Nightfall

Monthly publication of the Huachuca Astronomy Club

May 2013

President's Notes

Member Star Party: Our next Member Star Party will be held at Palominas Starhaven Observatory (PSO) and hosted by Doug and Jean Snyder on Saturday May 11. A map to DSO is available on our web page. It will begin at dusk.

HAC Outreach: Bob Hoover, our outreach coordinator, has scheduled an event for Friday, May 17 at Bisbee High School, in Warren. This event includes Lowell Middle School participants and is being held in conjunction with the Kiwanis organization. Set up will begin before dusk around 6:00 PM. We are expecting a large attendance and would appreciate any members who can donate time and telescopes to help out. Please contact Bob Hoover at: (520) 378-0369, or send
email to: outreach (at) hacastronomy.com

Next Meeting: The next meeting of the Huachuca Astronomy Club will be on Friday, May 24 at the Cochise College student union building at 7 PM in Sierra Vista, AZ. Our guest speaker will be Dr. Fraser Watson, post-doctoral researcher with the National Solar Observatory (NSO). He is currently looking at long-term properties of sun spots using the SOHO/MDI and SDO/HMI spacecraft's instruments. His talk will be titled: 'Where did the sunspots go?' and he will be speaking about some of the properties of the Sun that we use to measure solar activity, how they have changed in the last 15 years (leading to what is a very quiet period of activity in the Sun right now) and what this could mean for the future in solar study as well as possible effects on the Earth. We will have a drawing at the end of the meeting for door prizes. This meeting is free of charge and open to the general public. For more information, visit www.hacastronomy.org.

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Clear skies and bright stars,

Kim Rogalski
President, Huachuca Astronomy Club

Astronomy Day April 20, 2013

by Ted Forte

Each spring, astronomical societies are encouraged to sponsor "public *viewing sessions, presentations, workshops, and other activities to increase public awareness about astronomy and our wonderful universe" on* a day set aside as **International Astronomy Day**.

As described by Wikipedia: *"**Astronomy Day** is an annual event intended to provide a means of interaction between the general public and various astronomy enthusiasts, groups and professionals. This event was started in 1973 by Doug Berger, the president of the Astronomical Association of Northern California. His intent was to set up various telescopes in busy urban locations so that passersby could enjoy views of the heavens."*

In that spirit, HAC held an Astronomy Day event at the Sierra Vista Public Library on Saturday April 20th. Member enthusiasm, some very detailed planning, and a gorgeous day all contributed to a most successful event.

Tommy Neyhart took on the challenge of planning and coordinating our event, assisted by the continuous encouragement of members like Doug Snyder who kept Astronomy Day on everybody's radar. However, a lot of members contributed to the success of the event.

Before he withdrew as HAC president, Bob Gent got the ball rolling with a request to the Mayor's office for a proclamation and some initial contact with the library administration. Our outreach coordinator, Bob Hoover, also did some of the early planning with the library. Then, once Tommy was appointed as coordinator, things really started taking shape. Tommy enlisted Doug Snyder, Glen Sanner and others to help with the details of laying out the plan of the day. They decided to set up a scale model of the solar system. Glen Sanner had the pieces for a solar system walk that had been used at previous events at the Patterson. Although Glen had to miss the Astronomy Day event, he was none the less a major contributor, having created the solar system display.

Answering the challenge laid down by Doug, Bert Kelher produced the Astronomy Day flier. Doug had them printed and distributed to several members who spread them around town. Meanwhile, Tommy worked through the HAC Board of Directors to fashion and distribute the press releases for the event, and briefed various city authorities, obtaining permissions and approvals, and keeping everything on track.

As Astronomy Day drew closer, the preparations intensified. Tommy addressed the club at the March meeting and drummed up the excitement. I helped Doug Snyder stage the solar system model at the Patterson and Bob Hoover obtained permission to use the USF's exquisite solar telescope at the event. Chris Ubing accepted the Mayor's Astronomy Day proclamation on behalf of the club at the April City Council meeting while Doug Snyder looked on.

The day dawned magnificent. Some wind cropping up in the afternoon was the only aspect of the weather that wasn't perfect. The sun cooperated too. We had sunspots and some very impressive prominences and other solar activity to show off. Bert Kelher, Gary Grue and I helped Tommy lay out the solar system model along Tacoma Street, while back at the library, several members were setting up telescopes. Gary had brought coolers with drinks and Dave Roemer and Nancy Hannaford brought some tables and such to use. Jean Snyder and I set up a canopy to house the Night Sky Network displays and the tables with all of the giveaway items we had to share. NASA and Sky &Telescope provided most of the materials. We also had Sun Fact sheets that Doug created and a number of Astronomy magazines to give away compliments of Bob and Barb Kepple.

I am reluctant to list the names of the many members who attended; as much as I want to recognize them, it is almost inevitable that I will miss a few. So begging the pardon of those I miss, let me try. Bob Hoover, Doug and Jean Snyder, David Roemer, Nancy Hannaford, Bert Kelher, Bob and Barb Kepple, Ken Duncan, Kim Rogalski and Max Mirot all set up scopes. Gary Grue was kind enough to monitor my Sun-Funnel equipped refractor while I manned the tent. Gary had to leave early and Bert filled in for us on the sun funnel while simultaneously working his solar projection screen. Lots of other members stopped by to help or just visit. I saw Tom Kaye, Cindy Lund, Bill Howard, Katherine Zellerbach and Neal and Butch Galt. I'm sure there were others I didn't see. Many friends of HAC were also there.

The event lasted many hours. Some of us were there before 8:30AM and stayed past 4PM. I don't think anyone attempted an actual count, but I estimate that 200 people looked through our scopes or visited our tables. Most were taken by surprise, which is how I think it is meant to be. We wanted to reach those who normally don't think about astronomy or ever really look up at our sky and I think we succeeded. At least I know we succeeded in sharing a look through telescopes with a number of people who had never done so before. We succeeded in inspiring a bit of wonder and awe. We taught a few people some things they didn't know about our sun, our solar system and the science of astronomy. And we had fun doing it.

The next Astronomy Day this year is October 13. The events have been so successful that organizations like the Astronomical League have encouraged clubs to do two of them a year since 2011. So, the HAC Board is considering doing it all again this fall. If we do, we will be aided by a comprehensive "how to" report compiled by Tommy and an abundance of wonderful HAC volunteers. This April's event will be hard to top, but I'm confident we can do exactly that!

Astronomical League Observing Programs - Planetary Nebula

by Ted Forte

(Captured from the HACList)

May's installment on the running list of PN Program objects by month contains four targets. Add these to your observing list to round out your TSP or HAC MSP objectives, but don't forget that almost all of the PN program objects will rise above the horizon sometime during the night during mid-May.

First up is NGC 4361 in Corvus, and it's a good place to start if you are new to observing planetary nebulae because it's rather obvious even in smaller scopes. It is comprised of an easily seen central star surrounded by a bright circular nebula. Some, however, say that it is often mistaken for a galaxy. The outer regions of the disk are fainter but contain exquisite detail for those willing to spend the time studying it. The object was discovered by William Herschel. It is estimated to lie about 2500 light years away, but any distance estimates for this object are suspect; this is a rather unusual planetary in terms of its chemical makeup and the standard assumptions applied in distance measurements are probably inadequate in this case. To find it, imagine a south pointing triangle with equal sides of about 2.5 degrees; Algorab (Delta Corvi) and Gamma Corvi form the base and the planetary is the apex of the triangle.

Tiny by comparison, is IC 3568 in Camelpardalis. Jay McNeil nicknamed this little jewel the "Baby Eskimo" and one look at a detailed photograph will reveal the source of its other handle - "The Lemon Slice". But don't hold out too much hope of seeing much detail in this small disk, the professional astronomer community (Balick *et al*) proclaim IC 3568 as one of the morphologically simplest planetary nebulae in the sky. First try to catch the central star, and then pop in the OIII filter for a good look at the small nebula. You can decide for yourself if there is structure to be gleaned. IC 3568 is visible all year from our latitude with May nights seeing it reach its highest point in our sky. Imagine it as the tip of a triangle pointing toward the Big Dipper with Polaris and Epsilon Ursae Minoris (the middle star in the handle of the Little Dipper) as the base. It is 8 degrees from either star.

The next two planetaries were discovered by George Abell in the 50's and 60's through examination of Palomar Sky Survey photographic plates. Most famous for his catalog of galaxy clusters, Abell published his catalog of planetary nebulae in 1966. Most, if not all of the PNe in his catalog were unknown before then and are understandably challenging for backyard telescopes.

Abell 35 in Hydra is known as "The Bow Shock" nebula (another McNeil moniker) and images show a very pronounced bow-shock shape. It has been described on the web as "one of the most bizarre looking nebulae in the sky". I see just a large irregular patch of faint nebulosity that requires a filter to be seen at all. Look for an arc of three stars (7, 8 and 9th magnitude) 4 degrees east of Kraz (Beta Corvi). The PN is about 15 arc minutes to the north.

Abell 36 is the "Bat Symbol" nebula (yup, Jay McNeil again). Seeing the bat symbol within this faint disk may require chemical enhancement in addition to a narrowband filter. Try averted vision, low power and a clean OIII filter and who knows? Your observing site just might echo with cries of "holy ionization, Batman, I SEE it!" Extend the imaginary line connecting 4th magnitude Beta Hydrae with 3rd magnitude Gamma Hydrae another six degrees to find the planetary.

Both of these are quite difficult, so don't despair if you don't detect much. Any detection is acceptable and if you can't achieve even a hint, well, negative observations are accepted.

"Negative observations" will be accepted for the ADVANCED program if sufficient evidence is submitted to establish that the proper field was examined on at least two separate attempts and every reasonable effort was made to detect the object.

To record a negative observation, the observer must make at least two observing attempts on different nights, record all of the data required for a standard observation and describe in detail the methodology used to confirm that the proper position was examined. Each negative attempt MUST include a sketch of the star field. Observers are encouraged to make as many attempts to detect the object as possible and to submit negative observations only when resigned that detection is impossible. Negative observations WILL NOT be accepted for the basic program.

Our monsoon makes observing in July and August rather spotty. You may want to check the PN list now: http://www.astroleague.org/files/obsclubs/PlanetaryNebula/StandardList.pdf and try to check off some of the objects in Scorpius and Sagittarius to ease your burden later. We'll talk about them as they come up, but if you're out in the wee hours (3am) this month, you can get a good start on them.

May Planetaries:

NGC 4361	PN G294.1+43.6	Crv	12h25m01.1s	-18°50'25"
IC 3568	Baby Eskimo	Cam	12h33m22.8s	+82°30'54"
Abell 35	PN G303.6+40.0	Hya	12h54m04.1s	-22°55'40"

Good luck and happy observing.

Ted

Exploring the Water World

In some ways, we know more about Mars, Venus and the Moon than we know about Earth. That's because 70% of our solar system's watery blue planet is hidden under its ocean. The ocean contains about 98% of all the water on Earth. In total volume, it makes up more than 99% of the space inhabited by living creatures on the planet. As dominant a feature as it is, the ocean—at least below a few tens of meters deep—is an alien world most of us seldom contemplate. But perhaps we should.

The ocean stores heat like a "fly wheel" for climate. Its huge capacity as a heat and water reservoir moderates the climate of Earth. Within this Earth system, both the physical and biological processes of the ocean play a key role in the water cycle, the carbon cycle, and climate variability.

This great reservoir continuously exchanges heat, moisture, and carbon with the atmosphere, driving our weather patterns and influencing the slow, subtle changes in our climate.

The study of Earth and its ocean is a big part of NASA's mission. Before satellites, the information we had about the ocean was pretty much "hit or miss," with the only data collectors being ships, buoys, and instruments set adrift on the waves.

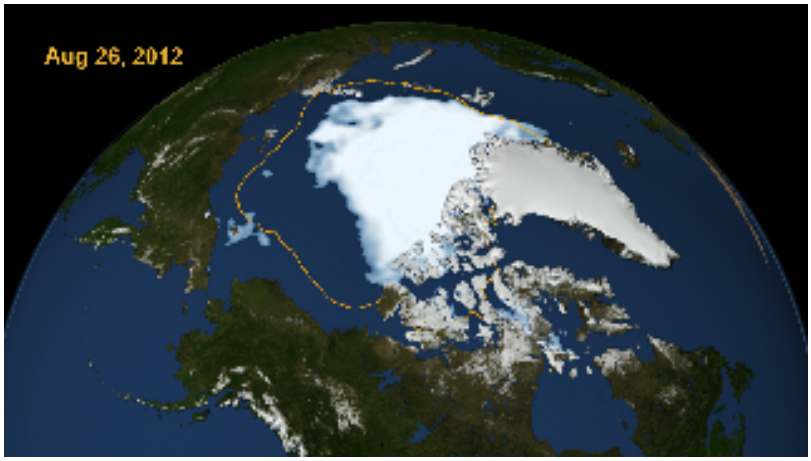
Now ocean-observing satellites measure surface topography, currents, waves, and winds. They monitor the health of phytoplankton, which live in the surface layer of the ocean and supply half the oxygen in the atmosphere. Satellites monitor the extent of Arctic sea ice so we can compare this important parameter with that of past years. Satellites also measure rainfall, the amount of sunlight reaching the sea, the temperature of the ocean's surface, and even its salinity!

Using remote sensing data and computer models, scientists can now investigate how the oceans affect the evolution of weather, hurricanes, and climate. In just a few months, one satellite can collect more information about the ocean than all the ships and buoys in the world have collected over the past 100 years!

NASA's Earth Science Division has launched many missions to planet Earth. These satellites and other studies all help us understand how the atmosphere, the ocean, the land and life—including humans—all interact together.

Find out more about NASA's ocean studies at http://science.nasa.gov/earth-science/oceanography. Kids will have fun exploring our planet at The Space Place, http://spaceplace.nasa.gov/earth.

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



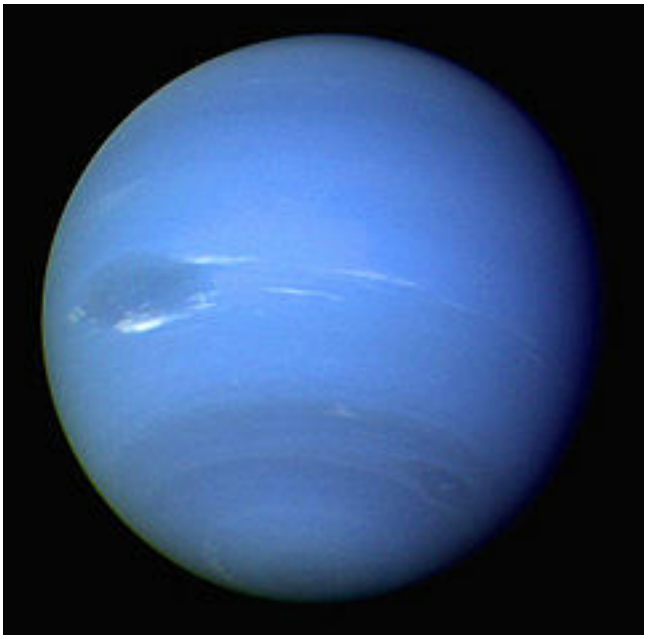
Caption:T*his image from September 2012, shows that the Arctic sea is the smallest recorded since record keeping began in 1979. This image is from NASA's Scientific Visualization Studio at Goddard Space Flight Center. Editors: Download this image at http://spaceplace.nasa.gov/news-images/arctic-sea-ice.jpg .*

Book Review

The Neptune File: A Story of Astronomical Rivalry and the Pioneers of Planet Hunting, by Tom Standage

Cindy Lund

The Neptune File is basically about the discovery of the planet Neptune through mathematical calculations based on the orbit of Uranus. However, the book covers a lot of related topics including the discovery of Uranus, the controversy over credit for the discovery of Neptune, and the recent discovery of unseen extrasolar planets using mathematical calculations.



The book begins with William Herschel's discovery of Uranus in March, 1781. He was observing in Gemini, when he saw a fuzzy blob. Herschel naturally though the blob was either a nebula or a comet. A few days later, he observed the blob again. Since it had moved against the background of stars, he concluded it was a comet. However, this "comet" was very strange. It had no tail, and its orbit was close to a circle, not a parabola. The President of the Royal society wrote Herschel saying that many astronomers thought Herschel had discovered a new planet. The discovery was confirmed when a star in Tobias Mayer's 1756 star catalog was found to be missing. Calculations showed that missing star was right where the new planet had been.

Standage explained how astronomers use a transit telescope and a mural quadrant to get an object's exact location in the sky. (The transit telescope obtains the right ascension, and the mural quadrant obtains the declination.) Astronomers then used this information to calculate a planet's orbit and determine where it will be at any time in the future (or where it was in the past). By the late eighteenth century, astronomers could predict where a planet would be within a couple of arc seconds, except with Uranus. Astronomers just could not get it to behave. They would calculate an orbit, which worked for a while, but in a few years Uranus was off track. Moreover, the error in longitude increased as the years passed.

The Neptune File then gets into its main story: the discovery of Neptune and the astronomers involved. Stanage tells of George Biddell Airy, the Royal Astronomer who ran the Royal Greenwich observatory with a strict time-tabled regime. He tells of young John Couch Adams, a self-taught mathematical genius who decided to solve the problem with Uranus when he was still an undergraduate.

Adams, like most astronomers, thought that Uranus was being perturbed by an unseen planet beyond it. Unlike many astronomers, he thought that the location of the unseen planet could be calculated. To that end he spent two years doing calculations to determine the position of this planet. First, he solved a simple version of the problem, assuming that the unknown planet had a circular orbit and was twice as far from the sun as Uranus. Then he asked the royal observatory for the data on Uranus's orbit. He then set up and solved a system of 21 equations to determine the position of the new planet. In late September, 1845, Adams completed his calculations and sent his results to Airy in October. However, neither Adams nor Airy published the results.

Meanwhile, a French astronomer, Urbain Jean-Joseph Le Verrier , had also become interested in the problem of Uranus and was also calculating the position of an unseen planet perturbing Uranus's orbit. Le Verrier was an established astronomer, confident and ambitious. He was perhaps too confident and ambitious, for he was described as "difficult." He, like Adams, calculated the position of the planet that was disturbing Uranus. Unlike Adams, he published his results, doing so on June first, 1846.

Le Verrier and Adams had calculated very similar locations for the unseen planet. All astronomers had access to Le Verrier's paper, but only Adams Airy, and a few others connected to the Royal Observatory knew about Adams's results. Therefore, one would think that Airy, and therefore England, would have a head start and would discover the planet first. However, that did not happen. Instead, Airy asked James Challis, directory of the Cambridge Observatory to search for it. Challis did a slow search, recording the positions of all the stars in a large area. He then planned to go back over the area and see if any stars had moved, but he was scooped.

The new planet was instead discovered at the Berlin Observatory, using only Le Verrier's prediction. On 23 September 1846, Astronomers Johann Gottfried Galle and Johan Franz Encke were discussing searching the unseen planet, when astronomy student Heinrich d'Arrest begged them to let him help with the search. Galle and d'Arrest searched the stars near Le Verrier's predicted location, but none had a disk. They then decided to compare the stars they observed to the stars in a star map. After matching a few stars, Galle described a faint star. D'Arrest found the map had no star listed in its location, and said, "That star is not on the map!" The next day they observed the "star" again and found that it had moved by just the right amount. The previously unseen planet had been found.

Then the controversy erupted. John Herschel, the son of William Herschel, wrote a London newspaper about Adams and his prediction of the new planet, which had come before Le Verrier's. This letter caused outrage in France, where astronomers felt the English were hijacking the discovery. English astronomers were also displeased, since they had not been told about Adam's prediction. The controversy raged through the end of 1846. There was even controversy over the name of the new planet, with the French wanting to call it Le Verrier and almost everyone else going with Le Verrier's original choice, Neptune. Finally, John Herschel brokered a compromise, acknowledging Le Verrier's achievement but working to get recognition for Adams.

The Neptune File then goes beyond the discovery of Neptune and covers astronomers' attempts to use mathematics to find more planets. For nearly 150 years, they had no success in finding planets, either in the solar system or around other stars. Only Pluto was found, and that was a coincidence. Then in 1995, Michel Mayor and Didier Quezloz used radial velocity calculations to discover a planet orbiting the star 51 Pegasi. Standage then briefly discusses the techniques used for finding planets. By the time the book was published, in 2000, dozens of extrasolar planets had been discovered, but none had been seen. Now, of course, we have a few images of extrasolar planets, but the vast majority of the 885 discovered so far have been detected indirectly, just like Neptune was.

The Neptune File tells a fascinating story. I learned a lot about the astronomers and the astronomy of the 1840's. Standage makes the tale of Neptune's discovery and the controversy surrounding it very interesting. I would recommend this book for anyone interested in learning about the discovery of Neptune, or for anyone interested in reading about astronomical history.

(The picture is one that Voyager 2 took of Neptune in 1989. It was obtained from Wikipedia.)

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2013—ARIZONA's Astronomically Handy Sky Calendar from Doug Snyder & the H.A.C.—2013

ARIZONA Observers SKY EVENTS Calendar for 2013 —All Times shown are MOUNTAIN STANDARD TIME*

January 2013

HIGHLITE1: Moon & Jupiter on 21st
HL2(month):**Saturn's Rings open to 18°**
Note: **HAC** = **H**uachuca **A**stronomy **C**lub

03 Th Quadrantids Meteor Shower - unfavorable year due to Moon light! 04 Fr ☾ Last Quarter Moon 2058 hrs.
11 Fr ● **NEW MOON** 1244 hrs.(lunation#1114)
12 Sa **HAC** Member **S**tar **P**arty (S.P.)
17 Th **HAC** Pub. S.P.;P.O.; SS@1743h.
18 Fr ☽ First Quarter Moon 1645 hrs.
21 Mo MOON & Jupiter v. close, 2000h
25 Fr **HAC Meeting**, Cochise College, 1900 hrs
26 Sa ○ Full Moon, 2138 hrs.
29 Tu Zodiacal Lt. in W., pm, next two weeks after evening twilight.

February 2013

HIGHLITE: Merc. & Mars close on Feb. 8th

03 Su ☾ Last Quarter Moon 0656 hrs.
09 Sa **HAC** Member **S**tar **P**arty (S.P.)
10 Su ● **NEW MOON** 0020 hrs.
14 Th **HAC** Pub. S.P.; P.O.; SS@1808hrs. 15 Fr **NEA** 2012 DA14; to mag.12 in evening hrs.; size= 57meters; visit spaceweather.com
16 Sa Merc. evening planet in W., 7"
17 Su ☽ First Quarter Moon 1331 hrs. 22 Fr **HAC Meeting,** Cochise College
25 Mo ○ Full Moon 1326 hrs.
27 We Zodiacal Lt. in W., pm, next two weeks after evening twilight

March 2013

HIGHLITE: Messier Marathon S.P. 04 Mo ☾ Last Quarter Moon 1453 hrs. 09 Sa **HAC Messier Marathon S.P.**
09 Sa **Comet Pan-Starrs** (C/2011 L4); 2100hrs, at Perihelion—Mag. 0?
11 Mo ● **NEW MOON** 1251 hrs.
14 Th **HAC** Pub. S.P.; P.O.; SS@1829h.
16 Sa **KartchnerCavernsStatePark**SP.
17 Su Moon&Jup. close;1900hrs; 1.4°
19 Tu ☽ First Quarter Moon 1027 hrs.
20 We **Vernal Equinox**, 0402 hrs.
22 Fr **HAC Meeting,** Cochise College
27 We ○ Full Moon 0227 hrs.
31 Su Merc. morning planet in E. size 9" Easter Sunday

April 2013

HIGHLITE: Saturn Opposition, 4/28
HL2: Comet Pan-Starrs (early in month & bright?)

02 Tu ☾ Last Quarter Moon, 2137 hrs. 06 Sa **HAC** Member S.P.
10 We ● **NEW MOON** 0235 hrs.
14 Su Jupiter within 4° of crescent Moon
18 Th ☽ First Quarter Moon 0531 hrs. Th **HAC** Pub. S.P.; P.O.; SS@1852h.
20 Sa **ASTRONOMY DAY—Global**
22 Mo Lyrid Meteors—v. unfavorable due to moonlight; peak 0400?
25 Th ○ Full Moon, 1257 hrs.
26 Fr **HAC Meeting,** Cochise College
28 Su Saturn at **Opposition,** 0100 hrs. mag. +0.1, size 18.8", 8.82 AU

May 2013

HIGHLITE: Merc., Venus, Jup. Conjunction! 02 Th ☾ Last Quarter Moon, 0414 hrs.
05 & 06 Su & Mo **η Aquarid Meteors**; favorable; pk@4am each morning; possibly 40 per hr.
09 Th ● **NEW MOON** 1728 hrs.
11 Sa **HAC** Member S.P.
16 Th **HAC** Pub. S.P.; P.O.; SS@1912hrs.
17 Fr ☽ First Quarter Moon 2134 hrs.
24 Fr ○ Full Moon, 2125 hrs. very shallow penumbral Lunar Eclipse, 1.5%; mostly undetectable, starts at 2053hrs.
24 Fr **HAC Meeting,** Cochise College
24-29 Planetary Conjunction, **best** of 2013;evening twilight line up of Merc.,Venus,Jup.;26th is !!
31 Fr ☾ Last Quarter Moon, 1158 hrs.

June 2013

HIGHLITE: (Gamma) Delphinids?

04 Tu Venus in **M35**, pm, low in NW
08 Sa ● **NEW MOON** 0856 hrs. **HAC** Member S.P.
11 Tu **Meteors**-Del.; 0100-dawn? v. favorable year, activity is ??
12 We Merc. G. Elong. 24°, pm planet
13 Th **HAC** Pub. S.P.; P.O.; SS@1927hrs.
16 Su ☽ First Quarter Moon 1024 hrs. 20 Th Merc. 2° S. of Venus, pm
20 Th Summer **Solstice** 2204 hrs. 23 Su ○ Full Moon,0432h.largest of 2013 28 Fr **HAC Meeting,** Cochise College
29 Sa ☾ Last Quarter Moon, 2153 hrs.

July 2013

HIGHLITE: Mars, Jup., Merc., am, E., July **22nd**

01 Mo Pluto at Opposition,1800 hrs.
06 Fr Moon/Mars close; . low in E.,0430h.
08 Mo ● **NEW MOON** 0014 hrs.
15 Mo ☽ First Quarter Moon 2018 hrs.
22 Mo ○ Full Moon, 1116 hrs.
26 Fr **HAC Meeting,** Cochise College
29 Mo ☾ Last Quarter Moon, 1043 hrs.
29-30 Mo-Tu: **Meteors:** Delta(δ)Aquarids; am hrs.; favorable year

August 2013

HIGHLITE1: Perseid Meteor Shower
HL2: Moon/Planet pairings, am! & pm during month

06 Tu ● **NEW MOON** 1451 hrs
11-13 Su-Tu; **Perseids**; Pk. am of 12th; fast, bright
14 We ☽ First Quarter Moon 0356 hrs.
20 Tu ○ Full Moon, 1845 hrs.
23 Fr **HAC Meeting,** Cochise College
26 Mo **Neptune** at Opposition, 1900 hrs.
28 We ☾ Last Quarter Moon, 0235 hrs.

September 2013

HIGHLITE: Moon&Venus close, pm, 8th

03 Tu Zodiacal Lt. in E., am, next two weeks before twilight.
05 Th ● **NEW MOON** 0436 hrs.
12 Th ☽ First Quarter Moon 1008 hrs. **HAC** Public S.P., P.O.;SS@1830hrs.
19 Th ○ Full Moon (Harvest), 0413 hrs.
22 Su Fall **Equinox**,1344 h. (Aurora?)
26 Th ☾ Last Quarter Moon, 2055 hrs.
27 Fr **HAC Meeting,** Cochise College

October 2013

HIGHLITE: Jup. Dbl Shadow Transits (3) 17th, 18th, 26th; details online

03 Th Zodiacal Lt. in E.,am, next two wks. **Uranus** at Opposition, 0700 hrs.
04 Fr ● **NEW MOON** 1734 hrs. **HAC** Member S.P.
05 Sa **Kartchner Caverns StatePark** S.P.
10 Th **HAC** Public S.P., P.O.;SS@1755hrs.
11 Fr ☽ First Quarter Moon 0402 hrs.
12 Sa **Astronomy Day** (Autumn)
18 Fr ○ Full Moon,1638h.; Lunar eclipse @MR
25 Fr **HAC Meeting,** Cochise College
26 Sa ☾ Last Quarter Moon, 1640 hrs.

November 2013

HIGHLITE: Comet ISON (C/2012 S1) !!!! ??? 01 Fr Venus G. Elong. E.(47°),0100hrs., **pm** planet
02 Sa **HAC** Member S.P. Jup., dbl. Shadow Tr., 0414hrs., I & Eu;
03 Su ● **NEW MOON** 0550 hrs.
05 Tu S. Taurid meteors Pk., 0400 hrs.; favorable;
07 Th **HAC** Public S.P., P.O.; SS@1727 hrs.
09 Sa ☽ First Quarter Moon 2257 hrs.
17 Su ○ Full Moon, 0816 hrs.; Merc. **am** planet 22 Fr **HAC Meeting,** Cochise College
25 Mo ☾ Last Quarter Moon, 1228 hrs.
28 Th **Comet ISON**, **Perihelion** @ 1600hrs.
30 Sa **HAC** Member S.P. (for **December**)

December 2013

HIGHLITE: Comet ISON ??? !!!!

02 Mo ● **NEW MOON** 1722 hrs.
06 Fr Venus@greatest illumination, mag. -4.9, 26% illuminated, size 41" 09 Mo ☽ First Quarter Moon 1008 hrs. 12 Th **HAC** Public S.P., P.O.;SS@1714h. 13 Fr Geminid Meteors Pk. 2300h., fair? 14 Sa **HAC Meeting/XMAS Party** 17 Tu○ Full Moon,0413h.(smallest 2013)
21 Sa Winter **Solstice,** 1011 hrs.
22 Su Ursid Meteors Pk., 0700 hrs.
25 We ☾ Last Quarter Moon, 0648 hrs.
26 Th **C/ISON:** closest to Earth, 0300h.

*Times/Dates= ARIZONA Mountain Standard Time (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; ;
I=Io; Eu=Europa; G=Ganymede; C=Callisto; UT=Universal Time; **bold text=**possibly a promising/worthy event, activity or object; G_Elong=Greatest Elongation; dbl= double; AU=Astronomical Unit; °= degrees; *compiler*: **Doug Snyder** (C/2002 E2, MP15512); V1.1.2013