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Science for nonscientists

Saturn moon Titan beckons other UA majors

By Anne Minard
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Until recently, Adam Deutch, a junior business major at the University of Arizona, wouldn't have bothered to pick up a newspaper story about space exploration.

"I'd read the headline," he recalls.

But that was before Deutch and a handful of his classmates designed and launched their own mission to Titan, Saturn's largest moon, which has been made famous lately by NASA's Cassini-Huygens probe.

The project was part of a planetary sciences class, PtyS 209, that's offered in the fall semester. It's for non-science majors — but David Kring, the professor, decided to turn his students into scientists anyway.

"They didn't think they could do it," Kring said about his students' initial reaction to their assignment. "They are non-science majors. In general, when they read these articles in the paper, they browse over them, thinking that they can't understand the material."

But Kring led the students through the mission step by step. First, each of several teams in the class had to agree on a mission theme.

"One of the teams is very interested in life. They wanted to do a series of measurements to decide if there were prebiotic compounds," he said, referring to the basic chemical elements that combine to make living things. "Another team looked at climate."

Then, they decided on a set of mission objectives — smaller questions they could ask to help them understand their themes. They equipped each spacecraft with instruments specific to its mission, and then simulated all the missions with the help of the NASA/UA Space Imagery Center, which Kring directs. It's one of 18 facilities like it in the world, where NASA maintains research collections of planetary photography, maps and technical records.

Olga Feingold

Adam Deutch

Deutch said access to Kring's research — and his co-workers — made the class an impressive experience.

It was supposed to be a general class, he pointed out, but "the education we got far surpassed being general. I think it was mainly because we go to a research university. We held six meteorites from six different locations. He showed us a million-dollar prototype of an instrument."

Deutch said there were times when he questioned what a researcher meant in a particular study, and Kring would say: "Well, why don't you ask him? His office is right there."

Kring said the process the students used is the exact same one scientists use — and to throw even more reality in the mix, he let them solve the inevitable electronic problems that plagued their instruments. Overall, he said, he wanted to give his students logical, problem-solving tools to take into other classes, and their lives.

And when the students' spacecraft reached Titan and they started getting data back, real life came crashing into the classroom.

"You have a complete range of emotions," Kring said. "And that's similar to a real spacecraft mission. There are moments when you are completely ectatic, and there are moments when you're completely befuddled. The class becomes quite animated. At this point . . . they own the mission the same way those of us in the professional community feel like they own a mission."

Kring should know. He's one of about two dozen scientists on a UA team working with NASA on the Cassini-Huygens mission, a $3.4 billion effort to explore Saturn, its rings and its moons.

Cassini, the mother ship, was launched from Earth in 1997 and started orbiting Saturn in June. It traveled about 883 million miles.

Huygens is a smaller probe that piggybacked on Cassini, and will take off on its own to explore Titan on Christmas Day. The moon is 3,000 miles wide, about the driving distance from Tucson to Maine. It's the largest of Saturn's roughly 20 moons, a count complicated by the fact that Saturn's characteristic rings are made of orbiting particles — and sometimes scientists can't decide which of those particles are big enough to be called moons.

The reason scientists are curious about Titan has something to do with Earth.

"One of the reasons we're very interested in Titan is because it has an atmosphere," Kring said. "Some of the chemical reactions that occur in that atmosphere and on the surface of Titan may mimic some of the prebiotic chemical reactions that occurred on early Earth."

Most people think that, at minus 290 degrees Fahrenheit, Titan is too cold to support life.

But Deutch and a classmate, Olga Feingold, used their mission in Kring's class to challenge that theory.

"Our theme was to see if the heat from impact craters could allow biology to begin. In the end, we found everything we needed to prove that correct," Feingold said.

Huygens' job, as it parachutes toward the surface of Titan, will be to send back information about gases and particles in the moon's atmosphere.

"Whereas on Earth we have rain composed of water, on Titan, there may be rain composed of methane," Kring suggests. And information like that could yield insights about the ways early life formed on Earth.

Exploring Titan's atmosphere is the main thrust of the Huygens mission. Anything the probe sends back after it lands — expected on Jan. 14 — is a bonus, Kring says. And Earthlings will lose contact with the craft about two hours after it lands.

Astronomers around the globe will be tracking Huygens' progress, some of them from Tucson — and, to be sure, at least two of Kring's students from the fall semester will be watching.

"I definitely know I'm going to go to that," Feingold said. "I want to stay up to date with all the things I learned about."

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