

THE YOUNG ASTRONOMERS NEWSLETTER

NASA'S JUNO AT JUPITER IN JULY!

NASA's JUNO mission spacecraft is due to arrive at Jupiter on July 4th. The spacecraft consists of three large, triangularly positioned solar array panels, plus centrally located instruments and propulsion and guidance engines.

It was launched on August 5, 2011 and is expected to begin its orbital insertion burn on July 1. Orbit is to be achieved on July 4.

The goals of the mission are:

- 1) Analyze the atmosphere of Jupiter. In addition to hydrogen and helium, what are the proportions of water, ammonia and other gases?
- 2) Measure gravitation and magnetic fields. (the gravitational measurements may help us determine the composition of Jupiter's core. Is the core, truly metallic or does it consist of metallic hydrogen that was compressed by the enormous gravitational pressure?)

The space probe carries nine, on-board instruments, including a color camera. These will be utilized over 24 months and over 30 orbits. The first few weeks will be used to make adjustments to the orbital period ellipticity. The normal, 14-day, elongated orbit won't be achieved until around November. At perihelion, the spacecraft will hover 5,000 km above the cloud tops.

De-orbit is to take place in February, 2018, which will cause the spacecraft to sink into Jupiter's gaseous atmosphere. This suicidal step is meant to eliminate the possibility of any debris from the spacecraft from impacting on any of Jupiter's moons. (taken from NASA and other web sites).

GLYCINE AND PHOSPHOROUS FOUND ON COMET 67P

The European Space Agency's Rosetta probe has used mass spectrometry to detect the amino acid, glycine and diatomic fragments containing phosphorous on the comet 67P/Churyumov-Gerasimenko. Both substances are considered to be important components of biomolecules. In addition, other organic molecules were detected, such as methyl amine, ethyl amine, methyl isocyanate, acetone, propanal, and acetamide.

The chemicals were believed to be released from dust grains present in 67P's coma (the hazy envelope that surrounds a comet) and picked up by the probe as it orbited the comet. This supports the theory that molecules needed for life reached Earth by way of comet collisions. (Chem. Eng. News, May 30, 2016.)

MILKY WAY STRUCTURE

The July issue of Astronomy magazine features an article about the structure and evolution of our home galaxy, particularly from the perspective of its cross-sectional structure. Our knowledge of the Milky Way structure is the result of continual research which began decades ago and is based on land-based studies, like the Apache Point Observatory Galaxy Evolution Experiment (APOGEE), and space probes, such as the Wilkinson Microwave Anisotropy Probe and the European Space Agency's (ESA) Planck satellite. Currently, the ESA has the Gaia satellite which is surveying more than a billion stars.

The latest sketch of the Milky Way describes a central bulge that includes the nucleus (black

hole) and the central bar. Four spiral arms radiate out from the central bar.

Overall, the Milky Way spiral structure is about 100,000 light years in diameter.

The disk itself is believed to be multi-layered, with a central thin disk that is about 300 light years thick and consists of young stars. Above and below this is an "old" thin disk which is about 1,000 light years thick. And above and below this is the thick disk at about 3,000 light years. It seems that as young stars age, they diffuse out of the thin disk and settle into the outer disk layer. The Sun and solar system are located in the "old" thin disk, at a distance of about 30,000 light years from the central core.

The Milky Way may have begun about 10 to 12 billion years ago as a random blob of dark matter, dwarf galaxies and the ever-present gas and dust. Over time, other matter, such as dwarf galaxies was accreted. This is still going on now, as the Large and Small Magellanic clouds are being drawn in. The odd trajectory of some in-falling objects has produced stars that are orbiting the Milky Way in a direction opposite to that of the Sun and the majority of Milky Way stars.

We await more information from APOGEE and ESA's Gaia mission to help us construct a more detailed picture of our cosmic home.

RARE HUGE SPIRAL STRUCTURES DISCOVERED

Patrick Ogle and his team at Caltech have found distant spiral galaxies that are bigger and brighter than expected. These monsters are termed "superluminous spirals". They are producing new stars at the prodigious rate of 5 to 65 solar masses per year, compared to our Milky Way which averages just about one solar mass per year. These galaxies have diameters ranging from 180,000 to 400,000 light years in diameter. (Sky & Tel., July, 2016).

Rare fact: Due to Einstein's relativity effect, the center of the Earth is younger than the outer shell. Due to the greater gravitational pull, a clock placed at the center of the Earth will tick very slightly more slowly than a clock located at the Earth's surface. It can be calculated that the Earth's core is about 2.5 years younger than the surface. (Sci. News, June 25, 2016).

July birthdays: Hans Bethe (July 2, 1906) developed theories on nucleosynthesis in stars. Henrietta Leavitt (July 4, 1868) worked out the luminosity to cycle connection for Cepheid variables. Jocelyn Bell Burnell (July 15, 1943) discovered pulsars. Georges Lamaitre (July 17, 1894) Belgian priest who proposed the idea of the Big Bang.

JULY MOON PHASES

New Moon: July 4; First Quarter: July 11; Full Moon: July 19; New Moon: Last Quarter: July 26.

PLANET INFORMATION FOR JULY

Jupiter: In the west, below Leo.

Saturn and Mars: In the south (Mars will have a distinct red coloration), close to Antares in Sagittarius.

Venus: In the west at sunset. Visible beginning after July 5.

Mercury: In the west at sunset. Very close to Venus, but also close to the Sun, right before sunset.

METEOR SHOWERS

July is a quiet month for meteor showers. Most of the showers are weak. The only significant one is the **Delta Aquariids**, which peak around July 28.

Forsyth Astronomical Society website:

<http://www.fas37.org>

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Have a great summer.

Bob Patsiga, editor.