

# Mine on the Moon

Fusion researchers want to go where man has been before.

When President Bush announced his desire to send humans back into deep space, he brought a dream of a UW-Madison research team one giant leap closer to reality.

Scientists with the UW Fusion Technology Institute have been working on a plan to harness the moon as a source of energy since 1985. That year, during a 2 a.m. eureka moment, team scientist **John Santarius** realized that the moon's surface might contain large amounts of helium-3 atoms, one of the most promising fuels for creating power through fusion.

Fusion — a nuclear reaction through which multiple atoms combine to form new ones — can generate energy that is cheaper and cleaner than fossil fuels or nuclear power generated by fission, the splitting of atoms. Unlike the fuels currently used to create fusion, helium-3 atoms don't release any radioactive material, which makes them an attractive alternative. The only problem is that helium-3 is pretty rare on Earth.

On the moon, however, it's plentiful. Data from lunar samples suggest the moon contains more than a million tons of helium-3, enough to supply the earth with energy for at least one thousand years.

"A fuel cycle fueled entirely by helium-3 reactions would produce nuclear energy without generating any nuclear waste — that's the ultimate goal," says **Gerald Kulcinski**, a professor of nuclear engineering who directs the institute.

Despite that promise, the institute's work has been stuck between a rock and a hard place. Researchers have collected data and even designed prototypes of equipment that



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**UW researchers envision a day when mining machines would traverse the moon, harvesting helium-3 as a source of energy.**

could be used to mine and process helium-3, but two of the organizations that might help them test their theories have thus far remained skeptical.

"NASA doesn't believe we'll ever get fusion to work, and the Department of Energy never thought we'd go back to the moon," says Kulcinski. "Both agencies think they can do their part, but they don't trust each other. This is where we've been ever since."

Bush's call for a lunar base could change that. The president has targeted putting a base on the moon by 2020 as a precursor to launching a manned mission to Mars. Those plans could give the UW researchers an opportunity to send along equipment and get their first chance to see how it works in space.

Although most of that technology is geared toward mining helium-3 — such as an institute-designed bucket-wheel excavator, which can scoop up enough helium-3 each year to power Milwaukee — researchers say it can also be used to support life on the moon. For every ton of helium-3, the excavator also produces nine thousand tons of life-

supporting compounds, including water, oxygen, nitrogen, and carbon, and more than six thousand tons of hydrogen that could be used in energizing fuel cells.

"By going back to the moon," says Kulcinski, "we remove one of the barriers blocking our research — the very idea that we are never going back."

— Emily Carlson

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