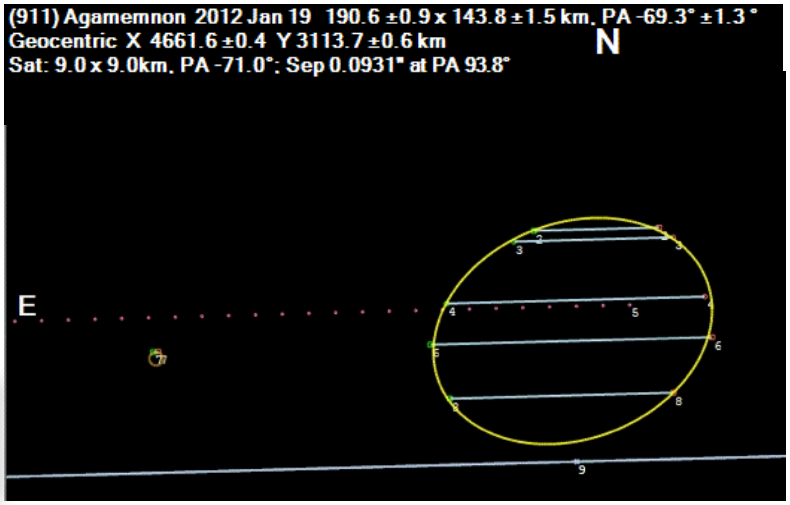
Star Gazer News

Astronomy News for Bluewater Stargazers
Vol 8 No. 3 March 2014



Mar 2014 Contents

On Jan 19, 2012, 8 observing stations were set up in Maryland and New Jersey to monitor the occultation of an 8th magnitude star called HP 41376 by a 14.8 magnitude asteroid called Agamemnon. Among them was David Dunham, the guru of occultation science, who has a lifetime association with the International Occultation Timing Association. The team detected a 6.8 magnitude drop in light output from the star (it basically went out). The duration of the occultation varied depending on where the stations were set up along the shadow path, and the final profile of the 185 km asteroid was well determined as shown in the diagram above. The most remarkable event however was a short blip in light output that came a few seconds after the main event, probably caused by a satellite of Agamemnon. More remarkable still, is that there is video of the event here: http://www.youtube.com/watch?v=2-MDuVPPt_E. Enjoy!

Don't Miss the Regulus Occultation

On Mar 20, if you are in the right place in Ontario, you can see Regulus disappear for up to 14 seconds as it is occulted (eclipsed) by a small asteroid named Erigone. Erigone is 72 km in diameter but it is small enough that gravity has not rounded its contours into a sphere and it is irregular -"potato-shaped" in other words.

BAS is planning an expedition to the ground track to try to add to the scientific results being collected by IOTA (International Occultation Timing Association) in an attempt to define the shape of Erigone.

If you are interested in taking part in an expedition to a location where we can see the event, please email John or Aaron at the email addresses given on the top of page 2. More details at the Mar 5 meeting.

Barry's Bay, Killaloe and Eganville, ON (Highway 60) are ideally located for the event. Highway 28/132 Bancroft to Renfrew is closer to us but a secondary road. Final choice depends on weather conditions closer to the event.

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From the "Top": by Aaron Top pres. BAS

15 + Years Discern Photography

For the past 15 + years I have had the pleasure of learning how to use so many different cameras. As you can see by the photograph above I have used over 12 different camera's film as well as digital. I recall taking photography class and actually developing the film negatives ourselves. It was not soon afterwards that the digital era took over. I never claim to be an expert but over the years you learn a thing or two. No matter where I go I always have people asking me to show them how their "new" camera works, or showing off their own photography to me. It is these little things that keep me humble. I often strive for perfection, however, over the years I have learned to accept my limits. -Aaron

Editor's note: I, too have gone through the film-to-digital era and done my own processing. Truth be told, not many of us, even the die-hards miss the darkroom much. I do recall being cooped up in a small room breathing chemical fumes, or playing for hours with the enlarger trying to bring out faint details in astronomical photos..and failing. Photoshop does it much more easily! I also recall the long, tedious and precise temperature control required to do colour slides. I tried it once or twice thinking I could save time and money doing it myself. While having to wait 2 weeks for slides to come back from the processing lab was a pain, after ruining a few rolls of hard-earned astro slides, I gave it up as not worth the effort for the meager savings and a small error ruining many weeks of images.

I think most photographers of my era who changed over to digital (reluctantly, in many cases) have gradually become convinced that the multi-megabyte images now available with even inexpensive digital cameras are as good or better than film images. I certainly find the instant gratification of seeing a nice star image pop up on the LCD screen much preferable to the old way of doing things. And image processing is so easy.

Still, I do have a few favourite slides of events that will never happen again. But many, many slides will never see the light of a slide projector (I have three of those -only one working). I have 14 albums of 30 pages or so each and with 20 slides per page that comes to 8400 slides. At about a dollar a slide for processing, that is an investment of close to $10 000 (add postage). As for digital, I now have amassed over 100 DVDs (4.7GB ea) of astronomical images alone -about 10 times as many images as I have slides. Whew! And that only since I got my first Canon DSLR in 2006.

Astronomy Events March 2014

Mar 7 Fri (FQ) **Moon in centre of Hyades** near Aldebaran (about 2° from Aldebaran) in evening sky -a good photo opportunity for simple tripod shots.

Mar 14 Fri (FM-2) **Mercury at greatest elongation** (27.6° W) from the Sun in the morning sky but down in twilight glow.

Mar 16 Sun (FM) **Full Moon** "Sap Moon". The sap may be rising but only if there is a dramatic turn in weather!

Mar 18 Tue (FM+2) **Moon, Mars and Spica** rise about 9 pm in the East. Objects are in a triangle each about 4° away from the other. Saturn rises later, about midnight or so.

Mar 20 Thu (FM+4) **Occultation of Regulus by asteroid Erigone (163).** Details page 2 and at March 5 meeting.

Mar 22 Sat (LQ-2) **Mercury and Neptune only 1.2° apart** in morning sky before sunrise.

Mar 27 Thu (NM-3) **Venus near crescent Moon** (3.3° apart) above eastern horizon before sunrise. Photo op!

Mar 30 Sun (NM)

BAS Events for March 2014

Mar 1 Sat (NM) **Messier Marathon@Fox** viewing at Fox weather permitting, a dusk 'til dawn event if you wish - come prepared. Details by email. Backup Mar 29

Mar 5 Wed **BAS meeting** G R Museum 7 pm, Annual Gen. Mtg (short) and talk on **Lunar Eclipses 2014** Speaker: John H. We will probably have the talk first, then AGM.

Mar 20 Thu **Occultation of Regulus by asteroid Erigone 163.** (FM+4) Regulus should disappear for 14.3 seconds, a magnitude drop of 11.3! Path of occultation is east of here, travel required. Details at Mar 5 BAS meeting.

Mar 26 Wed **Adventure Talk**: **Aurora** Bruce County Museum 9:30 am talk by John H.

Mar 29 Sat **Messier Marathon (backup)** and **EARTH HOUR** (NM-1) public viewing 8:30 pm to 9:30 pm

Reminders!

March 26 Astrophoto Contest Deadline!

Submit images to stargazer@wightman.ca. See website for rules.

2014 BAS membership fees are due!

Ten BASIC Astronomy Facts

(adapted from Jason Harlow U of Toronto)

Click on blue items for an informative diagram.

1. Sun, Moon, stars and planets all appear to rise in the East and set in the West each day because the Earth rotates once on its axis every 24 hours.
2. Phases of the moon are caused by the relative position of the Sun, Earth and Moon. As the Moon orbits Earth, we see the phases cycle through 29 days: new, waxing crescent, waxing gibbous, full, waning gibbous, waning crescent, then new again. Waxing phases are visible in the afternoon and evening, waning phases are visible in the morning,-the FM is visible all night long.
3. Earth orbits the Sun once per year. The constant tilt of 23.5° of the Earth's rotation axis causes seasons in the N. and S. high latitudes.
4. The Sun and stars are identical objects: huge spheres of hot Hydrogen gas, radiating heat and light,-the Sun is brighter because it is much closer.
5. The Moon and planets in our Solar System are cool spheres like the Earth, and much smaller than stars, shining because of reflected sunlight.
6. The Solar System includes the Sun, 8 planets, but not Pluto/Charon, which is classified as a large double asteroid), +many moons, asteroids and comets. The Solar System is a very small portion of the Milky Way Galaxy, a giant collection of stars 100 million times larger than the Solar System. All the stars seen at night are part of the MW Galaxy.
7. The Milky Way Galaxy is a spiral galaxy of about 400 billion stars, including the Sun, one of many galaxies in the Universe.
8. The Sun and Solar System, including the Earth, formed from a collapsing cloud of gas 4.6 billion years ago. The collapse was due to its self-gravity and the initial rotation led to the orbits of the planets around Sol, and the Sun's rotation.
9. The universe and all the galaxies in it began in an 'explosion' about 14 billion years ago. Galaxies are still receding from each other as a result of the 'Big Bang'. We detect radio waves showing direct evidence of the initial event. These waves are called Cosmic Microwave Background Radiation.
10. A black hole is an object so dense that its surface gravity prevent anything from escaping, -not even light. This surface is the event horizon.

Conjunctions, Oppositions, Elongations

[adapted from **Darker View** by Andrew Cooper]

As a planet moves across the sky there are particular points in its orbit that describe the motion, part of the jargon of astronomy that can confuse the uninitiated. The terms used commonly here on **Darker View** (connect to Andrew Cooper's website here: http://darkerview.com/wordpress/) are ideas that date back to the early beginnings of astronomy.

Superior Conjunction

A conjunction is the close approach of any two objects in the sky; they are not physically close in space, merely along the same line of sight. Superior and Inferior conjunction refer specifically to those times when a planet passes in front or behind the Sun as seen from our vantage point on the Earth. During these conjunctions the planet will be lost in the glare of the Sun and disappears from view for a time. After superior conjunction the object will appear in the morning sky, rising higher each day, eventually reaching opposition (see below). Then the object can be observed further into the evening sky. In the weeks before superior conjunction the object will slowly slide into the glare of the Sun, disappearing into the sunset.

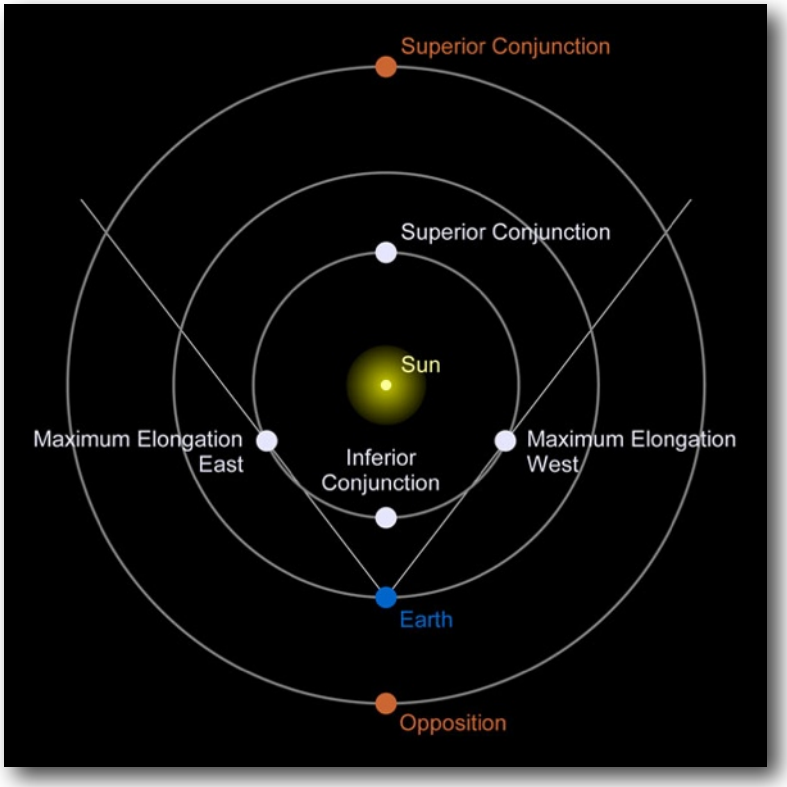
Superior conjunction is when a planet passes behind the Sun. All solar system body in orbit around the Sun will pass through superior conjunction.

Inferior Conjunction

Objects that orbit sunward of the Earth can pass through inferior conjunction when the object passes between the Earth and Sun. For the major planets this includes Mercury and Venus, as well as any asteroids or other small bodies with an orbit that passes inside one astronomical unit. These objects seldom pass directly in front of the Sun as seen from Earth due to slight inclinations in the orbits so they pass above or below our Sun as seen in the sky. When an object does pass directly in front of the Sun its silhouette can be seen against the disk (use proper filters!). Such an event is called a **transit**, and are often eagerly anticipated events for skywatchers.

Opposition

Objects that orbit outside the Earth's orbit will pass through opposition, the moment the object is opposite the Sun in the Sky. This includes Mars, Jupiter, Saturn, Uranus and Neptune, as well as any small body outside the Earth's orbit. Opposition can also be considered the moment when the Earth passes between the object and the Sun. At opposition, an outer planet completely crosses the night sky. During opposition the object will rise at sunset and transit near midnight, setting at dawn. Thus, it is well placed for observation through most of the night.



Maximum Elongation

Planets with interior orbits, Mercury and Venus, appear to rise out of the sun's glare as its orbit takes the object further from the Sun as seen from our earthbound vantage point. Eventually the object reaches a furthest point before it again heads back into the glare, This furthest point from the Sun is referred to as maximum elongation. Western elongation occurs in the morning sky when the planet is west of the Sun. Eastern elongation occurs in the evening sky.

Thus for inner planets the order of events is simple, superior conjunction is followed by maximum eastern elongation after the planet emerges from behind the Sun and is seen in the evening sky. The planet then moves through inferior conjunction, passing between the Sun and Earth to appear in the morning sky and head for maximum western elongation. After max elongation the planet then slides behind the Sun as seen from earth to superior conjunction.

The March Equinox: 'Tis the Season' to Spy the Zodiacal Light

adapted from an article *by* DAVID DICKINSON Sep 16, 2013

The week leading up to the March equinox offers you a fine chance to catch an elusive phenomenon in the evening sky.

We're talking about the zodiacal light, the ghostly pyramid-shaped luminescence that can be seen in the post-dusk sky. Zodiacal light also heralds the approach of dawn (in September) extending from the eastern horizon along the ecliptic.

March is a great time for northern hemisphere observers to catch sight of this glow just after sunset. This is because the ecliptic is currently at a high and favorable angle, pitching the zodiacal band out of the atmospheric murk low to the horizon.

In order to see the zodiacal light, you'll need to start watching before astronomical twilight—the start of which is defined as when the setting Sun reaches 18 degrees below the local horizon—and observe from as dark a site as possible under a moonless sky.

The Bortle dark sky scale lists the zodiacal light as glimpse-able under Class 4 suburban-to-rural transition skies. Under a Class 3 rural sky, the zodiacal light may extend up to 60 degrees above the horizon, and under truly dark—and these days, almost mythical—Class 1 and 2 skies, the true nature of the zodiacal band extending across the ecliptic can become apparent. The appearance and extent of the zodiacal light makes a great gauge of the sky conditions at that favorite secret dark sky site.

The source of the zodiacal light is tiny dust particles about 10 to 300 micrometres in size scattered across the plane of the solar system. The source of the material has long been debated, with the usual suspects cited as micrometeoroid collisions and cometary dust. A 2010 paper by Peter Jenniskens and David Nesvorny in the *Astrophysical Journal* cites the fragmentation of Jupiter-class comets. Their model satisfactorily explains the source of about 85% of the material. Dust in the zodiacal cloud must be periodically replenished, as the material is slowly spiraling inward via what is known as the Poynting-Robertson effect. None other than Brian May of the rock group Queen wrote his PhD thesis on *Radial Velocities in the Zodiacal Dust Cloud*.

But even if you can't see the zodiacal light, you still just might be able to catch it. Photographing the zodiacal light is similar to catching the band of the Milky Way. Typical exposure settings are 15 to 20 seconds at 2000 to 3200 ISO. Wide angle lenses are preferred.

Under a truly dark site, the zodiacal light can compete with the Milky Way in brightness. The early Arab astronomers referred to it as the false dawn. In recent times, we've heard tales of urbanites mistaking the Milky Way for the glow of a fire on the horizon during blackouts, and we wouldn't be surprised if the zodiacal light could evoke the same. We've often heard our friends who've deployed to Afghanistan remark how truly *dark* the skies are there, as military bases must often operate with night vision goggles in total darkness to avoid drawing sniper fire.

Another even tougher but related phenomenon to spot is known as the gegenschein. This counter glow sits at the anti-sunward point where the particles are approaching 100% illumination. This time of year, this point lies off in the constellation Pisces, well away from the star-cluttered galactic plane. OK, we've never seen it, either. A quick search of the web reveals more blurry pics of guys in ape suits purporting to be Bigfoot than good pictures of the gegenschein. Spotting this elusive glow is the hallmark of truly dark skies. The anti-sunward point and the gegenschein rides highest near local midnight.

The spring equinox occurs on March 20 at 12:57 pm EDT (we switch from EST to DST on Mar 9 this year). This marks the beginning of spring for the northern hemisphere and the start of winter for the southern.

The Full Moon occurs on Mar 16th, so observing after the 20th gives a short window where zodiacal light viewing is possible. By New Moon Mar 30, conditions will be ideally dark but then the zodiacal light viewing is more difficult as it sinks below the horizon.

Read more: http://www.universetoday.com/104757/the-september-equinox-tis-the-season-to-spy-the-zodiacal-light/#ixzz2fAa75GIz

In March in the southern hemisphere, zodiacal light is visible in the dawn before sunrise. A similar view would occur in September in the north. This image was taken Apr 7, 2011 from the Atacama Lodge near San Pedro d'Atacama in Chile. It shows the cone-shaped glow of the zodiacal light with Venus just above the clouds. An upside-down Summer Triangle is in the lower left corner with Deneb the lowest bright star showing through the edge of a cloud. Image was a 30 s exposure at 2000 ISO at f/2.8 using a wide angle 10 mm lens on a Canon 50D.
Photo by J. Hlynialuk

Aristarchus Plateau

"Slowly, silently, now the Moon
Walks the night in her silver shoon,
This way and that, she peers and sees,
Silver fruit on silver trees."
"**Silver**" by Walter de la Mare

I remember the day I first laid eyes on the **Cambridge Photographic Moon Atlas**. It was on October 9th, 2012, when I visited Chapters, in London, Ontario, during a 3 day Fall visit with our family at their Ilderton farm. I usually go right to the astronomy section during my visits to bookstores, hoping to find the newest astronomy publications. There was only one copy of this book on the shelf, it cost $55, and it had just been published by the Cambridge University Press. The book contained the most spectacular, non-spacecraft images of the Moon ever taken from the Earth's surface **with sub arc-second resolution**! It has been said that "every telescope has its own Moon" and because the Moon displays a pleasing view with any telescopic aperture this book is a useful guide for any amateur.

I turned to my favourite region of the Moon, the Aristarchus Plateau, located in the northern portion of Oceanus Procellarum, and was stunned by the quality of the images. The prominent crater, Aristarchus, is the brightest area on the moon, and it can easily be seen with binoculars. To my mind, it is one of the components of the Moon's "silver shoon", mentioned by Walter de la Mare in the verse above.

Aristarchus is young, being only 500 million years old , and it is the site of the most frequently observed "transient lunar phenomena". These are occasions when a lunar feature unexpectedly brightens and, interestingly, the Apollo 11 astronauts observed this phenomenon near Aristarchus while on their July 1969 journey. Aristarchus has a diameter of 40 km, a central mountain peak, and a floor that lies 3 km below its crater rim.

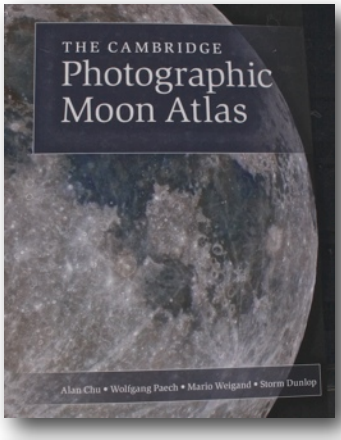
At right are two high resolution images from region 58, called "Aristarchus". Notice that adjacent to #1 Aristarchus , is the feature called Schroter's Valley (#2), which I like to call the "Grand Canyon on the Moon". This valley forms the longest sinuous rille on the Moon (170 km), and it measures about 2/3 the length of the Grand Canyon on Earth. The valley begins about 30 km north of Herodotus at a constricted area called the "Cobra Head", which interestingly, was not formed by running water, but by the collapse of a long lava tube after the lava flow stopped and the lava roof fell in. The telescopic views, under good seeing conditions, are similar to the image rendition. In my experience, using medium to high telescopic powers, the walls of Aristarchus display the fascinating radial white and gray "zebra stripes" shown in the image and on a night of steady seeing the view is riveting!

The talented astrophotographers are Alan Chu from Hong Kong and founding member of the Hong Kong Astronomical Society, Wolfgang Paech from Hanover, former Director of the Public Observatory in Hanover, Mario Weigand from Frankfurt, a nuclear physicist with 18 years of experience as an astrophotographer, and Storm Dunlop, a writer and Fellow of the RAS, whom is a past president of the British Astronomical Association.

Their book begins with a 26 page introduction which covers the "Origin and Evolution of the Moon", the Structure of the Moon", "Lunar Nomenclature", "Lunar Topography", Lunar Observations", and ends with a description of the "Imaging Techniques" employed by the authors.

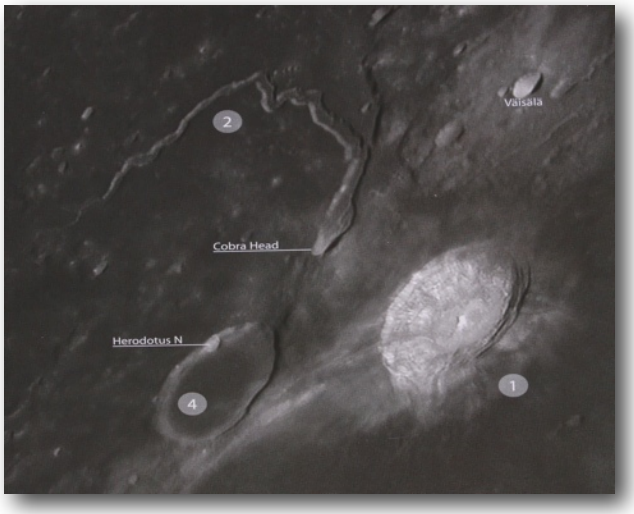
I find it interesting that they employed amateur telescopes with apertures ranging from 150 mm (6 inches) to 350 mm (14 inches) and they imaged from Germany and Namibia. Their book presents 69 regions of the Moon, with each region occupying two pages. Accordingly, the visible near-side of the Moon is shown in 388 large format, high resolution images, complete with corresponding descriptive charts. Each region is described in detail and the detailed pictures of lunar craters, mountains, valleys, rilles, maria and domes are given the most modern scientific interpretation.

I have shown this book to a number of my astronomy friends and each one has proceeded to order his own copy. I highly recommend it, and, in my opinion, this book should be in every amateur astronomer's collection. It will become your essential lunar observing guide!



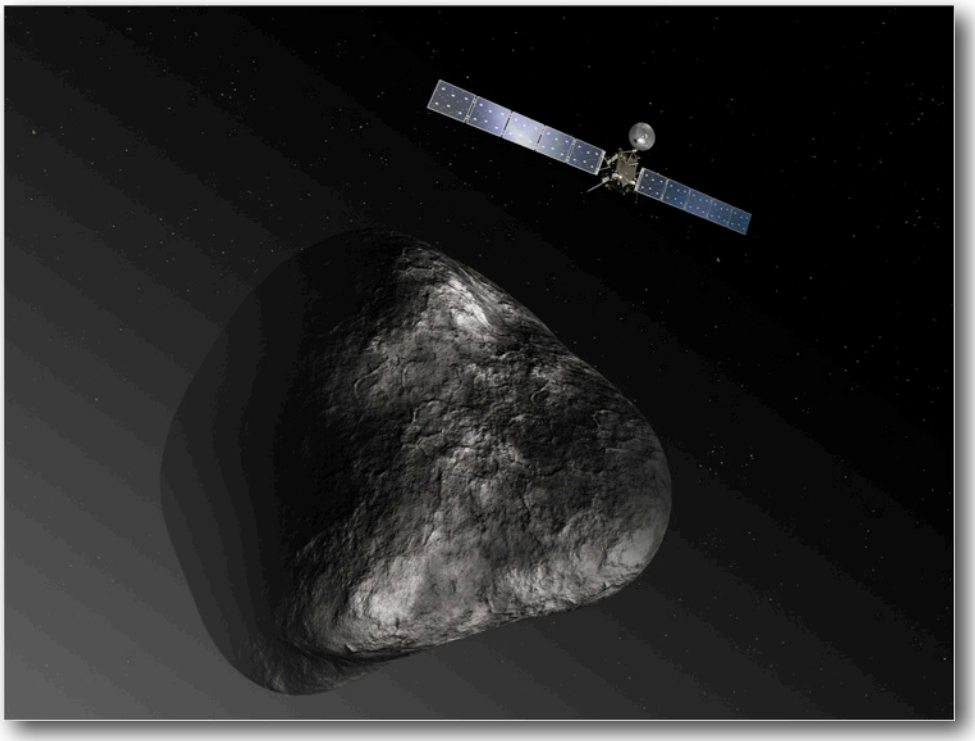
The Cambridge Photographic Moon Atlas by Alan Chu, Wolfgang Paech, Mario Weigand, and Storm Dunlop. Pub. 2012, Cambridge Univ Press ISBN 978-1-107-01973-7

"Aristarchus Plateau" Region Located in the North of Oceanus Procellarum, Region 58, Courtesy of The Cambridge Photographic Moon Atlas



"1. Aristarchus", "Cobra Head", "4. Herodotus", and "2. Schroter's Valley" Region 58, Courtesy The Cambridge Photographic Moon Atlas

Lander/Orbiter will Reach Target Nov 2014



Three NASA science instruments are being prepared for check-out operations aboard the European Space Agency's Rosetta spacecraft, which is set to become the first to orbit a comet and land a probe on its nucleus in November. Rosetta was reactivated Jan. 20 after a record 957 days in hibernation. U.S. mission managers are scheduled to activate their instruments on the spacecraft in early March and begin science operations with them in August. The instruments are an ultraviolet imaging spectrograph, a microwave thermometer and a plasma analyzer.

"U.S. scientists are delighted.[So are ESA scientists.-ed] The Rosetta mission gives us a chance to examine a comet in a way we've never seen one before -- in orbit around it and as it kicks up in activity," said Claudia Alexander, Rosetta's U.S. project scientist at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. "The NASA suite of instruments will provide puzzle pieces the Rosetta science team as a whole will put together with the other pieces to paint a portrait of how a comet works and what it's made of."

Rosetta's objective is to observe the comet 67P/Churyumov-Gerasimenko up close. By examining the full composition of the comet's nucleus, and the ways in which a comet changes, Rosetta will help scientists learn more about the origin and evolution of our solar system and the role comets may have played in seeding Earth with water, and perhaps even life.

The **ultraviolet imaging spectrograph**, called Alice, will analyze gases in the tail of the comet, as well as the coma, the fuzzy envelope around the nucleus of the comet. The coma develops as a comet approaches the sun. Alice also will measure the rate at which the comet produces water, carbon monoxide and carbon dioxide. These measurements will provide valuable information about the surface composition of the nucleus. The instrument also will measure the amount of argon present, an important clue about the temperature of the solar system at the time the comet's nucleus originally formed more than 4.6 billion years ago.

The **Microwave Instrument for Rosetta Orbiter** will identify chemicals on or near the comet's surface and measure the temperature of the chemicals and the dust and ice jetting out from the comet. The instrument also will see the gaseous activity in the tail through coma.

The **Ion and Electron Sensor** is part of a suite of five instruments to analyze the plasma environment of the comet, particularly the coma. The instrument will measure the charged particles in the sun's outer atmosphere, or solar wind, as they interact with the gas flowing out from the comet while Rosetta is drawing nearer to the comet's nucleus.

NASA also provided part of the electronics package the Double Focusing Mass Spectrometer, which is part of the Swiss-built **Rosetta Orbiter Spectrometer for Ion and Neutral Analysis (ROSINA)** instrument. ROSINA will be the first instrument with sufficient resolution to separate two molecules with approximately the same mass: molecular nitrogen and carbon monoxide. Clear identification of nitrogen will help scientists understand conditions at the time the solar system was born.

Rosetta, composed of an orbiter and lander, is flying beyond the main asteroid belt. Its lander will obtain the first images taken from the surface of a comet, and it will provide the first analysis of a comet's composition by drilling into the surface. Rosetta also will be the first spacecraft to witness, at close proximity, how a comet changes as it is subjected to the increasing intensity of the sun's radiation.

The solar-powered spacecraft was placed into a deep sleep in June 2011, to conserve energy during the portion of its trajectory that carried it past the orbit of Jupiter. During Rosetta's hibernation, all instruments and subsystems were shut off, except for the main computer including a spacecraft clock and a few heaters. ESA mission managers are beginning to commission the spacecraft and its instruments.

"The successful wake-up of Rosetta from its long, lonely slumber is a testament to the teams that built and operate the spacecraft, and the international cooperation between ESA and NASA ensured that we had some of the world's largest deep space dishes available to relay the first signal back to Earth," said Mark McCaughrean, senior scientific advisor in ESA's Directorate of Science and Robotic Exploration. "There is still a lot of work ahead of us before the exciting comet rendezvous, escort, and landing phase, but it's great to be back online."

ESA member states and NASA contributed to the Rosetta mission. U.S. science investigators are partnering on several non-U.S. instruments and are involved in seven of the mission's 21 instrument collaborations.
For information on the U.S. instruments, visit: http://rosetta.jpl.nasa.gov
More information about Rosetta is available online at: http://www.esa.int/rosetta

Comet Missions Scorecard

International Cometary Explorer (ICE)
Launched on 12 August 1978, ICE achieved the first-ever comet encounter. This NASA spacecraft was originally known as ISEE-3 (International Sun-Earth Explorer). Having completed its original mission, it was reactivated and diverted to pass through the tail of Comet Giacobini-Zinner on Sep 11, 1985. It also observed Comet Halley from a distance of 28 million kilometres in March 1986.

Vega-1 and Vega-2
Launched Dec 15 and 20, 1984, these two Russian probes each left a lander on the surface of Venus as they flew past it on the way to investigate and photograph Comet Halley. Vega-1 made its closest approach to the comet on Mar 6, 1986 at a distance of 39 000 km. Vega-2 flew in closer to the comet nucleus at a distance of 8030 km on Mar 9, 1986.

Sakigake and Suisei
Launched Jan 8, 1985 and Aug 19, 1985, these twin spacecraft were Japan's first deep-space missions. Suisei approached to within 151 000 km of Comet Halley on Mar 8, 1986 to observe its interactions with the solar wind. Sakigake approached to within seven million kilometres of the comet on Mar 11, 1986.

Giotto
Launched Jul 2, 1985, ESA's Giotto obtained the closest pictures ever taken of a comet. This spacecraft flew past the nucleus of Comet Halley at a distance of less than 600 km on Mar 13, 1986. Images showed a black, potato-shaped object with active regions which were firing jets of gas and dust into space. Giotto then became the first spacecraft to visit two comets when it passed within 200 km of Comet Grigg-Skjellerup on 10 July 1992.
Giotto was placed in hibernation on Jul 23, 1992, and the spacecraft has since been inactive. Giotto returned to the vicinity of the Earth on Jul 1, 1999. The distance of its closest approach was very uncertain, the estimate being about 220 000 km, just over half the Earth-to-Moon distance. No communication with the spacecraft took place at this time. Giotto will continue to orbit the Sun for the foreseeable future, completing six revolutions roughly every seven years.

Deep Space 1
This is the first spacecraft in NASA's New Millennium program. Launched Oct 25, 1998, its primary mission was to test 12 new advanced technologies. It approached within 26 km of Asteroid 9969 Braille on Jul 28,1999. The few pictures returned showed that Braille's longest side is about 2.2 km across and its shortest side appears to be 1 km. In an extended mission, it encountered Comet Borrelly in Sep 2001, and returned images and other science data. The spacecraft was retired on Dec 18, 2001.

Stardust
Launched Feb 7, 1999, this NASA mission travelled into the cloud of ice and dust that surround the nucleus of Comet Wild-2, coming to within 150 km of the nucleus itself on Jan 1, 2004. There, it gathered comet dust particles and delivered them back to Earth in 2006. In an extended mission phase Stardust-NExT (New Exploration of Tempel-1) visited Comet Tempel-1 in 2011, the comet that was the target of the Deep Impact mission (see below).

Contour (Comet Nucleus Tour)
Launched on Jul 3, 2002, Contour was a NASA mission to improve our understanding of comet nuclei. Encounters were planned with three comets. The spacecraft remained in Earth orbit until Aug 15, 2002, when it began the transit to Comet Encke. NASA controllers were not able to re-establish contact with the spacecraft following this manoeuvre and concluded the spacecraft was lost.

Deep Impact
NASA's Deep Impact mission launched in January 2005. It consisted of two craft. The main spacecraft performed a flyby of Comet Tempel-1 and recorded images and data. The second craft was the 'impactor', which was propelled into a target site of the comet in July 2005. The impact excavated debris from the comet, allowing the main spacecraft to analyze the composition of surface and interior materials of a comet. In an extended mission phase, Deep Impact was reassigned as EPOXI, a combination of two missions: DIXI, Deep Impact Extended Mission, and EPOCh, Extrasolar Planet Observation and Characterization. The EPOCh phase was carried out en route to Comet 103P/Hartley-2, of which it made a close flyby on Nov 4, 2010.

Rosetta
ESA's Rosetta mission was launched on Mar 2, 2004. It has spent ten years in space and will reach Comet 67P/Churyumov-Gerasimenko in Nov, 2014. It will follow the comet as it orbits around the Sun, and will be the first mission to attempt a landing onto a comet nucleus.

The Short List:

S/C name	Launched	Target	Arrival
ICE	08-12-78	Giacobini-Zinner	Sep/85
Vega-1	12-15-84	Halley	Mar/86
Sakigake	01-08-85	Halley	Mar/86
Suisei	08-19-85	Halley	Mar/86
Giotto	07-02-85	Halley	Mar/86
Giotto	07-02-85	Grigg-Skjellerup	July/92
Deep Space 1	10-25-98	Borelly	Sep/01
Stardust	02-07-99	Wild-2	Jan/04
Contour	07-03-02	Encke	lost Aug/02
Deep Impact	01-12-05	Tempel-1	July/05
Deep Impact (EPOXI)		Hartley-2	Nov/10
Rosetta	**03-02-04**	**Churyumov-Gerasimenko due to arrive Nov/2014**	

ESA Rosetta orbiter (above) and Lander that will attempt to anchor itself to the surface of Comet Churyumov-Gerasimenko in Nov 2014. Rosetta will monitor the comet as it changes through much of its orbit. **Credit:** *ESA*

ESA Herschel Detects Water Vapour on Ceres

Dwarf planet Ceres (lower right) is located in the asteroid belt, between the orbits of Mars and Jupiter. Observations by ESA's Herschel space observatory between 2011 and 2013 find that the dwarf planet has a thin water-vapour atmosphere. It is the first unambiguous detection of water vapour around an object in an asteroid-like object.

Image Credit: ESA/ATG medialab

[Even this NASA artist's impression gets the density of objects in the asteroid belt wrong. None of the others shown here would be visible from the neighbourhood of Ceres nor would they be as densely packed as the illustration shows. -ed]

Scientists using the Herschel space observatory have made the first definitive detection of water vapor on the largest and roundest object in the asteroid belt, Ceres. Plumes of water vapor are thought to shoot up periodically from Ceres when portions of its icy surface warm slightly. Ceres is classified as a dwarf planet, a solar system body bigger than an asteroid and smaller than a planet.

Herschel is a European Space Agency (ESA) mission with important NASA contributions. "This is the first time water vapor has been unequivocally detected on Ceres or any other object in the asteroid belt and provides proof that Ceres has an icy surface and an atmosphere," said Michael Küppers of ESA in Spain, lead author of a paper in the journal Nature. The results come at the right time for NASA's Dawn mission, which is on its way to Ceres now after spending more than a year orbiting the large asteroid Vesta. Dawn is scheduled to arrive at Ceres in the spring of 2015, where it will take the closest look ever at its surface.

"We've got a spacecraft on the way to Ceres, so we don't have to wait long before getting more context on this intriguing result, right from the source itself," said Carol Raymond, the deputy principal investigator for Dawn at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, Calif. "Dawn will map the geology and chemistry of the surface in high-resolution, revealing the processes that drive the outgassing activity."

For the last century, Ceres was known as the largest asteroid in our solar system. But in 2006, the International Astronomical Union, the governing organization responsible for naming planetary objects, reclassified Ceres as a dwarf planet because of its large size. It is roughly 590 miles (950 kilometers) in diameter. When it first was spotted in 1801, astronomers thought it was a planet orbiting between Mars and Jupiter. Later, other cosmic bodies with similar orbits were found, marking the discovery of our solar system's main belt of asteroids.

Scientists believe Ceres contains rock in its interior with a thick mantle of ice that, if melted, would amount to more fresh water than is present on all of Earth. The materials making up Ceres likely date from the first few million years of our solar system's existence and accumulated before the planets formed. Until now, ice had been theorized to exist on Ceres but had not been detected conclusively. It took Herschel's far-infrared vision to see, finally, a clear spectral signature of the water vapor. But Herschel did not see water vapor every time it looked. While the telescope spied water vapor four different times, on one occasion there was no signature.

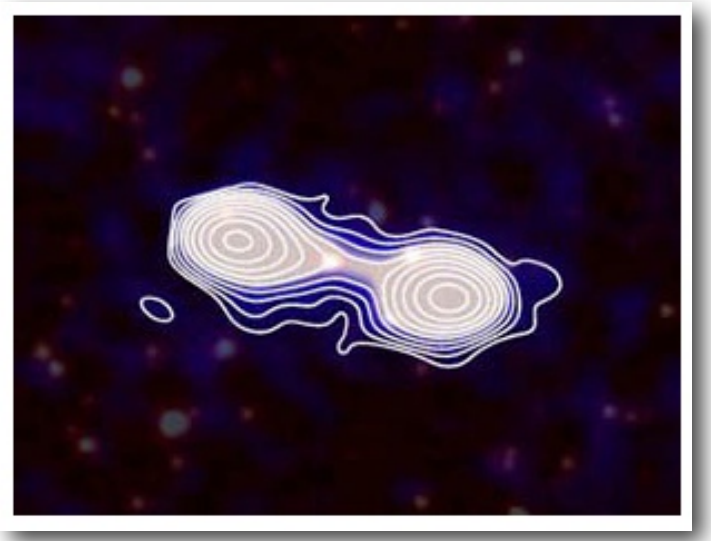
Here is what scientists think is happening: when Ceres swings through the part of its orbit that is closer to the sun, a portion of its icy surface becomes warm enough to cause water vapor to escape in plumes at a rate of about 6 kilograms (13 pounds) per second. When Ceres is in the colder part of its orbit, no water escapes. The strength of the signal also varied over hours, weeks and months, because of the water vapor plumes rotating in and out of Herschel's views as the object spun on its axis. This enabled the scientists to localize the source of water to two darker spots on the surface of Ceres, previously seen by NASA's Hubble Space Telescope and ground-based telescopes. The dark spots might be more likely to outgas because dark material warms faster than light material. When the Dawn spacecraft arrives at Ceres, it will be able to investigate these features.

The results are somewhat unexpected because comets, the icier cousins of asteroids, are known typically to sprout jets and plumes, while objects in the asteroid belt are not. "The lines are becoming more and more blurred between comets and asteroids," said Seungwon Lee of JPL, who helped with the water vapor models along with Paul von Allmen, also of JPL. "We knew before about main belt asteroids that show comet-like activity, but this is the first detection of water vapor in an asteroid-like object."

The research is part of the Measurements of 11 Asteroids and Comets Using Herschel (MACH-11) program, which used Herschel to look at small bodies that have been or will be visited by spacecraft, including the targets of NASA's previous Deep Impact mission and upcoming Origins Spectral Interpretation Resource Identification Security Regolith Explorer (OSIRIS-Rex). Laurence O' Rourke of the European Space Agency is the principal investigator of the MACH-11 program.

More information about Herschel is online at:
http://www.esa.int/SPECIALS/Herschel

Find black holes in space from the comfort of your couch



Can you see the infrared galaxy between its radio jets? Credit: radio.galaxyzoo.org

News Release:
University of Minnesota Dec 18. 2013

Astronomers launch new online 'citizen science' project

Contacts: Rhonda Zurn, College of Science and Engineering, rzurn@umn.edu, (612) 626-7959
Brooke Dillon, University News Service, bldillon@umn.edu, (612) 624-2801

MINNEAPOLIS / ST. PAUL (12/18/2013) — Got a tablet or a laptop? Now you can discover black holes from the comfort of your couch.

An international group of researchers, including astronomers from the University of Minnesota, have launched a new "citizen science" project—called Radio Galaxy Zoo (radio.galaxyzoo.org)—that allows anyone to become a cosmic explorer.

By matching images of the sky in both infrared and radio wavelengths, users can help identify which galaxies possess active supermassive black holes. The infrared data comes from NASA's Wide-Field Infrared Survey Explorer (WISE) satellite, while the radio data is from the Karl G. Jansky Very Large Array (VLA) in New Mexico. Future images in the project will include data from the ATCA and ASKAP telescopes in Australia and from the orbiting Spitzer Space Telescope.

A black hole is an object for which gravity is so strong that even light cannot get out. Supermassive black holes drag in nearby material, growing to billions of times the mass of our sun and occasionally producing spectacular jets of material traveling nearly as fast as the speed of light. These jets often can't be detected in visible light, but are seen using radio telescopes.

While this all sounds a little technical, astronomers say getting involved to help identify supermassive black holes is easy.

"It takes about a minute to learn what to do," said Julie Banfield, an Australian coordinator of the international project from the Commonwealth Scientific and Industrial Research Organization (CSIRO). "Then to actually work with the images takes only a few seconds each—perhaps a couple of minutes for the really tough ones. You just need to match up a couple of pictures and look for what you think is the galaxy at their center."

University of Minnesota College of Science and Engineering researchers involved on the Radio Galaxy Zoo science team include physics and astronomy professors Lawrence Rudnick and Lucy Fortson and postdoctoral researcher Kyle Willett.

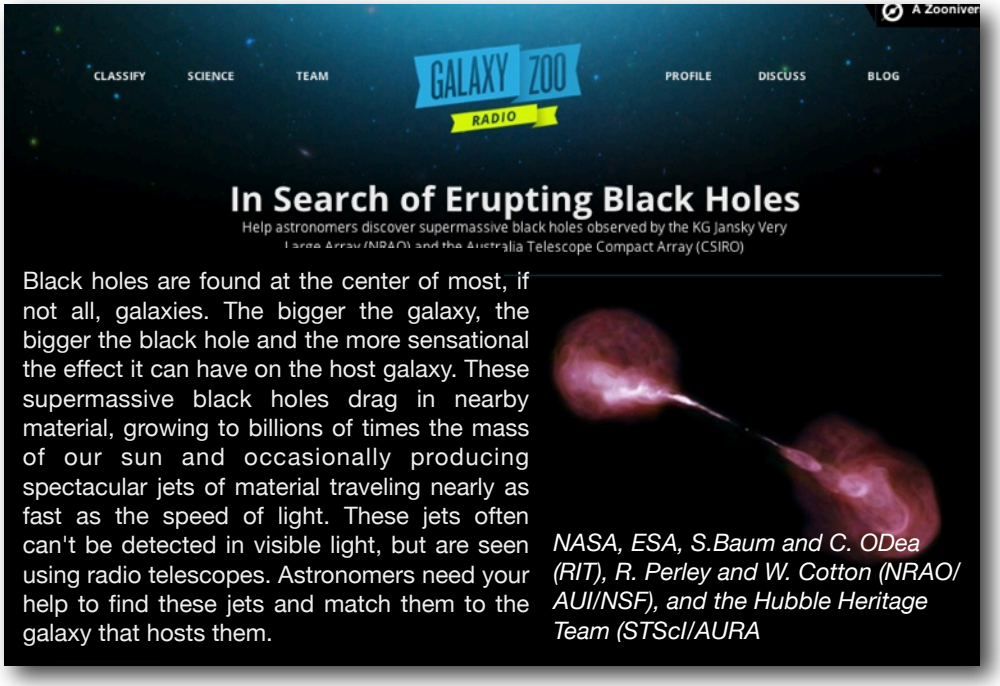
"Eventually, we will have up to 20 million radio sources that need classifications," Rudnick said. "Computers and a few astronomers can take us only so far. Pattern recognition by large numbers of people will be essential in finding these black holes."

In order to better understand how these black holes form and evolve over time, astronomers need to observe many of them at different stages of their lifecycles. To accomplish this, astronomers need help from the public to identify as many black hole/jet pairs as possible and associate them with their host galaxies. With a large enough sample (from "citizen scientist" classifications), astronomers can pick out black holes at different stages and build a better picture of their origins.

Individuals who choose to participate will be part of a community of almost a million people who work in the "Zooniverse"— a set of citizen-science projects covering everything from galaxy shapes to cancer data to whale songs.

Both the Spitzer Space Telescope and WISE are operated by NASA, while the VLA is operated by the National Radio Astronomy Observatory. ATCA and ASKAP are operated by the Commonwealth Scientific Industrial and Research Organisation in Australia.

For more information or to start your classifications, visit radio.galaxyzoo.org.



NASA, ESA, S.Baum and C. ODea (RIT), R. Perley and W. Cotton (NRAO/ AUI/NSF), and the Hubble Heritage Team (STScI/AURA

Image Right: *Screen Shot of the radio.galaxyzoo.org home page.*

A Look at the Hazards of Green Laser Pointers

by DAVID DICKINSON APRIL 4, 2013

A recent study released by researchers at the National Institute of Standards and Technology (NIST) has revealed an alarming trend. Of 122 hand-held laser pointers tested, 44% of red lasers and 90% of green lasers tested failed federal safety regulations.

The primary culprit was overpowered units. The Code of Federal Regulations in the United States limits commercial class IIIa lasers to 5 milliwatts (mW). And yes, lasers above 5 mW *are* commercially available in the United States, but it is illegal to market them as Class IIIa devices. Some units in the NIST study tested as high as 13 times over the legal limit at 66.5 mW. For context, many military grade rifle mounted lasers are rated at 50 mW.

"Our results raise numerous safety questions regarding laser pointers and their use," stated NIST laser safety officer in the recent paper presented at the Laser Safety Conference in Orlando, Florida.

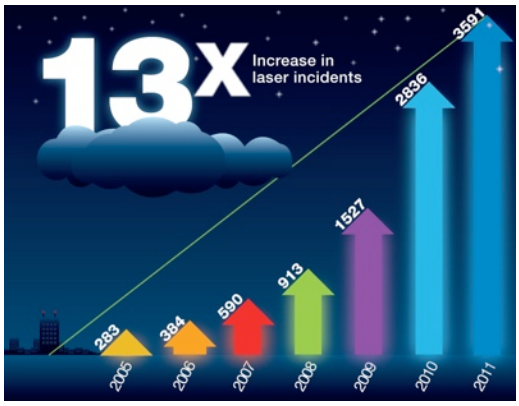
Why should backyard astronomers care? Well, since hand-held lasers first became commercially available they've become a familiar staple at many public star parties. Reflecting back off of the dust and suspended particles in the atmosphere, a green laser provides a pointer beam allowing the user to trace out constellations and faint objects. Lasers can also be mounted on the optical tube assemblies of a telescope for pointing in lieu of a finder scope.

An amateur astronomy club based near San Antonio, Texas even coordinated signaling the International Space Station with a pair of powerful searchlights and a 1 watt blue laser in 2012, just to prove that it was possible.

But such devices are not toys. Even a 5 mW laser can temporarily blind someone at short range. Further eye damage can often linger for days or even permanently and can go unnoticed. This is why researchers working around lasers in research facilities such as LIGO (the Laser Interferometer Gravitational Wave Observatory) must submit to routine eye exams.

The trouble with green lasers is that, well, they look too much like light sabers.

It's for this reason I keep mine on a very "short leash" at star parties and NEVER hand it off to anyone, no matter how well meaning, child or adult. I also NEVER point it below the local horizon, (there's wildlife in them trees). A laser reflected inadvertently off of an optical surface such as a car window or primary mirror can also do just as much damage as a direct aiming.



And also, NEVER aim one at an aircraft. In fact, it's a federal violation to do so. The Federal Aviation Administration has reported a 13-fold trend in reported aircraft/laser incidents from 2005 to 2011. There has also been an upward trend in individuals being tracked down and prosecuted for such offenses. If it blinks, assume it's an aircraft and steer clear!

In a post-9/11 era, the Department of Homeland Security has been concerned with the potential threat posed by laser pointers as well. It's not yet illegal to fly in the US with a 5mW laser pointer in your carry-on luggage, but and several countries now outlaw them all together, a note for traveling astronomers. Note that the *de facto* policy often comes down to the particular TSA officer you're dealing with.

With this sort of news, we wonder if laser pointers might become outlawed entirely in the coming years. 5mW range lasers are generally classed IIIa or 3R systems. By the American National Standards Institute (ANSI) guidelines, such devices under the recent NIST study would fall into the much more hazardous IIIb range for 5-500 mW lasers. Such lasers can cause permanent eye damage with direct exposure for periods of as little as 1/100th of a second.

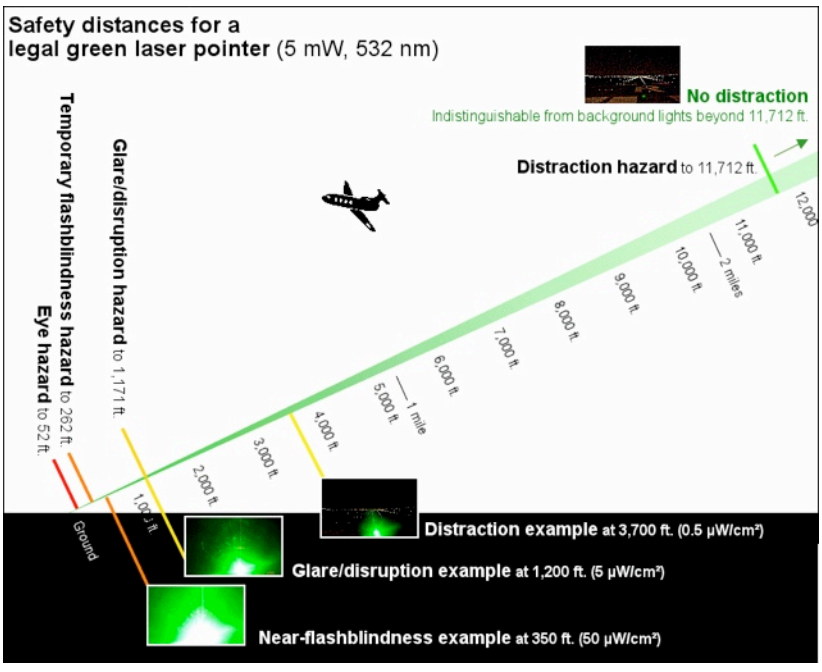
It's also worth noting that actual reported cases of laser injuries are fairly rare. A 2004 paper from the Archives of Ophthalmology cites 15 injuries worldwide each year, while a recent 2012 paper in PLoS ONE estimates "220 confirmed laser eye injuries have occurred between 1964 and 1996," for an average of 6.9 laser injuries per year.

The Code of Federal Regulations limits output for green laser pointers to 5mW in the visible range and 2mW in the infrared. 75% of the tested devices exceed this standard for infrared emission as well. Note that there have been anecdotal reports that even the *point source* generated by a laser (say, by shining it against a wall) can be excessively bright. This recent NIST study was the first time we'd seen a back up argument for this. Many of the cheaper handheld lasers sold online (think in the 20$ USD range) may forgo the infrared filtering component all together.

So in lieu of an outright ban on laser pointers, what can be done? Joshua Hadler cites the need for a better accountability for laser manufacturers. "By relying on manufacturers' traceability to a national measurement institute such as NIST, someone could use this design to accurately measure power from a laser pointer." Mr. Hadler also notes that a simple test bed for laser pointers can be built using off the shelf parts for less than $2,000 USD. We're surprised there's not "an App/Kickstarter for that…" already. (Would-be designers take note!)

In the end, we'd hate to see these crucial tools for astronomy outreach banned just because a very few individuals were irresponsible with them. Through accountability from production to application, we can assure that laser pointers remain a vital part of the amateur astronomer's tool kit.

Read more: http://www.universetoday.com/101171/a-look-at-the-hazards-of-green-laser-pointers/#ixzz2p3KxHeTb



Coma Berenices

Coma Berenices is a open cluster of 5th and 6th magnitude stars about 15° southwest of Canes Venatici. It should be observed on a clear and moonless night; with fieldglasses, between 20 and 30 stars can be seen, clearly suggesting the shape of a head of flowing hair. The brightest star in this group, β Comae Berenices, has a magnitude of 4.3 and lies about 8° to the west of the main group of the cluster (see chart). Many spiral galaxies lie in this constellation.

Double Stars

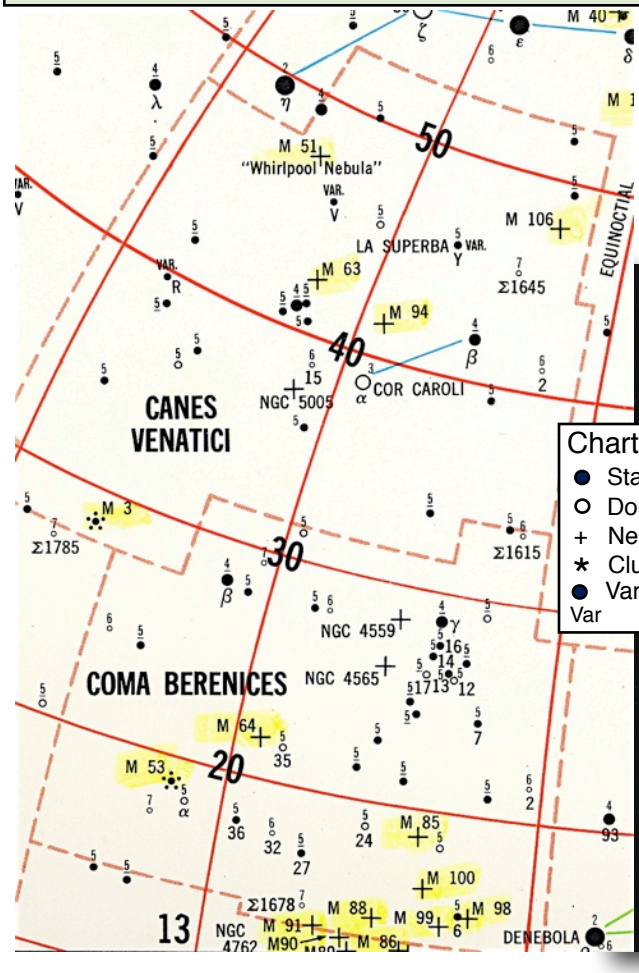
Star	Mag.	Sep (s)	Location	Remarks
2	6.0·7.5	4	120222	
12	4.8·8.0	66	122026	
17	5.4·6.7	145	122626	White-Lilac
24	4.7-6.2	20	123319	Orange-Blue; beaut. contrast
35	5.2-7.4-9.0	1-29	125121	Lilac-Blue; triple
Σ1678	6.8-7.5	33	124315	

Messier Objects

	Mag	Location	Remarks
M 53	7.6	131018	Globular Cluster. [60 000 LY]
M 64	8.8	125422	Spiral Galaxy. Large and bright."Black Eye" Galaxy 20 Million LY away
M 85	9.3	122318	Spiral Galaxy.
M 88	10.2	123015	Spiral Galaxy.
M 91	---	124114	Probably a comet. [Actually NGC 4548 -ed]
M 98	10.7	121115	Spiral Galaxy
M 99	10.1	121115	Spiral Galaxy. Large and bright.
M 100	10.6	122016	Spiral Galaxy.

Objects of Interest in Coma Berenices (Com)

NGC 4559 - Spiral Galaxy seen edge-on. Location 123428.
NGC 4565 - Spiral Galaxy, mag 11.0. Location 123426. 31 MLY away



Canis Venatici

α-Canum Venaticorum - Cor Caroli
γ-Can Ven - La Superba

This constellation is fairly difficult to identify as it consists of only two stars, the brightest (Cor Caroli) having a magnitude of only 2.8. Its two brightest stars are almost parallel with the last two stars in the handle of the Big Dipper and lie about 12° to the southwest. Cor Caroli forms one corner of the "Diamond of Virgo," a perfect diamond in the heavens formed by joining the stars Cor Caroli, Arcturus in Bootes, Spica in Virgo and Denebola in Leo. 15 Canum Venaticorum, a double star, can be separated with steadily held fieldglasses. Observe also the variable star La Superba, a beautiful flashing dark red star.

Double Stars

Star	Mag.	Sep'n (s)	Location	Remarks
α	3.2-5.7	20	125439	Pale Yellow·Lilac; easy for 2" telescope
2	5.8-8.0	12	121441	Orange-Blue; fine contrast.
Σ1615	6.0-8.2	27	121233	Yellow-Ashen.
Σ1645	7.0-7.5	10	122645	Fine pair.

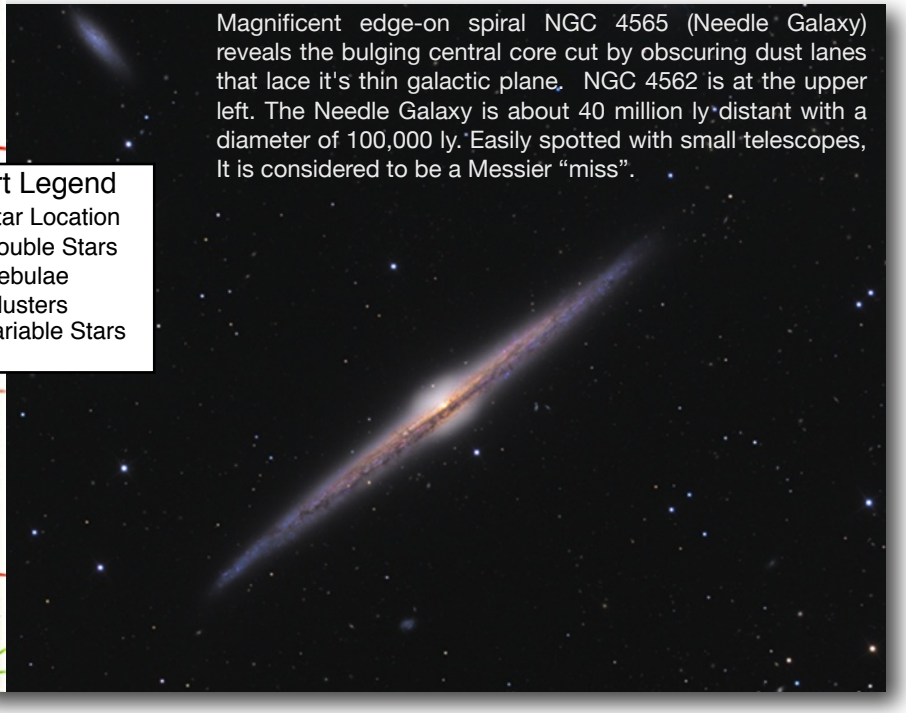
Messier Objects

	Mag	Location	Remarks
M3	6.3	134029	Globular Cluster. 40,000 LY away; very unusual. 1/7 of the 1,000 stars in M3 are variable, all having a period of half a day.
M51	8.1	132847	Spiral Galaxy. The famous "Whirlpool Nebula," seen exactly broadside-on.
M 63	9.5	131442	Spiral Galaxy.
M 94	7.9	124941	Spiral Galaxy.
M 106	8.6	121748	Spiral Galaxy.

Other Objects of Interest in Canis Venatici (CVn)

NGC 5005 - Spiral Galaxy, magnitude 9.6, location 130937.
R Canum Venaticorum - Long period (328 days) variable, maximum magnitude 7.7. Location 134740.
V Canum Venaticorum - Long period (192 days) variable, maximum magnitude 6.8. location 131746.
Y Canum Venaticorum - "La Superba," a variable star of the 5th magnitude and brilliant red colour. Loc'n 134246.

Below: NGC 4565 -Galaxy on Edge APOD image for July 5, 2012. **Image Credit & ©** Ken Crawford (Rancho Del Sol Obs.)



Times provided in EST until March 9, then DST

Mar 01 03:00 NEW MOON rises locally at 6:52 am EST
07 17:07 Aldebaran 2.1°S of Moon
08 08:27 FIRST QUARTER rises locally at 11:14 pm EST
Mar 09 02:00 **Daylight Saving Time** stars -ahead one hour
10 07:20 Jupiter 5.2°N of Moon
11 15:46 Moon at Apogee: 405367 km
14 03:00 **Mercury at Greatest Elong: 27.6°W**
13:33 Regulus 5.1°N of Moon
16 13:09 FULL MOON rises locally at 7:47 pm DST
18 ------ **Zodiacal Light** vis. in W. after sunset for 2 wk.
16:38 Spica 1.7°S of Moon
23:14 Mars 3.2°N of Moon
20 12:57 **Vernal Equinox**
23:40 Saturn 0.2°N of Moon: Occultation (not vis. locally)
22 08:00 Mercury 1.2° S of Neptune
17:00 **Venus at Greatest Elong: 46.6°W**
23 21:46 LAST QUARTER rises locally at 2:07 am DST
26 11:10 Mars 4.6°N of Spica
27 05:52 **Venus 3.6°S of Moon**
14:30 Moon at Perigee: 365706 km
29 01:00 Mercury 6° S of Moon
30 14:45 NEW MOON rises locally at 6:54 am DST
31 00:00 Mars 5 °N of Spica

BAS Events

Mar 1 Sat (NM) **Messier Marathon@Fox** (prime night) viewing at Fox weather permitting, a dusk 'til dawn event if you wish -come prepared. Details by email. (Backup night: Mar 29)

Mar 5 Wed **BAS meeting** G R Museum 7 pm, talk on **Lunar Eclipses 2014** Speaker: John H. followed by Annual General Meeting

Mar 20 Thu (FM+4) **Occultation of Regulus by asteroid Erigone (163)** Regulus should disappear for 14.3 seconds, a magnitude drop of 11.3! This is a must see event. Path of occultation is east of here, travel required. Details Mar 5

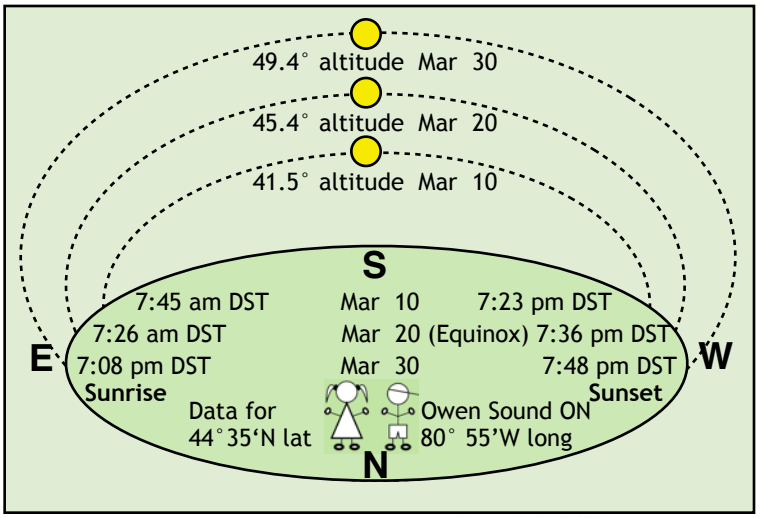
Mar 26 Wed **Adventure Talk**: **Aurora** Bruce County Museum 9:30 am talk by John H.

Mar 29 Sat (NM-1) **Messier Marathon (backup)** and **EARTH HOUR** public viewing 8:30 pm to 9:30 pm

Planets

MERCURY, is a morning sky object and reaches greatest distance from the Sun Mar 14. Still, it is hugging the horizon at dawn and less than 10° high at sunrise -not a great apparition for northern viewers. **VENUS,** is a prominent Morning Star at magnitude -4.7 and stays more than twice as high as Mercury in dawn twilight. A thin last crescent Moon is only 3° from Venus on Mar 27. **MARS** (magnitude -0.5 and brightening) rises about 9 pm by month-end and is visible till dawn near Spica in Virgo. **JUPITER**, (-2.4) is 45° high by sunset in March and sets by 3 am by month-end, -good Jupiter viewing all month if you can stand the cold. **SATURN,** (mag 0.5) rises at 2 am at the start of March and by midnight at the end. Ring tilt is very nice about 22.5 degrees this month. Both **URANUS,** (5.7) and **NEPTUNE,** (7.8) are above the horizon at sunset but by month end Neptune sets by the end of twilight and Uranus is too close to the Sun to observe. Both **asteroid, Vesta (6.1)** and dwarf planet, **Ceres (7.0)** are in the same part of the dawn sky as Mars. Charts are available on the BAS website. **PLUTO** (mag. 14) is in twilight at dawn presently and near Venus this month, but the viewing time before the Sun rises is short. 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 reaches Equinox on March 20 at 12:57 DST.



Special Events

Regulus Occulted by Asteroid Mar 20

In my personal list of the most spectacular events in astronomy, at the top are solar eclipses. Next come the lunar variety of eclipses and after that great comets. I might be talked into putting comets ahead of lunar eclipses because comets are rarer. Good lunar eclipses come along every two or three years. Occultations come fourth in my list. There are several types:

1. **Total occultations** of stars by the moon are events where a bright star is blocked by the body of the Moon. These are listed in the RASC Observer's Handbook or on the IOTA website.
2. **Grazing Occultations** occur if the star skips along the lunar limb and peeks out from behind a lunar mountain or two. A good article about an event of this type can be found on our website. Look for "Aldebaran Graze" on the USEFUL LINKS page.
3. **Asteroidal Occultations** involve an asteroid passing in front of a star and where many of these involve faint stars, once in a few years a bright star is occulted. The March 20 event involving the 22nd brightest star (on a par with Deneb and Pollux) is extremely rare and worth making an effort to observe. This Mar 20, when Erigone occults Regulus, blotting it out for a dozen seconds or so, will be the best opportunity to add this event to one's life list of interesting astronomical observations.

The Mar 20 event is a solar eclipse of a sort, except an asteroid, not the Moon, blots out the star Regulus (instead of the Sun). I don't expect there to be much corona visible, however. Contact the International Occultation Timing Association (IOTA) for more about this event here: http://occultations.org/regulus2014/]. Contact the editor (stargazer@wightman.ca) or Aaron Top aarontop@hotmail.com if you want to join the BAS expedition to watch this event.

March 2014

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

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.

TWO 12-inch Dobs available.

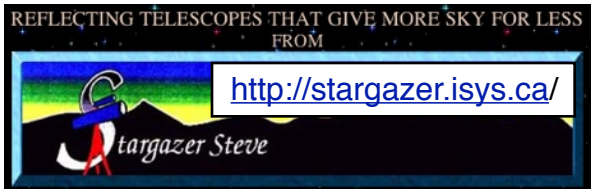
Both 12-inch loaner telescopes are available for the spring. Our two **8-inch dobsonians** are presently out on loan. Contact Brett T. or Aaron T. to check on availability. Scopes come in and out periodically so keep checking with Brett or Aaron if you are interested in a loaner.

SGN Classified Ads Section

(Now also on our website)

FOR SALE: Televue Pronto

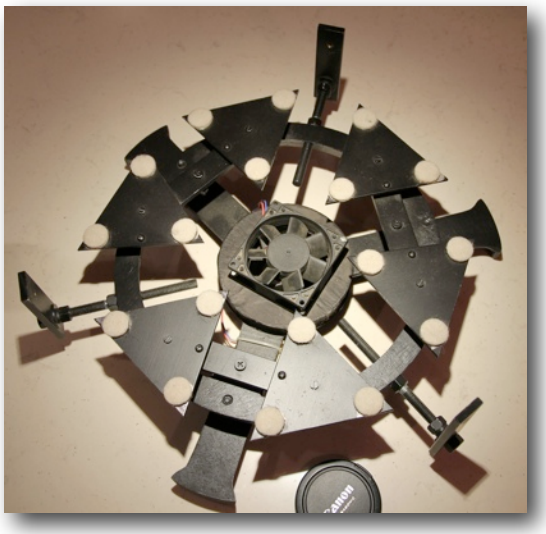
2 element E.D. Refractor, 2.7" / 70mm diameter. f.l. 480mm, f/6.8. with 1-1/4" Star Diagonal, with 45 degree Prism diagonal (for terrestrial viewing), with TeleVue Red dot finder, complete with TeleVue Soft Case. Asking $ 700.-- Firm Anton VanDijk 519 376-9912



FREE: Mirror-grinding machine to a good BAS home

The mirror-grinding machine is still available. Note that it is not finished but plans are available from Mirror-o-Matic.com. Designed to do 12 inch mirrors but will handle smaller 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 (stargazer@wightman.ca)

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



The cartoon at right is produced by a delightfully wacky blogger, Randall Munroe at xkcd.com. [Try it, you'll like it]. Munroe's astronomical connection is two-fold: the Pleiades are his favourite astronomical object and he has an asteroid named after him: 4942 Munroe (formerly 1987 DU6). His cartoons periodically have an astronomical theme and he offers them with no strings attached.

The Cartoon Corner