December 2017 **Volume 25 Number 12** **Forsyth Astronomical Society**

YOUNG ASTRONOMERS NEWSLETTER

CONGRESS WARNS NASA THAT DELAYS IN COMPLETING THE SLS WILL ERODE PUBLIC CONFIDENCE

In his opening statement to the space subcommittee on NASA's exploration systems, Rep. Lamar Smith (R-Texas) said that congress needs to have confidence in the ability of NASA to complete the construction of the Space Launch System in a timely fashion. Further delays will erode the public's confidence and financial support.

This statement was given on Nov. 9 and supported by Rep. Brian Babin (R-Texas). Smith's statement came shortly after NASA announced that the Exploration Mission first test launch will have to be delayed from 2017 to 2019, and more likely to June 2020.

The SLS is to be the vehicle that takes humans to the asteroids, the Moon and even to Mars. [Space.com].

LONGLASTING SUPERNOVA HAS ASTRONOMERS RETHINKING THE BASICS OF SUPERNOVA PROCESSES

Astronomers at UC Santa Barbara and Las Cumbres Observatory (the LCO observatory is a network of at least 20 worldwide telescopes controlled by a central robotic controller) discovered in 2014 a supernova whose explosive flash lasted far longer than expected.

The average duration of a supernova blast is about 100 days, but the energy coming from the supernova named iPTF14hls persisted for more than 600 days. And, it grew brighter and dimmer at least five times over three years, according to chief investigator, Lair Arcavi.

Furthermore, it seems likely that this activity was detectable as far back as 1954 and again, possibly between 2010 and 2014. [www.Researchgate.net].

JUNO IS GIVING JUPITER THE ONCE-OVER

NASA's Juno mission to Jupiter is giving us a close look at the amazing dynamics within and around the gas giant. An update on the mission was given in the December issue of Sky & Telescope by Fran Bagenal of the Univ. of Colorado. She is co-chair of the Juno Magneto-spheric Working Group.

You can imagine if you have a massive body with extreme gravitational, magnetic and electrical forces, a rapid (10 hour) rotation to stir up hydrogen, helium, water, ammonia (NH_3), phosphine (PH_3), silica (SiO_2) plus possibly sulfur and carbon compounds, and add millions of years of solar radiation, you'll end up with a complex soup of swirling cyclonic storms, eddies of various colors and behaviors.

Juno used an on-board optical camera (JunoCam), plus various spectroscopic instruments (magnetic, electrical, ultraviolet, infrared, microwave) to survey the planet's atmosphere, while dodging the super-powerful magnetic and electrical fields. Each polar orbit of the gas giant takes about 53 days.

The coloration of the bands and great red spot on Jupiter are likely the result of photochemical products generated by ammonia, phosphine and possibly ammonium sulfide. White regions in the clouds are ammonia crystals.

The deeper we go into the planet, the more dense and hotter it becomes. Gravitational pressure causes the hydrogen to take on a liquid-metallic form, while blobs of helium are forced to float on top. A certain amount of

silica "dust" is dispersed in the gas layers. The latter might have been added to the mix as the result of comet and asteroid collisions.

The metallic hydrogen provides free-flowing electrons that produce an electrically conducting zone. This is the source of the planet's powerful magnetic field.

The turbulence and strong magnetic field produce aurorae at both poles. The energies that drive the auroras are the most powerful in the solar system.

Juno is scheduled to end its mission in February, 2018 by diving into the planet.

JUNOCAM PHOTO OF A MASSIVE STORM IN JUPITER'S ATMOSPHERE FROM A DISTANCE OF 6,300 MILES

NSF TO REDUCE SUPPORT FOR PUERTO RICO'S ARECIBO RADIO OBSERVATORY

The Arecibo Radio Telescope in Puerto Rico suffered only minor damage during Hurricane Maria. Damage was sustained by 15 to 20 (out of thousands) panels in the dish. Repairs should cost from $4 million to $8 million.

However, more serious harm will be coming from a gradual cut-back of financial support from the National Science Foundation.

Up to now, the NSF could be counted on to provide at least $8 million annually. This amounts to about two-thirds of the observatory's budget. But, this will be reduced to $2 million over the next five years.

There will now be a concerted effort to secure agreements with various institutions which could enter into partnership and contribute financial support. Directors are optimistic that the facility will continue to operate.

The Arecibo observatory is the world's second largest radio telescope. It has contributed greatly to our knowledge of deep space structure and it is currently being used to look for potentially habitable exoplanets. [Space.Com].

SUNSPOTS: WE HAVE A LOT TO LEARN

Sunspots, the regions in the Sun's photosphere with higher than average magnetic fields and lower than average temperatures are known to follow cyclic behavior with peak activity roughly every 11 years. But the time frame for rise and fall of sunspot activity is not precise, nor is the degree of activity the same.

We are currently in cycle 24, which began in 2008. It began a year late, and appears to be of lower than average intensity. Activity looks to be the lowest in 100 years. Cycle 25, due to begin in 2020, is predicted to be even more quiet.

The generation of sunspots is believed to be initiated by the dynamics of convection currents in the solar gaseous atmosphere. The currents undergo shear because the regions do not rotate as a joined unit. Gases near the Sun's equator travel at a faster rate than gases located near the solar poles. This stirs up the gases and perturbs the magnetic fields which then causes the pop-up of surface sunspots. However, it is not known what causes some sunspot cycles to be more active than others.

Of concern to us earthlings, is what effect variation in sunspot activity has on Earth's climate. [Astronomy, Dec. 2017].

BIRTHDAYS IN DECEMBER

Isaac Newton (Eng.); b. Dec. 25, 1642, d. Mar. 20, 1727. Astronomer-mathematician. Developed laws of gravity, calculus, invented the reflector telescope, studied diffraction of light.

Tycho Brahe (Dane); b. Dec. 14, 1546, d. Oct. 24, 1601. Danish astronomer-mathematician who created detailed plots of the known planets (prior to the use of telescopes) which were utilized by Kepler (see below) to develop his famous laws of planetary motion.

Annie Jump Cannon (Amer.); b. Dec. 11, 1863, d. Apr. 13, 1941. Astronomer who studied variable stars and established the O,B,A,F,G,K,M classification of star luminosity/temperature. She did most of her work at the Harvard College Observatory. She created the Henry Draper Catalogue of star spectra.

Gerard Peter Kuiper (Amer., Dutch born); b. Dec. 7, 1905, d. Dec. 23, 1973. Studied the atmospheres of the planets. Discovered Saturn's moon, Miranda and Neptune's moon, Nereid.

Johannes Kepler (Ger.); b. Dec. 27, 1571, d, Nov. 15, 1630. Formulated the famous three laws of planetary motion.

Arthur Stanley Eddington (Brit.); b. Dec. 28, 1882, d. Nov. 22, 1944. English astro-physicist, who worked out various laws for stellar pressure-temperature dynamics and utilization of Einstein's theory of relativity.

MOON PHASES FOR DECEMBER: Full: Sun. 12/3; **Last Qtr.:** Sun. 12/10; **New:** Mon. 12/18; **First Qtr.:** Tues. 12/26 The full moon on the 3rd will appear larger than normal, since it coincides with its closest approach. The difference is not much. Only about 7 percent larger. Can you tell the difference?

GEMINID METEOR SHOWER: Peaks during the morning of the 14th. Total active period ranges from the 4th to the 17th. The moon should not be much of a problem during this time period.

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THE PLANETS DURING DECEMBER: Mercury and Saturn are low in the southwest, right after sunset. They will be difficult to spot in the glow of the setting Sun. **Mars** rises in the east around 3 a.m. and **Jupiter** comes up about an hour and half later. For early risers, keep watching the eastern sky, since **Mercury** reappears late in the month. So, on New Year's Eve morning, you might be able to see Mercury, Jupiter and Mars. But you need an unobstructed view of the low eastern horizon, and, of course, you need clear skies.

WINTER SOLSTICE ON THE 21ST: The tilt of the Earth's axis causes the Sun to shine more directly on the southern hemisphere; making it summertime in Australia but the start of winter for us in the northern hemisphere. But take heart; from the 21st onward, we will be getting more and more minutes of daylight each day.

Check the winter sky map on page 4. It can help you find the winter constellations. Look for Orion the Hunter and Sirius the dog star in Canis Major. It is the brightest star in the whole sky at magnitude -1.4. You can't miss the star cluster, Pleiades, like a flock of mosquitos on the shoulder of Taurus the Bull.

Have a great holiday season! Bob Patsiga; editor

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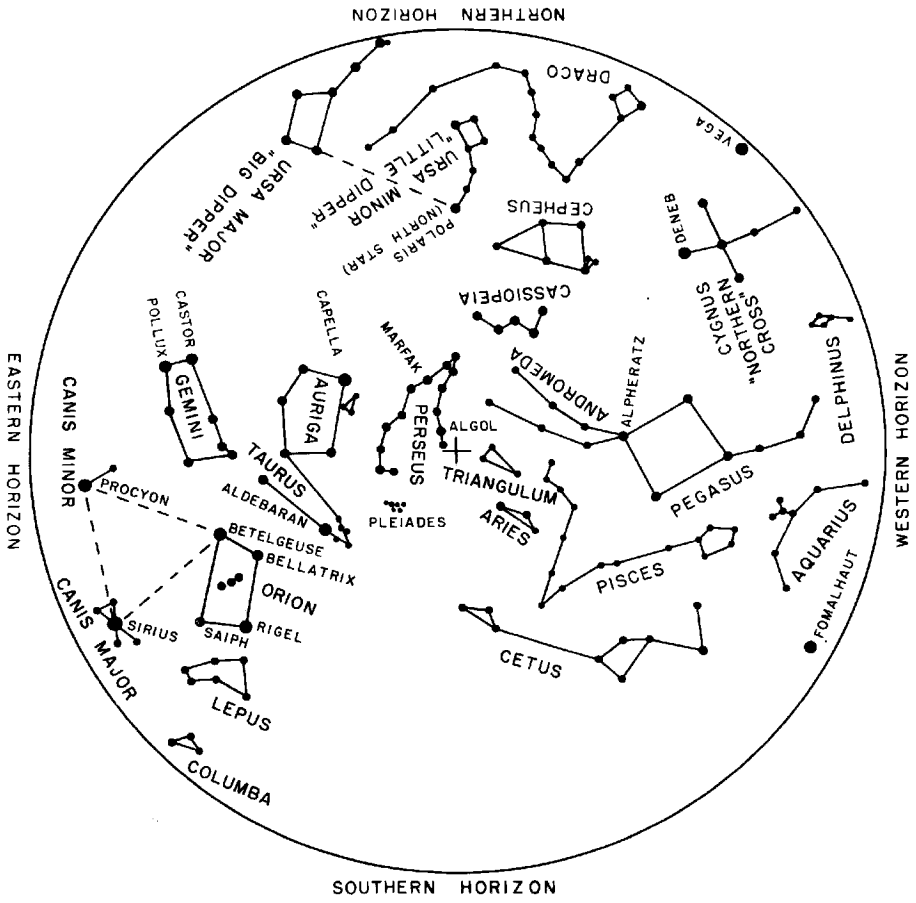
THE WINTER SKY

There are a lot of neat constellations in the winter season. We are looking through the cross section of the Milky Way and so, we see many stars. In December, low in the east, we see the bright star, Sirius, the brightest star in the sky (mag. -1.4, 8.6 LY). Sirius is also known as the Dog Star, because it is found in Canis Major. Up from Sirius, you will see three stars in a row which make up the belt of Orion the Hunter. Sirius and Orion will gradually shift to the west (and more straight up) as we progress into January and February. The right arm of Orion (to our left) is the red giant star Betelgeuse (mag. 0 – 1 variable, 400 LY). In Orion's left leg we see Rigel (mag. 0, 800 LY). With binoculars, you should be able to find the Orion Nebula in the sword of Orion. It shows up as a bright fuzzy region. If you go toward the zenith from Orion, you should see a large pentagon. This is the constellation Auriga, with its main star, Capella. Off to the right (west) of Orion is Taurus the Bull. One of the horns of the bull is part of Auriga. Continuing westward a bit, you'll see the Pleiades star cluster, which is very easy to spot. Going in the eastward direction from Orion, we find Gemini. The Geminid meteor shower occurs in mid

December.



THE NIGHT SKY IN DECEMBER