



# alpha

Astronomical League of the Philippines' *HerAld*

© 2012, Astronomical League of the Philippines

Visit our website at [www.astroleaguephils.org](http://www.astroleaguephils.org)

Vol. 10, Issue No. 10  
October 2012

Francisco Lao, Jr.  
Editor-in-Chief

e-mail at:  
<[appulse2000@yahoo.com](mailto:appulse2000@yahoo.com)>



Happy 9<sup>th</sup> Anniversary, Astronomical League of the Philippines! © James Kevin Ty

## CLUB & LOCAL NEWS

### September Meeting

Last September 9, members of the Astronomical League of the Philippines (ALP) celebrated their 9<sup>th</sup> anniversary at the Manila Planetarium. Members who attended were ALP President James Kevin Ty, wife Charito and son Kendrick Cole (KC); VP Jett Aguilar; Secretary Christopher Louie Lu, wife Karren and daughter Frances; PRO Armando Lee, wife Mia and son Jason; directors Peter Benedict Tubalinal, wife Joy and daughter Stephanie, and Rich Pijuan; Liza Quitlong; Ma. Belen Pabunan; Nel Lagda; Gary Andreassen, wife Irma and son Steinar; Arnel Campos and wife Michelle; Miguel Enrique Cajita and dad Trix; lah Serna; Norman Marigza; Mike Enage; and, Jeremias Soriano with children Jessica Joy and Elijah Jeremie.



ALPers brought a lot of pot luck food (*right, top*) to share with fellow ALPers. The meeting proper started at around 1:15 p.m. with ALP director Peter Benedict Tubalinal (*above*) leading a prayer to thank God for all the blessings and success ALP had obtained in the past 9 years. Afterwards, ALPers helped themselves on the bountiful and delicious lunch. Members also used the opportunity to discuss and chat on the latest news in astronomy and space. After lunch, ALPers went inside the Planetarium dome to watch a documentary movie entitled "Mission to Mars", produced by BBC Horizon. Last August 6, 2012, NASA & JPL's most ambitious rover landed in Gale Crater on the Martian surface. Called Mars Science Laboratory (MSL), this latest rover was equipped with the latest and most advanced science equipment to probe, analyze and communicate its finding back to Earth.

It featured the people involved in MSL's robotics, mechanics, on-board computers and experiments, not to mention the power-supply that the Mars rover "Curiosity" will use. The most amazing feature of the documentary was how they planned to land the Mars Rover on the red planet using the largest heat-shield ever made, then the strongest supersonic parachute, and finally, the 'Sky-crane' to allow MSL to soft land on the Martian surface.



After the show, through the kindness of Manila Planetarium Curator Bel Pabunan, the planetary show "The Starry Night" was shown to ALPers. It was a great way to reminisce how beautiful our night sky is and also served as though they were observing and imaging under dark skies during the rainy season. Lastly, ALP President James Kevin Ty and PRO Armando Lee discussed the upcoming September 22<sup>nd</sup> InOMN and Starpeace 2012 to be held at Rajah Sulayman Park as well as the October 13<sup>th</sup> Caliraya Stargazing Session. The meeting ended at around 5:30 p.m. - *James Kevin Ty & Christopher Louie Lu*

### International Observe the Moon Night

Last September 22, ALP members joined the world in celebrating the International Observe the Moon Night (InOMN) and Starpeace 2012 at Rajah Sulayman Park beside Aristocrat Restaurant, Malate, Manila. Members who were present were ALP President James Kevin Ty, wife Charito and son Kendrick Cole; Secretary Christopher Louie Lu, wife Karren and daughter Frances; PRO Armando Lee, wife Mia and son Jason; Treasurer Andrew Ian Chan and lah Serna; directors Edgar Ang and John Ray Cabrera; Miguel Enrique Cajita with dad Trix; Gary Andreassen, wife Irma and son Steinar; Arnel Campos; Belen Pabunan; Liza Quitlong; Nel Lagda; Mary Ann Ramirez; Maximo Zabanl; Cristina and her student Benz Felices; and, the staff of Cutting Edge, which is the Philippine distributor of Celestron Telescopes. The event in the early evening was marred by drizzle and a short burst of hard rain, so the members were not able to set up till around 8:20 p.m. James brought along a portable setup in Canon EF 100-400mm f/4.5-5.6 IS L lens with eyepiece adapter on sturdy tripod; Christopher with his Celestron Powerseeker 80mm refractor on EQ-1 mount; Arnel with Celestron MiniMak50 on sturdy tripod; Gary with his Celestron C6N Newtonian reflector on Orion SVP EQ-5 mount; and Miguel with his C130 Newtonian reflector on EQ-1 mount. Cutting Edge brought along a new product, the Sky Prodigy 70mm refractor, a GPS GOTO telescope system (⇒ p. 144).



Planetarium curator Bel Pabunan and her staff were there to celebrate InOMN and StarPeace 2012 with ALP.



People look through the various scopes while Dr. Armando Lee handles InOMN Twitter conversation with VietAstro and other astro orgs around the world.



Guest Numan Sha viewing the Moon through James' Canon EF100-400mm L lens with eyepiece adapter.

Despite the bad weather some people were able to drop by to get the chance to view through the different telescopes that were set up for observing the Moon. Unfortunately, the Moon half-heartedly cooperated and let a few people get a chance to view her through clouds.



At around 9:30 p.m., they called it a night and had their traditional group shot taken before packing up.

Then hard rain fell again! We were lucky to still be able to show the Moon despite such a short time. - *James Kevin Ty*

**ALPer Featured**

Our very own ALPer John Nassr's image of the Sombrero Galaxy was featured at the Amateur Astronomer Picture Of the Day website on Sept. 11, 2012.



M 104 is an easy star hop west of Spica and is a striking Messier galaxy to visually behold. The "Sombrero Galaxy" lies along the border of Virgo and Corvus and glows at a relatively bright magnitude of 8.5. Its edge-on perspective presents a nice view of its prominent dark dust lane. The extremely bright nucleus is believed to harbor a super massive black hole. Its large and symmetrical bulging halo is populated by numerous globular clusters.

**Reports**

**Moon**

Sept. 24. 9-day old waxing gibbous Moon (68.2% illuminated). I had to image through thinly veiled haze but it turned out alright.



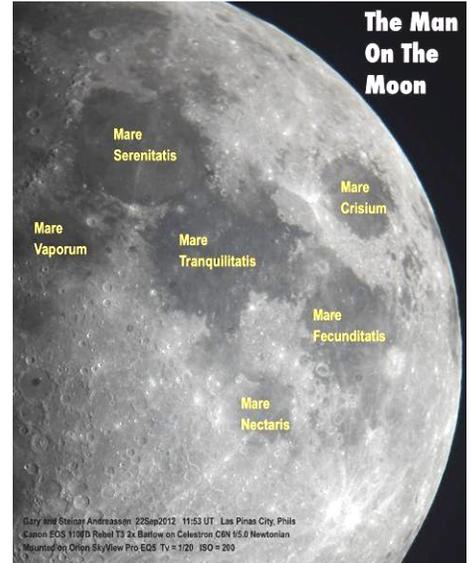
Taken with a Canon 450d on Celestron Powerseeker 80EQ f/11 at 1/20 second on ISO 100. - *Christopher Louie Lu*

Sept. 27. Waxing gibbous Moon imaged with a Nikon D3100 at prime focus on a Sky Watcher Explorer 150PL at ISO 100.



- *Norman Marigza*

Sept. 22. Finally . . . the skies took pity on us mere amateur astronomers and parted for at least a few hours so my son and I could take this shot. Thank God for small favors.



Imaged with a Canon EOS 1100D Rebel T3 and 2x Barlow on Celestron C6 f/5 Newtonian on Sept. 22 from Las Pinas City.

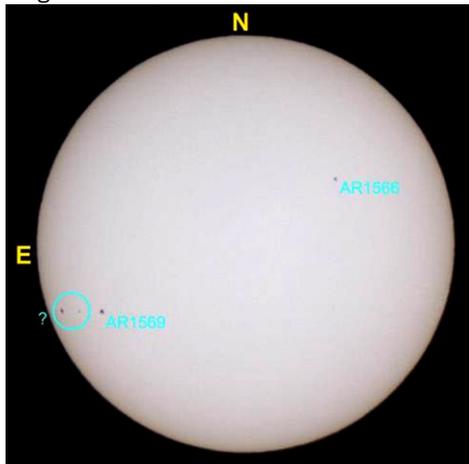
Sept. 30. Siyempre, super duper mega hyper cloudy tonight. This was the only shot I could manage of the Harvest Moon.



- *Gary and Steinar Andreassen*

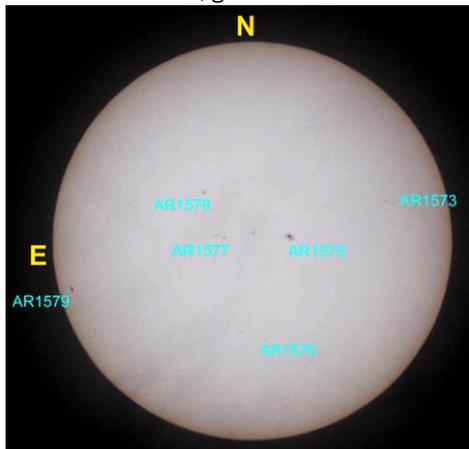
Sun

Sept. 12. Our local star had become relatively quiet. AR1566 had decayed quite a bit as it neared the western limb of the Sun. AR1567 and AR1568 had decayed and could no longer be seen.

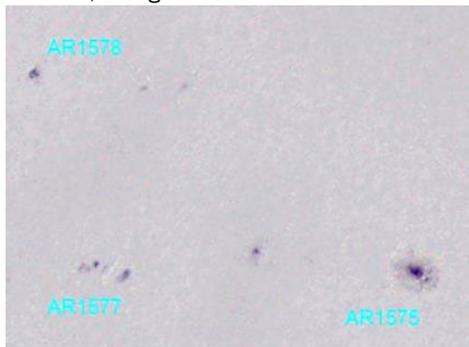


New sunspot groups had risen on the eastern limb just behind AR1569. Taken with a Canon 450d on Celestron Powerseeker 80EQ f/11 with Baader solar filter, density 3.8. 1/4000 second at ISO 100.

Sept. 25. Through haze, I attempted to image the Sun. I'm not truly satisfied with it, but it's the most I could do, given the situation.



The Sun had been very quiet except for AR1575, that gave off a C-class flare.

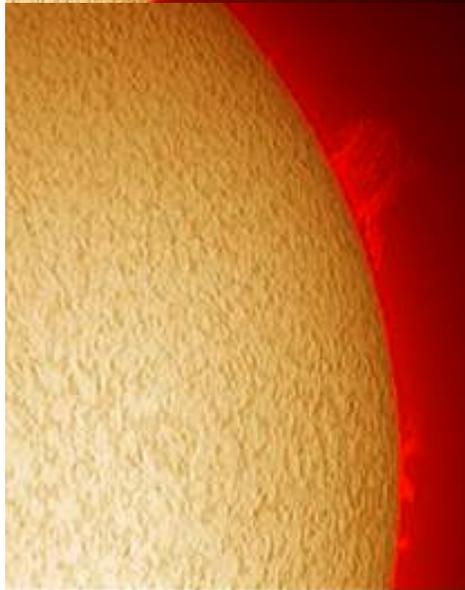


- Christopher Louie Lu

Sept. 4. The sky this morning was partly cloudy and seeing was not good.

Two large faint eruptive prominences were visible in the northeast and southeast limb. AR11560 was large but was silent in its core through H $\alpha$ .

Another large group, AR11564, was very active in its core as viewed through H $\alpha$ . Lots of small sunspot groups littered the entire disk of the Sun, with AR11553 firing another small flare before exiting the southwest limb. Overall, it was a great session.



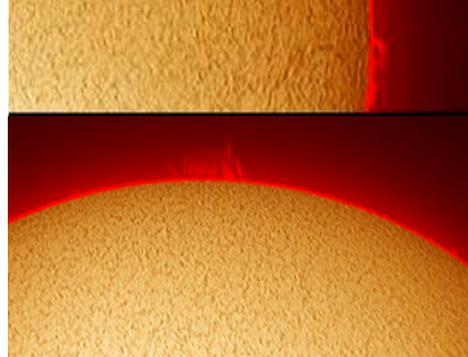
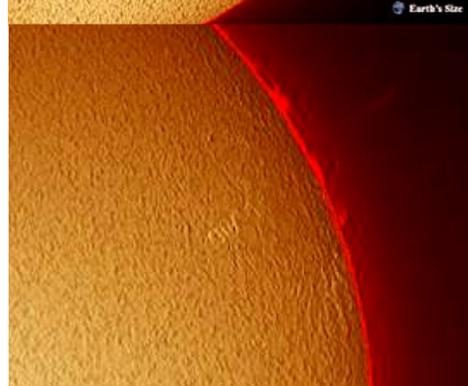
Sept. 6. The sky this morning was very cloudy, but I was able to see the Sun in H $\alpha$  through passing clouds.

Not much solar activity on the Sun except for an interesting faint, long, thin dark filament situated between AR11564 and AR11562.

I was able to image it before clouds totally rolled in and ended my imaging session.

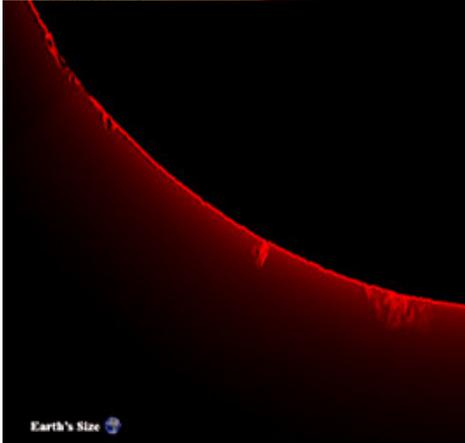


Sept. 7. The sky this morning was partly cloudy and seeing condition was fair. 2 huge hedgerow prominences were visible in the northern and southwest limb. Another beautiful flying ejected prominence could be seen in the northwest limb! 5 sunspot groups were visible on the Sun. I was clouded out again as I was planning to image in white light.



Sept. 8. The sky this morning was partly cloudy and seeing condition was fair. The southwestern huge hedgerow prominence was still visible but was starting to dwindle a bit compared to yesterday ( $\Rightarrow$  p. 146).

AR11562 and AR11564 continued to be active as they started to make their exit to the southwest limb. There was also another nice large eruptive prominence in the southern limb which I was able to observe before clouds covered my view again.



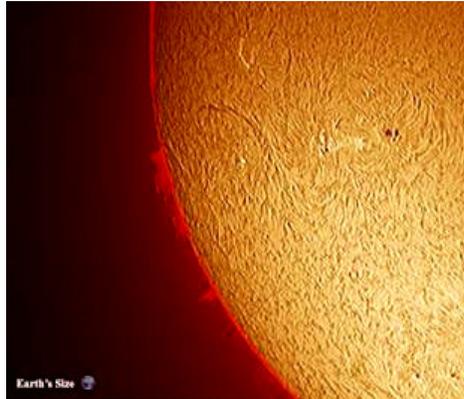
Sept. 13. The sky this morning was cloudy and hazy but I could still see the Sun, so I tried to force myself to observe the Sun in white light and saw 2 nice sunspot groups - AR11560 and AR11570 emerging from the southeast limb. Despite passing clouds, I managed to still image them.



Sept. 22. The sky this morning was partly clear, so I didn't waste time to image right away. AR11575 was large and nice to view both in white light, as well as H $\alpha$ .

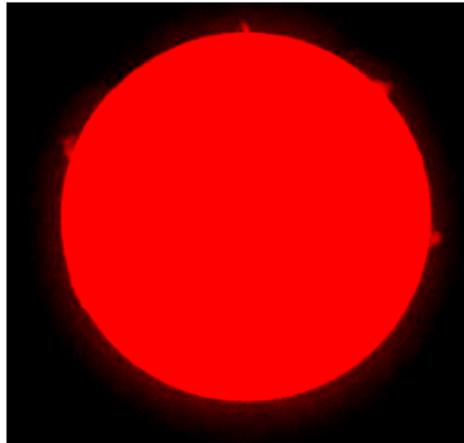


AR11576, on the other hand, was moderate in size but inconspicuous in appearance. There was also a large, wide hedgerow prominence visible in the southeast limb as well as a large arching dark filament beside AR11575.



- James Kevin Ty

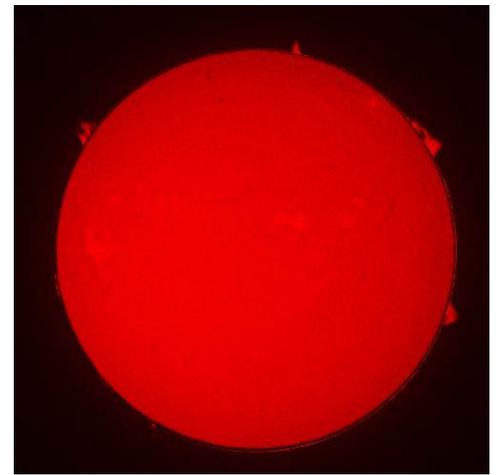
Sept. 1. I was dodging clouds and haze this early evening, and I was able to take only one image of the Sun in H-alpha using the Coronado SolarMax 60 and Nikon D7000.



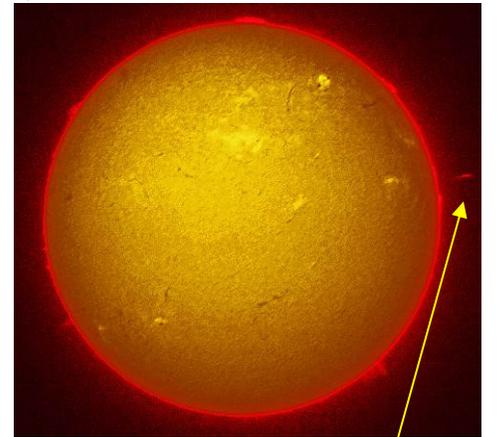
And what a shame that I did not get the chance to take more images and better ones, as the Sun was peppered with large prominences on the limbs - there was a large loop prominence on the northwest side and eruptive prominences elsewhere.

Sept. 2. The morning was nice that Sunday with a cloudless sky, but the seeing still wasn't as good, as the air still wasn't as stable as desired.

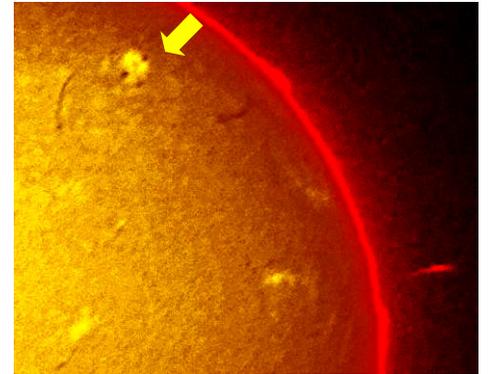
The strong prominences were still there, though they have changed a bit in character. The eruptive prominence on the southeast now showed two distinct and separated loop prominence features, like the letter "M", while the northeast prominence became a very wide prominence that definitely carried material in a large flat loop over the solar surface. It was probably the largest structure in the limb of the Sun that time (there weren't prominent dark filaments on the solar disk).



Sept. 6. The Sun presented quite a nice display this evening, and I experimented with increasing the exposure I take to 1/125 second at ISO 6400 and seeing where that would take me. I was floored when I got details on the solar disk at a much yellower color rather than the faint features I get at 1/500 sec at ISO 200.

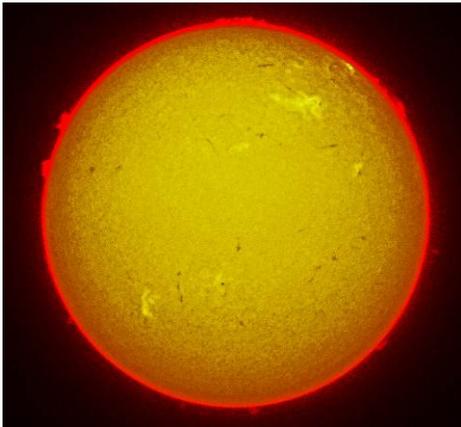


You could see a nice detached eruptive prominence on the right side and a hedgerow prominence on the lower right side of this composite image.

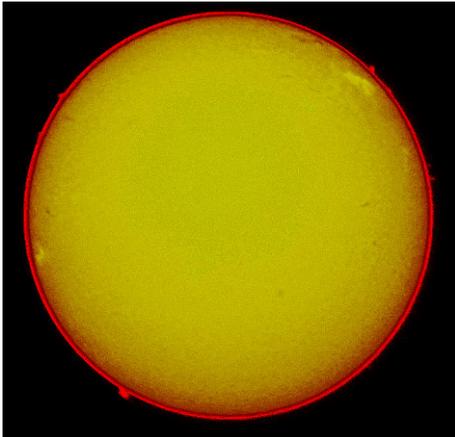


What was more, while processing, there seemed to be an explosion on the upper right side that seemed to be in 3D - rising above the surface of the Sun's disk, like a nuclear explosion (above - upper left), but looking connected to the end of a dark filament ( $\Rightarrow$  p. 147).

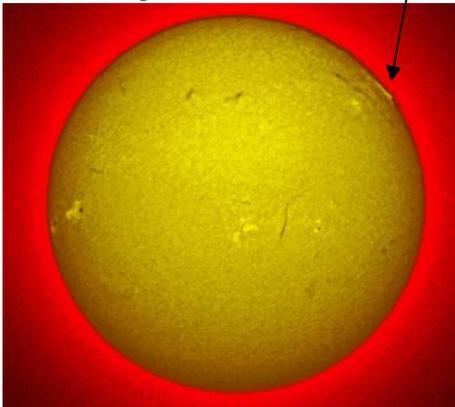
**Sept. 8.** A lot of the prominences have gone down, but there's some great activity on the disk of the Sun, with active regions and dark filaments.



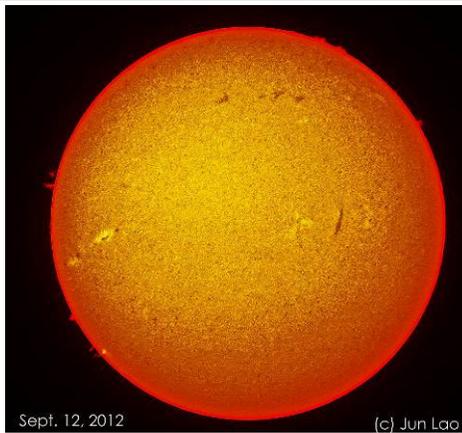
**Sept. 10.** The Sun was somewhat quiet in H alpha - both on the disk and on the limb.



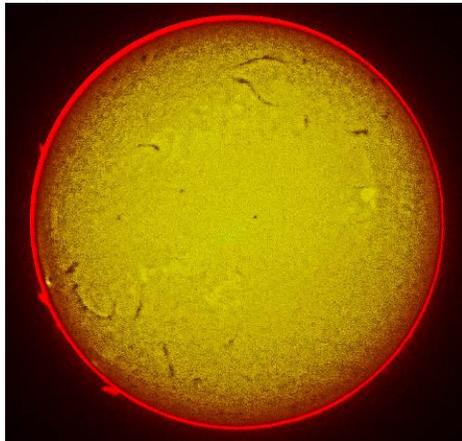
**Sept. 11.** The Sun showed some more activity, especially as one of the active regions was heading toward the limb - note that this area on the upper right was showing height as it was heading toward the limb.



**Sept. 12.** The Sun was showing more signs of activity with taller prominences on the limb and active regions on the disk of the sun providing for brighter areas and dark filaments on the surface.



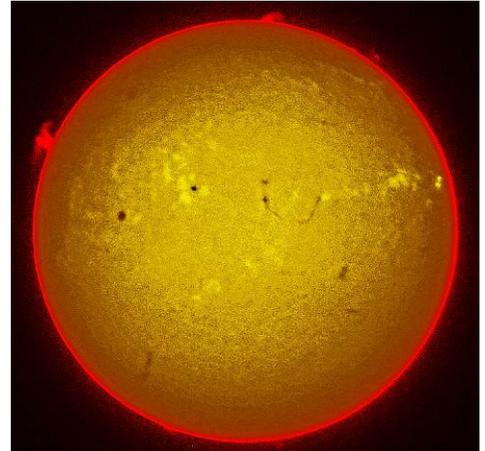
**Sept. 24.** I arrived back in the US in the afternoon, with a bad cold I picked up in Manila the week I was there, but the nice blue sky outside in the late afternoon prompted me to observe the Sun and image it in H alpha, and what an active surface the Sun had - lots of long dark filaments, which are essentially prominences projected on the disk of the Sun, and appearing darker, even in H alpha, because they were cooler in temperature than the surface.



**Sept. 27.** Wow! When I observed in the early evening (the Sun sets around 7:30 p.m.) I was surprised to see such a nice sight - tall prominences - one with a lot of detail, and another eruptive one, and long dark filaments!

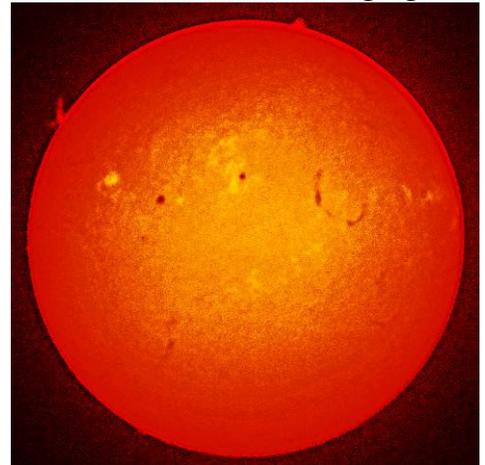


**Sept. 29.** Another fantastic day for prominences! The very large prominence complex on the southeast limb had morphed into a fantastic fountain-type display, while the prominence on the east limb had developed a fountain. One of the small prominences on the northeast limb had become what seemed to be a floating loop prominence.



A large dark filament near the center and several active regions continued to make the Sun such a nice active object to observe.

**Sept. 30.** Playing around with exposures and processing gave a much oranger Sun. The strength and staying power of the eruptive prominences on the east and southeastern limb showed these continued to be quite intense, while the long dark filament in the center of the Sun's disk continued going.



- Jun Lao, Mason, Ohio

### Jupiter

**Sept. 6.** Seeing was unstable today. I also had some dew problem. The Great Red Spot (GRS) and Oval BA had just set in this image. The wake of the GRS could be seen on the South Equatorial Belt (SEB). The mid-Equatorial Zone (EZ) had a prominent red band. The North Equatorial Belt (NEB) was very complex and still chaotic. The North Tropical Zone (NTrZ) had a strong yellow color while the North Temperate Belt (NTB) was red and the northern edge was chaotic (⇒ p. 148)



20:37UT I: 335 II: 246 III: 283 (5 min)

Sept. 15. It has been raining here for more than a week. I had a break this morning. Seeing was good with Jupiter high up.



20:35UT I: 314 II: 157 III: 196 (5 min)



20:51UT I: 324 II: 167 III: 206 (5 min)



21:00UT I: 330 II: 172 III: 212 (7 min)

The GRS and Oval BA were in conjunction. The red ring of Oval BA was very prominent. The GRS was still faded but the center of the GRS was dark. The wake of the GRS was very complex. Note the dark spot following Oval BA.



20:43UT (CH4) I: 319 II: 162 III: 201 (7 min)  
**Jupiter: GRS/Oval BA Conjunction**  
 September 15, 2012 S: 7-9/10 T: 3-4/5  
 © Christopher Go (Cebu, Philippines)

Note the bright spiral outbreak in the NEB. The Equatorial Zone (EZ) had a prominent band. The NEB looked revived while the NTB was a prominent band. Things seemed to have quieted down on the NEB/NTB.

Sept. 16. Seeing was good this morning. The North North Temperate Zone Little Red Spot (NNTZ LRS) was prominent in these images. It was bright in Methane band. Note the strange feature at the NTBn. This feature seemed to be creating the dark streaks north of the NTB!! Is this an outbreak or a cyclone?



20:24UT I: 106 II: 301 III: 340 (5 min)

20:49UT I: 115 II: 311 III: 350 (5 min)

The NEB was going back to normal. The SEB had a lot of dark streaks possibly due to the interaction of the outbreak with the GRS.

Sept. 20. Seeing was excellent this morning. The Oval BA just passed the GRS. Note the dark oval following the Oval BA. The region following the GRS was very complex.



20:29UT I: 118 II: 183 III: 223 (5 min)



20:46UT I: 31 II: 195 III: 236 (5 min)



20:53UT I: 35 II: 200 III: 240 (5 min)

**Jupiter: GRS/Oval BA Conjunction**  
 September 20, 2012 S: 8-9/10 T: 4/5  
 © Christopher Go (Cebu, Philippines)



20:36UT (CH4) I: 24 II: 189 III: 229 (5 min)

20:40UT (UJ) I: 27 II: 192 III: 232 (4 min)

**Jupiter: GRS/Oval BA Conjunction**  
 September 20, 2012 S: 8-9/10 T: 4/5  
 © Christopher Go (Cebu, Philippines)

The Equatorial band was prominent in this region. The NEB looked revived with some complex rift systems. The North Tropical Zone (NTz) was still reddish. The NTB was prominent with some activity on its northern edge. - Chris Go, Cebu

## Exotic Location Starfield



View of Orion from my hotel room in Prague.  
– Ted Gonzaga

## Deep Sky Objects

The sky cleared for a few hours earlier (after midnight until pre-dawn), so I took the time to get subs for my favorite DSOs M31 and M42. I did try imaging other DSOs as well, with no luck in getting good subs. For the Orion Nebula, I combined the subs taken earlier with the ones that I took last January.



Sept. 14. The Triangulum Galaxy can be seen as a faint blob of light in the upper right part of the image. Obviously this needs more subexposures, and ones that are longer than 3 min and 30 sec.



Above taken with a Pentax \*ist DS and 200 mm f/4 lens mounted on a Synta EQ2 mount, unguided. 3 minutes and 30 seconds single exposure at ISO 1600.



Bottom left shows the constellation Triangulum. The blurry thing in the middle of the image is the Triangulum Galaxy (Messier 33). Pardon the crappy, noisy shot. Obviously using a 135mm f/2.8 lens and taking 3-minute subexposures wasn't enough.

Andromeda Galaxy.



Subexposures taken on July, August, and September 2012. Total exposure time: 37 minutes and 50 seconds using a Pentax \*ist DS and 200 mm f/4 lens. – Oliver Abrigo de Guzman

A few hours of clear sky finally arrived last night! My last deep sky image was taken five months ago and I felt I needed to warm-up my long dormant imaging techniques with a few quick target practice images despite some moonlight. I chose to use my 16-inch Newtonian at f/4.5 and new Nikon D7000 with a Baader MPCC coma corrector for a first light combo. In my excitement, I failed to ensure that the ideal back focus required by the coma corrector was properly set and that my camera sat orthogonally on the focuser. Thus stars on the edge of field were not the points I would have wanted.



The images of M57, the Ring Nebula, periodic Comet Hergenrother 168/P (*below*), and open star cluster NGC 884 in Perseus were each created from three 30-second stacked images exposed at ISO 8320. – John Nassr, Baguio

## Sky Calendar

### Comet Outburst

Comet 168P/Hergenrother, which passed through the perihelion of its 6.9-year orbit on October 1<sup>st</sup>, has erupted unexpectedly and dramatically. Although no one expected it to become brighter than 15<sup>th</sup> magnitude, the comet has blossomed significantly – to better than 10<sup>th</sup> magnitude by one recent estimate.



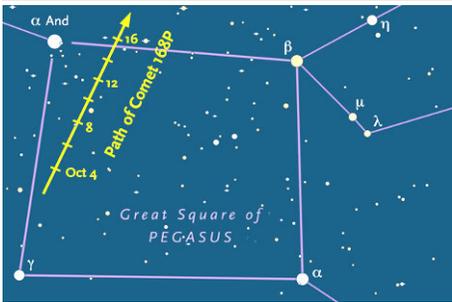
Comet Hergenrother by John Nassr, Baguio

Images show this periodic visitor to be almost starlike in appearance. Comet Hergenrother had a coma spanning about 3 arcminutes but a strong central condensation 8 arcseconds across. It looked a little more "fluffy" than it did a week earlier.

### Comet 168P/Hergenrother

Date	Right ascension	Declination
Oct. 4	00h 07m 02s	+21° 36.5'
Oct. 5	00h 05m 28s	+22° 21.3'
Oct. 6	00h 03m 56s	+23° 05.1'
Oct. 7	00h 02m 25s	+23° 48.0'
Oct. 8	00h 00m 56s	+24° 29.8'
Oct. 9	23h 59m 28s	+25° 10.6'
Oct. 10	23h 58m 02s	+25° 50.3'
Oct. 11	23h 56m 38s	+26° 28.8'
Oct. 12	23h 55m 16s	+27° 06.3'
Oct. 13	23h 53m 57s	+27° 42.7'
Oct. 14	23h 52m 41s	+28° 17.9'
Oct. 15	23h 51m 27s	+28° 52.1'
Oct. 16	23h 50m 16s	+29° 25.1'
Oct. 17	23h 49m 09s	+29° 57.0'
Oct. 18	23h 48m 05s	+30° 27.9'
Oct. 19	23h 47m 05s	+30° 57.7'

Comet 168P/Hergenrother crosses the northeast corner of the Great Square of Pegasus during the first half of October 2012. Tick marks indicate the comet's position at 0h on each date. The faintest stars shown are magnitude 7.4 (⇒ p. 150).



© Sky &amp; Telescope

This outburst puts the comet within range of backyard telescopes with apertures of 6 inches or larger. Comet Hergenrother is 1.4 astronomical units (AU) from the Sun but only 0.4 AU from Earth. You'll find it cruising slowly northward through the northeast corner of the Great Square in Pegasus. Moonlight won't be a problem for now, but you'll need a good star chart to distinguish it from surrounding faint stars.

In November 1998, when Carl Hergenrother discovered this comet on images taken for the Catalina Sky Survey with a 16-inch Schmidt telescope, it was initially thought to have a parabolic orbit. But the comet's periodic nature soon became apparent, and Australian observer Dave Herald recovered it during the next perihelion passage in 2005. Now Comet Hergenrother is again at perihelion — and it's putting on an unexpectedly satisfying show. — *Kelly Beatty, SkyandTelescope.com*

### Sundiving Comet

Astronomy forums are buzzing with speculation about newly-discovered Comet C/2012 S1 (ISON). Currently located beyond the orbit of Jupiter, Comet ISON is heading for a very close encounter with the sun next year. In Nov. 2013, it will pass less than 0.012 AU (1.8 million km) from the solar surface. The fierce heating it experiences then could turn the comet into a bright naked-eye object. Comet C/2012 S1 (ISON) will get to ~0.4 AU from Earth at the beginning of January 2014. According to its orbit, this comet might become a naked-eye object in the period November 2013 - January 2014, and it might reach a negative magnitude at the end of November 2013.



Karl Battams of the NASA-supported Sungrazer Comet Project lays out two possibilities: "In the best case, the comet is big, bright, and skirts the sun next November.

It would be extremely bright – negative magnitudes maybe – and naked-eye visible for observers in the Northern Hemisphere for at least a couple of months."

"Alternately, comets can and often do fizzle out! Comet Elenin springs to mind as a recent example, but there are more famous examples of comets that got the astronomy community seriously worked up, only to fizzle. This is quite possibly a 'new' comet coming in from the Oort cloud, meaning this could be its first-ever encounter with the Sun. If so, with all those icy volatiles intact and never having been truly stressed (thermally and gravitationally), the comet could well disrupt and dissipate weeks or months before reaching the sun."

"Either of the above scenarios is possible, as is anything in between," Battams says. "There's no doubt that Comet ISON will be closely watched. Because the comet is so far away, however, our knowledge probably won't develop much for at least a few more months."

Meanwhile, noted comet researcher John Bortle has pointed out a curious similarity between the orbit of Comet ISON and that of the Great Comet of 1680. "Purely as speculation," he says, "perhaps the two bodies could have been one a few revolutions ago." — *Spaceweather.com*

DAY HR	EVENT
<u>October 2012</u>	
08 10:36	LAST QUARTER
15 15:02	NEW MOON
17 03:01	Mercury 1.2° S of Moon
18 17:33	Mars 1.9° S of Moon
22 04:18	Orionids Meteor Shower Peak
22 06:32	FIRST QUARTER
26 09:42	Saturn at Opposition
27 00:52	Mercury Greatest Elongation 24° East
29 22:49	FULL MOON



- David Doody

Mariner 2 to Venus, the first interplanetary flight, was launched August 27 fifty years ago. This was a time when scientists were first learning that Venus might not harbor jungles under its thick atmosphere after all. A Russian scientist had discovered that atmosphere during the rare Venus transit of 1761, because of the effects of sunlight from behind. Mariner 2 proved interplanetary flight was possible, and our ability to take close-up images of other planets would be richly rewarding in scientific return, but it also meant we could use the spacecraft itself as a "light" source, planting it behind an object of our choosing and making direct measurements.

Mariner 4 did the first occultation experiment of this sort when it passed behind Mars as seen from Earth in July 1965. But, instead of visible light from the Sun, this occultation experiment used the spacecraft's approximately 2-GHz radio signal.

The Mariner 4 experiment revealed Mars' thin atmosphere. Since then, successful radio science occultation experiments have been conducted at every planet and many large moons. And another one is on schedule to investigate Pluto and its companion Charon, when the New Horizons spacecraft flies by in July 2015. Also, during that flyby, a different kind of radio science experiment will investigate the gravitational field.

The most recent radio science occultation experiment took place September 2, 2012, when the Cassini spacecraft carried its three transmitters behind Saturn. These three different frequencies are all kept precisely "in tune" with one another, based on a reference frequency sent from Earth. Compared to observations of the free space for calibration just before ingress to occultation, the experiment makes it possible to tease out a wide variety of components in Saturn's ionosphere and atmosphere.

Occultation experiments comprise only one of many categories of radio science experiments. Others include tests of General Relativity, studying the solar corona, mapping gravity fields, determining mass, and more. They all rely on NASA's Deep Space Network to capture the signals, which are then archived and studied.

Find out more about spacecraft science experiments in "Basics of Space Flight," a website and book by this author, <http://www2.jpl.nasa.gov/basics>. Kids can learn all about NASA's Deep Space Network by playing the "Uplink-Downlink" game at <http://spaceplace.nasa.gov/dsn-game>.