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Moon Dust

The gray powder may hold a source of clean fuel.

Helium is the gas of choice for kids. It makes their balloons—usually lifeless balls of air—float like magic. When they inhale helium, they talk like Donald Duck. But now a variant of this playful gas—specifically helium-3—has captured the interest of some adults. In fact, helium-3 might lure us back to the Moon as a source of energy that's cleaner than fossil fuels and safer than nuclear power.

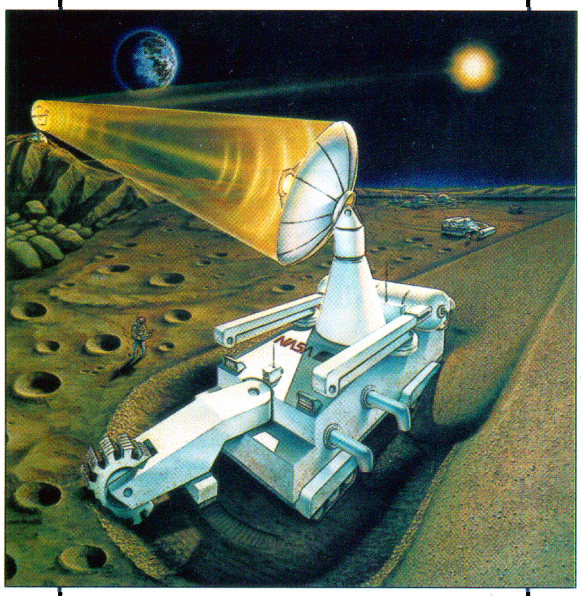
Although rare on the Earth, enough helium-3 lies trapped in the Moon's surface to meet our planet's energy needs for thousands of years, assuming physicists can manage to harness it in fusion reactors.

Helium-3 is generated in the Sun, which blasts it out through space in the solar wind. Magnetic fields around the Earth repel helium-3, but the Moon has no such barrier, so the gas has been building up in the lunar surface for four billion years.

Apollo astronauts brought back bags full of lunar regolith, the fine gray powder covering the surface. From these samples, and observations made by probes such as *Clementine,* scientists believe that one million tons of helium-3 are available for mining.

Harrison "Jack" Schmitt, a geologist who walked on the Moon during *Apollo 17,* says, "Right now I don't see any other stimulus for going back to the Moon. Probably the only way science is going to get back to the Moon is to piggyback on this kind of commercial operation."

Schmitt, a former U.S. Senator from New Mexico, proposed that NASA send two robotic rovers to the moon to search for helium-3. Schmitt's proposal called for the $145 million INTERLUNE project to be launched in 1997 under NASA's Discovery program. Instead NASA chose a $59 million lunar orbiter named *Prospector.*



John Andrews/University of Wisconsin

MOONLIGHTING—The quest for a clean fuel source may get humans back to the Moon. Helium-3, a molecule found in large quantities on the Moon, may be the right stuff.

Schmitt says, "For NASA, the Moon and any thought of helium-3 is totally off the table. They have shown no significant interest in it at all. The main reason seems to be they just didn't want to spend that much money, even though they said it was within the limits. They chose the cheapest of the proposals that were sent in."

However, a space agency across the Pacific ocean is interested. Schmitt says, "The Japanese are probably putting in tens of millions of dollars at a minimum into their lunar program, which one way or another is related to their interest in helium-3 fusion."

Despite NASA's reluctance to search for energy on the Moon, Schmitt continues to push the lunar mining concept.

A roving robotic miner would pick up the Moon dust and heat it to 700 degrees centigrade. As the helium-3 gas releases, the miner collects and liquifies it for transport back to the Earth.

Schmitt says, "It takes probably 10 to 15 square kilometers mined to a depth of three meters to get about a metric ton of helium-3. If you look at current coal and crude oil prices, the energy equivalent value of a metric ton of helium-3 is on the order of $3 billion. That would supply the overall needs of a city of ten million people for about a year."

But so far, no one has generated net energy from a fusion reaction. Gerald Kulcinski, director of the University of Wisconsin's Fusion Technology Program at Madison, says that fusion researchers "are close to breaking even, by a factor of three." He says Wisconsin physicists plan to build a helium-3 fusion reactor in 1997.

Helium-3 fusion research isn't well funded in the U.S., Kulcinski says. "The Department of Energy thinks NASA won't go back to the Moon, and NASA believes the physics people can't do it."

Kulcinski adds, "It's a possibility that if we sit on our hands, we could shift our dependence on the Middle East for oil to the Japanese for a source of helium-3 energy in the 21st century."—*Dave Cravotta*