
THE YOUNG ASTRONOMERS NEWSLETTER

JUNO: SOME CONCERNS WITH INSTRUMENTS AND ENGINE

All is not smooth sailing with NASA's Jupiter probe, Juno. Two concerns have popped up in the fall of 2016 as the spacecraft was making its second close pass on a 53-day orbit. First, there was some problem with communicating with one of the onboard instruments, the infrared Auroral Mapper (IRAM). Corrective programming has been devised, but has not yet been installed. Internal autosystems put the probe in a five day precautionary safe mode. The second problem relates to the propulsion system. It appears that there is some malfunctioning of the check valves associated with the engines.

In October, 2016, Juno technicians planned to have an engine burn to decrease the orbital period to 14 days. But concern with the valves prompted the engineers to postpone the burn. It was rescheduled for the December 11 close flyby, but was again postponed and a new date has not yet been set. At least during this latest flyby, onboard instruments were functioning properly.

If concerns regarding the engine valves persist, the decision might be to allow Juno to remain in the 53-day orbit. [www.space.com; www.theverge.com; www.missionjuno.swri.edu; also check Twitter]

EARLY SOLAR SYSTEM: PLANETS JOSLING FOR POSITION

During the first couple of billion years of our solar system, the dozen or more planets that existed at that time jockeyed positions and often collided, broke apart or merged to gradually settle into the configuration that we recognize today. This demolition derby not only produced the sequence of planets that we

know, but may have created some anomalies, like the reverse spin of Venus, the odd tilt of Uranus' axis and the formation of the moon. Some of the early bodies may have even been ejected out of the system altogether.

Various theories have evolved which are based on computer simulations as well as by observing the behavior of extrasolar planetary systems.

David Nesvorny and Kevin Walsh, senior scientists at the Southwest Research Institute in Colorado have studied planetary system dynamics and they believe that there may have been a fifth or even a sixth gas giant (in addition to Jupiter, Saturn, Uranus and Neptune). These all may have shifted their orbits over hundreds of thousands of years as the result of their gravitational interactions. Some may have been pushed out of the system and forced to go it alone in free space.

All this is complicated, and made even more complicated when one considers the role of the asteroids, Kuiper belt objects and the elusive, Planet Nine, in all of this pushing and pulling. Planets do not leave behind durable records. This is fertile ground for the theoreticians. [Astronomy, Feb. 2017].

THE GREEN BANK RADIO OBSERVATORY HAS BECOME AN AUTONOMOUS FACILITY

The National Radio Astronomy Observatory in Green Bank, West Virginia has officially become released from government support and oversight. The National Science Foundation ceased its formal association with NRAO on October 1, 2016. However, NSF will continue to provide funds at a gradually diminishing level. (Green Bank, Cont. p. 2)

Green Bank, cont. Staff at Green Bank and the NSF arrived at a plan that would still give the facility 60% of its budget in 2017, which amounts to \$8 million. This will be reduced to \$4 million in 2018. The loss of NSF funds will be made up for by the issuing of special contracts to agencies and institutions for use of the facility. [Sky & Tel. Feb., 2017].

THE HUNT FOR WIMPS

Dark matter, the proposed stuff that is said to make up most (approx. 85%) of all matter in the universe is proving to be coy in showing any hard evidence of its make-up. So far, the rotation rate of galaxies and lensing of images around galaxies has given us only circumstantial evidence of dark matter's existence.

Theoreticians tell us that dark matter may be composed of a hitherto unidentified or undetected particle called weakly interacting massive particle, or WIMP for short. They are proposed to have masses that are several times or more of ordinary protons. It had been assumed that sensitive detectors would be able to record the passage of WIMPs through our earth and bodies. But extensive study has not yet produced any WIMP signal. Also, the WIMPs have not appeared in experiments designed to make them. For example, many physicists believed that the Large Hadron Collider could produce WIMPs. But again, there have been no indication of the massive particles forming at these high energy conditions.

This is bringing about some alternative ideas of the dark matter particle. An alternate might be the axion, which has a mass that is a millionth of a billionth of that proposed for the WIMP. But still, no concrete detection of axions has been claimed.

The hidden resolution behind these negative experiments is to question our concept of the interaction of matter in space. These theories may be based on faulty models. These models rely on the concepts of symmetry and supersymmetry. They claim that for every ordinary matter particle there should be a "superpartner" which is the basis for dark matter.

So, if experiments continue to come up empty-handed, physicists may have to create new models and theories for cosmic forces. Dark matter may end up in a dark corner. [Sci. News, Nov. 12, 2016; Sci. News, Dec. 24, 2016].

EUGENE CERNAN IS EXPLORING THE STARS

Space explorers and astronomers received the sad news that lunar astronaut, Eugene Cernan passed away on January 16, 2017. Cernan is known as "the last human to walk on the moon". He and Harrison Schmitt operated the lunar module and rover which spent three days on the lunar surface.



NASA photo of Eugene Cernan adjusting the American flag on the moon's surface (Dec. 1972 Apollo 17 lunar mission).

Before that mission, he flew in Gemini 9 (1966) and Apollo 10 (1969).

Cernan was born March 14, 1934 in Chicago. He achieved the rank of captain in the U.S. Navy. [from NASA web site].

