

I • W A T C H



THE CENTER FOR GLOBAL AND REGIONAL ENVIRONMENTAL RESEARCH

FALL 2002

Sustainably Yours



To sustain: to support, nourish, to keep up or bear up. A sustainable activity can be maintained - theoretically forever - without depleting the enabling resources or fouling the environment.

The concept of “sustainability” fuels virtually all of CGRER’s efforts, whether broad or particular, educational or investigatory. Peel away the explanations and justifications surrounding any CGRER project: What remains are concepts and facts related to how we – as individuals and societies – claim resources for our own in either an exploitive or sustainable fashion. Ultimately, the quest for sustainability is a quest for the survival of humans on Earth.

Given CGRER’s thrust, it’s obvious why co-director Jerry Schnoor (along with CGRER undergraduate research assistant Ori Sivan) attended the *United Nation’s World Summit for Sustainable Development* as a delegate of the Iowa division of the United Nations Association (see page 5). Schnoor also had attended the World Summit’s predecessor, the 1992 “Rio Earth Summit.” That Summit produced the ambitious and idealistic Agenda 21: an action plan to implement economic development while sustaining Earth’s ecological balances.

The 2002 World Summit invited participants to establish partnerships to fund and implement Agenda 21’s sustainable development goals. Funding for sustainable development has been less than what was pledged a decade ago, and the success of this World Summit will remain unknown for many years. Much will depend on the actions of participants and individuals around the globe. And thus we return to the everyday efforts of CGRER members.

This issue of *IoWatch* examines the concept of sustainability, or living as if the future matters.

Water

An estimated 1.1 billion people now lack access to adequate drinking water. Within 25 years, an estimated half of the world's population could have trouble finding enough fresh water for drinking and irrigation. Half of the world's rivers are seriously depleted and polluted, and a quarter of the world's sea fish stocks are depleted. In the 20th century, urban and industrial development claimed half of the world's wetlands. Freshwater use multiplied sixfold.

With these statistics, it's easy to see why water was a major focus at the World Summit. In an effort to turn the tide, governments agreed to cut in half the number of people without clean drinking water and basic sanitation by 2015.

CGRER has always included a large contingent of researchers who focus on water-related problems, many of these research staff at the UI's IIHR-Hydroscience & Engineering.

Allen Bradley, for example, investigates the hydrology and hydrometeorology of floods and droughts. His graduate student **Jennifer Holman-Dodds** is carrying out her doctoral research on sustainable approaches to stormwater management. She is looking at whether land development practices designed to infiltrate rainwater into the soil (instead of shedding it into streams) could help mitigate flooding and other adverse runoff impacts of urban development.

This last June, CGRER co-director **Jerry Schnoor** taught a field course on water monitoring at IIHR's Mississippi River Environ-

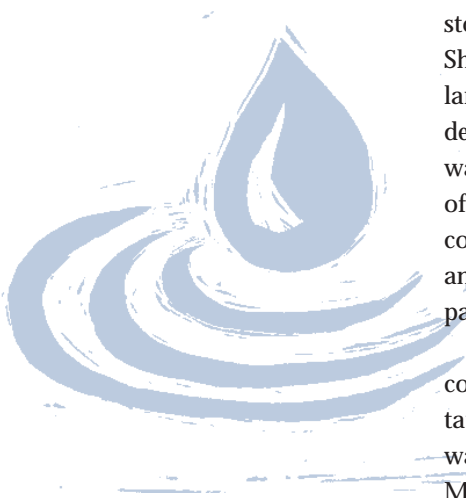
mental Research Station (MRERS), the first class taught in this new riverside field station near Muscatine, Iowa. MRERS is dedicated to interdisciplinary research on the Upper Mississippi River system and is destined to attract many joint projects with CGRER members.

Schnoor also took his water concerns to Washington this past March, when he testified before the U.S. House of Representatives' Resources Committee on the need for the *Upper Mississippi River Basin Conservation Act*. This bill focuses on monitoring and modeling nutrients and sediments in the Upper Mississippi River. And in November, Schnoor will travel to Italy to help lead a joint U.S.-Italian workshop on monitoring and modeling water quality.

Another CGRER member, **Lou Licht** (UI, adjunct CEE), continues his commercialization of the use of tree plantings to detoxify pollutants at urban, farm, and industrial locations. He pioneered and patented this use a decade ago at the University of Iowa, along with Jerry Schnoor. His

company Ecolotree Inc. now routinely installs plant-based landfill caps, solvent spill cleanups, and non-point runoff containment with treatment. Licht is currently researching the first prototype poplar-root sewage treatment system for a rural home, a novel swine manure lagoon closure using a tree cap in North Carolina, and a new-generation streamside buffer to remove sediment and fertilizer from cornfield runoff.

CGRER's **Pedro Alvarez**, **Michelle Scherer**, **Gene Parkin**, and **Richard Valentine** (all UI, Civil and Environmental Engineering) also are looking at bioremediation of groundwater pollutants, this time by permeable reactive barriers – specifically buried iron filings positioned to intercept the flow of chemically polluted groundwater. Their project, which investigates how bacterial processes can increase the efficiency of this process, recently won the “Project of the Year” award from the U.S. government's Strategic Environmental Research and Development Program.



Energy

In the last 50 years, global consumption of energy has increased over fourfold, yet 2 billion people worldwide still do not have access to electricity. The U.S., with less than 5% of the world's population, consumes over 25% of the world's energy. Oil consumption has increased sevenfold since 1950, and fossil fuels today provide almost 80% of the world's total energy needs. Resource depletion, polluted air and water, climate change - all are results of this profligate energy use.

It was hoped that the Summit would establish firm goals for increasing renewable "green" energy sources, perhaps to 10% of the world's total usage. However while the European Union and others supported such targets, the U.S. and some oil-producing countries opposed them. Thus the Summit's action plan instead calls for countries to "substantially increase" their global share of renewable energy.

CGRER members have been involved in many attempts to reshape energy usage to reduce greenhouse gas emissions and climate change. Unique here was a 4-week "solar bicycle tour" through sustainable cities in northern Europe, which CGRER Advisory Board member **David Osterberg** completed with 4 others this past summer. "Europeans realize that global warming is a reality," Osterberg explains, "and combating global climate change drives their energy policy. Straw-fired power plants, wind and solar energy, green roofs,

electricity generated from municipal waste, these types of innovations are a way of life in Northern Europe. Our trip attempted to draw media attention to such efforts, and to America's need to do similarly. 'Global warming is real, Europe recognizes this, and adopting a policy like Europe's would bring the U.S. and Iowa farmers lots of money' - this is what I stated repeatedly in the numerous speeches, newspaper stories, and radio interviews resulting from the bike trip."

CGRER's **Jerry Schnoor** has undertaken many efforts to stimulate similar sustainable energy production in Iowa. He's on the advisory committee for the newly published *Energy in Iowa: At a Turning Point*, the state's 2002 energy plan update, which calls for a commitment to expand our renewable energy. He continues to foster use of renewable energy sources through research projects such as the co-firing of Iowa-grown switchgrass at Alliant Energy's Ottumwa Generat-

ing Station. CGRER member **John Solow** (UI, Economics), along with **Michael Balch** and **Rick Ney**, are now looking at the environmental economics of this effort. They are constructing a framework for determining the economic expenses (e.g. cost of switchgrass) and benefits (e.g. "environmental savings" such as improved health and decreased air pollution) of substituting switchgrass for coal.

This year, a similar research program conducted with Quaker Oats of Cedar Rapids is looking at feeding oat hulls and cereal by-products into the University of Iowa's Power Plant along

with coal. These potential biofuels, normally waste products, could bring down electrical costs and reduce air pollution. For example, for each unit of energy produced, burning oat hulls would produce significantly less of the greenhouse gas carbon dioxide and acid-rain-producing sulfur dioxide than burning coal. Trial burns to test the viability of this fuel mix started in July and will proceed through the autumn.



David Osterberg (left) and Ed Woolsey pose in front of the U.N Framework Convention on Climate Change headquarters in Bonn, Germany. The Northern Europe tour involved a solar-powered bicycle that also recharged batteries in the investigatory group's computer and digital camera. The bikers were attempting to bring Europe's energy-related sustainable technologies back home to the U.S. More information can be found at www.greenbike.org.

Biodiversity

The 1992 Earth Summit brought the term “biodiversity” into common parlance, emphasizing the decreased stability and functioning of Earth’s processes that accompany diversity’s loss. However Earth’s plants, animals, and microorganisms continue their unfettered race toward extinction. While World Summit delegates pledged to cut significantly by 2010 the rate at which rare animals and plants are becoming extinct, no specific targets or mechanisms were adopted to slow the pace, and the plan’s wording does not inhibit countries from pursuing harmful development projects.

Much loss of biodiversity stems from fragmentation of natural ecosystems, repeated until these splintered ecosystems no can maintain native species. CGRER’s **George Malanson** (UI, Geography) is co-PI on a 1-year grant to produce a synthetic report on the effects of forest fragmentation in the U.S. The project, funded by the recently formed National Commission on Science for Sustainable Forestry, is intended to guide industrial, academic, and governmental foresters toward practices that will minimize the loss of biodiversity and other negative effects of such fragmentation.

David Bennett and **Marc Armstrong** (UI, Geography), along with several others, are starting a 3-year project to examine the interface between migratory elk populations of Yellowstone National Park and their food resource base. Funded by NSF, the group

will be collecting data to produce a computer model that will assess whether the changes in elk feeding patterns and migratory routes, initiated by growing human use of the valleys surrounding Yellowstone, are forcing unsustainable use of upland meadows and forests.

Dale Zimmerman (UI, Statistics) is in the middle of a 3-year project to develop models capable of accurately predicting the routes and parameters of the wanderings of wolves, caribou, polar bears, and other large wildlife carrying radio collars or satellite transmitters. Such knowledge is necessary for monitoring the long-term numbers and health of any given species. Zimmerman’s “Statistical Models and Methods to Analyze Telemetry Data” grant is funded by the Alaska Fish and Game Department.

And more. . .

Health and agriculture were other major topics discussed at the Summit. Here, as with other subjects, emphasis was placed on the linkages among environmental health, national agendas, and human wellbeing: for example the tremendous gains that clean drinking water and sanitation would bring in preventing cholera, and the need for affordable drugs to treat AIDS in developing nations.

Here too CGRER researchers are seeking solutions. For example **Pedro Alvarez** (UI, Civil and Environmental Engineering) is co-investigator of a new grant funded by the Iowa State Water Resources Research Institute to look at antibiotic-resistant genes harbored by disease-producing microorganisms found in soils of livestock feedlots. Antibiotics used to keep concentrated animals healthy are excreted and eventually alter microbial populations in feedlot soils. Alvarez is concerned with the fate and transport of these genes beyond feedlot

confines, and their eventual threat to human health.

Peter Thorne (UI, Occupational and Environmental Health) and **Keri Hornbuckle** (UI, Civil and Environmental Engineering), with others, are studying the release from swine confinement facilities of endotoxins, ammonia, volatile and semivolatile organic compounds, and other odor-producing substances that may threaten the health of rural residents. This research is funded through the UI’s Environmental Health Sciences Research Center, which Thorne directs.

(continued on p. 6)





Thoughts on the World Summit

Jerry Schnoor, delegate to the World Summit for Sustainable Development (held August 26-September 4, 2002, in South Africa), offers the following impressions of that signatory event:

Whether the recent World Summit on Sustainable Development (WSSD) represents a step forward remains to be seen. In the words of Jean Chretien, Prime Minister of Canada, "Sustainable development is about the very destiny of our planet." Yet since the 1992 Rio Earth Summit, forests have continued to be cleared and species lost, while greenhouse gases accumulate in the atmosphere.

Although there has been progress in life expectancy, literacy, and median incomes, much of the world is left behind without basic health care and sanitation. There are still 1.2 billion people without access to safe drinking water, 2.4 billion people without sanitary facilities, and more than 5 million children who die each year from clearly preventable diseases. As long as there is poverty of this magnitude, the world's poor countries will not be able to partner with richer countries to preserve

forests, protect species, and develop in a sustainable manner.

The World Summit was devoted to action, but official development assistance and progress have been lacking. In 1992, developed nations endorsed a goal of giving 0.7% of their GDP (gross domestic product) to developmental assistance. Today that percentage is about 0.2%. (Current U.S. development assistance is 0.1% of our GDP.) British Prime Minister Tony Blair lamented such statistics, stating "this is not charity - it is an investment in our collective future."

As the world's largest economy and emitter of greenhouse gases, the U.S. would appear to have a moral imperative to lead the cause more ambitiously. However due to its reluctance to endorse firm timeframes for cutting greenhouse gas emissions, increase renewable energy, and reduce agricultural subsidies, our government was criticized by many at the Summit.

Despite such criticism, the U.S. did remain fully engaged in the Summit and was signatory to the final implementation plan. More

than \$1 billion of new U.S. assistance was announced for energy programs, HIV/AIDS treatment, and safe drinking water in developing countries. Plans and timeframes to restore depleted fisheries and reduce threats of hazardous chemicals were endorsed by the U.S. early at the Summit.

Everyone now accepts that poverty looms as the largest impediment to sustainability. We must partner together to improve the lives of over 1 billion people living on under \$1 per day and to safeguard the environment. Partnerships between business, non-governmental entities, and governments emerged at the World Summit. Whether a step forward has been taken depends on the future response of these partners to provide significant funding for the implementation plan. Kofi Annan, Secretary General of the United Nations, called for political leaders to stop being economically defensive and to start being politically courageous. The world awaits the next courageous steps forward. *

NOTE: More of Schnoor's thoughts on the World Summit are published as a Viewpoint in the November 1, 2002, issue of the American Chemical Society's journal *Environmental Science and Technology*.

Future quest

Implicit in all World Summit discussions was a basic major question: Even with the best of efforts, can economic development – which depends upon use of Earth’s natural resources – be successfully paired with sustainability, which relies on tempering our impact on Earth’s natural functions? In the last 50 years, the world’s population has doubled to over 6 billion people. It is expected to increase to 9.3 billion by 2050. Since the mid-1980s, humans have exceeded nature’s capacity to regenerate itself – and today the human race is consuming Earth’s resources 20% faster than they can be replenished. The world’s 50 million richest people consume as many natural resources as 2.7 billion of the earth’s poorest people. The waste output of Americans has doubled in the last 40 years. What do these statistics imply?

Ultimately that question will be answered by the future. And the future depends in part on educating those to whom it belongs. Thus prior to the Summit, CGRER sponsored *Sustainable Futures for Iowa*, a program of the Iowa United Nations Association. Iowa’s college and graduate students were invited to create a plan for a sustainable Iowa and present it in written and verbal form. About 45 students in a dozen groups addressed topics such as sustainability in food production, transportation, land use planning, and energy. A summary document including portions of papers will be distributed to Iowa’s legislators. Eight of the participating students attended the World Summit, and since returning have maintained liaisons with South Africans – for example raising money for purchase of African garden seeds.

As Summit leaders stressed, knowledge about sustainable actions is only

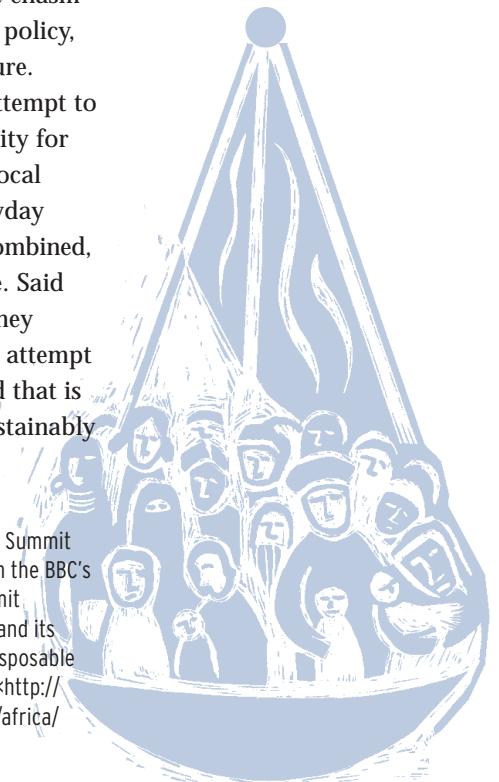
the first step in reaching stability. Equally important is successful application of that knowledge at the local level. A model for doing so is provided by former CGRER graduate research assistant **Jim Yienger**, who is resolved to use his training in engineering and Asian studies to reshape the public environmental forum. After receiving his master’s degree in Civil and Environmental Engineering in 2000, Yienger moved to Berkeley to serve as Asian coordinator for the *Cities for Climate Protection* (CCP) program, run through the International Council for Local Environmental Initiatives (ICLEI). The 560 cities worldwide that have committed to this program are inventorying their greenhouse gas emissions and developing an action plan to decrease their emissions. Jim’s focus area is India. He’s helping that nation’s 7 member cities undertake activities such as retrofitting their aging water pumping stations - a single action that

can decrease a city’s energy use by nearly a third.

At Yienger’s suggestion, an ICLEI representative recently visited Iowa City to provide information on becoming a CCP member. If Iowa City’s council members vote to join, CGRER has volunteered to assist with the program’s technical aspects.

Yienger’s efforts are helping to bridge the chasm between science and policy, technology and culture. They comprise his attempt to bring the responsibility for change back to the local level – to those everyday actions that, when combined, determine our future. Said more idealistically, they constitute one man’s attempt to forge a new world that is sustainable – and sustainably ours. *

NOTE: Statistics and World Summit outcomes were taken from the BBC’s “September 4, 2002, Summit Conclusions at a Glance,” and its special report entitled “Disposable Planet,” both available at <<http://news.bbc.co.uk/1/hi/world/africa/2230670.stm>>



Newcomers

CGRER welcomes new member **RHAWN DENNISTON**, a geology professor at Cornell College, where he teaches environmental geology courses such as hydrogeology, climate change, and geomorphology. Denniston has been known to certain CGRER members since 1995, when he started working on his Ph.D. in the UI's Geoscience department. His dissertation research focused on paleoclimatic studies using stalagmites as climatic proxies. His studies of Midwestern stalagmites helped him decipher temperature and vegetational changes during the past 13,000 years; he also looked at stalagmites from Nepal for indications of changes in monsoon rain patterns over the past 3,000 years. At Cornell, Denniston is continuing his paleoclimatic research. He's studying New Zealand stalagmites through a new CGRER seed grant (see "Seeds"), and also is using stalagmites to document Nevada's ancient climate shifts. He plans to continue his research collaboration with CGRER members Luis Gonzalez and Art Bettis, as well as his research use of the Paul H. Nelson Stable Isotope Laboratory.



Rhawn Denniston



Meredith Gooding



Roger Sullivan

Another newcomer to the CGRER fold is **MEREDITH GOODING**, who arrived as a 2-year post-doctoral fellow in September. Gooding was trained at Davidson College (in North Carolina), the University of Michigan, and North Carolina State University, where she earned a doctorate in Environmental Toxicology in May 2002. Her dissertation research carried her to Chile, where she documented the incidence of endocrine disruption among marine snails. She focused on tributyltin (TBT), a compound of anti-fouling paints commonly used on marine

ships. TBT leaches into salt water, where it masculinizes the females of certain snail species and may leave them sterile. Gooding also completed lab-based studies of possible mechanisms of TBT-induced endocrine disruption. Although endocrine disruption by synthetic chemicals is increasingly documented in mammalian populations, Gooding's study is one of the few that concentrates on invertebrates. While at CGRER, she hopes to integrate her knowledge of toxicology and endocrine disruption into existing research programs.

Gooding also will be working closely with Global Health Studies Program (GHSP) post-doctoral fellow **ROGER SULLIVAN**. The two are charged with commencing a joint CGRER-GHSP "Health and Environment" initiative that will pull researchers from both centers into interdisciplinary research that addresses international health concerns. The initiative is still in the conceptual phase; Gooding and Sullivan have barely unpacked their computers and settled into their offices. However with time it's hoped that they will identify funding agencies and existing UI research interests, and then prepare grants that

will bring in broad funding for diverse international studies concerning the environment and human health.

Sullivan recently completed his doctorate in anthropology at the University of Auckland, New Zealand. His dissertation work – an investigation of the psychotherapeutic effects of the betelnut, a traditional Micronesian drug – looked at the positive effects of chewing the betelnut on schizophrenic patients. During the coming 2 years, he will be continuing his study of the antipsychotic effects of betelnut's natural alkaloids and helping to teach GHSP classes, as well as working on the Health and Environment initiative with Gooding. *

■ A nationwide system of regional **Cooperative Ecosystem Study Units (CESUs)** is now being established to bring together federal land managers, environmental and research agencies, and universities, in order to encourage and improve environmental research, land management efforts, technical assistance, and educational efforts. CGRER is one of several institutions forming the newly designated **Upper and Middle Mississippi Valley CESU**. More information about CESUs can be found at <http://www.cesu.org/cesu/index.html>.

■ Both CGRER co-directors were honored by receiving chaired professorships this past year. **Greg Carmichael** is now the Karl Kammermeyer Professor of Chemical and Biochemical Engineering, while **Jerry Schnoor** is the Allen S. Henry Chair of Engineering. Carmichael (who currently serves as Associate Dean for Graduate Studies and Research in the College of Engineering) also received a Faculty Excellence Award for Service from the college in April 2002.

■ Welcome to CGRER visiting scholar **Iveta Carikova**, a Fogarty Fellow from the Slovak Republic, who has been working with Jerry Schnoor on GIS applications and the health effects of smelter contaminants.

■ **Sarah Larsen** and **Vicki Grassian** have received a \$350,000 grant from the Environmental Protection Agency entitled "Development of Nanocrystalline Zeolite Materials as Environmental Catalysts: From Environmentally Benign Synthesis to Emission Abatement."

SEEDS

CGRER has awarded \$75,815 of grant funds to 4 new research projects for FY 2002-2003. These grants are aimed at enhancing the sustainability of Iowa's native prairies, rivers, and climate, as well as migratory songbird populations and biodiverse forests in Mexico.



Rhawn F. Denniston (Cornell College, Geology): *Development of a High-Resolution Paleoclimate Data Set from New Zealand using Speleothem Growth Banding and Stable Isotopic Ratios* - \$16,140

CGRER researchers have been developing "paleoclimate proxies" for several years. These proxies (typically annual depositions of materials such as limestone in cave stalagmites) allow the interpretation of ancient climates that predate human record-taking, and provide a baseline for understanding future climatic shifts.

Denniston proposes to take his search for proxies to the Southern Hemisphere, for which paleoclimatic data remain sparse. He will perform high-resolution examinations of annual growth bands (which are linked to precipitation) and stable isotope ratios (which reflect temperature and vegetation activity) of

stalagmites collected in New Zealand. In addition to providing basic information about South America's previous long- and short-term climatic shifts, his studies will help decipher how the changes in Southern Hemisphere's climate corresponded to periods of rapid climatic change in the Northern Hemisphere. Such knowledge will feed into the growing realization that Earth's varied climatic regimes are inter-linked, with demonstrated connections ("teleconnections") linking past climate changes in the two hemispheres.



Tad Mutersbaugh and **George Malanson** (both UI, Geography): *Factors Affecting the Adoption and Conservation Value of Certified Organic Coffee Production in Oaxaca, Mexico* - \$19,700

Preservation of biodiversity in the tropics depends in large part on the ability of local residents to see such preservation as viable and profitable. Mutersbaugh and Malanson will attempt to assess indigenous Mexican farmers' responses to one such preservation-based program: growing certified shade-grown organic coffee. Doing so requires that coffee producers meet the stringent requirements of U.S. or European coffee certifiers. These requirements may include numerous environmental benefits, for example erosion control or preservation of a diverse canopy that favors wintering neotropical bird populations. However the certification process may be difficult and restrictive for

small coffee producers. The research team will attempt to describe the factors that shape farmers' participation in certification programs, and determine how well the certification programs foster preservation of native biodiversity. Their results can later be applied to certification of other crops (such as sustainably produced tropical lumber) and have wide-ranging implications for future conservation efforts, as well as establishing baseline data for future major NSF grants.



■ CGRER has assisted The World Bank in its creation of a new online distance learning course, "Urban Air Quality Management." Greg Carmichael is one of the instructors for Module 9. Although emphasizing Asia, the course provides a major interactive educational resource for students and professional around the world. See it at: http://www.worldbank.org/cleanair/caiasia/learning/activities/dist_learning/uaqm_course/coursehome.htm

■ **Keri Hornbuckle**, **Brian Boulanger**, and **Jerry Schnoor** announce a new \$130,000 grant from the Environmental Protection Agency (Region 5): "Synthetic Musk Fragrances in Great Lakes Sediment." Hornbuckle also is engaged in a new \$143,759 grant from the National Institute of Environmental Health Sciences, titled "Exposure Assessment Facility, Core of the Environmental Health Research Sciences Center," among other projects.

■ **Greg Carmichael's** efforts in "chemical weather forecasting" have been furthered by a new 3-year, \$310,000 NOAA grant entitled "Modeling and Emissions Analyses in Support of the Spring 2002 ITCT Field Experiment in the Eastern Pacific and Western U.S." The grant focuses the increasing effects of Asian pollutants on air quality in the western U.S. This past spring, using a California-based airplane to measure carbon monoxide, sulfur dioxide, and other pollutants, Carmichael and his colleagues were able to predict and successfully map a pollutant-laden dust storm originating in the Gobi Desert and blown westward across the Pacific Ocean.

■ **Luis Gonzalez** and **Greg Ludvigson** (with others) have received a 3-year, \$258,000 grant titled “Quantifying Changes in Hydrologic Cycle Fluxes over the Americas During the Mid-Cretaceous (Albian) Greenhouse World.” The project is an outgrowth of a CGRER seed grant. Gonzalez and Ludvigson also recently attended the International Workshop on Cretaceous Climate and Ocean Dynamics in Florissant, CO.

■ **Greg Carmichael** has received a five-year, \$2.3 million information technology grant from NSF, titled “ITR/AP & IM Development of a General Computational Framework for the Optimal Integration of Atmospheric Chemical Transport Models and Measurements Using Adjoints.” Among other things, the grant will be used to improve modeling of complex systems, further Carmichael’s studies of Asian air pollutants, and help develop “chemical weather” forecasting capabilities.

■ Former CGRER post-doctoral fellow **Tim White** is now a Mendenhall Fellow with the U.S. Geological Survey in Anchorage, AK.

■ **Jim Raich** coauthored the paper “Interannual Variability in Global Soil Respiration, 1980-1994,” published this year in *Global Change Biology* (8:800-812). His paper “Quantifying Fine-Root Decomposition: An Alternative to Buried Litterbags” was just published in the October edition of *Ecology*.

SEEDS continued

Stephen D. Hendrix (UI, Biological Sciences) and **Diane M. Debinski** (ISU, Animal Ecology): *Sustaining Pollinator Diversity in a Fragmented Landscape: What Landscape Features and Scales Affect Pollinator Diversity?* - \$19,975

Hendrix and Debinski’s research attempts to answer how we can maintain Earth’s irreplaceable ecosystem services in one particularly fragmented, exploited native community: Iowa’s tallgrass prairie. They will be completing preliminary studies on native butterfly and bee diversity in Iowa’s prairie remnants, with emphasis on how this diversity relates to the remnants’ size and pattern on the landscape. These insects provide a crucial role in ensuring pollination and thus successful reproduction

of the 70-80% of tallgrass prairie plants that are forbs, and thus are crucial to the longterm integrity of this endangered ecosystem. The pilot study will test sampling procedures, develop preliminary bee species lists, examine butterfly pollination behavior, and complete other prerequisites preliminary to an NSF proposal that will focus on evaluating the role of both large and small prairie preserves in maintaining tallgrass prairie pollinator diversity.



Mary Skopec (UI, Geography), **Lora Friest** (NRCS, Upper Iowa River Watershed Coordinator), and **Nancy Hall** (UI, Hygienic Laboratory): *Microbial Source Tracking in the Upper Iowa Watershed using *E. coli* Ribotyping* - \$20,000

Skopec, Friest, and Hall will be developing a tool to help evaluate the source and transport pathways of bacterial contaminants in Iowa’s rivers. Normally, in urban areas, the presence of harmless fecal coliform bacteria (*E. coli*) in water samples is an indicator of the potential for other human disease-producing organisms to enter the water. However in Iowa, *E. coli* may also originate from farm livestock or wildlife; these resources may have lowered risk to human health. Using a process called “ribotyping,”

the research team will be “DNA fingerprinting” *E. coli* from a variety of livestock and wildlife sources in the Upper Iowa River watershed. The group then will prepare a database that will allow rapid and accurate evaluation of the source of water contaminants, so that remedial actions can be targeted accurately. This new research field is likely to raise numerous questions about the natural occurrence and health effects of waterborne microorganisms, which will become fruitful subjects for additional major grant proposals. *

CGRER Members

Co-Directors

Gregory R. Carmichael
Jerald L. Schnoor

Executive Committee

David Bennett, Geography
Luis Gonzalez, Geology
Vicki H. Grassian, Chemistry
Paul R. Greenough, History
Stephen D. Hendrix,
Biological Sciences
Keri C. Hornbuckle, Civil &
Environmental Engineering
Diana Horton, Biological
Sciences
Sarah C. Larson, Chemistry
Lou Licht, Ecolo Tree
Gregory A. Ludvigson,
Geology

Members

University of Iowa

Anthropology
Michael S. Chibnik
Russell L. Ciochon

Biological Sciences

Stephen D. Hendrix
Diana G. Horton

Chemical and Biochemical Engineering

Gregory R. Carmichael

Chemistry

Vicki H. Grassian
Sarah C. Larsen

Civil & Environmental Engineering

Pedro J. Alvarez
A. Allen Bradley
William E. Eichinger
Robert Ettema
Keri C. Hornbuckle
Witold F. Krajewski
Lou Licht

Wilfrid A. Nixon
A. Jacob Odgaard
Gene F. Parkin
Michelle Scherer
Jerald L. Schnoor
Richard L. Valentine

Economics

Thomas F. Pogue
John L. Solow

Electron Spin Resonance Facility

Garry R. Buettner

Geography

Marc P. Armstrong
David Bennet
George P. Malanson
Michael L. McNulty
Tad Mutersbaugh
Claire E. Pavlik
R. Rajagopal
Rebecca S. Roberts
Gerard Rushton

Geoscience

Richard G. Baker
E. Arthur Bettis
Robert S. Carmichael
Scott Carpenter
Lon D. Drake
Luis Gonzalez
Gregory A. Ludvigson
Mark K. Reagan
Holmes A. Semken, Jr.
Frank H. Weirich
You-Kuan Zhang

History

Paul R. Greenough

Law

Jonathan Carlson
Burns H. Weston

Mechanical Engineering

V.C. Patel
Theodore F. Smith

Microbiology

Lacy Daniels

Physics & Astronomy

Louis A. Frank
Donald A. Gurnett
John S. Neff
Steven R. Spangler

Physiology & Biophysics

G. Edgar Folk

Occupational & Environmental Health

Peter S. Thorne

Public Policy Center

David J. Forkenbrock

Statistics & Actuarial Science

Dale L. Zimmerman

Iowa State University

Agronomy

Raymond W. Arritt

Animal Ecology

Diane M. Debinski

Botany

John Nason
James W. Raich

Geological & Atmospheric Sciences

William J. Gutowski
Eugene S. Takle

Cornell College

Geology

Rhawn Denniston

Hydrologic Research Center, San Diego, CA

Konstantine P. Georgakakos

■ **Konstantine Georgakakos** and D. Smith authored a paper, "Soil Moisture Tendencies into the Next Century for the Conterminous United States," published in the *Journal of Geophysical Research* 106 (D21): 27,367-27,382 (November 2001). That same issue also contains a companion paper, "An Assessment of Irrigation Needs and Crop Yield for the United States under Potential Climate Changes," by Brumbelow and Georgakakos.

■ For the second year, Greg Carmichael is teaching "Green Chemical Engineering" to undergraduate and first year graduate students. The course focuses on bringing environmental considerations formally into the engineering design process.

■ **Lou Licht** was an invited speaker at the "Sustainable Bioenergy Production Systems: Environmental, Operational, and Social Implications" conference held in Brazil in October 2002. The conference was sponsored by the Society of Forest Research and UN's Food and Agricultural Organization.

The University of Iowa's Center for Global and Regional Environmental Research (CGRER) promotes interdisciplinary efforts that focus on the multiple aspects of global environmental change, including its regional effects on natural ecosystems, environments, and resources, and on human health, culture, and social systems. Center membership is composed of interested faculty members at any of Iowa's colleges and universities.

Center goals are promoted by encouraging interdisciplinary research and dialogue among individuals whose disciplines touch upon any of the multifaceted aspects of global change. More specifically, the Center awards seed grants, fosters interdisciplinary courses, provides state-of-the-art research facilities and equipment, and holds seminars and symposia. The Center encourages students to broaden their studies and research through considering the multidisciplinary aspects of global and regional environmental problems. Through such activities, the Center attempts to assist Iowa's agencies, industries, and citizens as they prepare for accelerated environmental change that may accompany modern technologies.

Housed in the Iowa Advanced Technology Laboratory at the University of Iowa, the Center was established by the State Board of Regents in 1990 and received funding from a public utility trust fund, as mandated by the State of Iowa's Energy Efficiency Act.

IoWatch is published each fall. Comments, questions, and requests for additional copies should be directed to:

Jane Frank, Admin. Asst.
The University of Iowa
CGRER, 424 IATL
Iowa City, Iowa 52242
319-335-3333
FAX 319-335-3337
jfrank@cgrer.uiowa.edu
<http://www.cgrer.uiowa.edu/>



Written and edited by Connie Mutel
Designed by Leigh Bradford
Printed by The University of Iowa
Printing Department
Illustrations by Claudia McGehee

34680/11-02



Printed on
Recycled Paper

