Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers Feb 2019

Events:

General Meeting :

Monday, Feb 4, 2019 at the Ronald H. Roberts Temecula Library, Room A, 30600 Pauba Rd, at 7:00 PM. On the agenda this month is "*What's Up*" by Skip Southwick, our semi-annual *Show and Tell* and Chuck Dyson will graciously provide us with masticatable goodies and beverage.

Please consider helping out at one of the many Star Parties coming up over the next few months. For the latest schedule, check the Calendar on the web page.

By TVA member Steve Thornton. 400mm f/3.5 Nikon, 8 seconds at f/5.6, ISO 800

WHAT'S INSIDE THIS MONTH:

Send newsletter submissions to Mark DiVecchio <markd@silogic.com> by the 20th of the month for the next month's issue.

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General information:
Subscription to the TVA is included in the annual $25 membership (regular members) donation ($9 student; $35 family).

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Cosmic Comments
by President Mark Baker

I love that we are doing a Club Show and Tell for our February meeting…we have soooo much talent in so many areas and I somewhat selfishly want to bask in those abilities. There should be some awesome imaging shared, and hopefully astrophotography as well, but it's great when a favorite scope, especially home made / modified, is presented and explained…we never know from where inspiration may come!!! Even cell phone photos have become a qualitative staple, but not by me…cameras and I have both agreed long ago to avoid each other where possible!!!

Such events as our Outreach efforts and meetings like these serve to solidify the pride I have in being part of this organization…and I hope this is the year where the Club may just be able to support any desires to learn and improve across all Astronomical arenas by developing our own observatory complex. I thrill at the thought of having a local facility where observing, imaging, photography, spectroscopy, and most importantly, learning can all occur in one place. We just need to make it happen…more to come on this I assure you!!!

And did I mention my pride in associating with you all?? So here's to you and all you do…

Clear, Dark Skies my Friends…

Looking Up Redux

compiled by Clark Williams

from these sources:
SeaSky.org
Wikipedia.com
in-the-sky.org
The American Meteor Society, Ltd.
cometwatch.co.uk
NASA.gov
TVA App (2.0.1296)
FullAndNewMoon App (2.0)
Starry Night Pro Plus 7 (7.6.3.1373)
SkySafari 6 Pro (6.1.1)
Stellarium (0.18.2)

ALL TIMES ARE LOCAL PST WILDOMAR/MURRIETA/TEMECULA

Times are given in 24-hour time as: (hh hours, mm minutes, ss seconds)
hh:mm:ss or hhmmss
hhmm+ (time of the next day)
hhmm− (time of the previous day)
hhmm (seconds not shown)

Moon Phases for the month by date:

Monday the 04th @ 1304 NEW in Capricornus
Tuesday the 12th @ 1427 FIRST QTR in Taurus
Tuesday the 19th @ 0754 FULL in Leo
Tuesday the 26th @ 0328 THIRD QTR in Ophiuchus

Apogee comes on 2019-02-05 @ 0128 – 406, 555 km (252, 622 mi)
Perigee comes on 2019-02-19 @ 0107 – 356, 761 km (221, 681 mi)
2019 has: (13) new moons, (12) 1st Qtr moons, (12) Full moons, (12) 3rd Qtr moons
(0) Blue moons and (1) Black moon

Daylight Savings: (Pacific time is Timezone Uniform -8 GMT [-7 GMT PDT])
A great deal of procedural work is required before CA begins observing permanent Daylight Saving. Until then we remain on our previous date changes.
Starts: **2019 MAR 10 Sunday 0200 PST**
Ends: **2019 NOV 03 Sunday 0200 PDT**

Luna: Luna will rise late on the first, peeking above the horizon about thirty minutes past four in the morning. Luna is heading toward new on the 4th of the month so you should have some dark nights until mid-month when Luna has gotten around to rising about noon-thirty-two local time. And won't be setting until 0155+. By the end of the month we're deep into the third-quarter and dark night viewing will be back. In fact on the 28th Luna has hit the pillow by noon-forty-four and you will have a full dark night for viewing. There is a “supermoon” on the 19th so look for the big red “S” on Luna and say “Kal-El”.

Highlights: (distilled from SeaSky.org and Clark's planetary Orrey program[s])

4 February: Evening – **New Moon.** This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

15 February: Dark Skies Evening. The Delta Leonids (DLE) See February 25th below.

19 February: Evening - Full Moon. This full moon was known by some early Native American tribes as the *Full Snow Moon* because the heaviest snows usually fell during this time of the year. Since hunting is difficult, this moon has also been known by some tribes as the *Full Hunger Moon*, since the harsh weather made hunting difficult. The second of three supermoons for 2019, the Moon will be at its closest approach to the Earth and may look slightly larger and brighter than usual. (**http://SeaSky.org/**)

25 February: Dark Skies All Night. The meteor shower The Delta Leonids (DLE), occurs between Feb 15 - Mar 10 with the peak occurring on the Feb 25 every year. The meteor shower peaks on the 25th of February every year. The source of the meteor shower is Tempel-Tuttle. The closest star to the radiant point of the meteor shower is Zosma. The coordinates are at α: 168° and the δ: 16°. (http://SeaSky.org/)

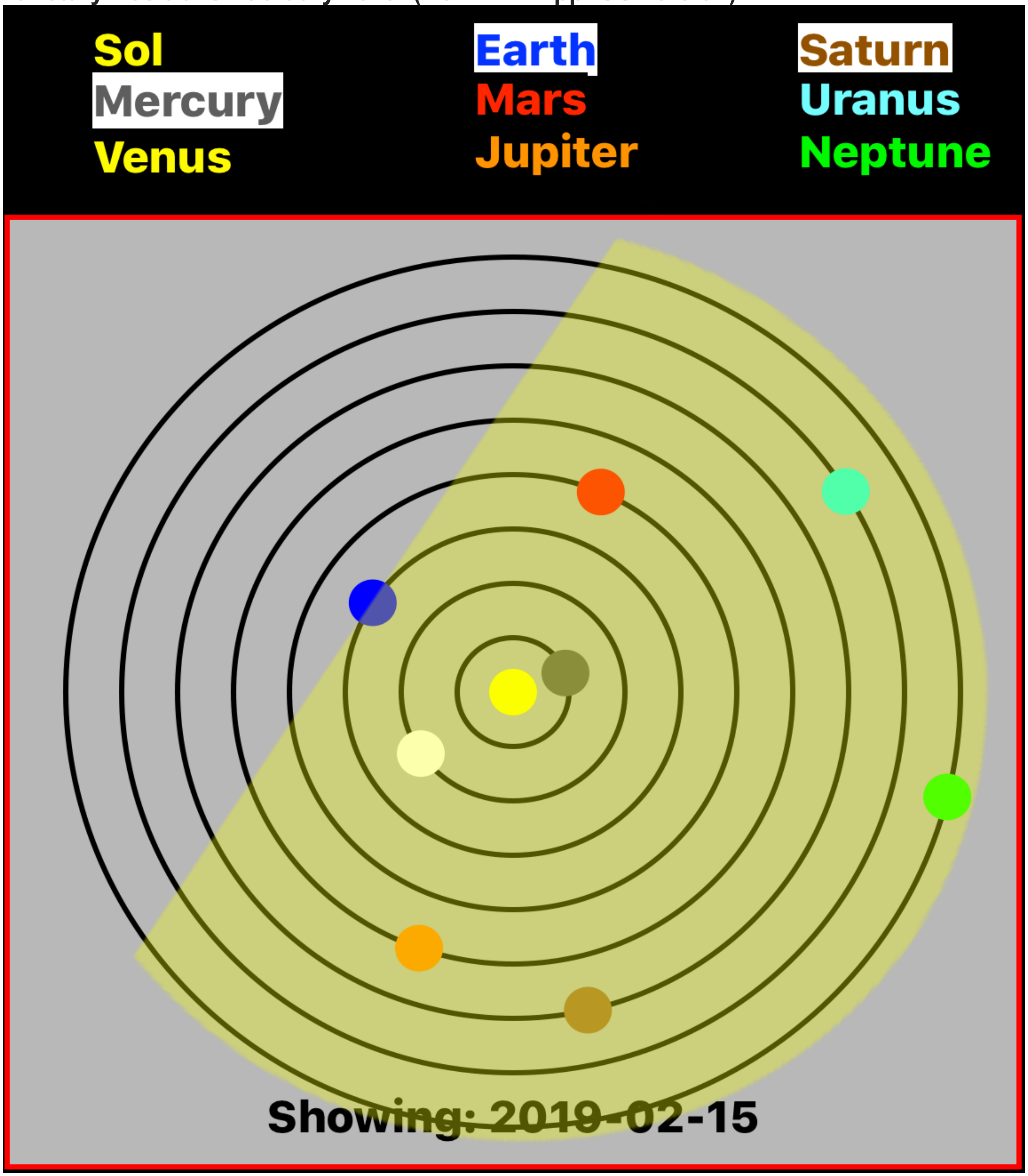
27 February: Before Sunrise - Mercury at Greatest Eastern Elongation. The planet Mercury reaches greatest eastern elongation of 18.1 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the evening sky. Look for the planet low in the western sky just after sunset. (http://SeaSky.org/)

Algol minima: (All times PST)

02/01/19	0006
02/03/19	2055
02/06/19	1745
02/09/19	1434
02/12/19	1123
02/15/19	0813
02/18/19	0502
02/21/19	0151
02/23/19	2241
02/26/19	1930

Planets:

Planetary Positions February 2019: (from TVA App iOS version)



Mercury: The Winged Messenger is lost to the glare of the Sun all month. That is the sun rises before Mercury all month. By the 27th Mercury is at its longest elongation and begins heading back toward the sun. You'll have to wait until about mid-month March before Mercury emerges into the morning sky before Sol.

- **Venus:** Is the Morning Star. Your best bet in the beginning of the month is between 0355 and 0630. By mid-month this has not changed much with viewing between 0410 and 0625. By the end of the month you'll have 0422 until about 0610.
- **Mars:** Mars is still visible this month rising on the first in the midmorning at about 0953. Transiting by 1620 and not setting until 2308. Mid-month finds Mars visible about the same time and setting around 2300. You will have a Waxing Gibbous Moon to contend with however about 60% illuminated. By the end of February Mars will be rising during daylight and transiting before Astronomical Dusk but doesn't set until 2230. And the moon will be back where it belongs; so as to set by noon.
- **Jupiter:** Jupiter is also a morning object rising at 0306 but lost to the glare of the Sun by 0630. By mid-month Jove will be visible between 0227 and sunrise. It will be rising before Venus. Come the end of the month Jupiter will rise by 0141 and will be stunning until Sol rises to spoil the fun.
- **Saturn:** Saturn still sits between Venus and Sol and as such remains a morning object. The start of February you'll find the ringed wonder in the early morning sky rising about 0506 and remains visible until sunrise. Saturn is rising in the early morning about 0420 by mid-month waiting for sunrise about 0632. By the end of the month you'll get a little longer view of Saturn as it rises at 0330 and won't get washed out until about 0617.
- **Uranus:** Uranus is still a good visual find and somewhat challenging. On the first Uranus will become visible by sunset at 1721; Uranus will set around 2321. Uranus is trailing Mars to the east about 7° 13'. On the 12th of February at 1754 Mars and Uranus will be separated by only 0º 58'. The moon will be in 1st qtr and about 53% illuminated. But it is 26º 52' to the east of Uranus. By mid month Uranus will be more difficult to find with the Waxing Gibbous Moon shining at 60% illuminated. Still you should be able to find it before it sets at 2231. By the twenty-eighth the moon is once again near the sun and you'll be able to find Uranus from sundown until about 2139.
- **Neptune:** Neptune is still visible but will be a real challenge for small scopes as it is +7.9 but only 0.2 arcseconds. The first of the month finds the blue jewel setting about 1952 with a sunset of 1721. By mid-month the set time has decreased to 1903 and by the end of the month knock off almost two hours to find Neptune setting by 1811. Like I said a challenge.
- **Pluto:** Pluto is gone until about the 14th when you can find Pluto rising at 0444 but the sun not rising until 0638. By the end of the month Pluto rises about 0350 and the sun follows at 0617.

Asteroids:

- Okay. I searched for asteroids in 2019 with a reasonable magnitude; say less than or equal to +10 in February there is nothing except the regulars: Juno, Vesta. Hebe, Eros, Herculina, and TG 387. So consult your local planetarium software or try https://www.asteroidsnear.com/year?year=2019.

Meteors:

- The new Moon on February 25th creates optimum viewing conditions for the Delta Leonids (DLE) meteor shower. The meteor shower occurs between Feb 15 - Mar 10 with the peak occurring on the Feb 25 every year. The source of the meteor shower is Tempel-Tuttle. The closest star to the radiant point of the meteor shower is Zosma. The coordinates are at α: 168° and the δ: 16°.

Comets:

- Comets come in various classifications:
  - 1) Short Period comets – further broken down into:
    - Halley Type: The Halley Types are believe to come from the Kuiper Belt and have periods in excess of 20-years.
    - Jupiter Type: The Jupiter types have a period less than or equal to 20-years.
    - Short period comets may have a near circular orbit or an elliptical orbit. The latter being far more common.
  - 2) Long Period comets – thought to originate from the Oort cloud these comets have periods of over 200 years and have random inclinations around the celestial sphere.
- Unless some bright long period comets are discovered it promises to be a disappointing year for comet enthusiasts. The year begins with a potentially naked eye comet [**46P/Wirtanen**] from 2018, though as it is close to the Earth it will be large and diffuse. The year closes with another close approaching comet but its brightness is uncertain. A long period comet that reaches perihelion in 2020 should be within small telescope range at the end of the year. Not much is visible in between! (https://www.ast.cam.ac.uk)
- **46P/Wirtanen** – discovered photographically on February 17, 1948, by the American astronomer Carl A. Wirtanen. The plate was exposed on February 15 during a stellar proper motion survey for the Lick Observatory. Due to a limited number of initial observations, it took more than a year to recognize this object as a short-period comet (Wikipedia). The magnitude is only +14.

Deep Sky:

Note: **L/Z is an abbreviation for ALT/AZ | R/D is an abbreviation for Right Ascension/Declination | α is right ascension | δ is declination. In each case, unless otherwise noted, you should look for the following on or about the 15th Day of February 2019 at 2100 PST and you will have about 20 minutes of viewing time total.**

Lets look for some more unusual objects:

- **NGC 4565**– AKA The Needle Galaxy or C38 – is an edge-on spiral galaxy about 30 to 50 million light-years away in the constellation Coma Berenices. It lies close to the North Galactic Pole and has a visual magnitude of approximately 10. It is known as the Needle Galaxy for its narrow profile. First recorded in 1785 by William Herschel, it is a prominent example of an edge-on spiral galaxy. NGC 4565 is a giant spiral galaxy more luminous than the Andromeda Galaxy. Much speculation exists in literature as to the nature of the central bulge. In the absence of clear-cut dynamical data on the motions of stars in the bulge, the photometric data alone cannot adjudge among various options put forth. However, its exponential shape suggested that it is a barred spiral galaxy. Studies with the help of the Spitzer Space Telescope not only confirmed the presence of a central bar but also showed a pseudo-bulge within it as well as an inner ring. NGC 4565 has at least two satellite galaxies, one of which is interacting with it. NGC 4565 is one of the brightest member galaxies of the Coma I Group. (Wikipedia)
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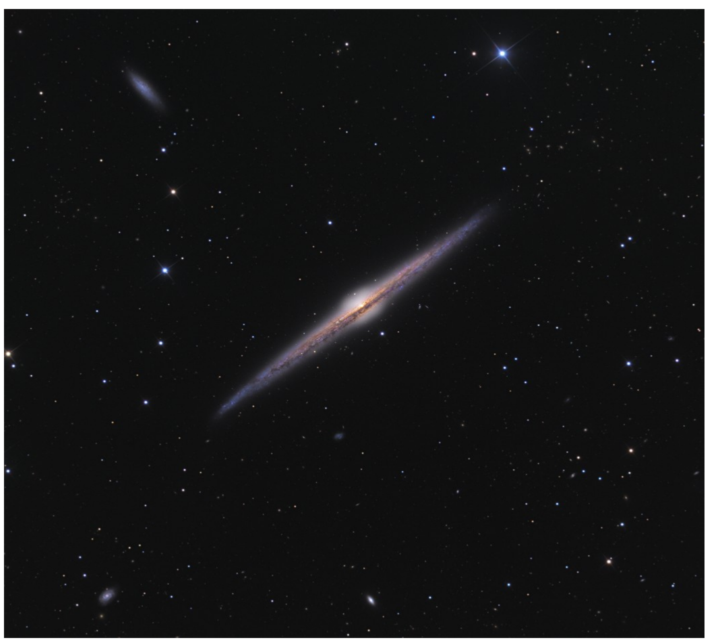
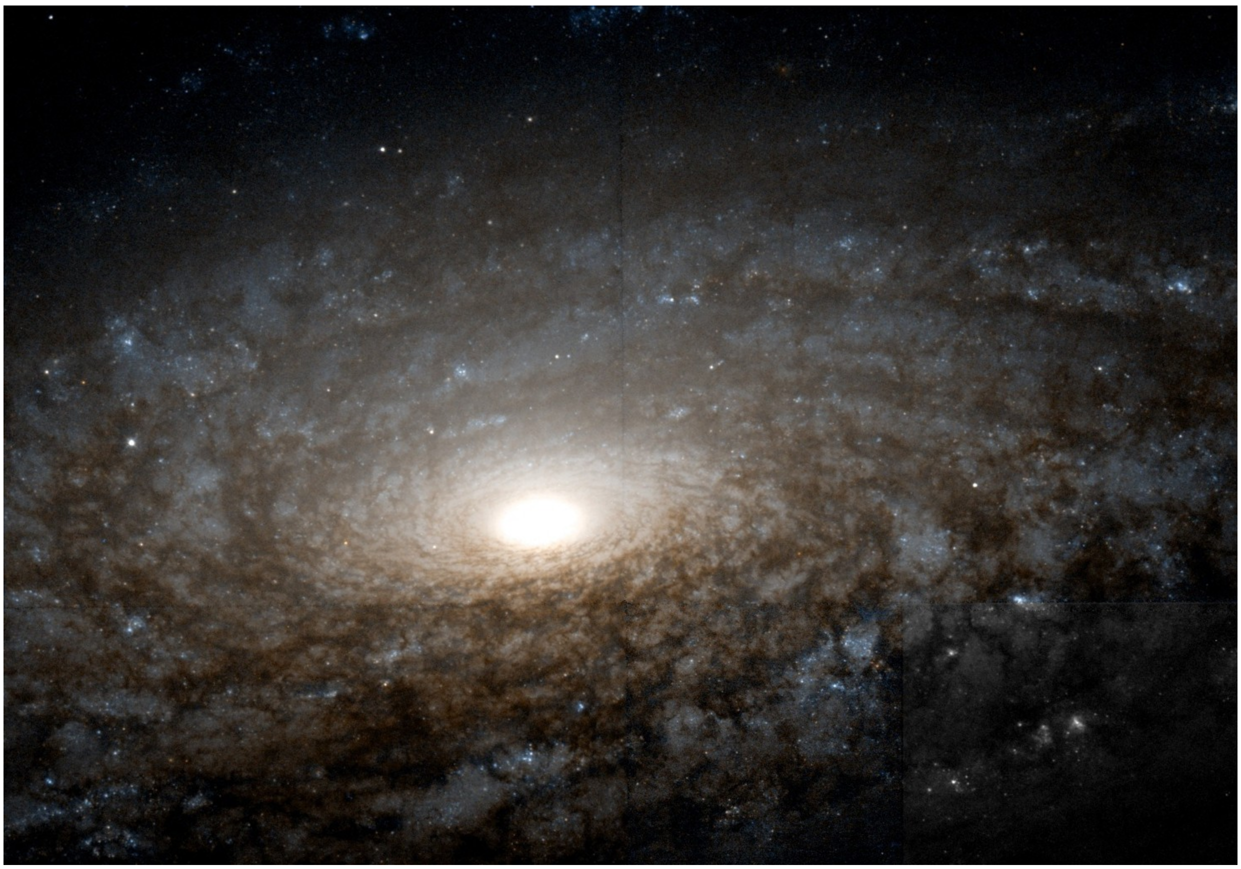


By Ken Crawford - http://www.imagingdeepsky.com/Galaxies/NGC4565/NGC4565.htm, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=29883206

- **NGC 2392** – AKA The Eskimo Nebula or C39 or The Clown Face nebula is a bipolar double-shell planetary nebula (PN). It was discovered by astronomer William Herschel in 1787. The formation resembles a person's head surrounded by a parka hood. It is surrounded by gas that composed the outer layers of a Sun-like star. The visible inner filaments are ejected by a strong wind of particles from the central star. The outer disk contains unusual, light-year-long filaments. NGC 2392 lies more than 2,870 light-years away, and is visible with a small telescope in the constellation of Gemini. (Wikipedia)

By NASA, ESA, Andrew Fruchter (STScI), and the ERO team (STScI + ST-ECF) - http://www.spacetelescope.org/images/heic9910a/, Public Domain, https://commons.wikimedia.org/w/index.php?curid=52133

- **NGC 3521 –** is a flocculent intermediate spiral galaxy located around 26 million light-years away from Earth in the constellation Leo. It has a morphological classification of SAB(rs)bc, which indicates that it is a spiral galaxy with a trace of a bar structure (SAB), a weak inner ring (rs), and moderate to loosely wound arm structure (bc). The bar structure is difficult to discern, both because it has a low ellipticity and the galaxy is at a high inclination of 72.7° to the line of sight. The relatively bright bulge is nearly 3/4 the size of the bar, which may indicate the former is quite massive. The nucleus of this galaxy is classified as an HII LINER, as there is an H II region at the core and the nucleus forms a low-ionization nuclear emission-line region. (Wikipedia)



By Own work, - datafile from http://hla.stsci.edu/hlaview.html, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=7806111

February is great for both viewing and imaging. Spend some time outside with your scope. Spring is coming.

For now – Keep looking up.

Random Thoughts
by Chuck Dyson

Sunspots

On December 31st after 221 days of no sunspots I saw two sunspots with my little telescope, yes I did; so, is the world saved from another ice age?

Or, is my thinking that sunspots or the lack of sunspots can cause significant weather changes on Earth just hysterical babble?

Before we dive into the nature and effect of sunspots let's take a look at what people in the distant past and not so distant past think of sunspots. For the Aztecs, sunspots were pocks on the face of the sun god and as this was before Columbus arrived in the New World it couldn't be pocks from small pox so it is possible the sun god had acne.

The Chinese decided around 800 B.C. that sunspots were small stars captured in the solar orb, the reasoning was that because the day is bright and the night dark, the stars had to be much smaller and dimmer than the sun and when they were captured they showed up as dark spots. Even though the stars were small, dim, and insignificant when compared to the Sun they were thought to be messengers for the gods and their number and movement needed to be observed and recorded to see if the messages could be deciphered. Because of their desire to decipher the messages in the sunspots we, today, have at least a partial record of solar sunspot cycles for almost a thousand years.

At the very end of the Renaissance, Christoph Scheiner writing to protect the writings of Aristotle and the dogma of the church that had embraced the writings of Aristotle, which opined that the heavenly bodies were perfect and unblemished in any way, claimed that the sunspots were the disks of planets circling the Sun. Oh poor Scheiner that while defending one concept of Aristotle he had inadvertently acknowledged that that the Sun could indeed have planets circling it and thus invalidated another. Today, of course, we still have different opinions as to what sunspots are. The college liberal arts major will shout, yes they always shout their opinions never just speak, it's a **UFO!!!** The college science major will say it's a thing that freaks out my cell phone.

So let's take a look at what and how we know anything at all about sunspots. The first question that we should answer is how in the heck could the early astronomers look at the Sun to see sunspots and not go blind? The short answer to the question is they did go blind or at least functionally blind from cataracts and macular degeneration but it happened over time and not all at once. Early astronomers looked at the sun at sunrise and sunset and especially on days when there was mist in the air but even with the extra atmosphere and mist there was still a lot of UV light getting through and this caused the ocular damage.

The first real understanding of the sunspots came with Galileo realizing from his rotational measurements that the sunspots had to be structures on the surface of the Sun and that the Sun actually rotated. Things got a little quiet in the field, except for the continued collecting of data and going blind until the 1830's and that's when William Herschel invented his solar wedge and although the wedge dumped 95.4% of the light out the back of the telescope 4.6% was still reflected up into the observers eye and was not a truly safe viewing device until the introduction of neutral density filters between the wedge and the eyepiece, but it was a darn good start.

In the 1840's Rudolf Wolf developed a method for the organized counting of sunspots and even today solar astronomers report their sunspot data in Wolf sunspot numbers so we have a consistent method for counting sunspots from the 1840's to today. The other big event that occurred in the 1840's was Samuel Heinrich Schwabe (sometimes referred to as Heinrich Schwabe) realizing that sunspots varied in number on a sort of a regular basis, a sunspot cycle, he guessed every ten years and that's close to our current estimate of eleven years.

The next big advance in understanding of sunspots came in the 1890's when the astronomy team of Annie Russell Maunder and Edward Walter Maunder noted that there were breaks in the solar sunspot cycle and this appeared to correlate with climate changes on Earth, the Maunder Minimum.

In the early 20th Century a young George Ellery Hale bursts onto the scene and when still a student invents the spectroheiliograph now this allows him to see the spectra of the Sun. As soon as Hale arrives at Caltech he starts building the Snow horizontal solar telescope on Mt. Wilson and in 1904 the world's first permanent solar telescope is born. The Snow telescope, after being debugged, allows Hale to see the solar spectra in fine detail and to focus on sunspots where he sees split spectral lines this is the Zeeman effect and it tells him that sunspots are magnetic bottles; Hale has uncovered the nature of sunspots. Knowing the nature of sunspots still does not tell us how they get to the surface of the Sun. The understanding of the interior workings of the Sun especially the upper 200000 kilometers called the convection zone was not well enough understood until the 50's and 60's to allow astronomers to propose solar models to explain how sunspots functioned.

Ok let's make a sunspot.

Our journey starts in the core of the Sun were it is hot enough and the pressure is high enough that some of the naked protons, that is a Hydrogen atom with its electron stripped off, will have enough energy to fuse themselves into a single nucleus and one of the protons will have a change in quarks and become a neutron and this fusion level banging will continue until we make a Helium nucleus at which time our newly made nucleus gives off a squirt of energy. This energy, a photon, will slowly make its way out of the Suns core and radiative zone to the convection zone. In the convection zone some of the larger atoms that are in the Sun can capture and retain some of their electrons as the pressure at this depth, 200,000 kilometers below the surface, is much less than the pressure at the core and the temperature is a cool 2,000,000 degrees Celsius, these atoms with electrons capture photons more easily than the independent nucleus and electrons do in a plasma so the gas heats up and rises to the surface, photosphere, where some of the photons escape into space as sunlight and the gas cloud cools, sinks back down, and the process starts over.

Oh if it were only that simple, remember that the Sun is rotating and creating its own magnetic field, .3 tesla (T) on average, just for comparison the Earth's magnetic field is .000032 T and the average magnet on your refrigerator is 5,000,000 T, but remember the Sun's magnetic field is ever so much bigger than that refrigerator magnet. The sun has magnetic fields created within the convection zone as well as above its surface. The magnetic fields within the Sun run from pole to pole and like the ocean currents on Earth flow from pole to pole too. Because the Sun is a gas, at least in the regions close to the surface, it rotates at different rates, 25 Earth days at the equator and 36 Earth days at the poles because of this differential rotation running perpendicular to the magnetic field the field is bent and can become quite contorted and as it becomes contorted it gains in field strength. The fields act as though they were giant tubes, one to two Earth diameters and dozens of Earths in length. Eventually the contorted tubes act as giant magnetic bubbles that trap the gases of the convection zone inside of it.

When the magnetic strength of the magnetic tube reaches 10 T, it rises above the photosphere and becomes a prominence if viewed at the suns horizon and a filament if viewed from above the solar surface. Once on the surface of the Sun the excited and energetic gases in the magnetic bubble give off photons and cools just like the gases in a gas cell that is not in a sunspot but unlike a regular gas cell the magnetic bubble prevents the gases from sinking back down and so the cooler gases of the sunspot collect on the surface and emit fewer and longer wave length photons.

Because the sunspots are emitting long wave photons of little energy the sunspots appear black to our eyes and they are definitely cooler than the average temperature of the Suns surface and it would be reasonable to think that with multiple sunspots on its surface the Sun would be cooler and emit less energy than a Sun with no sunspots. Your assumption would be reasonable but wrong because even though the interior of a sunspot, its umbra, is cooler than the average temperature of the Sun, 3,900 Celsius versus 5,500 Celsius, and as the interior gas approaches the magnetic walls of the bubble it is heated by the walls to about 5,000 Celsius, this is the sunspots penumbra, and gases outside of the sunspot but close to the magnetic wall are heated to higher temperatures than the average Sun surface temperature, 6,000 Celsius and more, this is the sunspots bright ring or faculae and the energy emitted by the faculae will more than compensate for the reduced energy emitted by the umbra and penumbra of the sunspot.

A Sun with several sunspots on its surface will emit more solar radiation than a Sun with no sunspots on its surface and so we have now identified a mechanism by which the Sun may influence the average global temperature on Earth. Did the seventy years of almost no sunspots in 1645 to 1715, the Maunder minimum, really cause the Little Ice Age (LIA) and did increase solar activity in 950 to 1215 really cause the Medieval Warm Period (MWP), the evidence that there was increased solar activity comes not from sunspot counts but from increases of two isotopes (Carbon 14 and Beryllium 10) that are produced in increased amounts when there is increased solar activity and from the surviving chronicles of the time that document much warmer weather than normal.

Can we now say that sunspots have and can cause major climate changes on Earth? Unfortunately no, the Earth's climate and what changes it is very complex and absolutely not completely understood. In the case of the MWP it was thought to occur at the end of a warm cycle and its demise may have been aided by some volcanic eruptions, during the warm period and with the invention of a plough that would work in heavy European soils the human population had ballooned and forests had been cleared to plant crops and this resulted in increased Co2 and H2O levels, both greenhouse gasses, when compared to the forest environment.

But all warm things come to an end and when the temperature started to drop, crops failed, people starved and farm land returned to forest possibly helping the trend. If this were not bad enough. in 1257 the volcano Salamas erupted, if we take Mt. St Helens as a 1X volcano then Salamas was a 100X and it was aided by three other volcanoes that were 10X, and this resulted in, as determined by changes of the level of signature isotope levels, a drop in the worlds ocean temperature of 0.6 to 0.7 degrees centigrade.

This sudden change in the earth's ocean temperature could have spurred the development of sea ice which would have reflected more sunlight back into space and enhanced cooling and could have changed the circulation patterns of the ocean currents that also could have enhanced cooling. To make matters even worse in 1348 a world, I should say of the known world at that time, traveler arrived in Europe a bacterium named Yersinia pestis, the Black Death, and around 40 to 50% of the people who had not already starved to death, now died from plague, more farms returning to forest. The consensus view, at this time, is that the changes in solar output may have participated in the global weather changes but may not have been the major cause of it. As solar cycle 24, the one just ending, was much weaker than the average cycle some have argued that we could be entering a new sunspot minimum and we will be able to see if there is climate cooling or a significant pause in global warming, stay tuned for solar cycle 25 starting in 2019.

Do sunspots have any more tricks up their sleeves? Yes two. When sunspots are born the can start out small and then grow. You should also know that sunspots are born in pairs and as they are magnets one spot is positive and the other is negative, also the spots in the northern hemisphere always have an opposite polarity when compared to the spots in the southern hemisphere, a neat way to find the solar equator just look for the area where the polarity shifts and that's the equatorial area.

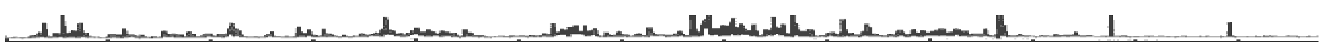
As sunspots grow the magnetic field grows too and occasionally the poles will reconnect and this apparently, and I say apparently because the understanding of the process is a little fuzzy, causes the magnetic field to compress brighten, thus the name solar flare, accelerate particles to very high speeds, and emit radiation in the X-ray and gamma ray range. Flares can last for a few seconds and release relatively little energy or they can last for an hour and release the energy of 10 million Mt. St Helens and if this stream of energetic particles and photons should hit Earth you will know about it in the form of aurora and phone static.

The other trick that sunspots have up their sleeve is called a coronal mass ejection (CME). A solar flare is down at the surface of the photosphere and could be called a magnetic tornado while the CME is up in the corona, and thus the name, and could be called a hurricane, much bigger than the tornado. It was once thought that CMEs were caused by Solar flares but they are now thought to be independent event but often associated, remember a CME is hard to see in the visible spectrum so they were not discovered and understood until the 60's and 70's this makes them a recently discovered phenomenon. A CME just like a flare comes in a wide range of energies and the material ejected from a low energy CME will take three days to reach Earth, if the CME is high energy the material arrives in only one day. If material from a high energy flare and a high energy CME reach Earth at the same time, it gets exciting for example in 1966 the U.S. established the Air Weather Service Solar Forecast Center and the center started issuing weekly space weather reports, in 1967 three X class solar flares went off and were aimed at Earth and the three days later the electrical storm jammed the entire Ballistic Missile Defense System only the space weather report showed that it was a natural phenomenon and not a Russian preemptive jam for a missile strike, WWIII averted.

How about our college students? Were either of their descriptions correct? The **UFO** is a no as none of the monitoring satellites have recorded the presence of spaceships recharging their dilithium crystals and dumping space garbage into the Sun prior to their next interstellar hop. The sunspots freak out my cell phone is also a no because it is not the sunspot per se but its energetic collapse into a flare or a CME that does the dirty work.

Cheers,
Chuck

And as always this work of art is suitable for framing or you can send it to someone that you know who really hates everything science and you would love to annoy.



Hexagon at Night, Quartet in the Morning
By David Prosper

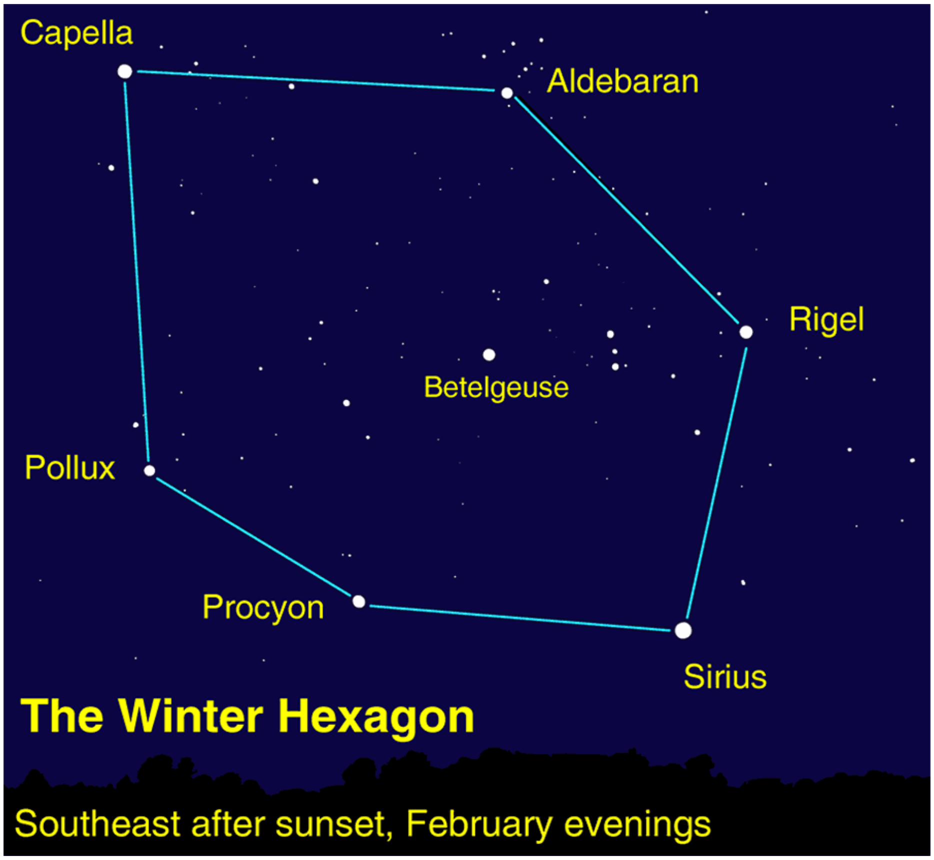
The stars that make up the **Winter Hexagon** asterism are some of the brightest in the night sky and February evenings are a great time to enjoy their sparkly splendor. The Winter Hexagon is so large in size that the six stars that make up its points are also the brightest members of six different constellations, making the Hexagon a great starting point for learning the winter sky. Find the Hexagon by looking southeast after sunset and finding the bright red star that forms the “left shoulder” of the constellation Orion: **Betelgeuse**. You can think of Betelgeuse as the center of a large irregular clock, with the Winter Hexagon stars as the clock’s hour numbers. Move diagonally across Orion to spot its “right foot,” the bright star **Rigel.** Now move clockwise from Rigel to the brightest star in the night sky: **Sirius** in Canis Major. Continue ticking along clockwise to **Procyon** in Canis Minor and then towards **Pollux,** the brighter of the Gemini twins. Keep moving around the circuit to find **Capella** in Auriga, and finish at orange **Aldebaran**, the “eye” of the V-shaped face of Taurus the Bull.

Two naked-eye planets are visible in the evening sky this month. As red **Mars** moves across Pisces, NASA’s InSight Mission is readying its suite of geological instruments designed to study the Martian interior. InSight and the rest of humanity’s robotic Martian emissaries will soon be joined by the Mars 2020 rover. The SUV-sized robot is slated to launch next year on a mission to study the possibility of past life on the red planet. A conjunction between Mars and **Uranus** on February 13 will be a treat for telescopic observers. Mars will pass a little over a degree away from Uranus and larger magnifications will allow comparisons between the small red disc of dusty Mars with the smaller and much more distant blue-green disc of ice giant Uranus.

Speedy **Mercury** has a good showing this month and makes its highest appearance in the evening on February 27; spot it above the western horizon at sunset. An unobstructed western view and binoculars will greatly help in catching Mercury against the glow of evening twilight.

The morning planets put on quite a show in February. Look for the bright planets **Venus**, **Jupiter**, and **Saturn** above the eastern horizon all month, at times forming a neat lineup. A crescent **Moon** makes a stunning addition on the mornings of February 1-2, and again on the 28th. Watch over the course of the month as Venus travels from its position above Jupiter to below dimmer Saturn. Venus and Saturn will be in close conjunction on the 18th; see if you can fit both planets into the same telescopic field of view. A telescope reveals the brilliant thin crescent phase of Venus waxing into a wide gibbous phase as the planet passes around the other side of our Sun. The Night Sky Network has a simple activity that helps explain the nature of both Venus and Mercury’s phases at bit.ly/venusphases

You can catch up on all of NASA’s current and future missions at nasa.gov**.**



The stars of the Winter Hexagon
Image created with help from Stellarium

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