 500 minor planets, including some potentially hazardous Near Earth Objects. We are active in many other astronomical research projects including comet discoveries, supernovae searches, and variable star studies. Some of our members provide important data to professional astronomers the world over.

In closing, we strongly agree with the recommendations made by the Planning and Zoning Commission to allow for a maximum of 100 nits for LED digital signs at night along with the proposed outdoor lighting reductions in total lumen levels, adding residential shielding requirements, and setting a maximum color temperature to 3,000K. These actions will lower outdoor light pollution and more importantly, they will protect our beautiful night skies for future generations.

We encourage you to support the Planning and Zoning Commission and approve their recommendations.

Sincerely,

Gary Grue, CCAAO spokesman

Kartchner Caverns Star Night

By Bob Gent

Another successful astronomy event is history.

We started the afternoon with solar observing of sunspots and prominences through filtered telescopes. This was made possible by the high tech telescopes that Rick, David and Nancy, Bert, Ken, and others brought. The weather was quite breezy and partly cloudy, but we were able to see through the breaks in the clouds. During early afternoon, the seeing was not good due to high winds, but later in the afternoon and evening, it improved.

During the solar observing, we had a surprise-distinguished visitor. One man walked up to my solar telescope, and we spoke a while about the astronomy events at Kartchner. I asked who he was and he said "I am Gary, the co-discoverer of Kartchner Caverns." Ted and I talked to discoverer Gary Tenen and took quite a few photos. Here's one of my photos.

Thanks to the Planetary Science Institute, I was able to show off some rare meteorites during the afternoon. Many were amazed to be able to hold pieces of Mars and Vesta in their hands. Thanks to PSI for making this possible!

At 5:30 pm, NASA Solar System Ambassador, Ted Forte, gave a great talk about the robotic exploration of the giant asteroid Vesta, the Dwarf planet Ceres, Saturn, Mars, and more. His handouts for the children were quite

popular. We also discussed the importance of dark skies and the outdoor lighting codes of Cochise County and Sierra Vista.

After Ted's talk, we met back in the observing areas where we were pleasantly surprised to see more telescopes. Several people from Tucson, including TAAA set up scopes. Ted brought his 18-incher, and I saw a very good view of Comet Lovejoy though it. Bill and Katherine brought their new 10-inch Meade SCT. One person, from TAAA brought a 20-inch Dobsonian telescope -- Thanks to all for bringing scopes! Here's a photo showing a few of us setting up and waiting for the skies to get dark.

We had great views of Jupiter, including a shadow transit of one of the Galilean moons. At my scope, we also observed the Double Cluster, the Great Orion Nebula, the Pleiades, and other wonders of the night sky. Throughout the day and evening we had to look around the partly cloudy skies, but there were enough clear spots for us to do some fairly good observing.

The event was well attended. For the evening observing, we'd estimate more than 100 people observed through our telescopes. The campground was full, and there was a wedding that night. The man whose daughter was being married visited me a couple times.

Thank you to all and clear skies

The heavyweight champion of the Cosmos

By Dr. Ethan Siegel

As crazy as it once seemed, we once assumed that the Earth was the largest thing in all the universe. 2,500 years ago, the Greek philosopher Anaxagoras was ridiculed for suggesting that the Sun might be even larger than the Peloponnesus peninsula, about 16% of modern-day Greece. Today, we know that planets are dwarfed by stars, which themselves are bound together by the billions or even trillions into galaxies.

But gravitationally bound structures extend far beyond galaxies, which themselves can bind together into massive clusters across the cosmos. While dark energy may be driving most galaxy clusters apart from one another, preventing our local group from falling into the Virgo Cluster, for example, on occasion, huge galaxy clusters can merge, forming the largest gravitationally bound structures in the universe.

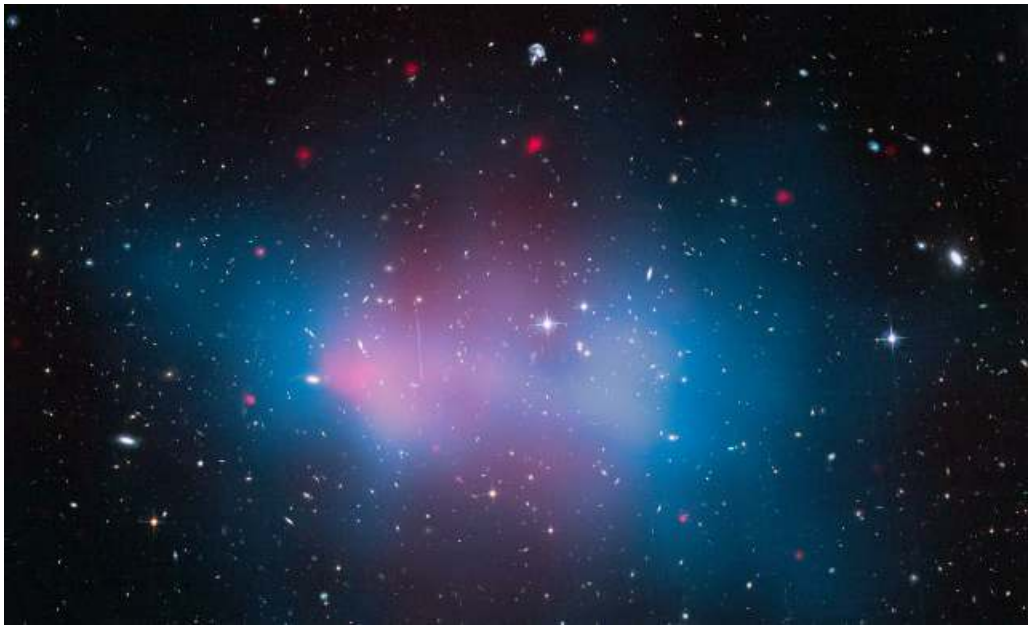
Take the "El Gordo" galaxy cluster, catalogued as ACT-CL J0102-4915. It's the largest known galaxy cluster in the distant universe. A galaxy like the Milky Way might contain a few hundred billion stars and up to just over a trillion (10^{12}) solar masses worth of matter, the El Gordo cluster has an estimated mass of 3×10^{15} solar masses, or 3,000 times as much as our own galaxy! The way we've figured this out is fascinating. By seeing how the shapes of background galaxies are distorted into more elliptical-than-average shapes along a particular set of axes, we can reconstruct how much mass is present in the cluster: a phenomenon known as weak gravitational lensing.

That reconstruction is shown in blue, but doesn't match up with where the X-rays are, which are shown in pink! This is because, when galaxy clusters collide, the neutral gas inside heats up to emit X-rays, but the individual galaxies (mostly) and dark matter (completely) pass through one another, resulting in a displacement of the cluster's mass from its center. This has been observed before in objects like the Bullet Cluster, but El Gordo is much younger and farther away. At 10 billion light-years distant, the light reaching us now was emitted more than 7 billion years ago, when the universe was less than half its present age.

It's a good thing, too, because about 6 billion years ago, the universe began accelerating, meaning that El Gordo just might be the largest cosmic heavyweight of all. There's still more universe left to explore, but for right now, this is the heavyweight champion of the distant universe!

Learn more about "El Gordo" here: http://www.nasa.gov/press/2014/april/nasa-hubble-team-finds-monster-el-gordo-galaxy-cluster-bigger-than-thought/

El Gordo is certainly huge, but what about really tiny galaxies? Kids can learn about satellite galaxies at NASA's Space Place http://spaceplace.nasa.gov/satellite-galaxies/



mage credit: NASA, ESA, J. Jee (UC Davis), J. Hughes (Rutgers U.), F. Menanteau (Rutgers U. and UIUC), C. Sifon (Leiden Observatory), R. Mandelbum (Carnegie Mellon U.), L. Barrientos (Universidad Catolica de Chile), and K. Ng (UC Davis). X-rays are shown in pink from Chandra; the overall matter density is shown in blue, from lensing derived from the Hubble space telescope. 10 billion light-years distant, El Gordo is the most massive galaxy cluster ever found.

Catch a sunrise lunar eclipse Saturday April 4

When the moon sets at 6:18AM Saturday morning, April 4, it will be deep in the Earth's shadow and in the final stages of a total lunar eclipse. Observers with an unobstructed western horizon will enjoy 12 minutes of totality in a bright twilight sky.

The first observable phase of the eclipse begins at 3:15AM but may take several minutes to be detectable. Twilight begins at 4:43AM with the total phase starting a few minutes later at 4:54AM. Totality ends at 5:06 AM in a bright twilight sky. The moon will still be partly eclipsed when it sets at 6:18AM. By then the sun will be above the horizon. Sunrise is officially at 6AM.

Review of Voyage to the Milky Way

Cindy Lund

Voyage to the Milky Way is about humanity's possible future in the cosmos, from the first steps we've already taken, to traveling to other stars. Donald Goldsmith covers not only the technological problems in colonizing the solar system and traveling to the stars, but the sociological and political issues involved in such an endeavor. Although Voyage to the Milky Way was written back in 1999, the book needs little updating.

Goldsmith begins by discussing the three ways to explore space; telescopes, robotic probes, and human spaceflight. While his bias is toward using robots to explore the solar system, at least for the time being, others, such as those of the X Prize Foundation, would like to begin human colonization of the solar system as soon as possible. So far, it seems that Goldsmith is getting his way.

Voyage to the Milky Way then covers the history of space exploration. Some of the information was familiar, but quite a bit was completely new to me. For example, I learned that a Russian, Konstantin Tsiolkovsky, wrote an essay on rocket propulsion, *The Exploration of Cosmic Space with Reaction Motors*, in 1903. I learned that Robert Goddard wrote a manuscript that predicted humanity riding nuclear powered asteroids to escape the sun's death.

Goldsmith then starts discussing colonizing the solar system, beginning with the moon. He covers the challenges facing would be colonists, such as the cost to get things to the moon and avoiding radiation. He also mentions that there is helium-3 on the moon, trapped in the lunar rocks. He asserts that this could be used for nuclear fission, both on the moon and on earth.

Next, Goldsmith asks the political questions. Who will govern space? Who will choose the space colonists? Who will pay for space exploration? I learned about the United Nations treaties governing outer space. The Outer Space Treaty, announced in 1967, says, among other things, that nations cannot makes claims of national sovereignty in outer space, and that signatories must avoid contaminating the bodies they visit. The Moon Treaty of 1979 would have prohibited mining on the moon. US lobbyists spoke out against this and so the US Senate did not ratify it. Goldsmith also discusses how the space colonies might be governed.

Voyage to the Milky Way then covers colonizing Mars and mining the asteroids. I learned that a metal asteroid a mile across would be worth trillions of dollars in iron alone. Further, the asteroid would be worth trillions of dollars in gold or platinum. Goldsmith points out that there are property issues involved. Who owns the asteroids? Would an asteroid be owned by the nation or corporation that first lands on it?

Goldsmith next discusses voyages to other star systems. He explains to the reader that the closest stars are about a million times further away than the planets in our solar system. This means that travel to other stars is centuries in the future, (if it occurs at all). Nonetheless, people have come up with possible ways to propel a spacecraft across the light-years. One way is to use laser sail propulsion. The spaceship would have a sail many miles across. A lens the size of Texas would focus light from the sun onto the sail, which would accelerate the spaceship to a large fraction of the speed of light. Another way is to use nuclear fusion. The spacecraft could use magnetic fields to gather interstellar matter for fuel. The best fuel source of course is antimatter, since when it is combined with ordinary matter, both turn completely into energy. The antimatter would have to be stored with magnetic fields, instead of any material container. Goldsmith also discusses how relativistic time dilation could allow astronauts to travel thousands of light-years while only a few years pass for them.

Finally, Voyage to the Milky Way covers searching for extraterrestrial life. Goldsmith points out that the vastness of space both makes life elsewhere in the universe a likely possibility, and very difficult to find.

I enjoyed reading Voyage to the Milky Way. Goldsmith addresses a multitude of issues and challenges in any effort to reach out to celestial bodies other than the earth. The book will be of interest to anyone interested in such exploration.

Congratulations to YES Fair Winners

HAC has awarded three prizes to science projects at the YES (Youth Engineering and Science) Fair.

Our first award goes to Robert Lopez for his project on "Hot Spots" dealing with the tilt of the Earth and solar heating. This is an individual project in the 5th-6th grade category, number 1602. The second HAC award will go to Amanda Nelson, a 7-8 grade project, titled the "Speed of Light." This was an innovative project using a microwave oven to check speed of microwaves using speed, frequency, and wavelength formulae. Project number 2409. The third HAC prize goes to Ethan Johnson for his project "Get wired," dealing with strength of electromagnetic induction. This is individual project number 2005 in the 7th-8th grade category.

2015 Winter Observations

Cindy Lund

I only went to two star parties this winter, both in January. I took my cousin Jean to Blue Marble Observatory (BMO). I was delighted to show her the extraordinary views of the night sky objects that could be seen through the telescope at BMO. She had never been to a sophisticated observatory before.

I saw Comet Lovejoy, the Moon, Jupiter, its four Galilean moons and a bright Bolide. I saw the nebulae NGC 2237 (Rosette Nebula), M42 (Orion Nebula), and NGC 2438. I also observed the galaxies M31 (Andromeda) and NGC 2093. In addition, I saw the open clusters M46, and M34; the latter for the first time.

January 17, 2015 at Blue Marble Observatory		
Comet Lovejoy	Comet	Bright core, large round coma, no noticeable tail. Coma is light blue towards the center.
NGC 2237 Rosette Nebula	Emission Nebula	Only part of the nebula was visible in the field. Saw a dim arc of nebulosity with irregular brightness, like clouds.
Bolide	Bright Meteor	Very bright, with a golden tail. Headed straight downward.
M42 Orion Nebula	Diffuse Nebula	Saw four stars in the Trapezium, with nebulosity around them. More nebulosity formed a C to the left of the Trapezium. On the right of the Trapezium were three lines of nebulosity, one going up and right, the others parallel and going straight right. Below the Trapezium was a star with nebulosity around it forming a slight 'e' shape.
M46	Open Cluster	Cluster filled field of view, no notable core, but stars less densely distributed toward edge.
NGC 2438	Planetary Nebula	Small roundish gray blob, off center of open cluster's main section.
M31 Andromeda Galaxy	Spiral Galaxy	Vertically oriented lens shape of nebulosity. Saw a dust lane on the right side of the lens, and a curve of nebulosity to the right of the dust lane. A satellite galaxy was visible to the left of Andromeda.
NGC 2903	Barred Spiral Galaxy	Galaxy appeared as a vertical lens. Noticed a dark lane running through it. Similar to Andromeda, but less bright.
Jupiter	Planet, Gas Giant	Yellow disk with two horizontal brown strips.
4 Galilean Moons	Moons of Jupiter	One on Jupiter's left, three on its right. The one on the right, closest to Jupiter was dimmer than the others. It was very close to Jupiter.

January 22, 2015 at Patterson Observatory		
M42 Orion Nebula	Diffuse Nebula	Saw nebulosity in a disk around the Trapezium. A band of nebulosity extended up from the Trapezium. A star surrounded be nebulosity up and to the right of the Trapezium.
Comet Lovejoy	Comet	Bright core with a dimmer coma. Appeared to be radiating from the core. Very slight tail to the right.
M34	Open Cluster	Noticed a V of stars and two pairs of stars below the V, one to the left, the other to the right. Nebulosity was visible around the pair of stars. All the stars were of similar brightness.
Jupiter	Planet, Gas Giant	Appeared blurry due to being low in the sky. A yellow disk with two brown stripes. One to the left of the equator, one to the right.
4 Galilean Moons	Moons of Jupiter	Moons oriented vertically, three above Jupiter, one below.
Earth's Moon	Moon	Three craters with central peaks along the terminator. A mare was visible along the terminator to the left of the craters.

Huachuca Astronomy Club – Board of Directors

Officers:

President: David Roemer Vice President: Chris Ubing

Secretary: Rick Burke Treasurer: Ted Forte

Members at Large:

Bob Hoover Wayne Johnson

Gary Grue Bert Kelher

Past President: Bob Gent

www.hacastronomy.com -- A great place to visit!

Our sponsors: Please support our sponsors, ***Farpoint and Starizona***. They have been keeping us supplied in door prizes for some years. If you have not contacted them lately, please consider this. They have a lot of great astronomical products that we all need. For more information on products and contact information, their websites are:

http://www.farpointastro.com/
http://starizona.com/

FOR SALE: Mirror Blank. 13 7/8" diameter by 4 1/2" thick. Pyrex Glass with no scratches or bubbles. Very Rare - Perfect for doing a large binocular. $75.00
Contact Rob Shernick at (520) 458-6790 or by email at nuvolari_p3@q.com

FOR SALE: Meade Starfinder 8" Reflector Telescope. Will Sell at a very reasonable price. Included are a Telrad Finder, Filters, and additional Lenses.
Please contact Mr. Jim Moses at (520) 803-0913 or at email <jjmoses2@gmail.com>

FOR SALE: Celestron Celestar 8 inch S/C Deluxe - $1200. Will also sell pieces individually
Contact Rhonda and Terry Taylor at (520) 366-2378 or by email at <twrl2@yahoo.com>
Or See Craigslist at at http://sierravista.craigslist.org/bar/4523742100.html

FOR SALE: Older Optical Guidance Systems 12.5" f/9 Ritchey-Chretian telescope. Very good Paul Jones ceramic optics, Robofocus secondary focuser, will include Takahashi collimating telescope. Some of the image through the scope are at Mshadephotography.com.
Contact Mike J. Shade at mshade@q.com

FOR SALE: Mae Childs has an 8" Celestron Nex Star Good condition with all original accessories.
Please contact Mae maechilds2014@aol.com

How to contact the Nightfall editor, Cindy Lund:

Email: alund@juno.com
Phone 520-456-4817 Mail:
3666 Via El Soreno
Sierra Vista, AZ, 85650

HAC Calendar of Events for March- April 2015

SU	MO	TU	WE	TH	FR	SA
1 March	2	3	4	5 11:05 AM Smallest Full moon of 2015	6 7PM HAC Meeting Cochise College library lobby.	7
8 Daylight Savings Time Begins (Not Observed Here)	9 Juno Stationary	10	11 Mars 0.3° N of Uranus 7:00 PM Master Gardeners Patterson	12	13 10:48 AM	14 Kartchner Star Party
15	16	17 Mercury 1.6° S of Neptune	18	19	20 2:36 AM Equinox 3:45 PM	21 Member Star party. Bob Kepple
22	23 Astronomy for the Curious Class Patterson 7PM	24 Pie in the Sky Faras Elementary	25 Aldebaran 0.9° S of moon. Cub Scouts Patterson	26 7:00PM Public Night Patterson Obs.	27 00:43 AM	28
29	30 Astronomy for the Curious Class Patterson 7PM	31	1 April	2	3 7PM HAC Meeting Library Cochise College library lobby.	4 5:06 AM
5 Easter	6 Astronomy for the Curious Class Patterson 7PM	7	8 Jupiter Stationary Saturn 2° south of Moon	9 Public Hearing City Council Lights and Signs 5PM	10	11 8:44 PM Kartchner Star Party
12	13 Astronomy for the Curious Class Patterson 7PM	14	15	16	17	18 11:57 AM Member Star Party Glen Sanner
19	20 Astronomy for the Curious Class Patterson 7PM	21 Church Youth Group, 7:15 Lyrid Meteors	22 Earth Day Lyrid Meteors	23 Lyrid Meteors Earth Day. Vet Park, 10a-2p Patterson Public Night 7:30pm	24 8AM Math and Science Expo Patterson	25 4:55 PM Astronomy Day See note below
26 Juno 0.1° North of Moon. Jupiter 5° North of Moon	27 Astronomy for the Curious Class Patterson 7PM	28	29	30	On Astronomy Day April 25: 10 AM to 1PM Sierra Vista Library. 7PM Kartchner State Park	

All times MST. Join Haclist to keep up to date with all of the Huachuca Astronomy Club events
Send an email to: haclist-subscribe@yahoogroups.com