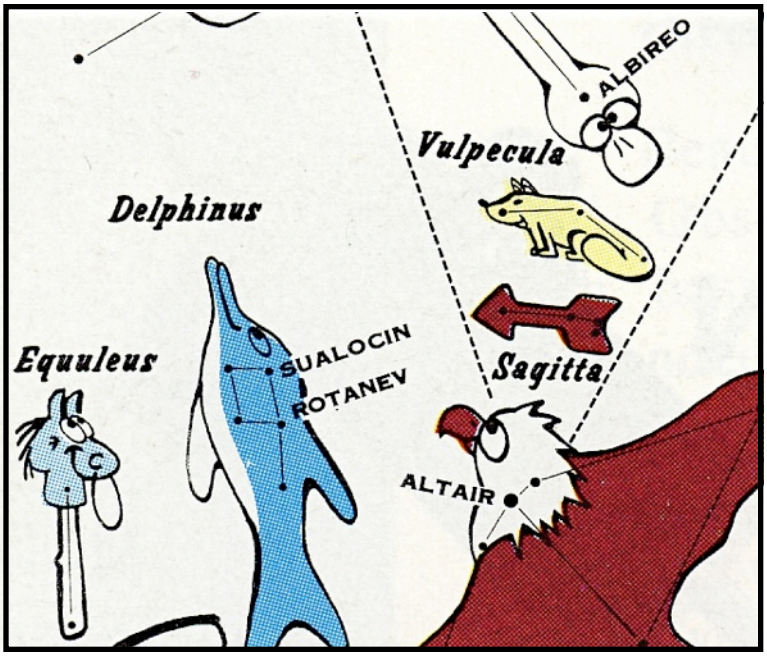
# Star Gazer News

*Astronomy News for Bluewater Stargazers*
*Vol 8 No. 7 July 2014*

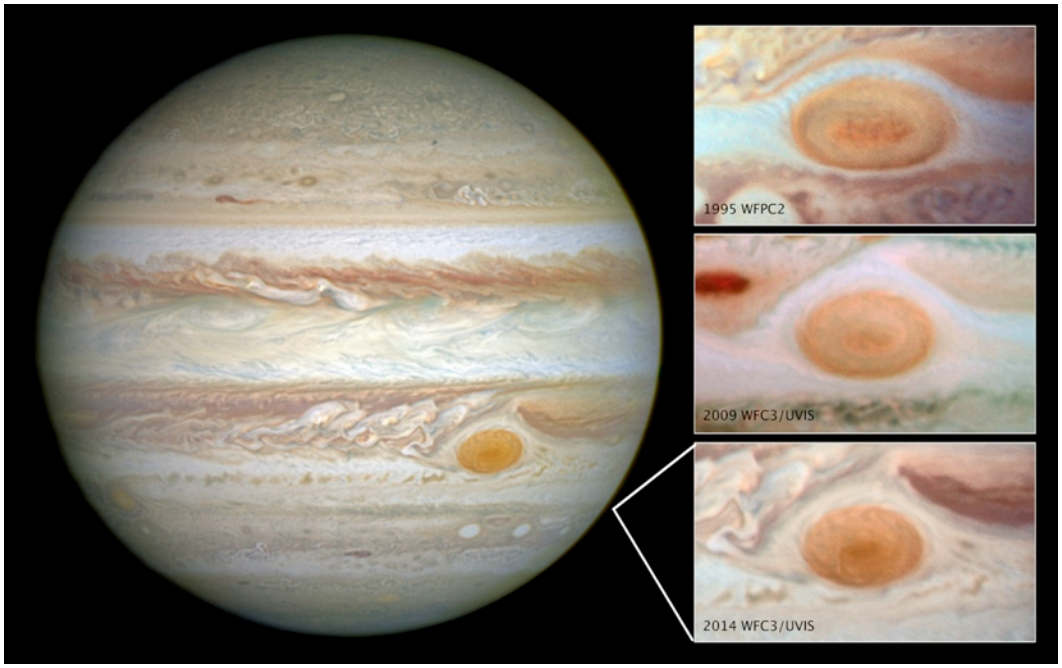
## July 2014 Contents






My favourite cartoon constellations are these created by George Reed and published in Sky & Telescope magazine in May 1980. S&T even issued a double page copy of the drawings that could be purchased from their catalog of publications. I still have the two-page spread from the 1980 issue and enjoy using them as a change of pace from the traditional depictions we are used to. Note the head of Cygnus the Swan in upper right and Reed's depiction of the Little Horse Equuleus as a child's hobby horse. Can you name the other two horses among the 88 constellations? One is easy, the other is not. [Ans on pg 14.] See pg 12 for more about the strangely named Sualocin and Rotanev. [Cartoon used with kind permission of George Reed.]

## NASA's Hubble Shows Jupiter's Great Red Spot is Smaller than Ever Measured




Jupiter's trademark Great Red Spot -- a swirling anti-cyclonic storm larger than Earth -- has shrunk to its smallest size ever measured. According to Amy Simon of NASA's Goddard Space Flight Center in Greenbelt, Maryland, recent NASA Hubble Space Telescope observations confirm the Great Red Spot now is approximately 10,250 miles across. Astronomers have followed this downsizing since the 1930s.

Historic observations as far back as the late 1800s gauged the storm to be as large as 40 800 km on its long axis. NASA Voyager 1 and Voyager 2 flybys of Jupiter in 1979 measured it to be 23 200 km across. In 1995, a Hubble photo showed the long axis of the spot at an estimated 20 832 km across. And in a 2009 photo, it was 17 080 km across.

Beginning in 2012, amateur observations revealed a noticeable increase in the rate at which the spot is shrinking -- by 930 km per year -- changing its shape from an oval to a circle.

"In our new observations it is apparent very small eddies are feeding into the storm," said Simon. "We hypothesized these may be responsible for the accelerated change by altering the internal dynamics and energy of the Great Red Spot."

Simon's team plans to study the motions of the small eddies and the internal dynamics of the storm to determine whether these eddies can feed or sap momentum entering the upwelling vortex, resulting in this yet unexplained shrinkage.

The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency. Goddard Space Flight Center manages the telescope. The Space Telescope Science Institute (STScI) in Baltimore conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy, Inc., in Washington.

For images and more information about Hubble, visit: http://www.nasa.gov/hubble

## From the Editor (1): Dark Sky Weekend BPNP July 25/26

The July 25/26 weekend is this year's annual Dark Sky Weekend at Bruce Peninsula National Park. Started in the International Year of Astronomy (or when BPNP was declared a Dark Sky Preserve, BAS has made its trek up to the exquisitely dark skies of N. Bruce Peninsula and in return for sharing views of the night sky with campers Friday and Saturday nights, we get free accommodations at Group Campsite 3. It has become a tradition that the Webster makes its appearance at this event c/o Brett T. the only BAS member who apparently has a trailer hitch...Anyway, if the skies are clear, they are DARK and worth the effort. Last year we were treated to a very nice auroral display (image below) punctuated by firefly "meteors". BAS has had this event on its calendar from the start and we hope to get a good group of BAS attendees. Note that the folks at the gate need to know that you are a BAS member so pre-register with Brett asap. He will be sending in the final list of attendees on June 30. And if you think aurorae are over with, see the article on pg 6. The best may be yet to come.

## Note 2: A correction to our Speaker List:

The originally scheduled speaker for the BAS meeting July 2 is not available until a later date, and we have arranged for a replacement talk to be given by Gregg MacKay. Gregg worked on the Canadian Arrow project several years ago that was competing for the X-Prize to create a man-carrying private rocket ship. At one point the Arrow was considered to be one of the top three competitors for the 10-Million dollar Ansari X Prize setup in May 1996. The prize would go to the first non-government organization to launch a reusable manned spacecraft into space twice within two weeks. It was modeled after early 20th-century aviation prizes to spur development of low-cost spaceflight.

## BAS Executive 2013-2015

| | | |
|---|---|---|
| **President:** | Aaron Top | aarontop@hotmail.com |
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**Past-Past President:** Dan Gieruszak
**Membership Chair:** Dave Skelton

## BAS Events July 2014

**Jul 2 Wed BAS meeting** ES Fox 7 pm Speaker: Gregg MacKay: Canadian Arrow Project (see below for more)

**Jul 4 Fri** (FQ-1) **Public viewing** Grey Roots Mus. 9 pm, members with scopes please.

**Jul 5 Sat** (FQ) **Moongaze at Inverhuron Pk**. Share the Moon and planets with campers (9 pm). Details from John H.

**Jul 12 Sat** (FM) **Moongaze at MacGregor Pk**. Share the Moon and planets with campers (9 pm). Details from John H.

**Jul 18/19** (LQ) **Whispering Pines Camping Weekend** Share sky views with others and camp free (BAS members only). Contact Gregg Rodgers at wpc@campontario.net to register.

**Jul 25/26** (NM) **Dark Sky Weekend** Bruce Pen Nat. Pk free camping BAS members Note: You must register with Brett Tatton by June 30 to reserve a free campsite.

**Jul 28 - Aug 1 Astronomy Kids Day Camp**

**Jul 29 Tues** Stargazing for Astronomy Kids with parents

## Astronomical Events in July

**Jul 5** Sat (FQ) **Moon and Mars** less than 0.5° apart, Spica 3° away. **Vesta and Ceres** less than 10 minutes apart. Details in June SGN pg. 5

**Jul 12** Sat (FM) ☹ Night of the **Full Moon** "Thunder Moon". **Mars and Spica** 1.3° apart

**Jul 29** Tue (NM+3) **S. δ-Aquarid meteors**, 20/h peak at 5 am Moon only 5% ES Fox session?

# Solar Haloes Over Keppel Henge Usher in Summer

All images by JH

The rainbow coloured band of light seen in the image above between the horizon and the 22° solar halo is actually part of a larger halo called the “circumhorizon halo”. It can appear parallel to the horizon all the way around but usually only portions (arcs) are seen. This site has all you will ever want to know about haloes -solar or lunar: www.atoptics.co.uk/halosim.htm

**Top right:** Even the stone face appears to be wearing sunglasses to ward off the bright sunlight that was present most of the day Saturday. **Image above:** Lunch was a pleasant affair in the shade talking with friends. **Image below:** a larger halo appeared below the common 22* halo for an hour or so after solar noon. It has been know to circle the entire sky just above the horizon. The high altitude cirrus was responsible for the display.

Something is not right with this sundial. Can you spot it?

# Covertly named stars -from Wikipedia

The naming of astronomical bodies is controlled by the International Astronomical Union (IAU), which normally names features on planetary surfaces after people, and then lays down strict standards for this naming – craters on Mercury, for example, are named after "famous deceased artists, musicians, painters and authors". However, the right of choosing names for asteroids is given to the discoverer, pending IAU approval. This tends to produce an idiosyncratic collection of names – whilst many are named after mythological figures, or prominent astronomers, many more are named after popular musicians, obscure historical figures, or personal friends of the discoverer.

The IAU does not name stars, and proper names (like Betelgeuse) are rarely if ever used by professional astronomers, and so there is no need for them to.

Some names have been given unofficially, and worked their way into star catalogues and thus to "formal" acceptance.

The earliest noted example was **Sualocin** and **Rotanev** (α and β Delphini), [the story for those is on pg 12 of this issue of SGN.-ed]

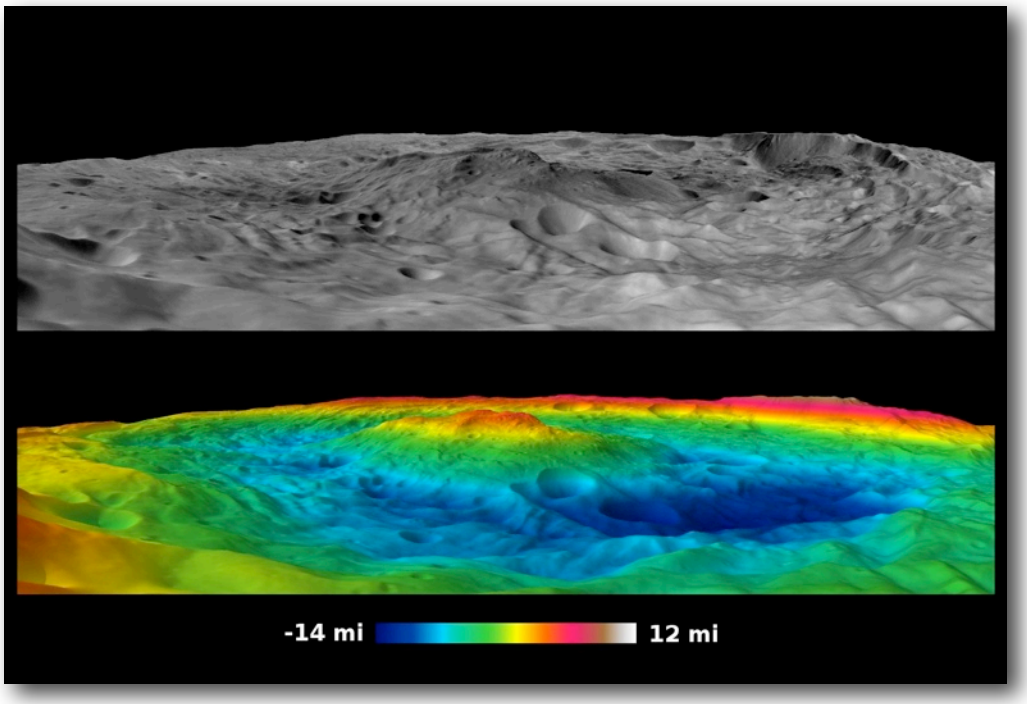
More recently, during the Apollo program, it was common for astronauts to be trained in celestial navigation, and to use a list of naked-eye stars from which to take bearings. As a practical joke, Gus Grissom named three stars after the Apollo 1 crew: — ***Navi*** (γ Cassiopeiae) which is Grissom's middle name spelled backwards, ***Dnoces*** (ι Ursae Majoris) being "second" spelled backwards referring to Ed H. White II (the second) and ***Regor*** (γ Velorum) Chaffee's first name backwards. The names stuck, and were used for the rest of the program. Unknown to Grissom, these stars already had traditional names but were not generally used, so Grissom's names made their way into other records. After the Apollo 1 fire, there was no move to remove Grissom's stars from the record -a sort of tribute to the crew after-the-fact.

**Commercial "star naming"**

International Star Registry and other companies sell "star names" to the public. It is the opinion of many astronomers that such businesses are fraudulent because the names assigned by businesses are not recognised by the International Astronomical Union and have no official status. These companies have been urged to improve the information they provide to customers before purchase and fully disclose the nature of what they are buying. [Some do, many don't bother -ed]

*Portrait of the Apollo 1 prime crew for first manned Apollo space flight. From L-R: Edward H. White II, Virgil I. "Gus" Grissom, and Roger B. Chaffee. On January 27, 1967 during a routine simulated launch test, a fire inside the Apollo Command Module ignited the pure oxygen environment and all three perished.*

# Vesta's Strange South Pole




The most prominent surface features on Vesta are two enormous craters, 500 km wide Rheasilvia crater, centered near the south pole, and the 400 km wide Veneneia crater. The Rheasilvia crater is younger and overlies the Veneneia crater. The Dawn science team named the younger, more prominent crater Rheasilvia, after the mother of Romulus and Remus and a mythical vestal virgin. Its width is 95% of the mean diameter of Vesta. The crater is about 19 km deep. A central peak rises 23 km above the lowest measured part of the crater floor and the highest measured part of the crater rim is 31 km above the crater floor low point. It is estimated that the impact responsible excavated about 1% of the volume of Vesta, and it is likely that the Vesta family and V-type asteroids are the products of this collision. If this is the case, then the fact that 10 km fragments have survived bombardment until the present indicates that the crater is at most only about 1 billion years old. It would also be the site of origin of the HED meteorites. All the known V-type asteroids taken together account for only about 6% of the ejected volume, with the rest presumably either in small fragments, ejected by approaching the 3:1 Kirkwood gap, or perturbed away by the Yarkovsky effect or radiation pressure. Spectroscopic analyses of the Hubble images have shown that this crater has penetrated deep through several distinct layers of the crust, and possibly into the mantle, as indicated by spectral signatures of olivine.

The large peak at the center of Rheasilvia is 20 to 25 km high and 180 km wide. [from Wikipedia]

# Countdown to Pluto Are we there yet?

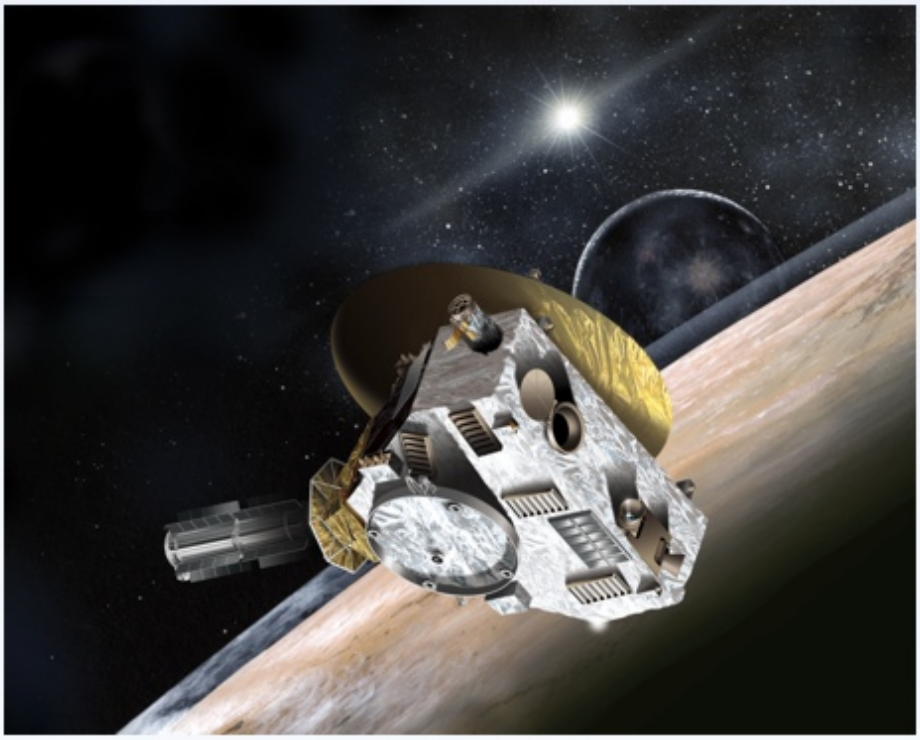
One of the fastest spacecraft ever built -- NASA's New Horizons -- is hurtling through the void at nearly 1.6 million km per day. Launched in 2006, it has been in flight longer than some missions last, and it is nearing its destination: Pluto.

"The encounter begins next January," says Alan Stern, of the Southwest Research Institute and the mission's principal investigator. "We're less than a year away."

Closest approach is scheduled for July 2015 when New Horizons flies only 10,000 km from Pluto, but the spacecraft will be busy long before that date. The first step, in January 2015, is an intensive campaign of photography by the Long Range Reconnaissance Imager or "LORRI." This will help mission controllers pinpoint Pluto's location, which is uncertain by a few thousand kilometers.

"LORRI will photograph the planet against known background star fields," explains Stern. "We'll use the images to refine Pluto's distance from the spacecraft, and then fire the engines to make any necessary corrections."

At first, Pluto and its large moon Charon will be little more than distant pinpricks—"a couple of fat pixels," says Stern--but soon they will swell into full-fledged worlds.



*Artist concept of New Horizons spacecraft. Credit: Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute (JHUAPL/SwRI)*

By late April 2015, the approaching spacecraft will be taking pictures of Pluto that surpass the best images from Hubble. By closest approach in July 2015, a whole new world will open up to the spacecraft's cameras. If New Horizons flew over Earth at the same altitude, it could see individual buildings and their shapes.

Stern is looking forward to one of the most exciting moments of the Space Age. "Humankind hasn't had an experience like this--an encounter with a new planet--in a long time," he says. "Everything we see on Pluto will be a revelation."

He likens New Horizons to Mariner 4, which flew past Mars in July 1965. At the time, many people on Earth, even some scientists, thought the Red Planet was a relatively gentle world, with water and vegetation friendly to life. Instead, Mariner 4 revealed a desiccated wasteland of haunting beauty. New Horizons' flyby of Pluto will occur almost exactly 50 years after Mariner 4's flyby of Mars—and it could shock observers just as much.

Other than a few indistinct markings seen from afar by Hubble, Pluto's landscape is totally unexplored. Although some astronomers call Pluto a "dwarf" planet, Stern says there's nothing small about it. "If you drove a car around the equator of Pluto, the odometer would rack up almost 8,000 km—as far as from Manhattan to Moscow." Such a traveler might encounter icy geysers, craters, clouds, mountain ranges, rilles and valleys, alongside alien landforms no one has ever imagined.

"There is a real possibility that New Horizons will discover new moons and rings as well," says Stern.

Yes, Pluto could have rings. Already, Pluto has five known moons: Charon, Styx, Nix, Kerberos, and Hydra. Numerical simulations show that meteoroids striking those satellites could send debris into orbit, forming a ring system that waxes and wanes over time in response to changes in bombardment.

"We're flying into the unknown," says Stern, "and there is no telling what we might find."

**Credits:** Author: Dr. Tony Phillips | Production editor: Dr. Tony Phillips | Credit: Science@NASA

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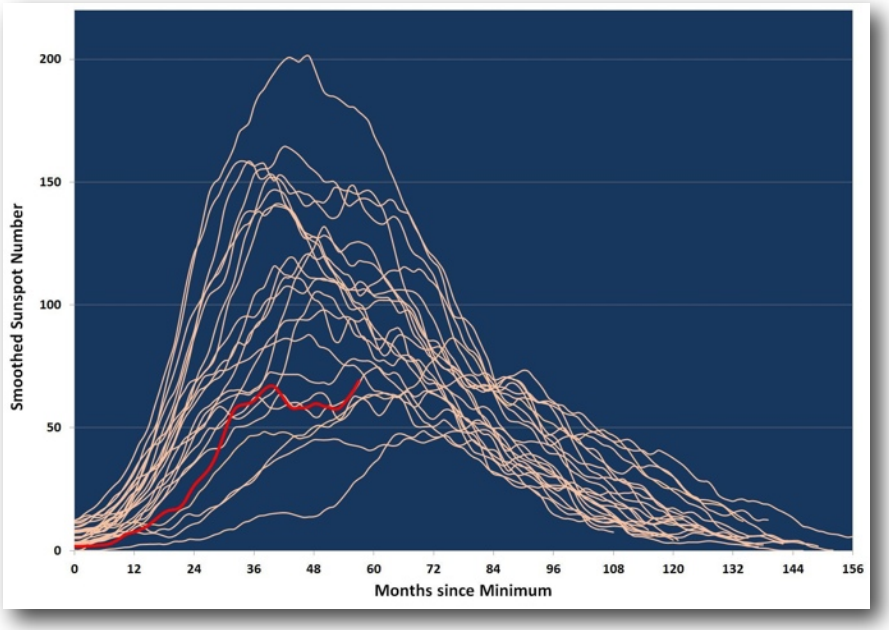
See more about the New Horizons mission here:
http://www.nasa.gov/mission_pages/newhorizons/main/index.html#UtdQbyjhzfh


*At time of publication, this countdown clock gave the time to Pluto encounter. Check the website above for the current time.*

## Solar Max is Here But its a "Mini"

NASA *Science News* June 10, 2014:

Years ago, in 2008 and 2009 an eerie quiet descended on the sun. Sunspot counts dropped to historically-low levels and solar flares ceased altogether. As the longest and deepest solar minimum in a century unfolded, bored solar physicists wondered when "Solar Max" would ever return. They can stop wondering. "It's back," says Dean Pesnell of the Goddard Space Flight Center. "Solar Max has arrived."




*Current plot of sunspots (red line) for cycle 24 shows it is in the lower end of such plots over the last century or so.*

Pesnell is a leading member of the NOAA/NASA Solar Cycle Prediction Panel, a blue-ribbon group of solar physicists who meet from time to time to forecast future solar cycles. It's not as easy as it sounds. Although textbooks call it the "11-year solar cycle," the actual cycle can take anywhere from 9 to 14 years to complete. Some Solar Maxes are strong, others weak, and, sometimes, as happened for nearly 70 years in the 17th century, the solar cycle can vanish altogether.

Pesnell points to a number of factors that signal Solar Max conditions in 2014: "The sun's magnetic field has flipped; we are starting to see the development of long coronal holes; and, oh yes, sunspot counts are cresting."

Another panelist, Doug Bieseker of the NOAA Space Weather Prediction Center, agrees with Pesnell: "Solar Maximum is here .... *Finally*." According to an analysis Bieseker presented at NOAA's Space Weather Workshop in April, the sunspot number for Solar Cycle 24 is near its peak right now. They agree on another point, too: It is not very impressive.

***The Carrington Event of 1859—a solar storm that set telegraph offices on fire and sparked Northern Lights as far south as Hawaii -a contemporary depiction.***

"This solar cycle continues to rank among the weakest on record," comments Ron Turner of Analytic Services, Inc. who serves as a Senior Science Advisor to NASA's Innovative Advanced Concepts program. To illustrate the point, he plotted the smoothed sunspot number of Cycle 24 vs. the previous 23 cycles since 1755 (graph upper right). "In the historical record, there are only a few Solar Maxima weaker than this one." As a result, many researchers have started calling the ongoing peak a "Mini-Max."

Pesnell believes that "Solar Cycle 24, such as it is, will probably start fading by 2015." Ironically, that is when some of the bigger flares and magnetic storms could occur. Biesecker has analyzed historical records of solar activity and he finds that most large events such as strong flares and significant geomagnetic storms typically occur in the declining phase of solar cycles—even weak ones.

Indeed, this "Mini-Max" has already unleashed one of the strongest storms in recorded history. On July 23, 2012, a plasma cloud or "CME" rocketed away from the sun as fast as 3000 km/s, more than four times faster than a typical eruption. The storm tore through Earth orbit, but fortunately Earth wasn't there. Instead it hit NASA's STEREO-A spacecraft, which recorded the event for analysis. Researchers now believe the eruption was as significant as the iconic Carrington Event of 1859—a solar storm that set telegraph offices on fire and sparked Northern Lights as far south as Hawaii. If the 2012 "superstorm" had hit Earth, the damage to power grids and satellites would have been significant.

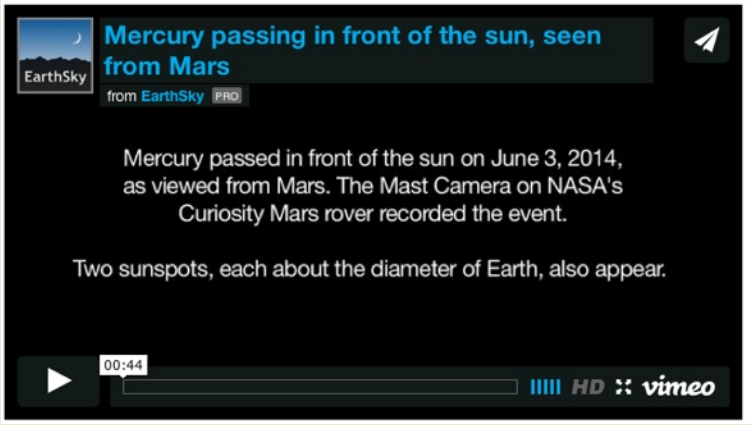
It all adds up to one thing: "We're not out of the woods yet," says Pesnell. Even a "Mini-Max" can stir up major space weather—and there's more to come as the cycle declines.

**Credits: Author/Production Editor: Dr. Tony Phillips**
**Credit: Science@NASA**
**Watch more at:** https://www.youtube.com/watch?v=8Ha7X6dWVQE&feature=youtu.be

This page will feature on a more-or-less regular basis, stories that are best viewed as video clips (or heard as audio) rather than read as text. Most are viewable in Youtube or as a video posted on the various astronomy information sites like **One-Minute Astronomer, EarthSky, Space.com, Physics World** or one of many **NASA space news** websites. See the BAS website LINKS page or the box at right for links to the sources used by SGN on a regular basis. All have free subscription services that will send astronomy and space news directly to your email inbox.

Clicking on each link in blue below the articles on this page should take you directly to the video which you can then view in your web browser. If that doesn't work, then copy the entire address that is underlined (leave out any periods or punctuation at the end of a sentence) open your web browser and paste it into address box.

## Transit of Mercury Seen From Mars




http://earthsky.org/space/mercury-passing-in-front-of-the-sun-seen-from-mars?utm_source=EarthSky+News&utm_campaign=146325a9f3-EarthSky_News&utm_medium=email&utm_term=0_c643945d79-146325a9f3-394035713

## Universe Today: Amateurs re-create Jupiter Time-lapse Animation


http://www.universetoday.com/112646/stunning-90-minute-amateur-timelapse-of-jupiter-re-enacts-voyager-flyby/#more-112646

Here is the original Voyager 1 sequence:
http://www.youtube.com/watch?v=yhHn8CWlSKg

## Astronomy & Space News Sources:

NASA: http://science.nasa.gov/

EarthSky: http://earthsky.org

Physics World: http://physicsworld.com/

Universe Today: http://www.universetoday.com/

Sky News: http://www.skynews.ca/

Sky & Telescope: http://www.skyandtelescope.com/

Astronomy:http://www.astronomy.com/

Spaceweather: http://spaceweather.com

## First Laser Communication from Space


The text story from NASA and the video that was sent can be accessed directly here:
http://science.nasa.gov/science-news/science-at-nasa/2014/18jun_opals/

The video (alone) that was sent multiple times in the 148 s contact can be accessed directly here:

https://www.youtube.com/watch?v=hPOstCZKycI

## Physics World: Keeping a Radio Telescope Eye on the Soviets

Bernard Lovell (right) in the control room at Jodrell Bank Observatory

http://physicsworld.com/cws/article/multimedia/2014/may/23/keeping-a-telescopic-eye-on-the-soviets

# Binoculars for Stargazing

*by Brian Ventrudo OneMinuteAstronomer*

Binoculars are telescopes. They are simply two small telescopes side by side, with a little extra optics to make the eyepieces close enough so you can comfortably look through both at the same time. Unlike a larger telescope, binoculars are easy and intuitive to use. They produce a right-side-up image and a large field of view which make it easy to aim them at an object and find what you're looking for. And they don't need any time to set-up and align. You just grab them and head outside under the stars. Binoculars are especially useful for seeing large craters on the Moon, the moons of Jupiter, the occasional comet, close groupings of the Moon and planets at sunrise and sunset, and, once you know how to find them, larger star clusters and groupings of stars all over the sky. Seeing with both eyes is also more natural.

All binoculars are marked with two key numbers: magnification and aperture. A pair marked 7x50, for example, magnifies 7 times (or 7x) and has objective lenses 50 mm in diameter. The bigger the lenses, the fainter the objects and the more detail you will see. A 50 mm lens will collect 50-60 times as much light as your dark-adapted eye, which means you objects will look 50-60 times brighter.

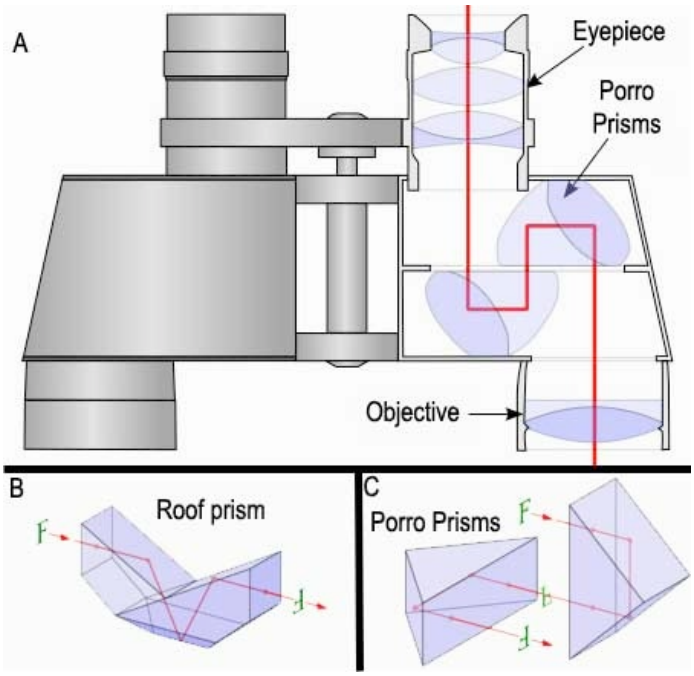
Binoculars that magnify between 6 and 10 times are extremely useful for stargazing and are usually light enough to hand hold for short periods of time. Higher power means you'll see more detail and a darker background sky. But you'll also see a narrower field of view, and it's harder to keep a high-power pair of binoculars steady enough to see fine detail since the slight shaking of your arms is also magnified. For hand-held use, magnification of 7-8x is optimum, and 10x is maximum. [Beyond that, mount them on a tripod for steadiness.]

Because of their larger aperture, a pair of 10×80 binoculars lets you see fainter objects than a 10x50 pair. The trade-off? Bigger lenses mean more weight, and you need a tripod to hold them steady. But note that higher power means the field of view is smaller, so you'll see less sky.

Another key measure of binoculars is the "exit pupil", the size of the bright disks of light you see in the eyepieces when you hold the binoculars at arm's length. The exit pupil is simply the ratio of aperture to magnification. So a 7×50 pair has an exit pupil of 50/7 = 7 mm (roughly), and a 7×35 pair has a 35/7=5 mm exit pupil. Ideally, the exit pupil should be no larger than your eyes' pupils when they are dark-adapted. Under age 30, most people have a dark-adapted exit pupil of 7 mm. But we lose about 1 mm every 10-15 years. At age 50, exit pupils may be around 5-6 mm. So if you're older, a pair of 7×35's or 8x42's (both with a roughly 5 mm exit pupil) might be a better choice than a pair of 7×50's (with a 7 mm exit pupil). Such binoculars are, on average, less expensive as well.

***How to Choose Binoculars***

When you select binoculars, stick with Porro prism binoculars, the classic type of binocular where the objective lens and eyepiece are offset. Binoculars that have a "straight through" view use roof prisms, and a good pair is expensive. Pay the premium only if cost is no object. Image-stabilized binos are even more expensive but those who have them say they are worth every penny.




When selecting a pair, pick up the binoculars and look at light reflected in the objective lenses. If the lenses have a good anti-reflection coating, they'll appear mostly dark, with a bit of reflected color. If the lenses appear white, or ruby red, don't buy them. Look through the lens at the prisms inside. A good anti-reflection coating shows a colored prism surface. A white surface on the prism means no AR coating. Not good... poor or no coatings will show ghost images of bright objects like the Moon and planets.

Hold the pair away from your face with the eyepieces toward you. Look at the bright disk of the exit pupil. The disk appears round if the prisms use high-grade glass (called BAK-4 glass, if you're interested). If the disk appears squared-off, the prisms are made from lower-grade BK-7 glass. Not terrible, but not optimum.

If you're near or far sighted, you don't need to wear your glasses when looking through binoculars. But if you have astigmatism, you will need your glasses. Make sure you can see right to the edge of the field of view while wearing your glasses. Also check for focus across the field of view. A decent pair of optics will hold focus out to the edge. It may not be perfectly focused right at the edge, but if it's way out of focus or highly distorted, move on to another pair.

***Good Bets for Stargazing Binoculars***

Expect to pay $100-$300 for a good pair of new binoculars for stargazing. Pay less and you usually get fuzzy images near the edge of the field of view and poor-quality optical coatings that give you dim images or ghost images. Very expensive binoculars give you crisp and bright views across the field, and this is nice to have if you can afford $500 or $1000 or more. But it's not necessary to pay this much.

As a rule of thumb, get stargazing binoculars with an aperture of 35 mm to 60 mm and a magnification of 7x to 10x. A pair of 7x35's is about the minimum acceptable for astronomical observing. A pair of 7x50's is better... this will give you the same magnification but a wider field of view.

If you are older than 40, you may not need the 7 mm exit pupil provided by 7x50's, so you might consider 8x42's which give slightly larger images. If you don't mind a little more weight, a pair of 8x56's or 10x50's are superb choices for stargazing. Also, 9x63's are excellent, though they are getting a little on the heavy side. Any more than 10x, and the image will get a little shaky. Any bigger than 63 mm, and the binoculars will get too heavy to hold for long periods. Look for a tripod adapter on these binos. As for brands, binoculars made by Orion, Celestron, Nikon, Pentax, and Vixen are usually good bets. Now go out and use them. You will like the view.

The previous article was slightly edited. The original is part of a larger piece written by Brian Ventrudo on Choosing Telescopes for Astronomy and is online from One-Minute Astronomy at: http://oneminuteastronomer.com/choose-telescope-astronomy/

Many astronomy sites have excellent articles on choosing binoculars. The link below takes you to the article written by Terry Dickinson, editor of Sky News:

http://www.skynews.ca/binoculars-an-essential-tool-for-backyard-astronomers/

# The Battle Against What Spaceflight Does To Your Health *Elizabeth Howell Universe Today*

Why do some astronauts come back from the International Space Station needing glasses? In the last three or four years, eye problems have affected 20% of astronauts.
It's one example of how extended stays in flight can alter your health. Despite NASA's best efforts, bones and muscles weaken and months of rehabilitation are needed after astronauts spend a half-year on the space station. But in recent years, there have been strides in understanding what microgravity does to the human body — and how to fix it.
Take the vision problem, for example. Doctors believed that increased fluid shift in the head increases pressure on the optic nerve, a spot in the back of the eye that affects vision. There are a few things that could affect that:

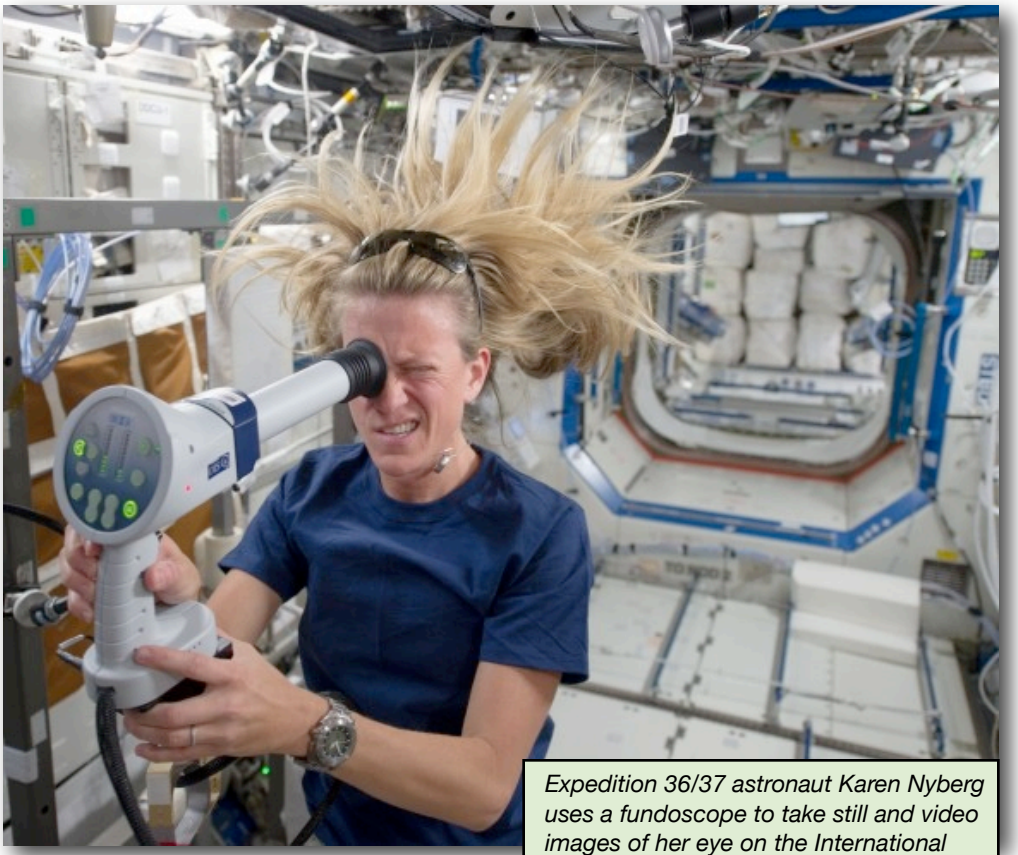
**Exercise**. Astronauts allot 2.5 hours for exercise on the ISS daily, which translates to about 1.5 hours of activity after setup etc. Weight lifting compresses muscles and could force more blood into their heads. An advanced Resistive Exercise Device on the space station that is more powerful than its predecessor is also causing the vision problem. It's ironic that the exercise device for working the muscles and bone, may hurt eyes.

**CO2 levels**. This exhaled gas is "relatively high" on the space station because it takes more power and more supplies to keep the atmosphere cleaner. Increased carbon dioxide exposure will increase blood flow to your head which aggravates the vision problem.

**Folate (Vitamin B) problems.** NASA has for a long time been looking at a biochemical (nutrient) pathway in the body that moves carbon units from one compound to another. This is important for synthesizing DNA and making amino acids, and involves several vitamins and nutrients. After scientists started noticing changes in folate (a form of Vitamin B), they probed further and found elevated but not abnormal levels of homocysteine, a type of amino acid at the heart of this one carbon pathway in those astronauts with vision issues after flight.

While NASA tries to nail down what is going on with astronaut vision, the agency has made substantial progress in preserving bone density during flights — for the first time in 50 years of spaceflight.

The advanced Resistive Exercise Device, an orbital weight-lifting device was installed and first used during Expedition 18 in 2008 and has been in use on the space station ever since. It's a large improvement over the previous interim Resistive Exercise Device (iRED), which didn't provide enough resistance, allowing some astronauts to "max out" on the device and could not further increase weightlifting loads after some weeks or months of use. The new device, ARED, which has twice as much loading capability resulted in crews that ate better, maintained body weight and had better levels of Vitamin D compared to those that went before. Most strikingly, they maintained their bone density at preflight levels.



*Expedition 36/37 astronaut Karen Nyberg uses a fundoscope to take still and video images of her eye on the International Space Station in 2014.* ***Credit: NASA***

While we think of bone as being cement-like and unchanging (at least until you break one!), it's actually an organ that is always breaking down and reforming. When the breakdown accelerates, such as when you are not putting weight on it in orbit, you lose bone density and are at higher risk for fractures.

Why is unknown, except to say that the bone seems to rely on some sort of "signalling" that indicates loads or weights are being put on it. Conversely, if you are to put more weight on your bones — maybe carrying a backpack with weights on it — your skeleton would gradually get bigger to accommodate the extra weight.

Even with ARED, it is still unknown whether this exercise affects the strength of the bone, which is ultimately more important than just mineral density. Nutrition and exercise may also be optimized, to further allow for better bone preservation.

That's one of the things scientists are excited to study with the upcoming one-year mission to the International Space Station, when Scott Kelly (NASA) and Mikhail Kornienko (Roscosmos) will be one of a small number of people to do one consecutive calendar year in space. The bone "remodelling" doesn't level off after six months, but perhaps it will closer to a year.

**About Elizabeth Howell**
Elizabeth Howell is the senior writer at Universe Today. She also works for Space.com, Space Exploration Network, the NASA Lunar Science Institute, NASA Astrobiology Magazine and LiveScience, among others. Career highlights include watching three shuttle launches, and going on a two-week simulated Mars expedition in rural Utah. You can follow her on Twitter @howellspace or contact her at her website.

Read more: http://www.universetoday.com/111913/the-battle-against-what-spaceflight-does-to-your-health/#ixzz33ANrXUp6

# First discovery of double star that brightens during eclipse

Apr 17, 2014 www.PhysicsWorld.com

For the first time, astronomers have seen a double star brighten rather than fade when one star passes in front of its companion. Predicted decades ago, the phenomenon arises from gravitational microlensing as the great surface gravity of a white-dwarf star magnifies its partner's light. The discovery by US researchers raises the hope that we will someday catch a neutron star or black hole doing the same thing, which would lend new insight into these extreme objects.

Many star systems are double, having two stars that orbit each other. In some cases, the orbit aligns edge-on to our line of sight, so that one star periodically eclipses the other and dims the light that we see. Astronomers have known of these eclipsing binaries for centuries. The best example is Algol – Arabic for "the ghoul" – which medieval astrologers considered to be the most dangerous star in the sky, probably because they knew that its light flickers. In 1782 British astronomer Edward Pigott correctly explained why Algol dims. It was not unitl 1973 that Swiss astronomer André Maeder predicted that some binaries should exhibit the opposite phenomenon. According to both Newton's theory of gravity and Einstein's general theory of relativity, mass bends light. Therefore, Maeder says, if a small but massive star eclipses its companion, then the small star's gravity should amplify the other star's light so much that it overwhelms the eclipse-induced darkening.

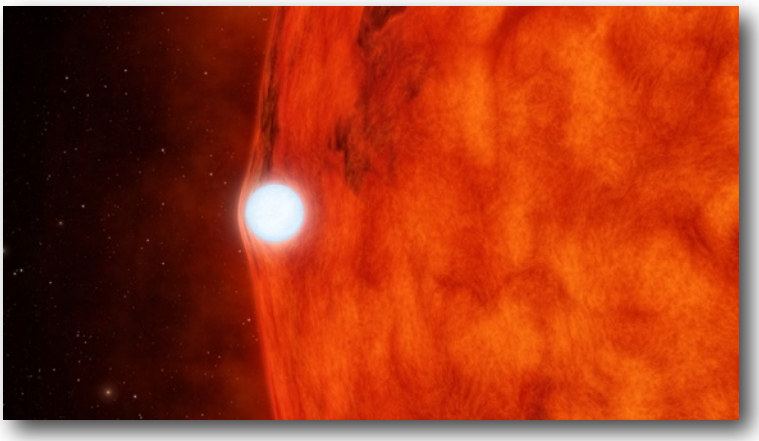
**Discovery at last**

Now, four decades later, a pair of astronomers has discovered the first example, 2600 light-years away. "We found it by accident," says Ethan Kruse, a second-year graduate student at the University of Washington in Seattle. "My main research is looking for new planets that other people have missed."

In early December 2013 Kruse was examining KOI 3278, a star that NASA's Kepler spacecraft had found to be fading every 88.18 days. This suggested that a planet circled the star with that periodicity and dimmed the light as it passed in front.

But Kruse noticed a strange feature. "The first thing I thought was that something had gone horribly wrong," he says. "Instead of finding a new planet, I found what looked to be the same signal as a planet transiting its star except upside down, where the star got brighter instead of dimmer." Each brightening was subtle, just 0.1%, and lasted five hours. The brighetnings repeated every 88.18 days, out of phase with the dimmings.

In fact, KOI 3278 has no known planet. Instead, it consists of a star like the Sun coupled with a white dwarf, a small dense star. The system dims when the white dwarf passes behind the Sun-like star and brightens when the white dwarf passes in front, magnifying the light of its mate.



**More exotic objects**

"This is a very nice surprise," says Maeder, who is now 72 years old. "I must say, I more or less forgot about this effect, and as a matter of fact, I did not expect it would be found in my lifetime."

Edge-on binaries containing more exotic objects – neutron stars and black holes – should also display periodic brightenings. "That's what I think is most interesting," Kruse says. "There are not a lot of people looking for such signals, and they might find them in the Kepler data." Such systems would yield new information on the masses of neutron stars and black holes.

"It's supercool!" says B Scott Gaudi, an astronomer at Ohio State University in Columbus. "It just shows the power of Kepler. You open up parameter space and you're guaranteed to find really interesting stuff." Last year, other astronomers reported a Kepler system with a white dwarf, but the gravitational brightening was too small to erase the eclipse.

Kruse and his university colleague Eric Agol have published their discovery online today in *Science*.

**About the author**

Ken Croswell is a US-based astronomer and author of *The Lives of Stars*

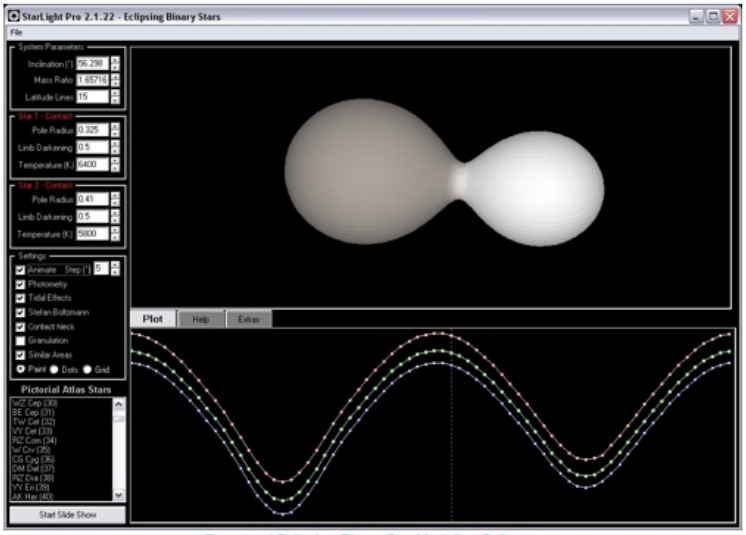
## What are Binary Stars?

Most stars are found in groups of stars that are gravitationally bound with each other. The majority of these stars are found in binary systems which are systems of two stars in orbit around a common center of mass. One can classify binary stars based on their appearance from earth. Stars that are far enough apart to be distinguished from each other are known as **visual binaries**. Other binaries are too close and far away to be seen separately but can distinguished using the doppler shift of their spectra. These are **spectroscopic binaries**.

In rare instances, such as with the star Algol the binary stars are close enough so that they eclipse one another. In this case, one can calculate not only the mass of the binary star systems, but also the radii of the stars.

Windows software Binary Stars (image right) by Dan Burton is available at the link below. Look in the Software Collection section of the site for related software for different platforms (including Mac).

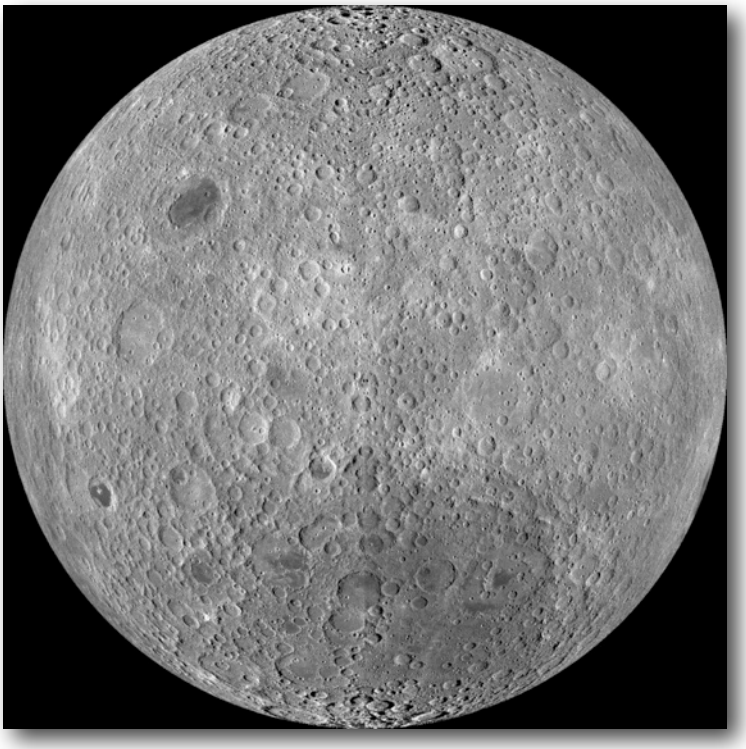
http://www.midnightkite.com/index.aspx?URL=Binary




Download Eclipsing Binary Star Modeling Software

# 55-yr-old moon mystery solved

News Release: Penn State University by A'ndrea Elyse Messer June 9/14



UNIVERSITY PARK, Pa. -- The "man in the moon" appeared when meteoroids struck the Earth-facing side of the moon creating large flat seas of basalt that we see as dark areas called maria. But no "face" exists on the farside of the moon (Clementine image right) and now, Penn State astrophysicists think they know why.

This mystery is called the Lunar Farside Highlands Problem and dates back to 1959, when the Soviet spacecraft Luna 3 transmitted the first images of the dark side of the moon back to Earth (dark meaning unknown, because sunlight reaches both sides. Researchers immediately noticed that fewer "seas" or maria existed on this portion of the moon that always faces away from Earth.

Astrophysicists Jason Wright,and Steinn Sigurdsson, and Arpita Roy, graduate student in astronomy and astrophysics, and lead author of the study, realized that the absence of maria, which is due to a difference in crustal thickness between the side of the moon we see and the hidden side, is a consequence of how the moon originally formed. The researchers report their results in today's (June 9) Astrophysical Journal Letters.

The general consensus on the moon's origin is that it probably formed shortly after the Earth and was the result of a Mars-sized object hitting Earth with a glancing, but devastating impact. This Giant Impact Hypothesis suggests that the outer layers of the Earth and the object were flung into space and eventually formed the moon.

*Last year, Australian astronomers reported identifying a possible 280 additional craters on the Moon. By combining gravity and topography data collected by satellites, the scientists from Curtin University in Western Australia were able to use computer modelling to at first identify two basins on the far side of the Moon. They later developed a high-resolution image to find a total of 280 "candidate basins" which they suspect are craters. "There are many more (craters) that have been mapped from optical observations or from just the shape of the topography," said researcher Will Featherstone. Read more at* http://www.davidreneke.com/australian-team-maps-moons-hidden-craters/#

"Shortly after the giant impact, the Earth and the moon were very hot," said Sigurdsson. The Earth and the impact object did not just melt; parts of them vaporized, creating a disk of rock, magma and vapor around the Earth.

"The moon and Earth loomed large in each others skies when they formed, " said Roy. The moon was 10 to 20 times closer to Earth than it is now, and the researchers found that it quickly assumed a tidally locked position with the rotation time of the moon equal to the moon's orbital period around the Earth. The same real estate on the moon has probably always faced the Earth ever since.

The moon, being much smaller than Earth cooled more quickly. Because the Earth and the moon were tidally locked from the beginning, the still hot Earth (2500 C) radiated towards the near side of the moon. The far side, away from the boiling Earth, slowly cooled, while the Earth-facing side was kept molten creating a temperature gradient between the two halves. This gradient was important for crustal formation on the moon. The moon's crust has high concentrations of aluminum and calcium, elements that are very hard to vaporize."When rock vapor starts to cool, the very first elements that snow out are aluminum and calcium," said Sigurdsson.

Aluminum and calcium would have condensed on the "cold" side first and thousands to millions of years later, these elements combined with silicates in the moon's mantle to form plagioclase feldspars, which eventually moved to the surface to form the moon's crust, said Roy. The farside crust had more of these minerals and is thicker.

The moon has now completely cooled and is not molten below the surface. Earlier in its history, large meteoroids struck the nearside of the moon and punched through the crust, releasing the vast lakes of basaltic lava that formed the nearside maria that make up the man in the moon. When meteoroids struck the farside of the moon, in most cases the crust was too thick and no magmatic basalt welled up, creating the dark side of the moon with valleys, craters and highlands, but almost no maria.

The NASA Astrobiology Institute and the Pennsylvania State Astrobiology Research Center supported this work.

# Sagitta the Arrow (Sge)

Sagitta is a small constellation, but its four brightest stars form a prominent and easily recognized shape that really resembles an arrow. It lies about halfway between β–Cygni and Altair in Aquila. The constellation lies in the Milky Way; sweeping this area with binoculars is well worthwhile.

### Double Stars

| Star | Mag. | Sep'n (s) | Location | Remarks |
|---|---|---|---|---|
| ε | 5.7-7.7 | 90 | 193516 | |
| ζ | 5.0-8.7 | 8 | 194719 | Green-Blue. |
| θ | 6.3-8.5-7.1 | 12-80 | 200821 | Pale Yellow-Pale Ashen |

### Messier Objects

| | Mag | Location | Remarks |
|---|---|---|---|
| M 71 | - | 195219 | Globular Cluster. |

### Objects of Interest in Sagitta

**15 Sagittae** lies in a beautiful field; just north of this star look for a striking sapphire-coloured star. Scan with low power the areas around η–Sagittae and just south of M71; these fields contain many beautiful pairs and triples.

# Delphinus the Dolphin

α-Delphini - Sualocin β-Delphini - Rotanev* see note below

Delphinius is an attractive, compact group of five rather faint stars between Sagitta and Equuleus; it takes little imagination to picture a leaping dolphin. This is a splendid area for sweeping with binoculars. Scan carefully the star fields around θ and ε –Delphini; there are many striking objects in this area.

### Double Stars

| Star | Mag. | Sep'n (s) | Location | Remarks |
|---|---|---|---|---|
| α | 4.0-12.0 | 43 | 203716 | Yell.-Bl. Green; beautiful |
| γ | 4.5-5.5 | 11 | 204416 | |

# Vulpecula the Fox (Vul)

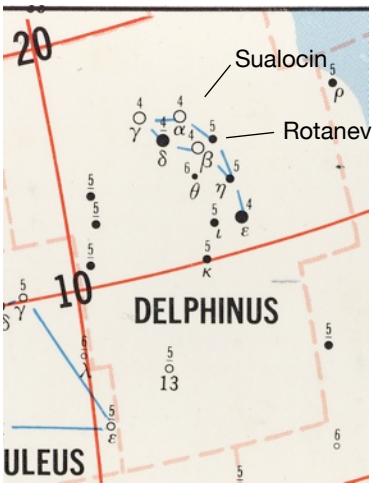
Vulpecula is a small, faint constellation south of Cygnus; its brightest star, 13 Vulpeculae has a magnitude of 4.5.

### Messier Objects

| | Mag | Location | Remarks |
|---|---|---|---|
| M 27 | 7.6 | 195822 | Planetary Nebula. The famous "Dumbbell" Nebula whose shape is indicated by its name. Use low power when observing. |

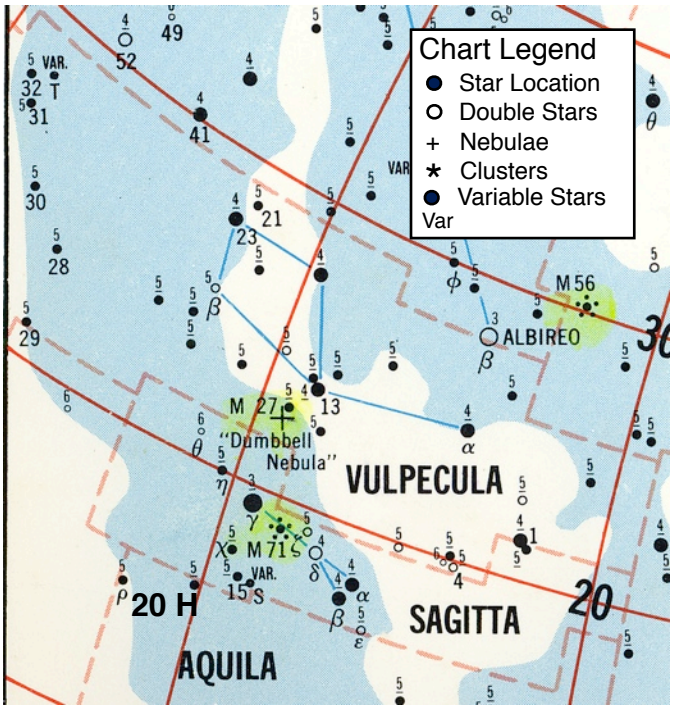
### Objects of Interest in Vulpecula

**T Vulpeculae** -short period (4 d 10.5 h) variable, magnitude range 5.5-6.5. Location 205028.




21 H

***Rotanev:** Sualocin and Rotanev read backwards gives "Nicolaus Venator", the Latin form of the Italian name "Niccolo Cacciatore" who was a PHD student and "seeing-eye" assistant to Guiseppe Piazzi when the famous astronomer had some temporary eyesight issues. (Piazzi discovered the first asteroid -Ceres in 1801). "Venator" and "Cacciatore" both mean "hunter" in their respective languages. It is not clear if Piazzi knew of his assistants little practical joke of naming the stars after himself. Cacciatore was too chicken (sorry) to let out his secret but probably felt justified since he did the majority of the work in the Palermo Star Atlas which was published in 1814. In any case, the names are now official.




**Dumbbell Nebula** imaged by Kitt Peak Observatory's 16-inch Meade LX200 with additional luminance data provided by Cold Spring Observatory. The RGB image exposures were 10:10:20 minutes and the Luminance was 135 min.

**Dumbbell Nebula, (**also known as Apple Core Nebula, Messier 27 or NGC 6853) is a well-known planetary nebula. It is often compared to the Ring Nebula in Lyra, but M27 is brighter (7.4 vs 8.8 mag), larger (8 arc min vs 1.5 arc min), has an easier central star to see (13.5 vs 15.7 mag) and has more structure than the Ring Nebula, M57. The main reason the Ring comes in second is that it is farther away, 2300 ly vs 1350 ly. The Dumbbell is so easy that the Ring is the planetary often used to test out optics -especially trying to resolve the central star.

**Image Credits:** Fred Calvert / Adam Block / NOAO / KPNO / AURA / NSF

**July 1** 10:08 Venus 4.0°N of Aldebaran
19:30 Regulus 4.8°N of Moon
4 Dwarf planet Pluto at opposition (mag 14.1)
**5** 06:59 FIRST QUARTER MOON (rises 1:57 pm DST locally)
20:21 Mars 0.2°S of Moon: Occultation not visible locally.
Vesta and Ceres closest to each other
**6** 01:32 Spica 2.0°S of Moon
**7** 21:48 Saturn 0.4°N of Moon: Occultation not visible locally.
**12** 06:25 FULL MOON (rises 9:04 pm DST locally)
13:00 Mercury at Greatest Elongation 20.9° W
**13** 03:27 Moon at Perigee: 358 259 km
13:39 Mars 1.2°N of Spica
**16** 14:00 Mercury 6.2° of Venus
**18** 21:08 LAST QUARTER MOON (rises 12:39 pm DST on 19th)
**22** 06:56 Aldebaran 1.8°S of Moon
**24** 13:16 Venus 4.4°N of Moon
15:00 Jupiter in Conjunction with Sun
**26** 17:42 NEW MOON (rises 5:57 am DST locally)
**27** 22:27 Moon at Apogee: 406 570 km
**28** 03:00 Delta-Aquarid Meteor Shower
**29** 01:36 Regulus 4.7°N of Moon

## BAS Events

**Jul 2 Wed BAS meeting** ES Fox 7 pm Speaker: Gregg MacKay: Canadian Arrow Project (see below for more)

**Jul 4 Fri** (FQ-1) **Public viewing** Grey Roots Mus. 9 pm, members with scopes please.

**Jul 5 Sat** (FQ) **Moongaze at Inverhuron Pk**. Share the Moon and planets with campers (9 pm). Details from John H.

**Jul 12 Sat** (FM) **Moongaze at MacGregor Pk**. Share the Moon and planets with campers (9 pm). Details from John H.

**Jul 18/19** (LQ) **Whispering Pines Camping Weekend** Share sky views with others and camp free (BAS members only). Contact Gregg Rodgers at wpc@campontario.net to register.

**Jul 25/26** (NM) **Dark Sky Weekend** Bruce Pen Nat. Pk free camping BAS members Note: You must register with Brett Tatton by June 30 to reserve a free campsite.

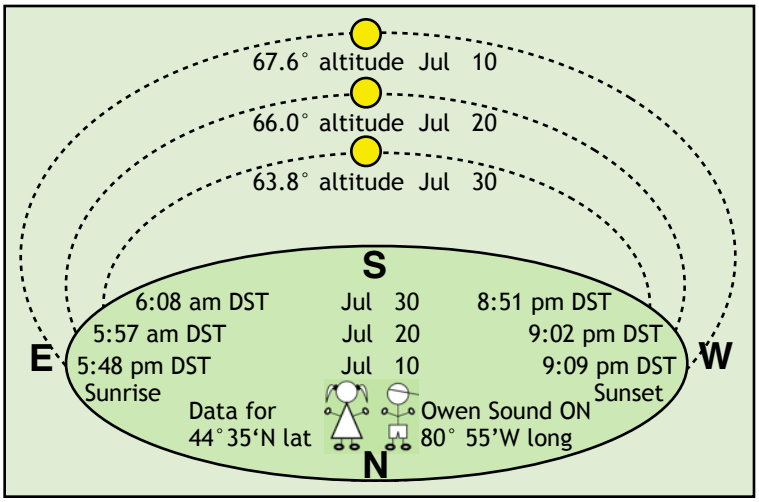
**Jul 28 - Aug 1 Astronomy Kids Day Camp**

**Jul 29 Tues** Stargazing for Astronomy Kids Camp with parents

## Planets

**MERCURY,** brightens from 2.5 to -0.6 mag in July and on July 12 is 21° from the Sun. It stays near Venus from July 12 to 20. Both are moving eastward before sunrise. **VENUS,** brightness drops to -3.8 by mid-month. A thin last crescent Moon is closest to Venus on July 24 and on the 25th the crescent appears near Mercury. **MARS** (magn. 0.2) is now setting around 1 am and by mid-month will be setting before midnight. Now less than 10 arc-seconds across, it shrinks to 8.4" by month end. **JUPITER**, (-1.8) is very low (10°) at sunset and passes behind the Sun on July 24. It reappears as a morning object later this summer. **SATURN,** (mag 0.5) is on the downward slide towards the western horizon this month. By month end it is setting around midnight. Ring tilt is closing but still 21 degrees in July. Both **URANUS,** (5.8) and **NEPTUNE,** (7.8) rise after midnight at the start of July, but by the end they are rising before midnight (Neptune first). Both **asteroid, Vesta (6.1)** and **dwarf planet, Ceres (7.0)** are in the same part of the dawn sky as Mars. They are **very** close to each other on July 5. Charts are available on the BAS website. **PLUTO** (mag. 14) is above the horizon all night long reaching opposition July 4. On July 22, it is only 2.5 minutes away from 5.2 magnitude star 29 Sag. Pluto finder charts for 2014 are now found on the BAS website.

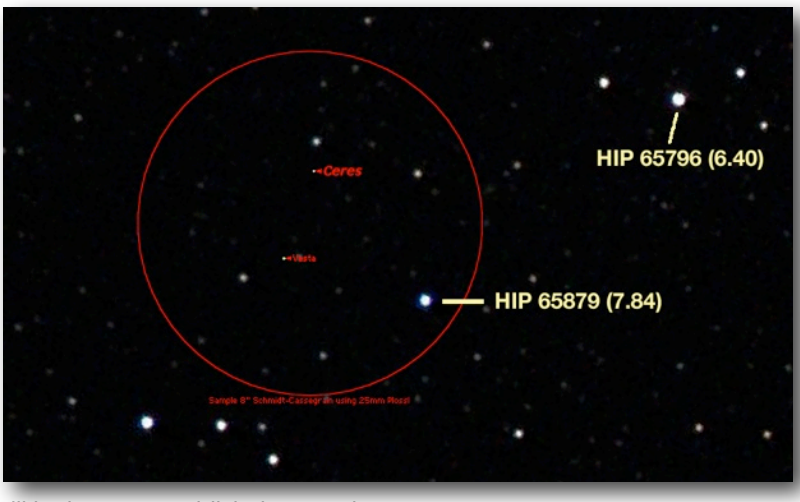
The diagram below gives the sunrise/sunset times and the Sun's altitude on three dates this month. The Sun continues slowly losing elevation during July after reaching solstice a month ago.




## Special Events

**Vesta and Ceres VERY close July 5**

The close approach of Vesta and Ceres is due this month on the might of the 5th, although nights either side will be just as good. Technically the minimum separation is July 5. The red circle below shows the typical FOV of a 25 mm eyepiece in an 8-inch SCT. The HIP stars shown are a bit brighter than Vesta at 7.1 and Ceres at 8.4. Note that the asteroids move rather quickly across the field shown here. On July 2, for ex. they are near HIP65796 at upper right. Have a look, and if you take images, send them to SGN. I will be happy to publish them. -ed




**July 2014**

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 FQ |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 FM |
| 13 | 14 | 15 | 16 | 17 | 18 LQ | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 NM |
| 27 | 28 | 29 | 30 | 31 | | |

By permission Univ. of Texas McDonald Obs.

## BAS Member Loaner Scopes

**Solar H-alpha scope now out on loan.**

Our Lunt solar scope can be borrowed by BAS members but there is a waiting list! Contact Aaron to get your name on it. We now have a suitable mount for it as well. A short training session will be provided on pickup.

**One 12-inch Dob available.**

Only one 12-inch loaner telescope is available for the summer. (The other is at Lion's Head "POD" Our two **8-inch dobsonians** are presently out on loan. Contact Brett T. or Aaron T. for on availability. Scopes come in periodically so keep checking with Brett or Aaron if you are interested in a loaner.


## SGN Classified Ads Section

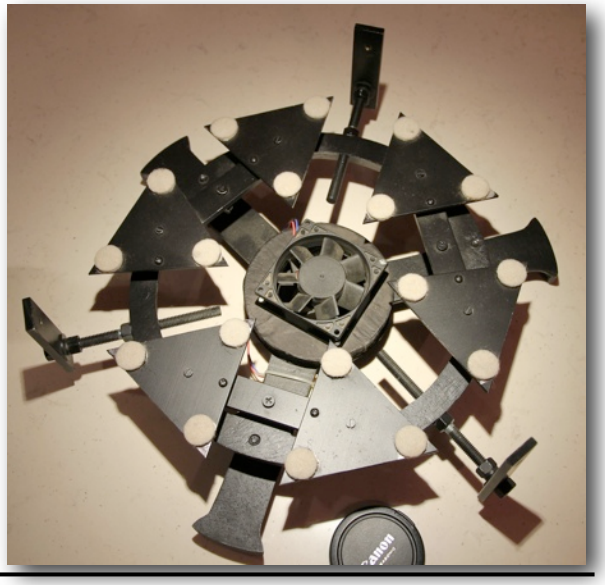
(Now also on our website)

### FOR SALE: Televue Pronto Price reduced to $600 !

2 element E.D. Refractor, 2.7" / 70mm diameter. f.l. 480mm, f/6.8. with 1-1/4" Star Diagonal, with 45 degree Prism diagonal (for terrestrial viewing), with TeleVue Red dot finder, complete with TeleVue Soft Case. Asking $ 600.-- Contact Anton VanDijk 519 376-9912 ravand@rogers.com

### FOR SALE: 16-inch mirror cell

Aluminum 18-point suspension mirror cell for 16 inch mirror (will accommodate 14 in). Comes with central cooling 12 V DC computer fan. Additional cooling fans available $5 ea. Asking $100 for cell.Contact John H. 519 371-0670 stargazer@wightman.ca



### FREE: Mirror-grinding machine to a good BAS home

One of our former members has donated a 90% finished mirror-grinding machine to BAS and we have decided to put it out there for anyone in the club who wants to give it a good home. Note that it is not finished but plans are available from Mirror-o-Matic.com and we have a copy of the file on computer. This unit was designed to do 12 inch mirrors but will handle smaller (8 & 10 inch) mirrors with some minor adjustments. BAS also has pretty much complete kits of abrasives and maybe even a mirror blank or two that we will include with the deal. Comes with documentation and a copy of Edmund Scientific Co. Mirror Grinding booklet. Note this outfit is free to current BAS members but if you are not a member, then you can purchase the unit for $120 and we will throw in a year's membership. Contact John (stargazer@wightman.ca) if you are interested.

**From pg 1:** The two horses in the sky are Pegasus and Monoceros, the unicorn, of course.