

Planetary Wonderings
February Focus: Deep Space Network
By Mary-Frances Bartels

For the past year and a half many NASA planetary missions have been mentioned in this column. Every space probe must send data back to Earth telling scientists what it has observed and/or done. How is this data obtained from the craft? Also, how do scientists command or upgrade software on the spacecraft from Earth? Both are performed using a system of dish-like antennas across the world called the Deep Space Network.

The Deep Space Network encompasses complexes strategically placed on three continents. The largest and most sensitive scientific telecommunications system in the world, it also performs radio and radar astronomy observations for the exploration of the solar system and the universe, and is managed and operated for NASA by the Jet Propulsion Laboratory. The antenna complexes are placed approximately 120 degrees apart around the world: at Goldstone in California's Mojave Desert; near Madrid, Spain; and near Canberra, Australia. This configuration ensures that an antenna is always within sight of a given spacecraft, day and night, as the Earth rotates. All of the antennas communicate directly with the Network Operations Control Center at JPL in Pasadena, California. The center staff directs and monitors operations, transmits commands, and oversees the quality of spacecraft telemetry and navigation data.

The large parabolic antennas are capable of receiving very weak signals from very distant spacecraft. It is not unusual for the total signal power arriving at a network antenna from such a spacecraft to be 20 billion times weaker than the power level in a digital wristwatch battery! The largest and most sensitive of the DSN antennas is 230 feet across. Sometimes antennas are "linked together" to make their effective sizes even larger. Such "arraying" allows for the capture of an extremely weak signal, or in some cases, to allow for a higher data rate.

As can be seen, the DSN plays an important role in unmanned space missions. Without it communication both to and from the various craft would be much more difficult, if not impossible. Additionally, it is used to directly study planets, the sun, asteroids, star formation process, and comets, as well as confirm the theory of general relativity.

So far I've gotten one response concerning my request for information on what readers would like to see in this column. That suggestion was to give information on how to start getting involved in astronomy and observing. I will try to give a few suggestions this month and continue some more next month.

A first step would be to stoke your curiosity through a visit to the local library. See what books and videos are available on astronomy and observing. Astronomy books are generally found in the 520 to 525 section of the Dewey Decimal System. Also, ask if they subscribe to any astronomy magazines. If they do, take a look at those as well. If not, find a library that does subscribe to astronomy-related magazines. The two "standards" are *Sky and Telescope* and *Astronomy Magazine*. While at the library ask about any local astronomy clubs or classes. If the librarian knows of none, more work will have to be done to find these resources.

Resource of the Month:

Your local library! Check out other library systems in your area. My family has library cards for Knox County (Mount Vernon), Centerburg, Sunbury, Columbus (Discovery Place Libraries), and Westerville.

Activity of the Month:

Here is an opportunity to use art with science! If you visit <http://solarsystem.nasa.gov/multimedia/gallery.cfm?Category=Kids> you will find space art drawn by youngsters. I wrote to the person in charge of that page and asked if he was still accepting entries. He responded that, while there are already a number of pieces of art awaiting publishing on the site, new entries may still be submitted. I encourage any student who enjoys creating space art to contribute a piece to this site. Please scan your work and e-mail to me. I will forward submissions to the site.

Check out past *Planetary Wonderings* columns at my www.KeepLookingUp.net site. Suggestions, questions, and comments about *Planetary Wonderings* are welcomed and may be directed to stargazer @ keeplookinup.net.

Remember to *keep looking up!*

Source: *NASA Facts: Deep Space Network*