

NASA wants to harvest water on moon and Mars, and students think they can help

September 27 2021, by Lisa Vernon Sparks



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Deep beneath Mars' red clay surface lie ancient oceans now frozen into ice sheets. Earth's moon has hidden water deposits, too—pockets embedded deep inside its rocks.

It's the kind of liquid treasure scientists at NASA hope to one day mine using specialized drilling tools on the [moon](#) or Mars.

As NASA looks for new technology to use in space, the agency is mining a different treasure to help develop those tools: the ingenuity of student engineers.

To that end, 10 student teams from universities around the country—including a team from Virginia Tech—gathered Friday at the Hampton Road Convention Center to share prototypes of remote-controlled drilling machines, during the "Moon to Mars Ice and Prospecting Challenge." The event was a three-day competition that began Thursday and ended Saturday.

The students' prototypes attempted to extract and harvest the most [water](#) from ice buried within simulated lunar and Martian landscapes—dirt, clay, sand—packed inside giant blue tubs. It's a technology NASA needs. Rather than sending tons of water into space with the astronauts, it's easier and saves millions to extract the water there.

"The most interesting thing about this is it has to be completely hands off. It has to be done mostly autonomously," says Shlok Agarwal, a 21-year-old senior leading the Virginia Tech team. "This helps us explore the surface of Mars and get water there. But if we were to send this without astronauts, we can control everything on that rig from down on Earth."

The water is needed for life-sustaining purposes and to produce [rocket fuel](#) for bringing astronauts home.

It takes plenty of mass for missions to Mars, said NASA Langley Research Center aerospace engineer Chris Jones, and reducing that is a primary goal. If astronauts can make the fuel or life support goods, such

as water and oxygen, it will help lighten their shipping load.

"For every pound you might have on the surface of Mars, it might take 20 to 30, even more times that (weight) launching from Earth to get it there," Jones said. "Saving a few 1,000 pounds of fuel on Mars could very easily turn into tens, or hundreds of thousands of pounds leaving Earth."

Rick Davis, the assistant director for science and exploration at NASA, scientists discovered evidence of water on the moon and Mars within the past 15 years.

On the moon, water deposits are mixed in the soil, likely from comets impacting the moon's surface, he said. Additionally, the moon has craters that don't receive sunlight and, as a result, stay extremely cold. If water is deposited in a crater, it stays there.

But because it's so cold on the moon, most machines don't work well.

"Accessing (the water) is a very tricky thing," Davis said.

Billions of years ago. there were oceans and glaciers on Mars similar to Earth, Davis said. But as the red planet started losing its atmosphere and became more frozen, some oceans evaporated. Some are still there, but when NASA launched satellite orbiters to search for underground lakes, the agency found something unexpected.

"We found all these ice sheets," Davis said.

For the competition, students are being judged on how much water their rigs can extract, either in the form of chips, liquid or steam, Jones said. They also will be judged on their process and how realistic their concept is for use on the moon and on Mars.

A [winning team](#) will be announced Monday, NASA Langley officials said.

Agarwal said he has been working on this project since his sophomore year and created the squad he named and now leads—the Martian Subsurface Analysis Team or MSAT. This school year, he received 80 applications from students who want to join.

Anaya Acharya, 21, a team member majoring in electrical engineering at Tech, said her mother, who has a master's in physics, encouraged her to pursue engineering.

"She always had this small guilt of not doing engineering. She was kind of one of my supporting role models," Acharya said. "There's hope for like, for very young engineers, who can come and develop something for the society."

2021 Daily Press.

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Citation: NASA wants to harvest water on moon and Mars, and students think they can help (2021, September 27) retrieved 9 April 2024 from <https://phys.org/news/2021-09-nasa-harvest-moon-mars-students.html>

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