On the rim of an Antarctic valley in 1975, the wind chill blasted at negative 20 degrees. Gisela Dreschoff was running a sled full of equipment to measure gamma radiation after having just hauled its 300 pound weight to the valley rim while her colleagues huddled in the warmer valley below. For hours she withstood the cold. At the mess hall later that evening, she was warming up when two hefty construction men came in from outside.

“It’s cold out there!” one of them said.
“How long were you out there?” said the other.
“Thirty minutes!”

Dreschoff looked at her graduate student Karen Harrower, the only other woman in the room, and they smiled to themselves.

What seemed like a private joke was a smile with lots of mileage behind it. Dreschoff, University of Kansas Adjunct Associate Professor of Physics and Astronomy, trekked to Antarctica and back just six years after women had first stepped onto the Antarctica continent for scientific research. Until that time, polar regions had remained gridlines on a map for women interested in science, despite the fact that they were designing and contributing to scientific experiments that men were carrying out in the field.

The introduction of women into polar fieldwork reads as a chronology of academic discrimination, personal attitudes, professional roadblocks, and arcane travel stipulations. Dreschoff came to KU from Germany to finish her PhD in physics in the late sixties. She remembers being appalled at the difference between the attitudes of European and American students. She had sailed through her European education without feeling excluded in any way, and the attitudes of her fellow students in the US shocked her.

“When I came here, I could not believe it. I got very angry. I was at the lab here, and what I learned quite rapidly was that young girls in high school, very intelligent, very good in math, if they wanted to have a boyfriend, be successful, they would have to suppress the knowledge that they are good at these things. It was the reverse in Germany. You could be proud of your accomplishments.”

Dreschoff attributes the difference to World War II, which she said in Europe created a strong female workforce that was expected to contribute equally to industry and science in the absence of men. In the US, Dreschoff tried to begin a recruitment program for high school girls but became discouraged. Instead, she began advising her college students to make a difference by continuing on to their PhDs and working hard at their jobs. She tried to lead by example, both through counseling her students and lugging sample rocks in Antarctica.

“I think I did my part by being out there and showing the men, ‘I am one of you, I can do it,’” Dreschoff said.

Dreschoff managed to leverage her field experience and language skills into a position as an associate program manager with the National Science Foundation. Later, she served as a lecturer on cruise ships around the Antarctic Peninsula. Despite the fact that she was usually the only woman in groups traveling to the Antarctic, she said she never felt uncomfortable or disrespected in the field.

“I was totally happy with the guys. I must honestly say that. Many times there was the feeling that if there were more women, they would feel better. I never understood that,” said Dreschoff.

For others, the ascent to the poles wasn’t so linear. Irene Peden, University of Washington Professor Emeritus in electrical engineering, spent years as a co-Principal Investigator for a project seeking to study how waves could propagate around the earth using buried antennas at low frequencies in Antarctica. For years the National Science Foundation tried to send women like her into the field. The Navy opposed these propositions on the grounds that women would need separate travel consideration and would distract men on their ships. The Navy required her to make her proposal peer-reviewed before she could go with a team of graduate students, many of whom had gone in previous years instead of her. The Navy also stipulated that she could not design an experiment for a hostile environment unless she had experience there. This pigeonholed her into creating a peer-reviewed proposal, even though her male colleagues did not have the same requirement.
NEEM REACHES BEDROCK

// BY NICK MOTT

For polar scientists in Greenland, Tuesday July 27, 2010 was a day of celebration.

After years of Arctic work, researchers at NEEM, an ice core drilling site in Northern Central Greenland, reached bedrock at a depth of 2537.36 m. Professor Dorthe Dahl-Jensen held the final chunk of the core, a symbol of five years’ perseverance, over her head in triumph as photographers snapped pictures.

The site was selected to obtain Eemian ice, or ice from the last inter-glacial period. In this period, the climate was remarkably similar to the climate of today. NEEM researchers hoped to find a drilling site with clean, intact layers of Eemian ice. In order to discern the condition of the layers, CReSIS researchers conducted a radar survey of the site during the first year of drilling. “We had a radar depth sounder that we pulled behind a tracked vehicle and did a grid right around the site to map the bedrock and also to try to map some of the deeper internal layers,” said CReSIS faculty member Carl Leuschen

CReSIS researchers were part of more than 300 scientists from 14 nations working on the project. Leuschen explained the significance of the core.

“As the snow falls, these gases get trapped in the snow. They essentially are trapped there, and so as more and more snow falls, they compress into ice. What we have in the ice is essentially samples of past atmospheres. By drilling these ice cores, they can get the gases out of the ice sheets at different depths and look at climate history.”

Eemian ice dates from about 115,000 to 130,000 years ago. Ice from this period is particularly useful because of its similarities to the current climate. It may therefore help to predict future changes in climate, Leuschen said. NEEM researchers hope that their findings will help determine the extent to which the melting Greenland Ice Sheet will influence sea level rise, and they expect to find a plethora of data about the Eemian period, at which time the temperature was about 2-3 degrees Celsius warmer than it is today. They obtained even older ice near bedrock, ice that should house DNA and pollen that scientists can use to determine the sort of plant life that existed on the site before it was iced over millions of years ago.

The NEEM project is headed by the Centre for Ice and Climate at the University of Copenhagen. Leuschen hopes that the success in Greenland means continuing CReSIS’ long history of collaboration with both the University of Copenhagen and the larger, international polar science community.

NEEM researchers celebrate reaching bedrock.

RACE TO THE TOP: THE LAST GLACIERS OF INDONESIA

// BY ASHLEY THOMPSON

Lonnie Thompson has extracted ice on the verge of meltdown worldwide. He’s collected samples from the Dasuopu Glacier in Tibet, witnessed shocking rates of ice melt atop Mount Kilimanjaro, and ventured high into the Peruvian Andes to the ice cap of Quelccava.

Thompson performs research that few scientists, if any, before him have dared to attempt, and he does so with the knowledge that these rapidly receding glaciers provide regional history of climate, as well as a glimpse into the climatic future. But there was one mountain, one place, whose lure he could not quell for some 35 years.

Indonesia’s Puncak Jaya, jutting 4884 meters – over three miles – above the Pacific Ocean, on the island the country shares with Papua New Guinea. Atop the mountain rest the only remaining glaciers in Oceania. And they’re melting at a rate faster than Thompson had predicted. Before his trip last summer, he worried he may have been forced to wait too long, and worried that pounding rain and increasing temperatures might muddle an accurate climate record dating back thousands of years.

Indonesia is a country of some 17,000 islands, 2,000 of which sit directly in the path of rapidly rising seas. Inundation could become of paramount concern by as soon as 2030. In the year 2009, concerns about climate change finally won out over political unrest after several denied requests. Thompson and his team were granted research permits to drill into the ice field, which sits within a protected national park. They arrived this May.

He took a series of preliminary test flights over the region last year. The ice field appeared healthy. It wasn’t going anywhere just yet. He breathed a sigh of relief that the decades of waiting hadn’t marred the possibility of obtaining a climate history in this region of the world that has been rather understudied until now. Successfully obtained ice cores from these glaciers would provide reconstructed histories of El-Nino-Southern Oscillation and the Austrial-Asian Monsoon from the western side of the Pacific Warm Pool. Records can be compared to those obtained on the eastern side of the Pacific Ocean to better understand climatic processes such as El-Nino.

Thompson and his team, co-led by Lamont-Doherty’s Dwi Sustanto, benefited from the assistance of Freeport, a U.S. mining company operating on the moun-

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CReSIS CONTRIBUTES TO USA SCIENCE & ENGINEERING EXPO
// BY NICK MOTT

Remote sensing isn’t exactly at the top of most children’s minds.

That all changed when CReSIS representatives sat alongside about 600 scientific groups and organizations and a quarter million visitors at the USA Science and Engineering Expo in Washington, D.C. on October 23 and 24.

“I’ve never seen so many people ever at a conference. It was enormous. People were just everywhere, and talking about it to their kids, and asking good questions,” said Cheri Hamilton, CReSIS K-12 Education Outreach Coordinator.

The Expo, held on the National Mall, was the final stage of a larger event: the two-week-long USA Science and Engineering Festival. It was designed to pique the interest of the nation’s youth in the fields of science, technology, engineering, and math. CReSIS was selected as one of 15 NSF organizations to attend the event and was the only representative from the state of Kansas.

In the CReSIS booth, students could fly a model of the Meridian aircraft over a block of simulated ice and view the radar results on a computer screen. A simulation of sea level rise developed by Haskell Indian Nations University and KU showed the landward migration of coastlines, and a flight simulator gave students the opportunity to feel like pilots. The activities in the booth were a great success and the kids had a lot of fun. Hamilton added that many of the younger kids liked crashing the plane.

According to Administrative Manager Jennifer Laverentz, the CReSIS booth offered something for everybody.

Hamilton said that the adults learned something, too. “The adults were really interested in the radar,” she said. “I think a lot of adults don’t have any idea what radar does or that it comes off of a plane or a sled.”

The Expo was the first time CReSIS offered a hands-on demonstration of radar to children. As the model Meridian crossed over the faux-ice block, the layers showed up onscreen, and when it was over the street, the computer recorded only a single, flat line. “You actually had proof that it was doing something,” Hamilton said. Radar is a difficult concept to teach children because it is invisible. By incorporating the computer screen and ice block simulation, CReSIS’ display performed a feat of magic: it made the invisible visible.

CReSIS faculty and staff members Hamilton, Laverentz, Carl Leuschen, and Stacey Freeman attended the event along with engineering graduate students Austin Arnett, Bill Donovan, Emily Arnold, and Aqsa Patel and the School of Engineering Public Relations Director Jill Hummels. Hamilton and Laverentz said that the Expo was a great opportunity for the graduate students to interact with kids and see themselves as role models, an opportunity they wouldn’t otherwise have had. “We had girl scout troops come through who were really excited to see females who were graduate students in science,” Laverentz said.

Both Hamilton and Laverentz thought that the conference was a success. In just two days, between 3 and 5 thousands students passed through the CReSIS booth. Hamilton said that the streets were so packed she could barely see into the other booths. She hopes that the conference will continue in future years and that she can continue to make the invisible visible with radar demonstrations at upcoming educational events.

CReSIS WELCOMES NEW EDUCATION COORDINATOR
// BY NICK MOTT

Stacey Freeman joined the CReSIS Education team in October of 2010.

She completed her undergraduate degree at the University of Wisconsin - Madison, where she received a B.A. in English and a minor in Business Administration. She went on to obtain her M. Ed. in Higher and Post Secondary Education at Arizona State University. Her masters thesis was on college access and equity issues among African-American high-school students. She recently completed her Ph.D. coursework at ASU in Educational Leadership and Policy Studies. She came to CReSIS from the Institute for Educational Research and Public Service at KU, where she worked as a program assistant focusing on after-school programs throughout the state of Kansas. As Education Coordinator at CReSIS, she is most excited about interacting with college students again. “I also look forward to strengthening CReSIS partnerships with local universities, community colleges and partner institutions, especially to increase our recruitment efforts,” she said.
“I had to decide if I wanted to pursue this,” said Peden. “We knew we had to make short-term sacrifices for long-term goals.”

The policy delayed her trip by a year, but, in 1970, she became the first woman to conduct research in the Antarctic interior. Like Dreschoff, she found a mostly amicable environment among her colleagues on the continent and in the lab. Both women quickly point out that working hard dispelled gender expectations overall.

“It takes persistence,” she said, “Pick out something that you enjoy and go for it. You have to decide if you can cope with it.”

Dreschoff commented, “What it means is, if you truly want to do something, you can do it. I believe in that. We were interested in the science. We wanted that data. So you can overcome many things.”

Since Dreschoff and Peden began their careers, women have risen to numerous positions within polar programs. However, they still represent a minority of researchers who flock to the poles each field season.

NASA glaciologist Lora Koenig is one of these women. Her current research focuses on accumulation rates in the West Antarctic Divide region. She plans to make her second trip to Antarctica on November 22nd. She has also spent three seasons in Greenland.

“I feel like women, specifically female scientists, doing fieldwork is increasing. The first time I was in the field, I was the only woman in camp, and on this traverse that we’re doing this year, there will be two women and three men,” said Koenig.

Koenig said that although women have certainly made advancements in polar field research over the years, conditions are far from perfect. A new mother, Koenig is leaving her baby with her husband for the six weeks that she will be in Antarctica conducting fieldwork.

“People certainly ask questions about that where I’m not sure they ask men as many questions about why they’re leaving their families and their children. I think that it’s not necessarily discrimination, but you certainly have to answer more questions,” she said.

On the other hand, Koenig said that she receives a lot of support simply because she is engaged in work that few other women pursue.

“I think it’s human nature sometimes to seek out similarities in our friends and the people that we associate with, and sometimes females have difficulty in the polar regions finding people who are a lot like them, when it’s male dominated,” she said. “And so as more women find people who are similar to them, I think they’ll be encouraged.”

Although female scientists like Dreschoff, Peden, and Koenig have made leaps and bounds in the past few decades, there remains a lack of female mentors for budding polar scientists to look up to.

Koenig hopes that as more women enter the field, they will serve as mentors, fostering in another generation of female scientists. Koenig remains optimistic that more and more women will brave the icy polar winds in the future; she thinks the numbers of men and women in the field will become more equal over time.

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CONTINUED: RACE TO THE TOP: THE LAST GLACIERS OF INDONESIA

tain. Logistical difficulties included airlifting some six tons of radar and drilling equipment—once it showed up. Thompson shipped 109 containers to New Guinea, of which only 100 were initially located. In the nine missing containers were the drills themselves, which led to a crisis-crossing adventure with Freeport’s Scott Hanna throughout Indonesia, island-hopping until they were at last uncovered in Abuda Airlines’ warehouse, in a dark corner.

“It was like Raiders of the Lost Ark,” Thompson recalls.

Once the proper equipment was in place back at the camp site, the process of extracting near-bedrock ice cores began. Thompson came in with a goal of obtaining four ice cores. The team ended up with three, measuring 32, 30, and 26 meters in length. Two were drilled to bedrock. The team also collected rainfall from around the island for isotopic measurements, and they placed a 30-meter stake on the bedrock in order to measure annual ablation rates. During their two weeks of camping on the ice, 30 centimeters of ice melted. At an annual rate, that is 7 meters of ice loss per year. For an ice field that’s just one-square-mile wide and 32 meters deep, this means the end is near. “Our mission was a salvage mission,” Thompson said.

From a scientific standpoint, these numbers are both frightening and staggering. Tropical glaciers act as a sort of canary in the coalmine for the future of the planet. But a different sort of fear and dismay exists for local communities whose ties to the ice go deeper than bedrock.

Toward the beginning of their 13-day stay on the ice, some 100 Amunges, one of four indigenous groups who claim the ice field, confronted Thompson and his team. “They would line up and yell at us at the top of their lungs. The locals certainly don’t recognize such things as Indonesian permits.” The scientists were in their territory, and they wanted to know what they planned on doing. With the help of a translator, Thompson learned that their main fear was that they were working for Freeport to establish a mining field. Once those concerns were put at ease, a second cultural clash became clear. In the Amunges’ religion, Puncak Jaya is a sacred mountain and represents the body of their god. The retreating glacier is the skull of this god. “For them, the loss of glacier means losing part of their soul. We explained we were trying to understand why it was disappearing,” Thompson said. Nearly five hours later, relations were somewhat restored, and the drilling continued.

The whole scenario reminded him of a scene out of “Avatar”. Science and culture often don’t understand each other, especially across borders. It reminded Thompson and others of the real mission at hand. The projected displacement and dwindling water supply in the world’s thirstiest regions, as well as the cultural and spiritual ties to the endangered glaciers, are all at risk of being disrupted or lost as a result of climate change. Thompson is particularly adept at removing himself from a strictly scientific mindset and works to engage locals on science education and involvement in research wherever he goes. He is currently working with Indonesian graduate student Donaldi Permana to study the ice cores. Permana is a second-year masters student in geology at OSU, and one of two students who “got this golden opportunity” to work alongside Thompson and other faculty at Byrd Polar Research Center as part of an exchange between OSU and the Indonesian Meteorological, Climatological, and Geophysical Agency. Besides the academic bolster such international exchanges provide, Permana sees benefits in engaging locals for other reasons.

“It is important to involve local people in the scientific process. People will have a better understanding of climate change science if the data come from their own regional area, so that they can see the changes by their own eyes,” Permana said.

Permana and other researchers will use key layers to date the horizontal layers, such as thermonuclear bomb layers and ash from volcanic eruptions that are documented in history, as Indonesia lies along the Ring of Fire. In preliminary tests, reproducibility seems clear, meaning the rainfall seems to have spared many layers from merging and melting. A complete measurement of at least one of the cores is expected to wrap up by Christmas.

“We’re very pleased with what we have seen so far in these records, Thompson said. “For a time I was thinking, ‘We’re too late,’ but we’ve now done an isotopic overview of two of the cores, and the reproducibility was amazing.”

Thompson will return to Indonesia to present the results in 2011, as well as hold a workshop for local scientists and the public. After that, it’s on to another remote peak in an effort to understand the past and future of local climate before such priceless records trickle away. <<<
CReSIS MAKES IMPACT AT NSTA CONFERENCE

// BY ASHLEY THOMPSON

CReSIS geology professor Leigh Stearns found herself in front of a somewhat unique audience on October 28 at the regional NSTA (National Science Teachers Association) meeting in Kansas City, Mo.

Accustomed to standing in front of her academic peers with years of experience in the field of glaciology, Stearns’ presentation took on a much more exotic feel in front of nearly 30 secondary science teachers. Photos of Stearns and other scientists exploring crevasses of East Greenland’s Helheim glacier and her explanations of the use of GPS technology to understand the glacier’s behavior captivated the audience.

For the first time, CReSIS K-12 Education Coordinator Cheri Hamilton and graduate student Brandon Gillette brought both a CReSIS engineering student and a professional glaciologist with them to present at the regional NSTA conference. While Stearns opened for Hamilton’s presentation, which included the perennial favorite Glacier Goo, Victor Jara-Olivares, PhD candidate in electrical engineering, presented alongside Gillette on remote sensing applications at the Poles.

“The CReSIS team presented two talks during the two-day conference: “Glacier Dynamics: The Science and the Activities,” and “Remote Sensing: Mapping the Ice Sheets in Greenland and Antarctica.” However, the CReSIS reach at NSTA went beyond these two 30-minute sessions. Riverton High School (Kansas) teachers Cynita Jones and Jayne Jones, who participated in CReSIS’s 2008 “The Heat is On!” climate change education workshop also presented at NSTA, drawing from CReSIS-related material that had been a hit in their own classrooms. And Gary Wesche, a 2009 PolarTREC teacher who accompanied a CReSIS research team to WAIS Divide in Antarctica last winter, gave a presentation entitled, “Bringing Glaciers into the Classroom.”

“It was neat to see the impact CReSIS has had on some of the presenters,” Gillette said.

A former high school science teacher himself, Gillette has attended the NSTA conference since his undergraduate days.

Hamilton and Gillette also passed out the new CReSIS Climate Change DVD and gathered more e-mail addresses for the Education ListServ, which keeps teachers across the country updated on CReSIS and climate change-related workshops, presentations, conferences, and opportunities for students.

NSTA holds three regional conferences per year. At each of the events, science teachers present on research or lesson plans in an effort to promote excellence and innovation in science teaching.
In the Summer 2010 Icebreaker newsletter, we featured profiles on 17 CReSIS-related REU students that worked this past summer at the University of Kansas and Indiana University. A total of 27 students participated in the CReSIS summer REU program, and here we profile the remaining 10 REU students that spent the past summer working at Elizabeth City State University. Here are the titles of the projects each student completed along with the name of their mentor.

Marvin Elder II is a freshman at Mississippi Valley State University in Math Education. His research project was entitled The Results of Data Collected from Surveys to Predict the Effectiveness and Analyze the Trends of Undergraduate Research Experience Programs and Virtual Seminars. His mentor was Dr. Yolanda McMillian.

Joseph Jackson is a freshman at Mississippi Valley State University in Computer Science. His research project was entitled Generation of Titanic Prime Numbers Through High Performance Computing Infrastructure. His mentor was Je-aime Powell.

Matravia Seymore is a freshman at Elizabeth City State University in Computer Science. Her research project was entitled Generation of Titanic Prime Numbers Through High Performance Computing Infrastructure. Her mentor was Je-aime Powell.

Jamal Pearce is a sophomore at St. Augustine’s College in Biology. His research project was entitled Establishing a Baseline of Water Quality along the Coast of Northeastern NC in Response to the Deepwater Horizon Oil Spill. His mentor was Jeff Wood.

Kiara Jones is a freshman at St. Augustine’s College in Chemistry. Her research project was entitled Survey of Post Last Glacial Maximum Environment: Unusual Soil Constituents in Rockyhock Bay Stratigraphy. Her mentor was Dr. Malcolm LeCompte.

John Bell is a freshman at Mississippi Valley State University in Computer Science. His research project was entitled Generation of Titanic Prime Numbers Through High Performance Computing Infrastructure. His mentor was Je-aime Powell.

Ryan Lawrence is a freshman at Elizabeth City State University in Chemistry. His research project was entitled Survey of Post Last Glacial Maximum Environment: Unusual Soil Constituents in Rockyhock Bay Stratigraphy. His mentor was Dr. Malcolm LeCompte.

Joshua Rhodes is a freshman at Elizabeth City State University in Chemistry. His research project was entitled Particulate Properties of the Dead Sea Retrieved by the Physical Optics Method. His mentor was Leonid Sokoletzky.

Derrick Griffin is a junior at Winston-Salem State University in Computer Science. His research project was entitled Particulate Properties of the Dead Sea Retrieved by the Physical Optics Method. His mentor was Leonid Sokoletzky.

Dalesha Cartman is a freshman at Mississippi Valley State University in Math Education. Her research project was entitled The Results of Data Collected from Surveys to Predict the Effectiveness and Analyze the Trends of Undergraduate Research Experience Programs and Virtual Seminars. Her mentor was Dr. Yolanda McMillian.

2010 Undergraduate Research Experience in Ocean, Marine, and Polar Science Research Students with ECSU Chancellor Willie Gilchrist and Dr. Linda Hayden, Pl.