

Newsletter

College of Physical and Mathematical Sciences

January

BYU grad is expert on fire, ice

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By Tad Walch

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OREM — Searing hot lava in the summer. Frigid pieces of the moon and Mars in the winter. Orem High graduate and planetary scientist Jani Radebaugh is splitting her year between fire and ice.

In August, she studied flowing lava in Hawaii with Brigham Young University students. And on Thursday she embarked on the first leg of a seven-week expedition to collect meteorites in icy Antarctica.

She has learned to sniff out trouble on multiple trips to Kilauea, an active Hawaiian volcano.

"I can smell my boots melting when it gets too hot," she said. "If you get smoky boots, get out."

Meteorite hunting in Antarctica is just the opposite — "Now I want my toes to be nice and toasty," Radebaugh said — and will require safety training in New Zealand this weekend and at a base camp in Antarctica before the search for space objects begins.

"It's amazing to think the two are even related, but planetary science is about extremes," she said. "The moon reaches a couple hundred degrees on one side while it's freezing cold on the other side. When trying to understand those extremes we look for extreme environments on Earth."

Extraterrestrial rocks stand out against the background in the Antarctic, known as the whitest place on earth. Last year, the annual Antarctic Search for Meteorites (ANSMET) collected 1,230 chunks of planets or asteroids. Radebaugh is one of 15 scientists and mountaineers selected for the 2005-06 ANSMET expedition, which is expected to gather a similar number of meteorites for other scientists around the world, NASA, the Smithsonian and the National Science Foundation.

"It's amazing to be involved in planetary science because in the last 10 years, the meteorite search program has been very successful," Radebaugh said. "It's boosted our knowledge of how the universe was formed and what elements make up the solar system. It feels like the golden age of planetary science."

ANSMET discoveries have proved that meteorites that reach Earth include pieces of the moon and Mars — not just bits of asteroids. Study of an ANSMET specimen found trapped gases identical to those found on Mars by the Viking landers, and similar rocks are giving scientists a window to the geology of Mars.

Radebaugh believes Kilauea is another window to Martian geology. She is studying volcanoes on the Mars moon Io and needs a way to figure out lava temperatures.

"Looking at volcanoes in outer space, it's really hard to figure out temperatures," she said. "On this trip, we could actually walk up and poke something into the lava and take temperatures. Then we used video to tape what we were looking at. It helped us understand what it's like to do measurements in outer space with images."

Getting to Hawaii is pretty straightforward. Antarctica is a different matter.

Radebaugh flew to Los Angeles on Thursday. The next stop is New Zealand, where she'll stock up on cold



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Jani Radebaugh

weather gear and food at a warehouse in Christchurch. After a few days, the group will load everything onto an LC-130 cargo plane for the flight to McMurdo Station in Antarctica, where they will undergo survival training and a shakedown — practice with tents, stoves and other essential gear.

Finally, the LC-130 will take the where it will land on skis on the searching for meteorites on January.

theaters, and will return home to fall. She earned a bachelor's degree geology at BYU. She recently science at the University of Arizona.

She hesitated only briefly when she because she knew it would be looking forward to adopting the diet of those in the Antarctica. The diet is necessary in an environment where temperatures hover around minus-30 degrees.

"I'm excited to eat all the butter and chocolate I want," Radebaugh said. "We'll need to eat 10 bars of chocolate a day because we need as much energy as can to stay warm."

"It's amazing to think the two are even related, but planetary science is about extremes," she said. "The moon reaches a couple hundred degrees on one side while it's freezing cold on the other side. When trying to understand those extremes we look for extreme environments on Earth."

Jani Radebaugh

scientists farther toward the South Pole, ice. The expedition will spend five weeks snowmobiles and sleds, returning in late

work as a geology professor at BYU next in physics and astronomy and a master's in completed a doctorate in planetary

accepted the invitation to Antarctica difficult. Now she's

BYU leads research in Utah desert

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By Jens Alan Dana

Nov. 3, 2005

The stars have finally aligned for BYU astronomers as they prepare to transport a robotic telescope to the Utah desert for long-term cosmic investigation.

Joseph Moody, BYU astronomy professor, said he and his students have worked on the Remote Observatory for Variable Object Research telescope for six years, ROVER is a computer-controlled telescope that will monitor heavenly objects such as black holes, quasars and supernovas, he said.

"This is a first step toward a major decade-long investigation into how the material around black holes change its brightness," Moody said. "We don't necessarily understand the physical mechanisms, or exactly why black hole environments brighten up. We know they do, but we want to understand why."

Brett Little, a sophomore and former ROVER project member, said he became interested in the ROVER project because of the potential knowledge gained through this research.

"We will be studying gamma ray bursters, or unimaginably massive explosions that take place all over our universe." Little said. "Studying these objects will help us gain a better understanding on how our

universe was created."

Although the project is considered low budget, ROVER is not low-quality workmanship. Wes Lifferth, a 25-year veteran machinist for the Department of Physics and Astronomy, said he designed the shed that will store the telescope to maximized platform stability and horizon visibility.

"Sometimes you'll see an amateur

observatory roof that will just slide off on a track, but the roof will hit the telescope." Lifferth said. "We didn't go that way, we went with a roof that will life up and over."

The team disassembled the telescope Wednesday and within the next week, the telescope will be taken our to the desert near Delta where it will be controlled remotely via the Internet, he said.

Moody said Utah is an ideal place

and dark nights. However, he said to study astronomy with its comparatively low pollution rates aside from an observatory at West Mountain, there is no real concentrated effort to research astronomy in Utah or Nevada- two ideal states for observatories.

"If just baffles me, but for some reason we have no large telescopes in these two state," Moody said. "There's been no concerted effort to establish a really good astronomical observatory in Utah."

ASA President visits the Statistics Department

By Kathi Carter

The Department of Statistics was privileged to have a campus visit on October 11, 2005 from Dr. Fritz Scheuren current president of the American Statistical Association, one of the oldest professional associations in the United States and the largest professional statistical association in the world.

Dr. Scheuren spent the day on campus primarily to investigate the processes and procedures of the KBYU-Utah Colleges Exit Poll. He encouraged the directors of the poll to export BYU's exit poll methodology to two additional states on a trial basis in 2006, with the intent of a more extensive expansion to battleground states in the presidential election in 2008. This would provide a basis for collecting data on attitudes and opinions as well as races that would aid in maintaining an election process within which the public maintained confidence.

Dr. Scheuren also made a presentation to the department and visited with a few faculty members as time permitted. This represented a rare opportunity for the department and the only time in memory that a sitting president of ASA has visited our campus.

11 Utahns recognized for work in science, technology

Joe Bauman

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Nov. 7, 2005

An amazing range of achievements marks the 11 Utahns honored last week with the Governor's Medal for Science and Technology.

They include a physicist, making measurements at the finest scale, a scientist who pinpointed how aspirin and related medicines work, educators, entrepreneurs, a forensic DNA expert, a computer-science pioneer, a co-developer of a patch for the space shuttle, an analyst discovering how materials fail, and a leader in getting the Moab radioactive tailing moved.

Greg Jones, the state science advisor, said the medals are a symbol of recognition to people who have provided "distinguished service to the state" in science and technology. This year, he added in a press release, the ceremony was scheduled for the Leonardo at Library Square.

The following honorees are listed in the order given by state officials in the release.

Academic winners:

- **Richard Grow**, professor of electrical engineering, University of Utah. He was chairman of the Department of Electrical Engineering from 1965 to 1977 and collaborated with others to establish the university's Computer Science Division. It was "the creation point for the computer graphics industry," says the citation.

"The foresight of beginning a computer-science program and recruiting expert talent generated a period of productivity that borders on lore in the field of computer graphics."

- **David W. Hoepfner**, professor of mechanical engineering at the U. He is a world expert in material and structural fatigue, wear and corrosion. "A lack of understanding in structural fatigue and the resulting failure of aircraft components are directly linked to the cause of several recent aircraft failures, resulting in thousands of deaths," says the citation.

Through Hoepfner's research, such failures can be better understood and may be prevented.

- **Daniel Simmons**, professor of chemistry and biochemistry, Brigham Young University, Provo. His discovery of the COX-2 and COX-3 enzymes and his clarifying the action of COX-2 "form the bases of the majority of treatments for pain and inflammation in common use today," says the citation.

Simmons told this newspaper that the COX-2 enzymes is "the target site of all the aspirin-like drugs." Discovering this allowed scientists to better understand how these drugs work.

Blood-thinning caused by aspirin works through COX-1, while anti-inflammatory action happens through COX-2. Because of these discoveries, pharmaceutical companies could develop improved painkillers. Will new medicines be produced? "Oh yes," he said. "We're just looking at the beginning of this..."

"What we would like to have is a drug that keeps the stomach from becoming ulcerated but has a potent anti-inflammatory activity" without cardiovascular problems.

- **Valy Vardeny**, distinguished professor of physics at the U. His work on nanoelectronics led him to measure charges moving through single molecules and collections of material. "My bread and butter is organic semiconductors," he told the Deseret Morning News, "but when you go deeply into it, you see that they're actually a bunch of molecules."

He and his team measure "optical, electrical transport and spin transport" in individual molecules. They grow what is called a "self-assembling nano-layer" of material for their work. Before the material can be measured, a chemist synthesizes molecules and a materials scientist works on the assembly.

"When I was a kid I always wanted to know, what is the electrical resistance of one molecule?" said Vardeny. "Now we know!"

Vardeny's citation notes that the research "has enormous potential in microelectronics and may result in a new generation of ultra-small devices."

Government:

- **Loren Morton**, Utah Department of Environmental Quality, Division of Radiation Control. A geologist and the state's senior hydrologist, he was honored for many achievements, including assembling the "key scientific information" that prompted the recent federal government decision to move the Moab uranium tailings away from the Colorado River.

- **Pilar Shortsleeve**, the state's forensic biology supervisor, She has put DNA technology on a solid footing so that it's used in criminal investigations and prosecutions throughout Utah. One of the instances she recalled in an interview was helping to convict a man guilty of multiple rapes in northern Utah.

She has been "working on establishing and keeping abreast of all the new forensic DNA technology."

New technology is always coming out, Shortsleeve added. One promising technique in forensics is called the DNA chip, a format that can quickly produce a DNA profile from a small sample.

Special Achievement:

- **Richard Koehn**, former vice president for research at the U. and cofounder of Sentrax Surgical, a new biotech company. The citation says, "Dr. Koehn has lecture on science and technology in more than 20 countries; has authored over 200 articles, papers, books, and presentations; and has sat on over 50 boards and committees ranging from the sciences to the arts."

College Publications

Chemistry

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