DISCOVERIES

with the Green Bank Telescope

Looking for Ice in Lunar Craters.

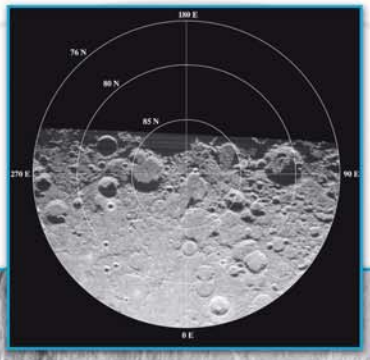
While most of the **Moon's** surface is exposed to the **Sun** over the course of a month, craters formed near the poles can have floors that are never illuminated by sunlight, even over hundreds of millions of years. Could these crater floors contain deposits of water ice or other frozen volatiles?

Armed with the knowledge that layers of ice are found in shadowed polar craters on **Mercury**, Smithsonian scientist Bruce Campbell and collegues set out to determine if lunar craters also contained ice. The team used the Arecibo Telescope in Puerto Rico, and the ***Green Bank Telescope*** to produce radar maps of the lunar poles. By transmitting a radar signal at a comparatively long wavelength – 70 cm. – the scientists were able to probe 5 meters or more beneath the lunar surface.

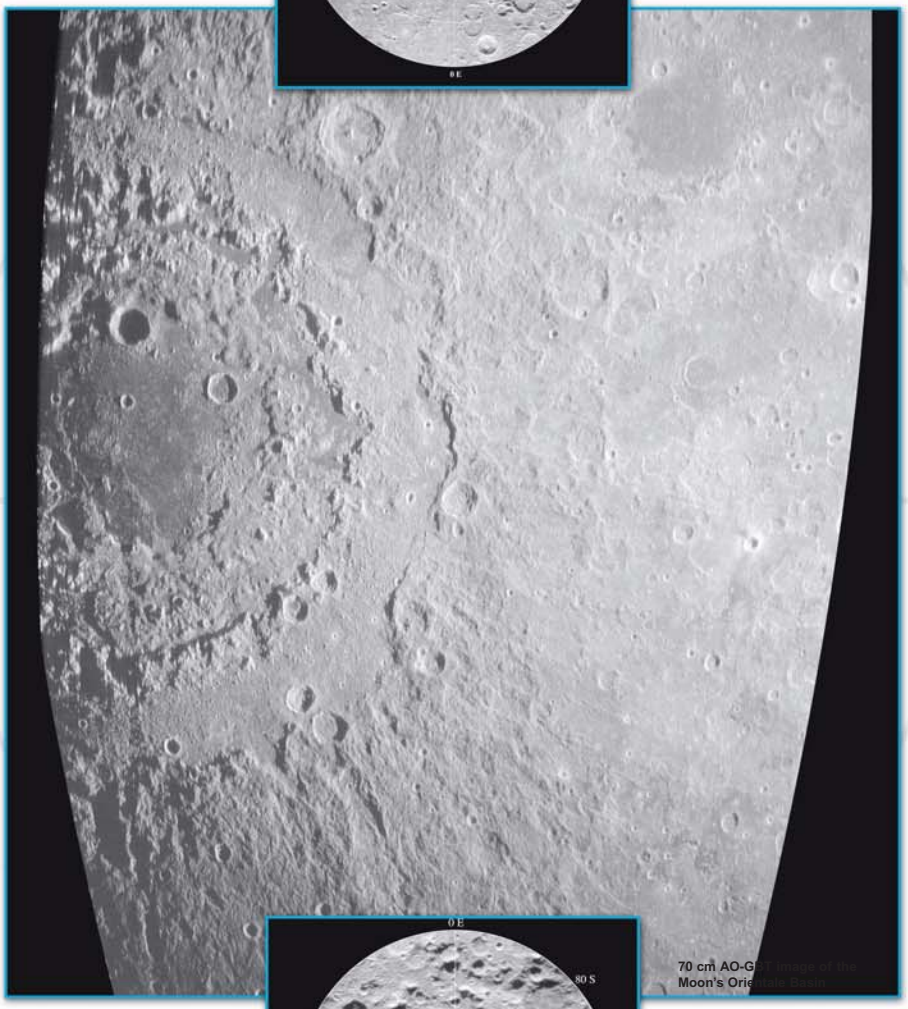
Thick ice layers, even if buried beneath a few meters of lunar dust, would appear as very bright radar reflections.

The team did NOT find such reflections in the floors of shadowed craters on the **Moon.**

This shows that any ice must be distributed as small grains or thin layers within the dust, making it less useful to possible future lunar explorers. This research was featured in a recent article in *Nature*.

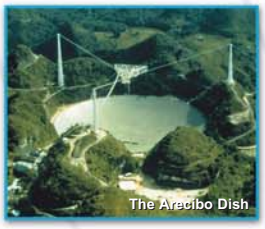


Radar Image of Lunar North Pole



This is an image of the **Orientale Basin** region of the ***Moon***, made by radar. A radar signal was sent from Arecibo Observatory at 430 MHz and received with the GBT. The experiment was done last October.

The Power of the Green Bank Telescope.



We use the 305-m radio telescope at the Arecibo Observatory, Puerto Rico, to transmit a radar signal toward the Moon. The most recent observations use a radio frequency of 430 MHz, or a wavelength of 70 cm. These signals penetrate to depths of several meters into the lunar "regolith" (a layer of mixed rock and packed fine dust that covers virtually all of the lunar surface). The radar reflection from the Moon is detected at either Arecibo or the 100-m Green Bank Telescope in West Virginia. These "echoes" do not form a picture in the same way that a camera operates. These new maps have a spatial resolution of 300 meters.

Radar Image of Lunar South Pole

Meet the Astronomer.

This research was done by Dr. Bruce Campbell of the Center for Earth and Planetary Studies at the Smithsonian Institution. Dr. Campbell received his B.S. in Geophysics from Texas A&M University in 1986, and his Ph.D. in Geology and Geophysics from the University of Hawaii in 1991. He joined the staff of the Center for Earth and Planetary Studies in 1992. From 1996 to 1998, he was the Discipline Scientist for NASA's Planetary Instrument Definition and Development Program (PIDDP). He served as CEPS Chairman from 1998 until 2002.

National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.