THE CENTER FOR GLOBAL & REGIONAL ENVIRONMENTAL RESEARCH

2013 ANNUAL REPORT

CGRER

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Photo by Iowa Flood Center

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The names of CGRER members and those affiliated with CGRER are highlighted in boldface throughout this report.

Photo at top: Ciha Fen Preserve in northeast Johnson County, Iowa (photo by Matthew Even)

Middle photo: CGRER is housed in the Iowa Advanced Technology Laboratories on the University of Iowa campus.

Photo at right: Monitoring equipment used by the Iowa Flood Center (IFC) in a project conducted with NASA on predicting global precipitation (photo by IFC)

THE CENTER FOR GLOBAL & REGIONAL ENVIRONMENTAL RESEARCH

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The Center for Global and Regional Environmental Research (CGRER) was established in 1990 with the intent of promoting interdisciplinary efforts that focus on global environmental change. Housed on the University of Iowa (UI) campus in the Iowa Advanced Technology Laboratories (IATL), CGRER is supported by revenues generated from investor-owned utilities, as mandated by the State of Iowa's Energy Efficiency Act. Funds are used to support research and provide services to faculty members and students across the state who are interested in environmental change. CGRER currently is composed of 103 members from 31 departments at seven institutions.

While environmental change is constant and natural, CGRER focuses on the human-induced acceleration of such change caused by modern technologies, lifestyles and population growth. Concerns about global change encompass multiple issues including its effects on natural ecosystems, environments and resources, and on human health, culture and social systems. Because global change promises to touch virtually every aspect of life and requires the reinterpretation of many fields of science and engineering, the humanities, medicine and law, an understanding of global change requires collaborative efforts among the many disciplines involved. CGRER's mission is to foster such collaborative interdisciplinary actions in three ways: by promoting dialogue among specialists and agencies, by educating students and the general public, and by fostering and supporting relevant research projects.

This annual report summarizes CGRER's activities in each of these three areas. Because CGRER's output is commensurate with that of its many members, a summary of which would require a small book, this annual report includes only a sampling of significant projects and efforts. Yet this sampling provides a vision of CGRER's multiple efforts to achieve its ultimate goal: assisting Iowa's agencies, industries and citizens in assessing and preparing for global change and its effects.

PROMOTE DIALOGUE AMONG SPECIALISTS AND AGENCIES

EDUCATE STUDENTS AND THE GENERAL PUBLIC

FOSTER AND SUPPORT RELEVANT RESEARCH PROJECTS

Photo by IFC

EXECUTIVE SUMMARY

2013 was quite a year. It began with the wettest spring in Iowa history, which ended a rather severe drought in 2012. But why must a drought be broken with such gusto? The wet, cool spring of 2013 prevented farmers from getting their seeds into the soil. Once their fields were finally planted, the rains stopped and dry conditions returned once more. Given the yo-yo year of 2013, we were lucky to escape without larger crop losses.

So how does all this weird Iowa weather relate to CGRER? It means that our research into global and regional climate change becomes more important than ever. We have a central role to play in interpreting scientific research to the public and helping to inform policy responses. We take this charge very seriously.

During this past year one of our initiatives was the second annual *Iowa Climate Statement 2013: A Rising Challenge to Iowa Agriculture*, which was signed by 155 faculty from 36 colleges and universities in Iowa. It's not easy to get that many professors to agree on anything, but the gravity of the issue brought us together. Agriculture is especially vulnerable to increasingly variable weather, prolonged droughts and intense precipitation events. Fortunately, Iowa farmers are amazingly skilled producers and they are already adjusting planting dates, tillage practices, cover crops, and fertilizer applications. While no one can predict the future with absolute certainty, CGRER's research can help foretell what is likely to occur and give information on the best ways to respond.

As a society, we must try to *adapt* to climate change. That means hardening our infrastructure to better withstand floods, droughts and severe storms. We need higher-elevation roads and stronger bridges, "floodable" buildings, protected electrical systems, better land use planning and zoning, new insurance products and financial instruments to guard against risk, deeper wells, and better soil conservation and agricultural management practices.

> We have a central role to play in interpreting scientific research to the public and helping to inform policy responses. We take this charge very seriously.

But in the end, adaptation will only take us so far. Humanity needs also to *mitigate* climate change, which means dramatically reducing our greenhouse gas emissions and transitioning from the fossil fuel age to an era of hyper-energy efficiency and renewable sources of power. The Industrial Revolution, powered by fossil fuels, lasted for more than 200 years. Overall it's been a good run. Fossil fuels warmed our homes, powered our businesses, and energized our transportation systems, providing jobs and prosperity for people. But we've been burning carbon, stored in the earth's crust over millions of years, and then releasing it back into the atmosphere in just a couple of hundred years. That's just a wink of an eye in geologic time. It's not surprising that this process is changing the atmosphere. While we are not going to run out of fossil fuels anytime soon, we are running out of a place to store our exhaust from burning them. These emissions are affecting the energy balance on earth, warming our atmosphere, acidifying our oceans and raising sea levels far greater than normal.

UI professors Jerry Schnoor and Greg Carmichael are co-founders of the Center for Global and Regional Environmental Research (CGRER).

Now the good news… Believe it or not, developed countries are making considerable progress in reducing their greenhouse gas emissions towards a goal of 20% by 2020. The United States has reduced its emissions to the lowest level since 1994. And this is not simply due to the economic dampening caused by the global recession and stagnant recovery. Rather, there is a structural change taking place in our economy and the first glimmer of behavioral change in our citizens. People are driving fewer miles, telecommuting, Internet shopping, moving back into cities and buying hybrid electric cars. Coal-fired power plants are being shuttered while wind, solar and natural gas plants are replacing them. Buildings are more energy efficient and the fuel efficiency of our transportation vehicles is improving at 3-4% every year.

CGRER is grateful to the rate payers of the State of Iowa, its investor-owned utilities, the University of Iowa and other agencies for sponsoring our research and educational outreach. We pledge to serve you even better in 2014.

Jerald L. Schnoor,
CGRER Co-Director with
Gregory R. Carmichael

Jerry Schnoor speaking at Adapting to Weather Extremes, *a CGRER-sponsored symposium*

Executive Committee

David Bennett
Geographical & Sustainability Sciences,
University of Iowa

Dennis Dahms
Geography,
University of Northern Iowa

Kajsa Dalrymple
Journalism & Mass Communication,
University of Iowa

Vicki Grassian
Chemistry,
University of Iowa

Sarah Larsen
Chemistry,
University of Iowa

Lou Licht
Ecolotree, Inc.

Charlie Stanier
Chemical & Biochemical Engineering,
University of Iowa

MESSAGE FROM THE CGRER ADVISORY BOARD

In many ways, 2013 was another record year for seeing the effects stemming from environmental change across Iowa, throughout the nation and around the world. The drought of 2012 was placed in the rear-view as eastern Iowa endured the wettest spring on record and, subsequently, returned to drought by the end of summer.

> In many ways, 2013 was another record year for seeing the effects stemming from environmental change across Iowa, throughout the nation and around the world.

These observations are well summarized in the *Iowa Climate Statement 2013: A Rising Challenge to Iowa Agriculture*: "Swings from one extreme to another have characterized Iowa's 2013 weather patterns." The statement was co-authored by many CGRER members, including Gene Takle, director of the Iowa State University Climate Science Program, and CGRER co-directors Jerry Schnoor and Greg Carmichael.

At the end of May, an ironically timed return of high water in the Cedar River greeted the attendees of the *Five Years Out: Ongoing Impacts & Challenges of the 2008 Floods* symposium in Cedar Rapids. The event detailed numerous impacts, challenges, successes and failures resulting from the 2008 eastern Iowa floods and subsequent recovery.

CGRER members presented fact-based evidence that provided insight and clarity surrounding the circumstances which influence such high-water events.

Locally and nationally, the burdens of extreme weather, such as flooding, drought or hurricanes like Katrina and Sandy, are well known. The economic disruption caused by these events is widespread and impacts nearly every facet of daily life. Recovery often requires significant time and financial investments, which makes repeated recoveries unsustainable options.

Modeling projections conducted by CGRER members indicate a positive trend for extreme weather events to occur with greater frequency into the foreseeable future. Research can provide invaluable insights on answering the question, "What actions could be taken to better our environment and reduce the impacts of these events?" Effective mitigation requires a thorough understanding of all the contributing factors affecting an issue. CGRER is leading the way, researching mitigation techniques, spawning discussion, and influencing policy that addresses the hard choices and long-term investments necessary for change.

Flood mitigation techniques focused on land and watershed management are being researched by various CGRER members across Iowa, with the premise that solutions discovered here can be replicated across the nation and around the world. Unsustainable land management is a major contributor to the problem and is recognized as having significant potential for mitigation. CGRER's development of the Water Sustainability Initiative—which included the hiring of ten new faculty members over the past four years—has brought together the necessary resources for conducting long-term investigation of mitigation techniques that best serve Iowa's and Iowans' needs while keeping the state economically viable.

Iowa City experienced widespread flooding in 2008. (photo by IFC)

Children participate in a STEM Science Festival. (photo by IFC)

CGRER's Outreach and Community Education (OCE) remains a results-driven resource for communicating necessary and timely messages to large audiences. OCE had numerous highlights in 2013, especially the *Living with Floods* project. The project commemorated the anniversary of statewide flood events over the past five years, celebrating progress towards recovery and raising awareness of flood mitigation strategies. The project sponsored several STEM Science Festivals for school children and five community forums on flood recovery progress. The *Living with Floods* project was implemented in addition to the daily environmental blogs, weekly radio segments and the Research Focus video series found at Iowa Environmental Focus. Clearly, CGRER OCE Director Joe Bolkcom and his staff had a very productive year.

CGRER is positioned at the forefront of addressing the many aspects of global environmental change and effectively communicates its research findings to a wide and diverse audience. The "lead by example" direction of Jerry Schnoor and Greg Carmichael continues to attract highly talented individuals, as can be seen throughout this report.

I am proud to serve as a CGRER Advisory Board member and am greatly encouraged by the role CGRER plays in addressing changes to the environment.

Tim Harden
Alliant Energy

The Iowa Flood Center is working on flood mitigation projects in the Turkey River watershed. (photo by IFC)

ADVISORY BOARD MEMBERS

Bob Dvorsky
Senator, Iowa State Legislature

Tim Harden
Alliant Energy

Mark Kresowik
Beyond Coal Campaign,
Sierra Club

Hiram "Chip" Levy
Retired from Geophysical Fluid Dynamics Laboratory, NOAA

David Osterberg
Occupational and Environmental Health, University of Iowa

William Stigliani
Center for Energy and Environmental Education, University of Northern Iowa

Sharon Tahtinen
Iowa Department of Resources

Nick Wagner
Iowa Utilities Board

Diane Debinski, Calla Olson and Ray Moranz on a butterfly survey in the Grand River Grasslands of southern Iowa (photo by John Delaney)

OUTREACH

CGRER members shared their expertise with the larger world through a variety of initiatives during 2013. Outreach efforts included a series of events marking the five-year anniversary of the historic floods of 2008, a symposium on adapting to weather extremes, and an Iowa Climate Statement focusing on rising challenges to Iowa agriculture.

ADAPTING TO WEATHER EXTREMES

In December, CGRER co-sponsored a day-long symposium in Des Moines on *Adapting to Weather Extremes: The Economic Impact in Iowa*. Over the past few years Iowa has been experiencing swings from one weather extreme to another, fluctuations that negatively affect Iowa agriculture, businesses and people. The conference, which attracted 150 participants from around the state, explored current and future challenges posed by extreme weather and strategies and policy options for adapting to these fluctuations. Keynote speakers included Bruce Rastetter, President, Iowa Board of Regents; Bill Northey, Iowa Secretary of Agriculture; Chuck Gipp, Director of the Iowa Department of Natural Resources; Paul Trombino III, Director of the Iowa Department of Transportation; and Nick Gerhart, Insurance Commissioner, Iowa Insurance Division. CGRER members **Richard Cruse**, **Aaron Strong** and **Larry Weber** also gave presentations.

The symposium's speakers included Paul Trombino III, Director of the Iowa Department of Transportation (above left photo) and Bill Northey, Iowa Secretary of Agriculture (photo at left).

IMPROVING AIR QUALITY

Scott Spak and CGRER doctoral student **Ashish Singh** were presenters at the 2013 Iowa Governor's Conference on Public Health in April in Ames. They spoke about lessons learned from the Johnson County Air Quality Study and the Iowa City Landfill Fire in 2012. Both provided new perspectives for quantifying Iowa's air quality conditions and trends. They also prompted the development of new decision-making tools for both emergency and routine events. Spak also introduced a range of new Iowa and federal resources for responding to air quality public health concerns.

Left: The Iowa City Landfill Fire was monitored by mobile weather radar units.

The lead authors for Iowa Climate Statement 2013 *included four CGRER members.*

IOWA CLIMATE STATEMENT 2013

A statement on the threats Iowa agriculture faces from climate change was released in October. Signed by 155 science faculty and research staff from 36 Iowa colleges and universities, *Iowa Climate Statement 2013: A Rising Challenge to Iowa Agriculture* describes the ways in which the state's major industry is being affected by adverse weather conditions caused by climate change. The statement referenced the swings between droughts and flooding that Iowa has recently experienced, extremes that scientists say are likely to become more common as greenhouse gases increase in the atmosphere. The lead authors of the statement included **Gene Takle**, **Jerry Schnoor**, **Greg Carmichael** and **Laura Jackson**, and many other CGRER members were co-signers. The statement urges action to reduce heat-trapping gases and implement adaptation and mitigation strategies to protect Iowa's agricultural industry.

LIVING WITH FLOODS

CGRER played a major role in *Living with Floods*, a statewide project to commemorate the five-year anniversary of the historic floods of 2008 and the two-year anniversary of western Iowa flooding in 2011. The project helped celebrate the progress made towards recovery and raise awareness of flood mitigation strategies and the interconnectedness of our environment and the watersheds in which we live.

A variety of events involving many CGRER members were held during the year. *Living with Floods* forums were held in Davenport, Des Moines, Dubuque, Iowa City and Muscatine, while Cedar Rapids sponsored a day-long conference focusing on the ongoing challenges and impacts of the 2008 floods on that city. STEM festivals designed to interest schoolchildren in science, technology, engineering and math were held in Cedar Rapids, Davenport, Des Moines, Dubuque and Muscatine. An Interdisciplinary Flood Workshop for Teachers, sponsored by the UI College of Education, brought together more than 30 teachers from flood-prone communities to develop curricula on the causes of flooding and how communities can develop resilience in the face of disaster. Free, public performances were given in June by New Orleans' Preservation Hall Jazz Band in the communities directly affected by devastating floods in the past five years: Cedar Rapids, Council Bluffs, Davenport, Des Moines, Dubuque, Iowa City and Muscatine.

Key collaborators with CGRER in the *Living with Floods* events were the UI College of Engineering, Hancher, the Iowa Flood Center, the UI College of Education and Department of Health and Human Physiology, and the State Hygienic Laboratory.

Living with Floods *brought New Orleans' Preservation Hall Jazz Band to Iowa City.*

CROWD-HYDROLOGY PROJECT

Adam Ward has brought a national program for recruiting citizen scientists to Iowa City. *CrowdHydrology.org* began at the University at Buffalo in New York in 2011 and has since spread to other states. Researchers place gauges in streams and post signs nearby asking passersby to text the water level readings to a phone number that links to an online database. While automated gauges are used on a growing number of rivers, the devices are expensive and so researchers don't have as much data on smaller bodies of water. The readings provide useful information that can be used in water and flooding research, and they are also a way for the public to become more engaged in scientific research. Ward has installed devices at three sites in Johnson County and one in Dubuque.

CLIMATE-CHANGE MEMOIR

Connie Mutel received a grant from CGRER for the completion of a book on climate change meant to appeal to a general audience. Her manuscript blends discussions of climate-change science and weather events with a journal of life in the oak-hickory woodland where she resides. The book, which will be published by the University of Iowa Press, seeks to engage and energize readers who might not read a more technical treatise. It will be an outreach tool that will assist CGRER in its goal of preparing Iowans for accelerating environmental change. The book will also encourage citizens to make changes that will help reduce greenhouse gas emissions. The grant helps fund the book's writing and editing and will help make its purchase price more affordable.

LEGISLATIVE RECEPTION

CGRER and the Iowa Flood Center co-hosted a Legislative Breakfast Reception at the Iowa State Capitol in March. More than 50 legislators as well as state and local agency officials attended the reception to learn more about the work of the two centers. CGRER members at the reception included **Witold Krajewski**, director of the Iowa Flood Center, and **Larry Weber**, director of IIHR—Hydroscience & Engineering, as well as **Brian Hornbuckle** and **Lou Licht**.

Brian Hornbuckle, ISU graduate student Ben Carr, and Representative Vicki Lensing

Below left: Witold Krajewski and Senator Bill Dix
Below: Larry Weber and Senator Rich Taylor

CGRER COMMUNICATIONS

Mallory Hughes, Jerry Schnoor and Jacklyn Even

INTERNS

Jacklyn Even works as CGRER's half-time multimedia intern while pursuing a BA in sociology. Jacklyn joined CGRER in May and has been involved with writing and recording radio spots and videos, blog updates, photography and social media outreach.

Mallory Hughes, an undergraduate with a double major in journalism and English, began working in November as a half-time intern at CGRER. Her projects have included writing profiles of UI Water Sustainability faculty members and their research for the CGRER blog and website. She has also edited Iowa Environmental Focus radio scripts and assisted at the *Adapting to Weather Extremes* symposium in Des Moines.

WEBSITE REDESIGN

The CGRER website underwent a major redesign in 2013. The new site uses an open source content management system and has a format more compatible with mobile devices and screen readers used by the visually impaired. You can visit our new website at cgrer.uiowa.edu.

IOWA ENVIRONMENTAL FOCUS

Iowa Environmental Focus features daily blog posts and weekly radio segments on environmental news and events. In 2013, 50 one-to-two-minute segments were produced and distributed to radio stations throughout Iowa. The radio segments highlight the work of CGRER members as well as current Iowa environmental issues and efforts toward greater sustainability. For more information, see iowaenvironmentalfocus.org.

Jerry Schnoor, Jacklyn Even and Mallory Hughes work on a radio segment for Iowa Environmental Focus.

CGRER MEMBERS

A SAMPLING OF AWARDS, ACHIEVEMENTS & APPOINTMENTS

Vanessa Baratta, an MS student advised by **Art Bettis**, **Adam Ward** and **Frank Weirich**, received an award for Best Graduate Student Poster at the North Central Section Meeting of the Geological Society of America. The poster presented the results of a study on bioretention cells funded by a 2012 CGRER Seed Grant to Bettis.

Greg Carmichael (left) has been appointed as a member of the NASA Advisory Board Earth Science Subcommittee, which is one of five reporting to the NASA Advisory Board. The subcommittee provides counsel to develop a scientific understanding of the Earth system and its response to natural and human-induced changes to enable improved prediction of climate, weather, and natural hazards for present and future generations.

Kajsa Dalrymple was named by the *Iowa City Press-Citizen* as one of "10 to Watch in 2013." Dalrymple was commended for her work on addressing water issues statewide, nationally and globally, including conducting Iowa's first statewide public opinion survey on water sustainability.

Susanna Donaldson (a PhD student of **Michael Chibnik**) was awarded a UI Ballard-Seashore fellowship for the writing of her doctoral dissertation on tobacco farming in eastern Tennessee.

William Eichinger (above, with UI President Sally Mason) was named the 2013 UI Faculty Hancher-Finkbine Medallion recipient. The award recognizes exceptional leadership, learning, and loyalty to the university.

Bill Field was appointed chair of the Radiation Advisory Committee of the EPA's Science Advisory Board. He was also selected to serve as one of nine members on the National Research Council's Phase 2 Analysis of Cancer Risks in Populations near Nuclear Facilities.

Bill Gutowski (right) was appointed co-chair of the Science Advisory Team for the Coordinated Regional Downscaling Experiment of the World Climate Research Programme (WCRP). The WCRP's goal is to develop a fundamental scientific understanding of climate and the effect of human activities on climate processes. WCRP is sponsored by the International Council for Science, the World Meteorological Organization, and the Intergovernmental Oceanographic Commission of UNESCO.

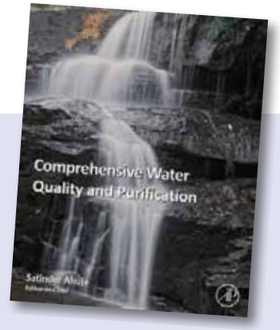
Keri Hornbuckle (below) was named an Executive Leadership in Academic Technology and Engineering (ELATE) Fellow by Drexel University. ELATE is a national leadership development program for senior women faculty in engineering and technology fields. She also received the Faculty Excellence Award for Research at the UI College of Engineering.

Laura Jackson (above) has been appointed director of UNI's Tallgrass Prairie Center. The center's mission is to restore native vegetation for the benefit of society and the environment through research, education and technology.

Wen Xin Koh (above left) a UI PhD student working with **Keri Hornbuckle**, gave an invited press conference at an American Chemical Society Meeting in Indianapolis. She spoke about her research on PCB 11 in human blood serum from populations in northwest Indiana and rural Iowa. Koh was supported in part from a travel award from CGRER.

Rachel Marek (above left), a UI PhD student advised by **Keri Hornbuckle**, and **Shen Qu** (at right), a UI PhD student advised by **David Cwiertny**, were given C. Ellen Gonter Environmental Chemistry Awards for best graduate student papers in the Environmental Chemistry Division at the annual conference of the American Chemical Society.

Michelle Scherer (above) has been invited to join the U.S. EPA Science Advisory Board's Environmental Engineering Committee for a three-year term beginning in 2013.



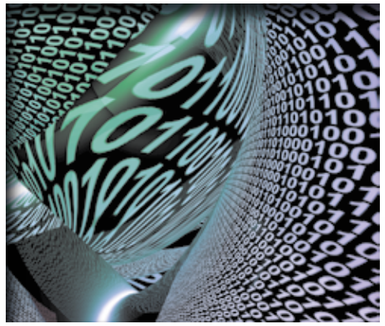
Jerry Schnoor was the editor of *Water Quality and Sustainability*, volume four of *Comprehensive Water Quality and Purification*, edited by Satinder Ahuja (Academic Press, Elsevier). Schnoor was also honored by ISU as one of 23 alumni to be named to its Chemical and Biological Engineering Hall of Fame.

Green Governance: Ecological Survival, Human Rights, and the Law of the Commons (Cambridge University Press) was published by **Burns Weston** and David Bollier. The book provides a new architecture of ecological governance to help combat the growing human-made threats to Earth's life-sustaining capacity.

EDUCATION

CGRER helps educate the next generation of researchers and scientists who will address the complex issues and problems associated with environmental change. Educational efforts during the year included a climate science forum for teachers from around the state, a multidisciplinary initiative on the emerging discipline of informatics, and a major report on the impact of climate change on agriculture.

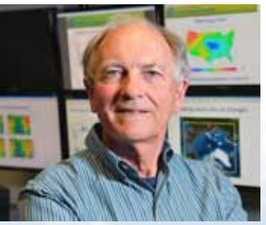
INFORMATICS INITIATIVE



A new UI initiative on informatics—a term used to describe the creation, evaluation and utilization of digital information—will be led by **Greg Carmichael**. The multidisciplinary effort is intended to establish the UI as a national center for excellence in this rapidly evolving discipline. As the amount of digital data grows exponentially, informatics provides an essential tool in a wide variety of fields and is a powerful enabler of research, education and engagement.

While the initiative will build on existing UI strengths, it will also include the hiring of an "informatics cluster" of new faculty. The UI's investment in the high-performance computing clusters Helium and Neon, along with expanded digital storage, provide the crucial capacity needed for big data work. The ultimate goal of the initiative will be to pull together faculty and staff to conduct leading-edge informatics research and discovery and to partner with researchers and teachers across campus whose work depends on the creation, evaluation and utilization of large amounts of digital information.

U.S. NATIONAL CLIMATE ASSESSMENT



Gene Takle and Jerry Hatfield of the National Laboratory for Agriculture and the Environment were the convening lead authors on the Agriculture Chapter of the National Climate Assessment, a report on the magnitude and impacts of current and future U.S. climate change that federal law requires at least every four years. The chapter summarizes the work of a team of 56 contributing authors who scanned more than 1,000 peer-reviewed research papers on the impact of climate change on agriculture. The report, to be issued early in 2014, says that climate disruptions to agricultural production have increased in the recent past and are projected to increase further over the next 25 years. By mid-century and beyond, these impacts will be increasingly negative on most crops and livestock. Many agricultural regions will experience declines in crop and livestock production from climate change-induced stresses. The rising incidence of weather extremes will have increasingly negative impacts on crop and livestock productivity because critical thresholds are already being exceeded. While agriculture has been able to adapt to recent changes in climate, increased innovation will be needed to ensure that the rate of adaptation of agriculture and the associated socioeconomic system can keep pace with future climate change.

MONARCH HABITAT RESTORATION

UNI's Tallgrass Prairie Center, directed by **Laura Jackson**, was featured in a *New York Times* article in December. The piece highlighted programs around the nation that are trying to restore habitat for monarch butterflies, whose numbers are dramatically declining. The insects migrate from the northern U.S. and Canada to Mexico and rely on milkweed plants as their sole food source during their caterpillar stage. As farmers in the Midwest and Great Plains take land out of conservation reserve programs and plant it with Roundup Ready varieties of corn, milkweed disappears from both fields and field edges. In an ongoing study at UNI, annual butterfly surveys in a 100-acre prairie documented 176 monarchs in 2010 and only 11 in 2013.

For two decades the Tallgrass Prairie Center has operated a program that grows milkweed and other native plant seeds for the Iowa DNR, which spreads them in parks and public lands throughout the state. The center also provides technical assistance, training and education for Integrated Roadside Vegetation Management programs, which are in place in 60 Iowa counties. Since 1998, 10,000 acres of Iowa roadsides have been restored with native vegetation through these programs, providing vital habitat for monarchs and other species.

Photos by Greg Houseal of the Tallgrass Prairie Center

CLIMATE SCIENCE EDUCATORS FORUM

In October, CGRER co-sponsored the *Iowa Climate Science Educators Forum*, an opportunity for science faculty from around the state to learn about the latest information on Iowa climate science. Held at Drake University, the event attracted 51 science faculty and students and featured presentations on the U.S. and global responses to climate change, adapting to extreme weather, what climate models say about Iowa rainfall, and earning trust with diverse audiences. Speakers included **Greg Carmichael**, **Witold Krajewski**, **Jerry Schnoor** and **Gene Takle**.

Witold Krajewski at the Iowa Climate Science Educators Forum

FIRST-YEAR SEMINARS

A number of CGRER members have participated in a program designed to involve UI students in active, engaged learning from their first semester on campus. First-Year Seminars are one-credit hour courses that introduce undergraduates to the intellectual life at the UI and help them make the transition to college-level learning. Classes are limited to less than 20 students and topics vary widely. In 2013 CGRER members **Greg Carmichael**, **David Cwiertny**, **Sarah Larsen**, **David Peate** and **Steve Spangler** taught First-Year Seminars on topics that included climate change and water sustainability.

Sarah Larsen taught a First-Year Seminar on Molecular Gastronomy: Chemistry for Hungry Minds.

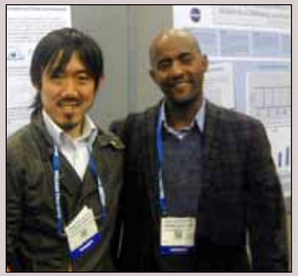
ENVIRONMENTAL SCIENCE COURSE IMPROVEMENTS

Art Bettis and **Adam Ward** have transformed Introduction to Environmental Science, a large UI general education course, from a traditional lecture hall format to a hybrid delivery class supported by technology. The changes are part of the Large Lecture Transformation Project funded by the UI Provost Office's Student Success Initiative. In an effort to better engage students with a more interactive and personalized learning environment, Bettis and Ward now deliver some course content on-line via text and video. Whole-course meeting times that were formerly lectures are now used to engage the class in guided discussions and in-depth analysis of pertinent local environmental science issues. Additional small group sessions further engage students in discussions, writing and peer review. The class also constructs a wiki, which is a website that allows visitors to make changes, contributions and corrections. The initiative's goal is to help identify alternative models for large courses that increase student engagement and satisfaction, thereby leading to greater student success. Bettis and Ward hope that the course will help cultivate life-long learners with the skills needed for scientific literacy.

CONFERENCE TRAVEL GRANTS FOR GRADUATE STUDENTS

In 2013, $18,000 was awarded to graduate students advised by CGRER members who were traveling to professional conferences to make oral or poster presentations.

Matthew Ampleman
Civil and Environmental Engineering, UI
Superfund Research Program Annual Meeting



Tibebu Ayalew
(above at right)
Civil and Environmental Engineering, UI
American Geophysical Union Fall Meeting

Patrick Bitterman
Geographical and Sustainability Sciences, UI
Annual Meeting of the Association of American Geographers

Robert Bullard
Chemical and Biochemical Engineering, UI
19th International Conference on Nucleation and Atmospheric Aerosols

Benjamin Carr
Agronomy, ISU
American Geophysical Union Fall Meeting

Bo Chen
Civil and Environmental Engineering, UI
American Geophysical Union Fall Meeting

Joseph Cullin
Earth and Environmental Sciences, UI
American Geophysical Union Fall Meeting and Society for Freshwater Science Annual Meeting

Susanna Donaldson
Anthropology, UI
Society for Applied Anthropology and Annual Meeting of the American Anthropological Association

Matthew Even
Earth and Environmental Sciences, UI
American Geophysical Union Fall Meeting

Ali Reza Firoozfar
Civil and Environmental Engineering, UI
World Environmental and Water Research Congress

Aruni Gankanda
Chemistry, UI
American Geophysical Union Fall Meeting

Gabriela Hamerlinck
Biology, UI
Society for the Advancement of Chicanos and Native American Students Meeting

Thilina Jayarathne
Chemistry, UI
American Geophysical Union Fall Meeting

Wen Xin Koh
Human Toxicology, UI
Society of Toxicology Annual Meeting and American Chemistry Society National Meeting

Nilsen Lasso-Rivas
Ecology, Evolution and Organismal Biology, ISU
Midwest Ecology and Evolution Conference

Yi Liang
Civil and Environmental Engineering, UI
10th International Phytotechnologies Conference

Paige Madsen (above)
Journalism and Mass Communication, UI
Association for Education in Journalism and Mass Communication Midwinter Meeting

Rachel Marek
Civil and Environmental Engineering, UI
American Chemical Society National Meeting

Stephani Miles
Journalism and Mass Communication, UI
Society for Risk Analysis Annual Conference

Fazlolah Mohaghegh
Mechanical and Industrial Engineering, UI
U.S. National Congress on Computational Mechanics

Iordanis Moustakidis (below)
Civil and Environmental Engineering, UI
World Environmental and Water Research Congress

Marlis Muschal (right)
Anthropology, UI
Plains Anthropological Conference

Cristina Munoz
Geographical and Sustainability Sciences, UI
Annual Meeting of the Association of American Geographers

Amanda Nelson
Biology, UI
Annual Meeting of the Ecological Society of America

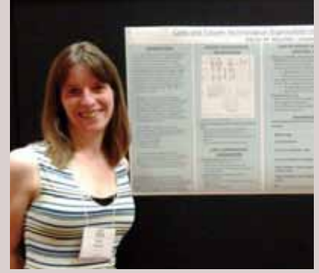
Jason Patton
Agronomy, ISU
International Geoscience and Remote Sensing Symposium

Nirmal Kumar Rai
Mechanical and Industrial Engineering, UI
U.S. National Congress on Computational Mechanics

Maija Eliina Sipola
Earth and Environmental Sciences, UI
European Geosciences Union General Assembly

Samuel Smidt
Earth and Environmental Sciences, UI
Society for Freshwater Science Annual Meeting

Yulia Tataurova
Chemistry, UI
American Chemical Society National Meeting



Tawny Tibbits (right)
Earth and Environmental Sciences, UI
Geological Society of America National Convention

Sarah Trabert
Anthropology, UI
Plains Anthropological Conference

Jennifer Trivedi
Anthropology, UI
Society for Applied Anthropology Annual Meeting

Laura Zangori
Teaching and Learning, UI
National Association of Research in Science Teaching (NARST) Annual International Conference

Right: Rachel Marek, Wen Xin Koh and Keri Hornbuckle at the American Chemical Society Fall 2013 National Meeting

RESEARCH

CGRER supports research projects that deepen our understanding of environmental change and help provide solutions to problems from the local to global levels. During 2013, research efforts included collaborations with NASA on atmospheric science and global precipitation measurements and a study of the potential harm of pharmaceutical steroids once they are discharged into the environment.

GLOBAL PRECIPITATION PROJECT

Satellite in NASA's Global Precipitation Measurement network (photo by NASA)

The Iowa Flood Center (IFC) collaborated with NASA to help improve a system that will predict precipitation—and potential flooding—using satellites. The IFC provided ground data that is being used to fine-tune NASA's Global Precipitation Measurement (GPM), an international network of satellites that will be launched in 2014 to improve the measurement of precipitation from space. GPM's goal is to provide worldwide estimates of precipitation every three hours.

The IFC's Iowa Flood Studies field campaign ran from May 1 to June 15 and involved scientists from ten research institutions. Numerous sensors and gauges were set up to measure rainfall at sites throughout northeast Iowa as accurately as possible, with the results cross-checked with the data collected by satellites. NASA chose to work with the IFC because of its network of monitoring instruments and its experience in studying and predicting floods. **Witold Krajewski** led the research efforts at the IFC.

ATMOSPHERIC SCIENCE CAMPAIGN

CGRER played an important role in a major airborne science campaign coordinated and funded by NASA. The Studies of Emissions, Atmospheric Composition, Clouds and Climate Coupling by Regional Surveys (SEAC4RS) was an airborne and satellite mission over the southern United States whose goal was to better understand how pollution, storms and climate mix. The campaign drew together coordinated observations from satellites, research aircraft, balloons and an array of sites on the ground.

The field portion of the study was based out of Ellington Air Force Base in Houston, Texas. A CGRER team member was on site during the entire field experiment, which ran from August through September.

CGRER provided high-resolution pollution forecasts to help determine if, when and where planes collecting data should fly on a given day. NASA had three planes collecting data and CGRER used its newly expanded Helium cluster computing system to produce its forecast. **Greg Carmichael, Charlie Stanier, Pablo Saide, Scott Spak** and **Jeremie Moen** participated in the study.

The SEAC4RS project included high-altitude observations made from airplanes.

SOUTHEAST ATMOSPHERE STUDY

Elizabeth Stone is taking part in the Southeast Atmosphere Study (SAS), the largest U.S. air quality study in decades. SAS is a joint project of the National Science Foundation, the Environmental Protection Agency, the University of Iowa, and 30 other U.S. and international research institutions. Five projects within SAS will assess various components of air quality, chemical and aerosol constituent evolution over the southeastern U.S. The goal is to discover the processes that control the biosphere-atmosphere interactions that affect regional climate and air quality in that region. Stone received an EPA STAR grant of $300,000 to study the sources and radiative properties of organosulfates in the atmosphere.

STEROIDS IN THE ENVIRONMENT

David Cwiertny's research on what happens to pharmaceutical steroids once they are discharged into the environment was published in *Science*. Up until now, it was thought that steroids and other pharmaceuticals degraded into harmless compounds once they entered the waste water system. Cwiertny's research has found that their bioactive properties may persist longer than was thought, posing potential ecological and health problems.

Cwiertny's research focused on three pharmaceutical steroids. Trenbolone, an anabolic steroid that is banned for human use but is used by the beef industry, was found to have the ability to regenerate itself under certain conditions into an active form. Similar results were found for the birth-control hormone dienogest, and dienedone, a banned anabolic steroid used as a body-building supplement. The results indicate that even trace amounts of these substances in the water supply can be problematic and that this new form of contaminant should be regulated and mitigated.

EARLY CAREER DEVELOPMENT AWARDS

Tori Forbes (below right) and **Sara Mason** (at left) received National Science Foundation (NSF) Faculty Early Career Development (CAREER) Awards. Forbes' award is for a study of how tubular nanomaterials transport and store water, research that may one day advance drug delivery and promote cleaner water. One of the outreach components of the grant is a partnership with the UI Natural History Museum to develop a new exhibit about the use of nanominerals in water purification.

Mason's award will fund theoretical studies on environmental nanoparticles that will aid in the development of new water purification methods. It will also include outreach to area community college students on opportunities for continuing education and research in chemistry. Over the next five years Forbes will receive $509,244, and Mason will receive $525,000. The CAREER award is the most prestigious NSF honor for junior faculty and recognizes research and teaching excellence. It is given to scholars who are likely to become future academic leaders.

Tim Mattes analyzed samples from deep ocean hydrothermal vents.

DEEP OCEAN CARBON SINKS

In a paper published in *International Society of Microbial Ecology (ISME) Journal*, **Tim Mattes** described how microbes that live in the deep ocean, below a depth where light can penetrate, absorb carbon. Carbon fixation has generally been thought to be limited to organisms that use sunlight as their energy source, but Mattes has found that microbes use chemical energy sources such as sulfur and methane from hydrothermal vents. Though the research provides insight into global biogeochemical cycles, there is as yet no evidence to suggest that these microbes play a role in mitigating global warming.

A SAMPLING OF GRANTS AWARDED TO CGRER MEMBERS

Art Bettis and **Thanos Papanicolaou** (co-PIs) and colleagues from the University of Illinois received a $4,770,600 NSF grant for *Critical Zone Observatory for Intensively Managed Landscapes* (2013-18). The UI's portion of the grant is $769,740. **Adam Ward**, **Doug Schnoebelen** and **Marian Muste** are lead scientists involved in the project.

Diane Debinski (co-PI) and colleagues were awarded a $498,891 grant from the U.S. Fish and Wildlife Service for *Adaptive Management in Working Landscapes to Provide Habitat for Species of Greatest Conservation Need* (2013-16).

Bill Gutowski (co-PI) and colleagues at the National Center for Atmospheric Research received a $2,775,294 NSF grant for *Collaborative Research: EaSM2: Advanced Climate and Regional Model Validation for Societal Applications* (2013-16). ISU's portion is $492,764.

Craig Just (co-PI) received a $177,113 grant from the Roy J. Carver Charitable Trust for *Cybermussel Enhancement* (2013-15).

Michelle Scherer (co-PI) received a $180,000 grant from the U.S. Department of Energy for *Mechanisms of Interfacial Reactivity in Near Surface and Extreme Geochemical Environments* (2013-15).

Scott Spak (co-PI) received a $120,000 grant from NASA for *Web-Enabled Tools for Air Quality Management Decision Support* (2013-14).

CGRER AIDS TO RESEARCHERS

CGRER provides state-of-the-art, high performance computing and visualization resources to facilitate interdisciplinary research. In 2013, research was conducted on CGRER-owned machines that have a storage capacity of nearly 400 terabytes. An essential complement to this equipment has been the investment by the UI's Information Technology Services in new high performance computing clusters on campus. In addition to the existing Helium cluster, a new cluster, Neon, will be operational in January of 2014. Neon is capable of 80 teraflops (as compared to 40 for Helium) and has large storage arrays to meet the needs of researchers on campus. CGRER has invested financially in both clusters, which provides our researchers priority when conducting research and analysis. In 2013, CGRER researchers logged over 428,000 CPU hours on Helium.

In addition, the UI now has an unlimited site-wide license for all Environmental Systems Research Institute products (ESRI). CGRER is one of two UI departments on campus from which support for ESRI products may be requested.

SEED GRANTS

In 2013, CGRER awarded a total of $149,145 in Seed Grants to five projects.

Use of Waste Heat to Sustainably Generate High Quality Effluent for Aquifer Recharge; **David M. Cwiertny** and Danmeng Shuai, UI Department of Civil and Environmental Engineering; $29,700.

Development of a Late Holocene Decadal-Scale Proxy Record of the North Atlantic Oscillation from Portuguese Stalagmites; **Rhawn Denniston**, Department of Geology, Cornell College; $30,000.

Impacts of Extended Drought Conditions and Global Warming on Groundwater Resources in Iowa and the Upper Midwest; Kristie J. Franz, William W. Simpkins, and Ozlem Acar, ISU Department of Geological and Atmospheric Sciences; $29,548.

Theoretical Description of Nanomaterials for Water Remediation; **Sara E. Mason**, UI Department of Chemistry; $30,000.

Groundwater Sustainability in Agriculturally Dominated Watersheds: A Case-Study in Mewat District, Haryana, India; **Adam Ward,** UI Department of Earth & Environmental Sciences and **Marian Muste**, UI Department of Civil and Environmental Engineering; $29,897.

Above: Sensors attached to river mussels in Craig Just's Cybermussel Enhancement Project
At Left: Burning is one of the alternative grassland management practices being researched by Diane Debinski and colleagues. (photo by John Delaney)

A SAMPLING OF PUBLICATIONS BY CGRER MEMBERS

Mearns, L.O., S. Sain, L.R. Leung, M.S. Bukovsky, S. McGinnis, S. Biner, D. Caya, **R.W. Arritt**, W.J. **Gutowski**, **E.S. Takle**, et al. 2013. Climate change projections of the North American Regional Climate Change Assessment Program (NARCCAP). *Climate Change Letters*, doi: 10.1007/s10584-013-0831-3.

Muhs, D.R., **E.A. Bettis III**, et al. 2013. Chronology and provenance of last-glacial (Peoria) loess in western Iowa and plaeoclimatic implications. *Quaternary Research*, doi: 10.1016/j.yqres.2013.06.006.

Muhs, D.R., J.R Budahn, J.P. McGeehin, **E.A. Bettis III**, et al. 2013. Loess origin, transport, and deposition over the past 10,000 years, Wrangell-St. Elias National Park, Alaska. *Aeolian Research*, doi: 10.1016/j.aeolia.2013.06.001.

Huang, M., **G.R. Carmichael**, T. Chai, R.B. Pierce, S.J. Oltmans, D.A. Jaffe, K.W. Bowman, A. Kaduwela, C. Cai, **S.N. Spak**, et al. 2013. Impacts of transported background pollutants on summertime western US air quality: model evaluation, sensitivity analysis and data assimilation. *Atmospheric Chemistry & Physics,* doi: 10.5194/acp-13-359-2013.

Egli, M., **D. Dahms**, and K. Norton. 2013. Soil production rates on silicate parent material in high-mountains: different approaches – different results? *Geoderma*, doi: 10.1016/j.geoderma.2013.08.01.

Debinski, D.M., J.C. Caruthers, D. Cook, J. Crowley and H. Wickham. 2013. Gradient-based habitat affinities predict species vulnerability to drought. *Ecology*, doi: 10.1890/12-0359.1.

Kawazoe, S. and **W.J. Gutowski**. 2013. Regional, extreme daily precipitation in NARCCAP simulations. *Journal of Hydrometeorology*, doi: 10.1175/2010JHM1297.1.

Abeysinghe, S., K.W. Corum, D.L. Neff, **S.E. Mason**, and **T.Z. Forbes**. 2013. Contaminant adsorption on nanoscale particles: structural and theoretical characterization of Cu2+ bonding on the surface of Keggin-type polyaluminum (Al30) molecular species. *Langmuir*, doi: 10.1021/la402736t.

Muste, M., D.A. Bennett, S. Secchi**, J.L. Schnoor,** et al. 2013. End-to-end cyberinfrastructure for decision-making support in watershed management. *Journal of Water Resources Planning and Management*, doi: http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000289.

Mutel, C.F. 2013. Toward Saving our Keystone Species. *Woodlands and Prairies Magazine*, 9(4): 14-18.

Pasakarnis, T.S., M.I. Boyanov, K.M. Kemner, B. Mishra, E. J. O'Loughlin, **G. Parkin**, and **M. M. Scherer**. 2013. Influence of chloride and Fe(II) content on the reduction of Hg(II) by magnetite. *Environmental Science & Technology*, doi: 10.1021/es304761u.

Neumann, A., T. L. Olson, and **M. M. Scherer**. 2013. Spectroscopic evidence for Fe(II)–Fe(III) electron transfer at clay mineral edge and basal sites. *Environmental Science & Technology,* doi: 10.1021/es304744v.

Petrich, N.T., **S.N. Spak, G.R. Carmichael**, D. Hu, A. Martinez, **K.C. Hornbuckle**. 2013. Simulating and explaining passive air sampling rates for semi-volatile compounds on polyurethane foam passive samplers. *Environmental Science & Technology*, doi: 10.1021/es401532q.

Andrews, A.E., J. D. Kofler, M. E. Trudeau, J. C. Williams, D. H. Neff, K. A. Masarie, D. Y. Chao, D. R. Kitzis, P. C. Novelli, C. L. Zhao, E. J. Dlugokencky, P. M. Lang, M. J. Crotwell, M. L. Fischer, J. T. Lee, D. D. Baumann, A.R. Desai, **C. O. Stanier**, et al. 2013. CO2, CO and CH4 Measurements from the NOAA Earth System Research Laboratory's Tall Tower Greenhouse Gas Observing Network: instrumentation, uncertainty analysis and recommendations for future high-accuracy greenhouse gas monitoring efforts. *Atmospheric Measurement Techniques*, doi: 10.5194/amtd-6-1461-2013.

Yucuis, R., **C. Stanier** and **K.C. Hornbuckle**. 2013. Cyclic siloxanes in air, including identification of high levels in Chicago and distinct diurnal variation. *Chemosphere*, doi: 10.1016/j.chemosphere.2013.02.051.

Kundu, S., T.A. Quraishi, G. Yu, C. Suarez, F. N. Keutsch and **E.A. Stone**. 2013. Evidence and quantitation of aromatic organosulfates in ambient aerosols in Lahore, Pakistan. *Atmospheric Chemistry and Physics*, doi: 10.5194/acp-13-4865-2013.

Takle, E.S., D. Gustafson, R. Beachy, et al. 2013. US food security and climate change: agricultural futures. *Economics*, doi: http://dx.doi.org/10.5018/economics-ejournal.ja.2013-34.

Ward, A.S., M.N. Gooseff, T.J. Voltz, et al. 2013. How does rapidly changing discharge during storm events affect transient storage and channel water balance in a headwater mountain stream? *Water Resources Research*, doi: 10:1002/wrcr.20434.

Ward, A.S., R.A. Payn, M.N. Gooseff, et al. 2013. Variation in surface water – groundwater interactions along a headwater mountain stream: Comparisons between transient storage and water balance analyses. *Water Resources Research*, doi: 10.1002/wrcr.20148.

INTERNATIONAL EFFORTS

CGRER research and educational efforts span the globe. This year included leadership in advising the World Meteorological Organization on environmental pollution and atmospheric chemistry and awards recognizing CGRER member's ties to China and Chile.

EINSTEIN PROFESSORSHIP

Jerry Schnoor was awarded the Einstein Professorship from the Chinese Academy of Sciences. Schnoor visited China in May to accept the award and deliver four lectures based on his research around the country. Each year the academy awards Einstein Professorships to 20 distinguished international scientists working at the frontiers of science and technology. Award recipients come to China for one to two weeks to lecture, lead workshops and interact with faculty and students. The program is meant to strengthen ties between recipients and Chinese scientists and enhance the training of future Chinese scientists.

ATMOSPHERIC ADVISORY GROUP

Greg Carmichael has been appointed chair of the Scientific Steering Committee for the Open Programme Area Group on Environmental Pollution and Atmospheric Chemistry of the World Meteorological Organization's Commission on Atmospheric Sciences. The World Meteorological Organization (WMO) is an agency of the United Nations with a membership of 191 states and territories. It is the UN's authoritative voice on the state and behavior of the Earth's atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources.

Within the WMO, the Commission on Atmospheric Sciences (CAS) supports research to help prepare societies when natural disasters strike, protect the environment, and ensure that the responses to environmental change are well informed. Its role is increasingly important because meteorological services are more and more science-driven. CAS facilitates global atmospheric research by fostering good planning processes of essential projects. It also encourages WMO member countries to direct their national resources towards these projects, to provide the mechanisms for good governance of these global efforts, and to support the efforts to improve meteorological services through research.

INTERNATIONAL IMPACT AWARD

Marcelo Mena-Carrasco, a graduate of the UI College of Engineering, received the UI 2013 International Impact Award. The honor was given for work that includes the implementation of a dramatically improved pollution-forecasting model for Santiago, Chile, that has significantly improved air quality in the city. UI researchers who have collaborated on this project include **Pablo Saide, Greg Carmichael** and **Scott Spak**.

The forecasting system makes use of CGRER-developed computer models. Mena-Carrasco has become well known in his home country through his work on the improved air quality forecasting model. He served as advisor to the director of Chile's environmental protection agency and to the minister of environment, and he has been featured in the country's national media many times speaking on environmental issues. Mena-Carrasco is currently a professor and research center director at Universidad Andrés Bello in Santiago. **Greg Carmichael**, who supervised Mena-Carrasco's PhD, **Pablo Saide** and **Craig Just** spoke at the awards ceremony in November.

Marcelo Mena-Carrasco stands on a hill overlooking Santiago, Chile, with a device that measures particulate matter in the air. (photo by Universidad Andrés Bello)

FIELD RESEARCH TRAVEL GRANTS FOR GRADUATE STUDENTS

In 2013, $13,138 was awarded to graduate students advised by CGRER members who were traveling to sites to complete field research for their thesis or dissertation.

Kaitlin Barber
Ecology, Evolution and Organismal Biology, ISU
Mortality Rates of Juniperus virginiana *(eastern Red Cedar) due to Fire in Native and Exotic Grassland Communities*

Jaime Butler-Dawson
Occupational and Environmental Health, UI
Exploring Gender Differences in Pesticide Exposure and Cognitive Function in the Gambia

Ryan Johnson
Geographical and Sustainability Sciences, UI
Evaluation of Random Forest for Delineating Midwestern Flood-plain Vegetation Types using a Fusion of Hyperspectral, LiDAR, and Digital Aerial Data

Theodore Marks
Anthropology, UI
Geochemical Sourcing of Archaeological Lithic Raw Materials with Portable X-Ray Flourescence Analysis in the Central Namib Desert, Western Namibia

Colin O'Sullivan
Civil and Environmental Engineering, UI
The Acquisition of Surficial Sediment from the Chicago Sanitary and Ship Canal for the Isolation, Identification, and Quantification of PCB Congeners and Related Compounds

Derek Richards
Geography, UNI
Climate Analysis Using Tree-Rings from the Wind River Range, Wyoming

Kimberly Szcodronski
Ecology, Evolution and Organismal Biology, ISU
Identifying Key Habitat Requirements for Rare Montane Meadow Butterflies Parnassius clodius *and* Parnassius smintheus *in Grand Teton National Park, Wyoming*

Thomas Williams
Geographical and Sustainability Sciences, UI
Estimating Carbon Fluxes on Avalanche Paths in Glacier National Park, Montana

Jaime Butler-Dawson in Gambia

Kimberly Szcodronski in Grand Teton National Park, Wyoming

Above: Derek Richards in Wyoming
Below left: Theodore Marks in the Central Namib Desert, Western Namibia
Below: Thomas Williams in Glacier National Park, Montana

ADMINISTRATION

Greg Carmichael and Jerry Schnoor

CGRER is directed by University of Iowa professors **Gregory Carmichael** (Dept. of Chemical and Biochemical Engineering) and **Jerald Schnoor** (Dept. of Civil and Environmental Engineering). Center activities are guided by an elected Executive Committee that consists of seven members (listed on page three) plus the two co-directors. The Executive Committee meets monthly to plan initiatives and chart CGRER's course. An Advisory Board of eight members (listed on page five) from outside the academic community meets annually to lend oversight to CGRER's activities.

Joe Bolkcom, Jane Frank and Jeremie Moen

Since 1992, CGRER has employed two full-time staff members. Administrative assistant **Jane Frank** oversees office operations. **Jeremie Moen** manages CGRER's computer facilities with the aid of services contracted from the Iowa Computer Aided Engineering Network. In addition, **Joe Bolkcom** serves as half-time Director of Outreach and Community Education. CGRER reports directly to the UI's Vice President for Research.

NEW MEMBERS

Liz Christiansen is Director of the UI Office of Sustainability, where she develops programs to promote sustainability and resource conservation and works to enhance the UI community's understanding of the ecological importance and financial feasibility of sustainability initiatives.

David Cwiertny is a UI assistant professor of civil and environmental engineering and an assistant faculty research engineer in IIHR—Hydroscience & Engineering. His specialties include environmental chemistry and water and wastewater treatment and reuse, including emerging contaminant classes in natural aquatic systems.

Ibrahim Demir is an assistant research engineer at IIHR—Hydroscience & Engineering, and an adjunct assistant professor in UI civil and environmental engineering. His research interests include hydroinformatics, environmental information systems, scientific visualization, and data analytics.

Meena Khandelwal (below, back row at right) is an associate professor of anthropology and gender, women's and sexuality studies, with a specialty in India. She is also director of the South Asian Studies Program. Among her projects is a collaboration with **H.S. Udaykumar** on solar cookers in India, a low-cost technology that has the potential to reduce women's workloads and help to address the problem of deforestation. The two are tracing linkages between forests, energy, gender relations, health, consumption and culture, working on the local to global levels.

Sara Mason is a UI assistant professor in chemistry. Her research group uses computational and theoretical chemistry to study geochemical surface science and the reactivity of environmental interfaces.

Tyler Priest is a UI associate professor with a joint appointment in the Departments of History and Geographical and Sustainability Sciences. His research and teaching interests are in the history of petroleum, energy and globalization. He is a leading expert on the history of offshore oil and gas.

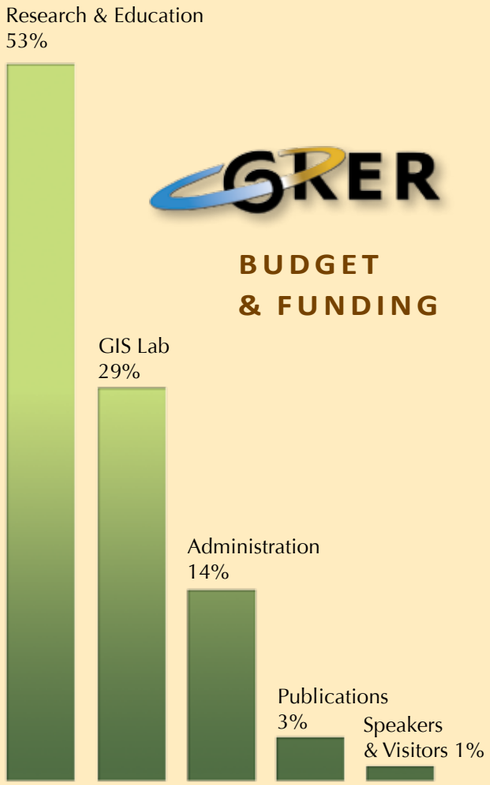
Douglas Schnoebelen has served as director of the Lucille A. Carver Mississippi Riverside Environmental Research Station (LACMRERS) since 2008. LACMRERS is a research and education center on the Mississippi River in Muscatine operated by IIHR—Hydroscience & Engineering. Schnoebelen is also a research engineer with IIHR—Hydroscience & Engineering and adjunct assistant professor in the UI Departments of Earth and Environmental Sciences and Civil and Environmental Engineering.

Kathleen Stewart is a UI associate professor and director of graduate studies in the Department of Geographical and Sustainability Sciences. She works in the area of geographic information science (GIS) with a particular interest in temporal GIS, which includes topics such as moving objects research, event modeling for dynamic GIS, and space-time accessibility for services such as healthcare.

James Tamerius is a UI assistant professor in the Department of Geographical and Sustainability Sciences. He does research on the environmental determinants of human health, using statistical and mathematical modeling techniques to examine the response of disease dynamics to temporal and spatial variability of climate and other environmental factors.

Eric Tate is a UI assistant professor in the Department of Geographical and Sustainability Sciences. His research focuses on the confluence of environmental hazards and society, primarily through the development of geospatial models of flood hazards, vulnerability and water sustainability.

H.S. Udaykumar is a professor of mechanical engineering at the UI and a faculty research engineer at IIHR—Hydroscience & Engineering. His research interests include the development of accurate and flexible numerical methods for the simulation of three-dimensional flows in the presence of moving boundaries. He teaches courses on energy and sustainability and is also working with NGOs in India on developing a low-cost, locally sourced solar cooker to help stem the problem of deforestation due to firewood harvesting.



BUDGET & FUNDING

$4.4 million in new external funding

In fiscal year 2013 (July 1, 2012-June 30, 2013), CGRER received $642,832 in revenue from investor-owned utilities as mandated by the State of Iowa's Energy Efficiency Act. These funds helped CGRER assist its members in a wide variety of initiatives.

This funding was magnified many times in the research money awarded to CGRER members from other sources. In calendar year 2013, CGRER members brought in $4.4 million in new external research funding.

$642,832 in revenue from rate payers through investor-owned utilities

MEMBERS

UNIVERSITY OF IOWA

Anthropology
Margaret E. Beck
Michael S. Chibnik
Russell L. Ciochon
James G. Enloe
Matthew E. Hill, Jr.
Meena Khandelwal

Biology
Andrew A. Forbes
Stephen D. Hendrix
Diana G. Horton

Chemical and Biochemical Engineering
Gregory R. Carmichael
A. Umran Dogan
Charles O. Stanier

Chemistry
Tori Z. Forbes
Vicki H. Grassian
Sarah C. Larsen
Sara E. Mason
Elizabeth Stone
Mark Young

Above: Thilina Jayarathne (a graduate student working with Elizabeth Stone) monitors equipment in the Southeast Atmosphere Study. Below: Near Centreville, Alabama, the view from an instrumentation tower used in the Southeast Atmosphere Study

Civil and Environmental Engineering
Allen Bradley
David M. Cwiertny
William E. Eichinger
Keri C. Hornbuckle
Craig L. Just
Witold F. Krajewski
Lou Licht
Timothy E. Mattes
Marian V. Muste
Wilfrid A. Nixon
A. Jacob Odgaard
A.N. Thanos Papanicolaou
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Douglas Schnoebelen

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Kajsa E. Dalrymple

Law
Jonathan Carlson
Burns H. Weston

Mechanical and Industrial Engineering
Geb Thomas
H.S. Udaykumar

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G. Edgar Folk, Emeritus

Occupational and Environmental Health
R. William Field
Joel N. Kline
Peter S. Thorne

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Donald A. Gurnett
Paul D. Kleiber
Steven R. Spangler

Science Education
Cory T. Forbes

Statistics and Actuarial Science
Kate Cowles
Dale L. Zimmerman

Urban and Regional Planning
Charles Connerly
Scott Spak
Aaron Strong

IOWA STATE UNIVERSITY

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Richard M. Cruse
Brian K. Hornbuckle

Ecology, Evolution, and Organismal Biology
Diane M. Debinski
John Nason
James W. Raich
Brian J. Wilsey

Geological and Atmospheric Sciences
William J. Gutowski
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Natural Resource Ecology and Management
Jan Thompson

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2013 ANNUAL REPORT

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