

Center for the Environment



C L A R K S O N U N I V E R S I T Y

A N N U A L R E P O R T - 2001 - 2002

AN INTERDISCIPLINARY ADVANTAGE



Susan E. Powers

From the world-renowned air quality research of Prof. Phil Hopke to mentoring by our students in middle school classrooms, research and education initiatives associated with the Clarkson Center for the Environment strive to link basic and applied research with practical solutions to complex challenges and to enable informed policy decisions.

Clarkson is one of the smallest nationally ranked research universities. Yet our size actually gives us advantages. It facilitates multidisciplinary interaction, flexibility and a team approach. It also fosters a campus culture that develops leadership skills in our graduates. Within this fertile academic setting, Clarkson faculty are recognized experts in a variety of environment-related disciplines.

Three years ago the University created a framework to promote collaborative links and to leverage these strengths. Today the Center for the Environment connects more than 50 faculty members, staff and students from business, liberal arts, science, and engineering.

The quality and impact of our interdisciplinary approach to research is illustrated by our flagship programs — the Center for Air Resources Engineering and Science (CARES) and our groundbreaking graduate program in Environmental Manufacturing Management (EvMM). Further development of the Great Rivers Center, with funding expected from the New York Power Authority and others, will extend our Great Lakes research expertise to the St. Lawrence River. Beyond these major programs, we have other faculty who are involved with activities ranging from wildlife ecology to sustainable energy systems.

Our interdisciplinary activities take advantage of Clarkson's collaborative culture, enabling a comprehensive systems view in addressing complicated environmental challenges. The institutional support for these activities also creates a competitive advantage for funding from government, foundation, and industry.

This annual report for 2001-2002 highlights a cross section of activities and achievements. It also illustrates, I believe, the breadth and prestige of our research, and our commitment to serving our students, community, and nation.

A handwritten signature in black ink, appearing to read "Susan E. Powers". The signature is fluid and cursive.

Susan E. Powers
Director, Clarkson Center for the Environment
Professor, Civil and Environmental Engineering

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Front cover: (Center) Associate Professor Amy K. Zander of Civil and Environmental Engineering, shown here with graduate students Kevin Graves and Heather Raymond, is performing analysis on innovative water treatment technologies. (Top) Center for the Environment Associate Director Bill Vitek and undergraduate Celin Hoyer review plans for an observation deck overlooking a wetland on Clarkson's property.

Air Resources Engineering and Science

CARES is developing better ways to address health and ecological effects of air pollution

Center for Air Resources Engineering and Science

CARES, a founding member of the New York Environmental Quality Systems Center, is analyzing the chemical composition of airborne particles through expertise in air sampling, chemical analysis, and application of fluid dynamics.

As the incidence of pollution-related deaths and other adverse health effects such as asthma continues to rise, air pollution has come to be perceived as not only an environmental problem, but as a serious public health problem. But while researchers have demonstrated a correlation between smog and increased morbidity, they typically measure this toxic mixture in bulk, without looking closely at the chemical nature of airborne particles and their individual effects on human health. Clarkson University's Center for Air Resources Engineering and Science (CARES) is challenging that traditional approach.

"Researchers currently use a very blunt instrument to measure airborne particles in terms of their mass, but that's clearly wrong," says Phil Hopke, an internationally renowned air quality researcher who's the

director of CARES and the Bayard D. Clarkson Distinguished Professor in chemical engineering and chemistry. "All particles do not have equal toxicity — some are clearly worse because they contain things known to be toxic. That's why we're developing better techniques to collect and identify the particulate components."

The center's research has attracted world-wide attention and significant financial support. CARES is a founding member of the New York Environmental Quality Systems Center, a network of 12 research institutions, which recently won a \$15 million grant from New York's Office of Science, Technology and Academic Research to study air quality.

CARES will acquire state-of-the-art instruments with this funding, enabling it to advance its expertise in air sampling, chemical analysis, and the application of fluid dynamics to the dispersion of airborne particles. This technology, combined with new specialized temperature and humidity controlled laborato-

ries, will offer CARES researchers greater ability to coordinate large government projects involving air monitoring and research from the Clarkson campus.

"We've solved the easy problems," says Hopke, who chairs the EPA's Clean Air Scientific Advisory committee. "But there are further things we can do through technology that would improve air quality, not only to counter disease but also to promote human productivity. That's the kind of work we're doing at CARES."

One area where the center may be best known is in receptor modeling data analysis methods designed to identify pollution sources and their contributions to the measured environmental concentrations. According to Hopke, more needs to

be done to identify what proportion of the airborne particles comes from sources of given types, such as diesel trucks or coal-burning power plants.

"You have this mixture coming from these different sources and they all have patterns of chemical species," explains Hopke. "We can then take those samples and use mathematics to pull them apart into their likely profiles, determining how much



Prof. Hopke and graduate student Wei Liu collecting airborne particles.

each of those sources contributed to the mass of particles.”

Hopke says identifying those chemical fingerprints has profound implications for addressing the health effects of air pollution.

“Once we know how the chemicals are being distributed, we can start to do correlations between clusters of health complaints, such as asthma, and the spatial distribution of the chemicals contributed by different sources,” says Hopke.

Recently, Hopke and center co-director Goodarz Ahmadi have been applying this method to air quality research near the Peace Bridge, a major trucking route between the U.S. and Canada. While Ahmadi has used computational fluid dynamic tools to study the wind patterns that distribute air pollution in nearby neighborhoods, Hopke has begun collecting data to determine the composition of the samples in an area where an increase in asthma has been reported.

“We are hoping to obtain an idea of the distribution exposures to the particles coming from the Peace Bridge so that we can look at the relationship between exposure to the particles and incidence of childhood

asthma,” explains Hopke.

He and Ahmadi are also collaborating on a study with the Lovelace Respiratory Research Institute in which they’re building physical models of human airways to track the inhalation and deposition of fibers in the respiratory system.

“Once we create a physical model of the tracheal bronchial airways, we’ll be able to calculate where the fibers attach themselves within the human body,” says Hopke. “It’s an example of how the center’s resources have enabled us to broaden our work. It’s giving us the room to explore.”

This focus on applying technology to human health problems is closely tied to the theme of Clarkson’s Wallace H. Coulter School of Engineering: “technology serving humanity.” The Center for Air Resources, Engineering and Science also benefits from the University’s emphasis on multidisciplinary cooperation, which creates a cross-pollination of ideas not always found at large institutions.

“This is the only way you can deal with a problem as complex as air pollution,” says Hopke, whose center has attracted faculty specialists in aerosols, particle deposition,

aerodynamics, and chemistry. “If you want to do something more than just superficially monitor the air, you have to approach it from different perspectives so you can plan a management strategy that’s going to be both effective and efficient. This environment is making that kind of collaborative work possible.”

Phil Hopke: A Policy-Related Perspective

One of the most striking features of the Center for Air Resources Engineering and Science is its focus on research that could directly influence public policy and human health in the short term. This perspective is due, in large part, to the fact that CARES Director Dr. Philip Hopke sits at the table where national decisions on air quality are being made.

“We do bring a policy-related perspective to our research,” says Hopke, who chairs the EPA’s Clean Air Scientific Advisory Committee.

“My involvement in government allows us to see what’s happening in the regulatory arena and determine where we can fit into that national picture.”

Hopke also brings his 30 years of experience to the EPA’s clean air subcommittee on particle monitoring. These committees are currently reviewing the research that will determine the new national air quality standards, including how particulate matter is measured. Hopke’s concern about the limits of current science in this area has been a driving force behind much of the CARES research.

“The more specifics we can gather on what’s causing the air pollution, its components and how it affects human health, the better we can target our resources,” says Hopke. “Right now, our standards are applying a broad brush approach.”

Hopke’s national advisory role enables him to anticipate trends and identify opportunities for the CARES center. For instance, he frequently travels to Southeast Asia as a consultant with the International Atomic Energy Agency. In this capacity, he has assisted several countries that are using nuclear techniques to analyze the composition of airborne particles. That interest has prompted Hopke to acquire state-of-the-art x-ray fluorescent analysis equipment that enables CARES researchers to pursue research in this area, as well.

Ultimately, he hopes the work at CARES will lead to positive changes in public policy.

“One of the things I’ve been pushing hard for is to improve the air quality monitoring network. I’m hoping that by the next time we revise the standard, we’ll have the data to do that,” says Hopke. “But one has to be patient and persistent. Eventually, the science will be there to permit better decision making.”



CARES Director Hopke: “We do bring a policy-related perspective to our research.”

Graduate student Heather Raymond, Prof. Thomas Holsen, and visiting scholar Seung-Muk Yi gather samples to look for power plant emissions.





EvMM

Making a more sustainable world

Clarkson interdisciplinary programs aim at producing practical changes

Environmental Manufacturing Management (EvMM)

EvMM integrates education and research for the redesign of products, processes, systems, and organizations to balance industrial manufacturing activities with environmental stewardship.



Ph.D. candidates in the EvMM program, Anahita Ahmadi Williamson and Brendan Williamson separate colored xerography toner particles in a density gradient column. They are working with the Xerox Corporation to develop a means of separating waste toner by color so that the toner particles can be recycled. Their preliminary work with black toner illustrated the significant savings and reduced solid waste achieved with toner recycling operations.

Perhaps you have tried a digital camera in which the image is stored on a small disk for processing and printing. To a user the steps are similar to film-based cameras: you locate the image in a viewfinder, focus, and click a button. But to a company such as Eastman Kodak, which manufactures cameras and related equipment, the digital approach has brought basic technological shifts from the processes required for the halide technology used for the past hundred years.

Such a shift raises profound questions related to manufacturing decisions, resource allocations, and waste management issues. For example, since digital cameras have no film, as market preferences shift the demand for film may change accordingly, with associated changes in material resources and the quality and character of wastes produced from its manufacture. Meanwhile, new and different material and waste flows result from manufacture of digital equipment. Such a collection of parts — raw materials procurement, processing, manufacturing technology,

product and waste output, and environmental, societal, and market impacts — constitute a system wherein the behavior of and decisions made about each element affect the performance of the system as a whole.

Understanding how such a system functions has been the major activity of Clarkson graduate students in the Environmental Manufacturing Management (EvMM) program. The innovative program was launched at Clarkson in 1998 with the assistance of a \$2 million grant from the National Science Foundation IGERT (Integrative Graduate Education and Research Training) program.

EvMM integrates education and research for the redesign of products, processes, systems, and organizations to balance industrial manufacturing activities with environmental stewardship. The overall goal of the program is to train graduate students, principally at the doctoral level, who have strong technical skills coupled with extensive exposure to the environmental, managerial, ethical, economic, policy, and communication aspects required to facilitate change in this complex field.

The integrated systems approach, which is at the heart of the program, includes and combines the following major research areas:

- integrated systems analysis;
 - technical design of improved processes and products;
 - assessment tools;
 - implementation of new management strategies.
- In recent years, a significant shift away from a

2001-2002 Year of Sustainability

Paul Hawken

“firefighting” mentality associated with compliance with federal regulations has occurred in corporate environmental policies. Not only have companies found end-of-pipe controls to be more expensive than estimated, but they have also discovered unexpected synergies between environmental and manufacturing technologies.

However, as companies integrate environmental management throughout corporate policy, they are also finding out that to minimize waste production and prevent pollution they must expand skills in both technical and managerial areas.

“Clarkson has had an opportunity to lead the way in developing new ideas and better processes to help create a sustainable environment,” says Prof. Thomas Holsen, Director of the EvMM program. “We aim to train future environmental and industrial professionals in a multidisciplinary setting so that they can become leaders at the cutting edge of change — both by performing original research and by putting their research results into practice.”

How the EvMM program is organized

EvMM students work with a team of faculty from all four schools — business, engineering, liberal arts, and science. Doctoral students may matriculate in any of Clarkson’s Ph.D. programs. Participating students complete an industrial internship.

Three students have earned degrees through the EvMM program. Two received M.S. degrees from the School of Business and one earned a Ph.D. in Civil and Environmental Engineering. Dr. Thomas P. Seager, who graduated in December 2001 following completion of his dissertation titled “A Thermodynamic Basis for Industrial Ecology,” is currently working as a Post-Doctoral Research Associate at the University of New Hampshire. Six students are currently involved in the EvMM program at Clarkson University.

During the 2000 spring semester, students in the class “Creating Environmental Policy” developed recommendations for a more environmentally sustainable campus and then delivered these in a report to the University administration. The result: President Denny Brown declared 2001-2002 the “Year of Sustainability.” The many levels of resultant activity included a lecture series, numerous student projects, and an institutional analysis.

“While the students’ recommendations pushed the issue into the spotlight,” explains President Brown, “we can trace the genesis back to the identification of the environment as a key research focus area for Clarkson.”

A Task Force with representatives from all walks of campus life studied four key systems: Energy, Campus Culture, Materials, and Ecosystems. “Environmental sustainability asks us to look at the entire system, to see where the costs and the impacts are,” explains Bill Vitek, Associate Director of Clarkson’s Center for the Environment, whose class made the initial recommendations. A lecture series explored the topic from many angles. It culminated with a talk by entrepreneur and environmentalist Paul Hawken, who co-authored, *Natural Capitalism: Creating the Next Industrial Revolution*.

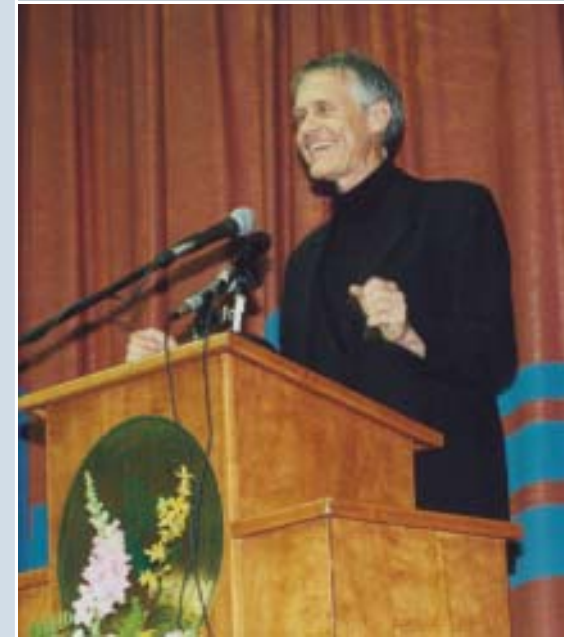
Another central activity of the year involved introducing environmental sustainability issues into the curriculum. A special topics course in the University Honors Program was team taught by professors from Civil and Environmental Engineering, Electrical and Computer Engineering, Mechanical and Aeronautical Engineering, and Liberal Arts. The students examined energy use in two representative campus buildings and made recommendations for steps that could be taken

to reduce energy consumption.

The sustainability initiative has continued into the 2002-03 academic year. Students in the sophomore University Honors course are investigating possibilities for creating a campus energy park for example, and a number of faculty members are performing research in related energy areas. Meanwhile the industrial ecology class has picked up recommendations from the task force and has incorporated projects to implement recommendations related to campus paper use and recycling, and computer energy consumption.

In addition, University administrators are exploring recommended strategies, ranging from the incorporation of sustainable energy design components in a new library, to creation of an environmental management system to monitor and manage our own impact on the environment.

Environmentalist Paul Hawken drew an enthusiastic audience in Clarkson’s lecture series on Sustainability.



Sustainability Symposium 2001

As part of the EvMM program, the Center for the Environment hosted a 2001 Symposium on Sustainability that brought together an international audience of scholars in industrial ecology, ecosystem health, environmental policy, and ecological economics.

Researchers and educators discussed issues such as energy supply, greenhouse gases, reducing waste production, measuring environmental impacts, and the influence of economics on environmental policy. These are diverse, complex problems that challenge traditional environmental management models. Addressing these problems

requires moving beyond local remediation and pollution prevention to a state of global sustainability — a state described as equitably sharing resources today to ensure that the needs of present and future generations can be fulfilled.

The primary aim in the Symposium was to advance thinking on multidisciplinary approaches to studying and achieving sustainable resource management. Keynote speakers included Jack Azar, Vice President of Xerox Environmental Health and safety; and Chris Golde, Research Scientist at the University of Wisconsin, Madison, an expert on multidisciplinary graduate education.

Creating Leaders for Tomorrow

Leadership

Curricular and outreach activities integrate research and learning



Interdisciplinary Undergraduate Programs

Clarkson has developed two strong interdisciplinary B.S. degree programs that prepare graduates to tackle practical environmental challenges: **Environmental Science and Policy** and **Environmental and Occupational Health**. Both emphasize fundamental knowledge in science and application of skills through project-based curricula, internships, and undergraduate research. New M.S. and Ph.D. degrees offered in **Environmental Science and Engineering** now provide graduate students with similar interdisciplinary experiences.

Environmental Science and Policy

How can a corporation develop new processes and materials to cut pollution? What measures are practical to safeguard endangered species? On what basis do we make choices or tradeoffs between demands of society and needs of nature? Such puzzles require creative and multidisciplinary solutions.

Clarkson's ES&P program, directed by Prof. Bill Vitek, prepares students to become leaders who will address such challenges. The curriculum combines both rigorous courses in all basic sciences and "big picture" courses in history, policy, economics, ethics, and law. These explore the history of the impacts of technology and of changing social values, as well as the evolution of environmental law and definitions of public interest.

Serious, focused research is a requirement for our students. Recent student projects include:

- Microbial remediation of toxic waste
- Natural history of a forest
- Policy recommendations for environmentally preferable purchasing at Clarkson
- Acid rain and the Adirondacks
- PCBs and the Hudson River
- Life cycle assessment of insulation materials

Student projects have launched the Clarkson Sustainability initiative (p. 4) and Nature's Course, a unique wild area on campus (see sidebar).

Environmental and Occupational Health

EOH involves the study and elimination of health hazards in workplace and community environments. Industrial hygienists apply their knowledge of chemistry, physiology, toxicology, physics, and engineering to identify and eliminate environmental hazards. Graduates of our program, which is directed by Prof. Alan Rossner, earn a B.S. in Industrial Hygiene-Environmental Toxicology.

Clarkson has one of the few undergraduate programs for environmental/occupational health/industrial hygiene in the country. When we introduced it in 1984, it was one of the first. And unlike others elsewhere, ours is not an add-on to a health sciences or sanitation program. EOH at Clarkson is distinctive in the way we integrate biology,

Clarkson students learn decontamination procedures as part of the certified HAZWOPER training provided by Prof. Alan Rossner.



Eighth grade students in Partners in Engineering view trash sorting operation during a field trip to the local solid-waste recycling station.

chemistry, engineering, and business courses.

EOH partners with companies such as Alcoa and Kraft Foods to conduct health hazard assessments in actual work environments through coops and internships. Our undergraduates work hand-in-hand with managers and other personnel on the job to assess exposure to chemicals, noise, and particulates. And they develop recommendations for the control of these hazards. In such experiences, students gain a full appreciation of real-world problem solving. This is a distinctive element of the Clarkson EOH program.

"Understanding chemical exposures and understanding engineering processes go hand-in-hand at a manufacturing facility. The EOH program provided the education I needed," says Nicole Rowe '99, an industrial hygienist at Bristol-Myers Squibb Company. "It was both focused and broad-based. And thanks to Clarkson's strong focus on internships and co-ops, I had the opportunity to apply skills I had learned to real-world problems before I graduated."

Nature's Course

The concept of Nature's Course, a 200-acre nature preserve on campus, was born four years ago as a challenge by Prof. Bill Vitek to students: What would it take for Clarkson to declare a part of itself wild?

Intrigued, the students researched efforts at other campuses, polled the Clarkson community (which overwhelmingly supported the project), met with University administrators, mapped the area, laid out trails, began long-term species and ecosystem studies, and designed and built an observation deck.

Including nearly a third of campus, Nature's Course is home to beaverdam — created wetland and several distinct types of forest. The diversity of the land and the species it supports provides an ideal outdoor classroom for studies in land ecology, aquatic ecology, and biology.

"Nature's Course is more than an outdoor laboratory and playground for outdoor enthusiasts," says Prof. Vitek. "In a very real sense, it represents a commitment to preserving the integrity and value of undeveloped wilderness. It's a permanent reminder to the Clarkson community that the quality of our lives and the health of the environment are not independent variables."

ES&P Director Vitek and undergraduate Celin Hoyer at Nature's Course. The 200-acre preserve was an initiative of his students.



K-12 Initiative: GE funds a national expansion

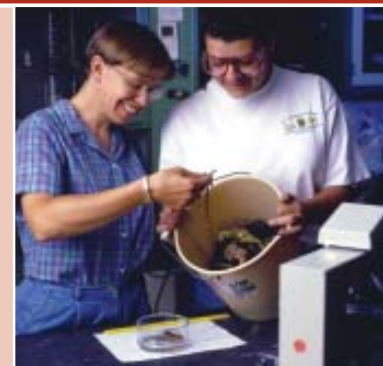
Potsdam area middle school students are at it again. Up to their elbows in compost, sorting trash, and pouring concrete into forms. And soon peers from around the country may be joining in. What is it? It's science!

Hands-on. Getting dirty. Asking questions. Looking for solutions. Educators believe this is the best way to motivate kids to become engaged in what is typically perceived to be a dull and dry subject.

Prof. Sue Powers of Civil and Environmental Engineering is leading a team that has been inspiring students in local middle schools for two years through a National Science Foundation-funded science and engineering teaching initiative. Clarkson's Partners in Engineering (PIE) and Project-Based Learning partnership programs have been so successful that they've attracted the attention of a national pre-engineering education organization and has now received a major grant from the GE Fund.

"In middle schools and high schools, science and engineering are often portrayed in a traditional, narrow sense," explains Powers. "We're trying to show that engineering and science are much more diverse. You can do something for the environment. You can help people. You can make a difference."

The GE Fund, the philanthropic foundation of General Electric Co., has awarded Clarkson \$315,000 over three years to convert its successful project-based curricula into 10-week modules that will be nationally distributed through Project Lead the Way (PLTW). A national high school pre-engineering program that involves practicing engineers in curriculum enrich-



Prof. Powers and graduate student Amanda Lavigne plan a composting lesson that involves worms.

ment, PLTW aims at spurring interest in engineering careers.

The Clarkson-developed courses have been taught in three local schools over the past two years. About a dozen fellows each year, both graduate students and undergraduates, are trained in teaching skills and go into the middle school classrooms to assist teachers with the science and technology units.

Prof. Powers is working with her team and PLTW to turn Clarkson's existing courses into an integrated 10-week module called "Environmentally Based Materials Processing" that will be piloted around the state in 2003-04. A second module is tentatively themed "Energy and the Environment." By 2004-05, both modules will be distributed nationally.

The idea is to bring an exciting hands-on science and technology program into schools that will draw in students from all kinds of backgrounds. "You need diverse curricula to attract diverse people," says Powers. "We're hoping to attract a larger variety of students to engineering, scientific, and technological careers."

Faculty and Student News and Achievements



The award-winning 2001 Environmental Design Team.

Environmental Design team takes First Place

Clarkson's Environmental Design team, composed of an interdisciplinary group of undergraduate students advised by Prof. Stefan J. Grimberg (CEE), won first place at the 2001 international competition in New Mexico for its solution to a challenge in mining pit wall stabilization design. It also won the Intel Corporation Award for Environmental Innovation. The team's design stabilized the walls by coating them with a reactive layer that concurrently neutralized acid generated by the tailings. The competition was sponsored by the Waste-Management Education and Research Consortium (WEREC). The team has won four first-place awards in the past decade.

Menz is Senior Fulbright Scholar

Fredric C. Menz, Professor of Economics, conducted research as a Senior Fulbright Scholar in the Center for International Climate and Environmental Research at the University of Oslo, Norway, from December 2001 to July 2002. From September through November 2001, he was a visiting scientist at the Center for Innovation, Technology and Policy Research at Instituto Superior Tecnico in Lisbon,

Portugal. The Fulbright grant enabled him to pursue research on global climate change, international environmental issues, and cooperative ventures to reduce air pollution.

Hopke team identifies source of Arctic pollution

Professor Philip K. Hopke and his co-researchers have identified the likely source of "Arctic haze," a concentration of aerosol pollutants first detected in 1957. Using particle characteristic comparisons and wind pattern information, the scientists determined that the particles originate from human activity in central Russia. The results, published in *Environmental Science and Technology*, are likely to affect future policies to improve air quality. Hopke, who is Bayard D. Clarkson Distinguished Professor of Chemical Engineering and Chemistry, delivered the keynote address at the 16th International Clean

Air and Environment Conference in Christchurch, New Zealand, in August 2002.

Pollution research scholarship winner

Young-Ji Han, a doctoral student in Civil and Environmental Engineering, was selected to receive one of just four scholarships awarded by the Air Pollution Educational and Research Grant (APERG) Program for 2001-2002. She received \$25,000 from the Mid-Atlantic States Section of the Air and Waste Management Association (MASS-AWMA) based on her research project "Source Identification of Vapor Phase Mercury in New York State," which is co-directed by Profs. Thomas Holsen (CEE) and Philip K. Hopke (ChE).



Amy K. Zander

Zander appointed to National Research Council Committee

In June 2002, Amy K. Zander, Associate Professor of Civil and Environmental Engineering, was appointed to the National Research

Council's Committee on Water Resources Research for the Nation. As mandated by the Congress, the committee will undertake an assessment of water resources research funded by federal agencies and significant non-federal organizations. The goal of the 18-month study is to determine whether the nation's investment in water resources research is adequate, with an emphasis on those areas of research that may be receiving inadequate attention to address emerging needs. The project is currently being sponsored by the USGS.

In April 2001 Clarkson's Partners in Education (PIE) Program dedicated a park bench after a team of Clarkson women science and engineering student mentors helped a group of middle school girls convert a waste product into aggregate used in concrete that they made into the bench.





Poojitha D. Yapa

Yapa named editor of *Hydraulics Engineering*

Poojitha D. Yapa, Professor of Civil and Environmental Engineering, has been named Associate Editor of the *Journal of Hydraulic Engineering*, a publication of the American Society of Civil Engineers and the preeminent peer-review publication for original research into the analyses and solutions of problems related to hydraulic engineering and water resources. He is a leading authority in the mathematical and hydraulic modeling of oil spills in rivers, lakes and offshore locations, and deepwater oil and gas spills.

Three NYWEA awards to Clarkson Students

Three Clarkson engineering and science students received awards for research at the annual New York Water Environment Association (NYWEA) conference in spring 2002. Cory McDowell, a graduate student in environmental engineering, received first place for his presentation of research that focused on the migration of petroleum pools following an ethanol spill. Civil engineering senior Jason Hime and molecular biology junior Alicia Crandall presented a joint research project that tied for second place. Their research focused on stimulating the biodegradation of trichloroethylene (TCE) in contaminated soil.

Recognition from the Corporate and Foundation Alliance

Clarkson's award-winning SPEED (Student Projects for Engineering and Design) which includes our award-winning Environmental Remediation Team, was honored in June 2002 by the Corporate and Foundation Alliance, a group of 38 organizations that support undergraduate science, technology, engineering, and mathematics education.

Visser receives 2002 Teetor award

Kenneth D. Visser, Assistant Professor of Mechanical and Aeronautical Engineering, received the Society of Automotive Engineers (SAE) 2002 Ralph R. Teetor Educational Award, which links education and industry by offering young engineering educators opportunities to exchange views with practicing engineers. His research interests include the application of fundamental aerodynamics to the design of wind turbines for renewable power and the reduction of energy-wasting drag in large over-the-road trucks.

Dhaniyala joins CARES

Suresh Dhaniyala was recently hired in the Mechanical and Aeronautical engineering department to help support the CARES initiative. Following completion of his Ph.D. in mechanical engineering from the University of Minnesota, Dhaniyala most recently conducted research as a post-doctoral scholar in the chemical engineering department at California Institute of

Technology, Pasadena. At Caltech, he designed a novel aerosol/gas inlet for sampling of semi-volatiles from high-speed aircraft. At Clarkson, he plans to continue working on atmospheric aerosols, specifically conducting laboratory studies of particle nucleation and growth and designing and developing aerosol instrumentation for aerosol monitoring.

Twiss joins Biology Department

We are pleased to announce the appointment of **Dr. Michael R. Twiss** as an Assistant Professor in the Biology Department. Prof. Twiss, who earned his Ph.D. in Limnology

from the INRS-Eau, Université du Québec, Sciences de l'eau in 1996, performs research aimed at understanding the impact of microbes on the fate of nutritive and toxic metals in natural waters. His area of expertise is the Laurentian Great Lakes ecosystem and his research has received the Chandler-Misener award from the International Association for Great Lakes Research.

Rossner earns McGill doctorate

Our congratulations are extended to **Dr. Alan Rossner**, who received his Ph.D. degree in October

2002 from the Departments of Epidemiology and Biostatistics and Occupational Health, McGill University, Montreal, Canada. The title of his thesis was "The Development of a Novel Personal Air Sampling Canister for the Collection of Gases and Vapors." Rossner has been Director of

Clarkson's Environmental and Occupational Health program since 1995.

New Ph.D. and M.S. degrees in Environmental Science and Engineering

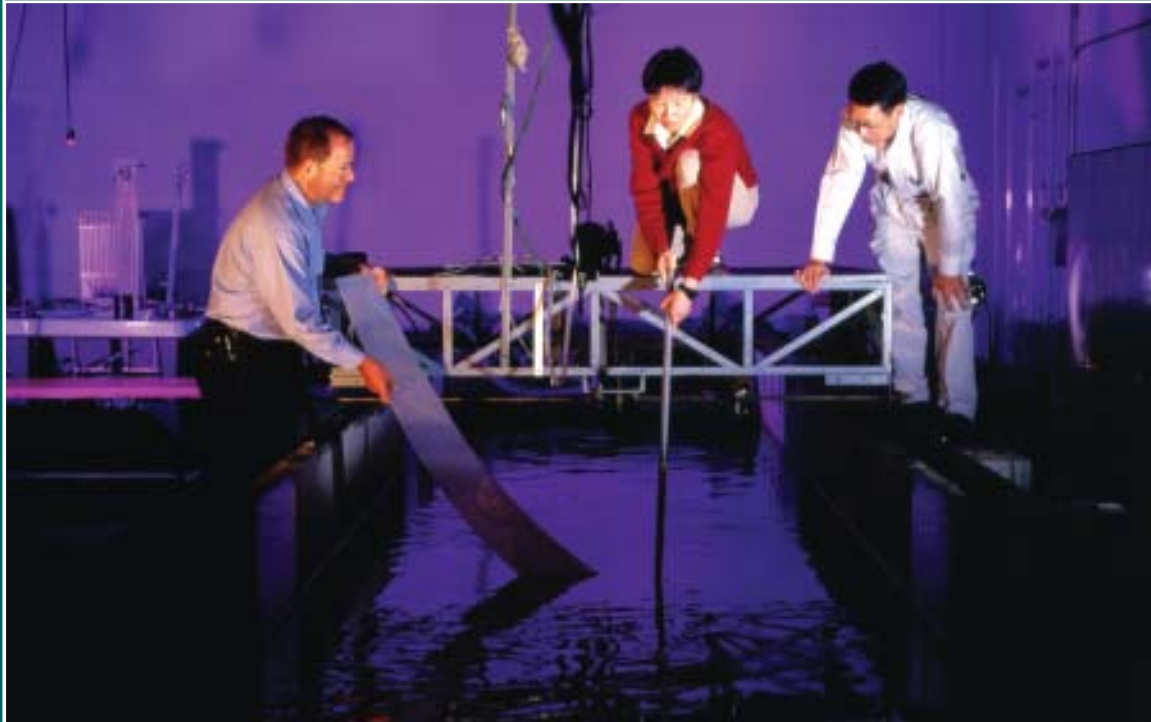
In October 2002 New York State approved a new Clarkson interdisciplinary Ph.D. program in Environmental Science and Engineering. An M.S. degree is pending. By allowing flexibility in required course work, these degrees improve opportunities for faculty from a number of departments to advise students interested in interdisciplinary research. These interdisciplinary degree programs will be administered through the Center for the Environment.

Shen appointed to International Joint Commission

Hung Tao Shen, Professor of Civil and Environmental Engineering, has been appointed to the Hydrology and Hydraulics Technical Work Group of the International Joint Commission's Lake Ontario-St. Lawrence River Study Board. The objective of the board is to evaluate the procedures and criteria used to regulate outflows of Lake Ontario and the management of the levels of the lake and St. Lawrence River. The group's responsibilities include developing hydrologic and hydraulic models of the Lake Ontario-St. Lawrence River System to enable simulation of levels, flows and other hydraulic conditions that would result from the application of various regulation plans given different hydrologic scenarios. Dr. Shen is also the editor of the *Journal of Cold Regions Engineering* of the American Society of Civil Engineering.



Prof. Kenneth Visser (r.) and graduate student Christopher Humiston are performing research aimed at increasing the efficiency of small wind turbines.



CLARKSON QUICK FACTS

Location — Potsdam, New York, in the foothills of the Adirondack Mountains near the St. Lawrence River

History — Founded in 1896 as a memorial to Thomas S. Clarkson, a pioneering businessman

President — Denny Brown

Provost — Anthony G. Collins

Campus — 640 acres, 49 buildings

Enrollment — 2,700 undergraduates, 350 graduate students from 40 states, 49 countries

Faculty — 168 full time

Schools — Business, Engineering, Liberal Arts, Science

Clarkson University does not discriminate on the basis of race, gender, color, creed, religion, national origin, age, disability, sexual orientation, veteran or marital status in provision of educational opportunity or employment opportunities and benefits.

Over the past two decades, Clarkson has emerged as one of North America's premier research institutions in cold regions engineering. Above, structural engineering and ice mechanics authority John Dempsey (l) discussing plastic simulation ice with Profs. Hayley Shen and Hung Tao Shen, who is the editor of the ASCE's *Journal of Cold Region's Engineering*. The research of Hayley Shen on pancake ice, shown at top near Antarctica and right at the U.S. Army's Cold Regions Engineering Laboratory in New Hampshire, is helping scientists better understand global climate changes.

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