Star Gazer News

Astronomy News for Bluewater Stargazers
Vol 8 No.5 May 2014

May 2014 Contents

Tarandus, also called **Rangifer,** The Reindeer, was a faint constellation introduced in 1743 on a star chart published by the Frenchman Pierre-Charles Le Monnier in his book *La Théorie des Comètes*. The chart showed the track of the comet of 1742 through the north polar region of the sky, and Le Monnier was inspired to place a new constellation representing a reindeer on the comet's course, close to the north celestial pole near Camelopardalis (The modern "Cam" is shown bottom pg 3). The reindeer was a reminder of Le Monnier's trip to Lapland in 1736–37 with the expedition of Pierre Louis de Maupertuis to measure the length of a degree of latitude in the far north. **Custos Messium** was introduced by the French astronomer Joseph Jérôme de Lalande on his celestial globe of 1775, and described in an accompanying pamphlet. The name Custos Messium is a punning reference to his countryman Charles Messier, the famed comet hunter, and in fact the constellation was often known as Messier, particularly in France. Its brightest star was of 4th magnitude. Both Tarandus and Messier are now obsolete.
(From Ian Redpath's *Star Tales)*.

ISS Imaging: Some Hints

The ISS has been a common sight in the sky this April passing overhead conveniently during evening hours. By the time you read this, however, ISS will be making passes in daylight and impossible to see. By mid-May it can be seen in the morning hours and finally in late May and into June, evening passes resume.

In general, photographing the space station should be easy. It is bright and a wide angle lens can catch the whole trail. But if the moon is out (image right) digital images will be washed out by moonlight. Even with no moon, a 3 minute exposure tends to be washed out even at a low ISO. That is why it is not that easy to get a good image if the trail has any length to it. So shoot with no Moon or try the method described below.

You <u>can</u> get the ISS and the Moon in the same shot but one needs to keep the exposure short and take enough to stitch the individual frames together to get the ISS "star trail".(I cannot guarantee that there will be a nice halo to add to the image, however). Here is how:

Set your DSLR to a high ISO like 3200. Exposure = 0.6 or 0.5 s. Use a wide angle lens (mine is a 10 mm Sigma) wide open. Then take your computer shutter control (you all have one, right?) and set it to take an exposure every 1 second. Take 200 frames or so to bracket the time the ISS should be visible. Then use StarStax or a similar program to paste all the single frames into one image and get it to fill the gaps between the ISS individual images on the final frame. (Or do this in Photoshop, manually). Voila! an ISS pass during moon light. It looks pretty much like what Ektachrome 400 would have recorded <u>in one shot</u> with no muss or fuss.

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Both images taken with similar equipment: 10 mm f/2.8 lens ISO 1000 exp. = 2 minutes piggyback on tracking mount. Same location: ES Fox Observatory.

As the seasons change:
The images here represent the "Summer Time" and "Winter Time" Milky Way as they appear near their peak of placement in the sky normally a month or so after solstice. Since I became interested in astronomy, the constellations, stars planets, etc. have become a part of me. I enjoy seeing them all in various places in the sky throughout the year, -like where Vega will rise in the spring, or watching Capella in the summer set and then rise again later in the early morning hours. I enjoy all these little things but what amazes me most is OUR GALAXY. As I stare at the Milky Way, I imagine the apparent spiral shape, over lapping arms and the central bulge. It is hard to picture the size of it all in my head because we get to see it right up close. It is over whelming to think that it will probably still exist well after we are gone. I like the fact that the stars correspond with the seasons like clock work. I wake up on early spring mornings before work and see the Milky Way [in the left image]. And I know that summer is coming...
Aaron

Astronomy Events May 2014

May 5 to May 11 **International Astronomy Week**
May 6 Tue (FQ-1) **Eta-Aquariid meteors** ES Fox@dark, moon first quarter, 60/h, peak 3 am
May 14 Wed (FM) **Full Moon** "Planting Moon"
May 15 Thu (FM+1) **Venus and Uranus close approach** (appulse) about 1.3° apart in dawn sky.
May 24 Sat (NM-4) **New Meteor Shower** Camelopardalids? Possible LARGE numbers from debris from Comet 209P/LINEAR peaking from 3 to 4 am. Obs Handbook indicates this may be **most intense shower in 2014!** Viewing at Fox (more on pg.3)
May 25 **Sun (NM-3)** **Venus near Moon** (1.5° separation) in morning sky before sunrise.
May 28 Wed (NM) ☻
May 30 Fri (NM+2) **Moon, Mercury close approach** (8°) in West after sunset. Jupiter above.

BAS Events for May 2014

May 3 Sat (NM+4) **BAS viewing @Fox** (backup May 10 Astronomy Day).
May 3/4 **ASTROCATS** Hamilton Centre RASC hosts astronomy trade show (Sat/Sun). More at www.astrocats.ca.
May 5 to May 11 **International Astronomy Week**
May 7 Wed (FQ) **BAS meeting** Grey Roots Museum 7 pm Trivia Night.
May 9 Fri (FQ+2) **Public viewing** Grey Roots Museum 9 pm (Members with scope, please) backup May 10 Astronomy Day at the Fox.
May 10 Sat (FQ+3) **Astronomy Day** ES Fox@dark, Moon viewing and Saturn is at opposition (mag = 0)
May 24 Sat (NM) **Meteor Shower viewing @Fox** starts Fri night/Sat am -an all night event if you like. Come prepared
May 26 Mon (NM-2) **Huron Fringe Birders** talk/viewing @ MacGregor Pk, 9 pm or so. Leader: John H. members with scopes requested after dark (note: this event is **not** at Fox Observatory as before).
May 31 Sat (NM+3) **BAS viewing** ES Fox@dark (optional viewing)

Get Set For Comet K1 PanSTARRS

www.universetoday.com by David Dickinson

Get those binoculars ready: an icy interloper from the Oort cloud is about to grace the night sky.

The comet is C/2012 K1 PanSTARRS, and it's currently just passed from the constellation Hercules into Corona Borealis and presents a good target for observers high in the sky in the hours before dawn. Observers currently place K1 PanSTARRS at magnitude +9.5 and brightening and showing a small condensed coma. Through the eyepiece, a comet at this stage will often resemble a fuzzy, unresolved globular star cluster.

And the good news is, K1 PanSTARRS will continue to brighten, headed northward through the early morning and then into the evening sky before reaching solar conjunction on August 9th, when it'll actually pass behind the Sun for a few hours as seen from our vantage point. We actually get two good apparitions of Comet K1 PanSTARRS: one for the northern hemisphere in the Spring and one for the southern hemisphere after it reaches perihelion and crosses south of the ecliptic plane in August.

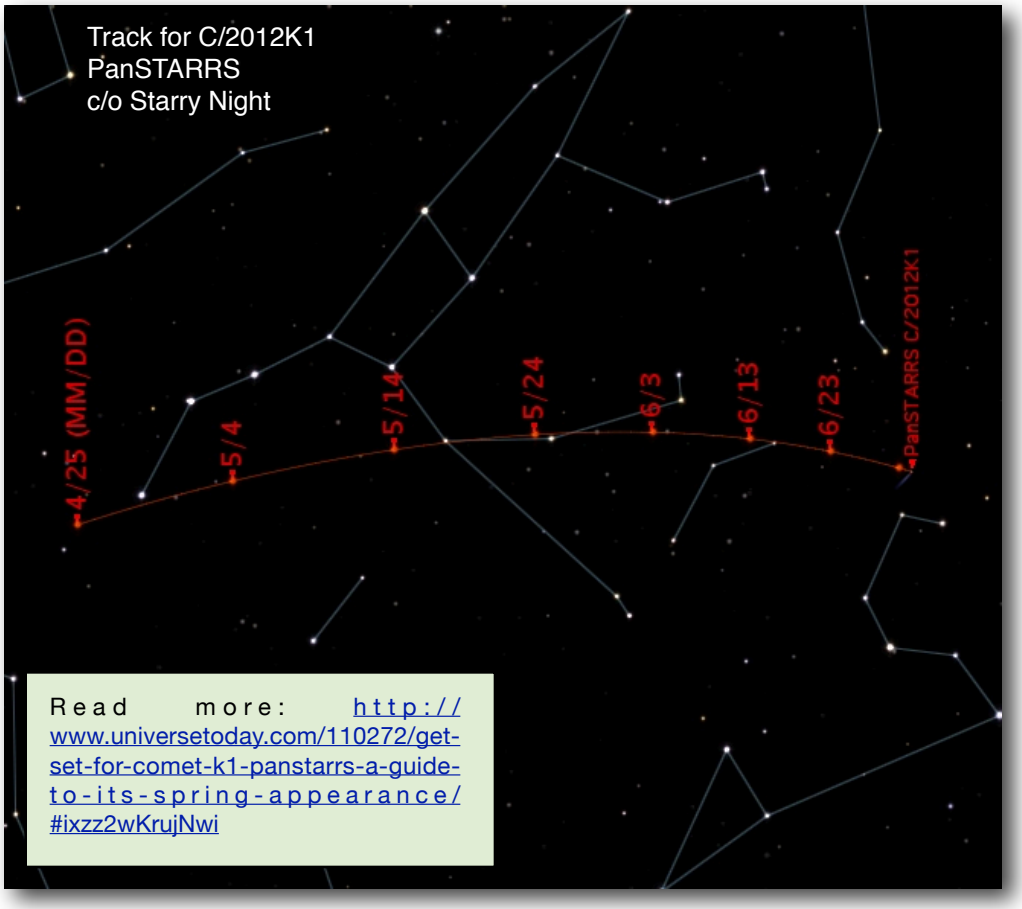
And it'll be worth keeping an eye out for K1 PanSTARRS online as well, as it passes into the view of SOHO's LASCO C3 camera on August 2 before exiting its 15 degree field of view on August 16th.

This actually means the comet will reach opposition twice from our Earthbound vantage point: once on April 15th, and again on November 7th. BUT, had K1 PanSTARRS reached perihelion in January, we'd have really been in for a show, with the comet only around 0.05 Astronomical Units (about 7.7 million kilometers) from the Earth!

But alas, such was not to be. At its best, K1 PanSTARRS will be hidden by the glare of the Sun
, to emerge into the southern sky. The comet has a steeply inclined 142 degree retrograde orbit, and thus approaches the inner solar system from high above the ecliptic plane.

Projections by veteran comet observer Seiichi Yoshida suggest that K1 PanSTARRS will begin to brighten dramatically towards +8th magnitude through April.

It's also worth noting that K1 PanSTARRS will make its first of two approaches at a minimum distance of 1.471 au from Earth May 4th and will be moving at about a degree a day – twice the diameter of the Full Moon – before receding from us once more for a closer 1.056 au approach to Earth on August 25th.
Comet K1 PanSTARRS will join the ranks of comets reaching binocular observability later this year which includes C/2013 V5

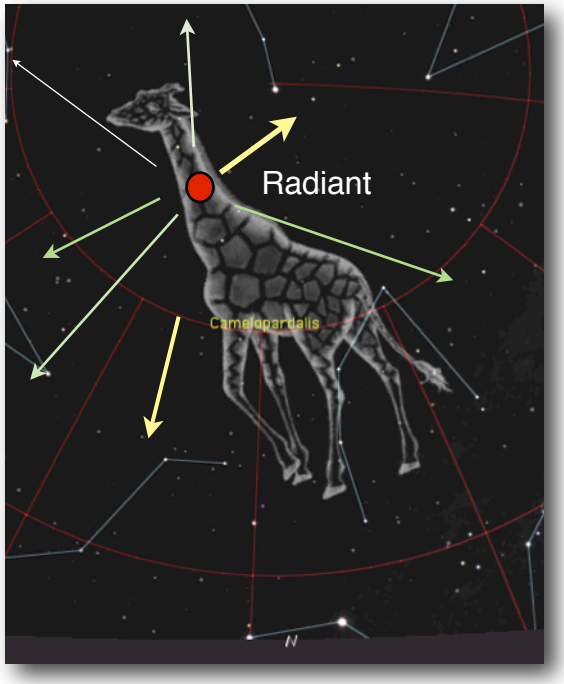


Oukaimeden, Comet C/2013 A1 Siding Spring, and the recently discovered C/2014 E2 Jacques, which may reach +7th magnitude as it nears perihelion this coming July.

And those are just the binocular comets that are scheduled to perform… remember, the next "big one" could come barreling in towards the inner solar system at any time to put on a memorable performance worthy of another comet Hyakutake or Hale-Bopp… just not TOO close!

New Meteor Shower Possible May 24 (3:00 am)

Meteor physicists, including those from UWO (see Special Events pg 13) are predicting a possible new meteor shower from the constellation Camelopardalis in the early morning of May 24 (Saturday am). The radiant is best placed for North American viewers which is why we are being especially encouraged to go out and report on the activity. A simple count of meteors seen over a specific time is all that is necessary to provide scientifically useful information. The radiant is located at 8 H 08 min RA, 79° dec which puts it in the neck of the Giraffe in the star chart at right. At the peak time, 3 am, Camelopardalis is at its lowest point above the northern horizon but the radiant point is 35° high. Observing at Fox will likely happen, but anywhere there is a flat northern horizon will do.



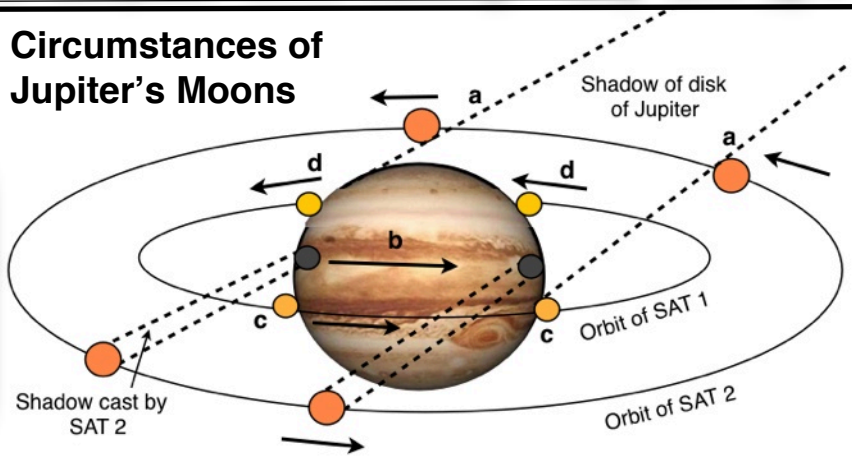
Good Jupiter Moon Watching

On several nights this spring during our scheduled BAS viewing evenings, Jupiter has been in the sights of one or more of the telescopes at the Fox.

The view at 1:05 am EDT Oct 12, c/o Starry Night. Callisto, Io (above) and Europa (L to R) and the three shadows on Jupiter's disc)(Io, Europa, Callisto)

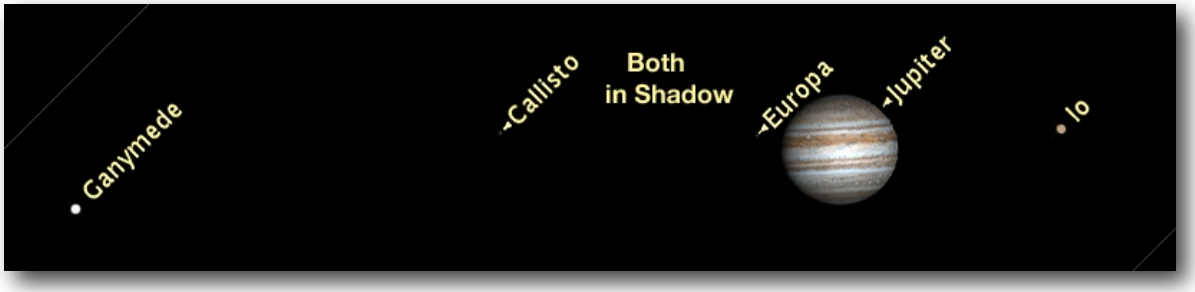
The representation above from Starry Night is the only thing observers locally saw of the rare triple transit in Oct last year due to the overcast. Another triple occurs on June 3 this year but it is a daytime event (more in June SGN). BUT mark Jan 24, 2015 on your calendar! A triple shadow transit, moons transiting, two shadows merging and more! Look for details in the Dec SGN issue.

Circumstances of Jupiter's Moons



a = beginning & end of eclipse of SAT 2 (SAT 2 passes into Jupiter's shadow)
b = transit of the shadow of **SAT 2** (obvious black dot moving across disk)
c = transit of **SAT 1** on disk of planet (difficult to see against Jupiter clouds)
d = occultation of **SAT 1** (view of SAT 1 is blocked by Jupiter's disk)

Even though we missed the triple last year, a double shadow transit was observed by several observers on March 23 when both Io and Ganymede cast shadows on Jupiter's disk. Both were seen simultaneously for about 25 minutes that night through gaps in clouds using the 10-inch SCT. It was noted that Io's shadow is smaller and sharper (it is closer to Jupiter) than Ganymede's shadow. It is enlarged mostly by virtue of being farther from Jupiter. That catch was pure luck.



Two Moons MISSING! At 10:15 pm, Apr 5, *Callisto and Europa were hiding in Jupiter's shadow, and BAS observers were not looking when they emerged at 10:40 pm and 12:15 pm. We only saw Io in a 20 mm ES eyepiece at 146X. The view of Jupiter was so nice we didn't wonder about where the other moons were!*

More recently, on Apr 5, in spite of a thick crescent Moon, 5 BAS members and a friend, got a good look at the gas giant. This time it was with the Webster-28 which Brett, Frank and Lorraine managed to set up in a cleared space beside the west wall of the observatory. The effort was worth it (thanks Brett!) because the disk of Jupiter had more detail than any of the observers could recall on previous occasions. There were multiple dark bands (belts) visible and detail in the two central ones was outstanding. The Red Spot was completing its transit but still visible near the edge of the disk. The subtle shades of colour were much more vivid, (28-inches of aperture does it, I think) and the Red Spot had distinct inner and outer zones that were quite obvious because of the colour difference. We also saw a much darker, smaller spot in the belt near the Red Spot. It was almost the dark colour of a moon shadow, but no moons were in position to cast it.

But, unknown to us, a pair of moons were set to emerge from the shadow of Jupiter -like the reappearance of our Moon after a lunar eclipse. The Starry Night diagram above right shows the two moons, Callisto and Europa still in Jupiter's shadow which stretches out to the left of the planet. At 10:40 pm, the first moon, Callisto was to emerge and then at 12:15 pm, Europa was to re-appear. Unfortunately we were not aware of these and so did not make the effort to observe them. A missed opportunity!

The 2014 RASC handbook lists Jupiter and Saturn moon events pg 230-240 and other Jupiter/Saturn information on pg 222-227. Apps are available as well. Try *Jupiter's Moons* and also *Saturn's Moons* from Sky&Telescope. Software Bisque also has one called *Gas Giants* which covers all 4 outer planets in the same app. All these come free and are available at the App Store. All three are now loaded onto the club's iPad which will stay at the Fox now that the weather is not too cold for electronics.

Personal Observations

Lorraine R. sent this email about the Jupiter viewing we did:
March 23 was the first time I was able to see any shadows across Jupiter's face. I assume this is because we were using the [club's] 10 and 12" scopes as opposed to my smaller scopes at home. We were all able to see the first shadow start to cross the planet's face. When it was time for the second shadow to appear, the sky got quite cloudy. You guys were able to make out both shadows in a break between the clouds. I could not. The second shadow was larger.

On March 30 we again looked for a shadow and were able to see Io's dark shadow transit Jupiter. Later we were able to pick out the actual moon Ganymede on the face of Jupiter. It appeared white, to me, but really not too hard to pick out. Fun!

On April 5 we again observed Jupiter but this time with the Webster's 28" telescope. We were able to see additional cloud bands, besides the usual 2 that are visible in smaller scopes. Then we were able to see the Great Red Spot on one of the main cloud bands. That was also a first for me.
She added this a few days later:
Today I got out my Celestron NexStar 130 SLT [5-inch reflector] that I haven't used for quite a long time. We got it all up and running again and I took it outside for a go at trying to find the sun. (I can bypass the safety feature and use the sun to align to). Aligning worked fine and [using a solar filter] we all took a look at the sunspots currently visible. Then I asked the GoTo to find Jupiter. That went fine too. However, the planet was just a tiny little sphere. Oh well. I learned that ***it is possible to see Jupiter in the daytime*** *if your scope can find it. I also learned that a 5" scope is just too small to see any detail on the planet. One more episode in the saga of Jupiter observing.*
Lorraine

[Anyone else out there seen Jupiter, other planets or even stars in the daytime? Please send in your reports to SGN. -ed]

Science Fair: All-Around Winners!

Apr 2 and Apr 9 were the dates for this years version of the Bluewater Regional Science and Technology Fair. BAS offers two awards in memory of Dr. Herb Coleman who got the club started with a donation of a telescope and observatory dome that became the basis for the first observing building operated by BCAS.

Although the winning project in the Sr. Division was not strictly on astronomy, BAS judges felt it fit the criteria of the award. The winners were Amber Ruetz and Avery Wetlaufer with a project on Solar Energy. [Sorry, but no picture was available at press time. -ed]

Apr 9 was the date for the Jr Division Bluewater Regional Science and Technology Fair. Winners of the Dr. Herb Coleman Memorial Prize were the two young ladies pictured right. Aleesha Ferrier and Avryl Bender worked on how the Earth's magnetic field varied with distance from the planet's poles and actually measured the strength of the field instrumentally. They tried a compass first but that only gave direction. The internet came to the rescue -the App Store had an iPad application called Magnetic Field which gives not only the direction but the magnitude as well. The familiar dipole field showed up in their measurements and changed in strength as the amount of current through the coil increased and decreased. Pretty impressive for Grade 6!

Lunar Eclipse Update

Once again, the clouds prevented an astronomical event from being enjoyed by local amateur astronomers. Just like the Regulus occultation that was clouded out, so was the lunar eclipse of Apr 15. Southern Ontario, and the US states to the south as well as parts of Quebec were both rainy and blustery with wet snow falling during the 5 hours or so of the lunar eclipse (2 am EDT to 5:30 am EDT). It was a large disturbance that moved through the region and dropped about 10 cm of snow before skies cleared Wed. At eclipse time, those to the west of Lake Michigan got clear skies and Clear Sky Chart showed good conditions in Kentucky and Virginia, both a long haul from gray Bruce and Grey.

This eclipse is reminiscent of the Mar 3, 2007 total that was similarly clouded out. A small group of BCAS members saw a faint chance of a hole developing over the north Bruce Peninsula and travelled to Dunk's Bay on a "wishful eclipse" search. No luck then either. However, in the Maritimes, Dave Cunningham (yes, related to our Quetican FOV columnist) captured the event in clear skies over the area. His image appears below. Taken through a Skywatcher 120 mm refractor, 1/5 s exp. ISO 800.

Two BAS member who did find clear sky, however, "had to move" to Dominican Republic to do it. Peter and Irene Harris, re-located there upon retirement and, although Peter was without telescope for the time being, he used his Canon Powershot SX240 at 45 mm and ISO 1600 to snap a 1/8 s exp. of the Moon coming out of eclipse at 4:42 EDT. Peter also sent in a wide angle image showing the eclipsed Moon, Spica and Mars. Spica is the bright star below the Moon in the image above.

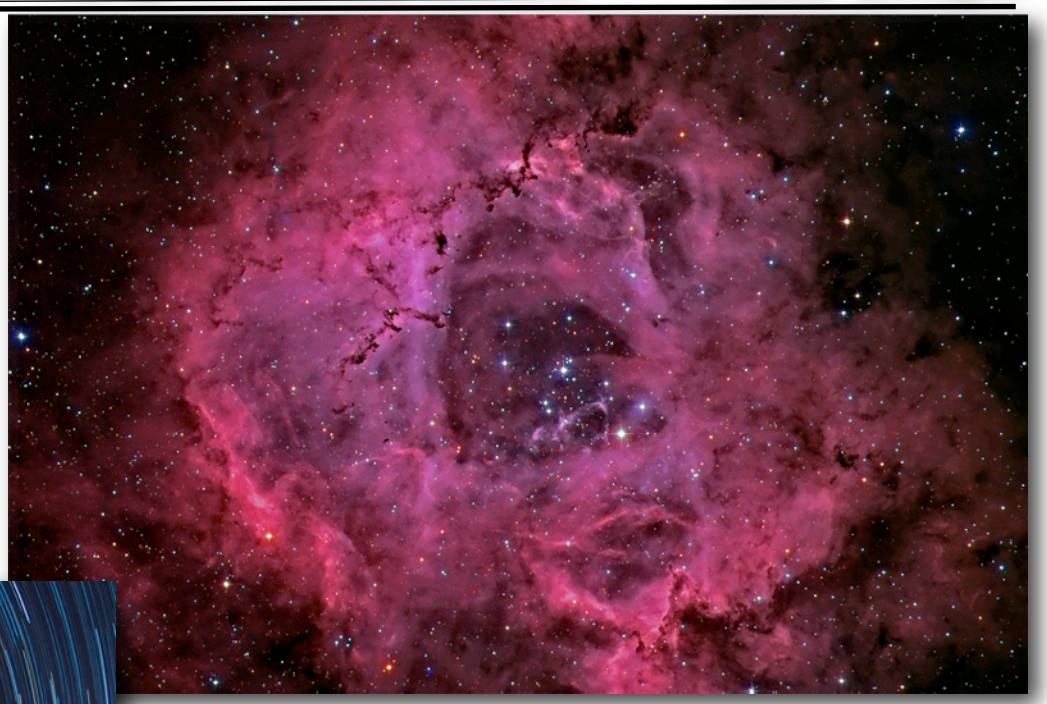
More in Image Gallery of
www.spaceweather.com

Mark your calendars!

Oct 8, 2014 is the next lunar eclipse. We will see the first half and then a totally eclipsed moon setting in the west. Two weeks later a partial solar eclipse happens much like the one we watched sink into Lake Huron back in May of 2012.

A total of 40 entries were received in 5 categories. The dozen or so entrants were a mixture of long-time astrophotographers and first-timers. Equipment ranged from simple cellphone cameras to dedicated CCDs and images were taken of deep-sky objects, the Moon and planets and even simple sunsets and rainbows. The moon proved a popular target with 16% of the total entries, followed by aurora and wide angle views of the Milky Way. **Thanks to all entrants who took the time to do the imaging and enter the contest!**

The winning entries in each category are displayed here. Winners have been contacted by email or phone to arrange for the pickup of prizes. Image details are on our website. Next month, the honourable mentions will be displayed.



Deep Sky: Paul Zelichowsky: Rosette Nebula

Unguided Tripod: Carson Morton: Star Trails over Elevators

Lunar/Planetary: Aaron Top Crescent and Venus

Under-18: Caleb Rodgers Transit of Venus (with Cellphone)

Cellphone: Lorraine Rodgers Crepuscular Rays

"You'll Have a Pocketful of Starlight"

"Catch a falling star an' put it in your pocket,
Never let it fade away !
Catch a falling star an' put it in your pocket,
Save it for a rainy day.
(think about it .... and, amazingly)
***You'll have a pocketful of starlight* !"**
Paul Vance and Lee Pockriss "Catch a Falling Star"
from Christopher Cokinos' book, "The Fallen Sky"

The FedEx delivery van arrived with a special delivery for my wife, Paula. It was from Eric Twelker, Certified Professional Geologist, Lawyer, and world renowned Alaskan meteorite collector and seller. This past February, our friends, Mike Tettenborn and his wife, Martha, paid us a visit at our Arizona Sky Village hacienda in SE Arizona after they had attended the International Tucson Rock, Mineral and Meteorite show. Mike has been an avid meteorite collector for decades and, while in Tucson, he had traded a number of his own meteorite specimens to add to his growing collection. After breakfast, Mike spread his impressive meteorite acquisitions on our dining room table and enthusiastically described each one. That evening, comet hunter and now planetary imager, Rolf Meier, and his wife, Linda, joined us and Mike repeated the demonstration. As Paula scanned the specimens, one meteorite in particular had caught her interest. It was a meteorite specimen from a 1960 meteorite

fall onto the plain of the Millbillillie and Jundee Stations, in Western Australia. It was called a Millbillillie Eucrite Achondrite meteorite and spectral analysis identified it as originating from the asteroid, Vesta! Paula was fascinated with it and I saw in her eyes the intellectual thrill of holding a piece of an asteroid. The seeds of a collector of those rare and beautiful rocks, particularly ones which fall from the sky, was now planted in her mind. I knew what she was thinking. She asked, "Where can I obtain my own Vesta meteorite?" Mike said he would make some enquiries among the collectors he knew and his special efforts resulted in the contact with Eric Twelker, the subsequent Fed Ex delivery, and Paula's first meteorite specimen.

Just looking at the 55.3 g meteorite you can see the black fusion crust with some flow lines which formed when it was heated during its fall through the Earth's atmosphere. At other places, you can glimpse a light-grey interior, and, on the outside, the orange staining resulting from the weathering that occurred while it lay on the Australian outback. A "Toonie" is placed beside it for scale (image left). It is classified as a "Eucrite-Achondrite" meteorite and spectral analysis indicates this meteorite originated from the surface/subsurface of Vesta. "Eucrite" means it is a stony meteorite composed of basaltic rock containing calcium-rich anorthite, pigeonite, and calcium-poor pyroxene. It is called an "achondrite" because it lacks chondrules, which are small spherical droplets of minerals formed in the solar nebula before the planets accreted.

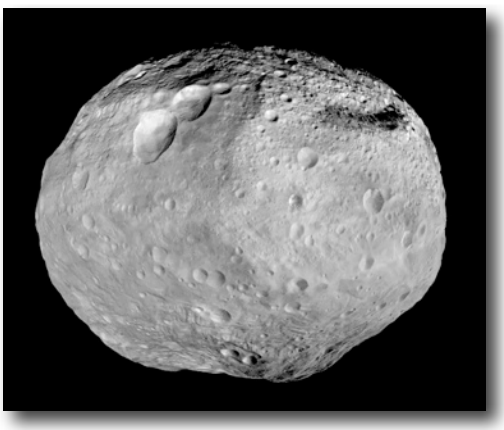
The Dawn mission to the Asteroid belt is one part of NASA's Discovery Missions. It is specifically aimed at providing insight into the roles played by size and water in the evolution of the planets. The dry and evolved minor planet Vesta (525 km diameter) and the wet and primitive dwarf planet Ceres (950 km) are excellent candidates to study and, hopefully, shed some light on planetary evolution in the early solar system. To travel the immense distance to the asteroid belt, this particular mission employed an innovative, light-weight, propulsive technology which used solar panels to power a Xenon gas ion-rocket motor. So, on July 16, 2012, Dawn went into orbit around Vesta and commenced almost 14 months of mapping the surface features, characterizing the surface mineralogy, measuring the topology, and sensing gravity anomalies caused by any internal asymmetry in mass distribution. The photos returned to earth were nothing short of spectacular!

The composite image of Vesta at the lower right shows some remarkable features on Vesta. The huge mountain at the south pole, visible at the bottom of the image, is more than twice the height of Everest! The depression seen to the left of the mountain is called the Rheasilvia crater and its 500 km width is 95% the diameter of Vesta. It is 19 km deep and sports a central peak 23 km above the mean crater floor! It is believed that Paula's Millbillillie meteorite originated in the collision that created this huge billion year old crater. At the top of the image are shown some concentric troughs and ridges. These are believed to be "grabens", or slumping features, caused by the faulting resulting from the collision which caused the Rheasilvia crater. The majority of the equatorial region of Vesta is sculpted by concentric ridges and troughs which in dimensions, dwarf those of the Grand Canyon on Earth. Notice the triplet of craters at the top .. dubbed the Snowman!

Paula at her Quetican Observatory desk, holding her Vesta meteorite.

Paula is learning that meteorites, in addition to being interesting geological specimens, have a fascinating story to tell. Rocks do in fact talk! Modern science can provide the translation and give the story. I suspect that her meteorite collection will only grow!

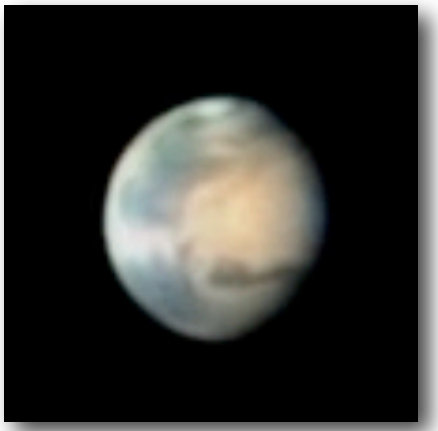
Composite image of Vesta taken by Dawn spacecraft. ***Image Credit: NASA***



A Guide to the Mars 2014 Opposition Season

by DAVID DICKINSON on FEBRUARY 10, 2014 www.UniverseToday.com

From SGN Editor: *Mars reached opposition for 2014 back on April 8. Opposition is the best time to observe Mars, as the Red Planet is closest to us and rises in the east as the Sun sets opposite to it in the west. Mars has reached 15" in apparent size and is starting to shrink, but slowly. Mars currently shows surface detail through a moderate-sized telescope and since it is higher in the less turbulent sky after opposition, observations can be more revealing even though technically it is getting smaller. It will still be good into May and early June. Don't miss it.*



Mars imaged by Leo Aerts on February 3rd. Shot using a Celestron 14" scope, DMK 21AU618 webcam with 2.5x Powermate and RGB Baader filters

From UniverseToday author David Dickinson

The 2014 opposition of Mars offers a mixed bag for observers. Hanging around 5-10 degrees south of the celestial equator just east of the September equinoctial point in Virgo, viewing opportunities are roughly equal for both northern and southern hemisphere observers. At opposition, Mars will shine at magnitude -1.5 and present a 15.2" disk, only slightly larger than the near minimum apparition of 2012, when it appeared 13.9" across.

This is a far cry from the historic 2003 appearance, when Mars nearly maxed out at 25.1" across. Why such a difference? Because the planet Mars has an exceptionally eccentric orbit. In fact, the eccentricity for Mars is 9.3% compared to 1.7% for Earth.This guarantees that all oppositions of Mars – which occur roughly 26 months/780 days apart – are not created equal. In our current epoch, Mars can pass anywhere from 0.683 to 0.373 Astronomical Units (A.U.) from the Earth. This year's passage sees Mars overtake us at 0.62 A.U. or over 96 million kilometres from Earth on the night of opposition. Mars is slightly closer to us at 0.618 A.U. six nights later on April 14th.

Now for the good news. Oppositions of Mars also follow a rough 15-year cycle, meaning that they get successively closer or more distant with every two year passage. And we're currently on an improving trend: the next opposition in 2016 is much better than this year's at 18.6" in size, and during the 2018 opposition, Mars will present a disc 24.3" across and will be nearly as favorable as the one in 2003!

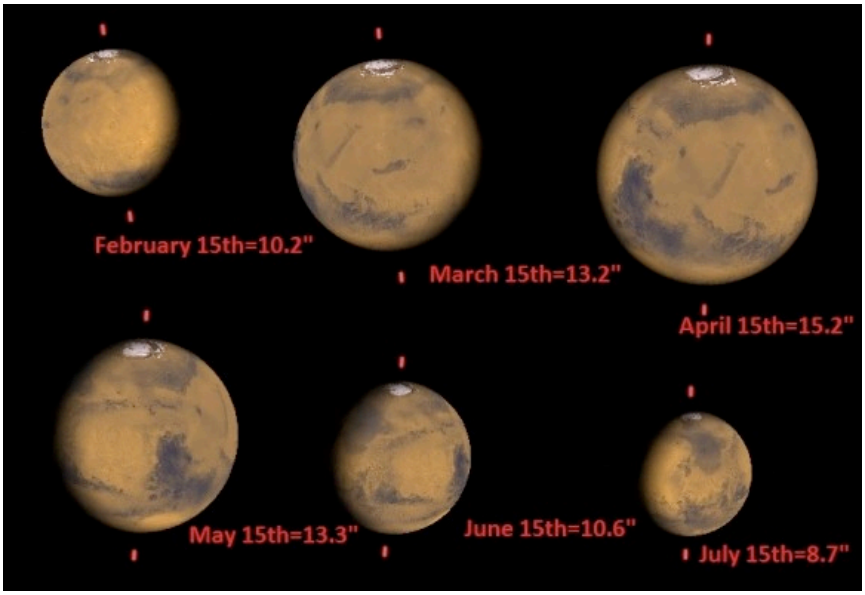
Though Mars is nicknamed the Red Planet, we've seen it appear anywhere from a pumpkin orange to a sickly yellow hue. In fact, such a jaundiced color change can be a sign that a planet-wide dust storm is under way. Such a variation can be readily seen with the naked eye. What color does Mars appear like to you tonight?

On Mars, northern hemisphere summer starts on February 15th, 2014. This means that the northern pole cap of the planet is tipped towards us at opposition during 2014. The day on Mars is only slightly longer than Earth's at 24 hours and 37 minutes, meaning that Mars will have seemed to rotated only an extra ~8° if you observe it at the same time on each successive evening.

The white pole caps of the planet are the first feature that becomes apparent to the observer at the eyepiece. In February, Mars showed a noticeable gibbous phase as we got a peek at the edge of the nighttime side of the planet. Mars is nearly "full" at opposition, after which it'll once again take on a slightly distorted football shape.

Challenge: Moons of Mars

Phobos and Deimos are a tough catch, but are indeed within range of amateur instruments. The chief problem lies in their close proximity to dazzling Mars. Phobos, +11.5 magnitude, never strays more than 14" from the Red Planet in 2014, and 12.4 magnitude Deimos never travels farther than 45" away. Phobos orbits Mars once in 7.7 hours —faster than the planet rotates beneath it —and Deimos orbits once every 30.3 hours. The best strategy for a successful Martian moon hunt is to either place Mars just out of the field of view at high power when a moon reaches greatest elongation or block Mars from view using an eyepiece equipped with an occulting bar. [Any star charting program like Sky Safari or Starry Night will plot the positions for the time of observation.-ed]



Martian Surface Features

Tracking the features of the Red Planet is also possible at moderate magnification. One of the largest features apparent is the dark area known as Syrtis Major. *Sky & Telescope* has an excellent and easy to use application named Mars Previewer that will show you which longitude is currently facing Earth. [The app called Mars Atlas (www.horshamonline.com/marsatlas) is also available for iPhone and iPad to help you identify surface features. Check recent issues of Sky News, S&T and Astronomy magazines for surface feature maps.-ed]

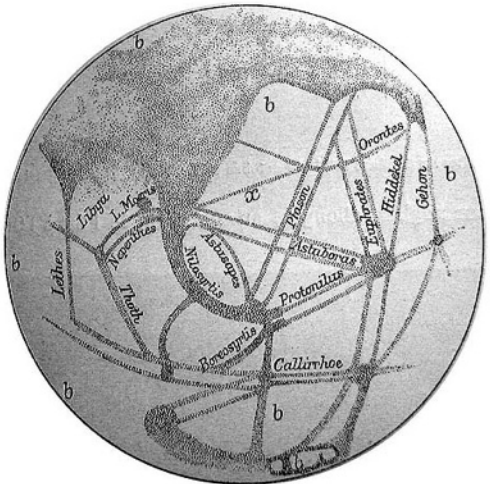
Sketching the regions of Mars is a fun exercise. You'll find that drawing planetary features at the eyepiece can sharpen your observing skills and give you a more critical eye to discern subtle detail. And this season also provides an excellent reason to turn that newly constructed planetary webcam or Mallincam towards Mars.

A growing (& shrinking) Mars through the 2014 opposition season. Created by the author using Starry Night Education software

Insight and Blunder: Past Observations of Mars

http://oneminuteastronomer.com

In the 19th century, the Italian astronomer Giovanni Schiaparelli reported detailed views of the planet's surface including an apparent network of channels, or canali, in Italian. These channels appear to be connected by tiny dots, although both seemed to flash in and out of view during moments of steady seeing. Schiaparelli and many of his contemporaries suspected these features were illusory and hoped that better telescopes would reveal the true nature of the features on the surface of Mars.



A drawing by Schiaperelli of the Martian "canali" circa 1888.

In the late 19th century, the wealthy and imaginative amateur astronomer Pervical Lowell built a research-grade observatory in Flagstaff, Arizona, to study the planet. Lowell Observatory remains there to this day. His optics were far better than Schiaparelli's, and he was no doubt aware of the possibility the canali were illusions. Yet Lowell claimed to not only see the canals clearly, he proposed they were evidence of advanced civilization on the planet. He wrote prodigiously about the subject for popular audiences, which often set him at odds with professional astronomers of the day, none of whom could verify his observations.

The possibility of life on Mars remained in the popular imagination until 1965 when the Mariner 4 spacecraft flew within 10,000 km of Mars and imaged craters on the Martian surface. This was bad news for the prospects of life: craters meant thin atmosphere and little erosion from wind or surface water. The story got more interesting in 1971 when Mariner 9 orbited the planet and captured thousand of images of craters, yes, but also massive volcanoes and what appeared to be dry riverbeds and flood zones, and canyons, one of which was a long as the continental United States. There were no canals: these turned out to be optical illusions that plagued Earthbound telescopic observers.

From 1976 onward, starting with the American Viking landers, planetary scientists have dispatched an array of high-tech orbiter, landers, and rovers to search for evidence of water, methane, and other atmospheric gases and soil components that might give some evidence of life on the planet. None have resulted in any indication of life on Mars, but the geology, geography, and chemistry of the planet have become much better understood.

The planet appears in many images to be remarkably Earth-like, looking much like a rocky desert landscape on Earth, with occasional evidence of winds, frosts, dust storms, and large quantities of frozen water in the polar caps. Much of this water presumably flowed on the surface long ago, creating many of the now dry rivers and canyons we still see. Because Mars is so cold and its atmospheric pressure so low, the water no longer flows and remains trapped in the polar caps and possibly underground.

The Martian Surface

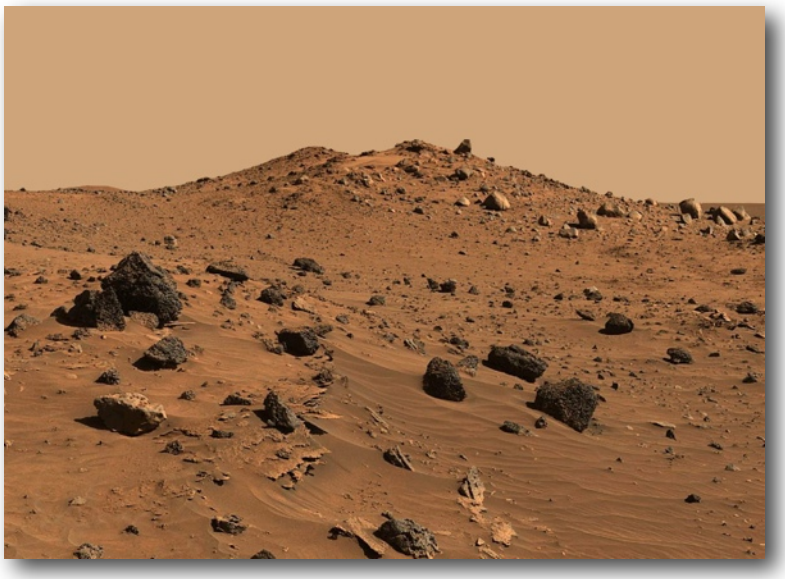
The surface of Mars is classified into two types of regions, the lighter red-orange regions covered with rusty dust and the darker regions which are large areas of exposed volcanic rock. During early days of telescopic observation, the light regions were thought to be continents so they were given names that described land masses. Major regions of this type include Elysium Planitia (the Elysium Plain), Arabia Terra (Land of Arabia), the circular Hellas Planitia (Plains of Greece), and Amazonis Planitia (Amazon Plains).

The darker regions were named after seas, lakes or other watery features. So there is the very large Mare Erythraeum (Arabian Sea) in the south, Mare Acidalium (named after a legendary fountain) in the north, and most strikingly, the large wedge-shaped feature Syrtis Major named after the Gulf of Sidra off the coast of Libya. Syrtis Major is the most obvious dark region on the Martian surface. Many of these dark regions appeared to early telescopic observers to change size during the Martian year. They suspected this was caused by changes in vegetation or rainfall. It turns out the dark regions do not change their dimensions, but instead occasionally are obscured by atmospheric dust. Schiaparelli and especially Lowell noted the region called Solis Lacus (Lake of the Sun), just south of what we now know to be Valles Marineris, seemed to wax and wane with the seasons. Lowell observed many (illusory) canals converging in this region and speculated it was the capital of the Martian civilization. Solis Lacus is a part of what's now called Solis Planum. Observers often remark that these dark regions appear green. They are not... they are grey-brown and simply appear green because of the contrast with the red-orange surroundings.

In some images of Mars from space or from Earth-based telescopes, whitish features are visible. These are usually cloud formations. They are associated with low-lying regions where clouds collect, or in the vicinity of the peaks of volcanoes where warm air rises up the side of the mountain and condenses into clouds.

Oct 2006 Image from Spirit Rover

On Spirit's 1000 Martian day, NASA posted this image (part of a larger panorama available online. Spirit was perched with a tilt to the north to maximize solar energy during Mars' winter. Spirit landed inside Mars' Gusev Crater on Jan. 3, 2004, PST (Jan. 4 Universal Time). It eventually succumbed at the end of May 2011.
Image credit: NASA/JPL/Cornell



Three Objects "Backtrack" Simultaneously

For the next few months, the planet Mars, asteroid Vesta and dwarf planet Ceres are all hanging out for stargazers conveniently located in the same general area of sky.

About one-third of the way from Spica to Arcturus, we have Ceres and Vesta doing a retrograde loop until June and a bit south, nearer to Spica, the planet Mars is doing the same thing. The approximate centre of the asteroids' loop is the third magnitude star ζ-Virgo (zeta-Virgo), or Heze, which is basically the central star of the constellation Virgo. Both Ceres and Vesta perform retrograde motion in March, April and May and resume forward (eastward) movement in early June. Ceres was brightest at opposition Apr 15 at magnitude 7.0 and Vesta outshone it at opposition on Apr 13 at magnitude 5.8.

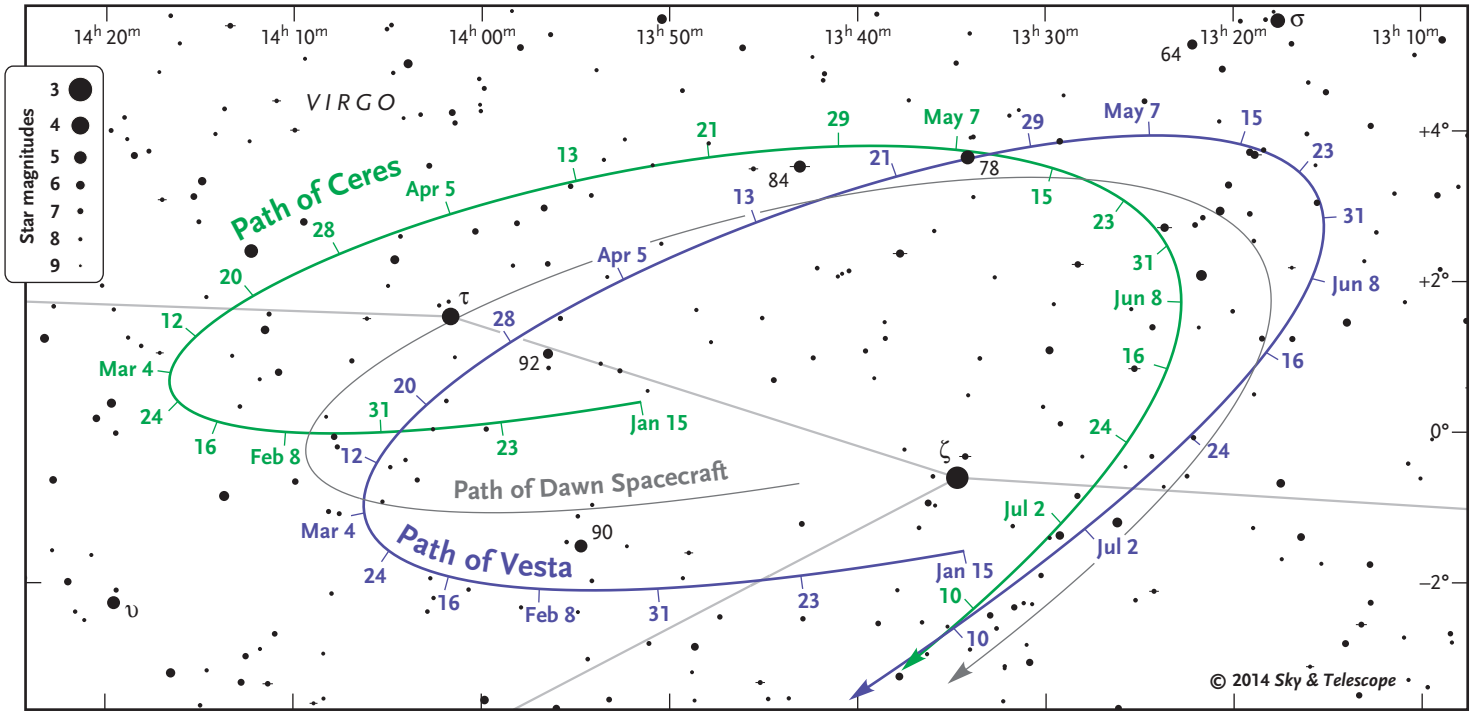
Mars' retrograding completes the triple feature! From March 1 to May 21, the Red Planet performs its backward loop in the sky and all three can be captured with a medium telephoto lens (I use an 85 mm on my Canon 60Da.) There are lots of opportunities to take images, as the trio are well-placed in the sky all spring, -even in July they are still above the horizon in the west at dark.

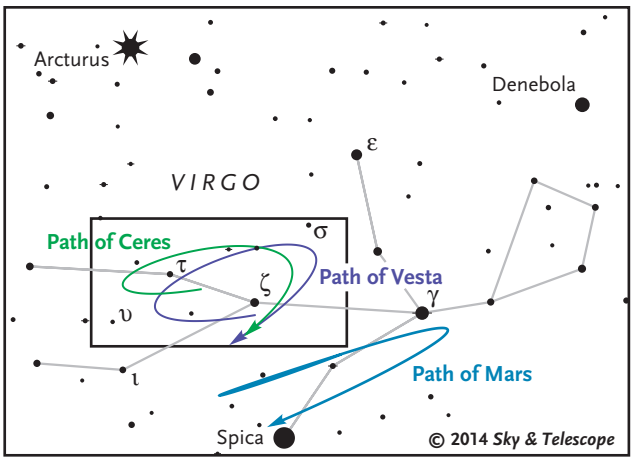
Even more remarkably, Ceres and Vesta's path cross at nearly the same time in mid-July. Note that only there do the dates correspond exactly. Around July 5 or so, Ceres and Vesta are about 10 minutes of arc apart! That puts them into the FOV of a 200X eyepiece in a typical f/10 Schmidt-Cassegrain telescope! This event will be described in detail in the June issue of SGN.

Retrograde Motion Explained

Retrograde motion is an illusion produced by the fact that Earth moving faster in its orbit catches up to the the outer planets (and asteroids) and passes them "on the inside of the curve". it happens one a year for all superior (outer) planets. Imagine passing a car on a curve, -the backwards motion of the slower car is entirely due to the fact that you are going faster.
The motion of interior planets is trickier to visualize but they retrograde as well. Here is an applet written by Daniel V. Schroeder http://physics.weber.edu/schroeder/sky/WholeSkyApplet.html

Meanwhile, the star chart from S&T below (also available on our website) will guide you in locating Ceres and Vesta over the next few months. Note that the chart also shows the path of the Dawn Spacecraft which is due to go into orbit around Ceres in Feb, 2015. Images of Dawn's previous visit to Vesta can be found here: http://dawn.jpl.nasa.gov/



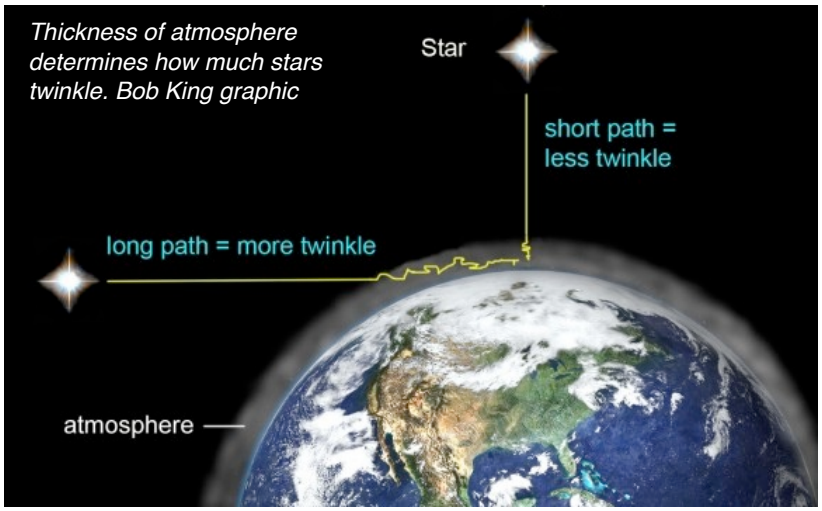


Ceres and Vesta
January 15 – July 10, 2014

The tick marks are for 0 hours Universal Time on the dates indicated. This moment falls on the evening of the previous date in the time zones of the Americas.

Sirius, UFO trickster

by BOB KING *on* MARCH 23, 2014 Universe Today



Thickness of atmosphere determines how much stars twinkle. Bob King graphic

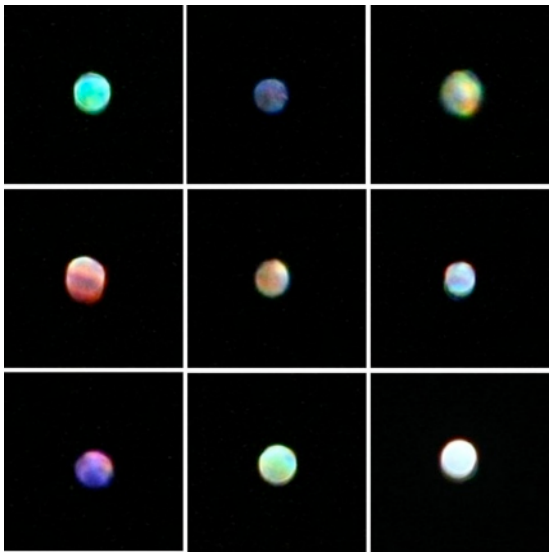
For all the hours of dark sky time amateur astronomers accumulate, few of us have seen a UFO. It makes sense. We're generally familiar with the stars and their movements, where the planets happen to be and the atmosphere's uncanny ability to distort and parse light into strange and beautiful phenomena. Not that some skywatchers haven't seen a few things that defy immediate explanation.

While some might say this takes away the magic of the night sky, rendering us blind to the possibility of UFOs, I'd argue the contrary. Knowledge deepens our appreciation of all we see, hear, smell and touch.

Familiar objects often mistaken for UFOs include bright stars, planets and satellites, but high – if not highest – on the list is Sirius in the constellation Canis Major the Greater Dog.

Sirius has attained UFO status for several good reasons: at magnitude -1.5 it's the brightest star in the sky, it "moves" both slowly and rapidly and shoots out light of different colors. Because it's bright, and for many of us, falls along an easy line of sight on Spring evenings, we're bound to notice it. No star sparkles more intensely especially when hovering low in the sky.

Stars. So big but yet so tiny. Despite their enormous size, distance reduces stars to tiny pinpoints even in the largest telescopes. When a star beam hits our atmosphere, it gets yanked around by parcels of air of varying density, speed and size. Each parcel acts like a individual lens, refracting or bending the star's light into a tiny image. As the air churns overhead, the positions of all those individual images continually change, zigging the star in random directions. While our eyes aren't keen enough to distinguish the many tiny images moving to and fro, we sense the starlight's tortured path as sputtering light or twinkling. All stars flitter around – just ask telescopic observers – but twinkling is most noticeable in bright stars like Vega, Canopus, Rigel and especially Sirius.


Bob King's defocused Sirius images show colours

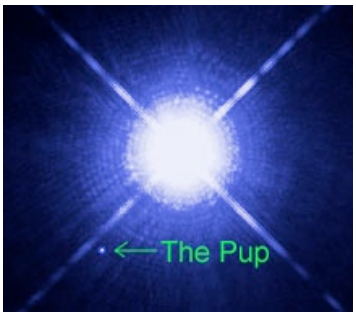
Mind you, it doesn't necessarily matter how calm it is on the ground. Some 10 miles of relatively thick air between you and Sirius provide plenty of opportunities for fluttering images on many otherwise tranquil nights. Bright planets generally don't twinkle because they're close enough to show actual *disks*. Tiny shifts induced by atmospheric turbulence can bodily move a star with ease, but planets are big enough compared to the size of the air cells to hold their own and beam forth a steady light.

For some, Sirius' twinkling creates the sense that a star is moving or shooting about, making it that much more mysterious. Superimposed on this apparent rapid movement is the slow westward drift of the stars caused by Earth's rotation. People have contacted me about brilliant, slow-moving objects, and it's clear they've been watching a star get a free ride from our revolving planet.

So we've got brightness and movement going for us – what about color? Colors come from the air, too. Just as white light is composed of a rainbow or spectrum of individual colors from indigo to red, so is starlight. When Sirius is low above the horizon, refraction (bending of light) is strong enough to create images of the star in every color of the rainbow and cast them about in different directions. Split-second variations in air density and flow make for continuous multi-color sparkles. Sirius' colors are fairly obvious with the naked eye, but I've found binoculars show them even better. By the way, the jerkiness induced in holding binoculars steady adds another motion factor to the UFO equation.

Once, a fellow came to our local planetarium with video he'd taken of a UFO, hoping for help in identifying the object. We watched it change from a star to a bloated disk and back to a star again as the image jumped wildly about in the shaky, hand-held camera. Knowing the date and time of the footage, we instantly knew it was the camera struggling to maintain autofocus on Sirius.

I remember thinking, "wow, we really helped this guy out", but he was less than pleased. We tried to explain that he was seeing not only the brightest star in the sky but one twice as massive as the sun and nearly twice its size. But facts were of no use. Convinced he had recorded a UFO anyway, he took his video and promptly left!



Sirius A and B NASA image

I'd love to see a real space ship UFO powered by alien biology. Deep down many of us suspect they exist. With 1,779 extra-solar planets confirmed to date, habitats for potential life seem more certain than ever. But what are the odds of little green men dropping by anything soon? Not only are the distances between stars daunting, but intelligent species may have no interest in outer space or leaving the home planet. After all, whales don't build space ships.

Bob King

I'm a long-time amateur astronomer and member of the American Association of Variable Star Observers (AAVSO). My observing passions include everything from auroras to Z Cam stars. Every day the universe offers up something both beautiful and thought-provoking. I also write a daily astronomy blog called Astro Bob.

Bootes

α-Bootis - Arcturus β-Bootis - Nekkar
γ-Bootis - Seginus ε-Bootis - Mirak or Izar (also Pulcherrima)
η-Bootis - Murphrid μ-Bootis - Alkalurops

Bootes is an easily recognized constellation resembling a huge kite. Arcturus, its brightest star, has a magnitude of 0.2 and is the 6th brightest star visible in the sky. Arcturus can be located by following backwards the curve of the Big Dipper handle; the curved line connecting these stars extended about 30° will lead your eye to Arcturus. It is a giant star about 80 times as bright as the sun and is 32 light years away. δ Bootis is a fieldglass double; θ Bootis lies in an attractive field. [More recent Hipparcos values for Arcturus give distance = 36.7 ly, size = 25.7 suns and luminousity = 170 suns. -ed]

Double Stars

Star	Mag.	Sep'n (s)	Location	Remarks
δ	3.5-7.5	105	151434	Yellow-Blue.
ε	2.5-5.0	3	144327	Orange-Green; beautiful object.
ζ	4.6-4.6	1.2	143914	
ι	4.8-8.8	38	141551	Yellow-White.
κ	4.6-6.6	13	141252	White-Blue; very fine.
μ	4.5-6.7	108	152337	
ξ	4.8-6.9	7	144919	Yellow-Purple; good contrast.
π	4.9-5.8	6	143817	Both White.
39	6.1-6.8	3	144849	Fine color contrast.
44	5.3-6.1	3	150448	Binary.
Σ1785	7.2-7.5	3	134727	
Σ1835	5.6-6.8	6	142109	
Σ1850	6.1-6.7	25	142628	Yellow-Blue.
Σ1919	6.1-7.0	24	151119	Yellow-White.

Objects of Interest in Bootes (Boo)

R Bootis - Long period (223 days) variable, maximum magnitude 7.2. Location 143527.
V Bootis - Long period (258 days) variable, maximum magnitude 7.9. Location 142739

Corona Borealis

α-Coronae Borealis -Gemma β-Coronae Borealis - Nusakan

Corona Borealis is a very attractive semicircular group of stars between Hercules and Bootes, all the stars being of the 4th and 5th magnitudes with the exception of Gemma, the "Pearl of the Crown." There are a relatively large number of variable stars in this constellation; two of them, both irregular variables, are especially interesting. R Coronae (Location 162132) remains for months and sometimes years as a 6th magnitude star; then, for no apparent reason. it will decrease rapidly to the 12th or 13th magnitude. T Coronae is even stranger; normally a 9th magnitude star, in May 1866 it suddenly became very bright, reaching the 2nd magnitude. In 1946 it suddenly brightened again to the 3rd magnitude, only to fade again to its original brightness. It belongs to a special group of stars known as recurrent novae.

Double Stars

Star	Mag.	Sep'n (s)	Location	Remarks
ζ	5.1-6.0	6	153837	Greenish White-Green.
ε	6.0-7.0	0.8	152131	
ν	5.3-5.4	371	162034	Both Golden.
σ	5.8-6.7	5	161334	
Σ1964	7.3-7.4-8.8	15-2	153737	Triple.
23	6.3-8.8	35	162132	

Neither Bootes or Corona Borealis contain any Messier objects.

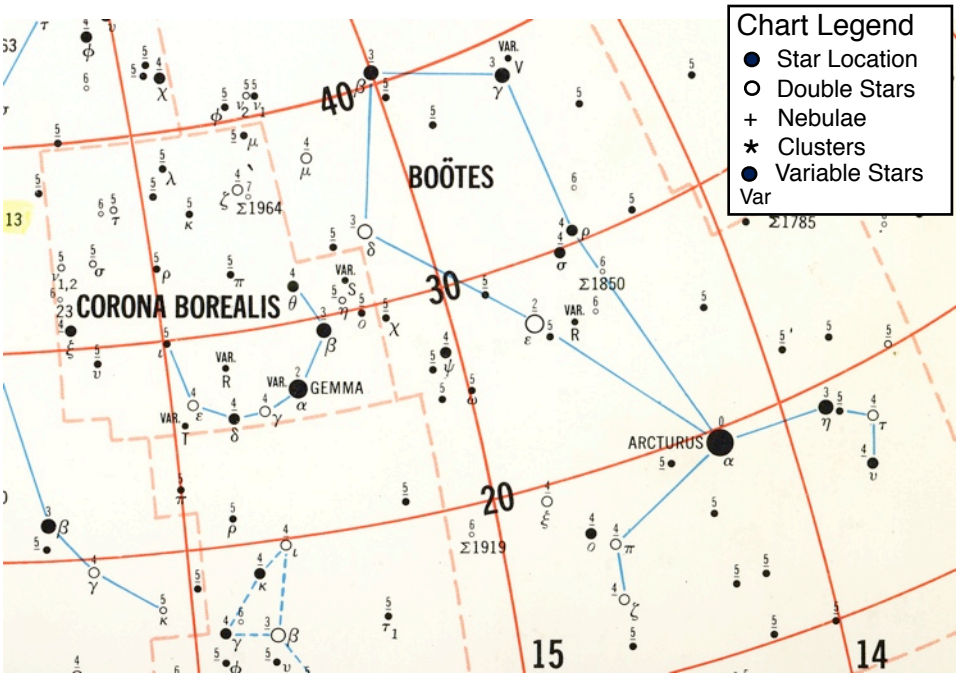
Arcturus: World's Fair Star

Arcturus is a rather famous star for several reasons but not because it is an orange giant about 26x larger than the sun, about 180 x the sun's luminousity, a slightly variable star and may have a stellar companion or two. The star achieved notoriety when its light was "used" to open the 1933 Chicago World's Fair. It was thought that light from Arcturus had started its journey at the time of the previous Chicago World's Fair in 1893, 40 years previously. The figure was off a bit (distance = 36.7 ly) but the lights were to go on when a photocell detector at a telescope at four observatories in the area (Yerkes included) detected the light from Arcturus. The signal was sent as they detected it (supposedly) and an elaborate display showed the light arriving from each telescope and presto, the big searchlight went on. Later, another story came out that a local telescope actually did the deed as a backup. [Or maybe somebody just threw the switch -ed].

α-Bootis: "Runaway Star"

Arcturus, aka α-Bootis (and Sirius, α-Canis Majoris) are also notable for their high proper motions. Several early star charts were accurate catalogues of stellar positions and Ptolemy's "Almagest" is the oldest and best in this regard. But the modern location of Arcturus (one example), shows a measurable change in its location. It appears Arcturus has a large "proper motion" through the sky of 2.281 arc-sec per year (122 km/s or 440 000 km/h!). In the interval since Ptolemy's catalogue, Arcturus has travelled over 1.25°, only exceeded by the nearest stars in the α –β-Proxima Centauri group. But, because Arcturus is 37 ly away, vs only 4.3 ly, its actual space velocity is much higher,-the highest known. No wonder it is called the "Runaway Star".

The figure of Bootes, now described as being kite shaped, will change into more of an ice-cream cone over the next few thousand years. To compare, it would take 100 000 years for the Big Dipper asterism to change as much. Arcturus is actually cutting through the galactic disk in a perpendicular direction and is not alone in this since about 50 other stars of the Arcturus Stream are doing the same thing.



Times for events below are given in DST

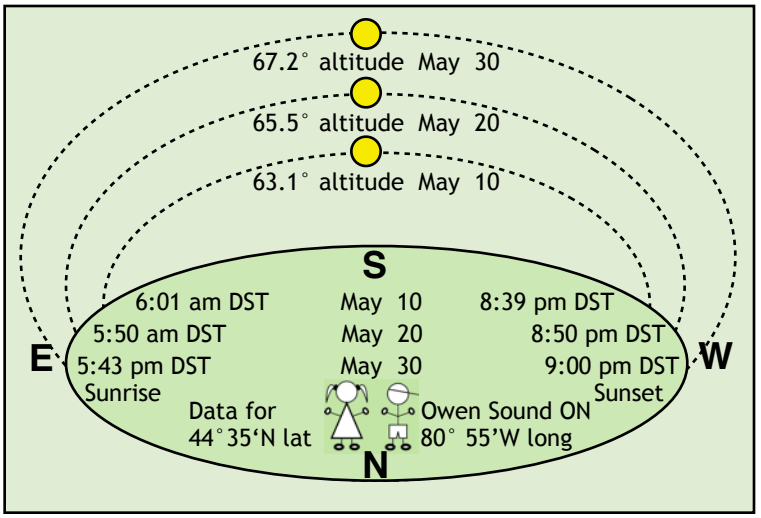
May 01 10:51 Aldebaran 2.0°S of Moon
04 09:02 Jupiter 5.5°N of Moon
06 03:00 Eta-Aquarid Meteor Shower (60/h, Moon 42% wax)
06 05:22 Moon at Apogee: 404 319 km
22:15 **FQ MOON** rises locally at 12:24 pm DST
08 04:43 Regulus 5.2°N of Moon
10 13:00 **Saturn at Opposition Mag 0.06**
11 08:32 Mars 3.0°N of Moon
12 07:47 Spica 1.7°S of Moon
14 07:41 Saturn 0.5°N of Moon: Occultation (not vis. locally)
14:16 **FULL MOON** rises locally at 8:45 pm DST
18 06:58 Moon at Perigee: 367 099 km
21 07:59 **LQ MOON** rises locally at 1:50 am DST
24 03:00 **New meteor shower from Camelopardalis?** (NM-4), poss.100-400/h? see Secial Events & pg.3
25 02:00 Mercury at Greatest Elongation: 22.7°E
10:43 Venus 2.3°S of Moon (Moon/Venus photo op 5 am)
28 13:40 **NEW MOON** rises locally at 5:52 am DST

BAS Events

May 3 Sat (NM+4) **BAS viewing @Fox** @dark (backup May 10 Astronomy Day).
May 3/4 **AstroCATS** Hamilton Centre RASC hosts astronomy trade show (Sat/Sun). More at www.astrocats.ca.
May 5 to May 11 **International Astronomy Week**
May 7 Wed (FQ) **BAS meeting** Grey Roots Museum 7 pm Astronomy Trivia Night. Fun! Prizes!
May 9 Fri (FQ+2) **Public viewing** Grey Roots Museum 9 pm (Members with scopes, please) backup night May 10 Astronomy Day at the Fox.
May 10 Sat (FQ+3) **Astronomy Day** ES Fox@dark, Moon viewing and Saturn at opposition (mag = 0)
May 24 Sat (NM) Camelopardalid Meteor Shower viewing @Fox
May 26 Mon (NM-2) **Huron Fringe Birders** talk/viewing @ MacGregor Pk, 9 pm or so. Leader: John H. members with scopes requested after dark (note: this event is **not** at the Fox Observatory).
May 31 Sat (NM+3) **BAS viewing** ES Fox@dark (optional viewing)

Planets

MERCURY, is an evening sky object now and reaches its greatest distance from the Sun May 25. It slides 2.5° under the Pleiades on May 7. This is not a bad apparition for northern viewers. **VENUS,** is a prominent Morning Star in the east at magnitude -4.0 but is now on the outer loop of its orbit and growing slightly dimmer. A thin last crescent Moon is less than 3° from Venus on May 25. **MARS** (mag. -0.9) rises before dark near Spica in Virgo. Good Mars viewing continues. **JUPITER**, (-1.9) is about halfway up the SW sky and in good position for viewing. By month-end it is setting around midnight. **SATURN,** (mag 0.0) rises at sunset and is in the sky all night (opposition May10). Ring tilt is still about 22°. Both **URANUS,** (5.7) and **NEPTUNE,** (7.8) are above the horizon at sunrise in the east but not by much. Uranus is less than 1.5° from Venus on May 15. Both **asteroid, Vesta (5.5)** and **dwarf planet**, **Ceres (6.7)** are well placed and bright, look near Mars. Charts are available on the BAS website and pg 10 above. **PLUTO** (mag. 14) is in twilight at dawn presently and near Venus this month, but the viewing time is short before the Sun rises. Pluto finder charts for 2014 are now on the BAS website. Ceres is an easier dwarf planet to spot, however.
The diagram below gives the sunrise/sunset times and the Sun's altitude on three dates this month. The Sun continues to climb in elevation until next month's Solstice.
The May moon phase graphic below shows lunar phases for each night of the month. Times of moonrise for NM, FQ, FM and LQ are given in the Calendar listing above left.



Special Events

Camelopardalids?

This is the abstract from a paper written by Quanzhi Ye and Paul A. Wiegert of the University of Western Ontario to be published in Monthly Notices of the Royal Astronomical Society about the possibility of an intense new meteor shower May 24.

Previous studies have suggested that Comet 209P/LINEAR may produce strong meteor activity on Earth on 2014 May 24; however, exact timing and activity level is difficult to estimate due to the limited physical observations of the comet. Here we reanalyze the optical observations of 209P/LINEAR obtained during its 2009 apparition. We find that the comet is relatively depleted in dust production, with Af {\rho} at 1 cm level within 8 months around its perihelion. This feature suggested that this comet may be currently transitioning from typical comet to a dormant comet. Syndyne simulation shows that the optical cometary tail is dominated by larger particles with {\beta} ~ 0.003. Numerical simulations of the cometary dust trails confirm the arrival of particles on 2014 May 24 from some of the 1798-1979 trails. The nominal radiant is at RA 122° +/-1°, Dec 79° +/-1° (J2000) in the constellation of Camelopardalis. Given that the comet is found to be depleted in dust production, we concluded that a meteor storm (ZHR>=1000) may be unlikely. However, our simulation also shows that the size distribution of the arrived particles is skewed strongly to larger particles. Coupling with the result of syndyne simulation, we think that the event, if detectable, may be dominated by bright meteors. We encourage observers to monitor the expected meteor event as it will provide us with rare direct information on the dynamical history of 209P/LINEAR which is otherwise irretrievably lost.

May 2014

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

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 summer. 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

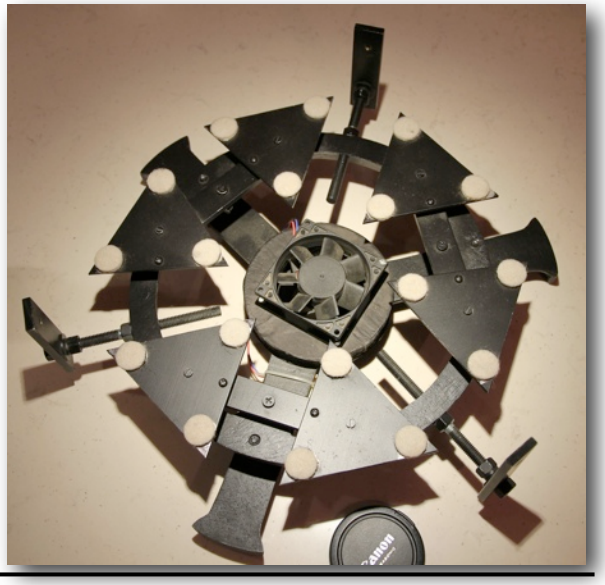
(Now also on our website)

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 ravand@rogers.com

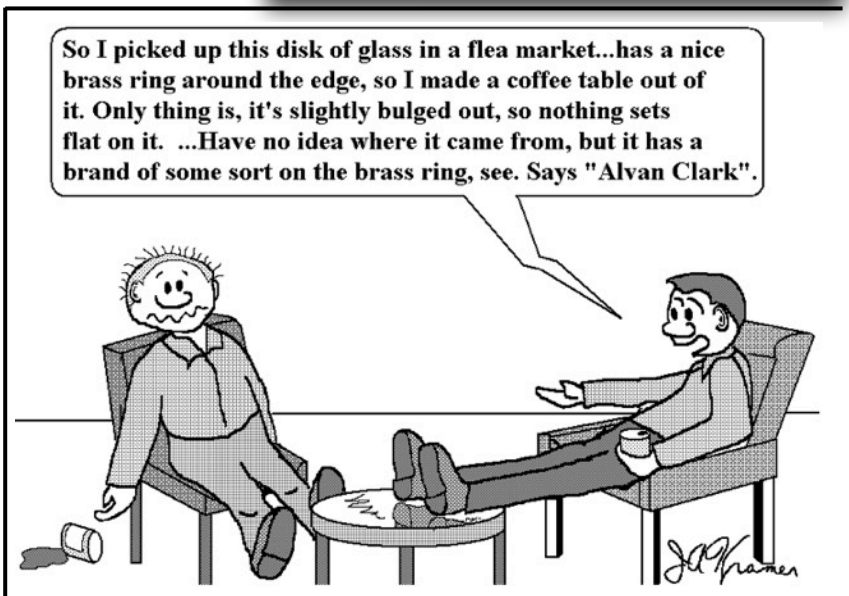
FOR SALE: 16-inch mirror cell

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

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)



This astronomy cartoon is an original drawing by long-time member of the LCAS (Lake County Astronomical Society) and are used with his kind permission. LCAS was founded in Lake County, Illinois in 1982 and they are still going strong.