Space Exploration:
First Authorship in *Nature* Offers Launching Pad for Isaac Smith

In graduate school as a physics major at the University of Missouri - St. Louis, Isaac Smith helped introduce visitors to the night sky at the school's observatory. After a friend introduced him to geology, he realized he could combine his interests by pursuing a doctorate in geophysics.

Smith now works with Jack Holt, a research scientist in the Jackson School's Institute for Geophysics. Using a shallow radar (SHARAD) instrument onboard NASA's Mars Reconnaissance Orbiter, they're trying to understand how the northern ice cap of Mars formed. The SHARAD instrument has allowed them to peer into the ice and reveal layers beneath the surface that formed over millions of years.

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Two of the most notable features of the red planet's northern ice cap are a set of troughs that spiral out from the center like a gigantic pinwheel and a canyon larger than the Grand Canyon. These features had puzzled scientists since they were first photographed by orbiting Mariner spacecraft in the early 1970s. In May 2010, Smith was first author on a paper in the journal *Nature* explaining how the spiral troughs formed. In the same issue, Holt and colleagues explained how Chasma Boreale formed.

It turns out both the spiral troughs and Chasma Boreale were created and shaped primarily by wind. Rather than being cut into existing ice recently, as had been thought, the features formed over millions of years as the ice sheet itself grew. By influencing wind patterns, the topography of underlying, older ice controlled where and how the features grew.

Smith's and Holt's radar data also record a

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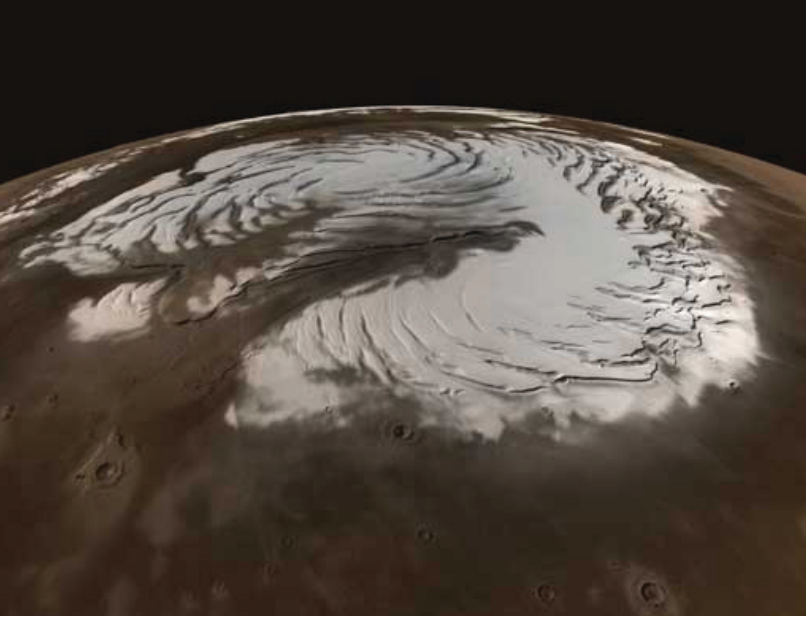

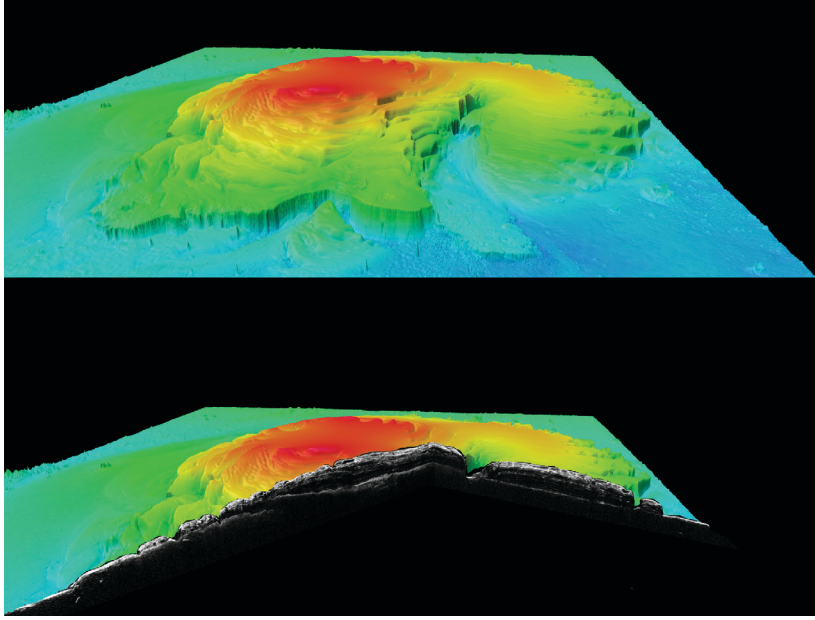

Mars' northern ice cap (NASA/Caltech/JPL/E. DeJong/J. Craig/M. Stetson). Two intersecting radar paths slice a wedge in Mars' north polar ice cap, revealing layers in the ice (NASA/JPL/University of Texas at Austin/Prateek Choudhary).

wealth of information about the history of climate on Mars for the past few million years. They'll spend the next few years reconstructing that history.

It was already a big honor for such an early career scientist to be first author on a paper in Nature. The media attention that followed was icing on the cake. Stories about his and Holt's research appeared in many outlets including the *New York Times*, *MSNBC*, *Discover Magazine*'s blog, and *Universe Today*.

"The successes that I've had here are a direct result of my advisor," said Smith. "He was developing these new ways to use radar on Mars before I got here and he has directed my work."

Smith said the size and breadth of the Jackson School's research programs can't be beat.

"No matter what your research interests, we probably do what you want to do here," he said. "It's a dynamic and growing area. There are a lot of people coming in with lots of fresh ideas."

That also opens up the doors for interdisciplinary research. "I'm doing geophysics, but I'm also doing geomorphology with David Mohrig and Gary Kocurek," he said. "We're going to come up with a great story about what's happening on Mars. So there are opportunities to combine fields, whereas a smaller program doesn't have those opportunities."

Despite the school's size (285 grad students), Smith feels a tremendous sense of community.

"We have a very large group of people who love hanging out with each other," he said. And he noted that sense of community extends to faculty.

"Coming from physics, where the student-professor relationship can be more standoffish, here we can be friends with our professors, not just first name basis, but we spend time with them outside of school. We're still students, but we can talk with them like peers."

Smith plans to complete his Ph.D. in 2012 and then continue his planetary research and eventually try teaching. "I don't expect to have the whole of the north polar cap of Mars understood by then," he said. "I expect there to be more research to be done there."

If you would like to talk to Isaac or other current students in the Jackson School, contact Philip Guerrero, graduate program coordinator, at philipg @mail.utexas.edu or 512-471-6098.

Outstanding Financial Support

The Jackson School was created through the largest gift ever given to a single public university. The school's endowment and emphasis on student success make it an excellent home for graduate students.

Smith noted all graduate students are guaranteed at least a teaching assistantship or research assistantship, allowing most to support themselves at the university without resorting to outside work.

"They pay you well enough to live comfortably," he said. "For doctoral students, it's guaranteed for five years. You don't have to worry about finding funding."

Many students are supported entirely by grants and fellowships. In 2009-10, there were more TA and RA positions than graduate students to fill them.

Another form of financial support are grants to attend conferences. Each student is guaranteed money to publish abstracts and present at scientific conferences. In the past, the grants have allowed students to attend three to five conferences.

"As a future academic I think this is the best opportunity out of any school because you have this money that's guaranteed to you," he said.