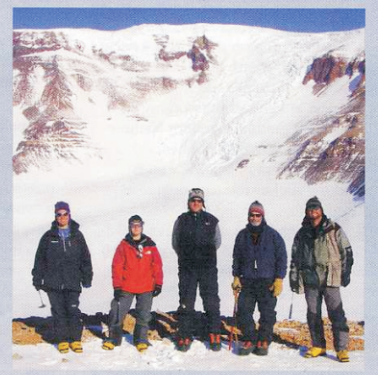
# the ULTIMATE field trip

## UWM geologist and students search for clues to the 'Great Dying' in Antarctica

*by Laura L. Hunt*

How does the Earth age? Not gracefully, if you consider the planet's physical changes during the last 300 million years, says John Isbell, a UWM professor of geosciences. Isbell researches glacial rock from hundreds of millions of years ago to decipher its role in how the Earth – and life on it – changes.

Our planet has overhauled its surface numerous times through the millennia by way of volcanic activity, glacier development, ocean shifting and movement of the land masses. Along the way, it also has been battered by meteorites. It's the rock left behind that can give a full accounting of Earth's evolution, says Isbell, and it can be used to help predict changes to the physical world in the future.



Members of the polar expedition included (from left) Nichole Kneppath, Zelenda Koch, John Isbell, Tim Cully and Peter Flaig. Cully, a camp mountaineer, is the only one without UWM ties.

"We're looking for a 'polar view' of the Earth," says Isbell, and he's not referring to cold weather. "A polar view is a complete picture based on the assumption that what happens in one part of the Earth is the result of changes in other parts."

So what part of the Earth could offer him undisturbed glacial rock from so long ago? He had to go to Antarctica for that.

PHOTOS COURTESY JOHN ISBELL

## TO THE BOTTOM OF THE WORLD

Isbell spent November, December and part of January as the lead scientist of an expedition of 30 researchers from nine different organizations conducting studies supported by the National Science Foundation. Their camp lay 400 miles from the South Pole.

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The research groups Isbell led shared a remote camp in the Beardmore Glacier, near a coastal region on the Ross Sea (facing New Zealand) that Sir Ernest Shackleton discovered in the early 1900s.

Isbell has been to Antarctica more than a dozen times (seven times since joining the UWM faculty in 1992), and has made discoveries on several of the trips that have turned into science news headlines. This time, he also took two UWM students – and the expedition included a UWM alum who is the research assistant to Isbell's colleague from Vanderbilt University.

## THE UWM CONNECTION

The research on this trip was done in partnership with Molly Miller, professor of earth and environmental sciences at Vanderbilt. Working with Miller was graduate student Nichole Knepprath ('02 BS Geosciences), a former student of Isbell's, who is working on her master's degree at Vanderbilt.

Isbell's graduate student, Peter Flaig, himself an alum (BS '02 Geosciences) and former classmate of Knepprath's, spent years as a professional photographer before deciding on a career change that would allow him to combine geology research with photography and his training in Geographic Information Systems (GIS).

The other team member, Zelenda Koch, had finished all but a year of her bachelor's degree in geosciences at UWM before embarking on the trip. An experienced mountain climber, Koch's job was to help the team navigate the terrain.

Early November is halfway through spring in Antarctica. Temperatures hovered around 30 below when they arrived, but by departure time it was summer and the weather had warmed to between zero and 10 degrees.

"The extremely low humidity makes the cold much easier to bear," says Isbell. "The real culprit is the wind. It can make you miserable."

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Isbell chose his companions both for their knowledge of the science and their physical stamina. Each had to pass strenuous physicals and took survival training before flying by helicopter to their isolated camp, which consisted of tents, snowmobiles and use of a small twin-engine plane.

## THE 'GREAT DYING'

Despite the extreme environment, Isbell had another reason for choosing the bottom of the world for fieldwork. Antarctica was the epicenter of arguably the most pivotal geographic change thus far in Earth's history.

The time frame Isbell studies is from roughly 300 to 245 million years ago, when life on Earth consisted mostly of marine life, plants, amphibians and small reptiles. Movement of the Earth's tectonic plates had pushed the continents together into one land mass, called the Pangea. Around 270 million years ago, the environment in the southern half of the Pangea morphed from icehouse to greenhouse conditions.

But the most significant event of this period signaled the end of the Paleozoic Era and, quite nearly, the end of life on Earth. A massive extinction swept the planet 250 million years ago, wiping out 95 percent of marine life and more than 70 percent of terrestrial life.

The Permian-Triassic extinction, also called the "Great Dying," was much worse than the better-known extinction of the dinosaurs that occurred 180 million years later.

## ANTARCTICA HOLDS THE CLUES

Like forensic scientists meticulously reconstructing a huge crime scene, Isbell and company are looking for geological evidence that will explain what happened. Antarctica holds the clues to the formation and division of the Pangea.

They also are interested in a development that took place before the great extinction: The glaciers in Antarctica disappeared, setting into motion a domino effect on other conditions, such as weather patterns and sea levels.

According to Flaig, the extinction occurred during a time of many tectonic plate collisions that were building mountain ranges and influencing the climate. The period also was marked by copious volcanic activity, which could have altered the atmosphere.

Any of these significant events, or a combination of them, could have caused the Great Dying, geoscientists believe. Another theory is that, in the midst of these changes, an asteroid smashed into the southern Pangea, causing the mass extinction.

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## READING THE ROCK

"To me, the Earth is the ultimate history book and geology is the language that it is written in," says Flaig. "We need to read the rock record to understand the history of the planet."

Because the Great Dying may have been sparked by a number of changes happening at once, the UWM team included the Vanderbilt researchers, who specialize in the fossil record of animals living during those ancient times.

"Fossils give you clues to what the climate was like and what kind of animals were surviving at the time," says Kneppath, who studies the sedimentary rock history in areas of tectonic activity, such as glacier beds. "It's almost like a puzzle."

Knepprath and Flaig had already done some fieldwork with Isbell as undergraduates. "We were comparing what was happening in Antarctica to what we found in glacier areas in Wyoming and Colorado," says Knepprath.

Last summer, they joined Claudia Baretto, a UWM professor of biological sciences, and Peter Sheehan of the Milwaukee Public Museum, in Montana, where the pair studies fossil remains of animals and dinosaurs from the Cretaceous-Tertiary period.

Isbell called it "doing some reconnaissance."

## A RARE EXPERIENCE

Isbell hopes the National Science Foundation will next approve a grant for Baretto/Sheehan and Isbell/Flaig to compare data from the two extinction periods.

Meanwhile, Isbell's students realize that they had partaken of a rare experience – nationally funded research at the ends of the Earth – while still in college.

It's not a privilege they take for granted. Says Flaig: "John gave me the opportunity of a lifetime to work on something that I feel is important to science and humanity."

**Students Zelenda Koch (left) and Peter Flaig had to complete survival training before accompanying John Isbell to Antarctica.**