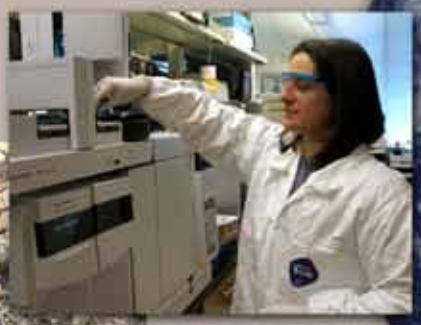
C G R E R

THE CENTER FOR GLOBAL AND REGIONAL ENVIRONMENTAL RESEARCH

2011 ANNUAL REPORT



www.cgrer.uiowa.edu

CGRER

WWW.CGRER.UIOWA.EDU

THE CENTER FOR GLOBAL & REGIONAL ENVIRONMENTAL RESEARCH

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

Photo at right: Matanuska Glacier in Alaska (Photo by Susan Kilgore)

THE CENTER FOR GLOBAL & REGIONAL ENVIRONMENTAL RESEARCH

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 public 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 86 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 require 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.

EDUCATE STUDENTS AND THE GENERAL PUBLIC

PROMOTE DIALOGUE AMONG SPECIALISTS AND AGENCIES

FOSTER AND SUPPORT RELEVANT RESEARCH PROJECTS

Executive Summary

TELLING OUR RESEARCH STORY

What's your story? Everyone has one.

But some people are more adept at telling their story than others. I try to explain to my students that it's not enough to do good research—they also need to become accomplished storytellers. Otherwise, who will ever pay attention to their research or publish their dissertation? They must be able to write concisely, express themselves clearly and present their work in a compelling fashion. Only then will their work become understood and utilized for further research, patents, inventions and policies.

At CGRER, we are in the same position as our students. We must conduct excellent research and learn to tell our story well. Otherwise, we have failed in our mission to the state and nation. So again this year, we've endeavored to tell our story. Not only because we like to be heard, but also because our message may benefit people and the planet.

As you'll read in this annual report, CGRER members accomplished a great deal in 2011. Our researchers were awarded a three-year grant from the Environmental Protection Agency to study air pollution and climate effects of black carbon aerosol in three disparate corners of the globe: the Arctic, India and California. CGRER investigators were instrumental in a major $20 million EPSCoR project from the National Science Foundation (NSF) for renewable energy and energy efficiency research at Iowa State University, the University of Northern Iowa and the University of Iowa. In addition, CGRER members received a $1 million grant from NSF to investigate climate and land use effects on water quality in the Iowa/Cedar River Basin. CGRER researchers also explored the effects of wind turbines on crops, flooding on urban planning, and water sustainability in agricultural settings.

We're trying to do a better job of telling our research story through a variety of initiatives. Joe Bolkcom, our education and outreach director, helped organize a panel discussion for UI investigators this year on how they can translate their research into non-technical language and reach broader audiences. CGRER's Iowa Environmental Focus (iowaenvironmentalfocus.org) daily blog and weekly radio spots—as well as our sponsorship of legislative breakfasts and community meetings—have helped us tell our story beyond the boundaries of our campuses.

CGRER's story must be delivered accurately and with sensitivity because the gravity of the matter is so great. For example, the recent Special Report of the Intergovernmental Panel on Climate Change (ipcc-wg2.gov/SREX) is quite complex and nuanced in its revelations regarding extremes of climate change. It stresses that communities must understand these matters so they can respond wisely and adapt to meet future challenges. To quote from the report:

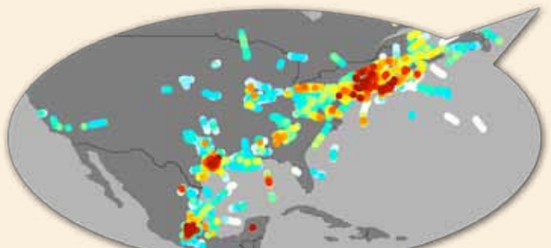
There is evidence that some extremes have changed as a result of anthropogenic influences including increases in atmospheric concentrations of greenhouse gases. It is likely that anthropogenic influences have led to warming of extreme daily minimum and maximum temperatures on the global scale.

The report continues in its assessment of losses from climate-related disasters:

Economic losses from weather- and climate-related disasters have increased, but with large spatial and interannual variability. Economic, including insured, disaster losses associated with weather, climate and geophysical events are higher in developed countries. Fatality rates and economic losses expressed as a proportion of GDP are higher in developing countries.

The report makes it clear that losses due to climate extremes are distributed unevenly across the globe depending upon the exposure, vulnerability and preparedness of communities. Although *adaptation* is the thrust of the report, *mitigation* must also be pursued to minimize the damages associated with climate change. That brings us to the link between research and policy. We hope that the work of CGRER researchers will help inform better policy-making as well as contribute to the world's understanding of environmental change.

This past December, policy makers met in Durban, South Africa, for the 17th Conference of the Parties (COP 17) under the United Nations Framework Convention on Climate Change.



They were unable to set legally binding limits for countries to reduce their emissions today, but 194 nations did agree that a treaty with "legal force" was needed to avert a 2°C (3.6 °F) increase in global average temperatures and serious interference with the climate system. Participants agreed to negotiate the details of that agreement by 2015, so that emission reductions can take effect by 2020. It was also agreed that both developed and developing nations share responsibility to reduce their emissions, but with differing responsibilities for each. All in all, there was more progress than originally expected at Durban, and hope remains fervent for staving-off major climate disruption.

CGRER's research story doesn't garner the international attention that a United Nations conference does. But we believe our work can make a difference for individuals, for the state of Iowa and for the larger world. Our research is as practical as finding new ways to save energy and reduce greenhouse gas emissions in one's home, and as complex as creating a global model for reducing soot particles in the atmosphere in order to save lives and reduce global temperatures. We take our responsibilities very seriously, and we are grateful for the support of Iowa investor-owned utilities and the people of Iowa for helping to make our work possible.

JERALD L. SCHNOOR,
CGRER CO-DIRECTOR WITH
GREGORY R. CARMICHAEL

CGRER

EXECUTIVE COMMITTEE

MESSAGE FROM THE CGRER ADVISORY BOARD

Having served on the CGRER Advisory Board for more than two decades, I know firsthand the contributions that this organization makes to the state, nation and world. Under the leadership of Jerry Schnoor and Greg Carmichael, CGRER has grown to include a network of nearly 90 members who are working to address a wide range of difficult environmental issues. They are conducting research on how we can improve water quality, reduce air pollution, develop cost-effective alternative wastewater treatments, address climate change, promote wind and biomass energy and reduce the damage from future floods.

While CGRER members conduct research around the globe, many of their efforts are focused on Iowa. As you will read in this report, CGRER is forming a growing number of partnerships with communities across the state so that we can work together to address our most pressing environmental issues.

We know that solving these complex problems will require the participation of a broad range of citizens, civic leaders, policy makers and scientists.

This past year CGRER has tried to better communicate the work of its members to the public, showing how their efforts are having a positive impact in Iowa as well as beyond the borders of our state. To that end, CGRER conducted a seminar aimed at helping researchers improve their public engagement efforts. CGRER also expanded the information available through its Iowa Environmental Focus daily blog, radio show and website. If you're looking for useful and interesting environmental news, I urge you to regularly visit iowaenvironmentalfocus.org.

I believe it is critically important for scientific researchers to help us better understand what they do and why it matters. Some of our greatest achievements as a country have been driven by the extraordinary research conducted at our public universities. It is essential that we continue to rely on evidence-based solutions as we tackle the critical issues facing our state and nation.

I share the tremendous pride that so many Iowans feel in the accomplishments of the faculty and staff at our public universities. I am particularly proud of the work being done by CGRER and am honored to serve on its Advisory Board. I know that in the coming year, CGRER's dedicated and talented members will continue to help the state work toward a prosperous future.

STATE SENATOR
BOB DVORSKY

Below: Brandi Janssen visits Eastern Iowa CSA for her project "Producing Local Food and Local Knowledge." Photo above right: Purple kale grows in central Iowa.

Senator Dvorsky, center, meets with Larry Weber, right, UI Professor of Civil and Environmental Engineering and director of IIHR-Hydroscience and Engineering.

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

Photo right: Massive upland erosion in a bare field in Iowa (Photo provided by Thanos Papanicolaou)

ADVISORY BOARD MEMBERS

Robert Dvorsky
Senator, Iowa State Legislature

Darrell Hanson
Iowa Utilities Board

Jon Kallen
Manager, Environmental Policy and Strategy,
MidAmerican Energy

Jim Klosterbuer
Senior Environmental Consultant,
Alliant Energy

Mark Kresowik
Eastern Region Deputy Director,
Beyond Coal Campaign
Sierra Club

Hiram "Chip" Levy
Senior Research Scientist,
Geophysical Fluid Dynamics Laboratory, NOAA

David Osterberg
Occupational and Environmental Health,
University of Iowa

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

Sharon Tahtinen
Legislative/Policy Liaison for Environmental Services Division
Iowa Department of Natural Resources

OUTREACH

A variety of outreach initiatives helped CGRER members share their expertise with the larger world in 2011. Projects included collaborations with the city of Dubuque on its sustainability efforts, computerized mapping of future floods in Iowa, and a website that draws attention to the problem of increasing farmland erosion.

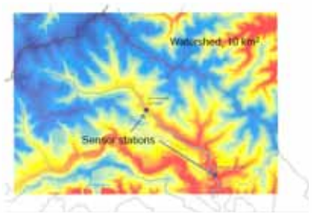
PARTNERS IN SUSTAINABILITY

The city of Dubuque's efforts to be more environmentally sustainable are benefiting from collaborations with CGRER members. **Chuck Connerly** is overseeing 35 graduate students from the UI School of Urban and Regional Planning who will do nine projects in Dubuque during the next two years. The efforts are

part of the school's Iowa Initiative for Sustainable Communities and will also involve undergraduate interns from Clarke University, Loras College, the University of Dubuque and Northeast Iowa Community College.

The students are developing projects that include researching and mapping renewable energy sources to fill the gap when the Dubuque Power Plant closes in 2015; working with area colleges to connect them with local food producers; and designing a Green and Healthy Homes program. While the projects will benefit Dubuque, they will also give students valuable real-world experience in their fields.

In addition, **Jerry Schnoor** is working with the city to develop the Sustainable Dubuque Watershed Network. The two-year pilot project features the installation of water quality sensors on a creek with flooding, water quality and sewage by-pass issues. The sensors give real-time water quality information that will be used to better understand the urban water cycle and raise local awareness of water quality problems. The project involves faculty and students from Dubuque colleges and universities as well as citizen



Above: The north fork of Catfish Creek in Dubuque. Left: Students meet with project managers.

scientists wanting to contribute to their community. It is funded by $25,000 from the City of Dubuque and $60,000 from the UI Office of the Vice President for Research.

Dubuque is regarded as a national leader in sustainability, which is defined as the ability to meet the environmental, economic and social equity needs of today without reducing the ability of future generations to meet their needs.

MAPPING FUTURE FLOODS

The UI Iowa Flood Center is proving to be an increasingly valuable resource for Iowans. In 2010 it began developing computer models of flood-prone communities in Iowa. This past year, that project grew in depth, scope and ease-of-use, allowing Iowans across the state to see how future flooding may affect their areas.

With a click of a mouse, the Iowa Flood Information System (IFIS) allows citizens to see what areas will be inundated by each six-inch rise in water. While communities already have 100- and 500-year flood maps, the new technology offers far more detailed and up-to-date information. The tool is especially helpful for those who live on the outskirts of 100-year flood plains, as well as local officials preparing for future floods. The IFIS features an easy-to-use, Google Map-based interface.

In 2011, the Iowa Flood Center posted new maps for Cedar Rapids, Des Moines and the area around Hills in Johnson County, and the maps for Charles City and Waterloo were updated. In September, Iowa City's inundation map was posted on the National Weather Service website. The IFIS also features flood forecasts, real-time rainfall maps displaying current conditions and past rainfall accumulation, and information from remote sonar sensors on water levels of rivers throughout

the state. Information is currently being collected for inundation maps for Ames, Elkader, Mason City and Ottumwa, which will go online next year.

The Iowa Flood Center was established in 2009 in response to the massive floods of 2008. Its director is **Witold Krajewski.** The flood maps are posted at www.iowafloodcenter.org.

OUTREACH TO LEGISLATORS

In March, CGRER and the Iowa Flood Center co-hosted a Legislative Breakfast Reception at the Iowa State Capitol. The annual event helps educate legislators about the significant environmental research being done in Iowa and the ways it can benefit the state. Fifty-one legislators attended, along with several key state agency members and interest group participants. Also in attendance were CGRER members **Witold Krajewski, Marian Muste, Elizabeth Stone** and **Larry Weber**, as well as CGRER advisory board members **Jon Kallen** and **Sharon Tahtinen**.

Witold Krajewski

IFC Iowa Flood Center

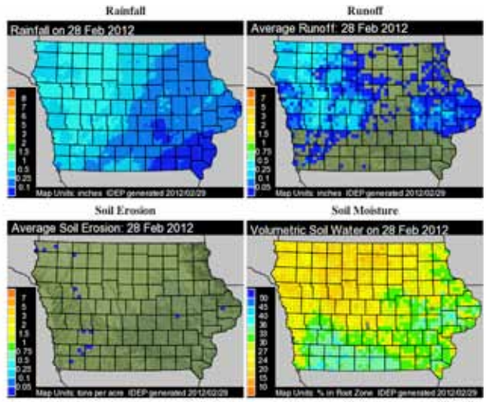
SUSTAINABLE FOODS & CLIMATE CHANGE

In November, acclaimed author Frances Moore Lappé addressed more than 700 people at the UI on the topic of "Sustainable Foods and Climate Change: Fixing a Broken System." Lappé is the author of 18 books, including the influential *Diet for a Small Planet*, which has sold three million copies since its publication 40 years ago.

Long before the term "carbon footprint" was coined, the book popularized ways of eating that minimized environmental damage. The lead sponsor of the lecture was CGRER; other sponsors included the UI School of Urban and Regional Planning, UI Public Policy Center, the UI Office of Sustainability and the UI Lecture Committee.

COMMEMORATING THE 2008 FLOOD

CGRER has begun collaborating with the UI College of Engineering and Hancher Auditorium on plans to commemorate the five-year anniversary of the 2008 floods. *Living with Floods* will celebrate the progress the state has made towards recovery, raise awareness of the need for flood mitigation efforts, and educate citizens about our watershed and its vulnerabilities. The project will culminate in June 2013 with free public performances by New Orleans' Preservation Hall Jazz Band in a half-dozen Iowa communities greatly affected by the floods. In the months leading up to the show, events will be held to encourage people to reflect on their flood experiences and learn about the complex issues relating to flooding.



ESTIMATING EROSION

Richard Cruse and colleagues continue to draw attention to one of the state's most serious environmental problems through the Iowa Daily Erosion Project (wepp.mesonet.agron.iastate.edu), a website that estimates the daily soil erosion rate for every township. The project has documented numerous townships that in some years have soil erosion rate estimates of 10 to 100 times the soil renewal rate.

Cruse began the website in 2002 to draw increased attention to the problem of excess soil erosion. The loss of valuable topsoil is accelerating in Iowa as more grassland is put into row crops and as the frequency of heavy rainfalls increases. By showing a daily simulation of the erosion process on nearly 20,000 hill slopes across the state, Cruse is helping to focus mitigation efforts on the areas of greatest need. Media outlets that include *The New York Times* have referenced the website as a source of information for the problem of soil erosion. The Daily Erosion Project is a collaboration between ISU, the UI, the National Soil Erosion Research Lab and the National Laboratory for Agriculture and the Environment.

CLIMATE CHANGE REPORT

Climate Change Impacts on Iowa 2010, a report describing the effects of climate change in Iowa, continued to receive media attention in 2011. The report was the subject of newspaper editorials and articles, TV programs and radio shows across the state, including Iowa Public Radio's program ***The Exchange***. Report authors and CGRER members **Jerry Schnoor**, **Gene Takle** and **Laura Jackson** participated in the hour-long program in January. The report is available at www.iowadnr.gov/Environment/ClimateChange/ClimateChangeAdvisoryCo.

CGRER COMMUNICATIONS

Michael Gallagher joined CGRER as a half-time intern in July and has worked on a variety of projects as he pursues his MS in journalism. He writes scripts for CGRER's radio segments and assists with their editing, recording, promoting and distribution. In addition, he updates the Iowa Environmental Focus blog at least once a day with articles, photographs and links and helps spread the word about CGRER activities through social media websites. He has begun a blog series "Environmental Experts Speak," which features interviews with individuals around the state involved in environmental issues. Featured experts have included **Richard Cruse, Steve Hendrix, Keri Hornbuckle, Connie Mutel, Jerry Schnoor** and **Charlie Stanier**.

Brynne Schweigel served as a quarter-time intern during the year while completing her BA in journalism/mass communication and political science. She worked with the Iowa Environmental Focus radio program, including recording and editing clips and making contacts with media outlets, and also contributed to its blog.

Morgan Yarker has been a quarter-time CGRER intern since 2008. A doctoral student in science education, Yarker assisted **Charlie Stanier** in a summer workshop for middle school teachers on weather, climate and energy (see page 14), and provided additional teacher support following the workshop. She presented her dissertation research on helping people understand climate models at a conference in Norway, and co-authored a publication on the need to adequately train scientists in developing countries to use climate models effectively. The publication was distributed at COP 17 in Durban, South Africa.

Brynne Schweigel and Jerry Schnoor create a radio segment for Iowa Environmental Focus.

IOWA ENVIRONMENTAL FOCUS

CGRER's blog and radio project grew in popularity and visibility during the year. Launched in 2010, Iowa Environmental Focus (iowaenvironmentalfocus.org) features daily blog posts and weekly radio segments on Iowa environmental news and events. The one-to-two minute segments often highlight research being done by CGRER members and are sent to 90 stations, 30 of which run them weekly while the rest use the content on a more occasional basis.

Above: Jerry Schnoor, Brynne Schweigel and Michael Gallagher. Right: Morgan Yarker in front of the Kjosfossen Waterfall on a tour held during a conference in Norway.

GRER MEMBERS

A SAMPLING OF AWARDS, ACHIEVEMENTS & APPOINTMENTS

Dick Baker's former student Laura Strickland at the Snowmastodon Fossil Site.

Dick Baker was selected to be on a team of more than 40 U.S. scientists investigating the Snowmastodon Fossil Site in Colorado, which is managed by the Denver Museum of Nature and Science. Baker is working on the site's plant macrofossils, which are the preserved remains of leaves and other vegetation that are large enough to be seen without a microscope.

Nandita Basu (below) has been appointed to the editorial boards of *Hydrology and Earth System Sciences* and *Hydrological Processes*.

Art Bettis (above) was elected president of the American Quaternary Association, a professional organization of North American scientists who study the Quaternary Period, the last two million years of Earth history.

Michael Chibnik's book *Anthropology, Economics, and Choice* was published by the University of Texas Press in Austin. He has also been appointed editor-in-chief of the *American Anthropologist*, the flagship journal of the American Anthropological Association.

Two graduate students working with **Michael Chibnik** received recognition during the year. **Brandi Janssen** received an $18,500 grant for 2011-12 from the Wenner-Gren Foundation for her doctoral project, "Producing Local Food and Local Knowledge: The Experiences of Iowa Farmers."

Susanna Donaldson won the Eric Wolf Prize from the Society for the Anthropology of Work for an essay on changing work organization among tobacco farmers in eastern Tennessee.

Richard Cruse received the 2011 President's Leadership Award from the Soil and Water Conservation Society, an international nonprofit scientific and educational organization.

Luciana Cunha, a PhD candidate working with **Witold Krajewski**, was awarded a NASA fellowship of $30,000 for her project "Scaling-based Flood Prediction: Exploring the Benefits of Satellite Remote Sensing."

Rhawn Denniston was featured in *The Atlantic Magazine's* on-line "Nine-And-A-Half Questions" series. Denniston discussed topics that included China's pursuit of renewable energy and the challenges of educating people about climate change.

Piotr Domaszczynski, a PhD candidate working with **Witold Krajewski**, was awarded a NASA fellowship of $30,000 for his project "Developing Precipitation Algorithms for a Mobile Network of Polarimetric X-band Radars for GPM Validation."

Bill Gutowski was appointed co-chair of the new Societal Dimensions Working Group of the Community Earth System Model (CESM) at the National Center for Atmospheric Research. CESM is a global climate model that provides state-of-the-art computer simulations of Earth's past, present and future climate states.

Amanda De Hoedt, Martha (Ejura District Chief), Craig Just and Tim Houser in Ghana.

Craig Just received the 2011 International Studies Outstanding Faculty Mentor Award, which recognizes outstanding contributions in international education and exceptional mentoring and support of UI students who are pursuing a BA in international studies.

Rachel Marek, (above) a PhD candidate working with **Keri Hornbuckle**, received a Graduate Assistantship in Area of National Need (GAANN Fellowship) from the U.S. Department of Education. The award funds tuition, benefits and a spending account for 2011-2013.

Marian Muste and **Connie Mutel** were honored by the Iowa State Board of Regents with Awards for Staff Excellence in recognition of their outstanding accomplishments and contributions to the UI and to the state of Iowa.

Connie Mutel

Marian Muste

Marian Muste was nominated as Vice-President of the International Association for Hydro-Environment Engineering and Research.

Connie Mutel was appointed as Iowa United Nations Day chair for 2011. She spoke to high school students from across the state at October's U.N. Youth Symposium in Des Moines.

Wilfrid Nixon gave a presentation on environmentally sustainable road maintenance at Winter Fair Nordicway in Ostersund, Sweden.

Thanos Papanicolaou was named a Distinguished Iowa Scientist by the Iowa Academy of Science. He was recognized in a ceremony held at Wartburg College for his work in upland erosion and watershed studies related to agriculture in Iowa.

The UI College of Engineering held the inaugural **Richard L. Valentine** Distinguished Lecture in October. The speaker was Chad Jafvert of Purdue University, who was the first doctoral student of Richard Valentine. The annual event honors Valentine, a UI professor of civil and environmental engineering since 1982.

Wilfred Nixon, center, on the outskirts of Stockholm following his presentation at Winter Fair Nordicway.

Below: Piotr Domaszczynski with network of X-POL radars

EDUCATION

CGRER helps prepare the next generation of researchers and scientists to address the multifaceted environmental problems facing the world. Educational efforts in 2011 included a major grant promoting renewable energy and energy efficiency, innovations in graduate training, and the establishment of a program in wind energy at the UI.

SUSTAINABLE ENERGY SYSTEMS GRANT

CGRER members **Nandita Basu, David Bennett, Greg Carmichael, Marc Linderman** and **Gene Takle** play a prominent role in a major new grant that aims to make Iowa a national leader in renewable energy and energy efficiency. The five-year, $20 million NSF grant features these initiatives:

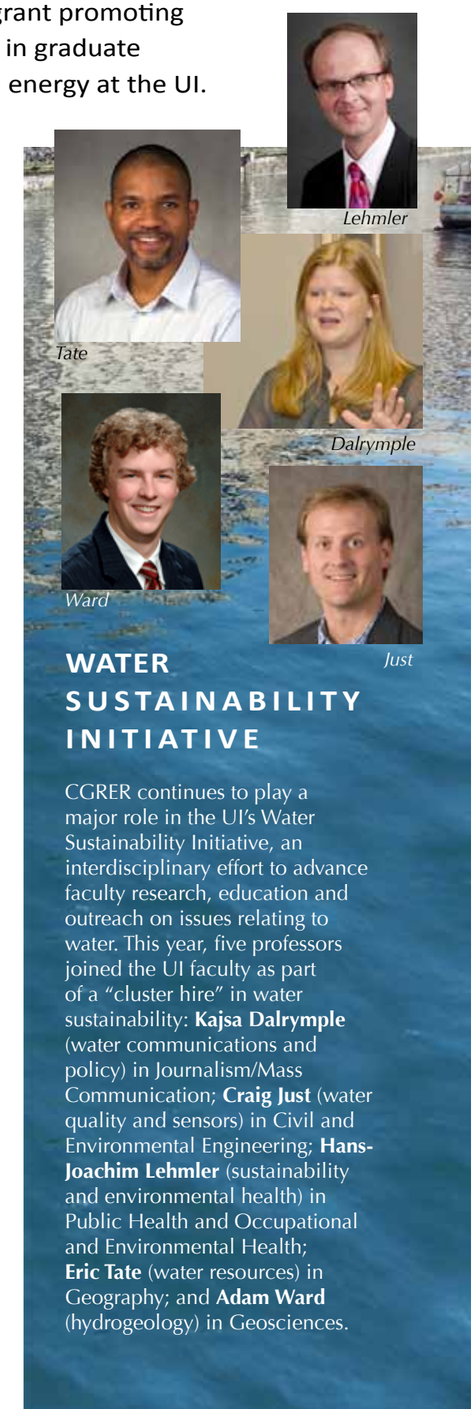
Bioenergy platform:
Focuses on how to sustainably produce and heat large quantities of biomass (such as corn stalks) to generate electric power and transportation fuels

Wind energy platform:
Uses advanced engineering principles to improve the reliability and efficiency of wind turbines

Energy utilization platform:
Studies building energy science and how human behavior influences energy conservation decisions

Energy policy platform:
Explores ways for engineers and economists to collaborate and advise lawmakers on renewable energy and energy efficiency issues, including establishing a program to train engineering and economics faculty to work together on energy issues

In addition, the grant supports the hiring of new faculty members, the transferring of campus energy inventions to private companies, and the creation of a statewide Future Leaders in Advancing Renewable Energy Institute to help meet the labor needs of Iowa's emerging green economy. The research will be conducted primarily at Iowa's three public universities, but it includes partnerships with the state's community and private colleges, school districts, government agencies and industries. The grant is part of NSF's Experimental Program to Stimulate Competitive Research (EPSCoR), which is targeted at states and regions that have not won as much NSF research and development funding as other areas. The Iowa Power Fund, a state program supporting energy innovation and independence, has also granted the project $2 million to pay for research equipment.



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WATER SUSTAINABILITY INITIATIVE

CGRER continues to play a major role in the UI's Water Sustainability Initiative, an interdisciplinary effort to advance faculty research, education and outreach on issues relating to water. This year, five professors joined the UI faculty as part of a "cluster hire" in water sustainability: **Kajsa Dalrymple** (water communications and policy) in Journalism/Mass Communication; **Craig Just** (water quality and sensors) in Civil and Environmental Engineering; **Hans-Joachim Lehmler** (sustainability and environmental health) in Public Health and Occupational and Environmental Health; **Eric Tate** (water resources) in Geography; and **Adam Ward** (hydrogeology) in Geosciences.

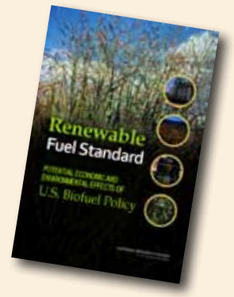
INNOVATIONS IN GRADUATE EDUCATION

This fall saw the arrival of the first cohort of graduate students in the UI's new interdisciplinary program Geoinformatics for Environmental and Energy Modeling and Prediction (GEEMaP). GEEMaP is funded by NSF's Integrative Graduate Education and Research Traineeship (IGERT) program. The first cohort consists of eight students who are pursuing PhDs in one of the seven GEEMaP-affiliated departments, while benefiting from the interdisciplinary research experiences and real-world internship opportunities provided by GEEMaP. **Kate Cowles** is the director of GEEMaP, and several other CGRER members are advisers, research leaders and instructors in the program.

TELLING YOUR RESEARCH STORY

More than 65 UI faculty members participated in an October seminar on "Telling Your Research Story." The event was the brainchild of **Greg Carmichael** and focused on the need for researchers to better communicate with the larger world about their work. Panel members Meenakshi Gigi Durham, **Donald Gurnett, Jerry Schnoor** and Amy E.T. Sparks described how they translate their technical research into accessible language. There is a growing need for faculty members to do so today, as competition increases for grants and public funds. The seminar was designed to help researchers across the disciplines find a narrative for their work that is clear, compelling and shows benefits to the larger society.

Panel members gave a variety of suggestions for how faculty can reach broader audiences. Feedback on the session was positive, and plans are underway for a follow-up seminar on more detailed communication strategies and techniques. "Telling Your Research Story" was sponsored by CGRER, University Communication and Marketing, and the UI Office of the Vice President for Research.



RENEWABLE FUELS REPORT

Jerry Schnoor was one of the authors of a report on biofuels published by the National Research Council at the request of the U.S. Congress. *Renewable Fuel Standard* evaluates the economic and environmental consequences of increasing biofuels production as a result of the current Renewable Fuel Standard. The report describes biofuels produced in 2010 and those projected to be produced and consumed by 2022, and discusses the potential environmental harm and benefits of biofuels production and the barriers to achieving the consumption mandate. The report says that it is unlikely the U.S. will meet biofuel mandates under the current Renewable Fuel Standard by 2022 unless innovative technologies are developed or policies change, and that the standard may be an ineffective policy for reducing global greenhouse gas emissions.

Left: Jerry Schnoor, Meenakshi Gigi Durham and Amy E.T. Sparks
Right: Research panel participants

SCIENCE EDUCATION WORKSHOP

Charlie Stanier led a five-day summer workshop for 21 middle school teachers from across Iowa on weather, climate and energy. The teachers heard presentations by experts in these fields, took field trips, were given sample curricula and access to on-line resources, designed experiments, and gained hands-on experience working with models that support conceptual understandings of the disciplines. The workshop helped the teachers meet new standards for science education both nationally and at the state level and was funded by NSF and CGRER. Stanier was assisted by **Morgan Yarker**, a CGRER intern pursing a PhD in science education.

EXPLORERS SERIES

Many CGRER members have shared their expertise with the public through the UI Explorers Seminar Series, which is sponsored monthly by the UI Museum of Natural History. The lectures focus on environmental or cultural research and take place in the museum's Biosphere Discovery Hub. During the past two years, the series has featured **Nandita Basu, Margaret Beck, Art Bettis, Jonathan Carlson, Greg Carmichael, Matthew Hill, Sarah Larsen, Connie Mutel, Jerry Schnoor** and **Holmes Semken**. Many of their presentations can be seen on YouTube.

CGRER VISITING SCIENTISTS

Alex Laskin
Pacific Northwest National Laboratory, *Environmental Molecular Chemistry of Atmospheric Aerosols*

Zhiquan Liu
Mesoscale & Microscale Meteorology Division, National Center for Atmospheric Research, *3D Ariational Assimilation of MODIS Aerosol Optical Depth: Implementation and Application to a Chinese Dust Storm*

Dylan Millet
Department of Soil, Water and Climate, University of Minnesota *Organic Chemicals in the Global Atmosphere: Quantifying Sources and Impacts*

Sailesh Rao
Climate Healers, Inc., San Ramon, California, *From Meditation to Mitigation? Changing Paradigms in the Face of Climate Change*

WIND ENERGY PROGRAM

David Bennett has received a $100,000 grant from the Iowa Alliance for Wind Innovation and Novel Development to establish an interdisciplinary wind energy education program at the UI. The undergraduate certificate program will involve two core courses and a set of elective courses designed to build expertise in one of two specialty areas: wind energy production or geographic information science for wind energy. Courses will be offered in the UI departments of geography, civil and environmental engineering, and mechanical and industrial engineering, along with IIHR-Hydroscience & Engineering. CGRER members **Marc Linderman, Marc Armstrong** and **Marian Muste** are also involved in developing the new program, which builds upon Iowa's strengths as a national leader in wind energy.

An example of an anthropogenic organic aerosol event witnessed by Alex Laskin on a trip to Shanghai, China. On the left is the guide poster from the observation deck of the Shanghai World Financial Center. On the right is the city as seen on March 20, 2010.

CONFERENCE TRAVEL GRANTS FOR GRADUATE STUDENTS

In 2011, $10,275 was awarded to graduate students advised by CGRER members who were traveling to professional conferences to make oral or poster presentations.

Andrew Ansorge
Agronomy, ISU
American Geophysical Union Fall Meeting

Jennifer Trivedi at the Katrina Memorial located in Biloxi, MS. The black wall marks the height of the storm surge. (Photo by A. Trivedi)

Jeremy Bril
Civil & Environmental Engineering, UI
Association of Environmental Engineering and Science Professors Education and Research Conference

Robert Bullard
Chemical & Biochemical Engineering, UI
American Institute of Chemical Engineers Annual Meeting

Haihan Chen
Chemical & Biochemical Engineering, UI
American Geophysical Union Fall Meeting

Ashish Datt
Chemistry, UI
Gordon Research Conference

Renato Prata de Moraes Frasson
Civil & Environmental Engineering, UI
European Geosciences Union General Assembly and American Geophysical Union Fall Meeting

Joshua Livermore
Civil & Environmental Engineering, UI
Association of Environmental Engineering and Science Professors Education and Research Conference

Brandi Janssen
Anthropology, UI
Society for Applied Anthropology Annual Meeting

Joyce Lok
Agronomy, ISU
American Society of Agronomy International Meeting

Theodore Marks
Anthropology, UI
Society for American ArchaeologyAnnual Meeting

Jessica Monson
Geoscience, UI
Geological Society of America Annual Meeting

Imali Ama Mudunkotuwa
Chemistry, UI
American Chemical Society Spring National Meeting

Nick Petrich
Civil & Environmental Engineering, UI
Society of Environmental Toxicology and Chemistry North American Annual Meeting

Cerisa Reynolds
Anthropology, UI
Society for American Archaeology Annual Meeting

Zach Rodenburg
Civil & Environmental Engineering, UI
Society of Environmental Toxicology and Chemistry North American Annual Meeting

Timothy Schulz
Civil & Environmental Engineering, UI
Society of Environmental Toxicology and Chemistry North American Annual Meeting

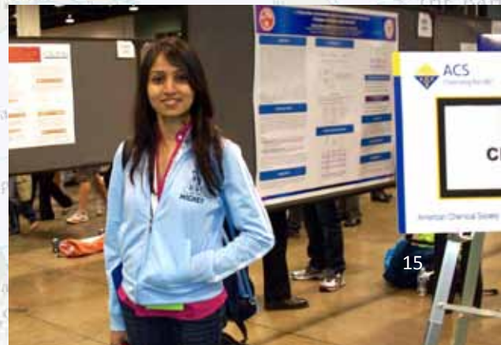
Sinan Sousan
Chemical & Biochemical Engineering, UI
American Association for Aerosol Research Annual Meeting

Tommy Ekamitra Sutarto
Civil & Environmental Engineering, UI
American Geophysical Union Fall Meeting

Jennifer Trivedi
Anthropology, UI
Center for Rebuilding Sustainable Communities After Disasters workshop, Univ. of Massachusetts-Boston

Achilleas Tsakiris
Civil & Environmental Engineering, UI
American Geophysical Union Fall Meeting

Imali Ama Mudunkotuwa at the American Chemical Society Spring National Meeting



Above: Rachel Yucuis with siloxane sampling equipment in Chicago, IL. Below: Luke Juran's photo from India, where poor access to water is complicated by serial monsoon flooding.

FIELD RESEARCH TRAVEL GRANTS FOR GRADUATE STUDENTS

In 2011, $11,755 was awarded to graduate students advised by CGRER members who were traveling to sites to complete field research for their thesis or dissertation.

David Gough
American Studies, UI
The Value of the Commonwealth: An Ecocritical History of Robinson Forest
Robinson Forest, Southern Appalachian Mountains

Luke Juran
Geography, UI
Water and Sanitation Components of Disaster Reconstruction: The Case of Post-Tsunami South India
Nagapattinam, Tamil Nadu, India

Mary Kathryn Rocheford
Geoscience, UI
Soilscapes: A Study of the Effects of Past Land-Use Activities on Soil Characteristics
New Philadelphia, IL and Spring Mill, IN

Clare Tolmie
Anthropology, UI
Cultural Adaptations to Climatic Instability: Adoption of Bone Tools by Neanderthals at the Grotte du Renne, Arcy-sur-Cure, France
Paris, France

Jiayu Wu
Natural Resource Ecology & Management, ISU
Continuation of Urban Catchment Stream Flow and Water Quality Monitoring in Central Iowa
Altoona, Ankeny, Des Moines, Johnston, and Pleasant Hill, IA

Rachel Yucuis
Civil & Environmental Engineering, UI
Organosiloxane Compounds in Urban and Rural Air
Chicago, IL

Left: Mary Kathryn Rocheford takes soil samples from shovel test pits for geochemical analysis. Below: Jiayu Wu surveying the shape of a stream channel near Summerbrook Park in Ankeny, IA.

A SAMPLING OF EDUCATIONAL EFFORTS BY CGRER MEMBERS

Barbara Eckstein continues to explore connections between the humanities and the environment. She presented a paper at the Modern Language Association in Los Angeles on "Child's Play in Rivers and Ravines: The Formation of a Movement and a Nation." At a symposium on sustainability and American Literature at the University of Illinois at Urbana-Champaign, she gave the paper "Catching the Place Tone, Finding the Spirit Region," which addresses the role of the humanities in work on sustainability. At the Association for the Study of Literature and the Environment at Bloomington, Indiana, she presented the paper "Rethinking Miasmas: Hogs and Human Health."

Art Bettis and Ted Neal initiated a service learning project to train students to do assessments of urban streams, a collaborative effort with the City of Iowa City and the Natural Resources Conservation Service. Bettis and Neal have trained four UI graduate students and five undergraduates on how to gather information about the physical conditions of the streams in Iowa City, documenting problems such as log jams and severe bank erosion. The information will be used by the city to prioritize funds designated for stream restoration and improvement. The service learning program is a win-win for the city and UI students. Iowa City benefits because it doesn't have the public works staff to do these assessments, and students benefit because they are learning to use assessment methods on state-of-the-art equipment, skills that will give them an advantage in the job market.

Scott Spak has launched *Iowa Climate Stories*, a citizen science project that is collecting personal observations of twentieth-century climate change in the Midwest. Students in his Air Pollution and Climate Change in Iowa course at the Iowa City Senior Center note changes they have observed in Iowa's climate, and research and compare their recollections to historical weather records. They then record brief web videos to share their findings with the world. This project is among the first to record personal climate change histories in non-aboriginal communities, and is also one of the first to connect personal histories with numerical data as a way for citizen scientists to explore and understand climate variability.

University of Iowa students conducting stream assessments in Iowa City (Art Bettis photo)

RESEARCH

CGRER supports research projects that deepen our understanding of environmental change and help provide solutions to global problems. Initiatives in 2011 included investigations on the effects of black carbon on climate change, documenting the benefits of biking for health and the environment, and exploring how wind turbines affect crop production.

BLACK CARBON EFFECTS

Greg Carmichael and **Scott Spak** have received a three-year grant from the Environmental Protection Agency to study the pollution and climate effects of black carbon aerosol, which arises from sources such as diesel engine exhaust and cooking fires. The total award of $900,000, including a $324,000 UI portion, will fund a joint project between the UI, the National Oceanic and Atmospheric Administration and the University of Colorado-Boulder.

The project will examine how black carbon (BC) affects air quality and climate in California, India and the Arctic. Atmospheric exposure to BC has been linked to increased mortality and pulmonary disease. Black carbon is also a strong, short-lived climate forcing agent, and so control of these emissions offers the possibility of slowing the rate of global warming. This research will identify new methods and metrics for evaluating the benefits of reducing BC emissions at urban to global scales, and will help inform policies designed to reduce the polluting and climate change effects of black carbon.

Carmichael and Spak published another black carbon research project in *Nature Climate Change*. Working with colleagues at universities in California and Chile, the two found that sugarcane ethanol production in Brazil generates up to seven times more air pollutants than previously thought. The research team used agricultural survey data from Brazil to calculate emissions of air pollutants and greenhouse gases from the production, distribution, and use lifecycle of sugarcane ethanol from 2000 to 2008. The majority of emissions come from burning the sugarcane fields prior to harvesting, a practice the Brazilian government has been trying to discourage but which still continues, particularly in remote areas. The research calls into question sugarcane's status as an advanced, environmentally friendly fuel source due to its low greenhouse gas emissions, and highlights the need for more comprehensive research on the environmental effects of growing and using biofuels.

THE BENEFITS OF BIKING

Scott Spak has found that biking not only improves the health of bicyclists—it can also benefit their neighbors. Spak and colleagues at the University of Wisconsin-Madison studied the potential impact of replacing short auto trips with biking in the eleven largest metropolitan areas in the upper Midwest. The study assumed that round trips less than five miles normally made by car would be replaced by active or public transportation, and that half of these trips would be made by bike during the warmest six months of the year.

The study, published in *Environmental Health Perspectives*, first looked at how air pollution-related illness would be reduced by eliminating the short auto trips, and then estimated the health benefits for the bicyclists themselves through greater fitness and lower health care costs for conditions like obesity and heart disease. Spak concluded that each year an estimated $8 billion and 1,300 lives could be saved by the combination of improved air quality and increased physical fitness. The study also finds that people in downwind rural areas would benefit from improved air quality.

Photo by Philippe Alès, Wikimedia Commons

WATERSHED RESEARCH

David Bennett and colleagues have been awarded a $1 million NSF grant to conduct research in the Iowa/Cedar River Watershed. The five-year grant will fund investigations into how regional natural and human systems respond to changes in climate, economic and policy conditions that operate over larger geographic and temporal scales. The researchers will model land use decision-making to simulate how humans respond to changing conditions, and then link that information to models of surface and ground water quality to examine the environmental impact of various scenarios. CGRER members **Nandita Basu, William Gutowski, Marian Muste** and **Jerry Schnoor** are also involved with the grant.

REDUCING AIR POLLUTION

Charlie Stanier presented the second part of a report to the Lake Michigan Air Directors Consortium (LADCO), the regional organization that provides technical assistance and coordination on air quality for state regulators in Michigan, Wisconsin, Illinois, Ohio and Indiana. The first report analyzed observations from an air quality monitoring project in Wisconsin. For the second report, Stanier and colleagues modeled the effects of controlling emissions from power plants, automobiles and agricultural sources. The findings will help state officials to predict and reduce wintertime pollution events. **Greg Carmichael, Scott Spak,** Jaemeen Baek and Yoo Jung Kim also contributed to the reports.

WIND TURBINES AND CROPS

In 2009 **Gene Takle** received a CGRER seed grant to study whether wind turbines affect crop growth and yield, the first research study of its kind. The initial research attracted considerable attention and an expanded research project was launched in 2011. His preliminary analysis is that wind turbines have a measurable effect on the microclimate of the surrounding crops. Takle is now working on a multi-year project called Crop-Wind-Energy Experiments (CWEX) with colleagues at the University of Colorado, the National Laboratory for Agriculture and the Environment, and the Ames Laboratory. Takle is also involved with the Sustainable Energy Systems Grant (see page 12) and will help establish an outdoor laboratory to collect wind speed and turbulence data, study the reliability of turbine blades, and improve the designs of turbine drivetrains.

NASA AIR QUALITY TEAM

Greg Carmichael and **Scott Spak** have been appointed to the NASA Air Quality Applied Sciences Team (AQAST), which includes 20 university faculty and scientists from NASA, the Environmental Protection Agency, and the National Oceanic and Atmospheric Administration. The team helps air quality managers at the local to national levels address urgent air quality issues. AQAST members support policymakers with expertise in the wide array of Earth science tools and data sets available from NASA and other agencies. The work by Carmichael and Spak is funded by a four-year, $575,000 NASA grant.

MUSSELS AND RIVER HEALTH

Craig Just and Anton Kruger have received a two-year, $398,000 grant from the Roy J. Carver Charitable Trust to fund research on a mussel-based, biosensing network designed to investigate diurnal river nitrogen cycling. The project involves measuring ingestion and digestion of phytoplankton and other nitrogen-containing organisms by mussels. It will also monitor mussel movement and filtering activity through an underwater radio network. Mussels have the ability to remove nitrogen from river water, which may help reduce the hypoxic "dead zone" in the Gulf of Mexico. The project will be conducted, in part, at IIHR's Lucille A. Carver Mississippi Riverside Environmental Research Station, located on the banks of the Mississippi River near Muscatine.

SEED GRANTS

In 2011, CGRER funded five new seed grants for the coming fiscal year, for a total of $149,879.

You-Kuan Zhang
UI Geoscience
Keith Schilling
Iowa Geological Survey
Nitrogen Load Reduction Evaluation for the Huai River: Balance Pressures from Agricultural Intensification, Industrialization and Climate Change
$30,000

Eugene S. Takle
ISU Climate Science Program
Shannon L. Rabideau
ISU Meteorology
Exploring Alternatives to the "Typical Meteorological Year" for Incorporating Climate Change into Building Design
$30,000

Janette R. Thompson
Timothy W. Stewart
ISU Natural Resource Ecology and Management
Kristie Franz
ISU Geology and Atmospheric Sciences
Quantifying Urban Headwater Stream Flow and Water Quality Dynamics to Develop Predictions for Urbanization and Climate Change Scenarios in Central Iowa
$29,897

Elizabeth Stone
David Wiemer
UI Chemistry
Development of Quantification Standards and Methods to Evaluate Agriculturally Derived Organic Aerosol
$30,000

Stephen Hendrix
UI Biology
Harsha Doddapaneni
UI Carver Center for Genomics

Are Solitary Bee Communities Collapsing? An Empirical Test for Declines and the Search for Colony Collapse Viruses in Solitary Bees
$29,982

A SAMPLING OF GRANTS AWARDED TO CGRER MEMBERS

Nandita Basu and **Larry Weber** (co-PIs) received a $190,735 grant from the Rebuild Iowa Office for *Hydrologic Impacts of Artificial Drainage Hydrologic Impacts of Drainage Systems* (2011-15).

Rhawn Denniston (PI) was awarded a $98,000 NSF grant for *RUI: Reconstruction of Recent and Late Holocene Tropical Cyclone Landfalls in Northwestern Australia using Flood Deposits in Aragonite Stalagmites* (2011-2013).

Vicki Grassian (PI) was awarded a $99,999 grant for *NSF Workshop on Nanomaterials and the Environment: The Chemistry and Materials Perspective* (2011-2012).

William Gutowski (co-PI) and colleagues at eight institutions received a $4 million grant from the Department of Energy for *Improving Decadal Prediction of Arctic Climate Variability and Change Using a Regional Arctic System Model* (2011-2015). ISU's share of the grant is $527,000.

Thanos Papanicolaou (co-PI) was awarded an NSF grant for $279,691 for *The Role of Relative Submergence on Flow-Obstacle Interaction: Implications to Sediment Transport* (2011-13).

Michelle Scherer (PI) was awarded a $259,844 NSF grant for *Collaborative Research: Stable Isotope Investigation of Fe Oxide Reactivity and Natural Isotope Fractionation* (2011-14) and a $650,000 grant from the U.S. Department of Energy for *Electron and Atom Exchange Between Aqueous Fe(II) and Structural Fe(III) in Clays: Role in U and Hg(II) Transformations* (2011-14.)

Scott Spak (PI) and co-investigators **Greg Carmichael, Charlie Stanier** and **Elizabeth Stone** received a $160,000 grant from University of Iowa Facilities Management for *Air Quality Impact of Stationary Power Generation at the University of Iowa* (2011-12).

CGRER AIDS TO RESEARCHERS

CGRER continues to provide high-performance computing and visualization resources to facilitate interdisciplinary research. During the year a Helium Cluster (shown below) capable of processing large computer models and simulations was introduced. As an investor in Helium, CGRER researchers have the permanent use of 88 dedicated central processing units and specialized software. In addition, storage capacity was increased to nearly 250TB. CGRER is also one of four UI departments that supports and distributes geographical information system (GIS) software through a campus-wide site license with the Environmental Systems Research Institute, Inc.

A SAMPLING OF PUBLICATIONS BY CGRER MEMBERS

Basu, N.B., S.E. Thompson, P.S.C. Rao. 2011. Hydrologic and biogeochemical functioning of intensively managed catchments: a synthesis of top-down analyses. *Water Resources Research*, doi:10.1029/2011WR010800.

Basu, N.B., P.S.C. Rao, S.E. Thompson, et al. 2011. Spatiotemporal averaging of in-stream solute removal dynamics. *Water Resources Research*, doi:10.1029/2010WR010196.

Wilson, H., **R.M. Cruse**, and L. Burras. 2011. Perennial grass management impacts on runoff and sediment export from vegetated channels in pulse flow runoff events. *Biomass and Bioenergy*, doi: 10.1016/j.biombioe.2010.08.059.

Wilson, H., **R.M. Cruse**, and L. Burras. 2011. A method to adapt watershed-scale sediment fingerprinting techniques to small-plot runoff experiments. *Journal of Soil and Water Conservation*, doi: 10.2489/jswc.66.5.323.

Quinton, E., **D.E. Dahms**, and C. E. Geiss. 2011. Magnetic analyses of soils from the Wind River Range, Wyoming, constrain rates and pathways of magnetic enhancement for soils from semiarid climates. *Geochemistry, Geophysics, Geosystems*, doi:10.1029/2011GC003728.

Debinski, D.M., R. A. Moranz, J.T. Delaney, et al. 2011. A cross-taxonomic comparison of insect responses to grassland management and land-use legacies. *Ecosphere*, doi:http://dx.doi.org/10.1890/ES11-00226.1.

Pillsbury, F.C., J.R. Miller, **D.M. Debinski** and D.M. Engle. 2011. Another tool in the toolbox? Using fire and grazing to promote bird diversity in highly fragmented landscapes. *Ecosphere*, doi: 10.1890/ES10-00154.1.

Testa, J.R., M. Cheung, J. Pei, J.E. Below, Y. Tan, E. Sementino, N.J. Cox, **A.U. Dogan,** et al. 2011. Germline BAP1 mutations predispose to malignant mesothelioma. *Nature Genetics*, doi: 10.1038/ng.912.

Carbone, M., Y.I. Baris, P. Bertino, B. Brass, S. Comertpay, **A.U. Dogan,** et al. 2011. Erionite exposure in North Dakota and Turkish villages with mesothelioma. *Proceedings of the National Academy of Sciences of the United States of America*, doi: 10.1073/pnas.1105887108.

Pettibone, A., J. Wang, **W.E. Eichinger**, A. Clarke, S.A. Vay, D.R. Blake, and **C.O. Stanier**. 2011. Size-resolved aerosol emission factors and new particle formation/growth activity occurring in Mexico City during the MILAGRO 2006 Campaign. *Atmospheric Chemistry and Physics*, doi: 10.5194/acpd-11-6651-2011.

Forbes, C.T. 2011. Preservice elementary teachers' adaptation of science curriculum materials for inquiry-based elementary science. *Science Education*, doi: 10.1002/sce.20444.

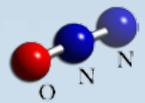
Mudunkotuwa, I.A. and **V.H. Grassian**. 2011. The devil is in the details (or the surface): impact of surface structure and surface energetics on understanding the behavior of nanomaterials in the environment. *Journal of Environmental Monitoring*, doi: 10.1039/C1EM00002K.

Abiodun, B.J., **W.J. Gutowski**, A. A. Abatan, and J. M. Prusa. 2011. CAM-EULAG: A non-hydrostatic atmospheric climate model with grid stretching. *Acta Geophysica*, doi: 10.2478/s11600-011-0032-2.

Fisel, B.J., **W.J. Gutowski**, J. M. Hobbs, and J. J. Cassano. 2011. Multiregime states of Arctic atmospheric circulation. *Journal of Geophysical Research*, doi:10.1029/2011JD015790.

Martinez, A. and **K.C. Hornbuckle**. 2011. Record of PCB congeners, sorbents and potential toxicity in core samples in Indiana Harbor and Ship Canal. *Chemosphere*, doi.org/10.1016/j.chemosphere.2011.08.018.

Hu, D., A. Martinez and **K.C. Hornbuckle**. 2011. Sedimentary records of non-aroclor and aroclor PCB mixtures in the Great Lakes. *Journal of Great Lakes Research*, doi: 10.1016/j.jglr.2011.03.001.



Rubasinghege, G., **S. Spak, C. Stanier, G. Carmichael**, and **V. Grassian**. 2011. Abiotic mechanism for the formation of atmospheric nitrous oxide from ammonium nitrate. *Environmental Science & Technology*, doi: 10.1021/es103295v.

INTERNATIONAL EFFORTS

CGRER members work both regionally and around the globe to address problems relating to environmental change. In 2011, international efforts ranged from research on climate and chemical emissions in Asia to air quality forecasting in Central America.

CHEMISTRY, CLIMATE & HEALTH RISKS IN ASIA

Air pollution in Asia (Photo by Alex Laskin)

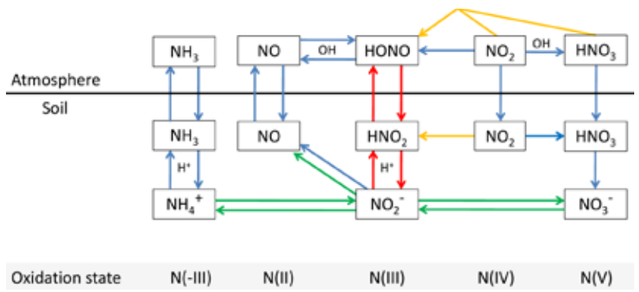
Greg Carmichael has received a three-year NSF grant to study the impacts of changing climate and chemical emissions in Asia. The total award of $700,000, including a $167,000 UI portion, will fund a joint project between the UI, the National Center for Atmospheric Research and international partners in India, Japan and China. The interdisciplinary project addresses climate and air quality in Asia and their impacts on humans, including connections with hydrology, ecosystems, extreme weather events and human health.

The grant funds collaborations between Asian and American scientists and students, including workshops to be held in China and Colorado in 2012 and 2013. The goal is to establish a team of scientists who can identify key scientific questions relating to chemistry, climate and health risks in Asia and create a plan for future studies. The grant also funds Earth System Model simulations that will produce high-resolution emission inventories and assess the vulnerability of humans to air quality changes and extreme natural events.

As one of the most highly populated and economically dynamic parts of the world, Asia is a region with significant emissions of greenhouse gases, aerosols and other pollutants, which pose high health risks to urban populations.

SOIL CHEMISTRY RESEARCH

Yafang Cheng published an article in *Science* that solves an important problem of biological nitrogen chemistry. Working with colleagues at the Max Planck Institute for Chemistry in Germany, Cheng found that soil nitrite can be released into the air in the form of nitrous acid and indirectly enhance the self-cleansing capacity of the atmosphere. The release of nitrous acid from arable soils is particularly important in developing countries because of the increased use of fertilizers and soil acidification. The research shows that soil nitrite can buffer, but not entirely counteract, the overall impact of fertilizer application. Cheng was a UI post-doctoral researcher studying under **Greg Carmichael** and is now an assistant professor in the Department of Environmental Sciences and Engineering at Peking University in China.



FLOOD RISK RESEARCH IN FRANCE

IIHR-Hydroscience & Engineering graduate student **Kyutae Lee** was awarded a prestigious five-month fellowship to conduct research at the Université Claude Bernard Institut National des Sciences Appliquées in Lyon, France. Lee will work on the project "Standardized Framework for Uncertainty Analysis in Support of Flood Risk Management." The Chateaubriand Fellowship Science Program offers young scientists the opportunity to conduct research in a French laboratory in order to strengthen collaborations, partnerships and joint projects through international scholarly exchange. Lee is a PhD candidate working with **Marian Muste**.

Kyutae Lee

AIR QUALITY REGULATIONS IN CHINA AND INDIA

Naresh Kumar is documenting the effects of more stringent air quality regulations in two of the world's most polluted cities. In a report published by the National Bureau of Economic Research, Kumar and colleagues at Peking University and the University of Maryland found that during the 2008 Beijing Olympics, the Chinese government's stringent efforts reduced pollution by 30 percent. They also found that 60 percent of those gains had faded by October, 2009. The study suggests that it is possible to achieve real environmental improvement in an authoritarian regime, but the magnitude of the effect and how long it lasts depend on the political motivation behind the policy interventions.

Kumar published additional research in *Atmospheric Environment* on the effect of new air quality regulations in Dehli, India. Working with a colleague at Brown University, Kumar administered a socioeconomic and respiratory health survey to 1,576 households and collected air pollution data at 113 sites spread across Delhi and neighboring areas. To measure air quality levels in the previous years, the researchers analyzed satellite images provided by NASA's Moderate Resolution Imaging Spectroradiometer. The study is one of the first to use remote sensing imagery to look at the effects of air quality on health. Kumar found that recent dramatic changes in air quality regulations have had a substantial positive effect on the health of city residents, particularly for low-income men who spend substantial portions of each day outside.

AIR QUALITY FORECASTING IN CENTRAL AMERICA

Pablo Saide, a PhD candidate working with **Greg Carmichael**, was one of the instructors at a four-day course on Air Quality Forecasting in Central America held at Universidad Nacional in San Jose, Costa Rica. Attendees work in meteorological offices or are in charge of air quality measurement and forecasting in countries that include Costa Rica, Panama, El Salvador and Guatemala. The workshop, which was funded by the World Meteorological Organization, presented information on the health effects of common pollutants, techniques for predicting air quality and how air quality predictions can be disseminated and used.

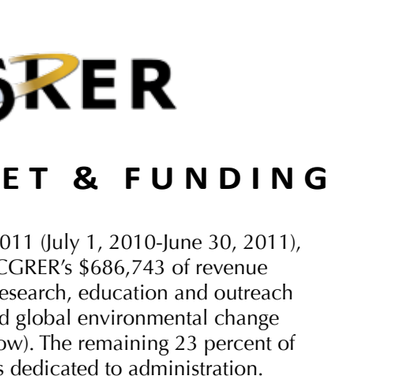
Above: Course attendees in Costa Rica
Background photo: Costa Rica

BUDGET & FUNDING

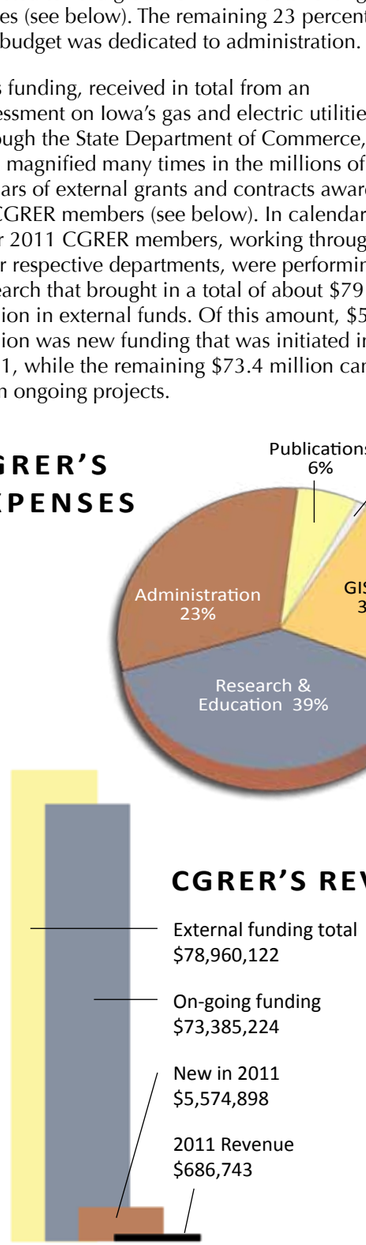
In fiscal year 2011 (July 1, 2010-June 30, 2011), 77 percent of CGRER's $686,743 of revenue was spent on research, education and outreach directed toward global environmental change issues (see below). The remaining 23 percent of the budget was dedicated to administration.

This funding, received in total from an assessment on Iowa's gas and electric utilities through the State Department of Commerce, was magnified many times in the millions of dollars of external grants and contracts awarded to CGRER members (see below). In calendar year 2011 CGRER members, working through their respective departments, were performing research that brought in a total of about $79 million in external funds. Of this amount, $5.6 million was new funding that was initiated in 2011, while the remaining $73.4 million came from ongoing projects.

CGRER'S EXPENSES



CGRER'S REVENUE



Greg Carmichael and Jerry Schnoor

ADMINISTRATION

CGRER is directed by UI professors **Gregory Carmichael** (Department of Chemical and Biochemical Engineering) and **Jerald Schnoor** (Department of Civil and Environmental Engineering). Center activities are guided by an elected Executive Committee that consists of nine members (listed on page 3) plus the two co-directors. The Executive Committee meets monthly to plan initiatives and chart CGRER's course. An Advisory Board of nine members from outside the academic community (listed on page 5) 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.

Beach photo: Jeremy Bril received a CGRER conference travel grant to attend the 2011 Association of Environmental Engineering and Science Professors Conference in Tampa, FL. He is shown here at a networking evening event.

MEMBERS

UNIVERSITY OF IOWA

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

Biological Sciences
Stephen D. Hendrix
Diana G. Horton

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

Chemistry
Tori Z. Forbes
Vicki H. Grassian
Sarah C. Larsen
Mark Young

Civil & Environmental Engineering
Nandita Basu
A. Allen Bradley
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
Gene F. Parkin
Michelle Scherer
Jerald L. Schnoor
Richard L. Valentine
Larry Weber

Economics
Thomas F. Pogue
John L. Solow

Electron Spin Resonance Facility
Garry R. Buettner

English
Laura Rigal

Geography
Marc P. Armstrong
David Bennett
Naresh Kumar
Marc Linderman
George P. Malanson
Michael L. McNulty, Emeritus
R. Rajagopal
Gerard Rushton

Geoscience
Richard G. Baker, Emeritus
E. Arthur Bettis
Robert S. Carmichael
Jeffrey Dorale
Lon D. Drake, Emeritus
David W. Peate
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