June 2017 Volume 25 Number 6 Forsyth Astronomical Society

YOUNG ASTRONOMERS NEWSLETTER

NASA APPROVES PHASE B OF PLANNED MISSION TO JUPITER'S MOON EUROPA

Jupiter's moon Europa is believed to contain a vast subsurface ocean which is covered by a layer of ice and minerals. Occasionally the aqueous soup spurts outward as a steamy volcanic eruption. Some believe that this ocean has the potential to harbor life forms, since the environment, temperature and mineral resources could support life.

Phase B represents the design phase which takes place after the initial conceptual study. The plan is to have an exploratory spacecraft launched in the 2020's. It will carry high resolution cameras that can take thousands of images over 40 to 45 flybys of Europa [Astronomy, June, 2017]

WORLD-WIDE RADIO ASTRONOMY ARRAYS UNDER CONSTRUCTION

The world of radio astronomy is becoming larger and more elaborate. Two sites, one in South Africa and one in Australia are in various stages of completion. The combined project is called the Square Kilometer Array. The South African MeerKAT radio astronomy array has 64 antennas constructed and is expected to have in place as many as 2000 over the next decade.

Similarly, the Australian counterpart, called SKA1 is underway with the goal of eventually setting up tens of thousands of dishes.

Radio telescopes detect the very weak signal coming from atomic hydrogen as well as certain other molecules such as carbon monoxide and formaldehyde. However, the signal from hydrogen atoms (at 21 centimeter wavelength) is most useful since hydrogen is so prevalent in the cosmos. Radio waves have the advantage of not being absorbed by interstellar dust. But the signal is weak, and so to cancel out background noise, the signal from more than one radio telescope is combined by a process called interferometry. This reduces the background random noise and augments the real signal coming from the cosmic source. An array of many small dishes can get detailed images of gas clouds and galaxies.

The radio antenna dishes are made in various sizes and geometries in order to maximize signals from specific sources. The dishes are placed in remote areas of available land surface so as to minimize radio noise from population centers. The integration of this complex system requires huge computer capacity.

The Square Kilometer Array is a project supported by twelve countries and has as its headquarters the Jodrell Bank Observatory in England. [Sky & Telescope, June, 2017]

WHAT WILL BE THE DAMAGE WHEN AN ASTEROID HITS THE EARTH?

Researchers at the University of Southampton in England have done over a million computer simulations of collisions of asteroids and other space rocks with the Earth. They varied the object size, location and angle of impact as well as population density at the spot of impact, and came up with fatality predictions.

It turns out that if a 200-meter (roughly two football fields) wide space rock hit London, more than 8.7 million people would be killed. Most of the lethality would come from winds and shock waves, rather than earth quakes or tsunamis.

Missiles smaller than 56 meters wide did not make it to the Earth, but exploded in an airburst. But even these have enough energy

to send out a shocking wind blast which creates intense heat that can burn the skin. The pressure wave can rupture internal organs.

Tsunamis will be the dominant destructive force for water impacts. But tsunamis will only be a fraction as deadly as land impacts.

For all impacts on land or water, the fatalities will be caused by heat, wind and shock waves. Land-based effects such as earthquakes and blast projectiles will result in less than 2 percent of local deaths.

No consideration was given to long-term effects due to atmospheric influence on global weather.

Deadly asteroid collisions are rare. Most asteroid or space particles are tiny and burn up harmlessly in the atmosphere. The 20-meter-wide rock that lit up the sky and shattered windows around the Russian city of Chelyabinsk in 2013, represents an event that occurs about once a century. The 10-kilometer-wide asteroid that struck the Earth 66 million years ago, and blamed for the demise of the dinosaurs may hit us roughly every 100 million years. [Sci. News, May 13, 2017].

A ROUND TRIP TO MARS

Humans who want to make a round trip to Mars better have about twenty-six months available for such an endeavor. With current technology, it would take about seven months to reach Mars. While the trip takes place, Earth would have travelled in its orbit around the Sun and be millions of miles further away from Mars. So, the astronauts would have to wait about a year before conditions would be right for the return journey. So, 7 plus 12 plus 7 equals 26. [From "Facts From Space", by Dean Regas].

JUNE BIRTHDAYS: Fred Hoyle, (Brit.), b. June 24, 1915; d. Aug. 20, 2001. Astrophysicist. One of the earliest to explain nucleosynthesis, the formation of the elements in the cores of stars. Also did popular science and science fiction writing. **George Ellery Hale,** (Amer.), b. June 29, 1868; d. Feb. 21, 1938. Specialized in solar observation. Established the Yerkes Observatory, Mount Wilson Observatory and Palomar Observatory. Hired Harlow Shapley and Edwin Hubble. **Giovanni Cassini**, (Ital.), b. June 8, 1625, d. Sept. 14, 1712. Studied Saturn and discovered separations in the rings. **Charles Messier,** (Fr.), b. June 26, 1730, d. April 12, 1817. Studied the nebulae and created his list of Messier Objects.

CAN MAN-MADE LOW FREQUENCY RADIATION PROTECT THE EARTH?

NASA's two Van Allen Probes have detected a "bubble" of very low frequency radiation that is situated between the two Van Allen regions. The outer VA region holds high-energy electrons that are released during solar eruptions. They head inward toward the Earth, but are intercepted by the bubble of VLF. It is speculated that there is a match in frequencies so that there is an interactions and mutual annihilation by way of: "wave-particle gyro resonance" according to Phil Erickson, of MIT, one of the authors of the Space Science Reviews article.

Apparently, there is sufficient human-generated VLF radiation to maintain this protective barrier. It is a curious fact that we have not observed these clouds of electromagnetic radiation before VLF radiation has been in general use (before the 1950's). So, we do not know what the pristine Van Allen belts look like. Nevertheless, it appears that man-made radiation is now influencing space weather.

[spaceweather.com; May 18, 2017 and NASA.com].

MOON PHASES IN JUNE: First Qtr.: Thurs. the 1st; Full: Fri. the 9th; Last Qtr.: Sat. the 17th; New: Fri. the 23rd.

PLANETS IN JUNE: We will be getting our last glimpses of **Mars** in June. The red planet is fading into the west-northwest horizon, right after sunset. We won't get to see it again until September. On the other hand, **Jupiter** at magnitude of -2.2 is hard to miss. It is the brightest nighttime object, other than the moon. See it near the bright star, Spica, in Virgo. **Saturn** is also making a good showing for itself at mag. 0.0, as it lags Jupiter in the east and is visible all night in Ophiuchus. In the early morning, look for very bright (mag. -4.4) **Venus** in the east, as it rises two hours before the Sun. **Mercury** is hard to see this month, since it rises in the east just a half hour before sunrise. It then is quickly lost in the Sun's glare.

SUMMER SOLSTICE: Wed. June 21. You can calculate the angle of the Sun (SA) at noon on this day by a couple of steps. First, you need to know your location on Earth as your latitude angle. We'll call that **L.** For Winston Salem, our latitude is about 36°. Then, we need to know that at the Summer Solstice, the Sun's angle to the Earth's equator, (we call that the declination, and label it **D)** is +23.5°. Then we use the equation: **SA = 90° – L(+ or -)D = Sun's angle.** For the summer solstice, we use **D =** +23.5° For winter solstice, we use **D =** -23.5° So, for Winston Salem, the Sun's angle should be = **90 – 36 + 23.5 = ?** That means the Sun's angle above the horizon at noon should be 77.5°. You can refer to the June 2016 issue of this Newsletter to learn how to make an alidade that can be used to measure the Sun's angle to the horizon. This is like a sextant and is easily made using a straw and a protractor. Remember: **NEVER LOOK AT THE SUN WITHOUT PROPER EYE PROTECTION**

PICK THE MARS NON-LANDERS. Which of the following **did not** land on Mars? (ans. Below)

Curiosity Juno Huygens Spirit Viking Phoenix Voyager Opportunity

Pathfinder Cassini New Horizons

See the sky chart for the summer sky on the next page.

See the path of the Moon's shadow during the Aug. 21 solar eclipse (from NASA) on the last page.

Ans,: Juno, Huygens, Voyager, Cassini, New Horizons.

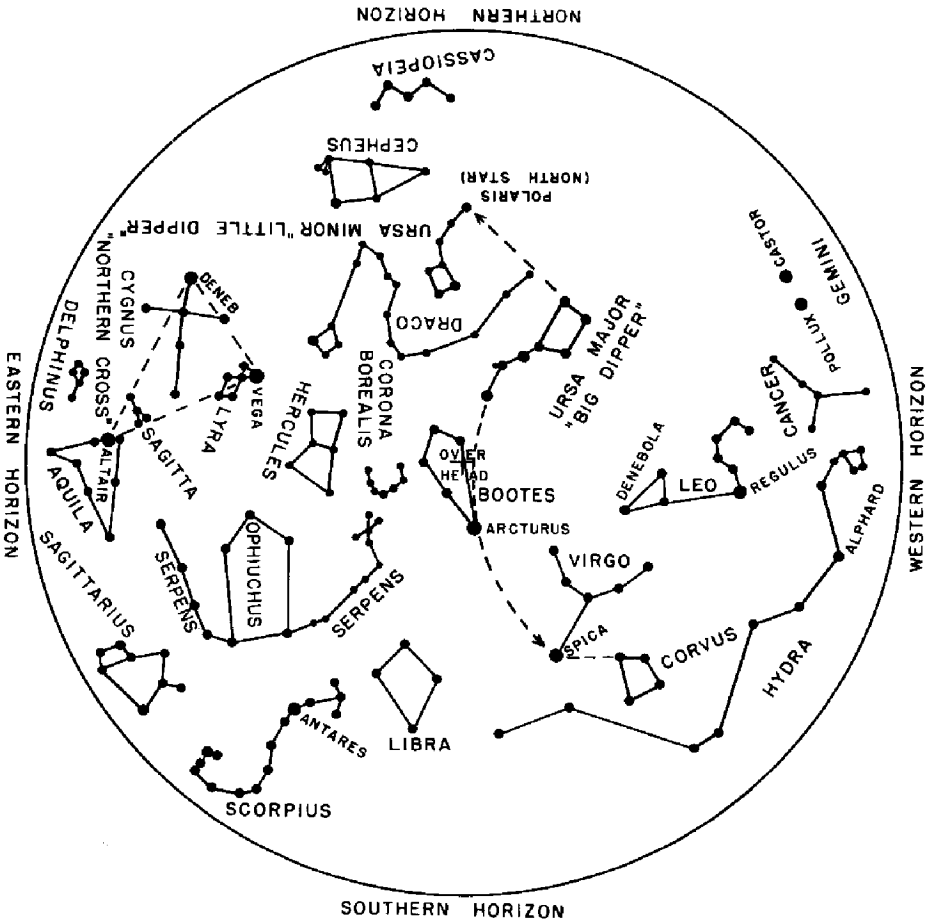
Forsyth Astronomical Society website: http://www.fas37.org Kaleideum phone: 336-767-6730 Ext. 1000

Plan for the August 21 Solar Eclipse! Bob Patsiga, editor

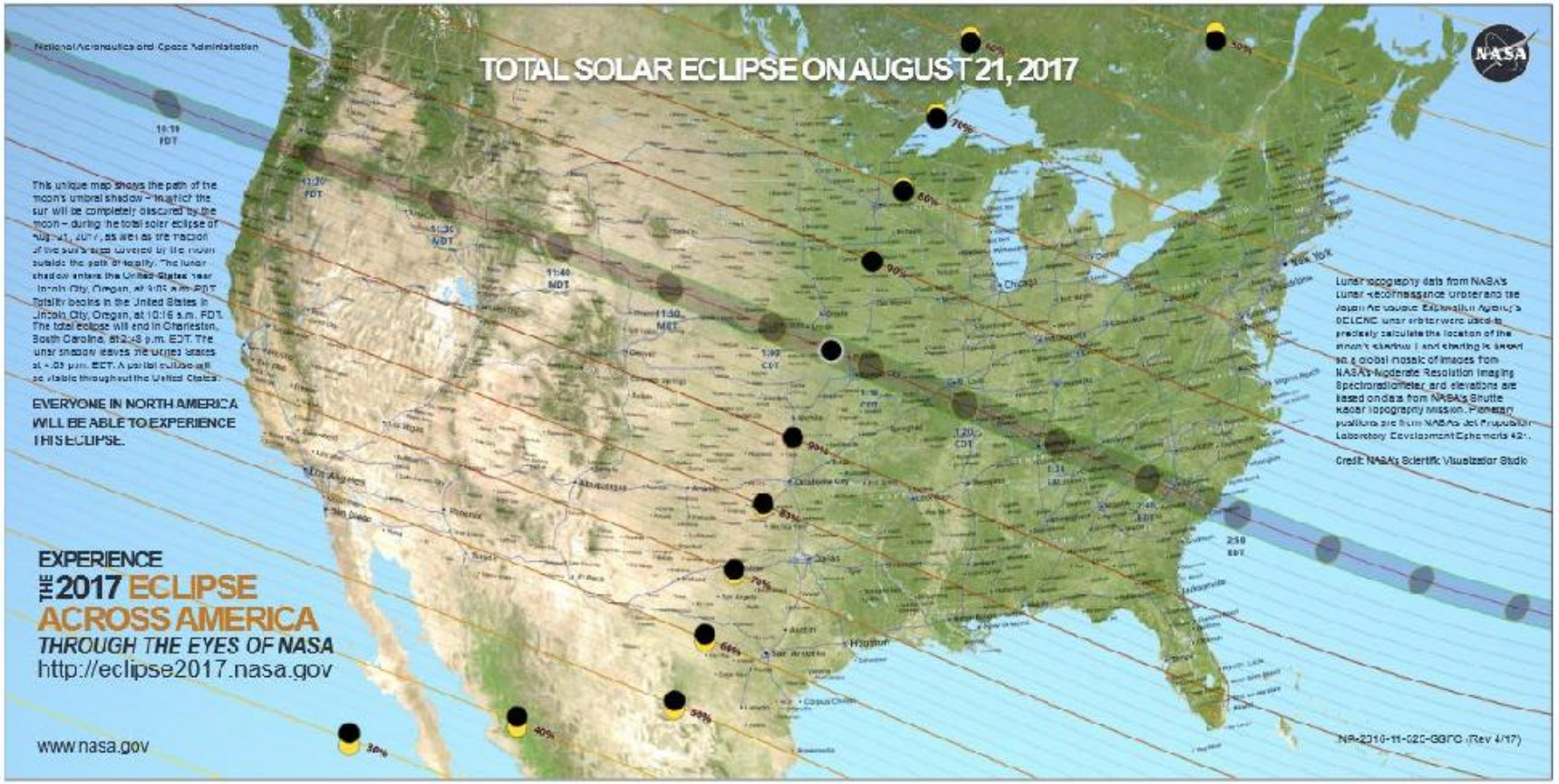
THE SUMMER SKY

In the summer, if we are in an ideal location, we can see the Milky Way band extend from the southern horizon to the northern horizon. On the southern horizon, we see the fish-hook tail of Scorpius the scorpion and just above the tail, we see Sagitarius The Archer. In the region between Sagitarius and the tail of Scorpius, we are looking toward the center of the Milky Way. A lot of dust and gas blocks out the visible light from the center of our galaxy. The main star in Scorpius is Antares (mag. 1, 600 LY). Antares is a red supergiant star, about 200 times the size of our sun.

High over head, we see the Summer Triangle with the three stars: Deneb (mag 1, 3,000 LY) in the tail of Cygnus the Swan; Vega (mag 0, 25 LY) in Lyra the Harp and Altair (mag 1, 17 LY) in Aquila the Eagle. Sagitarius has the asterism name: The Teapot. Looking north, we see the Big Dipper (Ursa Major) is lined up vertically (handle up and bowl down) a little off to the west of the North Star. Look for more numerous “shooting stars” (meteorites) in the summer, especially look for the Perseids in mid August.



THE NIGHT SKY IN JUNE


National Aeronautics and Space Administration
TOTAL SOLAR ECLIPSE ON AUGUST 21, 2017
This unique map shows the path of the moon's umbral shadow – in which the sun will be completely obscured by the moon – during the total solar eclipse of August 21, 2017, as well as the fraction of the sun's area covered by the moon outside the path of totality. The lunar shadow enters the United States near Lincoln City, Oregon, at 9:05 a.m. PDT. Totality begins in the United States in Lincoln City, Oregon, at 10:16 a.m. PDT. The total eclipse will end in Charleston, South Carolina, at 2:48 p.m. EDT. The lunar shadow leaves the United States at 4:09 p.m. EDT. A partial eclipse will be visible throughout the United States.
EVERYONE IN NORTH AMERICA WILL BE ABLE TO EXPERIENCE THIS ECLIPSE.
Lunar topography data from NASA's Lunar Reconnaissance Orbiter and the Japan Aerospace Exploration Agency's SELENE lunar orbiter were used to precisely calculate the location of the moon's shadow and viewing its effect on a global mosaic of images from NASA's Moderate Resolution Imaging Spectroradiometer and elevations are based on data from NASA's Shuttle Radar Topography Mission. Planetary positions are from NASA's Jet Propulsion Laboratory Development Ephemeris 421.
Credit: NASA's Scientific Visualization Studio
EXPERIENCE THE 2017 ECLIPSE ACROSS AMERICA
THROUGH THE EYES OF NASA
http://eclipse2017.nasa.gov
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NP-2016-11-025-GSFC (Rev 4/17)