Lawrence, Kansas, USA—September 2013 saw close to 100 delegates converging at the University of Kansas (KU) for the International Glaciological Society’s (IGS) second Symposium on Radioglaciology. The Symposium started with an icebreaker reception on the ninth floor terrace of the main campus hotel. A busy five-day program followed with over 50 oral presentations, an Early Career Scientist workshop, two midweek social excursions, an intertribal pow-wow and BBQ dinner at the Haskell Indian Nations University, and a banquet featuring a talk on local history and the infamous John Brown. The symposium closed with a UAV workshop on Friday morning.

The IGS Symposium was co-hosted by the Center for Remote Sensing of Ice Sheets, headquartered at KU, and co-sponsored by the National Science Foundation (NSF), NASA, KU, the KU School of Engineering, and KU Research and Graduate Studies.

Founded in 1936 with its headquarters in Cambridge, UK, the International Glaciological Society was established to “provide a focus for individuals interested in practical and scientific aspects of snow and ice.” IGS sponsors a wide variety of lectures, field meetings and symposia all around the world throughout the year. The Society is best known for publishing the Journal of Glaciology and the Annals of Glaciology. It also produces a monthly news bulletin, ICE, which will feature CReSIS and the Radioglaciology Symposium in its next edition.

“From my perspective as a glaciologist who works with radar data, I found the conference to be very professionally educational, as the many talks and posters explained some of the new developments and products that have entered the field of radioglaciology over the last few years,” said Douglas MacAyeal, IGS President and a professor of Geoscience at the University of Chicago.

MacAyeal and IGS Secretary General, Magnus Már Magnússon, organize multiple IGS symposia and events annually featuring distinguished speakers, scientists and students from a variety of glaciological disciplines. CReSIS and IGS hosted delegates from as far afield as Australia, Belgium, Brazil, China, Canada, Denmark, Germany, Japan, the Netherlands, New Zealand, Norway, Spain, USA and the United Kingdom.

Dr. Richard Alley delivers keynote address

Special guest and Keynote Speaker Dr. Richard Alley was one of the many highlights of the conference, setting an enthusiastic and upbeat tone during his talk on “Ice

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Dr. Richard Alley, professor of geosciences at Pennsylvania State University, was kind enough to do an interview with CReSIS about his career, climate change and the future of scientific research. Dr. Alley recently visited CReSIS when he was the keynote speaker at the International Glaciological Society’s (IGS) Symposium on Radioglaciology in Lawrence, Kansas.

Sorcha Hyland: What inspired you down this career path into geological and specifically – cryospheric research?

Dr. Richard Alley: My interest in geology and the natural world goes way back, with lots of encouragement from my parents and from community members in rock and mineral societies. Then, I got a summer job with Ian Whillans at Ohio State after my freshman year there. The rest, as they say, is history. I worked with Ian through BSc, and then stayed at Ohio State for MSc. Ian advised that I decide what I wanted to do, then do a PhD with the best person in the world for that. And, after getting married, I told Ian that I had to do something that I could make a living at. After exploring many possibilities over a year, I asked Ian to take me back, and he did. And, that best-person-in-the-world advice took me to Wisconsin and Charlie Bentley for the PhD.

SH: At what point, if any, did you find your attention turning to global climate change? And to a more public role in this regard? Did “it” pull you in – or what was the motivating factor that led you to sharing the fruits of your research?

RA: Ian and Charlie were both well aware of the societal implications of the work, and kept us up-to-date. But, what really moved me was helping describe the remarkably abrupt climate changes we observed in the GISP2 core.

As an example of a climate change NOT caused directly by CO2, that generated all sorts of interest, an invitation to brief the US Vice President on the results, and subsequently the National Research Council/National Academy of Sciences Committee on Abrupt Climate Change. But, I was raised and educated with the full understanding that we owe it to society to share the results of the research they paid for, and that use of those results in decision-making really can make us better off.

SH: How difficult is it to navigate your role[s] not just as a scientist but as a scientific advisor and educator?

RA: Time may be the biggest issue—all of the different aspects of our job are important. You know the usual categories—teaching, research and service. But, we might more easily describe the job as learning what no one else knows, sharing that knowledge with people, and helping them do good things with it. All matter. Increasingly, though, the university is paid for by tuition from students, at a time when the interest in the research discoveries and the importance (including economically) of those discoveries to the broader society is increasing. (The role of NSF and CReSIS in helping us share our discoveries broadly is very important!)

SH: How does one handle this responsibility – as a scientist and an educator – knowing how serious our situation is?

RA: Sleep less? Seriously, all of us at CReSIS, and really across the universities, face this challenge, and I think as a community we are doing well. I hope I am.

SH: What informs your teaching and what do you think about when you stand in front of a brand new class of students?

RA: The world would probably support a few million hunter-gatherers, but we are a few billion planter-builders, powered by fossil fuels we are burning a million times faster than nature saved them for us, but with the knowledge that with good enough science and engineering, policies and politics, we can build a sustainable society for the 10 billion people coming. And, those scientists and engineers, policy-makers, builders and planters are sitting there in class, looking for the tools to make it happen.

SH: In your award citation from the EGU (European Geosciences Union), as first recipient of the Louis Agassiz Medal in 2005, they described you as the “thorn in the backside of the Bush administration”. How would you describe the impact your work is having on the current administration, if any? And do you see any developments occurring in terms how science might further influence policy making at a national and global level?

RA: A large body of scholarship shows that with a wise and measured response to climate change, we end up with a bigger economy, more jobs, greater national security, a cleaner environment than what we’ll have if we continue with business as usual, sort of a win-win-win-win situation. Many public statements by policy-makers suggest that they may not have heard, or appreciated, the benefits available from this response. So, there is much more that can be done.

SH: How do you view the future of cryospheric research – what do you foresee as possible obstacles – and how might we overcome these?

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An Exchange of Research & Culture: Dr. Dorthe Dahl-Jensen

// by Tyler Wieland

As a high school student in Denmark, Dr. Dorthe Dahl-Jensen was eager to study nature. Her curiosity in exploring the natural world led her to study the ice sheets as an undergraduate, and her initial experiences in the field sparked her interest in understanding how the world’s changing climate affects the ice sheets.

As a Danish citizen, Dahl-Jensen has a strong cultural connection to the people of Greenland, which is considered an autonomous country within the Kingdom of Denmark. She said this is the primary reason why her research focuses heavily on the Greenland ice sheet.

Dahl-Jensen, who is one of the leading researchers in ice sheets at the Niels Bohr Institute of Ice and Climate at the University of Copenhagen, said her current research is what brings her to the Center for Remote Sensing of Ice Sheets in Lawrence, Kan.

Though she has been to Lawrence, Kan. before, this is the first time she will be on an extended stay. Dahl-Jensen, her husband, who is also working at CReSIS, and her daughter all arrived in Lawrence, Kan. in the middle of August for a three month research exchange.

Research at CReSIS

“I have had a long and fruitful collaboration with the researchers at CReSIS,” Dahl-Jensen said. The University of Copenhagen and the University of Kansas have a long history of exchanging professors and graduate students to assist with collaborative research ventures between the two universities.

She said, “CReSIS is the leader in radar and the development of radar technology to monitor and record changes in ice sheets.” It is this that brought her to Lawrence, Kan.

According to Dahl-Jensen, the radio echo data being collected by CReSIS’ radars will help a collaborative group of international researchers determine the prime locations for drilling future deep core sites across Greenland, New Zealand and Antarctica.

She said the tools and data that CReSIS provides her is an important element in reconstructing the Greenland ice sheet to see how it has moved and changed through time.

Cultural Exchange

“The work environment reminds me of home, but the cultural is much different,” Dahl-Jensen said. While her family is excited to be experiencing Kansas’ unique culture, her primary focus continues to be on her research. “I am taking advantage of the opportunity to work with the researchers at CReSIS and utilize the data available,” she said.

One of the more difficult cultural shocks for Dahl-Jensen and her family was the summertime heat. “Back home we are able to bike almost anywhere we would need to go, but some days it’s just too hot to bike across town.” She went on to say that in Denmark, everything is fairly close, so biking is more feasible than in Lawrence, Kan.

Dahl-Jensen’s 13-year-old daughter is currently enrolled at a local middle school. She said that though it has been difficult for her daughter to go to school in a foreign language, she loves the experience. Dahl-Jensen and her family will be in Lawrence, Kan. until November 6th.

Even while she is focused on her current research, she has many other projects planned or in development. “Research is always changing,” she said.

Current and Future Research

Dahl-Jensen took the time to highlight how exactly she plans to use the unique radar data and IceBridge technology to assist in determining future locations to drill ice cores. She said, currently, a Danish group is working on mapping Roosevelt Island in New Zealand for possible locations to drill. She hopes Operation IceBridge will be able to make a pass over the area in the near future.

Her next project will focus back on Greenland. In 2015, a collaborative group of researchers from the U.S., Germany and Denmark will be in the field studying the Renland, Greenland area for locations to begin deep ice core drilling. Dahl-Jensen expects to use CReSIS radar data to pinpoint the best location for the team to drill.

“It fascinates me to work with the past climate and understand how the climate has changed over the years,” she said. Dahl-Jensen hopes these deep ice core samples will help determine the movements of the ice sheets using the folds in the ice crystals to estimate the rate of change.

Another project in its early stages is a 2016 deep ice core drilling project, also located in Greenland. Dahl-Jensen said that she hopes the project will be able to shed some light on the northeast Green
Sheets and Sea Level Data: Models and Ways Forward.” A geologist and Evan Pugh Professor of Geosciences at Pennsylvania State University (PSU), Alley has also contributed to the United Nations panel on climate change, testified for Al Gore during Gore’s vice presidency, and received IGS’ own prestigious Seligman Crystal for his outstanding scientific contribution to glaciology in 2005. As a co-I on the CReSIS STC grant, Alley was the ideal candidate to leave no iceberg unturned during his opening of the Symposium. Alley, who testified before the U.S. Congress in 2010, stressed the importance of improving the scientific community’s understanding of the dynamics of ice sheets, ice shelves, glaciers and sea level rise to further support public policies that address the consequences of climate change.

A leading voice in the scientific community, Alley said U.S. senators are requesting specific numbers about sea level rise from the scientific community. He believes that part of improving estimations and knowledge of these forces comes from supporting students and research.

“We need radars, we need bright students,” said Alley of polar ice research. “We need to know the motions. Where it is and where it is going.”

**Dr. Dorthe Dahl-Jensen presents her latest research**

Dr. Dorthe Dahl-Jensen, who is on a research sabbatical at CReSIS, is the Director of the Niels Bohr Institute of Ice and Climate at the University of Copenhagen and the Chair of the Scientific Steering Committee that runs the NEEM project in Greenland. In her presentation, Dr. Dahl-Jensen discussed the research she is currently doing at the University of Kansas.

“I am using CReSIS’ radio-echo soundings to determine the best locations for deep ice core drilling,” she said.

Dahl-Jensen said her current research involves searching for the velocity of ice movements using the folds in the ice cores to estimate the rate of change. Dahl-Jensen believes if she can discover how the crystals have folded over each other using ice core data, she and her team could better model what changes to expect as the ice melts and propagates.

**Students Presentations**

Among the CReSIS students presenting at the symposium was Jerome Mitchell, a Graduate Research Assistant at Indiana University, who shared his research on techniques for detecting the layers in polar radar imagery. Mitchell, a Ph.D. candidate in Computer Science, was awarded a prestigious NASA fellowship earlier this year.

Christian Panton, a Ph.D. student at the University of Copenhagen, also attended and discussed automated internal layer tracing. Panton’s presentation took advantage of the dissertation research he conducted while visiting CReSIS during the spring of 2013.

Other prominent scientists featured at the conference included:

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2013 CReSIS REU Program

// by Bill Daehler

Each summer, CReSIS hosts undergraduate college students through the REU [Research Experience for Undergraduates] program. The students work with faculty and graduate student mentors to learn about scientific research. The program gives students from around the country an opportunity to network with leaders in their fields, develop professionally, learn research skills and work closely with faculty and other students.

This summer, 26 students participated in the REU program at four CReSIS partner institutions: Elizabeth City State University (ECSU), the University of Kansas (KU), Indiana University (IU) and The Pennsylvania State University (PSU). The REU program is supported with a grant co-funded by the National Science Foundation (NSF) and the U.S. Department of Defense. This summer’s REU program ran from June 3-July 26. Meet this year’s REU students:

Bernard Aldrich Jr. is a senior at Jackson State University in Mississippi. A Computer Science major, Aldrich says he is interested in “remote sensing, the process of cloud computing, and the management of a cluster.” This summer he worked with his advisor, Dr. John Paden, to “implement a snake tool to track the ice surface and ice bottom in a radar echogram.” Aldrich said he hopes to continue working with CReSIS over the coming years. In the future, he hopes to develop technologies that provide services to people around the world.

Tamara Gaynes is a senior studying Electrical Engineering at KU. She applied to the CReSIS REU program to gain some work experience that will help her find a job. Gaynes worked with her advisor, Dr. Fernando Rodriguez-Morales, on optimization of a microwave FMCW radar. Once she lands a job, Gaynes hopes to get some “real world” experience for a while, and then she may go to graduate school.

Renee Butler of Broken Arrow, Oklahoma is a junior at Haskell Indian Nations University in Lawrence, Kansas. Butler, who studies Environmental Science, says she joined the CReSIS REU program to get some work experience outside the classroom. “Since KU is near Haskell it was even better,” said Butler. She is worked with her advisor Dr. David Braaten on snow layer picking, which is “finding the different layers of snow accumulation to see if they are annual or many in one layer.”

An Exchange of Research & Culture:
Dr. Dorthe Dahl-Jensen

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land ice stream and its contributions to sea level rise.

According to Dahl-Jensen, this study would tell us a great deal about what we could expect for future sea level rise due to ice sheet mass loss in Greenland. While this project is not funded yet, she believes it is instrumental to the next stages of studying sea level rise from Greenland’s ice sheet.

Climate Change and Ice Sheets

When it comes to climate change and ice sheets – Dahl-Jensen takes two approaches. First, she focuses on the small scale. “In 50 years it will be interesting to see how the cultural and society of the people of Greenland changes,” she said. For example, as the ice melts more natural resources will become available and farming will likely become more prominent.

Next, she looks at the broader impact of her research involving ice sheets. “Studying how the ice sheets of Greenland and Antarctica continue to evolve will tell us what will happen as these ice sheets melt,” Dahl-Jensen said.

As an example, if all the worlds’ ice were to melt, these ice sheets could add approximately 65 meters or 210 feet to world’s sea level. With over one third of the earth’s population living in coastal areas, knowing just how fast and how much sea level rise will occur will be the only way to combat these changes.

“I enjoy working with young people and hearing their new ideas,” Dahl-Jensen said. Research is one of the most fluid fields to work in, which is just one of the reasons why she enjoys it so much.

CReSIS REU Students Participate in 2013 IGS Symposium

// by Darryl Monteau

Four CReSIS REU students, former and current, participated in the 2013 International Glaciological Society (IGS) Symposium held at the University of Kansas in September. All four students presented posters during the poster session and attended conference sessions and events.

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The students and their posters included:

- Michael Jefferson, ECSU Graduate Student (REU alumni): “Survey of the NASA ASAID Basal Stress Boundary in the vicinity of Elizabeth City State University Bay and West Antarctica Peninsula”
- Donquel Davis, Winston Salem University: “Estimating Surface and Bedrock layers in Polar Radar Imagery using Active Contours”
- Maya Smith, Winston Salem University: “Analysis Functionality to enhance MATLAB default interpolation schema using mGstat”
- Jimil Perkins, Norfolk State University: “Developing a Remote Sensing and Cloud Computing Curriculum for the Association of Computer/Information Sciences and Engineering Departments at Minority Institutions (ADMI)”

The CReSIS REU program encourages students to share their research and provides support and mentorship to students throughout the academic year. Dr. Linda Hayden is the Associate Director for Education and oversees both ECSU operations for CReSIS and the REU program. The CReSIS REU program has provided summer research opportunities for over 150 students.

Education Outreach at CReSIS

// by Tyler Wieland

The Center for Remote Sensing of Ice Sheets (CReSIS) brings science education into the classroom with the help of Cheri Hamilton, CReSIS’ K-12 Educational Outreach Coordinator. Hamilton and the Education Team work year-round to teach students about sea level change, glacier dynamics, water properties, icebergs, global warming, and remote sensing.

Each month Hamilton teaches fifteen 45-minute classes about polar science to elementary students in the area. This year Hamilton is expanding her reach to include five fifth grade classes that she taught last year as fourth graders.

“I will be practicing new lessons involving how climate change is affecting ice,” she said.

Hamilton hopes the background the fifth grade students have from her polar science-related lessons from the previous year will allow her to go more in-depth with the science behind climate change and ice.

Hamilton has led the K-12 Educational Outreach Program at CReSIS for the past seven years, bringing with her a 40-year career in elementary education outreach. She has taught everything from environmental science topics to engineering.

(article continues on next page)
New Video Profiles CReSIS Work

by Bill Daehler

CReSIS Graduate Research Assistant (GRA) Kuang Chen-Hsu has created a new video animation, now featured on CReSIS’ multimedia webpage, that provides an inside look at the everyday work done at CReSIS.

The video was made for the student portion of the 2013 Science and Technology Center (STC) Directors Meeting, held last month in Portland, Oregon. The STC student planning committee requested that each center provide a video about the work of the center’s students, according to Hsu.

This new animation follows Hsu’s summer video about the similarities and differences between the Arctic and Antarctic, which included facts about science, animals, geography and more. The new video introduces viewers to CReSIS work on data acquisition in Greenland, awards and fellowships given to CReSIS graduate students, the Research Experience for Undergraduates (REU) Program, education outreach, and student work.

Hsu is currently working on a new game that follows up on an educational children’s game he developed over the summer. The new game will teach users about the basic science behind radar technology and introduce concepts used by CReSIS researchers.

Follow this link to watch Hsu’s video:
http://www.youtube.com/watch?v=_u7f_UgBKrM

Q & A with Dr. Richard Alley

(article continued from page 2)

RA: We rely on a suite of satellites, ships, planes, bases, snowmobiles, computers, and more, plus people. These are not free. Satellites are perhaps the easiest to highlight in the US—under existing plans, we are likely to lose much of our observational capability over the coming decade or so. But, there are vulnerabilities in all the infrastructure, and in keeping people funded and working. If we can keep the community together and working, the future is outstanding—the observational tools and models now available have come so far so fast, and there is so much to be learned, that we face a very bright future.

SH: How do you view the interdisciplinary approach to cryospheric research that CReSIS and the IGS espouse? Are there other disciplines, including non-traditional or non-scientific disciplines that could further enhance our understanding of climate change—and our response to it?

RA: I’m a geologist with a minor in metallurgical engineering and materials science. My closest collaborators include a physicist turned geoscientist, and an electrical engineer turned geophysicist. We collaborate with chemists and biologists, climatologists and meteorologists, space scientists and more. Outstanding! There is room for a few more “ists”, I’m confident, and I think they will come—we’re having so much fun, and the work is so important.

SH: What were you most looking forward to in visiting Lawrence, KS as our Guest Speaker for the IGS Symposium on Radioglaciology?

RA: I didn’t really want to listen to me; I went to see the latest and greatest discoveries. It is still accurate that every major field campaign brings back surprises, so we have lots of important work to do.

Watch Dr. Alley’s testimony before the house committee here:
http://bit.ly/1a5Aono

Education Outreach at CReSIS

(article continued from previous page)

Science education in the classroom

“Ever since I was a kid I always wanted to know how everything worked, I always had questions,” Hamilton said. With her monthly lectures to students across the Kansas City area, she is able to answer questions fourth and fifth graders may not even know they have.

“I remember when I was a kid, I looked up the chimney and asked my mom how Santa could fit down there,” she said.

Hamilton explained that she knows her students have questions about science and she wants to get them interested in and knowledgeable about these topics as early as possible.

One of the new lesson plans she will be introducing this year will involve having students write their own questions, and then having the class evaluate them to see if they are one word answer questions or broad questions.

“If they ask their own questions then they will be more interested in the answer,” she said.

All research begins with scientific questioning and Hamilton hopes to teach her students just that. “I really want to get students interested and excited in science-related topics,” she said.

Hamilton believes science education will become even more important in the future, and she hopes the classes she is teaching currently will help give the next generation a framework for scientific questioning.

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New NRL Project to Improve CReSIS Radars
// by Bill Daehler

Dr. Stephen Yan is working on a project for the U.S. Naval Research Laboratory (NRL) that will enhance several of the radar technologies developed by CReSIS.

“We are developing an upgraded and integrated version of our Snow and Ku-band radars,” said Yan, an assistant research professor at CReSIS.

The Snow radar is used to measure the thickness of snow over sea ice. The Ku-band radar altimeter is used over ice sheets to make high-precision surface elevation measurements. These radars have both been attached to aircraft to survey ice sheets and sea ice in Greenland and Antarctica.

The Snow radar currently runs over 2-8 GHz and can detect the snow-ice interface and layers down to 70 meters; the Ku-band altimeter runs over 12-18 GHz and can detect the air-snow interface. CReSIS has a well-known track record of developing and deploying ice-sounding radar, most recently on missions with NASA’s Operation IceBridge. The NRL project seeks to improve the performance of some of these systems.

The radar that we are developing for NRL will operate from 2-18 GHz and therefore is an ultrawideband radar system,” said Yan. “The new radar system will also feature dual-polarization and beam-steering, so that we can measure the backscattering characteristics of snow and determine snow-water equivalent (SWE).”

SWE is the product of snow density and depth—it’s a very important parameter for hydrological studies because it tells researchers about the amount of water that could run off.

Yan said the project will take advantage of the new CReSIS Anechoic Chamber, which was opened last year. The chamber will help the research team with system response measurement and for “the characterization of the under-developing 2-18GHz dual-polarized antenna array,” according to Yan.

Yan said he plans on delivering a preliminary system by January 2014 and then continuing to make upgrades. The NRL contract is for two years with an optional extension of one year. Yan’s research team currently includes two Graduate Research Assistants (GRAs): Daniel Gomez-Garcia and Masud Aziz, both of whom are Ph.D. students in Electrical Engineering. During the fall semester, a new Master’s student, Jay McDaniel, will join the team.

The NRL project will build upon work by CReSIS Director Dr. Prasad Gogineni, Deputy Director Dr. Carl Leuschner, and Assistant Research Professor Dr. Fernando Rodriguez-Morales—who have long worked on the Snow and Ku-band radars.

“Their effort is an important factor for the award of the project,” said Yan.

The NRL is the U.S. Navy’s research lab, “a broadly based multidisciplinary program of scientific research and advanced technological development directed toward maritime applications of new and improved materials, techniques, equipment, systems and ocean, atmospheric, and space sciences and related technologies,” according to the NRL.
CReSIS Students & Team Members Attend the 2013 STC Directors Meeting

// by Darryl Monteau

The 2013 Science and Technology Center (STC) Directors Meeting was held at the Oregon Health and Science University (OHSU) in Portland, Oregon from August 21-23, 2013. Hosted by the Center for Coastal Margin Observation and Prediction (CMOP), this year’s conference theme was “Charting Today the Science and Technology of Tomorrow.” The agenda featured several prominent speakers and panelists, including U.S. Representative Earl Blumenauer (3rd District-OR).

A pre-meeting to discuss collaboration amongst the centers was held on August 21st for STC Education and Diversity directors, coordinators and staff. The regular meeting commenced on August 22nd with speakers, panel presentations, and the introduction of three new STCs:

• CBMM – The Center for Brains, Minds & Machines, led by MIT. Other institutions involved include Harvard, Cornell.
• The Study of Biology with X-Ray Lasers, led by the State University of New York.
• CIQM – Center for Integrated Quantum Materials. Institutions involved include Howard University, Harvard, MIT, and the Museum of Science (Boston).

Dr. Prasad Gogineni, CReSIS Director and University of Kansas School of Engineering Distinguished Professor, was part of a panel discussion titled “Science and Technology: A perspective from the National Science Board.” He was joined by representatives from the National Science Board (NSB) and the National Science Foundation (NSF).

Other CReSIS members in attendance included Dr. Carl Leuschen, CReSIS Deputy Director; Jerome Mitchell, CReSIS GRA and IU PhD student; Theresa Stumpf, CReSIS GRA and KU PhD student; Jennifer Laverentz, CReSIS Administrative Manager; and Darryl Monteau, KU CReSIS Education Coordinator.

The NSF’s Science and Technology Center (STC) program combines the efforts of scientists and engineers to respond to problems of global significance, supporting the intense, sustained, collaborative work that is required to achieve progress in these areas.

Currently there are 14 active and 35 graduated STCs in the United States.

Educational Outreach at CReSIS

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Understanding how students learn

Hamilton said, “We want to get them interested in science and educate them about future issues our planet may face due to climate change.” With the new science standards in place this year, she explained that the Education Team and herself can delve deeper into the climate change aspect their lessons.

Hamilton noted another interesting change to this year’s lesson plans is going from hypothesis and results to claims and evidence. “Since the children I teach are so young, they had issues at figuring out the ‘because of’ part in the hypothesis statement,” Hamilton said.

She expects learning about claims and evidence will help her students understand that you have a statement, and you either find evidence to support it or not.

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Educational Outreach at CReSIS

While the classes the Education Team teaches are geographically limited, Hamilton said the online information available on CReSIS’ website and the information she provides at conferences are for teachers everywhere to use.

Even with all of her years teaching science, Hamilton has learned that sometimes her lesson plans do not click with her young students. “If it works, great; if it doesn’t, move on,” she said.

Hamilton improves and updates her lessons using feedback from students, who journal about what they learned following every lesson.

She then reads the journals to figure out if her students understand the basic concepts each lesson is meant to convey. She said, “Whether it’s a lesson or an experiment, I can tell if they get it or not.”

Hamilton takes pride in the work she has done as a part of CReSIS. “The program has really grown since I started and it provides a unique opportunity to discuss polar science with young students,” Hamilton said.

CReSIS Co-Hosts International Research Conference

• Dr. Richard Hindmarsh of the British Antarctic Survey (BAS). Dr. Hindmarsh has worked at the BAS since 1991, studying ice flows, heat, and sub-glacial sediment and water.

• Dr. H. Jay Zwally of NASA. Dr. Zwally has played numerous key roles at NASA since joining the agency in 1974, such as working on a project that analyzed ice sheet mass balance using a laser altimeter satellite—this work culminated in the launch of the Ice Cloud and Land Elevation Satellite (ICESat) in January 2003. ICESat has generated significant amounts of data that have supported ice sheet research.

• Dr. David Crandall of Indiana University. Dr. Crandall joined the School of Informatics and Computing at Indiana University in 2001. He works in computer vision, the area of computer science concerned with automatically inferring semantic meaning from images, and is interested in problems that involve analyzing and modeling large amounts of uncertain data.

Midweek Excursions

In addition to inspiring discussion on ground-breaking research, the event also offered ample opportunities for the delegates to relax, socialize and network in more informal settings. 40 delegates spent a warm afternoon exploring the Kansas Tallgrass National Prairie Reserve with a guided tour led by Rose Ba-

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CReSIS Co-Hosts
International Research Conference
(article continued from previous page)

con, a local cattle rancher who lives with her husband Kent on a small farm outside of Council Grove, KS.

The Bacons are well-known for their stewardship of the land and the Flint Hill prairies specifically. Delegates ate a picnic lunch on bales of hay as the Bacons demonstrated how fire and grazing help to preserve the prairies and discussed the lengths and expense they go to in caring for their herds. Rose then led the party on a leisurely hike across the rolling prairie hills while discussing the local flora and fauna, as well as the history and geological evolution of the land.

While the majority of delegates opted for the rural excursion, a smaller number of IGS delegates chose the ‘urban’ excursion. A group of eight conference participants spent the afternoon on a guided tour of the Nelson-Atkins Museum of Art and the National World War I Museum in nearby Kansas City.

Both rural and urban IGS excursions reconvened at Haskell Indian Nations University for the final event of the day. Haskell, which opened in 1884 as an industrial training school for American Indian children, has grown from the original class of 22 students to an average enrollment of over 1,000 students each semester. Haskell is renowned for its pow-wows and annual Indian markets, and the IGS delegates were fortunate enough to experience an intertribal pow-wow first hand, as well as participate in the dancing and a Q&A session that followed. The pow-wow was paired with a traditional Kansas BBQ.

Final thoughts and future IGS Symposia

The IGS Symposium offered scientists from around the world an invaluable opportunity to meet and discuss research with colleagues they had never met in person.

“I had the chance to meet many of my professional colleagues whose papers I have read, but whose hands I had never shaken,” said MacAyeal.

“I think it was also really cool to give feedback to scientists that work at CReSIS. Having a chance to talk with them informally during the various parts of the conference and the workshop that followed on the Friday after the formal part of the conference was over was really helpful for me.”

The next IGS symposium is scheduled to take place from October 31st to November 2nd of 2013 at the Lammi Biological Station in Lammi, Finland. The meeting will provide a venue for Nordic glaciologists and students studying glaciology-related topics to present their latest research. The meeting will be hosted by the Department of Physics at the University of Helsinki.
Maya Smith is a junior at Winston Salem State University in North Carolina. She plans to graduate in 2015 with a degree in Information Technology. Smith’s research project was called “Analysis Functionality to enhance MATLAB default interpolation schema using mGstat.” The project enhanced some aspects of the CReSIS database, which is used by many researchers. Dr. John Paden was Smith’s REU mentor. Smith would like to pursue a Master’s degree after completing undergraduate coursework.

Tyler Berry returned to the REU program this summer after spending last summer with the program at KU. Berry will be transferring to KU from Haskell in the fall. Berry, who continued to work with CReSIS during the previous school year, worked on his research project with Dr. Fernando Rodriguez-Morales. After obtaining a bachelor’s degree, Berry says he hopes to continue his education into graduate school by studying Mechanical Engineering or Electrical Engineering.

Malcolm McConner is a senior at ECSU. At ECSU, McConner studies Elementary Education with a concentration in Mathematics. Last summer, McConner was a CReSIS REU at the University of Kansas. This summer, he participated in the ECSU program. McConner hopes to find a career as a teacher and earn a Master’s degree. Eventually, he wants to become a school administrator.

Ricky Dixon is a sophomore at Mississippi Valley State University (MVSU) studying Mathematics Education. His REU research project was done with support from his advisor, Dr. Darnell Johnson. Dixon was also a member of the RET math team. Dixon’s project was entitled “Using Common Core State Standards of Seventh Grade Mathematics in the Application of NXT LEGO robotics for CReSIS Middle School Students.” After graduating, Dixon said he hopes to get a graduate degree in Mathematics Education and teach near his hometown of Greenville, Mississippi.

Jessica Hathaway is a sophomore at ECSU in North Carolina. She is studying Elementary Education with a concentration in Mathematics. “I am interested in all research in the STEM areas,” said Hathaway. Hathaway’s mentor, Dr. Darnell Johnson, supported her as she learned about the Common Core and its important role in the country’s school system. Hathaway looks forward to a career as an educator; eventually, she hopes to earn a Ph.D. in Elementary Education and Mathematics.

Rashad Williamson is a sophomore studying Mathematics at Mississippi Valley State University (MVSU). Williamson’s research project was called “Determination of an Empirical Model Relating Canopy Cover to NDVI Values in the Pasquotank Watershed, NC.” This research contributes to the tracking of year-to-year forest density by using data gathered from NASA’S Landsat 7 satellite. Williamson hopes to pursue graduate studies following his graduation from MVSU.
Kelechi Onyiriuka, a native of Nigeria, is a senior at ECSU. He’s majoring in Pharmaceutical Science and Biology and minoring in Chemistry. While in the REU program, Onyiriuka worked on a research project—"The WaterMark Project: Human Actions Impacting the Quality of Water”—under mentor Professor Jeffrey Schloss. After graduating from ECSU, Onyiriuka wants to pursue a Ph.D. in Pharmaceutical Science.

Anthony Lynn is a junior at Winston-Salem State University studying Computer Science. Lynn’s summer research project was called “A comparative study of the 2011/2013 water quality assessments in the Pasquotank Watershed in Northeastern North Carolina.” This project consisted of collecting water samples and comparing the samples with data from 2011 water samples. Lynn’s REU mentor was Jeff Wood. He plans on attending graduate school after graduation.

Dorothy Brice is a sophomore studying Mathematics at Virginia Union University in Richmond, Virginia. Brice’s research project was entitled: “A comparative study of the 2011/2013 water quality assessments in the Pasquotank Watershed in Northeastern North Carolina.” Her mentor was Jeff Wood of ECSU. Brice plans on pursuing a Master’s in Mathematics after graduation—and eventually a Ph.D.

Michael Cobb is a senior at ECSU. He’s majoring in Chemistry with a concentration in pre-pharmacy. His research project this summer was called “The WaterMark Project: Human Actions Impacting the Quality of Water.” The research looked at how humans can impact the quality of water. Following graduation from ECSU, Cobb hopes to pursue a graduate degree in Biomedical Sciences.

Robin Brice is a junior at Fayetteville State University in Fayetteville, North Carolina. She is studying Biology with a concentration in Chemistry. Her summer research project was called “A comparative study of the 2011/2013 water quality assessments in the Pasquotank Watershed in Northeastern North Carolina.” Jeff Wood was Brice’s mentor through the program. After completing her undergraduate degree, Brice wants to pursue a Ph.D. in Veterinary Medicine.

Kalyx McDonald is sophomore studying Computer Science at Mississippi Valley State University. Her research project—“Terascan Curriculum Development and Integration of SeaSpace Technology into the Classroom”—was supported by advisor Je’aime Powell. The project developed a learning module called “Introduction to Remote Sensing” for K-12 classrooms. McDonald said the experience expanded her knowledge of remote sensing, which she hopes will help her find new internships for next summer. After graduating, McDonald hopes to continue studying for a graduate degree.
Courtney Farmer is a junior at ECSU. She is majoring in Mathematics and minoring in Education. Farmer’s research project—"TeraScan Curriculum Development and Integration of SeaSpace Technology into the Classroom"—focused on creating a curriculum for K-12 classrooms. The curriculum consists of a number of one-hour training modules, such as the module: "Introduction to Remote Sensing." Her mentor was Je’aime Powell. Farmer wants to find a career teaching math near her hometown of Hampton, Virginia.

Jimil Perkins is a sophomore at Norfolk State University majoring in Computer Science. His research project was entitled "Developing a Remote Sensing and Cloud Computing Curriculum for the Association of Computer/Information Sciences and Engineering Departments at Minority Institutions (ADMI)." This project was done with support from Perkins’ mentor, Jerome Mitchell. Perkins would eventually like to pursue a Master’s in Computer Science.

Zazie Lumpkin is a junior studying Computer Science at Spelman College. Lumpkin worked with two REU research partners—Dorias Brown and Donquel Davis—and under mentor Jerome Mitchell on a project entitled "Estimating Surface and Bedrock layers in Polar Radar Imagery using Active Contours." Before graduating Lumpkin said she hopes to start a non-profit in Atlanta "that promotes computing, computer literacy, game design, programming, web design, and provide a center for low-income and disadvantaged African-American students and their families to bond through exploring the wonderful world of technology." After graduating she hopes to earn a Master’s in Computer Science.

Derek Morris Jr. is a sophomore at ECSU. Morris is majoring in Computer Science and minoring in Mathematics. "The REU program provided an ideal of what I can do as a computer scientist," said Morris. During the REU program at Indiana University this summer, Morris worked with mentor Dr. Gregor Von Laszewski. Morris’ research project, "From 0 to 100: Cloud computing for the Non-Programmer," demonstrates how a student can use and program a cloud without prior programming or research experience.

Donquel Davis is a sophomore studying Computer Science at Winston Salem State University in North Carolina. Davis worked with two REU research partners and with mentor Jerome Mitchell on a project called "Estimating Surface and Bedrock layers in Polar Radar Imagery using Active Contours." The project looks into how polar scientists can speed up the time it takes to accurately determine and outline the layers of ice sheets. After completing his Bachelor’s degree, Davis says he hopes to continue studying Computer Science into graduate school.
Dorias Brown is a senior at Spelman College in Atlanta, Georgia. She is majoring in Computer Science and minoring in Art. Brown worked with fellow REUs Zazie Lumpkin and Donquel Davis on a research project called “Estimating Surface and Bedrock layers in Polar Radar Imagery using Active Contours.” Brown’s mentor through the program was Jerome Mitchell, an IU Graduate Research Assistant (GRA). After finishing school, Browns hopes to become a graphic designer, combining her studies in Computer Science and Art.

Ya’Shonti Bridgers is a junior studying Math Education at ECSU. Her research project—”X-Informatics MOOC: Web Development and Design”—was supported by her mentor, Sidd Maini, and supervisor, Dr. Geoffrey Fox. Her research project sought to improve online learning through enhancing the interaction between student users and the educational content.

Emma Reeves is a senior at Hamline University in St. Paul, Minnesota. Reeves is majoring in Physics and Geology and minoring in Mathematics. She’s interested in “using physical concepts to understand geologic phenomena.” Reeves said she wanted to learn more about geophysical techniques and climate research during this summer’s REU program, and she was excited to work with students from around the country. Reeves’ mentors this summer were Dr. Sridhar Anandakrishnan and Peter Burkett. Her research project, entitled “Finding mass influx along the Northeast Greenland Ice Stream using radar echograms,” used airborne radar data to study the North-East Greenland Ice Stream.

Michael Chamberlain is a junior attending the University of California, Berkeley. He’s majoring in Geophysics and minoring in Geo-engineering. Chamberlain’s research project created a method for determining the rate of mass input along the shear margins of the Northeast Greenland Ice Stream.” He said the REU experience was very beneficial. “The career support and assistance provided by Dr. Hayden and the ECSU staff was superb,” said Chamberlain. After graduating, Chamberlain hopes to pursue a graduate degree.

Justin Deloatch is a graduate student studying Mathematics with a concentration in Remote Sensing at ECSU. His summer research project is entitled “Utilizing HUBzero to Create an Educational Hub for CReSIS Educational Data Sets.” His project will create a Hub that “will allow students and educators to have access to (CReSIS) information for the use of education and scientific collaboration.” Deloatch’s mentor through the program was Dr. Geoffrey Fox. After completing his Master’s degree, Deloatch says he will pursue a Ph.D. in Computer Science.
Dr. Haiyang Chao joined CReSIS in August 2013 as an Assistant Professor of Aerospace Engineering at the University of Kansas (KU). Dr. Chao attended Zhejiang University in Hangzhou, China where he received a Bachelor’s in Electrical Engineering in 2001 and Master’s in 2005. In 2010, he earned his Ph.D. in Electrical and Computer Engineering from Utah State University. His research interests are in estimation, control, and dynamics of unmanned vehicles, particularly in unmanned aerial vehicles. Dr. Chao is currently working on research related to “vision-aided navigation, wind/gust estimation, cooperative control of unmanned systems, remote sensing, and small/micro UAV development.”

Jay McDaniel joined CReSIS in August as a GRA for Dr. Stephen Yan. A Master’s student in Electrical Engineering at the University of Kansas (KU), McDaniel will be supporting Dr. Yan’s project for the Naval Research Laboratory (NRL). He earned his Bachelor’s in Electrical Engineering from Kansas State University. McDaniel said he wanted to join CReSIS because of its excellence in radar design, which he plans on pursuing as a career.

Tyler Wieland joined CReSIS in August of 2013 as a student journalist. He is currently a senior majoring atmospheric science with minors in journalism and mathematics. Tyler said he wanted to work at CReSIS as a student journalist because he has an interest in both studying science and communicating scientific information to a wider audience. He was born and raised in Kansas and wishes to pursue graduate studies in atmospheric science and climatology following his undergraduate degree.

Elizabeth Post joined CReSIS in August 2013 as a graphic designer. Post is pursuing a BFA in Visual Communications from KU and already holds a degree in Business Marketing. She grew up in Kansas City and wanted to work at CReSIS after hearing great things about the work done by CReSIS’ previous graphic designer, Ashley Detmering.

Levi Houk joined CReSIS in September to support the education team. He has BS and MS degrees in Chemical Engineering from Kansas State University and the University of New Mexico, respectively. Houk plans to be a high school science teacher and wanted to work at CReSIS to get some in-class experience while he participates in the UKan Teach program at the University of Kansas. When not working, he enjoys hiking, cooking and spending time with his wife.