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Studying the scientists who are studying the Arctic crater with geological features similar to Mars

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William J. Clancey tags along when NASA researchers visit a crater 500 miles (800 kilometers) north of the Arctic Circle to explore its Marslike environment.

"The scientists are studying the crater, the geology and biology of this land, and I'm studying the scientists," Clancey said.

He wants to see how they go about their business to develop ways that computers and other devices can be used to help astronauts explore Mars.

Clancey, a computer scientist specializing in artificial intelligence at the University of West Florida's **Institute of Human and Machine Cognition** in Pensacola, is on loan to the NASA Ames Research Center at Moffett Field, California.

NASA scientists have found that the Canadian Arctic's Haughton Crater, formed when an asteroid struck Devon Island 24 million years ago, has many geological features similar to Mars.

"It was like Mars on Earth, a Mars park, if you will," said Pascal Lee, a planetary scientist for the private SETI Institute (Search for Extraterrestrial Intelligence) at Mountain View, California.

Lee also works at Ames as leader of the Haughton-Mars Project, which studies the similarities and differences between Devon Island and Mars.

Clancey, as leader of a NASA space exploration research team, has joined the Haughton scientists for their annual visits the past four years, spending 10 days to a month on the island each summer.

"We want to understand exploration," Clancey said. "How do people explore?"

To make the research realistic, scientists put on spacesuits that restrict their visibility and maneuverability. They limit their time on each traverse because on Mars they would be restricted by the amount of oxygen they could take with them.

One of the first lessons from Haughton was that all-terrain vehicles with single seats offer better mobility than larger moon buggies with side-by-side seating for two astronauts.

"You have much better balance," Clancey said. "It would be a one-on-one thing, but in a pinch if one of them breaks down you can get two people on one." Cumbersome spacesuit gloves quickly posed a challenge to the scientists as they took notes on their observations.

Clancey said the answer could be audio recordings that may have to be transmitted to Earth for transcription unless sufficient improvements are made in speech recognition software so it can be done on Mars.

Storing and accessing data, getting it back to Earth and communicating with Earth are other issues his team is working on.

Astronauts have near-instantaneous contact with mission control while in Earth orbit but will face lengthy delays from faraway places such as Mars.

"Imagine you're on Mars and you just had a malfunction," Clancey said.

It may be 10 minutes before the message gets to mission control, which uses 10 more minutes to formulate a response that takes yet another 10 minutes to get back to Mars.

"That's 30 minutes from the time that you said, 'Houston, we have problem,"' Clancey said.

The answer may be computers such as the fictional HAL 9000 in the film "2001: A Space Odyssey," which advised astronauts how to handle emergencies until deciding it had to get rid of them to complete its mission to Jupiter.

"We haven't built HAL, but it's the general notion of artificial intelligence," Clancey said. "We definitely have it within our capabilities to have programs that answer basic factual questions about where stuff is stored, what are the procedures I should follow, what's the interpretation?"

In contrast with past moon exploration, Clancey found scientists at Haughton returned repeatedly to the same spots instead of trying to sample as many different places as they could.

"They're not just out there on what we'd call a fishing expedition," Clancey said. "They have a sense in mind of what there is to be found and where they might look."

Lee said that's important for NASA to understand when designing Mars missions.

"Bill Clancey's work is at the very core of learning how to optimize the living and working conditions of humans on Mars," he said.

Another focus is on what scientists will do inside their Mars habitats.

The Mars Society in 2000 built a research station at Haughton similar to those that might be established on Mars. Six-member crews rotate in and out from June through August. The private group is building another station at Hanksville, Utah, for year-round study.

Clancey, meanwhile, is working on computer software to create a virtual reality habitat for testing layouts, designs and procedures and training future Mars explorers.

There is disagreement within and outside the scientific community about whether humans should go to Mars at all or if exploration should be left to robots.

Clancey believes there is a place for both.

"We're not going to Mars just for the science," he said. "We go because of the adventure. Why do you climb Everest? It's not just to get samples of rocks."

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