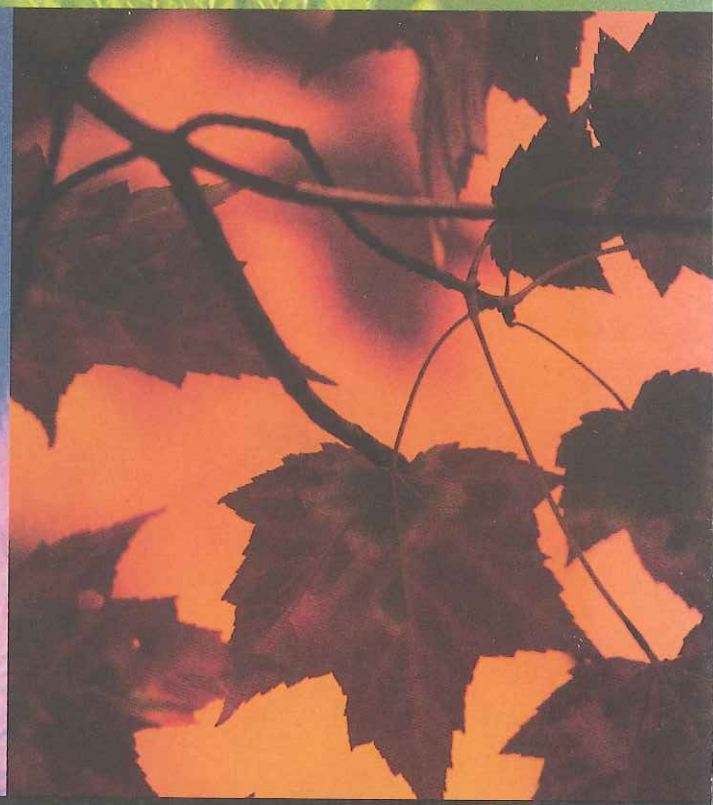
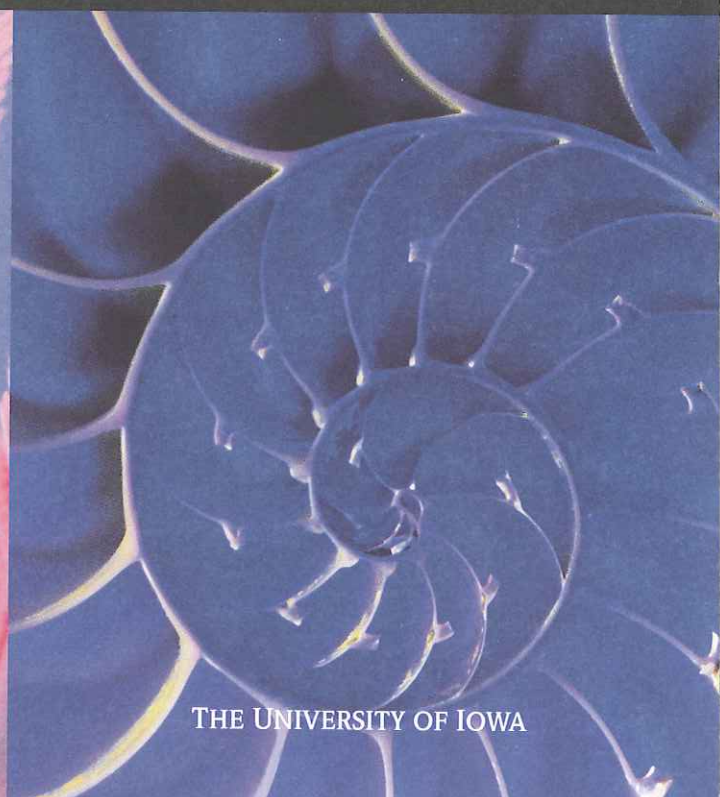
CGRER

1998 Annual Report



The Center for Global and Regional Environmental Research



THE UNIVERSITY OF IOWA

The Center for Global and Regional Environmental Research

CGRER

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 campus in the Iowa Advanced Technology Laboratory, 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 membership consists of faculty and professional staff members from Iowa's colleges and universities. CGRER currently is composed of 67 members from 22 departments.

While environmental change is constant and natural, CGRER focuses on the human-induced *acceleration* of such change caused by modern technologies. 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 interpretation 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 to assess and prepare for global change and its effects.

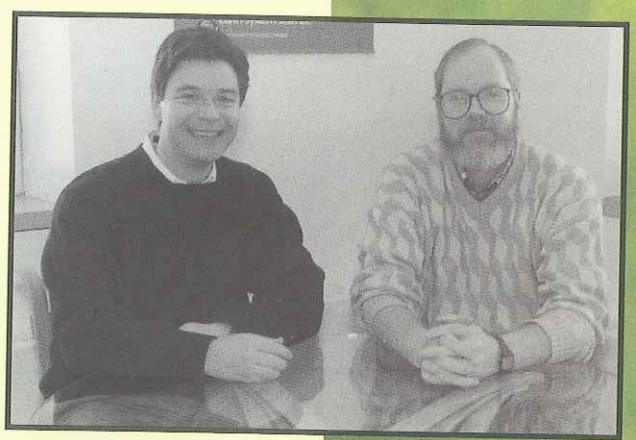
The preparation of the annual report provides an opportunity to pause and reflect on the activities and accomplishments of the last year. The Center for Global and Regional Environmental Research (CGRER) was established eight years ago as a means of facilitating and promoting interdisciplinary efforts related to global environmental change. As you can judge from the summaries presented in this annual report, CGRER is continuing to play its role effectively. One of the best signs of CGRER's vitality is seen in increasing membership. When we were first founded, in 1991, we had a membership of 23. This year we have an all-time high of 67, with representation from 18 departments, five colleges, and two universities. In addition, our interactions extend far beyond our membership, with CGRER collaborating with institutions, governmental agencies, non-governmental organizations, students, and private citizens at local, national, and international levels.

The year 1998 saw the opening of a new CGRER-sponsored laboratory, the Paul H. Nelson Stable Isotope Laboratory. This laboratory brings unique research capabilities to the state and will greatly aid our efforts to document and understand past climatic change through the study of paleoclimate indicators. In addition, CGRER's GIS and visualization laboratory was remodeled and expanded. Through a combination of funding sources, we were able to upgrade our computer hardware and expand our computational and visualization capabilities. The upgrade included the addition of a virtual reality environment for studying environmental data sets.

The major component of our activity is research, and in this realm 1998 was another successful year, with external funding exceeding $14.8 million dollars. While most of these funds were generated in the home academic departments of our members, a number of grants are administered by CGRER itself. Several of these new grants are focused on aerosol processes and energy-environment issues. Growing areas of activity are related to emissions accounting and the linking of climate change to other environmental problems. These activities are a response to the fact that the climate change debate has largely shifted away from whether we are affecting Earth's climate, and instead now focuses on mechanisms for stabilizing or reducing greenhouse gas emissions. Policies and strategies aimed at carbon stabilization require an accurate accounting of *net* greenhouse gas emissions (i.e., emissions reductions as well as increases in carbon sinks). CGRER has been helping the State of Iowa account for greenhouse gas emissions and develop possible emissions reduction plans. This effort, an example of how CGRER interacts with and supports the state government and Iowa's citizens, was recognized by the Iowa Energy Leadership Award presented to CGRER in November 1998.

EXECUTIVE

Effective greenhouse gas stabilization also requires participation of the developing countries. CGRER is actively involved in activities aimed at this challenge. For example, a member of CGRER's executive committee teaches a UNESCO-sponsored international educational course, Consequences of Global Environmental Change. Participating University of Iowa students sit in one of 15 classrooms that together encircle the globe and are linked via the Internet to form a "global virtual classroom." Members of the combined student body interact electronically and debate climate change policy, thus gaining appreciation of the legitimacy of differing viewpoints. Another focus area includes studies of the links between economic development and the environment in Asian countries. These studies highlight the importance of searching for win-win energy policies that emphasize short-term benefits associated with air pollution reduction.



We were very busy in 1998, but that is the way we like it! We look forward with excitement to 1999 and to furthering our various programs.

Gregory R. Carmichael
Co-Director

Jerald L. Schnoor
Co-Director

SUMMARY

ADVISORY

A Message from the Advisory Board

The Changing Utility Industry

Policy makers at state and national levels are considering the most sweeping restructuring of the energy utility industries undertaken for decades. Their decisions could importantly affect the local and global environment. Decisions grounded on sound knowledge will yield the best outcome for future generations.

The natural gas industry has become competitive for larger customers. Current efforts being undertaken by the Iowa Utilities Board will make competitive choice a reality for all natural gas customers in coming years.

The electric utility industry has begun a similar movement in states across the nation. In Iowa, the concept has been studied comprehensively and has become a subject of legislative consideration. The Department of Energy has proposed a plan for nationwide competition to the Congress. Wholesale competition, under the urging of the Federal Energy Regulatory Commission, has begun to change the way new electric generating facilities are selected and built.

All of these changes present significant challenges in the area of regulation, economics, taxation, and consumer education. Policy makers recognize the possibility that these changes could hold equally important consequences for the environment of this state, the nation, and the world. Yet, the knowledge base necessary to predict and evaluate these consequences is far from complete.

The Center for Global and Regional Environmental Research is a part of the search for that knowledge base. Changes in Iowa's utility industry could alter the mix of fuels used and the resulting air emissions. The opportunity to redesign the utility industry is also an opportunity to improve environmental quality if our decisions can be based on sound research and information. The Center offers Iowa a way to link the best scientific knowledge with the information needs of decision-makers.

Paula S. Dierenfeld, Commissioner
Iowa Utilities Board

Advisory Board Members:

Larry Bean
Iowa Department of Natural Resources
Energy Bureau

Representative Clyde Bradley
Vice Chair, Environmental Protection Committee
Iowa House of Representatives

Paula Dierenfeld
Iowa Utilities Board

Senator Robert Dvorsky
Appropriations and Education Committees
Iowa Senate

Senator William Fink
Ranking Member, Natural Resources and Environment Committee
Iowa Senate

Steve Guyer
Air Resources Manager
Alliant Utilities

David Osterberg
Department of Geography
University of Iowa

Dorothy Paul
United Nations Association, Iowa Division

Congratulations CGRER!

While CGRER's goal is not the collection of accolades, sometimes praise appears unexpectedly. Such was the case in September, when CGRER was notified that it had received an Energy Leadership Award from the Iowa Department of Natural Resources for its "outstanding contribution to the development of energy efficiency and renewable energy in Iowa." Through this award, CGRER was noted for its outstanding leadership in building a sustainable energy future for Iowa.

CGRER co-director Jerry Schnoor receiving an Iowa Energy Leadership Award on behalf of CGRER from Governor Terry Branstad.

Awards to CGRER's co-directors reflect the quality and accomplishments of the center's faculty as a whole. In 1998, Jerry Schnoor won a Distinguished Lecturer Award from the Association of Environmental Engineering Professors and traveled to 20 universities throughout the United States to talk on the impacts of greenhouse gases and methods for their reduction. His Global Change and Sustainable Development lectures were presented at Princeton, Johns Hopkins, and the Universities of Texas, Washington, and North Carolina, among other places.

Greg Carmichael became the first recipient of the Recognition Award from the Sixth International Conference on Atmospheric Sciences and Applications to Air Quality. The award, granted "in recognition for continuous and exceptional contributions to the application of scientific knowledge for the goal of improving air quality worldwide," recognized Carmichael's profound contributions to deciphering the environmental impacts of Asian economic development. His scientific contributions also won him election to the Commission of Atmospheric Chemistry and Global Pollution, a subcommittee of the International Council of Scientific Unions and a group that plays a major role in the organization of international activities in atmospheric chemistry.

CGRER Promotes Interdisciplinary Dialogue to Address Iowa's Needs

Multifaceted global change problems are best attacked by multidisciplinary research teams. CGRER facilitates the formation of such teams and the sharing of ideas among disciplines. CGRER also fosters transfer of information between the experts and the general public.

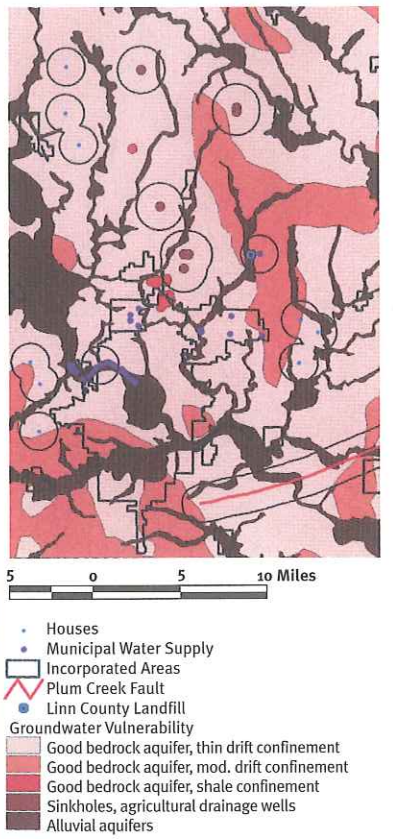
Iowa At A Glance

Since July 1997, CGRER has been funding the Iowa's Environmental Future effort — two projects directed toward making Iowa's environmental information accessible, in a query format, to the lay Iowan. George Malanson, professor of geography at the University of Iowa, has made great strides toward this end. He has produced and tested a Geographical Information System tutorial that teaches basic GIS skills and allows a user to import, manipulate, and analyze those features for which spacial data are available—for example generalized vegetation types for the time of settlement (1850), topographical features, and geological substrata. Other key features, such as current vegetation coverage, can be added to the system as data become available in GIS format.

Based on these accomplishments, CGRER in 1998 awarded Malanson another $20,000 to fund his efforts through June, 1999. He will be adding data to the GIS system and testing it on other potential users, such as high school students and NGO personnel.

Eugene Takle and William Gutowski, Iowa State University researchers in the Geological and Atmospheric Sciences Department, also received $20,000 to continue their portion of Iowa's Environmental Future studies. After spending their first year examining the detailed, site-specific correlation between climate and land use, they are using their second year to transform their climatic data sets into GIS-accessible forms that are easily used by students, policy makers, land use planners, and the like.

Landfill Site Suitability Map



Through Malanson's GIS system, lay users can create customized maps of Iowa or a particular region within the state, and then can manipulate these maps to answer their questions.

DIALOGUE

Mr. Carmichael Goes to Washington

Just like the rest of us, federal policy makers need to be educated about global change concerns. Thus national experts are regularly called to The Hill to share their insights. CGRER's co-director Greg Carmichael was honored with such an invitation in June of 1998, when he became one of two speakers at a seminar sponsored by the federal Global Change Program. His talk, "Development of Asian Megacities: Environmental, Economic, Social, and Health Implications," shared his extensive research results concerning Asian air pollutants with approximately a hundred legislators, embassy officials, congressional staffers, and other Washington D.C. policy makers.

The Lilies of the Field

Herbaria are to botanists what libraries are to other academicians. The pressed, preserved collections of plants housed in a herbarium contain raw information on species variations and distributions – key elements to understanding the effects of changing environments on our native flora. Because native plants serve as indicators of environmental integrity and change, CGRER in 1998 commenced a long-term, joint project with the University of Iowa Herbarium to computerize herbarium information. Thanks to CGRER's contribution of disk space and programming expertise, Iowa's researchers, governmental agencies, and general public may become some of the first in the nation to be able use the World Wide Web to locate herbarium specimens of each of the state's plant species by common and Latin name, and to generate time-specific county-based distribution maps. Diana Horton, project coordinator, hopes with time to extend the data base to include collections at Iowa State, the University of Northern Iowa, and other smaller Iowa herbaria.

Wise Men (and Women) From Afar

In 1998, five visiting researchers came to CGRER to broaden their own perspectives and those of CGRER members, as well as to establish collaborative efforts.

Jia Li, of the Department of Environmental Sciences and Engineering, University of North Carolina - Chapel Hill, came to CGRER for two weeks in January to start collaborating on a study of the health implications of air pollution in Chinese cities. She studied and later applied air pollution models designed to predict sulfur dioxide and particulate levels in major Chinese cities. The models, applied to present-day and future scenarios of economic development, were combined with data from Chinese mortality and morbidity studies to provide estimates of the costs associated with rising air pollution levels in China.

Itsushi Uno and ***Furuhashi,*** who came to CGRER from the National Institute for Environmental Studies, Japan, for short stints in February and December, visited as part of a long-term collaboration investigating the long-range transport of Asian pollutants. A resulting paper written jointly with CGRER members, presented at the annual American Geophysical Union meeting in December, was the first

documentation to establish that Asian air pollutants are transported across the Pacific Ocean and can impact air quality in the western United States.

Maite Mendez-Gil, of the University of Santiago de Compostela, Spain, spent a month on site in the spring and continued her application of CGRER's air quality models to the study of air pollution in Spain.

Peter Mieth, of the Institute for Computer Architecture and Software Technology at the German National Research Center for Computer Science, joined CGRER's ranks for half of June. His home institute is heavily involved in air pollution modeling at urban scales and assists with operational air pollution forecasts for Berlin, which are then used by the German Weather Bureau. Mieth visited to further the exchange and development of air pollution modeling tools with CGRER.

Corinne Galy-Lacaux, of the Aerological Laboratory at the University of Paul Sabatier, France, started a four-month visit to CGRER in November 1998 as part of the International Global Atmospheric Chemistry program (IGAC). This program is focusing in a major way on acidic deposition studies. Galy-Lacaux has been key to the first measurement program of acid deposition in Africa, and she is working with CGRER members on a modeling study to interpret these data.

Hans-Peter Kohler, an environmental microbiologist, arrived at CGRER from the Swiss Federal Institute of Technology in Zurich in July 1998. During his year in residence, he is studying how chiral molecules, synthetic organic ingredients of pesticides, are degraded as they move naturally through water and soil.

Look For Yourself

CGRER's home page provides considerable information on topics such as pollutant distribution and atmospheric models. It is also an excellent way to keep up with CGRER research projects, seminars, and the like. Tune in at

http://www.cgrer.uiowa.edu/ .

Overview	**Contact Info**	**Upcoming Events**	**Research**
What's New?	**Newsletters**	**Resource Center**	**People**
Other Web Links		**CGRER Computer Lab**	
Application for Membership in UCGIS			

CGRER Seminars, 1998

The following sixteen speakers from across the United States, Central America, Canada, and the Netherlands spoke on a variety of change-related topics in 1998:

Speaker	Affiliation	Title of Seminar
Rina Aguirre	Universidad Autonoma Nacional de Mexico (UNAM)	Mexican Pollution Release and Transport Report (PRTR), Development of an Integrated Report of Air, Water and Soil Pollution
Ricardo Alvarado	Minister of Science & Technology for Nicaragua	SME Development in Nicaragua: Science, Technology and Economy
Alwynne Beaudoin	Archaeological Survey Provincial Museum of Alberta	Early Postglacial Landscapes in the Eastern Slopes and Southern Alberta, Canada: Paleoenvironmental Evidence and its Relation to Archaeology
Dan Brown	Michigan State University	Mapping Forest Types from Presettlement Survey Notes: An Analysis of Boundary Vagueness
Daniel Cooper	Los Alamos National Laboratory	Observations and Comparisons of Lidar Data with Models
Susan Cutter	University of South Carolina	Assessing Hazard Vulnerability at the Local Level
Jay Herman	NASA/Goddard Space Flight Center	Global Distribution of UV-Absorbing Aerosols from Satellite Data
Robert Lackey	U.S. Environmental Protection Agency	Dances with Cobras: Science and Ecological Policy
Mihajlo Mesarovic	Case Western Reserve University	Bridging the Gap Between Science and Decision Making on the Global Environment
Kirk Moloney	Department of Botany, Iowa State University	Pattern-Process: What does Ecological Pattern tell us about Ecology?
James Raich	Department of Botany, Iowa State University	Modeling Forest Responses to Environmental Change – Hawaii
Sjaak Slanina	Netherlands Energy Research Foundation	Recent Developments in Atmospheric Deposition Measurements – New Findings from Field Experiments in China
Rudy Slingerland	Pennsylvania State University	Circulation in Epeiric Seas: Cretaceous Western Interior Seaway
Galina Vassilieva	University of Nebraska	Use of Activated Carbon for Bioremediation of Highly Contaminated Soils
Tim White	Department of Geology, University of Iowa	Sunspots and Wildfires: An ~300-year-old Record of Solar Cycle Effects on Earth's Climate?
Douglas R. Worsnop	Center for Aerosol & Cloud Chemistry, Aerodyne Research, Inc.	Heterogeneous Chemistry in the Laboratory and the Atmosphere

EDUCATION

CGRER Provides Education to Address Iowa's Needs

Education prepares today's students for tomorrow's needs. CGRER trains tomorrow's experts to deal with broad-scoped, multifaceted global change problems.

In 1998, approximately 9 masters degrees and 7 doctoral degrees were awarded to students working with CGRER members. Many more students, as well as public school teachers and the lay public, were encouraged through CGRER's activities and members to consider the multidisciplinary aspects of environmental problems.

Teaching the Students

All of CGRER's members struggle to make global change problems and their significance vital to students. Dave McGinnis's UNESCO-sponsored project is one of the more unusual and creative ways of doing so. His Consequences of Global Environmental Change course (Geography 44:178) at the University of Iowa represents one of 15 classrooms around the world that are linked via the Internet to form a "global virtual classroom." This linkage challenges undergraduate and graduate students from 14 nations to attack together an actual environmental problem, such as how to achieve the Kyoto protocols for greenhouse gas reduction. Through computer modeling exercises and Internet-based negotiations, assumptions and expectations regarding international environmental policy issues and their complexities become an intense learning experience for participating students.

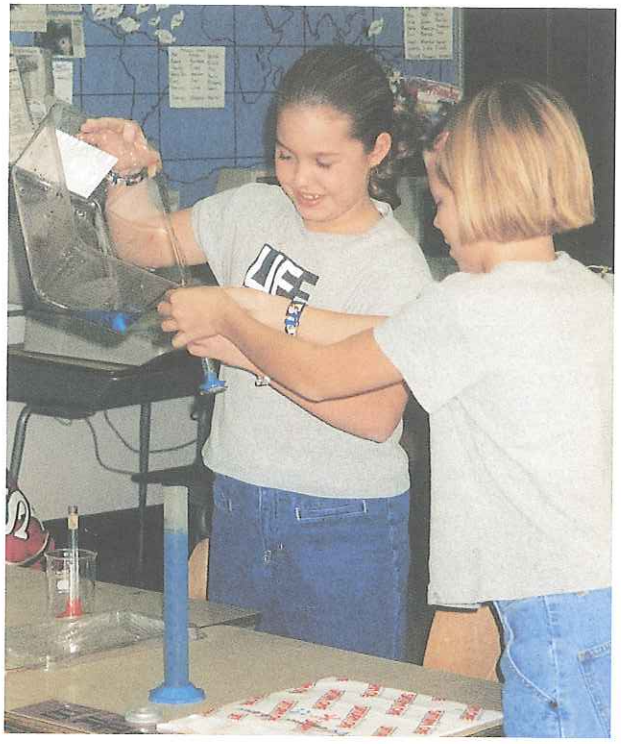
Training the Teachers

In 1998, CGRER continued its partial funding of workshops to train teachers about global change issues. Thanks to $4000 of additional CGRER funding (and the support of other contributors), UNI Center for Energy and Environmental Education professor Carl Bollwinkel's Environmental Issues Instruction Program will continue in 1999 to offer primary, middle school, and high school teachers weekend workshops on climate change. A total of approximately 200 teachers addressed in 1998 and 1999 will learn, among other things, how to apply the CGRER-authored *Iowa Greenhouse Gas Action Plan* in their classrooms to foster environmental education and action.

Ideas Go Both Ways

For several years, CGRER has been developing schemes to reduce Iowa's greenhouse gases and thus limit our state's potential contribution to global warming. A quarter of these gases are generated by one of Iowa's largest businesses, agriculture. What actions might help reduce these emissions, which are produced by everything from fertilizers, to farm animals, to farm machinery? In 1998 CGRER, with a grant from the U.S. Environmental Protection Agency (through the

Iowa Department of Natural Resources), began a thorough literature review of research on possible mitigation options. CGRER also is hosting two discussion sessions (organized by UI Urban and Regional Planning professor Cheryl Contant, with the help of Karen Mumford) involving agricultural producers, organizations, industries, and researchers. This first formal dialogue on this topic in the nation should help researchers and policy makers become more responsive to the needs of producers, who in turn will enhance their awareness of the problems of greenhouse gas emissions. With each group educating the others, the hopeful result will be a more complete exploration of practical and feasible greenhouse gas reduction techniques for agricultural producers.



Fifth-grade students at North Hill School, Burlington, Iowa, are exploring the basics of precipitation and how they can increase it in their closed-tank system. Because they understand basics, students will be able to consider responsible personal actions to alleviate climate change.

And, as before . . .

CGRER continues to publish its newsletter *IoWatch*, which this past fall focussed on efforts to rebalance the carbon cycle. And, in keeping with the tradition of periodically hosting a climate change symposium, CGRER is co-sponsoring an upcoming forum entitled "The Science of Global Climate Change," to be held at the University of Iowa on March 5, 1999. The intent of this symposium is to educate a broad array of students and the general public about current understandings of climate change.

CGRER Fosters Global Change Research to Address Iowa's Needs

What global changes have occurred in the past? What is occurring today? And how will global change affect all of our tomorrows? In an attempt to answer these questions, CGRER awards grants on change-related topics to Iowa researchers, solicits its own research grants, and provides state-of-the art research facilities and equipment to its members and their students.

Funds Flowing Out

The bulk of CGRER's research funds this year, as last, were granted to the Iowa's Environmental Future project, an effort to spread environmental data to the general public (see page 6). Two additional grants are described below.

Deciphering Origins: A grant of $5560 was awarded to Russell Ciochon, University of Iowa anthropology professor, to partially fund his field investigations in Java. These are directed toward broadening our knowledge of the environmental context of Asia's first human inhabitants. A supposed lack of artifacts supports the notion that *Homo erectus* inhabiting Java two million years ago did not possess stone tools. Ciochon will search for evidence of his counter-hypothesis: tools did indeed exist, but were shaped from soft volcanic rock. Ciochon will combine field surveys with use of sophisticated electronic scanning techniques to try to identify these now-weathered, otherwise-unidentifiable tools. Ciochon's ideas, if supported by field evidence, could reshape our understanding of *Homo erectus*'s interactions with the natural world in Asia and throughout the Old World.

Detailing Early Change: Determining the natural climatic variability and rate of climatic change during the past 10,000 years is crucial to the identification of human-induced environmental change today. In recent years, thanks in large part to research by CGRER member Luis Gonzalez, stalagmites have demonstrated their ability to reveal detailed seasonal fluctuations in ancient climates. Now, through a $50,000 start-up grant from CGRER and funding from other sources, Gonzalez will be able to decipher in-house the variations in the concentrations of oxygen and carbon isotopes that record climatic fluctuations in stalagmite bands. In 1998, the Paul H. Nelson Stable Isotope Laboratory was established in the University of Iowa Geology Department under Gonzalez's direction. This isotope laboratory, the only one of its type in the state, will provide a broad range of isotope analysis services to researchers across Iowa, as well as to the Iowa Department of Natural Resources. Its relatively inexpensive and fast service should foster innovative isotope-related research in geology, ecology, hydrology, and other sciences, and provide a training ground for graduate students. CGRER also has agreed to an annual supplement of $5000 for the laboratory director's salary.

RESEARCH

Funds Flowing In

CGRER's 67 members regularly receive grants for projects that help them decipher various aspects of global change. In addition, CGRER itself received five grants in 1998. One funded a look at techniques to decrease agriculturally-generated greenhouse gases (see pages 10-11). The other four are described below.

Deregulation Impacts: An analysis of the probable environmental impacts of deregulating Iowa's electric power industry was funded by the Iowa Energy Center and based on data provided by the staff of the Iowa Utilities Board. This study compared the actual 1996 air pollutant emissions produced by Iowa's electric generation plants with emissions that hypothetically would have been produced had a deregulated, competitive electric generation market existed in 1996. Researchers Richard Ney and Jerry Schnoor found that deregulation would have increased fossil fuel-generated electricity by 20% in Iowa, because some of Iowa's relatively inexpensive energy would have been purchased by consumers from surrounding states. This increased production, coupled with increased utilization of inexpensive coal-generated power (which produces relatively more air pollutants), would have raised Iowa's carbon dioxide emissions by 25%, sulfur dioxide emissions by 15%, and nitrogen oxide omissions by 28%. Thus actual electric power deregulation could lead to significant increases in Iowa's air pollutant and greenhouse gas emissions.

Growing Green Fuel: The Biomass Power for Rural Development Program is examining the potential use of fast-growing plants as fuel sources. Chariton Valley Resource Conservation and Development, Inc., in a project funded primarily by the U.S. Department of Energy, is running a pilot program to establish and burn 40-50,000 acres of switchgrass as such a "biofuel." CGRER will compute the total net greenhouse gas emissions produced by this process. CGRER also will compare that quantity to the greenhouse gas emissions that would be produced by burning an equivalent amount of coal, and will calculate the economic value of any net change in emissions.

Asian Impacts: CGRER's studies of the environmental impacts of Asian development are being continued under newly-awarded funding from the Japan Trust of the World Bank. This 1.5-year project, directed by Greg Carmichael, examines the potential mixes of fuels and technologies that Asia could use to meet its energy demands until the year 2020. Atmospheric chemistry transport models are being refined and integrated so that they will form a basis for predicting health, ecological, air pollution, and other energy-related risks for specific Asian regions and cities. Planners can then feed this information into their development decisions.

Following the Chemical Flow: Early in 1998 CGRER commenced a three-year grant, funded by the U.S. Department of Energy Atmospheric Chemistry Program, to explore the importance of aerosol surfaces and natural processes in oxidant cycles that lead to changes in ozone production in the

lower atmosphere. These complex integrated studies, co-directed by UI professors Greg Carmichael (a chemical engineer) and Vicki Grassian (a chemist), involve both disciplines and employ both laboratory and modeling techniques. Laboratory measurements to date have yielded significant and unexpected results: mineral particulate surfaces (such as windblown soil particles) react with organic molecules and may affect the production of atmospheric ozone and of nitrates adsorbed to airborne particulates.

The efforts of two CGRER postdoctoral researchers are feeding into this exploration. Ping Li, who arrived in July 1998 and who is funded for two years by the DOE project, is focusing on measurements of organic molecules interacting with aerosol surfaces in the atmosphere. Grant Underwood is using similar techniques as Ping Li, but is examining heterogeneous reactions of nitrogen oxides. Grant, who received the two-year environmental chemistry assignment funded by a grant from the Camille and Henry Dreyfus Foundation, arrived in December 1997.

And Carried Over From Last Year . . .

In addition to these new grants, CGRER's participation in the Iowa Comparative Risk Project (an effort to summarize Iowa's environmental risks and problems), funded in 1997, was completed in 1998. Four additional CGRER grants awarded in 1997 remained extant in 1998: an effort to assess the changing risk of heat stress in Iowa, funding for a postdoctoral associate in environmental chemistry (see preceding column), and two grants related to changing environmental risks in Asia. These projects were summarized in CGRER's 1997 Annual Report (pages 10 and 13).

Additional Aids to Researchers

CGRER's facilities, housed in the Iowa Advanced Technology Laboratories on the University of Iowa campus, continue to provide office, meeting, and laboratory space for CGRER's members.

The 1998 replacement of seven UNIX workstations with new units returned CGRER's computer laboratory to state-of-the-art equipment. The new workstations are twice as fast as the old ones, produce better graphics, can run larger models, and are upgradable. The GIS and visualization computer laboratory (which houses a variety of other types of computer equipment in addition to the UNIXes) also obtained a high resolution color printer in 1998.

1998's most impressive technological addition undoubtedly was the ImmersaDesk. This virtual reality research tool displays gridded numerical data sets as three-dimensional visual images that change over time. By wearing special goggles and manipulating a control stick (which is similar to a mouse in function), researchers standing in front of a four-foot screen can "immerse" themselves in complex mathematical models of the changing natural world.

To date, the ImmersaDesk has mostly been used to visualize wind patterns in the atmosphere and pollutant dispersion in Asia. Efforts to network CGRER's ImmersaDesk with two identical instruments on campus will in the future allow multiple researchers to manipulate the same data set simultaneously.

CGRER continues to maintain mapping-grade global positioning system (GPS) facilities, which in 1998 were used by the State Archaeologist's Office as well as by academic researchers, and two rural outdoor stations for field-related teaching and research.

INFORMATION

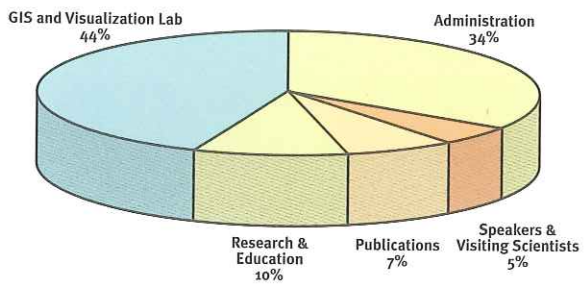
General Information

Budget

In fiscal year 1998 (July 1, 1997- June 30, 1998), two-thirds of CGRER's $435,000 of funding was spent on research, education, and outreach directed toward global change issues (Figure 1). Administrative costs consumed the remaining one-third of the budget.

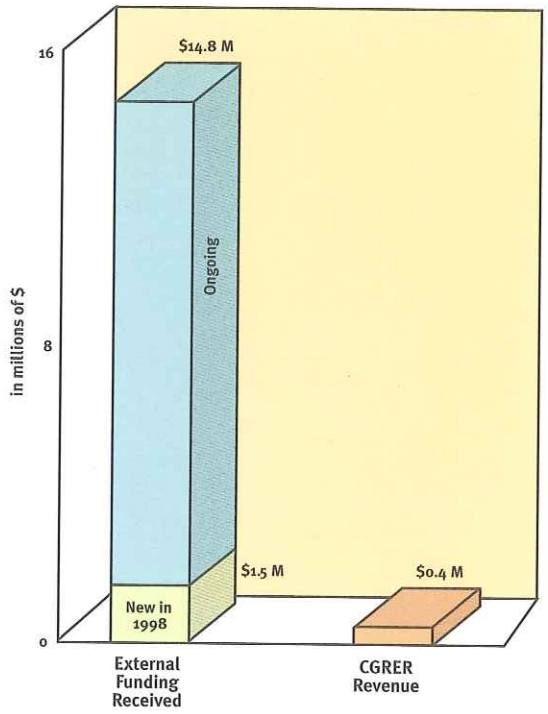
This funding, received in total from an assessment on Iowa's gas and electric utilities through the State Department of Commerce, was magnified many times in the millions of dollars of external grants and contracts awarded to CGRER members (Figure 2). In calendar year 1998, CGRER members were performing research that brought in a total of $14.8 million in external funds. This included both those grants awarded to CGRER directly and other grants awarded to CGRER members through their respective departments. Of this $14.8 million, $1.5 million was new funding that was initiated in 1998, while the remaining $13.3 million came from ongoing projects.

Figure 1. CGRER'S Expenses*



*Applies to Fiscal Year 1998

Figure 2. 1998 Leveraging of CGRER'S Income*



*Applies to Calendar Year 1998

Administration and Membership

CGRER is directed by University of Iowa 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 ten members plus the two co-directors. The Executive Committee meets monthly to plan initiatives and chart CGRER's course. An Advisory Board of eight members from outside the academic community meets annually to lend oversight to CGRER's activities (see page 5 for Advisory Board members).

Since 1992, CGRER has employed two full-time staff members. Administrative assistant Jane Frank oversees office operations. In 1998, data systems coordinator Mark MacLennan was replaced by Glenn Larson, who manages CGRER's computer facilities with the aid of services contracted from the Iowa Computer Aided Engineering Network. CGRER reports directly to the UI's Vice President for Research, Dr. David Skorton.

CGRER Members

Anthropology
Michael S. Chibnik
Russell L. Ciochon

Biological Sciences
Stephen B. Heard
* Stephen D. Hendrix
Diana G. Horton
John D. Nason

Chemical and Biochemical Engineering
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