Nightfall

Monthly publication of the Huachuca Astronomy Club

President's Notes

Next Meeting: **The next meeting of the Huachuca Astronomy Club will be on Friday, February 22 at the Cochise College student union building at 7 pm in Sierra Vista, AZ.**

The guest speaker will be our very own Bob Kepple, an Astronomical League Master Observer, and a noted author of astronomy guidebooks. Mr Kepple will be sharing some of his magnificent night sky photography taken from his HyperStar system in Palominas. We will be awarding one of Mr Kepple's signed Night Sky Observer's Guide, volume two as a door prize. In addition, HAC President Bob Gent will give an update on Near Earth Objects, and he will cover the history of past asteroid collisions with Earth. This meeting is free of charge and open to the general public. For more information, visit www.hacastronomy.org.

Astronomy at Douglas High School: **Ted Forte is shown using HAC's Night Sky Network "Magnetic Sun" kit. On February 4, 2013, Ted, Bob Hoover, and Bob Gent set up solar telescopes for the science classes.**

Member Star Parties: **As we are going to press, Ted and Halina Forte just hosted our February 9th star party. This was a big success and we send our appreciation. We have many other openings the rest of the year, and please let us know if you can host an event. March 9 would be a good date for Messier observing, and this date is open.**

Kartchner Caverns Star Night: **For the past three years, our club has been supporting "star nights" at Kartchner Caverns, and the next event is planned for March 16. Dr. Tim Hunter will be the guest speaker at Kartchner Caverns star night starting at 5:30 pm in the Discovery Center. His talk will include the a discussion and photographs of wonders of the night sky and preservation of our heritage of dark skies.**

Dr. Hunter has been an amateur astronomer since 1950. He built and operates the Grasslands Observatory near Sonoita, Arizona. In 1987, Dr. Tim Hunter and Dr. David Crawford founded the International Dark-Sky Association, Inc., to promote quality outdoor lighting and combat the effects of light pollution. At present, he is the chair of the board of trustees for the Planetary Science Institute and president of the board of directors of the International Dark-Sky Association. In addition, he is a Professor in the Department of Radiology in the College of Medicine at the University of Arizona.

On the afternoon of March 16, there will be solar observing, and this will be followed by the theater program. Starting at about 6:30 pm we will have telescopes set up in the bus parking area for public viewing of the night sky. We hope to see you there!

Public Nights at the Patterson: The next Patterson Observatory public nights are Thursday, February 14, March 14, April 18, May 16, and June 13. All of these events start shortly after sunset, and as always, we appreciate your help. Again this year, we will not be holding any events during July or August due to monsoons.

General meetings: This year, all of our meetings except December will be held on the 4th Fridays at Cochise College.

Outreach Coordinator: In the photo below, HAC Outreach coordinator Bob Hoover shares his telescope with solar filter with science students from Douglas High School . We have a number of public and private astronomy outreach events on the horizon. Bob is coordinating these events, and we are going to need help at several events.

International Astronomy Day: We will be hosting a big event at the Sierra Vista Library from 10 am to 4 pm on Saturday, April 20, 2013. Please mark your calendars.

Support from Amazon: Our club continues to receive funds from Amazon.com. A percentage of every Amazon sale that passes through our website is automatically donated back to our club. If you plan of doing online holiday shopping, please use the "Amazon" link on our website at www.hacastronomy.com.

Clear skies and bright stars,

Bob Gent
President, Huachuca Astronomy Club

The Art of Space Imagery

By Diane K. Fisher

When you see spectacular space images taken in infrared light by the Spitzer Space Telescope and other non-visible-light telescopes, you may wonder where those beautiful colors came from? After all, if the telescopes were recording infrared or ultraviolet light, we wouldn't see anything at all. So are the images "colorized" or "false colored"?

No, not really. The colors are translated. Just as a foreign language can be translated into our native language, an image made with light that falls outside the range of our seeing can be "translated" into colors we can see. Scientists process these images so they can not only see them, but they can also tease out all sorts of information the light can reveal. For example, wisely done color translation can reveal relative temperatures of stars, dust, and gas in the images, and show fine structural details of galaxies and nebulae.

This image of M101 combines images from four different telescopes, each detecting a different part of the spectrum. Red indicates infrared information from Spitzer's 24-micron detector, and shows the cool dust in the galaxy. Yellow shows the visible starlight from the Hubble telescope. Cyan is ultraviolet light from the Galaxy Evolution Explorer space telescope, which shows the hottest and youngest stars. And magenta is X-ray energy detected by the Chandra X-ray Observatory, indicating incredibly hot activity, like accretion around black holes.

Space Imagery Continued:

Spitzer's Infrared Array Camera (IRAC), for example, is a four-channel camera, meaning that it has four different detector arrays, each measuring light at one particular wavelength. Each image from each detector array resembles a grayscale image, because the entire detector array is responding to only one wavelength of light. However, the relative brightness will vary across the array.

So, starting with one detector array, the first step is to determine what is the brightest thing and the darkest thing in the image. Software is used to pick out this dynamic range and to re-compute the value of each pixel. This process produces a grey-scale image. At the end of this process, for Spitzer, we will have four grayscale images, one for each for the four IRAC detectors.

Matter of different temperatures emit different wavelengths of light. A cool object emits longer wavelengths (lower energies) of light than a warmer object. So, for each scene, we will see four grayscale images, each of them different.

Normally, the three primary colors are assigned to these gray-scale images based on the order they appear in the spectrum, with blue assigned to the shortest wavelength, and red to the longest. In the case of Spitzer, with four wavelengths to represent, a secondary color is chosen, such as yellow. So images that combine all four of the IRAC's infrared detectors are remapped into red, yellow, green, and blue wavelengths in the visible part of the spectrum.

Download a new Spitzer poster of the center of the Milky Way. On the back is a more complete and colorfully-illustrated explanation of the "art of space imagery." Go to spaceplace.nasa.gov/posters/#milky-way.

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

Astronomical League Observing Programs - Planetary Nebula

by Ted Forte

(Captured from the HACList)

This is the second installment of my effort to encourage you to seek out the planetary nebulae on the AL Planetary Nebula Program. The planetary nebulae for January were described here in message 10638 on Dec 31, 2012. Even if you didn't get out to observe the objects I listed last month, there's still time, they will be fairly well placed into April. What follows are the objects I recommend for February nights.

Most of you probably don't associate mid-winter evenings with planetary nebulae observing. Prominent overhead this time of year is the brightest collection of stars in the northern hemisphere, probably the best known constellation in the sky and a host of well-known showpieces, which with the exception of the Eskimo, probably doesn't include any PNe. However, eleven objects on the planetary nebula program list are optimum targets for February nights. It is an eclectic list, containing a few of the most famous as well as a few of the most obscure objects in the program. I hope you managed to observe all of the January objects over the past few weeks, but if you are just starting the program this month, welcome aboard!

My guess is that IC 2165 in Canis Major is not in your log book unless you make a habit of seeking faint, tiny planetaries. In an 8-inch scope it is quite stellar looking. At twice that aperture, however, it is a small disk that may be a bit annular. It photographs green but appears blue in the eyepiece to most observers. It owes its tiny size to its distance, probably about 2.5kpc away. Star-hoppers might imagine a line connecting Sirius with M42 and look for the planetary about a third of the way along it (closer to Sirius). It is about 5 degrees north of Murzim (Beta Canis Majoris). Use high power and a filter.

Jonckheere 900 in Gemini, discovered in 1912, gets perhaps more notoriety than it merits because of its unfamiliar designation. It lies a little more than half way from Gamma to Eta Geminorium and is about a degree SW of 4th magnitude 18-Gem. It is much easier to see than its obscure designation would suggest. Small, almost stellar, bright and green. Use the OIII filter and moderate power.

Minkowski 1-7 is also in Gemini but is a little more challenging. A small disk that responds well to filters, it lies about 2 degrees SW of 3rd magnitude Epsilon Geminorium.

NGC 2346 in Monoceros is a more interesting target. It is fairly bright, easy to locate and has some shape and structure even in smaller scopes. Its flattened edges and pinched waist earn it its "Hourglass" moniker, but it has also gotten press as "The Butterfly" after a 1999 Hubble image showed its shape to good advantage. The central star of NGC 2346 is known to be a binary - the once widely separated pair spiraled together during the pre-planetary phases of its evolution and is now very close. The planetary is fairly close to us, just 2000 light years away or so, which makes its actual size about a half of a light year across. It lies 42 minutes SW of Delta Moncerotis.

The "Gemini Nebula" or "Double Bubble", NGC 2371 and NGC 2372 is one of my favorite planetaries. It is hard to make out any shape in small telescopes, but in my 18-inch it is marvelous - two equal sized lobes aligned NE-SW. A faint central star can be detected between the two seemingly separate objects. There are arcs of faint nebulosity, the brightest segments of an outer halo, which reveal themselves on the best of nights. I find it rather easy to aim a telescope at this planetary by imagining it as the apex of an equilateral triangle whose base is formed by Castor and Tau Geminorium. It is three degrees SW of Castor.

George Abell discovered the Medusa Nebula in 1955, and it is now designated Abell 21. This object will prove the worth of your OIII filter. Abell 21 is a barely noticeable, no, nearly invisible without a filter. I remember a night at a star party when I encountered an observer that was having difficulty detecting this faint planetary in his SCT. I had an OIII filter in my pocket, and when we inserted it into his eyepiece, we witnessed a sort of magic. The filtered view reveals a large incomplete disk of delicate tendrils and wispy clouds. Use low power. Abell 21

completes an almost equilateral triangle with 3rd magnitude Gomeisa (Beta Canis Minoris) and 4th magnitude Lambda Geminorium. Both stars are multiple star systems that are worthy targets themselves.

NGC 2392 is certainly the most famous object on our February list. The Eskimo Nebula gets its name from its appearance in photos, which is reminiscent of a man wearing a parka. A bright central star is surrounded by an extended halo that often appears as two concentric rings. I often show this object to guests at public events; it is so easy to see that you can be sure people can pick it out. PNe are noted for bearing up well under high magnification and the Eskimo is particularly noted for it. I frequently view this PN at powers approaching 1000x. It is a short star hop from Wasat (Delta Geminorium) 2 degrees 22 minutes to the SW. It is 1.5 minutes south of an 8th magnitude star that is often playfully referred to as the "Eskimo's wife"

NGC 2438 in Puppis seems to lie inside M46, the pair make a striking visual contrast. The apparent enigma of a planetary nebula which is an end of life sun-like star residing in a bright nearby open cluster which by definition is composed of young stars is resolved by the fact that the two objects do not share the same radial velocity and are therefore not associated. In fact the cluster lies at about 5000 light years and the planetary at about 3000 light years making it a foreground object. Appearances can be deceiving in more ways than one. NGC 2438 seems to show a bright central star, but its real progenitor is a 17.5 magnitude no-show that is just behind the bright impostor. The bright open cluster might distract you, but with a little effort the PN is quite easy.

NGC 2440 in Puppis is another example of a PN with a central star impostor; a faint centrally located star that you can see with averted vision is probably not the true central star. The real central star is a candidate for the title of "hottest known white dwarf" with a surface temperature of about 200,000 Kelvin. The PN is an attractive object; an oval disk with bright knots , and in larger instruments a bi-polar halo is visible. Use a filter, averted vision, and high power. Any astronomer will tell you that the three stars of Orion's belt point to Sirius, right? Well not really, a line through the three belt stars extended into CMa would actually pass north of the Dog Star. But it would point directly to NGC 1440! Extend the line to a point where it would intersect a line dropping straight south from Procyon and point at that spot. NGC 2440 will be very close by.

NGC 2452 in Puppis is an annular ring when conditions are good and a small disk most other times. I see it as green, how about you? Use averted vision for this one too. See if you can detect brightness variations on the north and south edges. It is located halfway between Aludra (Eta Canis majoris) and Rho Puppis and forms the apex of an almost equilateral triangle with the 4th magnitude stars Markab and 3 Puppis.

Rebecca Jones and Richard Emberson are credited with discovery of an object in Lynx known as Jones-Emberson 1 in 1939. It is also known as PNG 164.8+31.1. Amateur astronomers David Knisley and Rick Johnson gave it its nickname: "Headphones Nebula". OK, if they say so. Actually it does look like a set of headphones in photographs, but I can't attest to seeing anymore than a vague shape; two brighter arcs only hinting at a continuous sphere. The filter is a must for this one. Use low power and averted vision. It is located 2.5 degrees NW of 27 Lyncis, a 5th magnitude multiple star system.

So there are the objects for February. Good Luck! The positions below are from Sky Tools:

IC 2165	PN G221.3-12.3	CMa	06h22m08.7s	-12°59'25"
J-900	PK 194-2.1	Gem	06h26m30.4s	+17°47'10"
M 1-7	PN G189.8+07.7	Gem	06h37m55.6s	+24°00'09"
NGC 2346	Hourglass	Mon	07h09m51.3s	-00°49'15"
NGC 2371	Gemini Nebula	Gem	07h26m10.4s	+29°28'20"
Abell 21	Medusa Nebula	Gem	07h29m34.5s	+13°13'41"
NGC 2392	Eskimo Nebula	Gem	07h29m44.3s	+20°53'35"

Book Review – Big Bang: The Origin of the Universe

By Cindy Lund

When I picked out *Big Bang*, I thought it would be about the Big Bang itself, the first few minutes of the universe. It was actually about how astronomers learned about the Big Bang, and how they determined that the Big Bang theory was correct and the Steady State theory was wrong.

The book starts with a chapter about the beginning of cosmology. It addresses how early astronomers determined that the Sun, not the Earth was at the center of the universe. Simon Singh explains how, before Kepler developed his laws and Galileo discovered the moons of Jupiter and the phases of Venus, the geocentric theory was more convincing. For example, the lack of stellar parallax is hard to explain if the Earth goes around the Sun. Moreover, the geocentric theory was actually better than the heliocentric theory in predicting planetary positions. After Kepler and Galileo's findings the Sun centered theory was more convincing, since there were things the earth centered theory could not explain.

This was mostly old knowledge to me, but I did learn a few things. For example, Tycho Brahe's observatory, Uraniborg, consumed over five percent of Denmark's gross national product. I also learned that once Kepler had access to Tycho's data, he thought it would take him eight days to fix the inaccuracies in the heliocentric model. It actually took him eight years.

The rest of the book talks about the development of the Big Bang theory. Again, much it was things I already knew, but there were also many new things, which I really enjoyed learning. For example, Singh discussed the great debate in 1920, i.e. the debate between Shapley and Curtis over whether the spiral nebulae were galaxies like the Milky Way. This was old information to me, but I learned that after the debate, some scientists wrote that the debate would never be settled. Robert Ball, an astronomy writer, wrote that astronomers were at the limits of knowledge. Four years later Edwin Hubble determined that the spiral nebula were galaxies.

Big Bang talks about George Gamow and Ralph Alpher's work on the formation of helium in the first few minutes of the universe. They calculated that there would be one helium nucleus for every ten hydrogen nuclei, which matched the observed ratio. Gamow got Hans Bethe to add his name to the authors, making the famous Alpher, Bethe, Gamow paper. Alpher also worked with Robert Herman on recombination, when the universe became cool enough for elections to attach to nuclei, 300,000 years after the Big Bang, they predicted there would be microwave radiation leftover from this event, the Cosmic Microwave Background Radiation.

I learned about the formulation of the Steady State Theory by Fred Hoyle, Thomas Gold, and Hermann Bondi. It was inspired by a movie, *Dead of Night*, in which lots of events occur, but in the end, nothing changes. They thought the universe might be like that, always expanding, yet unchanging. In Steady State theory, the universe was the same at all times. It was expanding but matter was continually created, so the density did not change.

Big Bang also includes a brief discussion of the search for variations in the Cosmic Microwave Background. Instruments sent up in balloons found no variation. I learned that work on the Cosmic Background Explorer satellite (COBE) was begun in 1976. Construction began in 1982, and it would have launched on a shuttle in 1988, if it had not been for the Challenger disaster. Instead, COBE was launched on a Delta rocket. The COBE team had to cut its weight in half, but it was launched in November of 1989. In December 1991, COBE found the variations.

One more thing I liked about *Big Bang* was the biographies of the scientists, especially the less famous ones. Fred Hoyle quit going to one school after a class on Roman Numerals, since he thought they were pointless. He quit another school after a teacher slapped him for insolence. He had brought a flower to prove it had more petals than the teacher had said. George Gamow and his wife tried to escape the Soviet Union in a row boat. They didn't succeed, but when Gamow was invited to a conference in Brussels, he got permission for his wife, who was also a physicist, to attend as well. They never returned. Fritz Houtermans, who figured out a partial theory of stellar nuclear fusion, lived in Germany, but fled to Britain, and then the Soviet Union, to avoid Nazi persecution. In the Soviet Union, he was arrested because the secret police thought he was a Nazi spy. After being released to Germany he was arrested by the Gestapo and interrogated some more.

Overall, I think Big Bang is a very good book. If you are interested in the history of cosmology, especially the history of the Big Bang theory, I recommend you check it out. I got it from HAC's book collection at Patterson, and a copy is also available at the Sierra Vista Public Library.

ARIZONA SKY-CALENDAR UPDATE FOR FEBRUARY 2013

by Doug Snyder (C/2002 E2)

Note: Unless otherwise noted, all dates and times are shown in Arizona's **Mountain Standard Time** – NOT **in Universal Time (U.T.) nor in Eastern Time (E.T.). MST is behind UT by 7 hours.**

Additional details of the monthly calendar HIGHLITE for February: **Mercury and Mars close on Feb. 8**: These two planets are within ½ degree of each other in the evening sky towards the west and with Mercury just to the north of Mars. Look for this pairing shortly after sunset, as both planets will be low in the west and don't 'stay up' too long themselves. Mercury will be at magnitude -1.0 and Mars at +1.2

What may be a second Highlite for the month is the pass of a small NEA (Near Earth Asteroid) on Friday, Feb. 15. This event is covered in more detail a few lines down.

Wednesday, Feb. 6: planetary conjunction: Mars, Mercury and Neptune close, in western skies, shortly before sunset. In Aquarius – good luck viewing this conjunction! Mars is 'on-top' with Mercury and Neptune side-by-side just below Mars.

Saturday, Feb. 9: HAC member star party: Where ever this event is held, it will probably get underway at about 6pm or 6:30pm. As of this writing, it is possible that the star party will be at the 'Desert Coyote Observatory' (DCO), located north of Hwy. 90 and just east of Sierra Vista – VERY dark skies! We thank our host in advance!

Sunday, Feb. 10: New Moon; this is the start of lunation #1115

Thursday, Feb. 14: Astronomy Night (Public) at Patterson Observatory: This outreach event is becoming quite popular in the community, and Sierra Vista metro area astronomers are encouraged to lend their support by attending and sharing their knowledge and love of the Arizona night skies! There will be a very nice 18% illuminated crescent Moon that evening. And probably more celestial wonders!

Friday, Feb. 15: Fly-by of NEA 2012 DA14 (Telescopic event): This object, estimated to be only about 50 meters in diameter (155 ft.), is predicted to come within about 18,000 miles of the Earth's surface. At its closest approach (favoring the night skies of Eastern Europe, then into Asia), it may reach 8th magnitude. But for our local Arizona skies, its passage through the northern sky constellations of Ursa Major, Draco, Camelopardalis and Ursa Minor, the magnitude will have decreased down to 11th, 12th, and 13th, as well as its velocity through space (a max. of near ¾ of a degree per MINUTE!). A favorable time for our Arizona viewing is from about 7pm on Feb. 15 (NEA in Camelopardalis at mag. 12) to about 5am on Feb. 16 (NEA in Draco at mag. 14). To acquire your own ephemeris, I recommend visiting the JPL Horizon's web interface at: http://ssd.jpl.nasa.gov/horizons.cgi?s_time=1#top and using your location coordinates (or use your observatory code, which I always use mine [code 925]). The February 2013 Sky & Telescope issue has a informative article regarding this NEA on page 51.

Saturday, Feb. 16: Mercury reaches Greatest Elongation East (18.1° from Sun) at 2pm, and its angular size in the evening western skies is 7" (arc-seconds).

Friday, Feb. 22: HAC General Meeting: This gets underway at 7 pm, and the meeting place is the Student Union room at Cochise College.

Wednesday, Feb. 27: A two-week period of the Zodiacal Light begins in the western evening skies after twilight. This can be a noticeable soft pyramid of 'whitish light' with its base near the horizon.

Reminder: There are ALWAYS exciting and unusual sky phenomena happening in our visible universe whether WE know it or see it; make your discovery tonight! These Arizona updates are just a fraction of observable sky events! Your feedback is always welcome. THANK YOU & CLEAR SKIES UNTIL NEXT MONTH – Doug (starhaven@palominas.com)

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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: [redacted](Gamma) Delphinids?

04 Tu Venus in **M35**, pm, low in NW
08 Sa ● **NEW MOON** 0856 hrs. **HAC** Member S.P.
11 Tu **Meteors-[redacted]**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

Huachuca Astronomy Club (HAC) of Southeastern Arizona
MEMBERSHIP AND RENEWAL APPLICATION

(Please print and fill in all information)

Date of Application: _____

Name(s): _____

Mailing Address: _____

_____

Telephone: _____

E-mail: _____

May we publish any of the following information on the Web site (please circle **Yes** or **No**):

Name **Yes / No**
City **Yes / No**
E-mail Address **Yes / No**

Memberships in HAC are for the calendar year and are pro-rated quarterly for new members.

Please CIRCLE your choice below:

Renewal	New Jan - Mar	New Apr - Jun	New Jul - Sep	New Oct - Dec	Membership Type
$25.00	$25.00	$17.50	$10.00	$7.50	Individual
$35.00	$35.00	$26.00	$17.00	$9.00	Family
$10.00	$10.00	$7.00	$4.00	$3.00	Student*
$20.00	$20.00	$14.00	$8.00	$6.00	Military
$25.00	$25.00	$17.50	$10.00	$7.50	Military Family

*Student memberships are for an individual who is enrolled in full time educational coursework; they do not have voting privileges.

MAKE CHECKS OUT TO**: Huachuca Astronomy Club**
Bring this form to a meeting or mail to:
HAC, P.O. Box 922, Sierra Vista, AZ 85636

Upon joining, you are entitled to a New Member Packet, as explained on our Web site. If you are a resident of Cochise County, we request that you pick up your packet at the first meeting you are able to attend. If currently residing outside of the county, we will mail you the packet.

There are five types of **membership** as follows: Regular, Student, Family, and Military. A Regular membership is for one individual, and has voting privileges. Family memberships shall include two adults and their children under the age of 18, who shall enjoy the privileges of the club including the right to vote (two votes per Family membership). Military memberships are for active duty members of the Army, Navy, Air Force, Marines, or Coast Guard. Military and Military Family memberships have identical voting privileges as Regular and Family memberships.

If and when interested, see the Web site for information about the Huachuca Astronomy Club's ***Sky & Telescope*** and ***Astronomy*** magazine's subscription plans.

QUESTIONS? Please send email to: treasurer@hacastronomy.com

Web site: http://www.hacastronomy.com

v3.1> *Revised 01/23/11*