Nightfall

Monthly publication of the Huachuca Astronomy Club

August 2013

President's Notes

It has not been an uneventful monsoon season for local astronomers. We have experienced a number of clear bouts in recent weeks that have enabled observations that we really had no right to expect. Comet ISON was recovered by Bruce Gary on the 12th of August making a splash in the world-wide astronomical community(the story follows on page 2). Since then, other local astronomers have had some success imaging the comet, and from those observations, and others, a grim assessment is emerging. Comet ISON is fainter than predicted, and the prospects for a fantastic showing in November and December are dwindling. Yet, ISON has already secured a place in history and is still an important comet to follow. The HAC Comet ISON Special Interest Group lives on and is ready to renew observations with full vigor.

The CISIG encountered a significant setback when the computer at the Patterson Observatory failed. Several members of the team made an early morning rendezvous at the observatory in the wee hours of Friday the 16th only to find that the computer would not power up. Doug Snyder, however, has the situation in hand and we should have a replacement computer up and running very soon.
Supernova 2013ej in M74 held at magnitude 12.5 for the first half of August. As of August 15th it seems to be starting to fade very slightly and it has reddened somewhat. You should be to see it with a 6-inch or larger telescope.

A bright nova in the constellation Delphinus — now officially named Nova Delphini 2013 — first showed itself on August 14th and quickly brightened to about magnitude 4.4. This is the first NOVA is years that has been bright enough to see naked eye.

Hopefully all will be well with the Patterson Observatory for next month's events. We will have our first post monsoon public night on September 12 and, of course, the Dine Under The Stars fund raiser on Saturday, September 28th. Money raised at DUTS funds scholarships made to University of Arizona, South students. Tickets for DUTS ($40 for adults) will be on sale at the August meeting. See Ted Forte.

Next Meeting

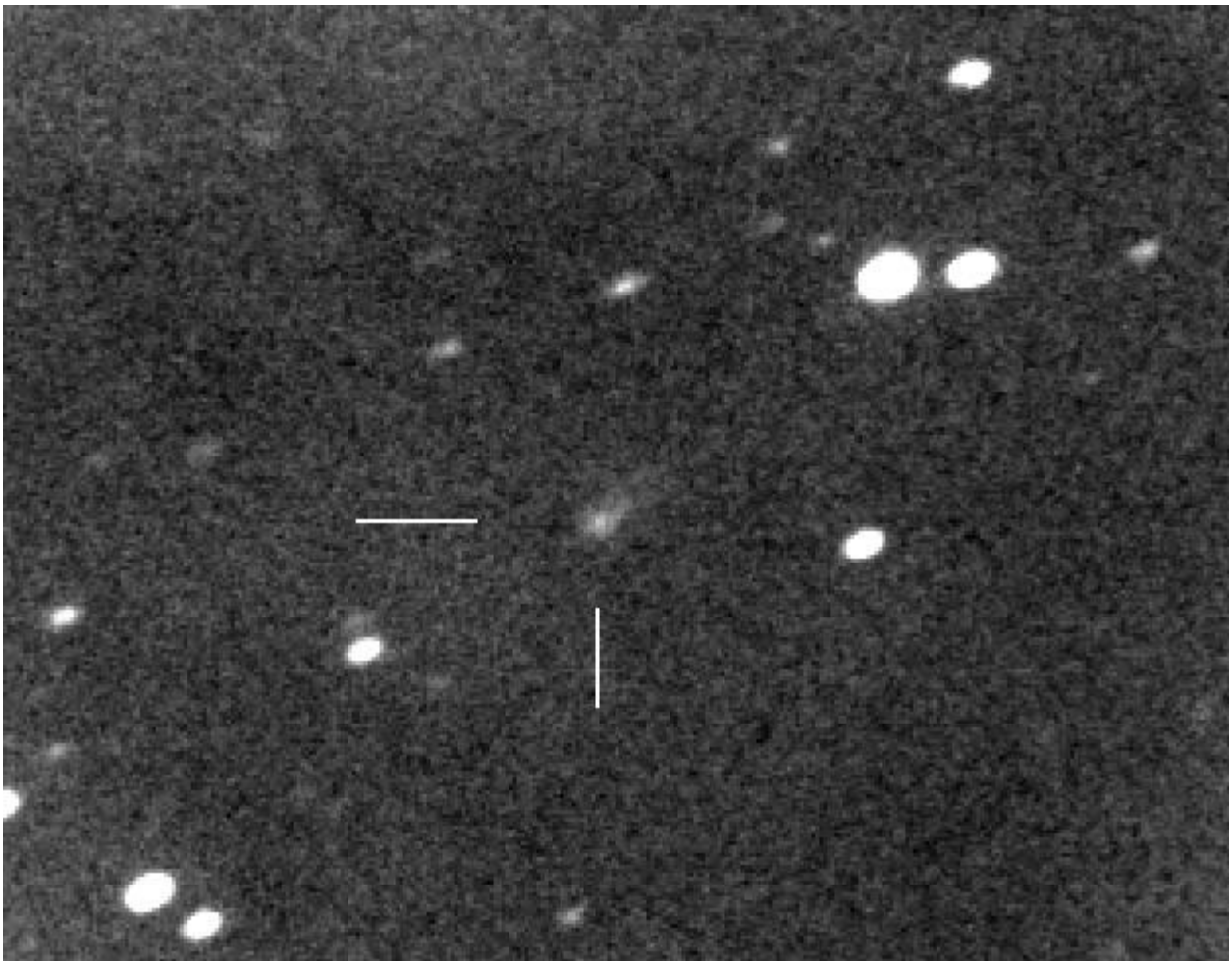
The August meeting of the Huachuca Astronomy Club will be held on Friday, August 23, 2013 at 7 PM in the community room of the Student Union Building at Cochise Community College, Sierra Vista campus. The meeting is free and open to the public. A door prize will be awarded.

There will be a presentation by Mr. Chris Ubing, the astronomy instructor at Cochise College. He will demonstrate planetarium software that can be used either with a computer, IOS or Android technology. The growing presence of smart phone technology allows us to demonstrate concepts in astronomy on computers and smart phones. During this presentation, he will give a review of some of the more common packages and how they may be used to enhance observations of the heavens and demonstrate concepts.

Comet ISON: RECOVERED! (Congratulations Bruce Gary of Hereford, AZ)

by Ted Forte

That was the headline, **Comet ISON: RECOVERED!**, on NASA's Comet ISON Observing Campaign (CIOC) page after evaluating images obtained by local amateur observer, Bruce Gary (a once and future member of HAC!). Bruce captured the comet on images taken on the morning of August 12, 2013 and is apparently the first ground based observer in the world to do so. Congratulations Bruce!



Here's a stacked image of Comet ISON made 2013 Aug 12, from 11:33 to 11:56 UT using an 11-inch aperture telescope. Field of view is 9 x7 'arc, north up, east left. Faintest star is 16th magnitude. Median combine of 23 20-second exposures. Elevation = 6.0 degrees, airmass = 8.7. Credit: Bruce Gary Hereford Arizona Observatory

It was an exciting morning on August 12, and members of the ***Comet ISON Special Interest Group*** (CISIG) were in on the excitement from the very beginning. One of the first places Bruce reported his apparent success was on the CISIG email group made up of HAC members.

HAC's Comet Team leader, Doug Snyder, went into action announcing the possible recovery on various social media outlets and started what was in his words a "firestorm" of activity and attracted the attention of a number of NASA scientists.

There was some initial uncertainty. Bruce first reported that the comet ephemeris from JPL Horizons did not match the ephemeris from the Minor Planet Center (MPC), with a discrepancy of several arc minutes between them. He aimed his Celestron 11-inch telescope with SBIG ST-10XME between the two positions to recover the comet. He later discovered that when he queried the sites he had neglected to change his request from "apparent RA/DE" to "Astrometric (J2000)." In the end, it became clear that the ephemeris from both sites were in agreement and precisely matched the position of the object on Bruce's images. Bruce commented later "*It's funny that I was using the wrong prediction and still found it. Floundering is fun!"*

Bruce was understandably reluctant to claim he had recovered the comet based on just this one observation. As the day wore on, he processed more of his images and was able to do a preliminary movement analysis and found the "*object of interest is moving at the right rate in the right direction*."

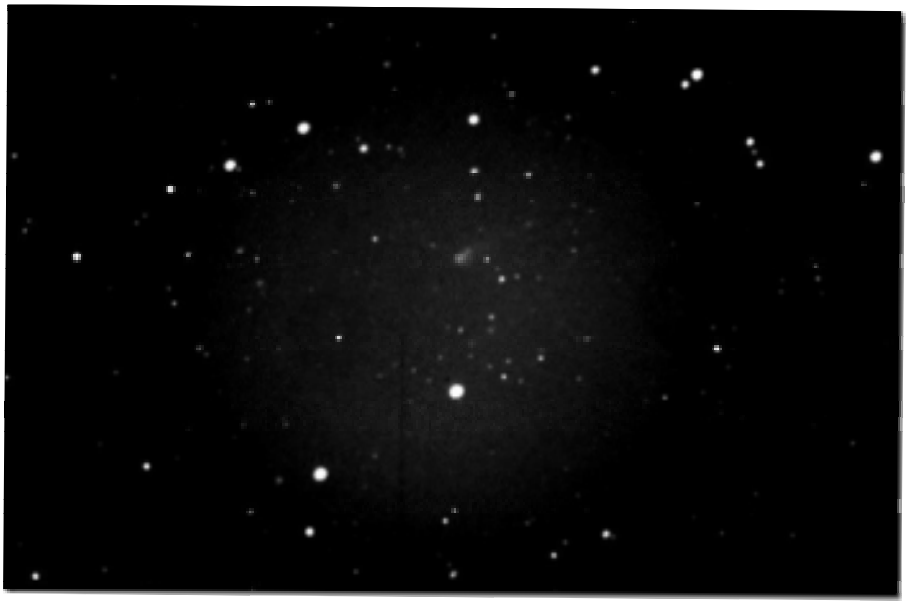
When Richard Miles of JPL wrote to tell him "*Attached is the predicted position of ISON for your recovery image and time post solar conjunction. As you can see it is exactly where it should be!"* confidence soared that ISON had been reliably imaged. By the end of the day, NASA's CIOC website was confidently reporting that ISON had been recovered. See: http://www.isoncampaign.org/karl/ison-recovery

The story, and the local excitement, actually began several days earlier on Aug 5 when members of the CISIG (aka HAC Comet Team) realized that there might be a break in the monsoon weather and a series of clear mornings was possible. We were still a couple of weeks away from the time the experts predicted ISON would be recoverable, but that didn't stop team members from gearing up for the attempt. David Roemer reported making modifications to his telescope mounting to allow him to reach down to the eastern horizon where ISON would be hiding in the morning twilight. Aug 6 was mostly clear and several members enjoyed the trio of planets rising in the east. But the comet was a no-show. Then on August 7, David got a nibble and for a time at least we thought, maybe. The object he caught certainly looked like a comet. But there were only a couple of stars in the image to fix a position and he was unwilling to make the leap. In hindsight, it seems very unlikely that he actually imaged the comet and he now reports with some certainty that the position of his object of interest doesn't match. Day after day, as ISON inched ever so slightly higher in mostly clear skies the effort continued without success. I even tried to recover the comet visually, setting up my 18-inch in my driveway where I could get a good angle to where the comet was hiding on the morning of August 9. No joy.

The stage was set, the anticipation mounting. So, when Bruce Gary's image came across our computer screens we were understandably excited, and privileged to witness the recovery.

The story isn't complete by any means. This isn't even the end of the first chapter, but just the first page. Bruce will continue to image the comet and will be working on determining a rotation period. You can follow his progress on his web page: http://brucegary.net/ISON/. The CISIG now has as its next objective to image the comet from the Patterson Observatory and secure bragging rights for that centerpiece of our Comet ISON outreach efforts. And, of course, each member of the team has their own personal objectives to image or observe this comet in the coming weeks. Accomplishment and discovery are what makes amateur astronomy so exciting and fun. Want to be a part of the team? Just let Doug Snyder add your name to the list. There are many more milestones to achieve in our ISON campaign. Rest assured that dazzle or disappoint, ISON is already an historic comet. Don't let the chance to embrace the excitement pass you by. Get your HAC Comet tee shirt and join the CISIG. The fun you experience may just be your own!

UPDATE FROM DOUG SNYDER (Captured from Haclist)



Above: Recent image of comet ISON by HAC member Dennis Whitmer

Keep up to date with Bruce Gary's analysis and images on his web site - his latest update is on 20130818. He is keeping busy, and world-wide activity is picking up with the comet, now in the constellation Cancer, The Crab. Bruce's web site is:

www.brucegary.net/ISON/

Astronomical League Observing Programs - Planetary Nebula AugustEdition

by Ted Forte
(Captured from the HACList)

Monsoon clouds aside, there is never a better time to start the Astronomical League's Planetary Nebula program than August. More than half the list is visible right now and no less than 31 of our 110 PNe are optimally placed in August. It is my intention to spark an interest in the program and suggest the objects that might be bagged in the coming weeks if the weather cooperates.

As is true of the entire list, our August selection contains both well known showpieces and some seldom mentioned objects that you might not consider tracking down if not for this program. There are no less than 17 of the 31 August objects that I would describe as "stellar". The up side of these stellar sized planetaries is that they are usually bright enough to see in small scopes, even in considerable light pollution. But that's not to say they are easy. The usual problem is to pick these tiny orbs out of the star field, that is, the goal here is to differentiate the planetaries from the ordinary stars in the field. This can be a bit tricky and requires a little skill and, no doubt, some practice. The principle problem is that they are small. So small, that their disks are usually close to the resolution limit allowed by our typical seeing conditions. I include in this group a few objects as large as 10 seconds in listed diameter because when coupled to a low declination, these can actually be quite challenging.

To bag these objects, you need to master the technique of "blinking"; hold a narrow band nebular filter such as the Lumicon OIII between thumb and forefinger and move it into and out of the light path by passing it between eye and eyepiece and then moving it out of your view. As you repeat this procedure, most planetaries will seem to blink. The filter preferentially passes the specific wavelength of light at which planetary nebulae are most bright. In moments of excellent seeing, many of these objects will be distinctly non-stellar, but at other times only the subtle improvement in contrast provided by the filter can reveal the planetary. A good computer generated chart of the field is also a big advantage. In less crowded star fields, your target object might be identified even without blinking a filter. I find that once positively identified, many of these small planetaries will indeed show a disk that you can discern.

Of our 31 August planetaries I will place the following in the stellar (at best a small featureless disk) category and say no more about them: in Sagittarius, NGC 6537, NGC 6565, NGC 6567, NGC 6578, NGC 6620, NGC 6629, NGC 6644, IC 4732 and IC 4776, in Aquila, NGC 6741, IC 4846, NGC 6790, Minkowski 1-70, NGC 6803 and NGC 6807, in Corona Australis, IC 1297, and in Cygnus, NGC 6833.

That leaves 14 August planetaries. Let's start in Lyra with perhaps the most famous planetary nebula of all. The marvelous Ring Nebula, M57 (NGC 6720) nestled midway between beta and gamma Lyrae. I doubt there is anyone on this list that hasn't seen this one. Can you detect its elongated shape and ragged edges along its long axis? How about the 15th magnitude central star? It takes superb seeing and high power to pick that out!

Also in Lyra, about a degree East of M56 is NGC 6765. It is slightly elongated and a filter makes the northern end stand out. Use moderate power, a filter, and averted vision.

Our two remaining Cygnus planetaries are rather famous. NGC 6826 goes by the name of the "Blinking Planetary". This blue-green disk has a very prominent central star. Stare directly at it and the nebula seems to fade away, use averted vision and it pops back into view as if by magic. Many objects display this optical trick, but none are so noted for it as this one in the northern wing of the swan. It is just 28' east of 16 Cygni which is a fine, wide, double star.

The other Cygnus object is Campbell's Hydrogen Star (PK 064 +5.1) which some will say I should have listed with the stellar objects above. Just its name lends it some romance, so it gets singled out here. While it is indeed tiny, its high altitude gives you at least a chance of seeing its barely detectable halo. This is one of the rare planetaries that responds well to an h-beta filter. It is located about two and a half degrees NNE of Alberieo and just 1 degree due north of the 5th magnitude star, 9 Cygni.

Aquila is a treasure trove of planetary nebulae. Besides the stellar objects above we have five interesting objects to consider for August. First up is Sharpless 2-71. So many of the objects in the catalog of Stewart Sharpless are so challenging that you might be hesitant to attempt this one. But fear not, it is quite reachable in modest apertures. Use averted vision, moderate power and an OIII filter. The lopsided disk of nebulosity surrounds a fairly bright central star. Imagine a triangle pointing toward Serpens whose base is Delta and Lambda Aquliae. The PN is 2 degrees SE of 5th magnitude Theta 2 Serpentis.

NGC 6751 is called the Dandelion Puff Ball. The press release for the Hubble Telescope image described a "glowing eye". See if you can detect some annularity in this greenish disk. The central star is visible and a filter will help to bring out the nebulosity. It is one degree south of Lambda Aquliae.

NGC 6778 is an oval disk. Can you see a central star? Its rather faint, but some observers have reported occasional glimpses. This planetary has gained some importance due to its "common envelope" binary central star. Studying how this close binary acts to shape the nebula is lending insight into the role that binary central stars play in planetary nebula formation. It sits nearly in the center of the triangle formed by Lambda, Delta and Iota Aquliae.

NGC 6781 just may be my favorite Aquila planetary. A beautiful planetary that will show detail in an 8-inch scope. Do you see it as a ring or a filled disk? The 16.8 magnitude central star is out of reach for most backyard telescopes. It is 3 degrees 50 minutes NW of Delta Aquliae along a line toward Zeta Aquliae, a star known as Deneb el Okab.

NGC 6804 is probably the easiest of our Aquilla targets. You may disagree. It has an offset central star and a second star involved on one edge.

Our one Draco entry this go round is NGC 6742 which is also fairly well known as Abell 50. This small bright disk is pretty easy and can be seen with or without a filter. The central star is not visible and the disk is featureless.

NGC 6572 is a small bright disk in Ophiuchus. What color do you see? This one seems to have an identity crises – it goes by various names that evoke different shades of blue or green. Various observers have nicknamed it The Blue Racquetball, The Emerald Nebula, and The Turquoise Orb.

IC 1295 is a large faint disk in Scutum. I find this one to be very seeing dependent. A filter helps a lot. It lies 24' ESE of the small globular cluster NGC 6712.

We'll end our list of August planetaries in Sagittarius. NGC 6563 is a fairly bright disk, that can appear annular in larger scopes. It lies two degrees west of Kaus Australis. A filter helps but is not necessary. The final object is another favorite of mine, the Little Gem, NGC 6818. This is a small blue disk that holds magnification well and has a strong response to filters. It is in the northern part of the archer and makes an isosceles triangle with alpha and beta Capricorni. See if you can detect its faint extensions that lie along its long axis, and then check out nearby Barnard's Galaxy aka NGC 6822.

Below is a table of the objects in the PN Program that are optimally placed in August.

NGC 6537	Red Spider	Sgr	18h05m49.4s	-19°50'34"
NGC 6565	He 2-362	Sgr	18h12m31.2s	-28°10'36"
NGC 6572	Blue Racquetball	Oph	18h12m36.4s	+06°51'22"
NGC 6563	He 2-361	Sgr	18h12m43.4s	-33°52'02"
NGC 6567	He 2-369	Sgr	18h14m21.3s	-19°04'25"
NGC 6578	He 2-381	Sgr	18h16m53.0s	-20°26'52"
NGC 6620	He 2-394	Sgr	18h23m32.5s	-26°49'01"
NGC 6629	He 2-399	Sgr	18h26m19.7s	-23°11'52"
NGC 6644	He 2-408	Sgr	18h33m12.4s	-25°07'19"
IC 4732	He 2-410	Sgr	18h34m31.7s	-22°38'15"
IC 4776	He 2-421	Sgr	18h46m31.1s	-33°19'58"
M 57	Ring Nebula	Lyr	18h53m58.5s	+33°02'30"
IC 1295	PN G025.4-04.7	Sct	18h55m10.8s	-08°48'54"
NGC 6742	Abell 50	Dra	18h59m37.8s	+48°28'45"
SH2-71	PN G035.9-01.1	Aql	19h02m31.4s	+02°10'03"
NGC 6741	Phantom Streak	Aql	19h03m08.8s	-00°26'05"
NGC 6751	PN G029.2-05.9	Aql	19h06m28.5s	-05°58'38"
NGC 6765	M 1-68	Lyr	19h11m30.8s	+30°33'41"
IC 4846	PN G027.6-09.6	Aql	19h17m01.8s	-09°01'33"
IC 1297	He 2-431	CrA	19h18m05.8s	-39°35'43"
NGC 6778	PN G034.5-06.7	Aql	19h18m56.9s	-01°34'42"
NGC 6781	PN G041.8-02.9	Aql	19h18m58.2s	+06°33'24"
NGC 6790	PN G037.8-06.3	Aql	19h23m28.2s	+01°31'55"
M 1-70	PN G045.4-02.7	Aql	19h24m51.7s	+09°55'06"
NGC 6803	PN G046.4-04.1	Aql	19h31m45.9s	+10°04'37"
NGC 6804	PN G045.7-04.5	Aql	19h32m04.8s	+09°14'47"

NGC 6807	PN G042.9-06.9	Aql	19h35m03.9s	+05°42'20"
Campbell's Hyd. Star	He 2-438	Cyg	19h35m09.9s	+30°32'16"
NGC 6818	Little Gem	Sgr	19h44m32.5s	-14°07'46"
NGC 6826	Blinking PN	Cyg	19h45m06.0s	+50°32'53"
NGC 6833	PN G082.5+11.3	Cyg	19h50m05.3s	+48°59'07"

Good luck with the clouds and let me know how you did in trying for any of these.

Ted

DINE UNDER THE STARS

By Ted Forte

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Dine Under The Stars (DUTS) is the major fund-raising event for the University South Foundation. With the proceeds from the 2012 Dine Under The Stars fundraiser, the foundation was able to award $20,000 in scholarships to University of Arizona South students.

HAC members have always supported this event by manning the Patterson Observatory as well as providing their own telescopes for sky gazing during the event. That is an important contribution that is very much appreciated, but I'd like you to consider doing something more. I would like you to consider buying a ticket to the event. Adult tickets are $40 each. Student tickets are $25 (valid ID required) and children 12 and under are $15. I hope you'll agree that it is a worthy cause.

I have recently taken a seat on the board of directors for the University South Foundation. I volunteered to serve on that board to represent the interests of the Patterson Observatory which the foundation owns, and we get to use. As a member of the board, I am asked to sell tickets to the DUTS event. So, if you are able to purchase a ticket, I hope you will do so from me. I'll have a number of tickets at the August meeting. If you are setting up a telescope or otherwise helping at the Patterson, you do not need to buy a ticket, of course, but your purchase will be much appreciated and will greatly benefit your community. Checks should be made out to University South Foundation.

This year's Dine Under the Stars will be held on Saturday, September 28, 2013 from 6:00 PM until 9:00 PM on the University of Arizona South campus (adjacent to the Patterson observatory). The event will feature an Hawaiian style luau, an Hawaiian band and dancers, a 50/50 raffle, a silent auction and star gazing. It should be a fun event attended by local business owners, politicians, university staff and faculty and other community supporters. And, I hope, you!

Size Does Matter, But So Does Dark Energy

By Dr. Ethan Siegel

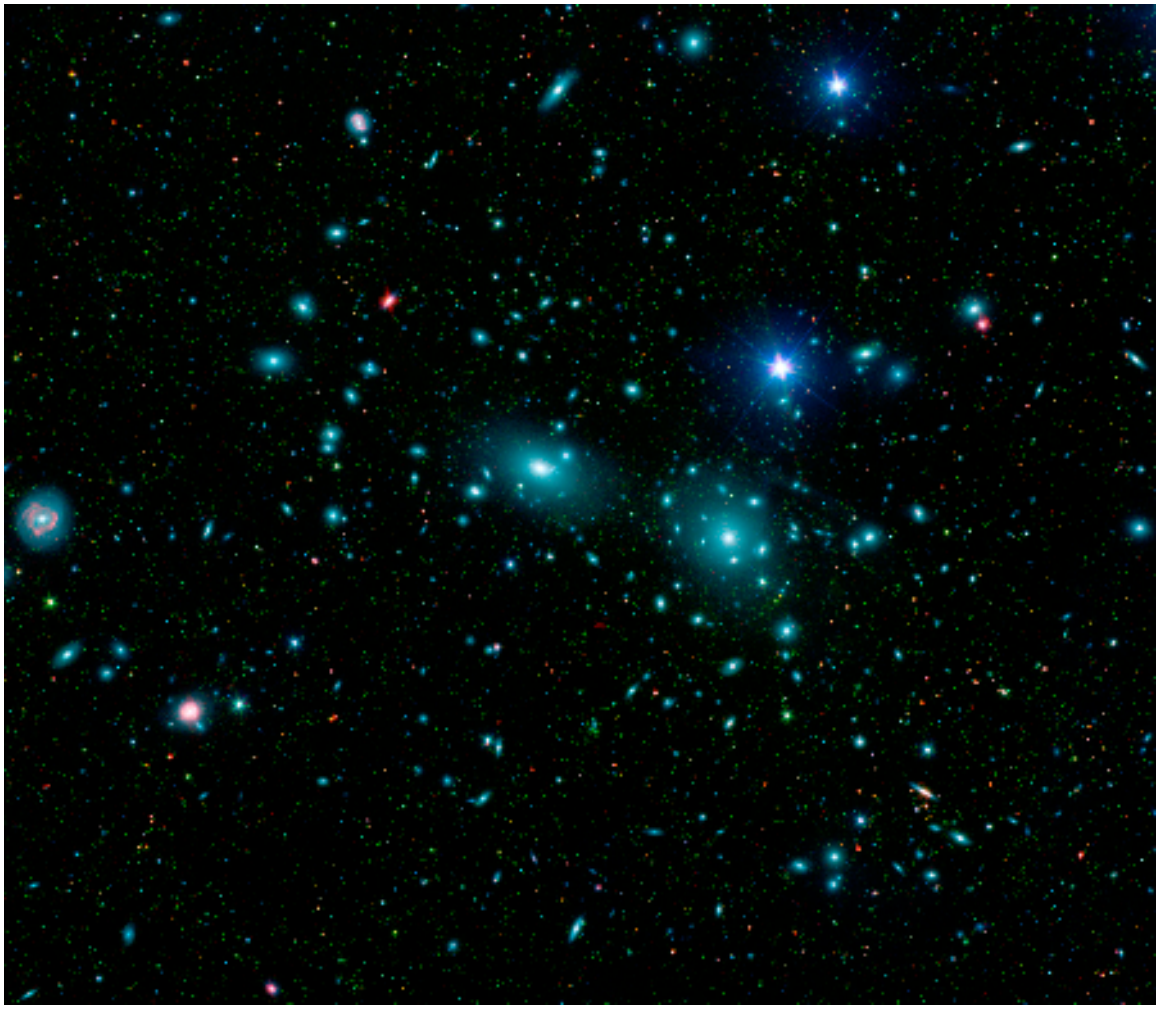
Here in our own galactic backyard, the Milky Way contains some 200-400 billion stars, and that's not even the biggest galaxy in our own local group. Andromeda (M31) is even bigger and more massive than we are, made up of around a *trillion* stars! When you throw in the Triangulum Galaxy (M33), the Large and Small Magellanic Clouds, and the dozens of dwarf galaxies and hundreds of globular clusters gravitationally bound to us and our nearest neighbors, our local group sure does seem impressive.

Yet that's just chicken feed compared to the largest structures in the universe. Giant clusters and superclusters of galaxies, containing thousands of times the mass of our entire local group, can be found omnidirectionally with telescope surveys. Perhaps the two most famous examples are the nearby Virgo Cluster and the somewhat more distant Coma Supercluster, the latter containing more than 3,000 galaxies. There are millions of giant clusters like this in our observable universe, and the gravitational forces at play are absolutely tremendous: there are literally *quadrillions* of times the mass of our Sun in these systems.

The largest superclusters line up along filaments, forming a great cosmic web of structure with huge intergalactic voids in between the galaxy-rich regions. These galaxy filaments span anywhere from hundreds of millions of light-years all the way up to more than a *billion* light years in length. The CfA2 Great Wall, the Sloan Great Wall, and most recently, the Huge-LQG (Large Quasar Group) are the largest known ones, with the Huge-LQG -- a group of at least 73 quasars – apparently stretching nearly 4 billion light years in its longest direction: more than 5% of the observable universe! With more mass than a million Milky Way galaxies in there, this structure is a puzzle for cosmology.

You see, with the normal matter, dark matter, and dark energy in our universe, there's an upper limit to the size of gravitationally bound filaments that should form. The Huge-LQG, if real, is more than *double* the size of that largest predicted structure, and this could cast doubts on the core principle of cosmology: that on the largest scales, the universe is roughly uniform everywhere. But this might not pose a problem at all, thanks to an unlikely culprit: **dark energy**. Just as the local group is part of the Virgo Supercluster but recedes from it, and the Leo Cluster -- a large member of the Coma Supercluster -- is accelerating away from Coma, it's conceivable that the Huge-LQG isn't a single, bound structure at all, but will eventually be driven apart by dark energy. Either way, we're just a tiny drop in the vast cosmic ocean, on the outskirts of its rich, yet barely fathomable depths.

Learn about the many ways in which NASA strives to uncover the mysteries of the universe: http://science.nasa.gov/astrophysics/. Kids can make their own clusters of galaxies by checking out The Space Place's fun galactic mobile activity: http://spaceplace.nasa.gov/galactic-mobile/.



Digital mosaic of infrared light (courtesy of Spitzer) and visible light (SDSS) of the Coma Cluster, the largest member of the Coma Supercluster. Image credit: NASA / JPL-Caltech / Goddard Space Flight Center / Sloan Digital Sky Survey.

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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]**el.; 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