Nightfall

Monthly publication of the Huachuca Astronomy Club

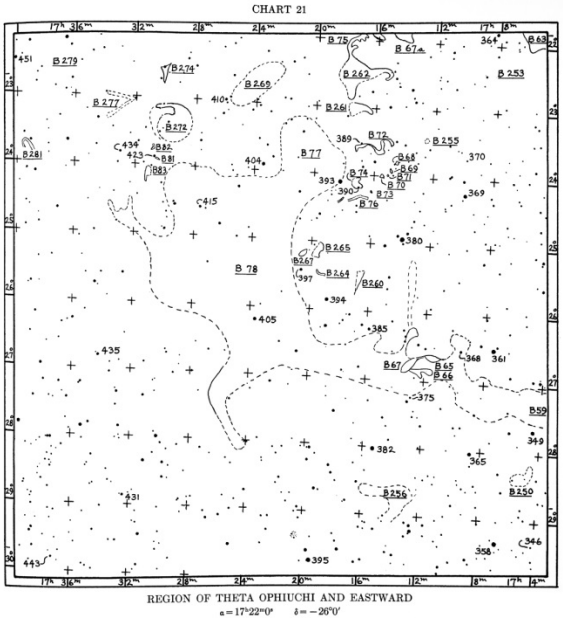
AUGUST 2014

President's Notes

It's August, a time to clean the bird poop off the primary mirror and blow out the Sonoran dust from the observatory computer. August is also a time to get ready for the clearing skies of fall. However, until then if the sky clears for a while, go outside take in the fresh air and look up. The Perseids (my favorite meteor shower) reach their maximum on August 12 this year (BAD, the full moon), but they are active from July 13 to August 26, which is good. Try looking a week before or after the full moon to have a chance of seeing any of the meteors. The Perseids are particles, as you know, released from comet 109P/Swift-Tuttle during its numerous returns to the inner solar system. Comet Swift-Tuttle came around last in 1992. I remember seeing it in an 8-inch scope, but it was not spectacular. The comet is expected (my word editor tells me that "is expected" is in the passive voice, so I am using it correctly) to make an impressive close pass of the earth in the year 2126. As I will then be 162 years old I will go out on a limb and say it will be spectacular, probably the comet of that century.

Also, on those rare clear nights in August try your luck at finding Neptune. The blue-green gas giant is in the constellation of Pisces and shining at about magnitude 7.8. Planetarium programs will show the planet's position and finder charts are available to print out on Sky and Telescope's website. It is possible to see Neptune in 8x40 binoculars, but you will need a scope of about 8" (diam.) to really see it as a colorful little world not just a bright dot. Once you do find it, pump up the power and see how different it looks from stars in the eyepiece field. Even in a very small telescope (3" or 4" diam.) it should still look like a soft disk of even brightness rather than a point or smudge of light.

If you are feeling more adventurous, try finding some objects from the Barnard Dark Nebulae Catalog. While many of the 370 objects need wide fields and low powers, or long exposures, many are quite easy even in binoculars. Written descriptions of E. E. Barnard's Catalog of Dark Nebulae can be found at, http://dvaa.org/AData/Barnard.html , and an electronic copy of the photographic atlas with charts is at http://www.library.gatech.edu/search/digital_collections/barnard/index.html. Plate 21 and chart 21 below are from the Georgia Tech digital collection and show many of the nebulae in constellation of Ophiuchus.



Our Next Meeting

The **Huachuca Astronomy Club** will hold their next meeting on August 8, 2014 at 7PM in the community room, Student Union Building, Cochise College, 901 North Colombo Avenue, Sierra Vista. Guest speaker Richard Harshaw will relate the recent efforts of a team of astronomers and engineers to test and assess the pointing accuracy of the McMath-Pierce 0.8 meter East Auxiliary Telescope at Kitt Peak National Observatory. Their efforts uncovered procedures that achieve the requisite accuracy required to successfully use speckle interferometry. Speckle interferometry is an imaging technique that can alleviate atmospheric distortion to obtain greater telescope resolution than can otherwise be achieved. Mr. Harshaw is a member of the Saguaro Astronomy Club and a prolific double star observer that has contributed thousands of double star measurements to the Washington Double Star Catalog. He has several articles on double stars published in Journals and is the author of *The Complete CD Guide To The Universe* (Springer Publishing 2006). The meeting is free and open to the public.

New Member Corner

We welcome Michael Jackson of McNeal AZ and Sue Mitchell of Sierra Vista to the club. **Welcome!** We are glad you joined.

Mount Graham Tour - By Wayne Johnson

We have an opportunity to tour the Mt Graham International Observatory on Saturday, Sept 6, 2014. It is a more intimate tour of the observatory than that offered by the town of Safford. The tour will be given by Dr. John Hill, the former project manager responsible for construction of the facility. One of the best parts of this tour is that it is free of charge, not the $40/person charged by the town. There will probably be a limit of 20 people allowed on the tour to keep it manageable. I still have to verify when the tour time starts and ends but it will be an all day event since it is about a 2 hour drive from Sierra Vista to get to the base camp of the MGIO just outside the town of Safford, AZ. Once we reconnoiter at the base camp it will take about an hour to go uphill. There is a gas-station/sandwich shop near the camp (I forget if it's just before the camp or just after it) if you want to bring something to eat up to the observatory. We'll probably have to carpool up the mountain to keep traffic to a minimum. Dr Hill has taken us on tours of the facility a couple times before, the last one about 5 years ago, and they're always excellent and informative. Please take advantage of this rare opportunity. We have about 6 people signed up for the tour already.

Let me know if you're interested by email at mrgalaxy@juno.com and I will have a sign-up sheet at the next HAC General Meeting as we firm up arrangements. Let's hope the Monsoons are done by that time!

2014 Lowell Speckle Interferometry Workshop

Friday-Sunday, October 3-5, 2014
Giclas Lecture Hall, Lowell Observatory, Flagstaff, AZ, USA
Workshop co-chairs:
Gerard van Belle, Lowell Observatory
Russell Genet, California Polytechnic State University

Overview

Speckle interferometry, once the sole province of professional astronomers, has expanded to include many amateur and undergraduate and even high school student observers and analysts. This expansion is due to the increased availability of high-speed CCD cameras, powerful PCs, PC-friendly software, and opportunities for publication.

Speckle interferometry overcomes normal atmospheric seeing conditions by taking a series (often thousands) of short-exposure images (typically 10-60 milli-seconds) which "freeze out" the usual atmospheric smearing. Speckle interferometry only works within the isoplanatic patch where atmospheric distortions are correlated—typically less than 10 arc seconds. Analyzing speckle images works best when observing geometrically simple objects such as close visual double stars, binary asteroids, Pluto and Charon, Jupiter's moons, and the diameters of large nearby stars.

The Lowell Speckle Interferometry Workshop brings professional, amateur, and student astronomers together in a synergistic mix that aims to consider science programs, speckle observations, data reduction, and analysis in a hands-on, informal atmosphere.

The workshop will feature, weather permitting, speckle interferometry observations on Lowell Observatory's 4.3-meter Discovery Channel Telescope in nearby Happy Jack. We will be using the Differential Speckle Survey Instrument (DSSI) developed by Elliott Horch. DSSI features simultaneous observations in two color bands and two Andor iXon EMCCD cameras.

Schedule

Friday, October 3
Morning: free time
Afternoon: Theory of speckle interferometry
Evening: at Lowell Observatory Rotunda patio
    All portable equipment set-ups are welcome
Saturday, October 4
Morning: free time
Afternoon: Science applications of speckle
    Binary stars
    Binary asteroids
    Pluto & Charon / Jupiter's moons
    Resolved stellar disks
Evening: at 4.3-meter Discovery Channel Telescope with DSSI
Sunday, October 5
Morning: free time
Afternoon: Data reduction workshop using observations from previous 2 nights
Evening: Banquet

The Invisible Shield of our Sun

By Dr. Ethan Siegel

Whether you look at the planets within our solar system, the stars within our galaxy or the galaxies spread throughout the universe, it's striking how empty outer space truly is. Even though the largest concentrations of mass are separated by huge distances, interstellar space isn't empty: it's filled with dilute amounts of gas, dust, radiation and ionized plasma. Although we've long been able to detect these components remotely, it's only since 2012 that a manmade spacecraft -- Voyager 1 -- successfully entered and gave our first direct measurements of the interstellar medium (ISM).

What we found was an amazing confirmation of the idea that our Sun creates a humongous "shield" around our solar system, the heliosphere, where the outward flux of the solar wind crashes against the ISM. Over 100 AU in radius, the heliosphere prevents the ionized plasma from the ISM from nearing the planets, asteroids and Kuiper belt objects contained within it. How? In addition to various wavelengths of light, the Sun is also a tremendous source of fast-moving, charged particles (mostly protons) that move between 300 and 800 km/s, or nearly 0.3% the speed of light. To achieve these speeds, these particles originate from the Sun's superheated corona, with temperatures in excess of 1,000,000 Kelvin!

When Voyager 1 finally left the heliosphere, it found a 40-fold increase in the density of ionized plasma particles. In addition, traveling beyond the heliopause showed a tremendous rise in the flux of intermediate-to-high energy cosmic ray protons, proving that our Sun shields our solar system quite effectively. Finally, it showed that the outer edges of the heliosheath consist of two zones, where the solar wind slows and then stagnates, and disappears altogether when you pass beyond the heliopause.

Unprotected passage through interstellar space would be life-threatening, as young stars, nebulae, and other intense energy sources pass perilously close to our solar system on ten-to-hundred-million-year timescales. Yet those objects pose no major danger to terrestrial life, as our Sun's invisible shield protects us from all but the rarer, highest energy cosmic particles. Even if we pass through a region like the Orion Nebula, our heliosphere keeps the vast majority of those dangerous ionized particles from impacting us, shielding even the solar system's outer worlds quite effectively. NASA spacecraft like the Voyagers, IBEX and SOHO continue to teach us more about our great cosmic shield and the ISM's irregularities. We're not helpless as we hurtle through it; the heliosphere gives us all the protection we need!

Want to learn more about Voyager 1's trip into interstellar space? Check this out: http://www.jpl.nasa.gov/news/news.php?release=2013-278.

Kids can test their knowledge about the Sun at NASA's Space place: http://spaceplace.nasa.gov/solar-tricktionary/.

Image credit: Hubble Heritage Team (AURA / STScI), C. R. O'Dell (Vanderbilt), and NASA, of the star LL Orionis and its heliosphere interacting with interstellar gas and plasma near the edge of the Orion Nebula (M42). Unlike our star, LL Orionis displays a bow shock, something our Sun will regain when the ISM next collides with us at a sufficiently large relative velocity.

Apollo 11 Memories

Forty-Five Years ago, on July 20, 1969 Neil Armstrong made his historic "Small Step" onto the moon. Ted Forte sent an email to the HAC list asking where HAC members were at the time. Here are some of the responses.

Ted Forte

> I watched from a barracks at the US Naval Training Center in Great Lakes (North Chicago) Illinois. I was a 19-year old sailor.

Kenneth Kirchner

> I did not exist. :)

Rick Burke

> I was on my summer break between freshman and sophomore years at Clarkson. I watched the landing at home with family.

Bob Kepple

> I heard the approach on the radio coming home from work, then watched the landing on TV after I got home.

David Roemer

> My dad was the news editor at "The Sacramento Union" newspaper and I was in grade school. On important days, my brother and I were commandeered to copyboy duties. On this day as the landing was to happen past the time the paper had to go to print there was a lot of activity and concern early on in the day but as the time to go to press got closer, my dad disappeared into the boardroom and shut the door. When he came out, he had the first section of the paper completed and readied for the pressroom. Later that night after they had landed, and the paper was put to bed, I was able to get a peek inside the boardroom. There stretched out on the large table were two completed "A sections" of the paper. On the cover of one section was "Man on the Moon" and had glad tidings from around the world and what was next in the mission. On the other cover, "Tragedy Strikes the Astronauts" and inside were the obituaries of the men and what the failure meant to the space program. That's the first time I understood what my dad did for a living.

Bob Gent

> At the time of the first moon landing on July 20, 1969, I was serving in the military, and I had taken leave to visit Pamplona, Spain. It was just after the running of the bulls, and the streets were very crowded. There were very few television sets anywhere in the area, but I recall one small cafe with a black and white TV. People were crammed inside, and there was no room to get near the TV. I stood with a friend in the street looking through the street-front window, as Neil Armstrong stepped on the moon. There were cheers and congratulations everywhere. It was amazing.

Emil Bovich

During the Apollo era, I was working for the newly established AC Electronics division of General Motors in Milwaukee, Wisconsin in various engineering assignments. Unknown to most people this division was set up to design and manufacture missile and related guidance systems. We in some cases designed and subsequently manufactured inertial guidance systems for at least five or six missiles. One of the missiles was Titan II and one of them--complete system sits in a silo on public display in Green Valley. I was the Reliability Engineering manager for the guidance system on this missile and worked closely with Joseph Shea who was the program manager--I mention him because his name is significant later in this note. Joe Shea later left GM and went to work for NASA in Houston in a high-level job on the Apollo program.

In my next assignment, I supervised the Reliability/Maintainability Analysis group that serviced all of the products that we designed and manufactured. It consisted of engineers, technicians, and statisticians. The people in the group analyzed data from product test and usage, did predictions, did physical failure analysis of failed parts including gyros and accelerometers.

Unknown to most is the concern that NASA had about the reliability of our gyros and accelerometers and this concern was communicated to the AC Electronics top management. We had many units on life test and performance was great. The management decided that we should provide NASA with a comprehensive analysis of instrument reliability data. The company management decided that the Assistant Apollo Program Manager and I should present and discuss these analysis results with Joe Shea in Houston. Many engineers and statisticians worked for a week preparing the data analysis after which we went to Houston, met with Joe, and he then went into a conference room filled with about 40 NASA top bananas, presented the data we gave him and was successful in convincing the attendees that our inertial products could do the job to the moon and back. No delay or suspension of the program occurred and everything went on as planned.

In 1962 as a result of AC Electronics having missile guidance system experience and I guess GM being a huge company with humongous assets and money obtained a contract with NASA to manufacture and provide engineering support on the Apollo program. The contract ran for many years.

MIT created the original design. We manufactured the inertial measurement unit in house including, as previously noted, the gyros and accelerometers, Raytheon manufactured the computer, and Kollsman manufactured the optical unit as our subcontractors and we were the system integrators. Our facility in Milwaukee was an impressive operation--about two

million square feet with many clean rooms as a small part of it. In the next phase usage of this facility after the missile guidance and Apollo business died we had developed an inertial navigation system for airliners and when that was blown away by GPS the facility reverted to automotive products including catalytic converters, computers, and various smaller electronic assemblies, eventually all of this was transferred to other GM divisions. Starting a few years ago, the facility was demolished and is being converted to retail, wholesale and city of Oak Creek public buildings. Oak Creek is a small city just at the southern edge of Milwaukee.

AC Electronics in Milwaukee before the Apollo era had opened a research lab in Santa Barbara, CA. It was named AC Electronics Defense Research Laboratories. At its peak, it had about 2500 employees. Early in the Apollo era, it was awarded a sub-contract by the Boeing Company to design and manufacture the Lunar Roving Vehicle (LRV). This would enable astronauts to drive around on the moon. The Lab developed a unique vehicle with wire mesh wheels that enabled it to readily cope with the moon's surface.

The LRV was about 10 feet long, 6 feet wide and fully loaded on earth weighed about 1500 pounds and on the moon about 250 pounds with two astronauts. It had a round trip range of about 16 miles at a speed of almost nine miles per hour. Four flight qualified LRV's were built and tested and delivered by the summer of 1971. The first mission to carry an LRV to the moon was Apollo 15 and thereafter Apollo 16 and 17. The astronauts on each mission picked up almost 250 pounds of lunar samples. The LRV's were left on the moon.

For a long time I have thought that the three greatest events that occurred in the history of mankind were the birth of Christ, humans on the moon, and the invention of the

Sierra Vista Library Telescope Review

Last September, the Huachuca Astronomy Club gave the Sierra Vista Public Library a telescope for patrons to check out.

The telescope available for check out at the library is an Orion StarBlast 4.5 Astro Reflector Telescope. It includes the telescope tube itself, the telescope stand, and an instruction manual. The telescope does not have separate eyepieces. Instead, it has an eyepiece zoom lens that goes from 8mm to 24mm, which the viewer twists to adjust. To adjust focus, the viewer uses rollers to move the eyepiece closer to the telescope tube or farther away from it. The telescope does not include a finder scope either, but one is not necessary, since the field of view is up to one degree. The telescope comes with an instruction booklet that explains how to set up and use it. The instruction booklet also includes a guide for viewing the moon and a couple of sky maps so that the viewer has some ideas of objects to look for in the sky.

The Library Telescope

The important aspects for a short use telescope are portability, durability, ease of use, and view.

The telescope must be portable, since the people taking it out will have to bring it home and then return it to the library. This means it must be fairly small. While some people (the very ambitious Gary Grue) may consider a ten-foot long telescope perfectly suited for transport, most would not. The library telescope is quite portable. When someone checks out the telescope, he or she receives a duffle bag containing the telescope tube and the instruction manual, and the telescope stand. The stand has a handle for easy carrying. Both the duffle bag and the stand will easily fit in the trunk or back seat of a car, or they could be carried onto a bus.

The telescope must also be durable, since many people will be using it, with a wide variety of levels of care and concern. This telescope has weathered the storm of use rather well, but some maintenance has been required on occasion. There are some minor scratches in the reflector but they don't adversely affect the view.

In addition to being portable and durable, the telescope should be easy to use. The people who check out a telescope rather than buy one will not want to spend too much time setting up the

telescope or figuring out how to use it. The library telescope is very easy to set up. Just unscrew the clamp on the telescope stand, put the tube in the clamp with the eyepiece away for the handle, close the clamp and tighten the bolt. Finding objects is harder, but not overly challenging. Users will need to line their eye up along the telescope and make sure the object they are looking for is just above the center of the telescope. They will then set the zoom lens to 24mm, for the largest field of view. They will look through the eyepiece and move the telescope around until they find the object. Then they should zoom in on the desired object, adjusting the focus as they go.

Of course, the view provided by the scope is also very important. People who check out a telescope are hoping to see objects that they are familiar with, but most likely rarely see through a telescope. The library telescope does provide good views. The view of Saturn is beautiful. Its rings are clearly visible and distinct from the main body. In my own attempts, I did not see any detail on Jupiter, but I did see its four Galilean moons. Mars appeared as a red disk, but no features were visible. The moon appears whole in the library telescope's field when zoomed out, but as I zoomed in, lots of detail was visible. I also looked at some deep sky objects. Albireo looks lovely, with a bright blue star and a brighter orange star. The two stars appear separate in all but the most zoomed out view. I viewed the globular clusters M4 and M13. They appeared as fuzzy disks, but their cores were visible and they were easily recognized as globular clusters. The views are rather easy to obtain, so I expect that most users will find the effort worthwhile.

I would recommend that anyone in the area thinking of buying their first telescope first check out this telescope from the library to see how they like it. It allows beginner astronomers to experience the thrill of finding and viewing objects through a telescope without spending the money to buy their own.

The library telescope is, as I have shown, an excellent telescope to have for the purpose intended. The telescope has been very popular. From last September to June it was checked out more than twenty times. I have found that there are long wait times for the telescope. The first time I went to check it out, back in April, I found I not only had to wait for the telescope to be returned, but for someone who had reserved it before me to have a turn. When I went to check it out again in June to prepare this review, I found I had to wait three weeks to get it.

Since the telescope is so popular, the Huachuca Astronomy Club may want to provide the Sierra Vista Library with another one of the same make. The cost for the scope is approximately $200. As more people learn about the availability of this telescope, the wait times will become longer.

In addition, if requests for the telescope do not increase, having another telescope available would allow the library to increase the time a patron is allowed to have a telescope. Allowing patrons to keep a telescope for 14 days would guarantee that they would have some time to view the sky without the moon adversely affecting their view.

Members' Photos

Moon and Venus by Ed Erbeck Jr

Pluto Three Nights by David Roemer

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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

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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;
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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 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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