Nightfall

Monthly publication of the Huachuca Astronomy Club

MAY 2014

President's Notes

May Brings Possible "New" Meteor Shower

During our night of May 23, we will scrape through several debris streams of Comet 209P/LINEAR, a periodic comet discovered in 2004. Astronomers from NASA, Europe, and Russia have given a wide range of estimates for the meteor shower (209P-ids) from these streams at 100 to 400 meteors per hour with the possibility of an outburst of over 1,000 meteors per hour (for a few moments to a few minutes), somewhere along the way. All of the main estimators have the shower arriving between about 07h to 08h UT from a radiant near the borders of Lynx, Ursa Major, and Camelopardalis. While they really do not know what amount of dust has sloughed off in the previous passages of the comet, several of the experts think there could be f large sand-size grains that will give bright meteors.

As always, these figures are estimates, but expect some sort of meteor activity and possibly a dramatic sight moving into the early hours of May 24. The shower will be well timed for us with the high activity near midnight, but we should start watching as soon as it gets dark on Friday evening, May 23, and continue until morning twilight on Saturday morning, May 24, a nearly new Moon should give good viewing conditions.

Start Shooting Wide Field Images Nightly of Ceres and Vesta

With Ceres at about Mag 7 and Vesta at Mag 6, these two objects should be easy for imaging with standard DSLRs and mid to long lenses. Piggybacking the camera on a tracking scope or on its own equatorial mount would be best, but with the ISO cranked up to 1,000 or 1,600 on the camera the exposure times needed to reach Mag 7 will be very short and could allow using just a tripod. ***Sky and Telescope*** has a nice finder chart available on-line to help you frame your shots to follow the movements within the same background star field.

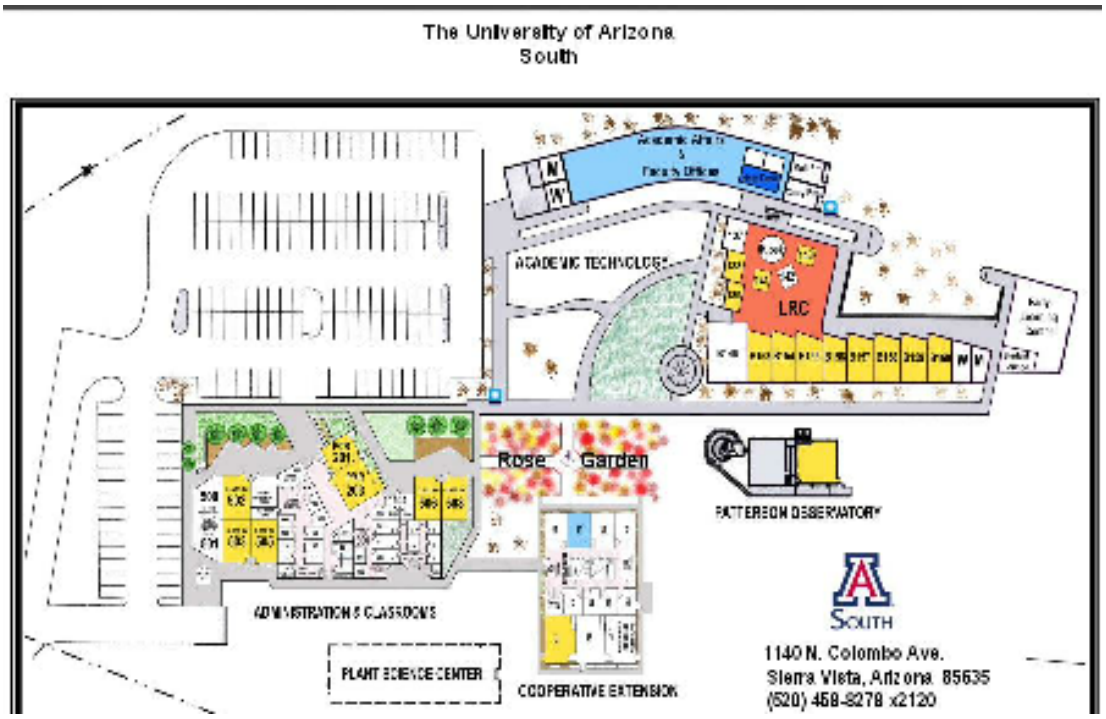
In addition, do not forget the Sun has been freckled with spots lately, Jupiter is still nicely situated in early evening, Mars is up all night, and Saturn is rising earlier all the time. Comets? Yep, we still have some good comets coming and going. C/2012 X1 (LINEAR) is in the morning sky shining at about Mag 9. C/2012 K1 (PanSTARRS) is on its way in and at about mag 9.5? C/2014 E2 (Jacques) at mag 9.6 is also on its way in and may get to be mag 7 after the solar go-a-round in July. I wish us the best of luck getting a look at it then.

Welcome New Members

Welcome to our new student members Jennifer Skinner and John Welter. John was our 2014 scholarship winner. Welcome also to Maryfrances Clinton and family members Rick and Sue Johnston Al and Lori Anderson and Robert Weierman. **Welcome to the club, we're glad you joined!**

May Meeting Notice

The May meeting of the Huachuca Astronomy Club will be held at **THE PATTERSON OBSERVATORY**. The observatory is located on the campus of the University of Arizona South, Sierra Vista. Parking is available in the UA South parking lot on the east end of the campus. Restrooms are available in the building behind the observatory near the *Early Learning Center*. There will be seating for a presentation in the Patterson Observatory classroom and everyone will get the chance to look the telescope over and view a few celestial splendors if you like. The meeting will be at the usual time – 7PM on Friday May 9. There will be a meeting of the HAC board of directors in the observatory before the meeting, beginning at 6PM. As always, the BOD meetings are open to the public and all members are welcome to attend.



The U of A South campus is immediately adjacent to the Cochise College campus, just to the north of our usual meeting location.

ASTRONOMY DAY NOTICE

By Tommy Neyhart

Chair, Sierra Vista Astronomy Day

Hi Everyone,

One of our club's biggest days of the year is rapidly approaching.

A week from tomorrow, Saturday, May 10, is Astronomy Day! As part of an international celebration, our club will be at the Sierra Vista Public Library on Tacoma Street.

Starting at 10:00 o'clock in the morning, we'll have solar telescopes set up so everyone, the public and club members alike, can see the Sun as never before. Seeing sunspots and solar prominences leaping from the surface will produce memories that will last a lifetime.

Please feel free to bring your telescope to the festivities. The more the merrier!

We'll also have a scale model of the solar system that will stretch from the Library east to the end of Tacoma, where Pluto will be awaiting a visit!

There will be our incredibly knowledgeable members on hand to answer questions and distribute literature and information.

You are not only invited to attended, you are wanted and needed. It is a perfect time to engage the public with all the good things we do, the great folks you are, and to attract new members. We have this opportunity only a couple of times a year, and it would be so great if you join us. It's always so much fun!

Looking so forward to seeing each and every one you on Saturday, the 10th, at the SV Library, to join us in celebrating Astronomy Day.

County Digital Signs Survey - Take the ON-Line Poll

The county is in the process of updating the Light Code and the Planning Department is looking for input on this matter from people who live in Cochise County.

The link below is to an online survey that has two quick questions ... one question asks you to chose an option regarding your preference and the other asks you to click on the area of the county you live in. It will take less than a minute.

You also have the option to leave a comment.

The poll is here:

https://www.surveymonkey.com/s/KPZCRFC

A MAY 2014 METEOR SHOWER YOU MAY NOT WANT TO MISS!

By Doug Snyder

A new meteor shower is being predicted to occur during the evening/morning hours of Friday/Saturday, May 23/24 2014, and it could be the strongest shower of 2014 and possibly even reaching meteor STORM levels! That level is of course not certain, but it is a possibility, and observers in North America are favored during our dark hours during that time. The predicted peak for this shower is around 0300 hours (3 AM) on the morning of Saturday, May 24, but it could also occur, or start earlier or later, or even be an event that endures much of the evening and morning, not unsimilar to the Leonid Meteor Storm many of us witnessed in 2001 when we, together as a group, counted over 3000 'shooting stars' from a dark sky site in Hereford. With the accompanying numerous fireballs and persistent trails, it was an historic sight none of us that were there will soon forget. What will this new, yet un-named shower bring us in 2014 - Let's go out and see!

The shower, however much it may or may not astonish us, is due to the 'newer' debris fields left in orbit by the Comet 209P/LINEAR. This comet was discovered in February 2004, and has a 5.04 year orbital period. A recent pass of the comet in 2012 brought it to within some 54 million miles from Jupiter, and its orbit was then perturbed by Jupiter. It is anticipated that the 'new' orbit of the debris of Comet 209P, will have it swinging within just under 300,000 miles of Earth's orbit on May 24th and that the minimum ZHR (Zenithal Hourly Rate) that several scientists have derived is a minimum of 100 per hour, and that is under dark (and clear !) skies!

The radiant point of this new shower has been determined to be due north, just below the North Star, also known as Polaris, and which is found in the constellation Ursa Minor (the Little Dipper). This radiant point is near the borders of the constellations of Ursa Major and Camelopardalis. In regards to the Moon's interference that morning of Saturday, May 24th, there will be a waning crescent moon rising at about 0230 hours (2:30 AM) and will be illuminated about 20%. As the meteors reach the atmosphere, expect to see ones that are both bright, and slow; the anticipated speed will be around 40,000 miles/hr (18 km/sec). The end of Astronomical Twilight on May 23 will be at 2050 hrs. (8:50 PM) and the start of Astronomical Twilight on Saturday, May 24 is 0345 hours (3:45 AM).

Folks, this might be (hopefully) a great photo opportunity and it might also be an excellent chance for a group all-nighter at a dark sky location as the HAC had in November of 2001 - only it will be considerably warmer in May than in November! In any event, ENJOY!!

Note: for some additional details, and diagrams, please refer to the excellent article regarding this NEW shower that appears in the May 2014 issue of Sky & Telescope.

Trip to MMT

By Ted Forte

As the crow flies it is just 45 miles from my observatory to the MMT observatory on Mt Hopkins but driving, it's more than a hundred mile trip and another 4400 plus feet in elevation (the MMT observatory is 8,585 feet). The road up to the observatory is daunting - with up to a 7000 foot drop off that at times is about 24-inches from your tires. It's enough to make an astronomy grad student switch to art history. It takes more than an hour to go from base camp to summit. Now, just imagine us driving down it after dark, part of the trek using only parking lights so as not to interfere with observations. It was fun, in a sick sort of way. The trip however was well worth the few moments of terror required.

Seventeen members and friends of the Huachuca Astronomy Club were given a personalized tour by observatory director Grant Williams, and what an awesome tour it was. The 6.5-meter (256 inch) MMT is the 14th largest telescope in the world. It used to be a multiple mirror telescope (6 individual telescopes arranged in a circular array) but is now one giant Cassegrain reflector on an alt-az mount. (MMT is no longer an acronym) The entire building rotates to point in azimuth and the scope has a full range of altitude movement inside a yoke.

At base camp, Grant opened the visitors center (normally closed on weekends) and gave us a private tour and then talked to us about the three 10-meter gamma ray telescopes that make up the Veritas array. Further up the mountain we stopped at the Ridge Range and toured the SAO's 48 and 60 inch telescopes. The staff attendant operator there was so happy to have company that it was difficult to extract ourselves - but we had to get to the summit before dark so as not to interfere with operations.

At the top we assembled to watch the sun set, hoping for the green flash that is sometimes witnessed there. Too much dust in the air for any success, but then it was into the giant cube of a building and a look at the monster scope.

We were able to get up close and personal with the scope. They lowered it down right over us so that we were standing inside the trusses between primary and secondary. The vertical doors opening onto a panoramic vista as the building rotated 360 degrees was just an incredible experience.

Then it was down into the control room for the start of operations. The telescope operator uses a variety of sensors to help her adjust and shape the mirrors into the best possible configuration. (The mirrors are deformable.) We watched as she made adjustments, while monitoring the mirror temperature and atmospheric seeing. While the sky wasn't very transparent, the seeing was an impeccable 0.4 arc seconds judged at the focal plane after that mirror magic! We also watched as the astronomers for the night's run obtained the spectra of a standard star. The data obtained on a set of standard stars is applied as corrections to the science targets.

Grant took us through the history of the observatory using pictures on his iPad and showed us some of the more famous science results achieved at the observatory. He explained many of the instruments that are available including the multiobject spectrometer that can collect spectra on up to 300 objects simultaneously. He showed us a video of the robots that magnetically arrange the 300 fiber optic sensors over the 1-degree detector. The robots can precisely set all 300 fibers in just 5 minutes.

Since the summit is barely large enough for the telescope, there was no room for a re-coating facility so the scope is designed to allow the mirror to be stripped and re-aluminized in situ. Grant explained in detail about the vacuum cap that turns the mirror into its own coating chamber once every five years or so. It was all just too cool.

We had to wait at the summit for a break between observations so that we could use lights for the steepest part of the trip down. Most of us spent that time outside looking at the stars and cringing over the encroaching lights in the valleys below. Tucson, Nogales, and even Sierra Vista looking like bright monsters gathering to devour the dark of this mountain refuge. I felt like I was standing in the shadow of a beautiful cathedral - I don't think any astronomer can stand close to a world-class telescope without some small bit of awe and reverence, and was thinking, how sad to look out on the seeds of its demise. It is only a matter of time, and not too much time at that, before the brightening cities below render this magnificent observatory impotent - like so many others on once remote mountaintops. When I think of how unnecessary, how preventable, the threat to observatories like this is, I can get very depressed. Will even one more generation get the chance to do real astronomy on Mt Hopkins? I wonder.

Some of the tour participants at the Visitor Center for the MMT Observatory

Good Lighting Is Easy

by Bob Gent

While many astronomers care deeply about preservation of our magnificent night skies, the issue of light pollution reaches far beyond that. Light pollution is caused by aiming lights into the sky, blinding people with glare, or by leaving lights on when and where they are not needed. When we allow bad lighting at night, we waste an enormous amount of energy and endanger our own health and safety as well as that of many animals. Fortunately, good lighting is easy.

Crime

Bright lights at night can give us a false sense of security. What we need is better situational awareness coupled with better light designs. Most crime actually occurs during the day, and at night, lighting by itself does not insure safety. A recent US Department of Justice report to Congress concluded, "We can have little confidence that lighting prevents crime, particularly since we do not know if offenders use lighting to their advantage.... In short, the effectiveness of lighting is unknown." Many of us are afraid of the dark, and with bright lights, we feel safer. But are we really? Do criminals need light to see to commit crime? Could they too be afraid of the dark?

Safety

Bright lights cause glare that decreases visibility. When lights shine in our eyes, we can't see much except the light source. We can't see the steps or handrails to a doorway. We can't see the bad guy behind the light. And you know what it's like to have drivers shine their high beams into your eyes. It takes a while to recover your night vision.

Human Health

For millions of years, life on earth evolved with a day and night. Now, we are turning the night into day with unintended consequences. Ongoing research indicates there may be serious impacts on human health from overly bright lights. When we sleep with lights around us or invading our bedroom window, we suffer something called melatonin suppression. This adversely affects our circadian rhythm - our sleep pattern – as well as our immune system. Medical doctors are also studying the link between cancer and melatonin suppression from lights at night.

Nature out of balance

Light pollution also adversely impacts many forms of nocturnal wildlife. Florida's sea turtles have been facing a major threat from bright lights. Endangered sea turtles emerge from the surf to deposit eggs in sand nests and later, tiny hatchlings struggle from their nests to return to the ocean. The turtles instinctively look for moon light reflecting off the ocean to guide them to the water, but mistake manmade lights for moon light and die. Similarly, many species of birds, especially small insect-eaters, migrate at night. Guided in part by the starlight of constellations, they are attracted to lights shining from skyscrapers, broadcast towers, lighthouses, monuments and other tall structures. Some birds either flutter about until they drop from exhaustion, or actually hit the object and die.

Property Rights

Light trespass is another serious problem. Light at night can be as offensive as neighbors driving across your yard or parking on your property. When a person aims bright floodlights at their neighbor's yard, they invade their property and destroy a good night's sleep as well as their ability to see the sky.

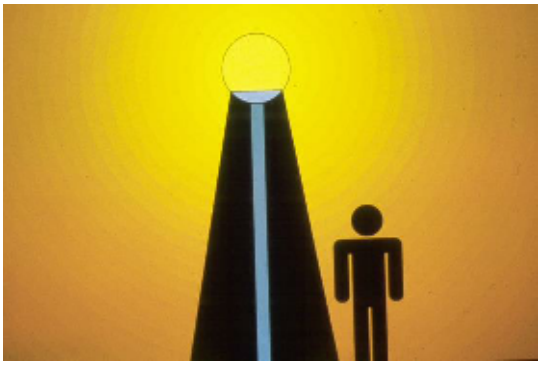
Monetary Investments

In Cochise County, astronomy is a major investment. By our estimate, there are over 50 astronomical observatories here. In addition, there are hundreds of millions of dollars in professional astronomical observatories near Cochise County. Even though we have good lighting codes in place, there are adverse impacts on both professional and amateur research being done. We need everyone's help to protect this research. Your local astronomers may be the ones to spot an asteroid headed for Earth!

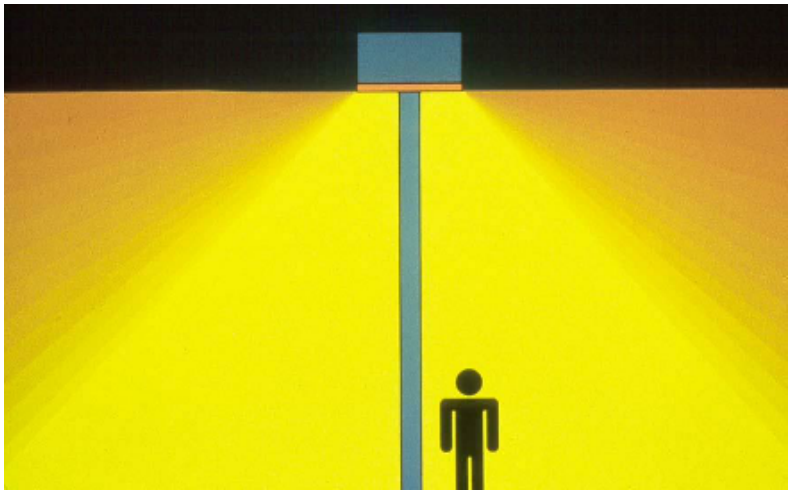
Here's a photo of the Great Orion Nebula taken a few days ago by the author. Photos like these are possible only from protected areas, like Cochise County.

Good Lighting is Easy

Our current city and county lighting codes are designed to help achieve the goals of good lighting. But in a nutshell, the key to high quality nighttime lighting is to follow a few simple rules. First, ensure that glare is minimized. Most glare comes from unshielded fixtures and bad lighting design. You should never see a light bulb. Shine the light down and only when and where it is truly needed. Don't light up trees or walls. Next, use time controls to insure that light is on when needed, and off when it is not. Lights should only be on when there is a person in the area. Motion activated lights are available, too. As an added bonus, your pocket book will benefit if you use only energy efficient light sources.



Here's an illustration showing light going everywhere except where it's needed.



A better way to light is to aim light down, and only when it's needed. Images courtesy International Dark-Sky Association, Inc.

Preserving Our Heritage

Light in the sky is called sky glow. It's a bright nighttime dome over most cities. It destroys our view of the universe. Go outside on a cloudless night. Here you can still see the color, shape and density of our own galaxy, the Milky Way. This is a privilege very few Americans have. It is priceless. All across the country and around the world, people are losing touch with the night. This means our children and generations to come are in danger of losing their right to experience the grandeur of the universe. That would be a tragedy! Let's not let that happen in Cochise County or Sierra Vista.

A THOUGHT TO PONDER

"It's hard to imagine that the incandescent electric lamp was invented little more than 100 years ago," says George Eslinger, former Director of the Los Angeles City Bureau of Street Lighting. "Since then urbanization and poorly controlled lighting has created a severe light pollution problem in industrialized countries."

"If we don't reverse this trend," he cautions, "the entire globe will soon be wrapped in a glowing envelope through which none of the magic of the Universe can be seen by the naked eye."

City dwellers have already lost most of the constellations, the planet Saturn, and a host of medium magnitude stars. They can forget about observing most meteor showers, too, or faint displays of Northern Lights.

It's a big loss. Young sky watchers grow up to be philosophers, scientists, poets, explorers, and school teachers. But kids aren't likely to watch -- or be inspired by -- a blank sky.

The Power of the Sun's Engines

By Dr. Ethan Siegel

Here on Earth, the sun provides us with the vast majority of our energy, striking the top of the atmosphere with up to 1,000 Watts of power per square meter, albeit highly dependent on the sunlight's angle-of-incidence. But remember that the sun is a whopping 150 million kilometers away, and sends an equal amount of radiation in all directions; the Earth-facing direction is nothing special. Even considering sunspots, solar flares, and long-and-short term variations in solar irradiance, the sun's energy output is always constant to about one-part-in-1,000. All told, our parent star consistently outputs an estimated 4×10^{26} Watts of power; one *second* of the sun's emissions could power all the world's energy needs for over 700,000 years.

That's a literally astronomical amount of energy, and it comes about thanks to the hugeness of the sun. With a radius of 700,000 kilometers, it would take 109 Earths, lined up from end-to-end, just to go across the diameter of the sun once. Unlike our Earth, however, the sun is made up of around 70% hydrogen by mass, and it's the individual protons — or the nuclei of hydrogen atoms — that fuse together, eventually becoming helium-4 and releasing a tremendous amount of energy. All told, for every four protons that wind up becoming helium-4, a tiny bit of mass — just 0.7% of the original amount — gets converted into energy by $E=mc^2$, and that's where the sun's power originates.

You'd be correct in thinking that fusing $\sim 4 \times 10^{38}$ protons-per-second gives off a tremendous amount of energy, but remember that nuclear fusion occurs in a *huge* region of the sun: about the innermost quarter (in radius) is where 99% of it is actively taking place. So there might be 4×10^{26} Watts of power put out, but that's spread out over 2.2×10^{25} cubic meters, meaning the sun's energy output *per-unit-volume* is just 18 W / m^3. Compare this to the average human being, whose basal metabolic rate is equivalent to around 100 Watts, yet takes up just 0.06 cubic meters of space. In other words, **you emit 100 times as much energy-per-unit-volume as the sun**! It's only because the sun is so large and massive that its power is so great.

It's this slow process, releasing huge amounts of energy *per reaction* over an incredibly large volume, that has powered life on our world throughout its entire history. It may not appear so impressive if you look at just a tiny region, but — at least for our sun — that huge size really adds up!

Check out these "10 Need-to-Know Things About the Sun":
http://solarsystem.nasa.gov/planets/profile.cfm?Object=Sun.

Kids can learn more about an intriguing solar mystery at NASA's Space Place: http://spaceplace.nasa.gov/sun-corona.

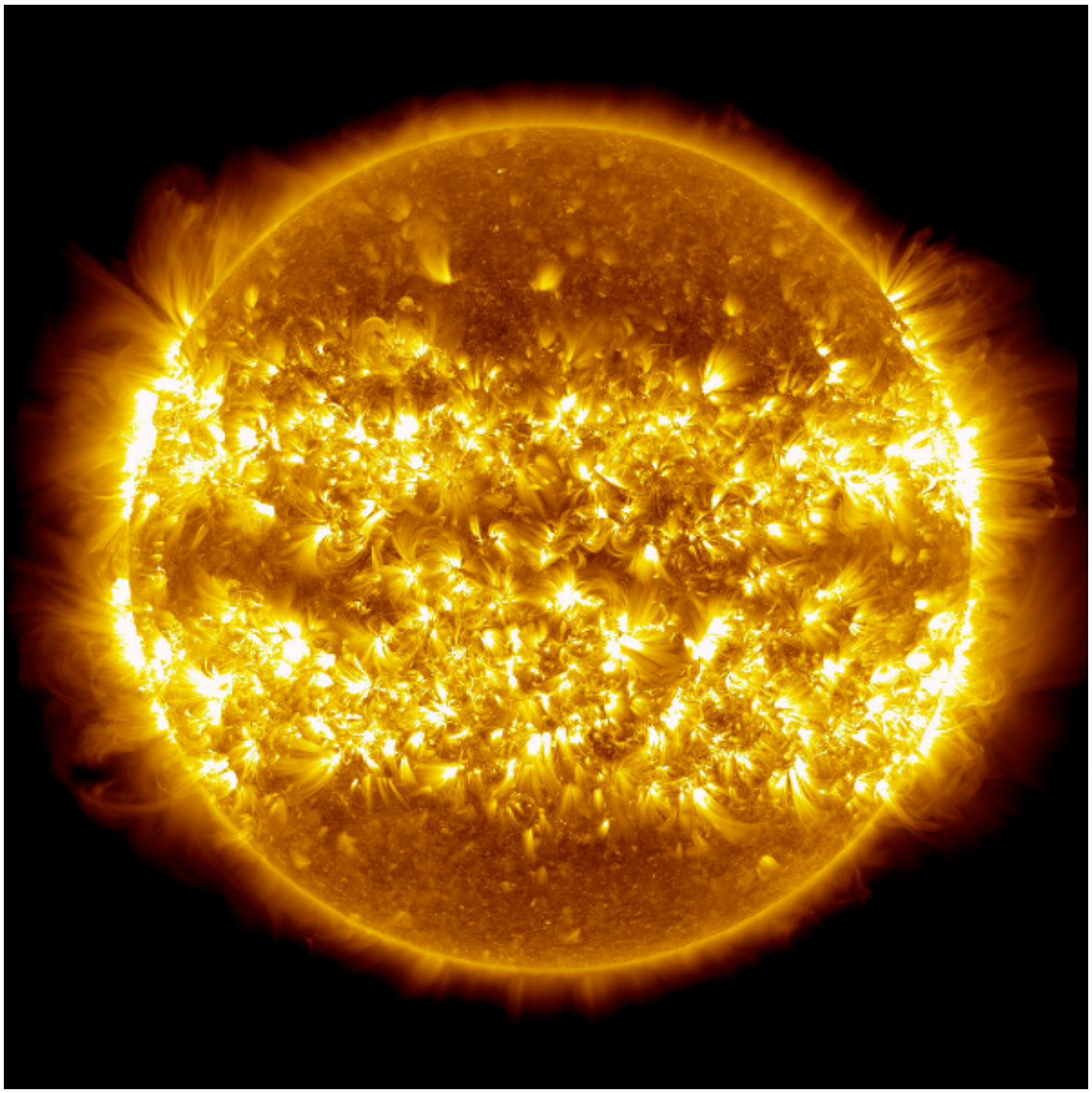


Image credit: composite of 25 images of the sun, showing solar outburst/activity over a 365 day period; NASA / Solar Dynamics Observatory / Atmospheric Imaging Assembly / S. Wiessinger; post-processing by E. Siegel.

THE SPACE PLACE is a joint effort by: NASA, Jet Propulsion Laboratory, California Institute of Technology and International Technology and Engineering Education Association.

The Huachuca Astronomy Club is proud to be a Space Place Astronomy Club Partner. The Patterson Observatory is a Space Place Community Partner.

Book Review

Starlight Nights - The Adventures of a Star-Gazer by Leslie C. Peltier

By Cindy Lund

Starlight Nights is the autobiography of amateur astronomer Leslie Peltier. He begins by describing an autumn night with his two telescopes, a six-inch and a twelve-inch. He personalizes the telescopes, imagining the six-inch pointing out to the twelve-inch, "If I cannot see sixteenth-magnitude stars, neither can you catch a comet." I love the beautiful, almost poetic way Peltier sets the scene.

Peltier was born in 1900, and grew up on a farm in Ohio. His first memory of the stars was seeing the Pleiades through his kitchen window and asking his mother what they were. He also remembered his father pointing out Jupiter to him when he was seven. In 1910, two bright comets appeared in the sky, 1910a in January and Halley 's Comet in May. Peltier saw both comets, but although Halley's was brighter, he remembered 1910a, the first comet he saw, more vividly.

Despite seeing the comets, Peltier's interest in astronomy did not begin until he was 15. He was fascinated by airplanes, read many books, and collected plant and insect specimens. One May evening, Peltier looked at the stars and asked himself why he did not know any of them. He checked out a book, The Friendly Stars, from the local library. Over the next year, he checked that book out again and again, learning to navigate the sky. He concentrated on the stars in the east, learning new ones as they appeared. One night he gave himself a preview of the winter stars by getting up at 4:00 in the morning. He wanted to see the stars without prejudice, to see what "constellations" he came up with. He didn't come up with much, but the night was still memorable.

Leslie Peltier called his first telescope the Strawberry Spyglass, because he got the 18 dollars to pay for it by picking 900 quarts of strawberries on his parents' farm. When he first looked through the two-inch refractor, he only saw a blur! Peltier quickly learned how to focus and work his new telescope. He gave it a simple mounting using an old grindstone. I was impressed by his dedication in working so hard to obtain his first telescope. Peltier explored the sky with his new telescope. He saw Uranus and Neptune, the Andromeda Nebula (as he calls it), M13, the Dumbbell Nebula, and the Trifid Nebula. In early 1918, Peltier joined the American Association of Variable Star Observers (AAVSO). To get his charts and other introductory materials, Peltier had to walk four miles to the post office during a snowy winter.

Peltier then begin his observations of variable stars. Every month, beginning in March 1918, he sent AAVSO his observations. I don't know when he stopped, but he was still sending them in 1965 when he wrote the book. (Since he died suddenly in May 1980, his last record was probably sent that April.) In June 1918, there was a partial solar eclipse in Ohio. Peltier, of course, observed it with his two-inch telescope. He noted the "horned sun" setting; cusp pointing down. That day would have been exciting enough, but that evening, soon after dark, Peltier noticed a bright new star. It was his first nova, and he saw it brighten overnight.

Late in 1919, AAVSO gave Peltier a four-inch telescope to use. He found this telescope too heavy to move around, so he constructed a permanent observing station in a cow pasture. This observing station was open to the air, but had a fence around it to keep the cows out. Peltier enjoyed observing in the open, but in 1921, his dad decided that he should have a real observatory with a dome. When father and son had constructed it, it was the only observatory in 90 miles. (Reading this reminded me how fortunate I am to have so many observatories nearby.) Soon after the Peltiers built the observatory, Leslie Peltier got a new telescope, a six-inch from Princeton. The new telescope was specially designed to search for comets. Its field of view was a full two degrees. Peltier learned that his new telescope had been used by Zaccheus Daniel, who discovered three comets with it. Peltier carved Daniel's name into the telescope's tube, along with the dates of his discoveries.

For three long years, Peltier searched for an undiscovered comet. Finally, in November of 1925, on Friday the 13th, he spotted one. He quickly gathered the comet's location, magnitude, and its rate and direction of motion. Then he called Western Union to send a telegram to Harvard College Observatory. Since it was after 6:00, the only way to send a telegram was to go to the signal tower in person. Peltier's parents had taken the family car, so Peltier biked to the signal tower in the dark. Peltier was concerned that the comet had already been discovered and he had been unaware of it, but on November 21, he got a call confirming his discovery. He recorded his comet in the telescope's tube. Over the next 30 years, Peltier discovered eleven more comets.

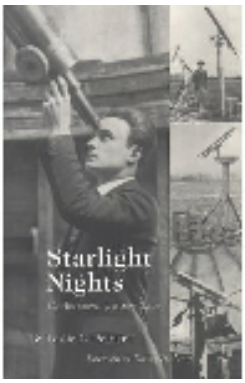
In 1933, Leslie Peltier married Dottie. They went on a long honeymoon, traveling throughout the southwest. They searched for hyalite, a mineral similar to opal, and visited Mount Locke, where McDonald Observatory would soon be built. Throughout his travels, Peltier continued his astronomical observations. He enjoyed seeing the southern stars that he could not see from Ohio.

When Leslie and Dottie Peltier were first married, they lived in Leslie's uncle's house, while he worked elsewhere. Peltier's uncle's house was near his parents, so Peltier could still use the Cow Pasture Observatory. However, a few years later, Peltier's uncle returned and Leslie and Dottie moved to a house in town. The Peltiers' knew that they would move again, so Leslie built a mobile observatory for his six-inch telescope. The Merry-Go-Round Observatory, as it was called, was just big enough for one observer. Rather than having the telescope and dome rotate, the whole observatory rotated.

In 1948, the Peltiers moved to a large house on the very edge of town, four miles from the farm where Peltier had grown up. Their new home included eight acres of property. Peltier moved his Merry-Go-Round Observatory to the highest point on his new estate. Meanwhile, Miami University, in Ohio, was replacing its old observatory. The old observatory, which included a twelve-inch Clark telescope, was given to Leslie Peltier. Moving the observatory 125 miles was a challenge, but with help from his neighbors, Peltier was able to place his new observatory next to his old Merry Go Round Observatory. With the twelve-inch telescope, Peltier could see stars down to sixteenth magnitude. This allowed him to observe his variable stars even when they were at their faintest. Soon after Peltier has set up his new observatory, he drove by his old farm late at night. He was saddened to find that, "Night no longer came to the farm." His old farm, and others nearby, all had floodlights.

Peltier ends his book discussing how the skies had changed from when he first began his observations. In 1965, when Starlight Nights was published, the skies included satellites and other artificial objects. He mentioned that he did not want man to reach the moon for many years. While we did land on the moon five years later, we have not been back there for over forty years. Perhaps Peltier was right, and we are not ready.

Overall, I thought Starlight Nights was an excellent book. I loved the vivid descriptions and poetic language Peltier uses. He makes his experiences come alive. I would recommend Starlight Nights to any member of the club who has not previously read it.



Long out of print, the much loved autobiography of celebrated comet hunter Leslie Peltier was reissued on the 100th anniversary of his birth.

Lunar Eclipse of April 15 - Photos by HAC Members

Rick Burke - Moon at near Totality

Ed Eribeck - Moon

Lunar Eclipse of April 15 - Photos by HAC Members (cont)

Paul Dybvg - Moon at 00:45

David Roemer - Moon about halfway into eclipse

Comet Photos by HAC members

Bob Kepple - Comet PANSTARRS and M51

Bob Kepple - Comet Jacques

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2014—Astronomically Handy Sky Calendar from Doug Snyder & the H.A.C.—2014

ARIZONA Observers SKY EVENTS Calendar for 2014 —All Times listed are MOUNTAIN STANDARD

JANUARY 2014

HIGHLITES:

Quadrantid Meteors
Jupiter at Opposition

01 We ● **NEW MOON** 0414 hrs. (MST)
03 Fr **QUADRANTIDS** Meteor Shower very favorable; view after midnight; radiant near constellation Bootes; possible hourly rate of up to 120
04 Sa Earth at perihelion 0500hrs.; 0.983 A.U.
04 Sa **HAC** Member Star Party (S.P.)
05 Su JUPITER AT OPPOSITION 1400 hrs.; Mag. –2.7 distance=4.2 AU size=47″
07 Tu ☽ First Quarter Moon 2040 hrs.
09 Th **HAC** Public S.P.; P.O.;SS@ 1735 hrs.
10 Fr **HAC Meeting,** Cochise College 7pm
15 We ○ Full Moon 2153 hrs.; smallest of 2014
23 Th ☾ Last Quarter Moon 2220 hr
25 Sa Saturn 1.2° north of Moon, 0535 hrs.
30 Th ● **NEW MOON** 1439 hrs.; lunation 1127
31 Fr Mercury G_ Elong. East (18☒0300 h., view as 'evening' star in western sky 1/2 hour after sunset; mag. –0.7

Jupiter's Galilean Moons—January 2014
There are no double-transit events this month, but satellite Callisto has four encounters with its mother planet (local dates and times):
1/11:1944 hrs. Occultation Disappearance
1/12: 0044 hrs. Eclipse Reappearance
1/20: 0438 hrs. Transit Ingress
1/28: 1854 hrs. Eclipse Reappearance
Note:**HAC=H**uachuca **A**stronomy **C**lub

FEBRUARY 2014

HIGHLITES:

Venus at its brightest,
Callisto's Shadow on Jupiter

01 Sa **HAC** Member S.P.
06 Th ☽ First Quarter Moon 1221 hrs.
Double Shadow Transit, Jupiter; 0323 hrs. (Europa & Callisto); rare
HAC Public S.P.; P.O.;SS@ 1800 hrs.
07 Fr Alpha Centaurid Meteors, Pk. 2305 hrs. Radiant point in southern hemisphere
11 Tu Venus greatest magnitude: -4.6, 1600h.
14 Fr ○ Full Moon 1654 hrs.
HAC Meeting, Cochise College 7pm
15 Sa Venus at greatest illumination, mag.-4.9; morning 'star' in southeast sky
17 Mo Zodiacal Light in the west for next two weeks following evening twilight
19 We Spica (star) within 2.5° of Moon,0500 h.
22 Sa ☾ Last Quarter Moon 1016 hrs.
26 We Venus within 6° of Moon, 0500 hrs.

Long Period Variable Stars– Feb. 2014
Verify with www.aavso.org ;listed are stars brighter than mag. 8 at max.: period in days (d);date is predicted epoch max.

0228-13;U Cet;7.5>12.6;235d;Feb.10
1811+36;W Lyr;7.9>12.2;196d;Feb.17
1901+08;R Aql;6.1>11.5;267d; Feb.15
2044-05;T Aqr;7.7>13.1;202d; Feb. 04

MARCH 2014

HIGHLITES:

Kartchner Caverns S.P.(22)
Messier Marathon?(29)

01 Sa ● **NEW MOON** 0100 hrs.
01 Sa **HAC** Member S.P.
06 Th **HAC** Public S.P.; P.O.; SS@1823 hrs.
08 Sa ☽ First Quarter Moon 0628 hrs.
14 Fr Mercury G_Elong. W. (28°); morning 'star' in twilight to the east
14 Fr **HAC Meeting,** Cochise College 7pm
16 Su ○ Full Moon 1010 hrs.
18 Tu Zodiacal Light in the west for next two two weeks following evening twilight
20 Th **Vernal Equinox** 0957 hrs.
21 Fr Saturn close (north) to Moon
22 Sa **Kartchner Caverns S.P. ;**1830 hrs.
23 Su ☾ Last Quarter Moon 1847 hrs.
29 Sa **HAC Messier Marathon**-Proposed This date 110 objects should be visible
30 Su ● **NEW MOON** 1146 hrs.

Possible Favorable Periodic Comets—Reaching Perihelion March 2014
Obtain elements/ephemerides at www.minorplanetcenter.net; listed dates/times are in UT (to retain MPC accuracy)
P/2007 H3 (Garradd); Mar 01.23;1.8 AU
P/2008 A2 (LINEAR); Mar 03.40; 1.3 AU
52P (Harrington-Abell); Mar 07.54; 1.8 AU
290P/1998 U3(Jager); Mar 12.57; 2.15 AU
117P/Helin-Roman-Alu; Mar 27.16; 3.0 AU

APRIL 2014

*HIGHLITE: **Total Lunar Eclipse (1 of 2 in 2014)***

03 Th **HAC** Public S.P.; P.O.; SS@1841 hrs.
07 Mo ☽ First Quarter Moon 0132 hrs.
08 Tu MARS at opposition, 1400 hrs.
09 We Comet 124P (Mrkos) at perihelion 0738 hrs.; perihelion distance 1.6 AU
11 Fr **HAC Meeting,** Cochise College 7pm
12 Sa Asteroid 4 Vesta at opposition 2200hrs.
14 Mo Mars closest approach, 0600 hrs.; 0.62 AU from Earth, mag. –1.5; Size:15.2 arc-seconds
14>15 (Mo>Tu): **Total Lunar Eclipse** 2157 hrs. (14th) to 0337 h.(15th) Total from 0010h. to 0124h. (15th)
15 Tu ○ Full Moon 0043 hrs.
17 Th Saturn close (north) to Moon, 0000h.
22 Tu ☾ Last Quarter Moon 0053 hrs.
23 We **Lyrid Meteor Shower,** Pk. 1045 h.; some 46% moon; view on 23rd am
26 Sa **HAC** Member S.P.
28 Tu ● **NEW MOON** 2315 hrs.

MAY 2014

*HIGHLITE: **Astronomy Day & Saturn at opposition, May 10***

01 Th **HAC** Public S.P.; P.O.; SS@1900 hrs.
1 Th Mercury @ perihelion; evening star, mag. –1.6; view WNW at dusk
6 Tu **Eta Aquarid Meteor Shower**, Pk@ 0100 hrs.;40% Moon; rate 60+?
06 Tu ☽ First Quarter Moon 2016 hrs.
09 Fr **HAC Meeting,** Cochise College 7pm
10 Sa **NATIONAL ASTRONOMY DAY** (**HAC** event at Sierra Vista City Library)
10 Sa **Saturn** at opposition, 1100 hrs.; mag. +0.1, 8.9 AU from Earth, total size of 42.4″ (planet itself 18.7″)
14 We ○ Full Moon 1217 hrs.
21 We ☾ Last Quarter Moon 0600 hrs.
24 Sa **NEW** Meteor Shower? Predicted strong peak from Midnight to 0100 on am of 24th; radiant in Camelopardalis; from Comet 209P/LINEAR; best of 2014?
28 We ● **NEW MOON** 1141 hrs.
31 Sa **HAC** Member S.P.

JUNE 2014

HIGHLITE:

Venus/Moon Conjunction
(photo-op?)

05 Th **HAC** Public S.P.; P.O.;SS@1923 hrs.
☽ First Quarter Moon 1340 hrs.
12 Th ○ Full Moon 2112 hrs.
13 Fr **HAC Meeting,** Cochise College 7pm
19 Th ☾ Last Quarter Moon 1140 hrs.
21 Sa **Summer Solstice** 0351 hrs.
24 Tu Conjunction of crescent 7% Moon and Venus; 0518 to ENE
27 Fr June Bootids Meteor Shower; overhead to dawn on 27th; may show outburst
27 Fr ● **NEW MOON** 0109 hrs.
28 Sa **HAC** Member S.P.

Long Period Variable Stars–June 2014
Verify with www.aavso.org ;listed are stars brighter than mag. 8 at max.: period in days (d);date is predicted epoch max.

1946+32; x Cyg; 5.2>13.4; 407d; Jun 24
1432+27; R Boo; 7.2>12.3; 223d; Jun 21

*Times/Dates= ARIZONA Mountain STANDARD Time (MST; NO DST; UT-7hrs); **updates/ details,** see: www.hacastronomy.com or http://skycalendar.blackskies.org;
Abbr: Tr=Transit; Pk=Peak; Merc=Mercury; E=East W=West; S=South; N=North; J, Jup.=Jupiter; V=Venus; v. = very; "=arc seconds; SS=SunSet; S.P.=Star Party; h., hrs.=hours (24 hour time system); MP=Minor Planet; MS=Moon Set; MR=Moon Rise; wks=weeks; Lt=Light; pm=evening; @=at; Pub.=Public ; NEA= **N**ear **E**arth **A**steroid; am=morning; mag.=magnitude; **meteor dates reflect predicted Peak Morning, but Moon may still be present; P.O.= Patterson Observatory; dbl= double; I=Io; Eu=Europa; G=Ganymede; C=Callisto; UT=Universal Time; **bold text=**possibly a promising/noteworthy event, activity or object; G_Elong=Greatest Elongation; AU=Astronomical Unit (93 million miles); °= degrees; *compiler*: **Doug Snyder**(C/2002 E2,MP15512, starhaven@me.com);V1.1.2014

2014–Astronomically Handy Sky Calendar from Doug Snyder & the H.A.C.–2014

ARIZONA Observers SKY EVENTS Calendar for 2014 –All Times shown are MOUNTAIN STANDARD TIME*

JULY 2014

HIGHLITE: Due to Monsoons, no scheduled observing events

03 Th Earth at aphelion,1700 hrs.; 1.016 AU
04 Fr Pluto at opposition, 0100 hrs.; mag. 14.1, distance 32.5 AU
05 Sa ☽ First Quarter Moon 0500 hrs.
07 Mo Saturn within 1.5° of 76% Moon; 2030 hrs.
11 Fr **HAC Meeting,** Cochise College, 7 pm
12 Sa ○ Full Moon 0426 hrs.
12 Sa Mercury G_Elong. W. (21°); morning 'star' in East, mag. +0.4; reaches mag. 0.0 on July 15
18 Fr ☾ Last Quarter Moon 1909 hrs.
26 Sa ● **NEW MOON** 1543 hrs.
29 Tu **Delta Aquarids** Meteor Shower Pk. at 0200 hrs.; rate may approach 20 per hour, some persistent trains.
30 We Alpha Capricornids Meteors– weak, slow moving, but yellowish fireballs can be photogenic; best rate of 5/hour?

July (first-half): C/2012 K1; evening hrs. in LEO; mag 7?

AUGUST 2014

HIGHLITE: Monsoon Season; Choose your own Highlite !

03 Su ☽ First Quarter Moon 1751 hrs.
08 Fr **HAC Meeting,** Cochise College, 7 pm
10 Su ○ Full Moon 1110 hrs; **largest** of 2014
12>13 Tu>We Perseid Meteor Shower Pk. at 1700 hrs. on the 12th; v. unfavorable due to strong moonlight; rates can be high as 90/hour under dark skies
17 Su **Conjunction:** Venus/Jupiter within 1.0° and close to Beehive cluster; 0500 hrs.; But very low in the ENE skies; closest planet-planet conjunction of 2014
17 Su ☾ Last Quarter Moon 0527 hrs.
24 Su Comet Siding Spring (C/2013 A1) at opposition, 1800 hrs.; may collide with MARS in mid-October !
25 Mo ● **NEW MOON** 0714 hrs.
29 Fr Neptune at opposition, 0800 hrs.; mag. +7.8; distance 29 AU; size 2.4"
31 Su Moon/Saturn/Mars within 5° circle; Moon will be at about 35%; 2000 hrs.

SEPTEMBER 2014

HIGHLITE: Comet Possibilities

01 Mo Aurigid Meteor Shower; peak after midnight of Aug. 31 and into morning of Sept.01; fast and many are bright ; low hourly rate (5) but may outburst
02 Tu ☽ First Quarter Moon 0412 hrs.
08 Mo ○ Full Moon 1839 hrs; Harvest Moon
12 Fr **HAC Meeting,** Cochise College, 7 pm
15 Mo ☾ Last Quarter Moon 1906 hrs.
20 Sa **Kartchner Caverns/HAC S.P.,** dusk
21 Su Zodiacal Light in east before morning twilight for next two weeks
22 Mo **Autumnal Equinox** 1929 hrs.
23 Tu ● **NEW MOON** 2315 hrs.
25 Th **HAC** Public S.P.; P.O.; SS@1813 hrs.
27 Sa **Saturn** within 2° of 14% Moon, low in the WSW, 2000 hrs.

Comet Possibilities for September 2014
C/2013 A1:v.low in S., early evening;9/17>9/30 (Siding Spring); encounter MARS on 10/19
C/2012 K1: low in E., early morning; 9/1>9/30
C/2013 V5: low in E., morning; 9/1>9/13

OCTOBER 2014

HIGHLITES: MARS & COMET; 1 LUNAR ECLIPSE & 1 SOLAR ECLIPSE IN SAME MONTH !

01 We ☽ First Quarter Moon 1233 hrs.
04 Sa **NATIONAL ASTRONOMY DAY** **HAC** opens Patterson Observatory for Public Exhibits and Viewing
07 Tu Uranus at opposition, 1400 hrs.
08 We ○ Full Moon 0351 hrs.
08 We **TOTAL LUNAR ECLIPSE** Start: 0117hrs., End: shortly after moonset at 0630 hrs.; Totality: 0328 h. to 0423 hrs.
09 Th Draconids Meteor Shower; unfavorable due to bright Moonlight
10 Fr S. Taurids Meteor Shower; Pk. 0500h.
10 Fr **HAC Meeting,** Cochise College, 7 pm
15 We ☾ Last Quarter Moon 1213 hrs.
19 Su **Comet Siding Spring** (C/2013 A1) **Close** Encounter/Graze with **MARS!**
20 Mo Zodiacal Light in East before morning twilight for next two weeks
21 Tu **Orionid Meteor Shower**; v. favorable; Swift, some bright, rate about 20+/hr.
23 Th ● **NEW MOON** 1457 hrs.
23 Th Partial **Solar ECLIPSE,** Start:1430 hrs. End: 1648 hrs.; max: 1543 hrs.(29.3%) **HAC** viewing at S.V. City Library, 1 pm
25 Sa **HAC** Member S.P.
30 Th **HAC** Public S.P.; P.O.; SS@1733
30 Th ☽ First Quarter Moon 1949 hrs.

NOVEMBER 2014

HIGHLITE: METEORS & FIREBALLS

01 Sa Mercury at G_Elong. W.(19°), 0600 hrs.; **best** morning apparition of 2014, east
06 Th C/2012 K1 (PanSTARRS) at (2nd) opposition, 2000 hrs., in Pictor; possibly will or will have brightened to mag. 6
06 Th ○ Full Moon 1523 hrs.
11 Tu North Taurids Meteor Shower; rate of about 5/hr; waning 77% moon & bright
14 Fr **HAC Meeting,** Cochise College, 7 pm
14 Fr ☾ Last Quarter Moon 0816 hrs.
17>18 Mo>Tu **Leonid Meteor Shower** Peak at 1500 hrs on 17th; view pm hrs on 17th into am hours on 18th; about 20% moon; fast meteors & bright; a good number leave persistent 'trails' ; no 'storm' has been predicted, but do you remember 2001? Some of us do. WOW.
20 Th **HAC** Public S.P.; P.O.; SS@1720 hrs.
22 Sa ● **NEW MOON** 0532 hrs.
22 Sa **HAC** Member S.P.
29 Sa ☽ First Quarter Moon 0306 hrs.

Comet Of The Month—An Observing and Imaging Challenge for C/2012 K1 (PanSTARRS)
Throughout November, this comet will remain VERY low near our southern horizon and reside in these constellations: Pictor, Dorado, Phoenix, Reticulum, Horologium, and Eridanus, but may reach mag. 6 this month. Close encounter with Globular Cluster NGC1261 on 11/13; good luck!

DECEMBER 2014

HIGHLITE: GEMINID METEOR SHOWER

06 Sa ○ Full Moon 0527 hrs.
12 Fr **HAC Meeting,** Cochise College, 7 pm
13 Sa **Geminid** Meteor Shower Pk. Favorable Year, but with 50% moon; Pk. 0500 hrs. Saturday am; hourly rate can be as high as 120/hr.; mostly bright, few leaving 'trains';12/14 (Sunday) morning activity is possible also; Parent body is asteroid 3200 Phaethon (1.5 year orbit); radiant is near Castor
14 Su ☾ Last Quarter Moon 0551 hrs.
15 Mo **Dbl. Shadow Transit**, J. ; 2312 hrs. (Europa & Io); Note: At 0025 hrs. on 12/16, **both** Europa & Io will be in the process of transiting Jupiter! See 'em?
18 Th **HAC** Public S.P.; P.O.; SS@1721 hrs.
20 Sa **HAC** Member S.P.
21 Su Winter Solstice, 1603 hrs.
21 Su ● **NEW MOON** 1836 hrs..
22 Mo Ursids Meteor Shower Pk. 1300 hrs.; good date, but poor peak timing; (favors northern Asia); radiant is near β Ursa Minor (Kokab); rate is about 10/hour; faint, with a few fireballs. Parent comet is 8P Tuttle
25 Th *MERRY CHRISTMAS TO ALL !*
28 Su ☽ First Quarter Moon 1132 hrs.
28 Su Conjunction of Moon and Uranus; 2245 hrs.; less than 1.0° apart; first quarter Moon and mag. 5.8 Uranus

HAPPY NEW YEAR !

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