NIGHTFALL
Huachuca Astronomy Club of Southeastern Arizona

December 2012

President's Notes

Next Meeting: **The next meeting of the Huachuca Astronomy Club will be Friday, November 30, 2012 at the Student Union Building, Community Room at Cochise College at 7 pm. The program will include showing of the PBS documentary "The Journey To Palomar." The production traces the epic personal and professional quest of the Chicago-born astronomer, George Ellery Hale to build the four largest telescopes of the 20th century, culminating with the 20-year effort to build the million-pound telescope on Palomar Mountain, a project considered the "moon shot" of the 1930s and 1940s. There will be a brief intermission after the first 45 minutes of the documentary. For more information, please visit** www.hacastronomy.com.

HAC opportunities: **We have some open positions including outreach coordinator and chief observer. These and other positions are described on our website under bylaws and constitution. Please let me know if you are interested in helping.**

Arizona Science and Astronomy Expo: **The ASAE was held at the Tucson Convention Center on November 10-11. There were more than one hundred vendors, and organizations with booths. It was extremely successful, and stay tuned for details on the 2013 expo.**

Public Night at the Patterson: **The next Patterson Observatory public night is Thursday, December 20.**

Return to Douglas: **The astronomy night for Paul Huber Middle School in Douglas was held on November 20. The weather was mostly cloudy, but we still had a good number of participants. Despite the cloud cover, HAC Member Ted Forte was able to show the moon through breaks in the clouds.**

The newly elected HAC Board of Directors: **Congratulations to our newly elected and reelected board members. Effective December 1, the HAC officers are Bob Gent president, Kim Rogalski Vice president, Ted Forte secretary, and Bob Kepple treasurer. The elected members-at-large are Duke Glishke, Ken Kirchner, Doug Snyder, and Bob Hoover. Wayne Johnson will continue to serve as Past-President.**

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.

Next Year: **We will be meeting on the fourth Friday of the month next year. We will be meeting at the same location at Cochise College, and our first meeting of 2013 will be held on January 25.**

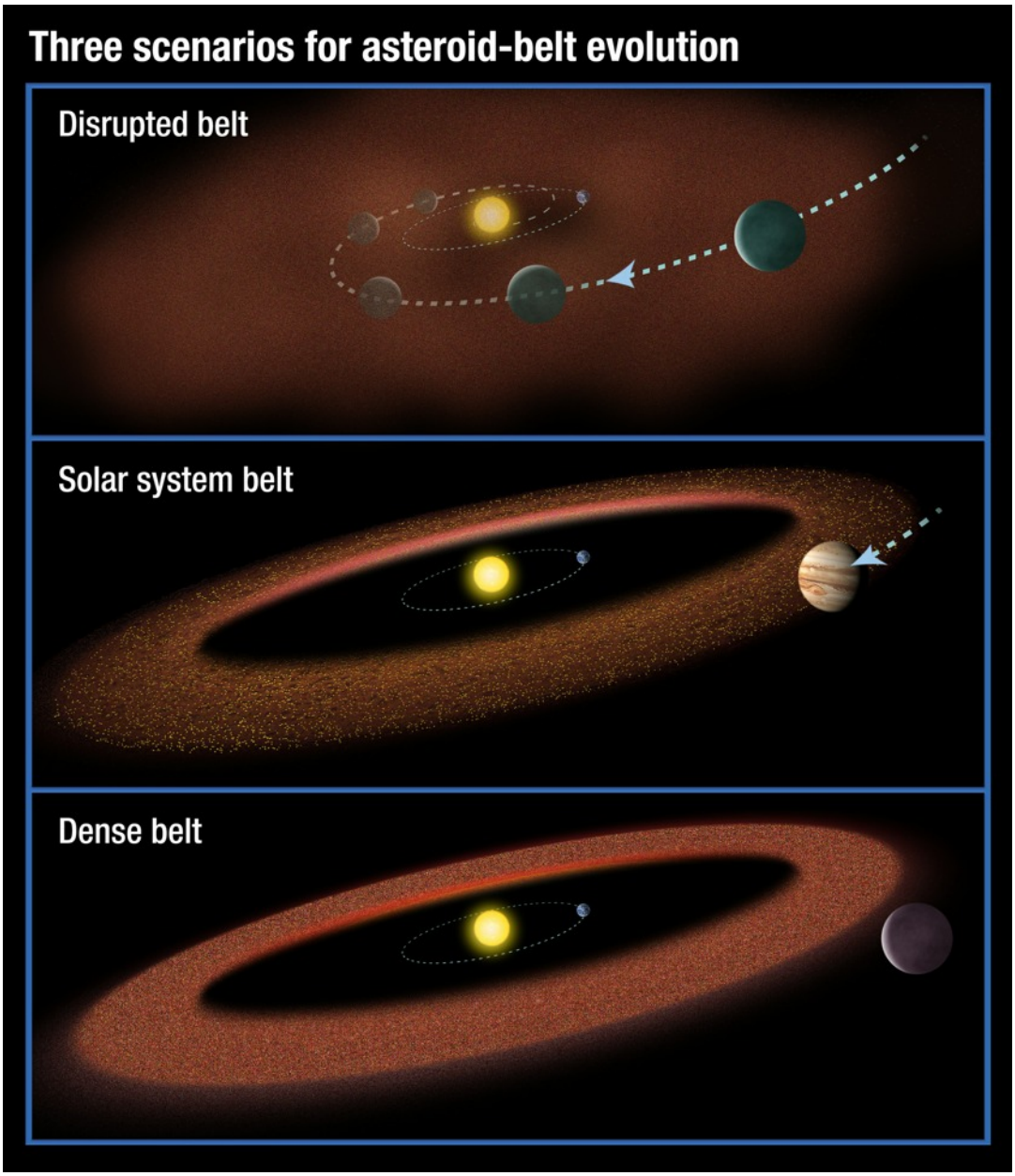
Clear skies and bright stars,
Bob Gent
President, Huachuca Astronomy Club

It Takes More Than Warm Porridge to Make a Goldilocks Zone

By Diane K. Fisher

The "Goldilocks Zone" describes the region of a solar system that is just the right distance from the star to make a cozy, comfy home for a life-supporting planet. It is a region that keeps the planet warm enough to have a liquid ocean, but not so warm that the ocean boils off into space. Obviously, Earth orbits the Sun in our solar system's "Goldilocks Zone."

Our solar system is represented by the middle scenario, where the gas giant planet has migrated inward, but still remains beyond the asteroid belt.



But there are other conditions besides temperature that make our part of the solar system comfortable for life. Using infrared data from the Spitzer Space Telescope, along with theoretical models and archival observations, Rebecca Martin, a NASA Sagan Fellow from the University of Colorado in Boulder, and astronomer Mario Livio of the Space Telescope Science Institute in Baltimore, Maryland, have published a new study suggesting that our solar system and our place in it is special in at least one other way.

This fortunate "just right" condition involves Jupiter and its effect on the asteroid belt.

Many other solar systems discovered in the past decade have giant gas planets in very tight orbits around their stars. Only 19 out of 520 solar systems studied have Jupiter-like planets in orbits beyond what is known as the "snow line"—the distance from the star at which it is cool enough for water (and ammonia and methane) to condense into ice. Scientists believe our Jupiter formed a bit farther away from the Sun than it is now. Although the giant planet has moved a little closer to the Sun, it is still beyond the snow line.

So why do we care where Jupiter hangs out? Well, the gravity of Jupiter, with its mass of 318 Earths, has a profound effect on everything in its region, including the asteroid belt. The asteroid belt is a region between Mars and Jupiter where millions of mostly rocky objects (some water-bearing) orbit. They range in size from dwarf planet Ceres at more than 600 miles in diameter to grains of dust. In the early solar system, asteroids (along with comets) could have been partly responsible for delivering water to fill the ocean of a young Earth. They could have also brought organic molecules to Earth, from which life eventually evolved.

Jupiter's gravity keeps the asteroids pretty much in their place in the asteroid belt, and doesn't let them accrete to form another planet. If Jupiter had moved inward through the asteroid belt toward the Sun, it would have scattered the asteroids in all directions before Earth had time to form. And no asteroid belt means no impacts on Earth, no water delivery, and maybe no life-starting molecules either. Asteroids may have also delivered such useful metals as gold, platinum, and iron to Earth's crust.

But, if Jupiter had not migrated inward at all since it formed father away from the Sun, the asteroid belt would be totally undisturbed and would be a lot more dense with asteroids than it is now. In that case, Earth would have been blasted with a lot more asteroid impacts, and life may have never had a chance to take root.

The infrared data from the Spitzer Space Telescope contributes in unexpected ways in revealing and supporting new ideas and theories about our universe. Read more about this study and other Spitzer contributions at spitzer.caltech.edu. Kids can learn about infrared light and enjoy solving Spitzer image puzzles at spaceplace.nasa.gov/spitzer-slyder.

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

Astronomy Expo Report

By Cindy Lund

My Dad and I went to the Astronomy Expo in Tucson on Saturday, November 10, from 10:30 to 5:00. We listened to talks by Phil Platt, Carin Bondar, Pamela Gay, and Donald Pettit

Phil Platt, the Bad Astronomer, gave a talk on the Mayan Apocalypse that is supposedly coming on December 21. He said that it was all nonsense. First of all, December 21, 2012, is only the end of a cycle in the Mayan calendar. It's a bit like panicking every time December 31 rolls around, because the calendar has ended. Phil also explained some of the things people think are going to happen. None of them were things the Mayans could have possibly known about, and none of them are going to happen anyways. For example, some people think that a Jupiter sized planet, Nemesis, is going to hit the earth. Phil pointed out that we would have noticed such a huge, close object by now. Others think the sun is going to align with the black hole in the center of the Milky Way. This happens every December, but alignment is never perfect, and the closest alignment was a few years ago, on a December 19th. Phil took every scenario and debunked it. The talk was quite humorous. I learned a lot about the unusual theories running around about planet destruction.

Carin spoke about biology in space. She discussed how the lack of gravity affects the astronauts. They lose as much bone mass in a month as senior citizens lose in a year. She also talked about reproduction in space. According to studies done with animals, conception and embryo development proceeds without issue, but there are problems with fetal development. I was surprised to learn this, since I thought fetuses were basically in a weightless environment. Carin said that if we are to stay in space long term, such as for multigenerational trips to the stars, pregnant women may have to spend time in places with artificial gravity. (Artificial gravity can be created by spinning a part of the spaceship).

The third talk was by Pamela Gay. I was familiar with Pamela from listening to her on Astronomy Cast. She talked about how ordinary people can do astronomy on their computers. For example, Pamela is the project director of CosmoQuest. On the CosmoQuest website, users can help map the moon or Vesta. Pamela explained how it works. A user is given a small picture of terrain. The user then marks the craters and other features before turning it in. Then the user gets another picture of terrain. The same pictures are sent to multiple users. After a picture has been marked by several (about 15) users, the markings are compared. If at least five users have marked a feature or crater, it is added to the official map of the Moon or Vesta. Knowing how many craters are in a certain area of a moon, planet, or asteroid tells how old that part of the surface is. I thought CosmoQuest was a really great idea. When I got home, I registered and began marking pictures of Vesta.

The last talk I heard was the Keynote Speaker, astronaut Donald Pettit. Donald had spent last December to last July on the International Space Station. Donald showed us a bit of clever engineering. When astronauts wanted to drink, they had to use pouches with straws so that the liquid wouldn't go floating around the spaceship. Then Donald came up with a cup that works in microgravity. It has a crease which the coffee flows along due to surface tension. The highlight of his talk, however, was the pictures he and his fellow astronauts had taken of the earth from space. The auroras were beautiful. So were the pictures of cities from space, even though they were basically pictures of light pollution.

In between the talks, my Dad and I looked at the booths. Vendors were selling lots of stuff for astronomy, such as telescopes and mirrors. My dad brought a new flashlight to take to star parties. The vendors were also giving away lots of free stuff, so I took a sampling from those generous vendors.

I really enjoyed the Astronomy Expo. All the talks were really interesting and I learned a lot from them. My only complaint was that there was not enough time between the talks to check out all the booths and activities. Maybe next year I will be able to attend again. I am looking forward to it.

My Favorite Winter Objects

By Cindy Lund

Winter, like all seasons, has pluses and minuses for observing. On the one hand, the skies are clear and the nights start early. On the other hand, it is freezing cold! Still, I have braved the cold, (double layers help) and gone to star parties to observe in the middle of winter. My favorite winter object is the Rosette Nebula, which has the open cluster NGC 2244 in its center. I also like the overlapping objects open cluster M46 and planetary nebula NGC 2438, as well as M82, the Cigar Galaxy.

NGC 2237: Rosette Nebula: Right Ascension: $06^h\ 33^m\ 45^s$, Declination: +04° 59′ 54″

NGC 2244: Open Cluster in Rosette: Right Ascension: $06^h\ 31^m\ 54^s$, Declination: +04° 56′

The Rosette Nebula is aptly named. It looks like rose in full bloom. A ring of nebulosity, varying in brightness, forms the petals. NCG 2244, an open cluster in the center of the Rosette, forms the center of the rose. The Rosette Nebula appears huge in the sky. I had to move the telescope around to see it all. I like the Rosette because it is big and bright and really does look like a rose. I also like getting to see a bonus object, NGC 2244, in the same field.

M46: Right Ascension: $07^h\ 41.8^m$, Declination: -14° 49′

NGC 2438: Right Ascension: $07^h\ 41.8^m$, Declination: -14° 44′

M46 and NGC 2438 are another example of two objects that appear in the same field. M46 is a large open cluster with tightly packed stars and no notable core. This would be cool enough, but in the same field is a planetary nebula, NGC 2438. NCG 2438 is a small fuzzy ring superimposed on M46. I have seen it as both gray and as bluish depending on the telescope and the filters used. I like seeing two objects in the same field and I like seeing a bit of color in the sky.

M82: Cigar Galaxy: Right Ascension: $09^h\ 55^m\ 52.2^s$: Declination: +69° 40′ 47″

The Cigar Galaxy is a starburst galaxy, seen edge on, with a dust lane cutting though the center. It appears as a very thin lens shape, almost a line, of bright fuzziness, cut in half by a dark line. This is a fairly unusual shape for an astronomical object. I like how clear the dust lane is in the right telescope.

My winter observing notes follow,

2/10/2007 at Desert Starlight Observatory

Object	What it is	Observations
M78	Reflection Nebula	
M79	Globular Cluster	
NGC 2362	Open Cluster	
M81 Bode's Galaxy	Spiral Galaxy	Dot with fuzz, not impressive. (bad haze)
M82 Cigar Galaxy	Irregular Galaxy	Elongated fuzz with black line across center
Saturn	Planet, Gas Giant	Yellow-white disk, rings vertical and face on

1/11/2008 at Patterson Observatory

Object	What it is	Observations
M87	Open Cluster	Scattered stars. Not too tight.
M42 Orion Nebula	Diffuse Nebula	An S -shaped Chinese Dragon; a bright S with fainter wisps
Sirius	Star (type A)	A bright diamond
Betelgeuse	Star (red supergiant)	A bright garnet (it was orange)
Iota Orion	triple star	Bright star, dimmer star near, another dim star 3x farther,
Earth's Moon	moon	

2/2/2008 at RepoGazer Observatory

Object	What it is	Observations
M42 Orion Nebula	Diffuse Nebula	White shallow 3 with loop in the center, black area to right
M46	Open Cluster	Tightly packed for an open cluster
NGC 2438	Planetary Nebula	Small fuzzy bluish O in middle of field with M46
Iota Cancer	Double Star	Yellow star slightly dimmer blue star to the left, vivid colors
M35	Open Cluster	Most tightly packed toward center top
Saturn	Planet, Gas Giant	Yellow brown disk, rings almost edge on, tilted \ 15 from horizontal

1/4/2009 at Wind Spirit Observatory

Object	What it is	Observations
Alnitak (left star in Orion's belt	Star (blue supergiant)	Very bright, blue and purple due to filter
M35	Open Cluster	Lots of stars, packed medium close
NGC 2158	Open Cluster	Small diamond shape, sparkled, can hardly make out tiny stars
NGC 2392 Eskimo Nebula	Planetary Nebula	Fuzzy slightly flattened disk with bright spot in center
NGC 7635 Bubble Nebula	Emission Nebula	Slightly darker patch of sky, with 3 faint stars
Venus	Planet (inner)	Very Bright, ½ moon shape (on right) Very bright white

2/21/2009 at Windy Mountain Observatory (Viewed on a screen)

Object	What it is	Observations
NGC 2371	Planetary Nebula	Like a Viking Helmet upside down. Half disk with wisps
NGC 2392 Eskimo Nebula	Planetary Nebula	Fuzzy ring around a solid disk
NGC ????	Open Cluster	Lots of densely packed star in core, arm going up and right
Betelgeuse	Star (red supergiant)	Huge white disk, slightly rough on edges, rays around it
M1 Crab Nebula	Supernova Remnant	Fuzzy rounded fat football, brighter on right, fainter around edge
Barnard 33 Horsehead Nebula	Dark Nebula	Vague Horse head shape, darker than rest of sky, star eyes
M42 Orion Nebula	Diffuse Nebula	Half circle brighter at center, fuzzy disk to low left, dark area between
M82 Cigar Galaxy	Irregular Galaxy	Edge on. Bright area in middle divided by dark band
M81 Bode's Galaxy	Spiral Galaxy	Very faint spiral arms, bright spot in center, seems barred, but isn't
Comet Kushida 144P	Comet	Bright spot above a fuzzy disk that has a slight tail.

12/11/2009 at Patterson Observatory

Object	What it is	Observations
NGC 884 & 869 Double Cluster	2 Open Clusters	Only saw one of the clusters (small field) stars medium packed, slight core
M38	Open Cluster	Stars fairly loose. Somewhat of an X shape
M36	Open Cluster	Loosely packed stars, no notable core
M37	Open Cluster	Much fainter than M36 or M38. Stars more densely packed
Jupiter	Planet, Gas Giant	Noticed 2 brown horizontal bands, the lower one, below the equator, notably darker.
4 Galilean Moons	Moons of Jupiter	1st and 3rd closest on left, 2nd and 4th closest on right

1/5/2010 at Junk Bond Observatory

Object	What it is	Observations
M77	Spiral Galaxy	Dim fuzzy disk w bright bar across center (mid ½ like Θ), small very bright core.
NGC 2237 Rosette Nebula	Emission Nebula	Fuzzy ring, same thickness as diameter of the hole in center, varies in brightness going around the ring
NGC 2244	Open Cluster	In center of Rosette Nebula, not very dense. Bright stars
Barnard 33 Horsehead Nebula	Dark Nebula	Dark black smudge in dark gray sky background. Approximately a vertical ellipse. Defined
M38	Open Cluster	Lots of bright stars, no notable core. Stars seemed to be in lines.
NGC 1907	Open Cluster	Right next to M38, about one tenth its size, (by diameter) Notable core. (center half by diameter)
M44 Beehive	Open Cluster	Naked eye fuzzy patch. In scope, prominent V of stars in center of disk of stars
Mars	Planet (inner)	Bright, light red-orange disk. Scattered stripes of darker red-orange (all more horizontal than vertical). Small clear polar ice caps on right and left. Left ice cap more defined.

1/7/2011 at Discovery Observatory West

Object	What it is	Observations
M77	Spiral Galaxy	Small bright dot with a fuzzy area around it
NGC 1023	Barred Spiral Galaxy	Fuzzy spot, longer horizontally than vertically, bright dot at center, tiny and faint.
M42 Orion Nebula	Diffuse Nebula	Bright area to the left, like a thick sideways V, dark patch at upper right, spiral curl at center right, dark spot at center with trapezium inside
M36	Open Cluster	Small, about 50 stars visible, all similar brightness, irregular jagged edges.
M37	Open Cluster	Bigger than M36, stars closer together, somewhat rounder, 1 star brighter than others
NGC 1097	Barred Spiral Galaxy	Bright dot with fuzziness all around but more horizontal than vertical Quite faint
Jupiter	Planet, Gas Giant	Medium brown band slightly below equator lighter one slightly above equator
4 Galilean Moons	Moons of Jupiter	Closest 2 on left, farthest 2 on right.

1/26/2012 at Patterson Observatory

Object	What it is	Observations
M42 Orion Nebula	Diffuse Nebula	Vertical dark lane, bright lane in د shape, same thickness. Dark lane starts at corner of bright lane and goes up about as high as bright lane. د' Many small stars "inside" bright lane
Alberio	Double Star	Two stars, one blue, smaller, dimmer, other yellow, larger (1.5 times larger diameter), brighter
M47	Open Cluster	Lizzie said it looks like a wine glass. Lots of stars, Noticed a small oval of several stars
Earth's Moon	moon	Three craters w central peaks Θ along bottom of view, with craters w/o peaks between them, More craters (w/o) peaks above, along with dark "seas"
Jupiter	Planet, Gas Giant	Two brown horizontal bands one (1.5 times thicker) in mid-latitudes, one at equator, rest yellow
3 Galilean Moons	Moons of Jupiter	Two very close together to the left of Jupiter, one farther to the left of Jupiter
Venus	Planet (Inner)	Bright light yellow disk. Round, full circle

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2012—ARIZONA's Astronomically Handy Sky Calendar from Doug Snyder—2012

ARIZONA SKY PHENOMENA Calendar—All Times shown are MOUNTAIN STANDARD TIME*

January 2012
HIGHLITE: Shadow Transits on Jup.
01 Su New Year's Day; HNY2012 !
03 Tu Dbl. Shadow Tr., 2327hrs.,G&Eu
Quadrantid Meteors Pk@2400h. view a.m. of 4th**; an 80% moon sets just after 0300 hrs.
09 Mo ○ Full Moon 0031 hrs.
10 Tu Dbl.Shadow Tr., 2326hrs., Eu&G
11 We Comet P/2006 T1(Levy); mag.7?; perihelion@2343 hrs, 1.0074AU
16 Mo Spica 2°N. of Moon, 0100 hrs.
☾ Last Quarter Moon 0209 hrs.
21 Sa Mars at mag.-0.3, size 10.7″
23 Mo ● **NEW MOON** 0040 hrs.
30 Mo ☽ First Quarter Moon 2110 hrs.

February 2012
HIGHLITE: C/2009 P1 Garradd
03 Fr **Comet Garradd,** 0.5° from M92 Globular in Hercules, 3am
07 Tu ○ Full Moon 1454 hrs.
09 Th Venus 0.3° N. of Uranus, pm; mag. –4.1 & +5.9; size: 16″, 3.4″; eyepiece recommended
10 Fr Zodiacal Lt. in W., pm, next 2 weeks; after twilight.
14 Tu ☾ Last Quarter Moon 1005 hrs.
21 Tu ● **NEW MOON** 1535 hrs.
25 Sa Venus 3° S. of waxing Moon
26 Su Jup. 4° S. of Moon, pm
29 We ☽ First Quarter Moon 1822 hrs.
Leap-day: 2012 has 366 days

March 2012
HIGHLITE: Planetary Arrangements
03 Sa Mars @**opposition**, 1335 hrs., size at 13.9″, mag. –1.2
05 Mo Mars closest to Earth, 1000hrs
Merc. evening planet in W., 7″
08 Th ○ Full Moon 0239 hrs.
10 Sa Zodiacal Lt. in W., pm, next 2 weeks; after twilight
14 We ☾ Last Quarter Moon 1826 hrs.
19 Mo Vernal **Equinox**, 2214 hrs.
22 Th ●**NEW MOON** 0738 hrs.
Dbl. Shadow Tr., 1935hrs., I&G
27 Tu Venus G_Elong. E., 46°, in western sky after sunset
30 Fr ☽ First Quarter Moon 1241 hrs.

April 2012
HIGHLITES: Saturn, Lyrid Meteors
03 Tu **Venus** 0.5° S. of M45 (Pleiades) in early evening, western skies
06 Fr ○ Full Moon 1219 hrs.
13 Fr ☾ Last Quarter Moon 0350 hrs.
15 Su **Saturn@ opposition**, 1100hrs
18 We Merc. morning planet in E., 8″
21 Sa ● **NEW MOON** 0019 hrs.
Lyrid Meteors, Pk 2200hrs.
28 Sa **Astronomy Day #1 2012**
29 Su ☽ First Quarter Moon 0259 hrs
30 Mo Venus at brightest mag., –4.7

May 2012
HIGHLITE: Annular Solar Eclipse
05 Sa η-Aquarid Meteors; unfavorable year due to moon; pk.1200hrs.
○ Full Moon 2036 hrs.; largest in 2012
12 Sa ☾ Last Quarter Moon 1447 hrs.
20 Su ● **NEW MOON** 1648 hrs.
Annular Solar Eclipse; best Arizona site: near city of Page; low altitude Sun; starts at 1724 hrs., max. at 1834 hrs.
28 Mo ☽ First Quarter Moon 1317 hrs.

June 2012
HIGHLITE: Solar Transit of Venus
04 Mo Partial Lunar Eclipse; penumbra starts 0148 hrs.; partial at 0259 hrs; partial ends 0506 hrs
○ Full Moon 0412 hrs.
05 Tu **Transit of Venus**; start at 1510 hrs.; still in progress at sunset at 1916 hrs.
11 Mo ☾ Last Quarter Moon 0342 hrs.
19 Tu ● **NEW MOON** 0803 hrs.
20 We Summer Solstice, 1607 hrs.
26 Tu ☽ First Quarter Moon 2031 hrs.

July 2012
HIGHLITE: Jupiter's Morning Light
01 Su Merc., west sky, pm twilight, mag. +0.4, size 8.1″
03 Tu ○ Full Moon 1152 hrs.
10 Tu ☾ Last Quarter Moon 1849 hrs.
12 Th Venus, am, brightest mag., -4.7
14 Sa Comet 96P/Machholz, Perihelion
18 We ● **NEW MOON** 2125 hrs.
21 Sa Dbl.Shadow Tr., 0354hrs, Eu & I
26 Th ☽ First Quarter Moon 0157 hrs.
28 Sa Dbl.Shadow Tr., 0446hrs, Eu & I
29 Su S. δ– Aquarid meteors Pk. in am, unfavorable year, 78%Moon
30 Mo Jupiter, am, size 36″, mag. –2.1

August 2012
HIGHLITE: Perseid Meteor Shower
01 We ○ Full Moon 2028 hrs.
09 Th ☾ Last Quarter Moon 1156 hrs.
12 Su **PERSEID** Meteors: **favorable!** View pm 11th & am 12th
13 Mo Dbl.Shadow Tr., 0348hrs., I & G
Occultation of Venus by the Moon; near 1340 hrs.
16 Th Merc. morning planet in E., 8″
17 Fr ● **NEW MOON** 0855 hrs.
24 Fr Neptune @ Opposition,0600h. mag.+7.8, size 2.3″, 29AU
☽ First Quarter Moon 0654 hrs.
31 Fr ○ Full Moon (**2nd**) 0659 hrs.

September 2012
HIGHLITE: Northern Lights in AZ ?
08 Sa ☾ Last Quarter Moon 0616 hrs.
12 We Epsilon (ε) Eridanids Meteors peak near 0600hrs; favorable
14 Fr Zodiacal Lt. in E., am, next 2 weeks before twilight
15 Sa ● **NEW MOON** 1911 hrs
Alert For aurora activity before, during & after Equinox
22 Sa **Autumn Equinox** 0749 hrs.
☽ First Quarter Moon 1241 hrs.
29 Sa Uranus @ opposition, 0000hrs. mag. +5.7, size 3.7″, distance 19.1 AU from Earth
○ Full Moon 1241 hrs.

October 2012
HIGHLITE: Meteor Showers (3)
03 We Venus/Regulus Appulse—one of the best for 2012; E., 0500hrs
08 Mo ☾ Last Quarter Moon 0034hrs
Draconids Meteors: 0300 to dawn
10 We **S. Taurids** Meteors: favorable!
13 Sa Zodiacal Lt., E., am, next 2 wks.
15 Mo ● **NEW MOON** 0503 hrs.
21 Su **Orionids** Meteors: v. favorable!
☽ First Quarter Moon 2033 hrs.
29 Mo ○ Full Moon 1250 hrs.

November 2012
HIGHLITE: LEONID Meteor Shower
06 Tu ☾ Last Quarter Moon,1736hrs.
12 Mo **N. Taurids** Meteors, 0400h.
13 Tu ● **NEW MOON** 1509 hrs.
17 Sa **Leonid Meteors!** First of 2 Pks., 0200hrs.; v. favorable
19 Mo 2nd **Leonid** pk. possible 2400h.
20 Tu ☽ First Quarter Moon 0732 hrs.
27 Tu Venus/Saturn Conjunction! E., am, 0630hrs., 0.6° separation
28 We ○ Full Moon 0747 hrs.

December 2012
HIGHLITE: GEMINID Meteor Shower
02 Su JUPITER @ Opposition, 1900 h.
04 Tu Merc. morning planet in E., 7.4″
06 Th ☾ Last Quarter Moon 0832 hrs.
13 Th ● **NEW MOON** 0142 hrs.
GEMINIDS Pk: 0500 hrs.; Very Favorable for 2012
19 We ☽ First Quarter Moon 2220 hrs.
21 Th Solstice (Winter) 0412 hrs.
22 Fr **Ursid** Meteors Pk., 0100 hrs.
28 Fr ○ Full Moon 0322 hrs.

*Times/Dates= ARIZONA MountainStandardTime (UT-7hrs), NO DST; **updates/ details,** see**:** http://skycalendar.blackskies.org; **Abbr**: Tr=Transit; Pk=Peak; Merc=Mercury; E=East W=West; S=South; N=North; J, Jup.=Jupiter; V=Venus; "=arc seconds; h., hrs.=hours (24 hour time system); MP=Minor Planet; MS=Moon Set; wks=weeks; Lt=Light; pm=evening; v.= very am=morning; mag.=magnitude; **meteor shower dates reflect predicted Peak Morning, but Moon may still be present; I=Io; Eu=Europa; G=Ganymede; C=Callisto; UT=Universal Time; **bold text=**possibly a promising/worthy event or activity; G_Elong=Greatest Elongation; dbl= double; AU=Astronomical Unit; *compiler*: Doug Snyder (C/2002 E2, MP15512); V2.0.2012