

Blue(r) Moon

The answer to the question of whether there is water on the Moon has swung from classical assumptions that the visibly dark areas were aquatic—and hence called *mare*, Latin for “sea”—to the conclusion, based on analyses of rocks brought back from Apollo missions between 1969–1972, that the Moon was bone dry. Fifty years hence, a more nuanced picture of lunar water has emerged from additional data. The Apollo rocks were found to hold traces of ancient water; satellites discovered water-ice in permanently shadowed craters; and other instruments detected signatures of water molecules appearing temporarily on the lunar surface.

A recent study adds to the ongoing reevaluation by showing that the crust of the young Moon held significantly more water than expected. These latest findings offer fresh insights into early lunar history as well as the origins of water in the Solar System broadly.

Scientists led by Tara Hayden, who carried out the research at the Open University in Milton Keynes, UK, and is now

NASA/GSFC/ARIZONA STATE UNIVERSITY



Moon meteorite shows that the primordial Moon's crust was enriched with water.

a postdoctoral scholar at the University of Western Ontario, examined a meteorite, dubbed Arabian Peninsula 007 (AP 007). In 2015, meteorite hunters found this approximately 1.3-kilogram, dark chunk of Moon rock that fell to Earth in Al Jouf, Saudi Arabia.

Characterization of AP 007 showed

it to be ferroan anorthosite (FAN)—the crustal material that formed when the primordial Moon solidified from an entirely molten state. The rock ranks among the oldest samples ever obtained of lunar crust, dating back 4.47 to 4.54 billion years. Furthermore, Hayden and colleagues made the first-ever detection in FAN of apatite, a mineral that contains volatile substances such as water.

The set of results illuminates the Moon's evolution. “A major takeaway from our study is that the early lunar crust was considerably enriched in water,” said Hayden. “We know more precisely when the Moon's crust may have formed, which was within 60 million years of the oldest solid material in the Solar System.”

“As this ferroan anorthosite is in a meteorite, it may have come from anywhere on the Moon's surface, and maybe outside the regions of the Moon that the Apollo missions sampled,” said Hayden. “Does this rock type across the Moon hold apatite, and does it have as much water as we have observed?” (*Nature Astronomy*)

—Adam Hadhazy

A Walk in the Woods is a Boost for the Brain

Modern urban life has its advantages and opportunities (e.g., access to education, jobs, health care, transportation, etc.). But with more than half the world's population now living in urban centers, and with that number expected to rise to 70 percent by 2050, urban living exacts a price—negative health and cognition effects due to “pollution, artificial light, stress, and overstimulation,” according to a team of scientists, who set out to quantify these effects. What they found confirms an age-old intuitive assumption: that a walk in nature is a good way to clear one's head.

In the study, cognitive neuroscientists Amy McDonnell and David Strayer, at the University of Utah, asked participants to complete a demanding mental exercise: count backward from 1,000 by sevens. Immediately after, participants took a test to determine how well they could focus on a task, and then took a forty-minute walk. Half the participants walked through the university's arboretum while half



Study participant outfitted with EEG to monitor brain activity during a walk in the woods

walked through the medical campus and parking lots. Both walks were calibrated to cover about two miles, with similar changes in elevation. The walkers wore EEG, or electroencephalographic, hats (along with signs informing passersby that they were research participants) to measure their brain activity and attentional capacity.

While the participants' brains showed similar levels of alertness during their walks, the ones who walked through the green space of gardens and trees showed improved

executive control, a bit higher than what one would expect after exercise. Said study author Strayer, “There's an idea called biophilia that basically says that our evolution over hundreds of thousands of years has got[ten] us to have a connection or a love of natural living things.” Humans have since been creating our own-built environment.

The researchers posit that spending time in more natural settings boosts not only cognitive ability but quality of life. Busy urban lives leave many people feeling overstimulated and sapped. The study results add to the growing evidence that being in nature refills the reserves drained by the grind of daily tasks and the strain of noisy, urban environments. Going forward, the researchers are interested in quantifying what kind of natural environment causes this brain boost, as there are a range of environments with conditions intermediate to arboreturns and parking lots. (*Scientific Reports*)

—Brittany Steff