November, 2016 Volume 24 Number 11 Forsyth Astronomical Society

THE YOUNG ASTRONOMERS NEWSLETTER

WISE AND NEOWISE

The Wide-Field Infrared Survey Explorer (WISE) was launched in 2009 with the goal to image the entire sky in the infrared wavelengths. It has accomplished a great deal, with the discovery of remote galaxies and hundreds millions of stars. The extremely luminous galaxies found gave rise to a new class of deep space objects called **extremely luminous infrared galaxies.** The most luminous galaxy found to date extends back to 12.5 billion light years distance. This takes us back to a time when the universe was only one-tenth of its present age (13.8 billion years). This remote galaxy generates the light of more than 300 trillion suns. This amount of energy is proposed to be due to a growth spurt from the galaxy's central black hole.

WISE took infrared photos of three-quarters of a billion objects, including galaxies, stars and black holes. It has discovered at least 100 brown dwarfs, the coolest stars. Of these, six are so thermally weak that they would only show up by infrared detectors. The coldest ones, with a temperature cooler than room temperature are called Y-dwarfs.

When the WISE solid hydrogen coolant gave out in 2011, its mission was nominally completed. But NASA has reprogrammed the probe to look at near Earth objects. Thus, in September, 2013, WISE became NEOWISE and its mission is to look for asteroids and comets that could potentially impact the Earth. And in this role, 211 near-Earth objects like asteroids and comets have been discovered. [www.nasa.gov]

COSMIC RAYS FACTS

Cosmic rays were discovered in the early 20th century by German physicist Victor Hess. He used an electroscope under a variety of locations and orientations to conclude that cosmic rays were coming from space. They likely originate from distant supernova blasts and other exploding bodies. They can also be sent out by our Sun when there are coronal discharges.

Cosmic rays are 90% protons, 9% alpha particles (2 neutrons plus 2 protons) and about 1% heavier nuclei. This turns out to be the overall composition of the universe. The difference is that cosmic rays are travelling very fast; at significant fractions of the speed of light. Their high speed gives them lots of energy, which can theoretically cause damage to humans. But most cosmic rays pass through our bodies without doing any harm.

The energy of cosmic rays is measured in units called electron-volts. The energies can be quite high, in the range of megaelectron volts (MeV) or even gigaelectron volts (GeV). Galactic cosmic rays come in an energy range of 100 MeV to 10 GeV. The range of energies is due to the speed of the particle. Cosmic rays that emanate from the Sun are weaker, except during coronal ejections.

When the astronauts were travelling to the Moon in the years 1968 - 1972, they experienced periodic flashes of light in their eyes as the result of cosmic rays passing through their eyeballs. Long-term exposure to unshielded cosmic rays can increase one's susceptibility to cancer. This is of some concern for astronauts going on long voyages to asteroids or Mars, and for airline pilots. [taken from Astronomy, Nov. 2016 article]

POSSIBLY TWO NEW MOONS DISCOVERED AROUND URANUS

Astronomers at the University of Idaho have carefully examined images of Uranus that were taken during the flyby of Voyager 2 in 1986. The astronomers detected an unusual wavy pattern in the rings of the planet that may be caused by the presence of two tiny moons. The wavy behavior may be due to gravity from the moons disrupting the particles in the rings. Further analysis of Uranus' rings by the Hubble telescope should help confirm the discovery. The moons are predicted to be in the range of 4 to 14 kilometers in diameter. [taken from various internet sites].

LUCKY TO FIND CHARON

Pluto's moon, Charon was discovered in 1978. It was fortuitous that it was discovered then, since two years later, the plane of Charon's orbit would by lined up with Earth to produce a 5-year-long period of perpetual Pluto-Charon eclipses. [Sky & Telescope, Nov. 2016]

PLUTO'S ATMOSPHERE

The November issue of Sky & Telescope has a full article about the composition and behavior of Pluto's atmosphere. The dynamics of Pluto's atmosphere is unique since the dwarf planet's axis is tilted at 120 degrees. This means that for roughly one-fourth of its orbit around the Sun, that is, 62 years (1/4 x 248), Pluto has its north pole pointing toward the Sun and one-fourth of its orbit the north pole is pointing away from the Sun. For the other two, one-fourth segments, the planet's axis is perpendicular to a line joining the Sun and Pluto.

Pluto is incredibly cold, with an overall average temperature of 45 Kelvin (minus 380 deg. F). This means that the main constituents on the planet's surface: nitrogen, methane, carbon monoxide and water are below their freezing points. The only way that an atmosphere of gases can exist on Pluto is through the process of sublimation, the conversion of a solid directly into a gas. Thus, one would expect there to be very little depth to the atmosphere. It is estimated to be roughly 125 miles in thickness. The atmospheric pressure varies from less than one-one hundredth that of Earth to more than 25 % of our pressure at sea level.

The unique aspect of Pluto's atmosphere is the existence of haze layers. These are believed to be formed by the break-down of methane into various other organic compounds, such as acetylene, ethylene and ethane that form aerosols that scatter light to give the atmosphere a beautiful blue cast.

SPACE TELESCOPE GAIA TO PRODUCE A 3-D MAP OF OVER 1 BILLION STARS

The European Space agency's Gaia space telescope is now starting its third year of imaging over 1 billion stars, 1 million galaxies, 500,000 quasars and thousands of undiscovered extrasolar planetary systems. Launched in 2013 and put into operation in 2014, the Gaia instrument is to create the largest and most accurate 3-D map of nearly one percent of all the stars in the Milky Way. These would be brighter than 20th magnitude.

This ambitious project is to last five years as the instrument will monitor each target object about 70 times. It will eventually settle into an orbit around the Sun at about 1.5 million kilometers from Earth. It is said that the position of objects will be known to within a few microarcseconds. This is like measuring the diameter of a human hair at 1000 kilometers. The information gained by this study will help in our study of star evolution and gauge the presence of dark matter. [Sci. News, Oct. 15, 2016]

NOVEMBER BIRTHDAYS: Edwin Hubble (Amer.) b. Nov. 20, 1889; d. Sept. 28, 1953. Promoted the idea that the Milky Way galaxy is only one of billions of galaxies, which are moving away from us in an expanding universe. **Frederick William Herschel** (Eng., German born) b. Nov. 15, 1738; d. Aug. 25, 1822. Proposed that the Milky Way was a flattened disk. He was the father of John Herschel, who discovered Uranus. **Carl Sagan** (Amer.) b. Nov. 9, 1934; d. Dec. 20, 1996. Popularized astronomy (television Cosmos series). **Christian Doppler** (Austr.) b. Nov. 29, 1803; d. Mar. 17, 1853. Explained that waves emanating from moving objects (like stars or trains) can be stretched or compressed. **Edmond Halley** (Eng.) b. Nov. 8, 1656; d. Jan. 14, 1742. Studied the motion of comets and predicted the return of Halley's comet. **Harlow Shapley** (Amer.) b. Nov. 2, 1885; d. Oct. 20 1972. Studied the Milky Way shape and size.

NOVEMBER MOON PHASES: First quarter: Mon. 7th; **Full:** Mon. 14th; **Last quarter:** Mon. 21st; **New:** Tues. 29th.

This November we will see a "Super Moon" because the Moon will be at perigee, and the closest to Earth than it has been since January 26, 1948. This brings our satellite to a distance of 221,524 miles (356,509 km) which can be compared to the average Earth – Moon distance of 238,000 mi (384,500 km). As a result of this "close approach" the ocean tides on Earth will be significantly greater. To our eyes, however, we will not be able to discern an increase in size of the Moon. The increase has been calculated to be only 7%. But, anyway, check out the full moon on the 14th.

PLANET INFORMATION FOR NOVEMBER: Venus at magnitude of -4.0, is beginning to make its presence known in the western sky after sunset. It will rise higher and higher as we move into the winter months. Early in November, and to Venus's right, is **Saturn.** But the ringed planet will be hard to find by naked-eye since the sky will be bleached by the setting Sun and nearby crescent Moon. Saturn will be nearly out of sight by the end of the month. But to take its place we begin to see **Mercury** that climbs into view in the southwest on Nov. 30. **Mars** is still hanging out in the southwest, but it is leaving Sagittarius and moving eastward into Capricornus. **Jupiter** is visible in the early morning hours with a magnitude of - 1.7, near Virgo's alpha star, Spica. **Uranus** and **Neptune** are more difficult to spot without binoculars.
Other events during November: The Leonid meteors are to peak on Thurs. the 17th. But they are not expected to be very numerous or distinct this year. Also, there may be a few Orionid meteors lingering from October. Be sure to set your clocks back one hour on Sunday evening, the 6th (Fall back!).

CALCULATOR CORNER: The density of an object is a number obtained by dividing the mass of the object (kilograms or grams) by the volume of the object (cubic centimeters or cubic meters). In other words: Density = mass/volume Or in units of g/cm^3 : D = Grams/centimeters cubed
The density of the Earth is about 5.5 g/cm^3 If you know that the mass of the Sun is 2.0×10^{33} grams and the Sun's volume is 1.4×10^{33} cm^3, calculate the density of the Sun in units of grams per cubic centimeters. (Answer below)

TOPIC FOR CLASSROOM DISCUSSION: Why is the density of the Earth greater than that of the Sun?

Ans. Density Sun = 1.4 g/cm^3

Forsyth Astronomical Society website: http://www.fas37.org **SciWorks Ph.:** 336-767-6730 ext. 1000
Have a great month. Go out and check the skies on a clear night. Bob Patsiga, editor