IIHR–HYDROSCIENCE & ENGINEERING

IIHR Currents

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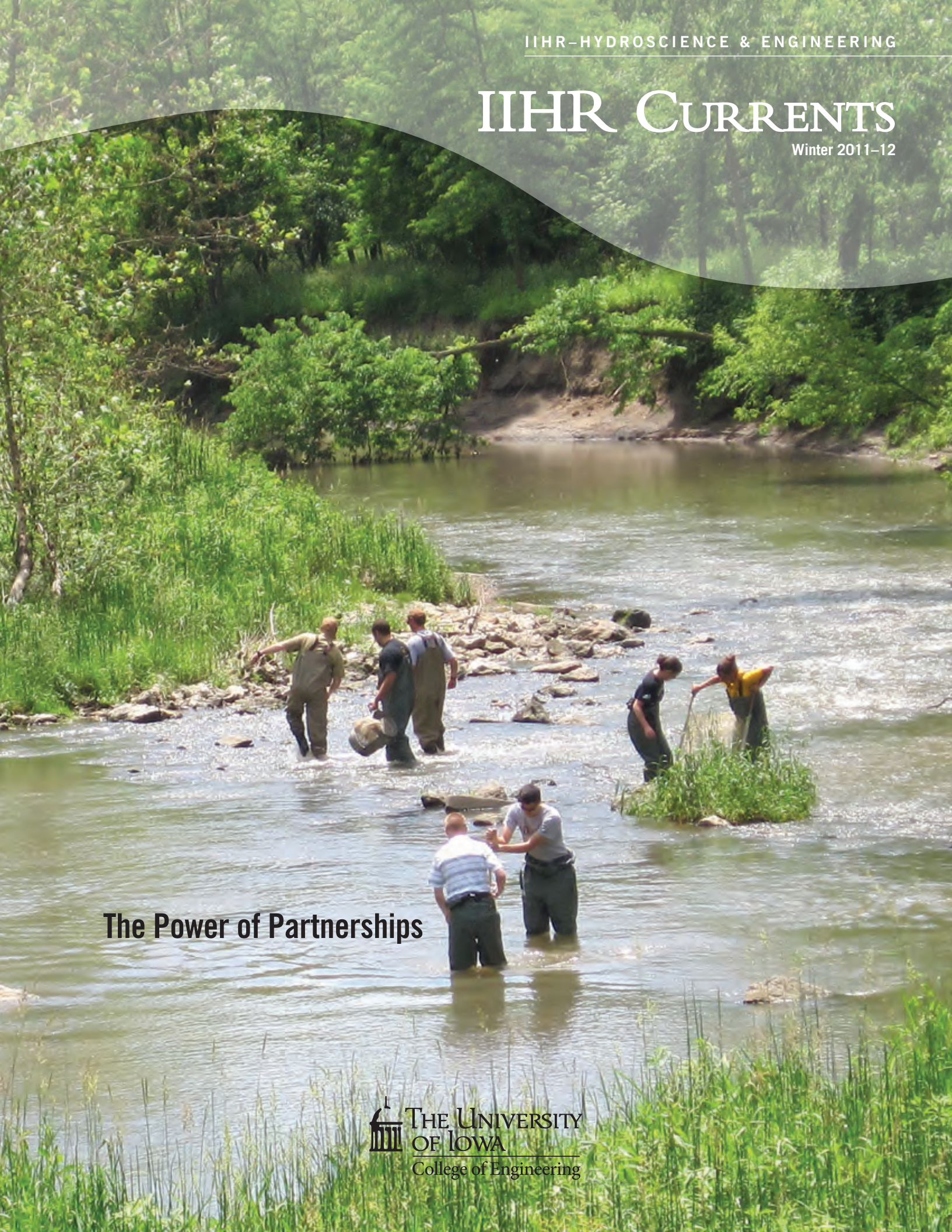

The Power of Partnerships

The University of Iowa
College of Engineering

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Students in IIHR's Water Quality class perform water testing at Pine Creek in Wildcat Den State Park. (Photo by Jacqueline Hartling Stolze)

Right:
The C. Maxwell Stanley Hydraulics Laboratory is the iconic home of IIHR—Hydroscience & Engineering.

Strength in Numbers: Partnerships at IIHR

When we work together, we get more done than we would working alone. This was true when I was in kindergarten, and it's still true today.

As we began the planning for this issue of *IIHR Currents*, we wanted to emphasize the many ways collaborations and partnerships help us build upon our strengths. As director of IIHR—Hydroscience & Engineering, I can see this playing out often in many different ways throughout the institute. Our partners can be found within IIHR and the university, but also outside academia in the realms of government, business, and nonprofits. Each of these partners brings something new and valuable to our efforts.

The magic of collaboration makes exciting new discoveries possible, and inspires new avenues of inquiry. Yes, there may be minor inconveniences when we work as part of an interdisciplinary team. But becoming familiar with a new subject area or learning the language of another discipline requires only a small effort, and the rewards can be fantastic.

Take for instance the case of the Water Sustainability Cluster Hire (page 17). In 2009, the University of Iowa established 10 new faculty positions to focus on water sustainability. These new faculty members represent widely varied backgrounds across the academic spectrum. IIHR has four new affiliates in the cluster hire. I hope you'll enjoy getting to know them through our *IIHR Currents* story and future pieces. The cluster hire includes professionals from fields such as engineering, the liberal arts, economics, law, and public health. Each faculty member provides his or her own unique viewpoint and expertise, rounding out this endeavor to address some of the world's most pressing issues.

PHOTO BY ANETA GOSKA

Of course, collaborations are nothing new at IIHR. Since the institute's earliest days, researchers have drawn upon the power of teamwork to advance the profession. Note, for example, IIHR Archivist Connie Mutel's piece about renowned IIHR Director Hunter Rouse and how his efforts stretched the institute's reach around the globe (page 12). His foundational work and international collaborations continue to draw researchers and students to IIHR to work with his successors. Important as those collaborative endeavors were, I believe partnerships are even more vital today, as IIHR seeks to grow and serve the citizens of Iowa and the world.

In particular, we are devoting ever more time to public service and the governmental sphere. With Iowa Flood Center Director Witold Krajewski, I have been working with our legislators and other elected representatives, serving as a resource to our state and to the nation. We hope to see this work bear fruit in the form of wise water policy and continued support for the Iowa Flood Center, and perhaps one day in a national flood center based here at the University of Iowa.

Partnerships like the ones in these pages give me inspiration and hope that we can, indeed, solve some of the "grand challenges for engineering" put forth by the National Academy of Engineers (**www.engineeringchallenges.org**). I believe partnerships across the disciplines offer the best hope for meeting the challenges facing our civilization. And best of all, our work continues to be rewarding and exciting, thanks in part to robust, productive collaboration.

Larry J. Weber
Director, IIHR—Hydroscience & Engineering
Professor, University of Iowa Department of Civil and Environmental Engineering
Edwin B. Green Chair in Hydraulics

Tracking the Breath of Life

Developing a Digital Lung

Ching-Long Lin loves his work.

The IIHR research engineer is a key player in a project to develop a digital model of the human lung. Lin, who is also a professor of mechanical and industrial engineering at the University of Iowa, has received three grants from the National Institutes of Health (NIH), including a four-year, $1.4 million grant in 2010 to help further his study of the interactions among pulmonary airflow, lung mechanics, and cell response. Lin serves as project director for the grant, which is supporting development of a digital human airway defense system.

Below: Mark Wilson provided invaluable expertise to the university's cluster computing efforts, Lin says. "Without him, this never would have happened."

Lin is engaged in a productive partnership with Dr. Eric A. Hoffman, a faculty member and researcher in radiology at University of Iowa Hospitals and Clinics. "It's turned out to be a good collaboration," Lin says. "I'm lucky to work with Dr. Hoffman."

Hoffman leads the Iowa Comprehensive Lung Imaging Center, which conducts computed tomography (CT) scans to study the structure and function relationship of the human lung. Scientists and physicians use CT images to evaluate distribution of air in and out of the lung for exchange with the blood. Hoffman has conducted hundreds of these scans, which Lin uses to develop a detailed geometrical model of the lung.

Helium

Lin's computational fluid dynamic (CFD) model simulates the flow of air through the lung. Until recently, the model was restricted to the trachea and one section of the lung, due to limits on computer processing. The complexity of the task is increased by the extreme variance in scale, which ranges from the biggest trachea to the microscopic level deep in the human airway. Lin's multiscale model can analyze more than 20 levels, or generations, of the human lung.

"It's really challenging," Lin says. "We are the only group that can do this."

A new parallel high-performance computing cluster at the University of Iowa, created by a partnership of researchers and IT professionals, is playing an important role in the digital lung project. In 2008, Lin received a $473,636 Shared Instrumentation Grant (SIG) from the NIH to support cardiopulmonary computing and imaging. Lin and 11 other UI researchers pooled their funds to purchase a high-performance computing cluster—known as Helium or "He"—to provide the computational power their research requires.

A 2011 UI grant doubled Helium's processing power. Helium harnesses the computational power of 3400 total cores, 10.6 TB of memory, and more than 500 TB of storage. Mark Wilson, director of research computing at IIHR, says researchers in many disciplines rely on Helium's high-performance computing tools and methods. "The cluster cuts run times dramatically," Wilson says.

Wilson credits Lin for bringing cluster computing to the university. "Ching-Long had a larger vision," he says. "Without him, this never would have happened." Lin, in turn, says it would have been almost impossible to build the cluster without Wilson's expertise. "He is really good."

The Physiome Project

Lin has also established a stereoscopic 3D visualization laboratory, enabling the analysis of large datasets on GPU-based workstations. He hopes to be able to present the results of his CFD work as 3D visualizations. "CFD scientific computation is one thing," he says. "Presenting your result in this very fascinating way is also important."

Before Lin joined the digital lung project, he conducted research using fluid mechanics and advanced CFD algorithms to study atmospheric boundary layer and two-phase flows. In 2004, Hoffman invited Lin to apply his knowledge of fluid mechanics and his expertise in high-performance computing to the human lung. "It is a very interesting area," Lin says.

The UI team's work is part of a worldwide initiative to understand the vast scale of human biology. Known as the "Physiome Project," Lin's digital lung is a crucial piece of this human puzzle.

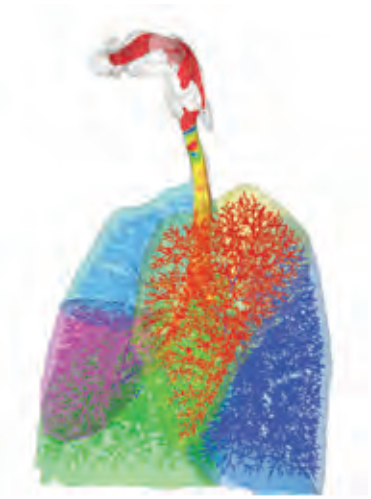
Can Work Be Fun?

For Lin, the work continues to be rewarding. "I enjoy it," he says. And that includes interacting with students. "I am lucky to get good students," he says. "I try to encourage their strengths."

Graduate student Shinjiro Miyawaki came to Iowa from Japan to study river hydrology, and found his way to Lin's digital lung team. Miyawaki's main role on the team is to simulate tissue motion in the lung through CFD modeling. "It's really exciting," Miyawaki says. He also appreciates the respectful way Lin listens to student ideas.

Lin says he tries hard to avoid putting too much pressure on his students. He hopes that they will find a profession, as he has, that keeps them motivated. "As long as they can get a job and be happy, that's all right," Lin says.

The digital lung project is a collaboration between the UI College of Engineering and the Roy J. and Lucille A. Carver College of Medicine. Lin's UI colleagues include Hoffman and Dr. David A. Stoltz, professor of internal medicine.



KNOWN AS THE "PHYSIOME PROJECT," LIN'S DIGITAL LUNG IS A CRUCIAL PIECE OF THIS HUMAN PUZZLE.

Above: IIHR Research Engineer Ching-Long Lin's work provides enhanced visualization of airflow through the lung.

Far left: Ching-Long Lin (center) and his graduate student team enjoy their work in the stereoscopic 3D visualization lab.

Left: Dr. Eric A. Hoffman, UI researcher and radiologist, is seen here in the CT working environment capturing data on an Egyptian mummy.

PHOTO BY MIKE STENERSON/UI PHOTO SERVICES

Water is Life

Partnerships for Iowa Watersheds

We all need and use water. This fact underlines the urgent need to understand and balance our many and varied water needs in a sustainable way.

A new project in the Iowa-Cedar Rivers Basin will do just that by promoting collaborative partnerships among stakeholders in the basin.

In 2009, the Iowa-Cedar Rivers Basin was named a part of the UNESCO-HELP program (United Nations Educational, Scientific, and Cultural Organization's Hydrology for the Environment, Life, and Policy). Later that year, the U.S. Army Corps of Engineers and the Iowa Department of Natural Resources (DNR) formed an interagency initiative, the Iowa-Cedar Watershed Interagency Coordination Team (ICWICT).

The UNESCO-HELP Basin is an integral part of ICWICT, fostering a new approach for water resources management by promoting a collaborative partnership among scientists, water resource managers, and water law and policy experts. ICWICT meets to reach consensus on important water-related issues in the basin that no one organization can solve alone, and to establish long-term strategies by combining resources and expertise.

The key ingredients of the new Iowa watershed initiatives are the integration of resources and expertise through stakeholder partnerships.

A Meeting of Minds

IIHR—Hydroscience & Engineering, which is home to the Iowa-Cedar UNESCO-HELP project, is just one of 20 entities involved in ICWICT, which includes academic organizations; NGOs; local authorities; federal, state, and county governments; and other stakeholders in the basin. This project fosters integrated water resources management, a new approach enabling a collaborative framework for stakeholders to work together on complicated water issues. The initial focus has been systemic flood damage reduction.

"Everything is about partnerships," explains IIHR Research Engineer Marian Muste, who is also the Iowa-Cedar UNESCO-HELP Basin coordinator. The main role of the UNESCO-HELP Basin is to bridge the gap between science and management. Among the activities sponsored by the UNESCO-HELP Basin are capacity building and training workshops designed to develop strong partnerships and share practical knowledge.

The key ingredients of the new initiatives are the integration of resources and expertise through stakeholder partnerships. Although it is a large and varied group, the team manages to avoid stalemate. "Working with diverse partners is incredibly challenging," says Jennifer Filipiak of The Nature Conservancy. "However, we are all motivated by a singular vision—a sustainable Cedar-Iowa River watershed." Jason Smith of the U.S. Army Corps of Engineers agrees, and adds that including many points of view is important. "I think it keeps the approach balanced," he says.

Public participation is also an important part of the process. "I believe the biggest opportunity for change lies in how the project seeks to engage the public in watershed management and planning," says Mary Beth Stevenson, a representative of the Iowa Department of Natural Resources who serves as Iowa-Cedar Rivers Basin coordinator.

Intelligent Digital Watershed

One of ICWICT's primary goals is to develop tools to help people make informed land use decisions that weigh the economic, environmental, and social aspects of their choices. One such tool is the "intelligent digital watershed," developed to support integrated and sustainable water resources management and a better understanding of human-natural system interactions through the use of advanced computer and communication technology (see story page 6). The best available hydrological, sociological, and economic data are used in this cyberinfrastructure-based system for monitoring, modeling, and forecasting within a watershed. The information is made available in a user-friendly and easily accessible system. "Giving land managers the opportunity to visualize the broad impact of decisions made locally could be a powerful agent of change," Stevenson explains.

Muste has been one of the drivers of the "cyberinfrastructure" efforts on campus since 2004, when he created a multidisciplinary research group in response to the National Science Foundation (NSF) cyberinfrastructure initiative. Muste and his colleagues were awarded NSF grants in 2006, 2008, and 2011, supporting cyberinfrastructure projects designed to understand and manage watersheds in an innovative way.

Filipiak believes ICWICT's work is critical. "Globally, our freshwater resources are imperiled. Humans need water in so many different ways, for so many different reasons … Water really is 'life.'" The HELP initiative is a global network including more than 90 HELP basins in about 70 countries. The Iowa HELP watershed is one of five in the United States, and the first in the Midwest. To learn more about the Iowa-Cedar Watershed Interagency Coordination Team, visit **http://iowacedarbasin.org/**.

Far left: IIHR Research Engineer Marian Muste on the banks of the Iowa River.

Left top: Jennifer Filipiak of The Nature Conservancy serves on the interagency initiative.

Left middle: Jason Smith represents the U.S. Army Corps of Engineers in the interagency initiative.

Left below: Mary Beth Stevenson of the Iowa Department of Natural Resources serves as Iowa-Cedar Rivers Basin coordinator.

A Flood of Information

The Intelligent Digital Watershed

People make decisions based on information at hand.

Armed with better information, would Iowans make better land-use choices affecting water quality?

That is the hope of the IIHR researchers who are developing the "Intelligent Digital Watershed" (IDW), but the verdict is still out, says IIHR Research Engineer Jerry Schnoor, the project's principal investigator. Schnoor, who is also the Allen S. Henry Chair in Engineering, is leading research to improve water pollution monitoring, supported by a three-year National Science Foundation grant of almost $1 million.

"We are trying to provide farmers with better information on the effects of their decisions on water quality and their income."

Jerry Schoor, IIHR research engineer

What, exactly, is an intelligent digital watershed? "It's an end-to-end system for the monitoring, modeling, and prediction of water and water quality within a watershed," Schnoor explains. The IDW is an electronic representation of the watershed as captured by data, with a series of interconnected numerical models. The IDW can simulate different scenarios in the watershed with regard to land-use choices, weather, commodity prices, and more. It includes surface waters, groundwater, snowpack, and soil water.

The computing power needed for this system of linked models is formidable. The IDW uses the latest technology in sensors, wireless and broadband communication, and high-performance computing.

"It is intelligent because the system can learn as it processes greater and greater amounts of digital information—or hydroinformatics—in real time," Schnoor says.

The Human Factor

Schnoor and his team built a local watershed observatory at Clear Creek near Amana, Iowa. Their observatory takes into account the human interactions with the watershed, and how the decisions people make can affect water quality. Schnoor calls it an "agent-based model," or ABM. "We have linked so-called 'agent-based models' with water quality and agricultural crop-growth models," he explains. "'Agents' in this case are the farmers and landowners who make decisions that affect water quality, such as which crops to plant, how much fertilizer to apply, and how to till the soil."

The team, which includes IIHR Research Engineer Marian Muste, surveyed farmers and landowners in the Clear Creek Watershed to gather their opinions and to develop a model that makes decisions much as its human counterparts would, based on economic issues and environmental values. "We hooked the water-quality model to the ABM model," Schnoor says, "so that farmers' decisions are used to set the land management practices in the water-quality model."

Better Data = Smarter Choices

Schnoor hopes that the IDW will provide useful feedback to landowners, who will have more accurate information on the results of their land-use choices. Besides the income from their crop, they will see soil loss due to erosion, effects on water quality due to runoff, and more.

"The beauty of our project and philosophy is that we share all information with everyone via the Internet," Schnoor explains. "As we share the results with real farmers, they too could learn and may change their decisions on how to run their farms for better income and agricultural production, as well as for environmental conservation of soil and water."

Learning from Each Other

IIHR graduate student Sudipta Mishra played an important role in building the intelligent digital watershed. Mishra, who is from India, says the work builds on his previous experience in the hydrological processes in agriculturally dominated watersheds. "We try to understand the links between shifts in land use, soil conservation practices, and the resulting water quantity and quality," Mishra explains.

He appreciates the multidisciplinary approach the project requires. "Working with people from other disciplines, ranging from economics to social science and computer science, is really exciting. Understanding their perspectives is often challenging, too."

Mishra adds, "I have learned many valuable lessons on how to work in a multidisciplinary team through this work."

Collaborator Andrew Kusiak, professor of mechanical and industrial engineering, leads the UI Intelligent Systems Laboratory. His team has been able to make use of the data assembled for the intelligent digital watershed project using data mining techniques. "Collaboration is worth the minor inconveniences of getting familiar with a new research domain that could produce immeasurable benefits," Kusiak says. "Collaboration is a discovery enabler and a research progress accelerator."

Learning from each other is one of the key concepts underpinning this effort. Schnoor hopes that the intelligent digital watershed helps us understand the balance between economic and environmental goals in a truly useful way.

"That is our goal," he says. "People make decisions based on information. We are trying to provide farmers with better information on the effects of their decisions on water quality and their income. Using this information, they may choose to modify their behavior, depending on how they value the trade-offs."

Above: UI Professor of Engineering Andrew Kusiak believes the benefits of collaboration are worth the extra effort.

Left: IIHR Research Engineer Jerry Schnoor (left) and grad student Sudipta Mishra diagram the intelligent digital watershed.

Global Problem . . .
Local Action

Science and policy can and should work together

as partners, not adversaries, says IIHR Research Engineer Thanos Papanicolaou.

"We need our science to be in place and well developed in order to foster educated policy-making," Papanicolaou says. "Science and policy should have a symbiotic relationship, rather than an antagonistic one."

IIHR Assistant Research Engineer Charlie Stanier says that collaboration often generates innovative new ideas.

Papanicolaou, who is also the Robert and Virginia Wheeler Faculty Fellow in Engineering, leads a research team that is learning more about the ramifications of intensified row-crop agriculture on soil erosion and the carbon cycle in Iowa. Last year, the team was awarded a three-year $642,000 grant from NASA to study the exchange of carbon between the soil and the atmosphere, the impact farming practices have on the carbon cycle, and the potential environmental effects for the Midwest and the world.

The Carbon Cycle

The researchers' primary focus is to measure how much carbon is stored in the soil and how much is emitted back into the atmosphere in the form of CO_2. "The carbon cycle is an exchange of carbon between the atmosphere, biosphere, and landscapes," Papanicolaou explains. "Carbon is exchanged through these domains due to different natural and human activities. One of these is cultivation."

As grain prices have risen sharply over the past five years, farmers have dedicated more and more farmland to row crops. "With more acreage under cultivation, there exists the potential for further soil degradation through tillage-induced erosion and soil loss, not to mention elevated carbon dioxide emissions from the soil and downstream water quality issues," Papanicolaou says. "These changes cannot go unchecked." He hopes the research can be helpful in developing sound, scientifically verified management strategies.

Researchers also hope to educate stakeholders about the benefits of carbon storage in the soil, and to create incentives to encourage the practices that make it possible. In addition, they are providing data on carbon emissions due to erosion for use in NASA's computer modeling efforts.

Papanicolaou says land use practices in agriculture have an impact not only on carbon cycle dynamics, but also on climate change. "For instance," he says, "More precipitation—more soil saturation—affects the rate at which carbon is sequestered, that is, kept in the ground. Eventually, what we want is to keep all organic matter, including [its] carbon, in the soil."

Iowa is in a position to take real leadership in this area, Papanicolaou says. He believes the state can potentially reduce greenhouse gas emissions statewide substantially by adopting conservation tillage practices.

What's In It for the Farmer?

"It's one thing to say to a farmer that you should do this, but are there any benefits for the farmer besides being a good land steward?" asks graduate student Ken Wacha, who grew up on a farm himself. He explains that their work could help facilitate the development of a carbon credit program, in which carbon stored within the soil could be quantified as "credits" that could be traded on a free market.

There are other benefits for farmers. "The more effective our practices are, the better," Papanicolaou explains. "We minimize the application of fertilizers, and that means we reduce the cost for farming, which is attractive … not only for the producers, but also for the consumers." Decreased fertilizer use is also a plus for the environment. "It's a win-win situation," he says.

Papanicolaou's research team is conducting field studies of soil carbon sequestration under different land uses and crop rotations. They use rainfall simulators to mimic precipitation. A collection system gathers the water and the soil. Next, the team conducts a soil analysis to determine the amount of organic carbon in the soil and how it is affected by erosion.

The experiments allow the team members to understand erosion and the carbon cycle at the

IIHR Research Engineer Thanos Papanicolaou (left) works with team members Chris Wilson and Ben Abban at a fieldwork site near Williamsburg, Iowa.

small scale, but for policy-makers, it's important to understand the entire system, says graduate student Dimitrios Dermisis. "You need to see the whole picture from a different point of view," he explains.

A Team Effort

UI engineering professors Charles Stanier (IIHR assistant research engineer) and Greg Carmichael (Karl Kammermeyer Professor of Chemical and Biochemical Engineering) are conducting simulated atmospheric carbon dioxide and isotope analyses to obtain carbon dioxide fluxes under different hydrologic and crop scenarios. Their goals are to develop a combined view of carbon cycle, including the soil, agricultural carbon, and atmospheric carbon; and also to develop a modeling tool to estimate atmospheric carbon transfers in the Midwest.

Stanier says he values the collaborations with Papanicolaou and the rest of the team. "It would be a rare scientist who could operate without collaboration, because it gives you new ideas," he explains.

It's a beneficial experience for the graduate students on the team as well. "We've all worked together very tightly," says Wacha. "It's laid-back and creative."

Papanicolaou says he hopes this collaboration will create a foundation on which to build future research capabilities in the Midwest, with the goal of developing a program of national stature to study carbon cycles in intensive agricultural systems.

He believes that by working together with farmers, agribusiness, and policy-makers, researchers can make a true environmental difference, not only for Iowa, but also for the region and even the planet. "Carbon cycling is a global problem, which can thankfully be solved locally," Papanicolaou says.

LACMRERS
In Good Company

Every day seems to bring a flood of negative environmental news. The problems are so complex, they often seem beyond the scope of what one person can address.

Top: USGS Research Ecologist Jeff Houser worked out of the Stanley Hydraulics Lab (home to IIHR) in 2009–10, which facilitated his collaborations with IIHR researchers.

Above: As a graduate student, Tom Smith was part of a team that worked to develop hydrodynamic models of the Mississippi River.

Right: LACMRERS Director Doug Schnoebelen (right) shows students Oscar Hernandez (left) and Brice Stafne a sediment core extracted from the riverbed of the Mississippi.

As director of LACMRERS (the Lucille A. Carver Mississippi Riverside Environmental Research Station), Doug Schnoebelen knows exactly how challenging the problems can be. He doesn't let that stop him, though, and in fact, he believes he knows the key: collaboration.

"There's a real desire for people to do the right thing," Schnoebelen explains. He thinks LACMRERS can bring people together to form partnerships to benefit the river. "The problems are so difficult," Schnoebelen says. "It takes a collaboration to make things work."

Understanding the Mississippi

Schnoebelen is building LACMRERS into a place where scientists, government agencies, nonprofits, communities, academics, and others who care about the river can meet and find common ground to make positive changes (see sidebar). "The beauty of LACMRERS is that we're in a position to engage all these people," he says.

LACMRERS was created in 2002 to support research and educational activities related to the Mississippi River and other large river systems. It is the first university-owned research and education center on the Upper Mississippi River, and it is operated by the University of Iowa College of Engineering's IIHR—Hydroscience & Engineering. More than $2 million in financial support from the Roy J. Carver Charitable Trust made LACMRERS possible; the research station was named to honor Lucille A. Carver.

In the last year, research at LACMRERS has grown exponentially. Current studies are focusing on mussel propagation, real-time water quality, the fate and transport of sediments, and hydrodynamic modeling of large river systems, linking computational fluid dynamics models with water quality. Collaborative work at LACMRERS involving colleagues in other academic disciplines at the university is taking off too, in areas such as geoscience, engineering, and geography. Collaboration is crucial to all these projects, Schnoebelen says, though sometimes it's hard to get people from different disciplines talking.

"It's kind of like herding cats *and* dogs," he laughs. But when collaboration happens, the results can be phenomenal.

Learning from the River

As an engineering graduate student, Tom Smith worked with the LACMRERS/IIHR modeling team, the U.S. Geological Survey (USGS), and the U.S. Army Corps of Engineers (USACE) to help develop hydrodynamic models of the Mississippi River, using fundamental physics-

[Doug] Schnoebelen believes the university is in a unique position to help bring about successful partnerships.

based equations to simulate the river's geography and geometry. Smith, who recently earned an M.S. degree, completed a model for Pool 8 and also supplied data to researchers at the University of Illinois for their ecological model. "Working with all the partners was great and really helped improve my team-building and production skills," Smith says.

Jeff Houser of the USGS serves as the water quality specialist for the Long Term Resource Monitoring Program (LTRMP), which funded the work. LTRMP is funded by the USACE, with scientific administration and coordination by the USGS. "I worked with the engineers to help provide some perspective on how the model output might be beneficial to river managers and ecologists," Houser says. "We have already learned a lot about the hydrology of Navigation Pool 8 from the output it has generated.

"The enthusiasm and skills of Doug, Nate [Young], Tom, and colleagues made establishing working partnerships pretty easy," he adds.

Users can run various scenarios through the Pool 8 hydrodynamic model to see what would happen under different circumstances. For example, the model could be used to determine the best sites for rebuilding some of the islands that were lost when the lock and dam system was built on the Mississippi in the 1930s. The islands provide important backwater habitat for wildlife, but Schnoebelen says it's crucial to put them in the right place to avoid creating more problems.

For Smith, it's rewarding to see the model in action. "Finally seeing the model producing results and [then] using those results to formulate ideas and solutions was exciting," he says. "This gave me a chance to use my engineering skills to help make a small difference, aiding river managers and biologists in restoring the environment."

Bridging the Gap

Schnoebelen believes the university is in a unique position to help bring about successful partnerships like these. "We can move very quickly when we need to," he explains. "But our biggest asset is our students."

Students approach a problem with a fresh outlook and none of the baggage or cynicism that experience can bring. "Students are always thinking outside the box, because they don't know what the box is!" Schnoebelen explains.

With years of experience in a government agency himself, Schnoebelen knows exactly what challenges his agency colleagues are facing, and he knows how LACMRERS can help bridge the gap.

"It's a balancing act," Schnoebelen says. "I think the really important thing is to listen."

He's is an optimist when it comes to LACMRERS and what it can achieve. "I'm really proud," he says. "I think we are beginning to be able to answer some of those difficult questions."

Partnerships at LACMRERS

Researchers at LACMRERS collaborate frequently with colleagues within the university, as well as government and nonprofit organizations. The following list provides a sample, but not a complete list, of these partners.

- City of Muscatine
- Iowa Department of Natural Resources
- Living Lands and Waters
- Muscatine Public Schools
- Muscatine Rotary Club
- State Hygienic Lab at the UI
- The Nature Conservancy
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- UI Departments of Geoscience, Geography, and Engineering
- UNI Education and Outreach for Science Teachers

Intellectual Connections Ar

TODAY, CHALLENGES SUCH AS CLIMATE CHANGE AND THE FAILURE OF ENGINEERING, AND BROADER ENVIRONMENTAL PROBLEMS, DO NOT

According to his wife, Hunter Rouse spent half his time away from home due to national and international business travel when his career was at its busiest. By 1967, shortly after he became dean of the University of Iowa's College of Engineering, his mother calculated that he had traveled half a million miles by air—the equivalent of 20 circles of the globe. Rouse's many trips were conceived with a broad goal in mind: promoting engineering hydraulics education and research, and establishing intellectual connections with colleagues and students around the world.

Of course, Rouse was not the first to connect IIHR to people and agencies beyond the university's walls. Indeed, partnerships have defined the Hydraulics Lab since the 1920s, when founding Director Floyd Nagler joined with the U.S. Department of Agriculture to develop functional culverts, bridge piers, and other practical structures. Nagler also affiliated the institute with the U.S. Army Corps of Engineers to survey and investigate utilization of the Upper Mississippi River and its Iowa tributaries.

A Statesman for Hydraulics

But it was Rouse who extended IIHR's connections into the international realm and pushed them to the extreme. He became well known for tirelessly fostering international exchanges of personnel, information, and goodwill. His love of travel and fascination with foreign cultures took him to Istanbul and Singapore, Bora Bora and Leningrad, and points beyond.

Believing that such travels boosted world understanding and stability, he encouraged international experiences among IIHR's staff. In the early 1960s, Rouse became one of five Americans to participate in a U.S. State Department–arranged exchange of American and Soviet hydraulics directors — an exchange that he had conceived. In 1974, he joined the first group of engineers to tour the People's Republic of China. A widely sought consultant and lecturer, he relished international conferences and projects, he examined research laboratories around the world, and he enjoyed being a world statesman for hydraulics.

Spreading the Gospel of Hydraulics

International travels brought foreign students flowing into "Rouse's Hydraulics Lab," many seeking mentorship by "the master" and then carrying his expertise back to their countries of origin, where they shared it with their own students. Once established in careers, these students asked Rouse to return and lecture at their universities. "Of course!" he would say, using his visits abroad as opportunities to strengthen existing professional bonds while recruiting new international students.

Soon Rouse was boasting that half of IIHR's graduate students came from nations other than the United States – a total of 43 other nations by 1970. Even today, former students returning to visit the "IIHR family" recount stories about Rouse's courses—the most demanding of their graduate years, they say, but also the most useful and profound, the classes that stretched them the most.

And what about students who couldn't travel to the United States? How would they learn to apply the fundamentals of fluid mechanics to hydraulic engineering problem-solving? Those who were able asked Rouse to design laboratories for their own universities. Would he provide plans for schools in Columbia? Perhaps for those in Venezuela and the Philippines? "Yes," he replied, drawing the preliminary designs himself and then supervising members of the IIHR shop staff as they constructed the necessary equipment. For those who could not afford such luxuries, Rouse wrote textbooks that expanded the fluids mechanics curriculum in the United States and many other countries, and he produced movies that he narrated himself, films that demonstrated with remarkable lucidity the important physical processes of water's flow. Those movies, now about a half-century old, are still occasionally used in classrooms (the films are also available on the IIHR website: **www.iihr.uiowa.edu/research/publications-and-media/films-by-hunter-rouse**).

ound the Globe

WATER SUPPLIES THROUGHOUT THE WORLD INCREASINGLY REMIND US THAT HYDRAULIC
RECOGNIZE POLITICAL BOUNDARIES.

No Rest for Rouse

Even after Rouse retired and retreated to the sunshine of Arizona to focus on his hobby of gemstones, the requests continued: would he come to South America? Taiwan? Mainland China? What about Australia? Rouse answered yes to all, lecturing abroad until his urge to travel quieted as he approached the age of 80, in the mid-1980s.

Hunter Rouse (who died in 1996 at 90) left Iowa for Arizona nearly 35 years ago, but his legacy lives on. IIHR continues to welcome graduate students from other nations—60 in 2011 alone, 57 percent of IIHR's total student body, representing 18 countries. But now the formal educational exchange goes both ways.

One year after Rouse died, IIHR initiated its International Perspectives in Water Resources Science and Management short-course, which takes 12–20 students abroad for two to three weeks to focus on multiple aspects of water resources elsewhere. To date, courses have traveled to China, Taiwan/Japan, Turkey, Egypt, Eastern and Western Europe, and Argentina, with a repeat visit to India in 2011–12. Rouse would have heartily endorsed this program.

In addition, IIHR scholars regularly travel abroad to lecture and consult with colleagues in other nations. They work with UNESCO to share flood-related research information around the world, and they teach in various venues — for example, training scientists in other nations in advanced methods of monitoring rivers and processing data for river flows. And IIHR continues to share expertise in developing practical structures through projects such as helping design dropshaft systems to carry storm or sewer water to underground chambers in Abu Dhabi, London, and Toronto (see story, page 23).

Today, challenges such as climate change and the failure of water supplies throughout the world increasingly remind us that hydraulic engineering, and broader environmental problems, do not recognize political boundaries. Put another way, we all — regardless of nationality or location — must respond within a global setting. Thus we need a union of people, organizations, and problem-solving approaches unlike any seen before — a forming of new and more comprehensive partnerships around the world. With nearly 100 years of international experience, and with the model provided by Rouse and other past leaders, IIHR is well suited to rise to the call.

By Connie Mutel

Above: Hunter Rouse (center) traveled the globe to share his passion for hydraulics.

Left: IIHR Researcher John S. McNown with students representing more than 10 different countries. They are clustered around the institute's air speed measurement tunnel.

Mapping the Future: The Iowa Floodplain Mapping Project

Accurate scientific information will be one of Iowa's best defenses against future floods, says IIHR Associate Research Engineer Nathan Young.

He is leading an effort to update floodplain maps for 85 of Iowa's 99 counties. Young, who is also associate director of the Iowa Flood Center (IFC), says that the new floodplain maps provide a direct and easy-to-understand way to communicate flood risk to Iowans.

The IFC, located at the University of Iowa's IIHR—Hydroscience & Engineering, is about one year into the four-year Iowa Floodplain Mapping Project, funded with $10 million from the U.S. Department of Housing and Urban Development. Working closely with the Iowa Department of Natural Resources (DNR), the IFC will develop floodplain maps for the Iowa counties that were declared federal disaster areas after the 2008 floods. Some or all of the maps will eventually be adopted by the Federal Emergency Management Agency (FEMA) as regulatory maps.

"We're excited to partner with the DNR on this important statewide project," Young says. "These maps will provide Iowans with new information concerning flood risk in their own communities, so they are empowered to make informed land use and land management decisions."

DNR Floodplain Mapping Coordinator Scott Ralston agrees. "We look forward to delivering quality flood hazard data to Iowans to increase public awareness and help protect life and property into the future."

A Herculean Task

The scope of the project is huge. IFC researchers are mapping all streams draining one square mile or more. To accomplish this, they rely heavily on statewide LiDAR (laser radar) data recently collected by the DNR. LiDAR is a remote-sensing technology that researchers use to develop digital elevation models of the land surface. The availability of LiDAR was a major reason mapping funds were allocated to the state, Young says. "LiDAR data allow for more precise delineation of floodplain boundaries." With these data, the team will be able to describe Iowa's river and stream networks, develop computer-based flood simulations, and delineate floodplains with reasonable accuracy.

The project involves digitizing the state's stream network, performing hydraulic and hydrologic analyses, and using

Left: Iowa Flood Center Associate Director Nate Young (left) and graduate student Nick Thomas overlook the Iowa River—just one of the thousands of Iowa rivers and streams that are part of the Iowa Floodplain Mapping Project.

Right: A preliminary floodplain map of Kalona, Iowa, (not yet approved by FEMA) prepared by research engineers and students at the Iowa Flood Center.

the results to create maps. After a successful pilot project in Poweshiek County, the team turned to the statewide effort. The extent of the project requires the development of innovative, efficient new floodplain mapping tools, and the new data products will offer value beyond the mapping projects.

"Scaling the project up to the entire state and developing and managing such a large volume of data is daunting," Young says. "We have hired a large number of engineers, GIS staff, and students dedicated specifically to the project. Our partnership with the DNR has also been a great help in that regard."

"It has been rewarding to utilize the technical expertise of the IFC in the areas of hydrology, river hydraulics, and state-of-the-art GIS technology," Ralston says. "The task ahead—to provide state-of-the-art floodplain mapping for Iowa—is daunting and challenging. … But we are confident that our partnership with the IFC will be successful."

A Great Place to Be

University of Iowa students, too, will benefit. Their work is essential to the project, and they will take away tremendous practical applied engineering experience. Graduate student Nick Thomas came to Iowa with an undergraduate engineering degree from the University of Minnesota in the fall of 2010, just in time to get in on the start of the floodplain mapping project.

Thomas believes this experience will serve him well no matter where his career leads. "No matter what I do, this knowledge will be useful," he says. "As a student, the flood center is a great place to be. Flooding is a problem for many people, and as part of a community of researchers all working toward a common goal through different means, it can be very exciting."

He adds, "The flood center is creating great tools and technologies to better study and mitigate flood devastation, so yes, I do feel that it is important."

When the maps are complete, Young says, they will guide floodplain regulation and management. Iowans will be able to access them on the Internet to better understand and identify their flood risks.

This project is exactly the kind of public service the Iowa Flood Center was established to provide, Young says. "This is an excellent opportunity for us to produce research that will benefit of the people of Iowa."

Complicated Waters: Kalona Floodplain Mapping

On June 15, 2010, the city of Kalona, Iowa, was soaked with more than two inches of rain in about an hour. Flash flooding from a nearby drainage ditch forced the evacuation of a mobile home park, where residents found themselves suddenly knee-deep in water.

The floodwaters receded quickly, and, compared to other recent floods in Iowa, this event could be considered minor. But Kalona is facing flooding issues that are actually quite complex. For almost a year, the city has been working to understand and modify a proposed floodplain map of the community presented by FEMA, the Federal Emergency Management Agency. The FEMA maps, which delineate the 100-year-floodplain (areas with a 1 percent chance of flooding each year, independent of previous years), would cost Kalona property owners almost $1 million in annual flood insurance premiums.

After the FEMA maps were released in 2010, the Kalona City Council asked the Iowa Flood Center (IFC) to help evaluate the maps. Established after the 2008 floods, the IFC offers a central resource of flood information and research. IIHR Director Larry Weber and IFC Associate Director Nathan Young met with the Kalona City Council several times over the ensuing 18 months to explain the floodplain mapping methodology and discuss refinements to the Kalona map.

The IFC team studied the methods used to create the maps and reran the models. In September, Weber presented the results of IFC's own 2D modeling of the area. The map looked quite a bit different than the FEMA original. Using LiDAR (laser radar) data to develop a digital elevation model, the IFC team modeled the geometry of the river and creek beds, as well as the surrounding area. Using the new map, Kalona's flood insurance tab would be cut almost in half.

"This is a more advanced engineering approach," Weber explains. "And it's more appropriate."

The new maps will undergo another round of revisions when the IFC team applies a major precipitation event to the model. This added layer of complexity will better show where the true risk is, Weber explains. "We want to be able to provide the best possible map."

The services of the Iowa Flood Center have been crucial to Kalona as the town finds its way through a complicated and costly situation, says City Administrator Ryan Schlabaugh. "The goal is to have the most accurate map possible," he says, "and the Iowa Flood Center is helping us do that."

Weber says that by working through this process with Kalona, the IFC has learned important lessons that can be applied elsewhere. IFC researchers are in the midst of a four-year Iowa Floodplain Mapping Project (see story page 14).

To complement the Kalona mapping project, five undergraduate engineering students are also working on a floodwater management plan for Kalona, suggesting flood mitigation projects, such as rainwater storage structures and buffer strips.

Although the process has by no means been a simple one for Kalona, the community is in effect leading the way through complicated waters.

Taming Total Dissolved Gas in Hells Canyon

Above: Associate Research Engineer Marcela Politano (left) and students Antonio Arenas Amado and Michael Carbone are part of a long-term research effort at IIHR to develop a reliable numerical model to predict total dissolved gas in tailraces.

Below: Gas transfer processes downstream of a spillway.

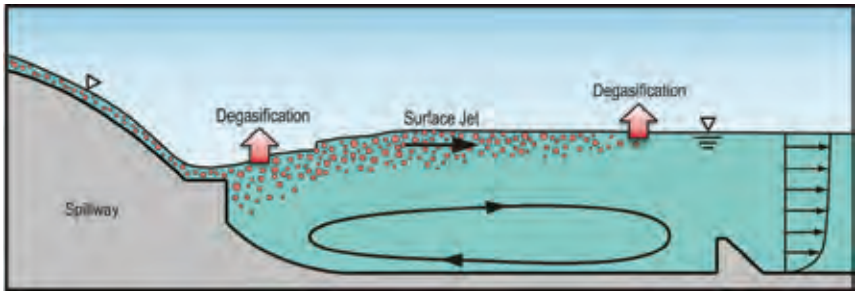
When a human diver comes to the surface from deep water too fast, the change in water pressure can cause a painful and sometimes fatal condition known as the bends. A similar condition, gas bubble disease, can harm or kill migrating fish as they pass through large hydroelectric dams.

Marcela Politano, an IIHR associate research engineer, is conducting research that contributes to systems that help fish pass safely through these dams. A native of Argentina, Politano is also an adjunct assistant professor of civil and environmental engineering at the University of Iowa.

Preserving Water Quality

Politano is leading an IIHR research team working with the Idaho Power Company, which operates hydroelectric dams on the Columbia and Snake rivers. These two rivers are among the largest sources of hydropower in the United States. "Hydropower is the most important renewable source of energy," Politano says. Hydroelectric power does not produce greenhouse gas emissions; the electricity is generally available as needed; and the reservoirs can be used for numerous purposes, including recreation.

But hydroelectric power can have negative impacts as well. "Hydroelectric projects have altered the natural habitat," Politano says. One environmental concern is total dissolved gas (TDG), or the amount of gas present in water. Elevated TDG can occur immediately downstream of the dam—known as the tailrace—and farther downriver. Elevated TDG harms many aquatic species, including salmon. Fish exposed to water with elevated TDG can develop gas bubble disease.



Recent work on the Hells Canyon Dam is designed to help the utility company meet state and federal regulations for water quality standards, including TDG.

Modeling TDG

Politano's research focuses on numerical modeling of TDG. Water flowing over a dam can become supersaturated with gas as the water plunges to extreme depths below the dam. "The severity of the effect depends on the level of TDG and exposure time," she explains.

Politano developed the first two-phase numerical model to represent the complex physics of a dam's tailrace. Her model can also evaluate technologies designed to reduce TDG and protect fish. For instance, spillway flow deflectors designed at IIHR redirect spill water to form a surface jet that prevents bubbles deep in the tailrace. The numerical model allows testing of these technologies before construction begins.

Graduate students Antonio Arenas Amado and Michael Carbone contribute to many aspects of the project. Arenas says he has learned about teamwork from the research. "This project was characterized by constant interaction with the sponsor," he says. He also jointly wrote several reports and a conference paper on the Hells Canyon Dam TDG simulations with Politano and Kelvin Anderson of Idaho Power. They presented their work at the 34th IAHR World Congress.

Politano's work is part of a long-term IIHR effort to develop a reliable numerical model to predict TDG in tailraces, complementing experimental studies. "Numerical simulations are becoming an indispensable tool," Politano says.

It Takes a Village: Water Sustainability

Engineers are typically can-do people, used to solving problems and getting things done. But some problems are so difficult, they require a multidisciplinary approach. The University of Iowa's cluster hire in water sustainability is designed to address one complex issue that affects every man, woman, and child on the planet: access to clean water. In 2009, the university announced it would create 10 new faculty positions to advance research, education, and outreach on water sustainability.

The new faculty members span the disciplines, from engineering and economics to law and communication. Four IIHR affiliates are part of the cluster: David Cwiertny, assistant professor of civil and environmental engineering (CEE); Craig Just, assistant professor of CEE; Eric Tate, assistant professor of geography; and Adam Ward, assistant professor of geoscience.

An H2O Revolution

Why does a water sustainability focus make sense at Iowa? The cluster hire builds on the university's established strength in this area, including IIHR and the Iowa Flood Center. And compared to many drought-stricken areas of the country, Iowa is blessed with an adequate (and sometimes excessive) supply of water.

Water issues also present the perfect combination of complexity and global scale for a multidisciplinary group effort such as this. The cluster hire approach makes many new and fruitful avenues of study possible, says Ward. "The cluster allows me to consider problems I would never have been able to address on my own," he says. "Understanding the broad context for my research enables me to more completely address society's problems."

Iowans put their water to work in many ways: for transportation, for irrigation, for drinking water, for recreation, and recently, for ethanol production. But even a water-rich state like Iowa can stretch resources too thin. Tate says it's important to consider water sustainability now, rather than wait for a serious problem to develop. "As a critical resource that touches so many aspects of our society, it makes sense to address the sustainability of water resources in a multidisciplinary manner."

Iowa is also ripe for change. The severe floods of the last 20 years have created a population eager to learn how to better manage water resources, says Cwiertny. "You have a community now that's going to be receptive, I think, and acutely aware of how water impacts them."

Cluster Power

How does a collaboration between 10 academics from very different fields work in the real world? Although the cluster is just getting started, so far, it's working very well. IIHR Research Engineer Jerry Schnoor, the group's mentor/leader, has organized regular water sustainability seminars, with a different cluster member presenting his or her work at each meeting. "We get to know each other, understand our complicated research interests, look for the synergies, and look for the opportunities we can pursue together," says Cwiertny. He's organizing more casual get-togethers, too, so they can also talk under relaxed circumstances.

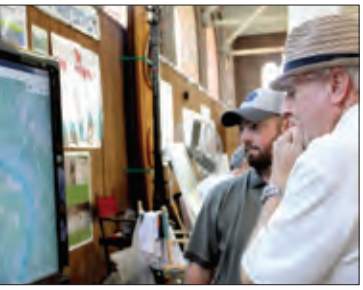
Cwiertny is especially glad to see communication and policy experts among the cluster's members. "The ability to communicate is going to be really important," he says. "We can develop the best technologies and engineering strategies, but they don't get very far until it can be implemented as smart policy that people can support and buy into." And change their behavior, adds Just. He believes sustainability is a behavioral issue rather than simply a resource or knowledge issue. "Changing behavior in the modern media world requires savvy communication. … The research has to be brought to life in communities through engagement and communication."

And clustering can be fun. For a native Californian like Cwiertny, it was a no-brainer to leave sunny California for Iowa and this professional opportunity. "I really do believe that we're doing good things and important things," he says. "Plus, your job has to be fun. I will tell you—I'm having great fun in the time I've been here at Iowa!"

"I get to learn new things all the time when I interact with people from other disciplines," Just says. He adds that learning to speak the languages of colleagues from other disciplines (all English, but still very different!) can be challenging. "But it's a challenge I'm up for!"

IIHR has four faculty associates in the water sustainability cluster hire: (l to r) Craig Just (civil and environmental engineering), Eric Tate (geography), David Cwiertny (civil and environmental engineering), and Adam Ward (geoscience).

IFC Outreach at the Iowa State Fair



PHOTOS BY JACQUELINE HARTLING STOLZE

Top: IFC Engineer Tony Loeser (left) shows off the capabilities of IFIS to an interested fairgoer.

Bottom: IIHR Engineer Harvest Schroeder prepares to sample deep-fried butter on a stick, which was offered at the Iowa State Fair to honor the butter cow's 100th birthday.

Every summer, people flock to the Iowa State Fair in Des Moines — more than 1 million in 2011. Many look forward to revisiting their favorite attractions—midway rides, the butter cow, food stands, and more. Sometimes, however, they encounter something new, and maybe even learn something.

In 2011, for the first time, the Iowa Flood Center (IFC) was a part of this Iowa tradition. The Iowa Department of Natural Resources (DNR) provided space for an IFC booth in the DNR building. The IFC has partnered with the DNR to build a network of 50 bridge-mounted stream sensors, with 50 more just deployed. Stream-level information gathered by the sensors is available through IFC's online Iowa Flood Information System (IFIS), which also brings Iowans timely data about precipitation, watersheds, and possible flooding.

IFC's booth featured posters, an operational stream sensor, and a 55-inch computer screen demonstrating the capabilities of IFIS. IFC faculty, students, and staff manned the booth through the fair's entire 11-day run.

"The fair offered us an ideal opportunity to reach out to thousands of Iowans and let them know about the Iowa Flood Center and the tools available on IFIS," says IFC Director Witold Krajewski. "This outreach helped the IFC achieve its mission to serve Iowans and share IFC resources and expertise."

Keith Gaynor, an engineer and a recent graduate of the civil and environmental engineering program, agrees. "The people who stopped by the booth seemed very interested in what we were doing here at the Iowa Flood Center," he says. "It was nice to get out and let people know there are tools available to them that can help improve their knowledge of flooding in Iowa."

IFC staff got the chance to listen, too. Dan Ceynar, an IFC engineer, says he enjoyed some lively conversations at the booth. "Fairgoers stopping by the IFC booth often became very animated when … they realized they could easily determine if their property was at risk."

For many international students and staff, the fair was a completely new experience. Derek Chang, a staff engineer from Taiwan, says it was his first visit to the fair. "It was surprising for me to see how many people attended," he says.

Some of the students enjoyed trying the fair's famous deep-fried foods on a stick, like undergraduate Matt Wolf. "I ate waaaay too much fried food," he says, "but it was all delicious!" For others, the food was just not to their liking. Luckily, the fair is large enough and varied enough that almost everyone can find something to intrigue and entertain them. Above all, it's a slice of Iowa culture.

Ceynar notes, "The state fair is a great Iowa tradition, and for the IFC to be able to participate in that tradition by providing meaningful outreach to Iowans was simply outstanding!"

Blowin' in the Wind: Understanding

"I'm not really an engineer," says IIHR Research Engineer Bill Eichinger. "I graduated from West Point and I knew how to spell 'engineer,' so they made me one."

In the army, Eichinger learned the kind of practical engineering that works in a war zone. It's an attitude he still cultivates today, though he works in an academic environment now. "The army has very much a get-it-done attitude," he explains. "I can appreciate that."

Team LiDAR

Eichinger, who is also the William D. Ashton Professor of Civil Engineering, leads a diverse team of students who have developed the same kind of pragmatic, get-it-done attitude. Student Sean Plenner, who has worked with Eichinger for two years, says he always keeps one of Bill's favorite sayings in the back of his head: "Proper prior planning prevents p*** poor performance."

Students are definitely not second-class citizens on this team. Besides Plenner, students on "Team LiDAR" include Brad Barnhart, David Koser, Adam Thompson, and Bryson Winsky. In addition to working with Eichinger, each student is conducting his own research, some of it quite advanced. "We have really good students here," says Eichinger.

The team's research uses laser radar, or LiDAR, to measure the emissions near large livestock confinement facilities. The findings have shattered old ideas, which held that emissions leave the facility uniformly and move parallel to the ground. Not so, says Eichinger.

"What we've found is that the stuff doesn't come out horizontally like everybody thought," he says. "It plumes upward in puffs and then travels in downwind. It actually gets lofted high up into the atmosphere."

LiDAR tracks particulates, which are tiny particles about 1/60th the diameter of a human hair. The particulates act as tracers for chemical compounds such as ammonia. "It's like watching smoke," Eichinger explains. "You can see where it's coming out and where it's going."

The team uses LiDAR to record vertical slices in the atmosphere about three seconds apart. With these data, they can make movies of what's happening, mapping the particulates' movements in three dimensions.

Many livestock facilities have shelter belts, or bands of trees, surrounding them, which were thought to actually stop the emissions. Eichinger isn't so sure. "Our suspicion is that it just gets lofted over the trees," he says. "Immediately downwind of a pig facility, you don't get as much as you do farther away."

Livestock Emissions

IIHR Research Engineer Bill Eichinger (center, back) leads Team LiDAR, pictured here: (l to r) Brad Barnhart, Bryson Winsky, David Koser, and Sean Plenner.

What's That Smell?

Although the emissions do smell bad, that's not the worst of it. They also contain ammonia and other dangerous substances. "Ammonia is not good for people," Eichinger says. "Near and in chicken facilities, the ammonia concentrations are not good."

Eichinger makes a point to stay out of the politics swirling around livestock confinement facilities. His goal, he says, is to understand what's happening and get the community to accept his ideas, which has not been easy.

"The ag community hasn't really responded," Eichinger admits. He doesn't let that deter him. His job, he says, is to figure out how to make these facilities work better. He envisions an improved building design plus strategic shelter belts to enhance lofting, so emissions will dilute faster and higher in the atmosphere, reducing risk for everyone.

Riding the Whale

Team LiDAR travels to livestock facilities in a 20-year-old customized RV they affectionately call "The Whale." Once at the site, they can set up their equipment within half a day. Typically, they spend about a week gathering data at each site.

The team collaborates with Jerry Hatfield and John Prueger of the National Laboratory for Agriculture and the Environment. They construct temporary towers to deploy micrometeorology instruments at several elevations near the livestock facilities as part of collaborative data collection efforts. "We value the collaboration with Bill as one of the most rewarding aspects of our professional careers," Hatfield explains. "Without this interaction, we would not be able to provide answers to some of the most difficult questions about air quality." Gil Bohrer, assistant professor for ecological engineering at Ohio State University, contributes computational fluid dynamics (CFD) modeling expertise.

Physics graduate student Brad Barnhart appreciates working on such a diverse collaborative team. "Our LiDAR team is a close-knit group," Barnhart says. "We're just like any sports team. … Everyone knows what needs to be done, and we divide up and get it done."

And Team LiDAR can accomplish a lot. "We all work together," Plenner says. Barnhart adds, "We don't have specialized jobs. This is great, because you don't have to do the same thing on every project, and it allows you to learn about every aspect of LiDAR data collection."

Eichinger's informal style is perfect for this group, Barnhart says. "Bill is a great mentor. He lets students choose their projects and allows them the time needed. … We have very few rules. We're not required to stay late, or even stay for set hours. This … puts the responsibility in our hands. … We do our work because we love to do it, not because we have to."

Eichinger agrees. "We have a good time," he says. "If it's not fun, it's not worth doing!"

Engineering a Bright Future

Luciana Kindl Da Cunha decided to become an engineer when she was just 16 years old.

In her native Brazil, she says, students choose their professions early. “Once you are in, you do not have the choice of changing the course.” She chose engineering because she felt that with this grounding, she could be successful in any field.

After completing a master’s degree, Cunha is now pursuing a PhD at IIHR. She works with Witold Krajewski, director of the Iowa Flood Center, and her work focuses on flood prediction methods that do not require historical data and that could be applied worldwide.

As the child of two academics, Cunha learned the value of an education from a very early age. Her father is a professor of business, and her mother of economics. “They are a true inspiration,” Cunha says. “They always encouraged me to follow in their footsteps, not just with their words, but mainly with their actions.”

Engineering in Brazil is a very male-dominated field, Cunha says. She is used to seeing surprise on the faces of those who ask about her profession. She is very proud of being an engineer. “I think it is an achievement for a woman!” she says. “However, I did have some difficulties when I was working in construction in Brazil. … But the chauvinism of some people turns out to be a motivation rather than a discouragement.”

Cunha became interested in flooding while working on a flood mitigation project for her hometown, Curitiba, Brazil. “I was amazed by the impact floods have in people’s lives, and by how uninformed the general population is,” Cunha says. She points out that floods are one of the most destructive natural disasters. Floods kill an average of 140 people in the United States every year and cause billions of dollars in damage. People in poor communities tend to be the most vulnerable. They often lose their homes and the few things they have worked a lifetime to possess. “This is truthfully a heartbreaking situation,” Cunha says.

Luciana Kindl Da Cunha, a native of Brazil, is proud to be an engineer. “I think it is an achievement for a woman!” she says.

At Home on the River

Traditional flood prediction methods depend on historical data, which developing nations often do not have. “I am currently developing flood prediction methods that do not require historical data and that have the potential to be applied worldwide,” Cunha explains. “These methods rely on remote-sensing information provided by space agencies such as NASA.” In the next 10 years, Cunha hopes to see the methods and knowledge she is developing applied to help save lives worldwide.

In the meantime, she is enjoying student life in Iowa City. “I love interacting with people,” she says. “Here, I have an amazing group of friends that includes people from more than 20 different countries.” They enjoy sports, dancing, movies, camping, and especially traveling. “Traveling is one of my biggest passions,” Cunha says.

She would encourage any woman considering a career in engineering to go for it. Cunha says, “No matter what, engineering will give you the basic skills to successfully achieve your goal.”

“My choice to study engineering was accidental,” explains Tibebu Ayalew, a graduate student in civil and environmental engineering and a research assistant at the Iowa Flood Center at IIHR.

Initially, Ayalew sought to emulate a high school biology teacher in his native Ethiopia, who inspired his love of science. Like any good mentor, Ayalew’s teacher encouraged him not just to go for his dream, but also to take it further and reach his potential by studying engineering.

Ayalew followed his mentor’s advice and eventually received a master’s degree in hydro-informatics and water management from Newcastle University in the United Kingdom. Today, Ayalew has found another admirable teacher, Professor Witold Krajewski at IIHR. “He is an inspiration for me,” Ayalew says. Ayalew wanted to study water resources engineering because he has seen the damage both drought and floods can do.

Since January 2011, after a semester at Drexel University in Philadelphia, Ayalew has been living in Iowa City, dividing his days between coursework and research at the Iowa Flood Center. “I am studying how using reservoirs modifies flood frequency, or reduces floods,” Ayalew says. “Having big reservoirs is not an acceptable practice these days. So there is an idea in the flood center that instead of having one big reservoir, why don’t we have very small reservoirs, but distribute many of them across the river basin?”

Demanding coursework and research make for a busy schedule, but Ayalew finds a balance and makes it all work. “I play tennis with friends and spend time with my family and playing with my kid.” Ayalew is married and has a 10-month-old daughter. He and his family have taken a liking to Iowa City. Ayalew enjoys the welcoming atmosphere of the Midwest and the convenience of the area.

Upon graduation, Ayalew hopes to work as a researcher, either at a university or in the government sector. He hopes to stay in the United States. “[Here] I have the opportunity to contribute something to some of the unsolved problems that exist in hydrology.”

Warm, relaxed, and dedicated, Ayalew is motivated by his desire to serve the greater good, to find answers to some of the existing problems, and to contribute to society.

By Amy Dalkoff

PHOTO BY ANETA GOSKA

Tibebu Ayalew hopes his graduate degree in engineering will help him contribute to society.

Paying it Forward: Alumni Provide Crucial Student Support

Brad Reuter's got it bad, and there's no cure—but he's perfectly happy with that.

"As Larry [Weber] put it, I caught the hydraulics bug," Reuter laughs. The undergraduate engineering student started out at IIHR—Hydroscience & Engineering as a Mechanical Shop employee. He got excited about the work he was a part of in the shop, and today, thanks to an alumni-supported scholarship, Reuter is close to earning a degree in engineering.

With direction from IIHR Research Engineer Thanos Papanicolaou, Brad Reuter designed and built this flume that simulates flow through different media (e.g., soil, wood chips, pea gravel) into drainage tile.

PHOTO BY MIKE STENERSON/UI PHOTO SERVICES

When Reuter was awarded the James L. Shive Scholarship earlier this year, he felt a weight drop off his shoulders.

Reuter was inspired by a hydroelectric dam modeling project for the Grant County Public Utility District, and a model study of dropshafts and tunnels for the United Arab Emirate of Abu Dhabi. "They combined everything I was interested in," Reuter says. "It really got me."

With the support of his supervisor, Reuter started taking undergraduate engineering classes over his lunch hour. He was able to take two classes per semester by eating his lunch in class—a little awkward, but doable.

But Reuter wanted to make faster progress on his degree, so he cut back his work to 32 hours a week so he could take a full schedule of classes. At the same time, he was working with his father's roofing business on weekends to pay for tuition. The schedule was tough, to say the least.

When Reuter was awarded the James L. Shive Scholarship last year, he felt a weight drop off his shoulders. He was able to give up the roofing work and devote his weekends to sediment transport research with IIHR Research Engineer Thanos Papanicolaou.

Reuter is grateful for the scholarship. "It took a huge burden off me," Reuter says. "I can focus more on my classes and research." He hopes to pursue graduate studies at IIHR after he graduates in May 2012.

The Shive Scholarship and the John F. Kennedy Fellowship support top-notch undergraduate students to pursue education and research in hydraulic engineering. For graduate students, the university offers the Hunter Rouse Scholarship, the Paul C. and Sara Jane Benedict Fellowship, and the Dr. Arthur R. Giaquinta Memorial Scholarship. Established to honor notable alumni and faculty of IIHR, these scholarships are made possible by gifts from alumni and friends of IIHR and the College of Engineering.

IIHR Research Engineer Emeritus Tatsuaki Nakato, who is also an IIHR alumnus, has been an enthusiastic and generous supporter of the Kennedy Scholarship. "What an amazing dynamic person he was!" Nakato says of former IIHR Director John F. Kennedy. "People all over the world respected him so much!

"If there were a Nobel Prize in engineering, instead of science and physics, he certainly could have gotten the Nobel," Nakato adds.

Nakato's gift, and others like it, provide a very tangible way of honoring those who have gone before by "paying it forward" to the engineers of tomorrow. Students such as Brad Reuter can pursue their professional dreams thanks to gifts from alumni who have benefitted from the educational resources at IIHR and the University of Iowa.

To contribute to an existing scholarship or fellowship, establish a new fund, or learn more about other giving opportunities at IIHR, please visit www.iihr.uiowa.edu and click on "Make a Gift to IIHR," or call 800-648-6973.

Bridging the Gap

"IIHR is the place to be," says Troy Lyons, IIHR director of engineering services. A University of Iowa alumnus, Lyons earned bachelor's and master's degrees in civil and environmental engineering.

"I started out at IIHR in 1998 as a student employee, then became a graduate student, and then was hired as a staff engineer to work on research projects," says Lyons. "My position and responsibilities have evolved over time as I've been given opportunities to grow and advance."

Lyons' job bridges the gap between engineers, researchers, and shop staff. He says his unique experiences within IIHR have involved all levels of research support activities—from model construction to model design, to proposal writing and project management. Lyons' research spans several areas, including river hydraulics, hydropower, physical modeling, and hydraulic structures.

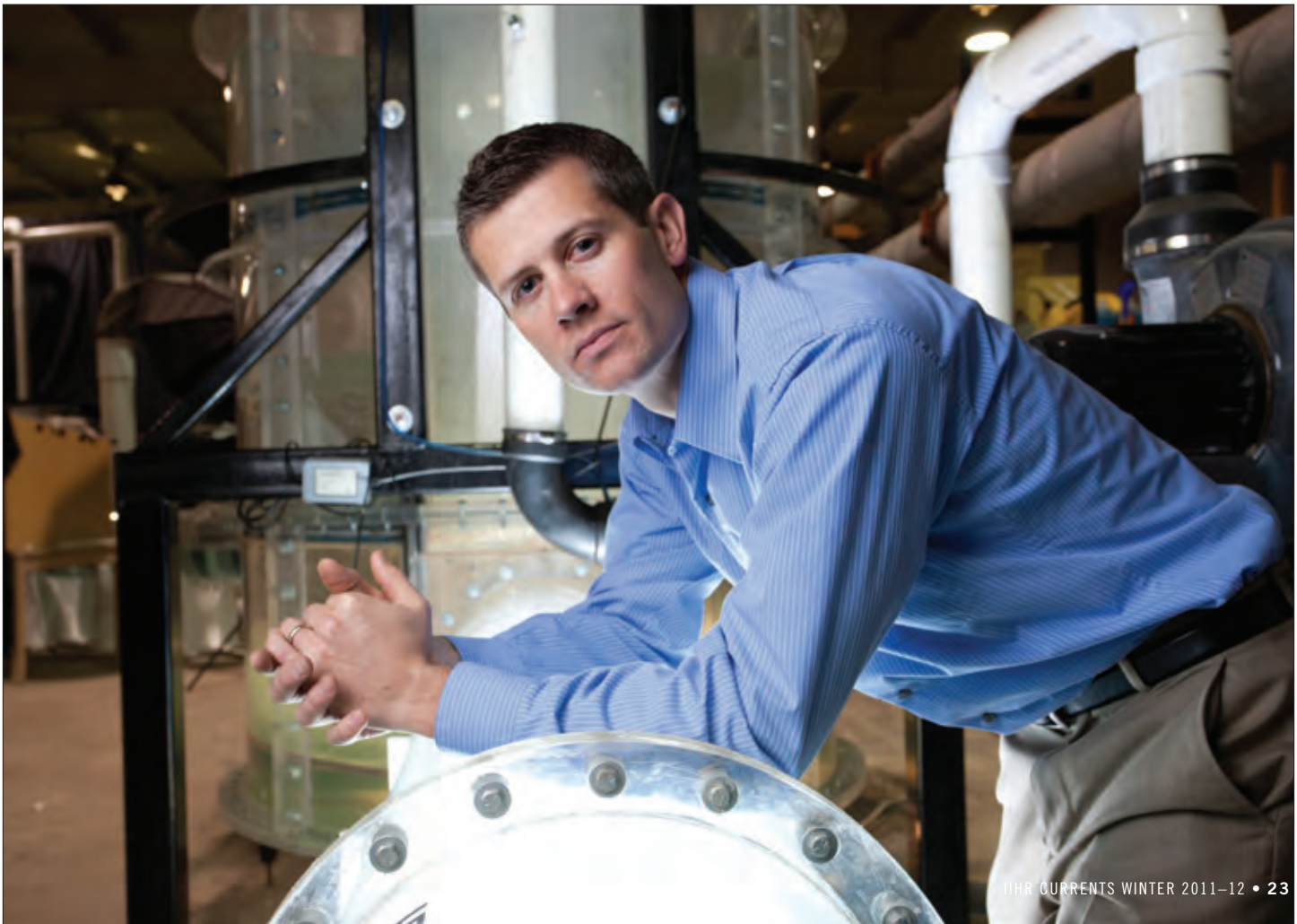
"Being part of any project that provides 'real-world' value to others is one of the most exciting and rewarding experiences of engineering," says Lyons. A recent real-world project focused on fish passage in the Columbia River. Lyons was part of a team researching and testing structures in the field. To see the final product yield great results is tremendously rewarding, Lyons says. "It's something I can take pride in professionally, and also know that it made a real impact."

A major focus area for Lyons has been dropshafts. "I've had the chance to be involved in eight different model studies over the past four years, each of which has been challenging, but also very rewarding." One recent project was a dropshaft and tunnel model study completed for the United Arab Emirate of Abu Dhabi, which Lyons says involved unique design challenges that had never been attempted before in a laboratory setting. This project even carried him to Australia to present his findings at a conference.

When he leaves work at the end of the day, Lyons spends time with his wife of 11 years, Angela, and their sons, 4-year-old William and 2-year-old Henry. "William thinks coming to work with me every day would be fantastic," says this proud father of a hopeful engineer. "That kid has a good head on his shoulders!" The family likes to take walks together and play outside. "I love spending time outdoors hunting, fishing, and enjoying nature," he says. He's even a licensed pilot. Indoors, Lyons enjoys home improvement, volunteering, and Hawkeye football.

Lyons is grateful for the opportunities he's been given at IIHR. "I've been especially blessed to work with outstanding people who have been a huge part of my love for IIHR."

By Amy Dalkoff



Troy Lyons with a drop shaft model developed for the city of London. Lyons serves as IIHR director of engineering services.

Hooked on Engineering

"I genuinely enjoy the research," says Faculty Research Engineer Michelle Scherer. She is using the glove box in her lab at the Seamans Center.

As a kid growing up in New Jersey, Michelle Scherer always liked math and problem solving. "Engineering seemed like the logical choice," she says. "Once I was in college and realized you could actually do engineering in an environmental context, I was hooked!"

Scherer is a professor of civil and environmental engineering at the University of Iowa, where she is the Robert and Virginia Wheeler Faculty Fellow of Engineering. She is also a faculty research engineer at IIHR.

In a world where women are sometimes discouraged from pursuing careers in fields such as engineering, Scherer skated through untouched. "I haven't really run into any discouragement," she says. "Either I was lucky or I simply ignored it—I'm honestly not sure which."

Quite the opposite, actually—she was fortunate to receive plenty of encouragement. "I have always had lots of people who helped keep me interested and inspired," Scherer says. She is especially grateful to her master's advisor, Nikos Nikolaidis, an Iowa alumnus. "He loved environmental engineering, and it was infectious." This is one infection she is happy to share. "I always try to remember to make sure my students get to see how much I genuinely enjoy the research," Scherer says.

One of Scherer's primary research areas is environmental geochemistry. "It is how water and soil interact," Scherer explains. "Since I am an environmental engineer, I am most interested in how pollutants react with water and soil." This is an area of concern to everyone, because it affects each of us personally. "Everyone should have access to clean water and safe food," Scherer says.

Scherer's current research focuses on a new process in which minerals in soil mix much more than expected. "We used to think that only the surfaces of a mineral reacted with pollutants," Scherer says. "Picture a lazy susan that you put ketchup or mustard on, and then you take it off. Well, our new findings indicate that the whole lazy susan, or mineral, can interact with the pollutants. That has some pretty significant implications for how things like arsenic, mercury, and uranium are released from soils into water."

Scherer says she loves teaching, and she finds it rewarding to watch students master the material and gain confidence. "My career is right where I want it to be," she says. "In 10 years, I hope to still be doing research that excites me, and to be working with students, faculty, and colleagues who are curious and engaged."

Outside of work, Scherer's interests focus on her family: two daughters, Kelsey (10) and Josephine (7). They have two dogs, a puggle and a great dane, which Scherer enjoys training. She also works out to stay healthy, and she enjoys reading and playing the piano. "I'm not very good … yet!" she says.

For Scherer the engineer, motivation is never a problem. "It's easy to stay motivated," she explains. "I like to figure things out, and there is a lot to figure out!"

From Nuclear Reactors to Naval Ships

Work is a pleasure for IIHR Research Engineer Pablo Carrica. “I like the challenge of discovery,” he says. “You can try and figure out something that nobody has figured out before.”

Carrica, who is also an associate professor of mechanical and industrial engineering, says his education in nuclear engineering is uniquely suited to his work. Thermohydraulics, which is one of the main aspects of nuclear engineering, is essentially fluid flow, Carrica says. “That’s what I’ve been doing since.”

After finishing his education in his native Argentina, Carrica worked for the Argentinean Nuclear Commission and later at an oil company as a simulation engineer, studying the flow of oil in reservoirs. His work at IIHR focuses on areas including multiphase flow, fluid mechanics, and computational fluid dynamics. “My main area is bubbly flows,” Carrica says. Bubbly flows occur across the board, from naturally occurring flows in waterfalls to chemical reactors, where bubbles are used to “increase interfacial area and exchange chemicals between components to get a product.”

Currently Carrica is working on several projects, including a study of bubbly flow around ships, as well as other smaller initiatives. One project focuses on wind turbines and another on submarine propulsion and maneuvering, both of which essentially focus on flow around rotating structures. “What I usually do is create models that other people can use for other applications,” he explains. For example, Carrica helped develop the groundbreaking CFDShip-Iowa, a computer code that can simulate the flow of air and water around a virtual ship.

Carrica’s dedication to his field is fueled by his love of discovery, but also by a true enjoyment of his subject. “I try to find fun things in my area,” he says. “That’s the way I ended up doing wind turbines. It’s related to my area, I like the subject of renewable energy, and I like wind turbines.”

In the future, Carrica hopes to take maximum advantage of the current technology, and to be able to use the supercomputers that are coming online to solve more complicated problems. For now, he says, “The challenges are more and more complicated every year, [and] as technology evolves, people have to focus more in a given area.”

When not conducting research, teaching courses, or modeling flows, Carrica’s other passions shine. “I play guitar, I run, and I spend time with family—that’s the most important thing.” Carrica is married to IIHR Associate Research Engineer Marcela Politano, and the family includes four children. They enjoy the ease and safety of life in Iowa, where they have lived since Carrica joined the University of Iowa as a visiting associate professor in 2002.

By Amy Dalkoff

PHOTO BY MIKE STEMERSON/UI PHOTO SERVICES

IIHR Research Engineer Pablo Carrica says he finds true enjoyment in his work.

A Life in Engineering

You'll hear no complaints from Jack Cassidy about his life as an engineer. "I say I never worked a day in my life," Cassidy says. "I still feel that way!"

Cassidy, who earned a PhD at IIHR in 1963, was born in Wyoming, the son of an electrical engineer. Cassidy was 5 years old when his father died in a plane crash. After his father's death, Cassidy's mother moved them to Montana and his grandfather's cattle ranch. He attended school in the nearby town of Roberts. As salutatorian of his high school class, he did not rank in the top 20 percent — there were only five students!

The country was in the midst of the Great Depression, and Cassidy worked for his grandfather and on other nearby ranches. "It was all the work there was," he remembers. "All the money I ever made went into the pot." These early experiences have stuck with him. "It certainly had a lot to do with making me self-sufficient," he says. "You learn how to fix things and how to get along."

He enrolled in the civil engineering program at Montana State College in 1948. The work was not easy. The tiny school in Roberts couldn't provide the proper preparation for his college classes. "I was playing catch-up all the way through," Cassidy says. "I compare it to trying to get a drink out of a fire hydrant."

At Montana State College, he met Alice Willman, and they married in 1953. Just a few months later, Cassidy was drafted into the U.S. Army. He served in Korea for one year with a combat engineering battalion. "It wasn't nice," he remembers. After the armistice, he served one more year in Japan and Okinawa.

After about four years in civilian life, Cassidy discovered there was more he wanted to know. He enrolled in graduate school at Montana State University (formerly Montana State College) in 1958. "I realized after about a year that I wasn't going to be able to get everything I needed," Cassidy says. He completed an M.S. at Montana State and then came to the University of Iowa and IIHR in 1960. The family bought a house in Iowa City, and Alice found work as a nurse at the VA Hospital. The couple had two sons (and later, a daughter), and Alice was a working mother when that wasn't the norm. Cassidy says he can't give her enough credit for keeping the family stable and happy. "She was a wonderful lady!" he says. [Editor's note: Alice passed away in 2005.]

Cassidy's PhD advisor was then-IIHR Director Hunter Rouse. "He was just remarkable," Cassidy says. Rouse's door was always open, at least for any work-related conversation. "He had no time for small talk," Cassidy says.

Rouse continually pushed his students to do more. "I just loved the guy for what he was and what he accomplished," Cassidy says. "He was exactly what I was looking for."

Cassidy accepted a faculty position at the University of Missouri-Columbia, where he rose to chair the department and rebuilt the hydraulics laboratory. After 11 years, Cassidy moved on to a job at Bechtel Corporation in San Francisco, where he eventually held the position of manager of geotechnical and hydraulic engineering. At Bechtel, Cassidy supervised the design of hydraulic/hydrologic systems for dams, water supply systems, nuclear power plants, and other projects worldwide.

After retiring from Bechtel in 1995, Cassidy began working as an independent consultant in hydrologic and hydraulic engineering, which he continues to this day.

Cassidy's awards and honors are truly too numerous to mention. The "pinnacle" for Cassidy was his induction as a fellow of the National Academy of Engineering. He now lives in Walnut Creek, Calif., where he is president of the Rossmoor Hiking Club and hikes five to seven miles, three times a week. He also enjoys woodworking, and he is writing a family history.

Through it all, Jack Cassidy has never forgotten the education and the grounding he found at IIHR. "It was just such a wonderful academic climate to be in," he says.

For a man who has never worked a day in his life, he has achieved a lot.

IIHR alumnus Jack Cassidy is a dedicated hiker who covers five to seven miles, three times a week.

PHOTO BY MIKE DICARLO

Mussel Man

Tatsuaki Nakato's three-decade career as a research engineer at IIHR almost didn't happen. After completing his PhD at IIHR, Nakato made a final visit to the lab before returning to his homeland, Japan. He met then-Director John F. Kennedy in the parking lot. "I just came to say goodbye," Nakato told Kennedy. Kennedy asked him if he had a job in Japan. When Nakato answered no, Kennedy replied, "Are you crazy? I'll hire you right away."

It was the start of a wonderful career, Nakato says, and he is grateful for Kennedy's guidance and mentoring. "What an amazing, dynamic person he was!" Nakato says. "People all over the world respected him so much.

"This was a Mecca for hydraulic engineers," Nakato says of IIHR during the Kennedy years. "So many famous scholars from all over the place came to learn from Jack Kennedy."

Nakato came to IIHR for PhD studies in 1971, in the midst of violent campus protests nationwide. "It was just a terrible period," Nakato remembers. Despite the upheaval, Nakato found an ideal academic and personal home in Iowa. "There were so many interesting projects!" he says. After completing a PhD degree on sediment transport, he stayed on as a postdoc working on the Lake Chicot Pumping Station in Arkansas. "I didn't know anything about pumping plants!" Nakato says. But when Kennedy introduced his young colleague to officials of the U.S. Army Corps of Engineers-Vicksburg District as a pumping plant authority, the pressure was on to actually become one. "He was a great motivator!" Nakato says.

Nakato enjoyed fieldwork, and he spent many happy hours taking sediment samples on the Mississippi River. "I became very familiar with the Upper Mississippi River," he says. That work paid off in 1999 when IIHR was going through an external review.

Former UI President Sandy Boyd was chair of the external review committee, and he asked IIHR faculty about their vision for the future. Nakato hesitantly raised his hand and proposed a research station on the Mississippi River focused on inland rivers. Boyd enthusiastically jumped on board, and the final report recommended that the university support the effort.

The research station, now known as LACMRERS (Lucille A. Carver Mississippi Riverside Environmental Research Station), opened in May 2002. It was the realization of a dream for Nakato, and the beginning of a new research focus as well: freshwater mussels. "Mussels are water cleaners," Nakato says. "They are a most underestimated creature."

Nakato noticed a heap of mussel shells, tossed aside by muskrats, near LACMRERS. The shells were slated to be thrown away, but Nakato saw a treasure. He rescued the mussel shells of some 40 different species, which he used to create an impressive display at LACMRERS.

The river near Muscatine was a favorite habitat for mussels until over-harvesting by the pearl button industry depleted the population. In the early 2000s, the federal government reintroduced endangered Higgins Eye mussels to northern parts of the Upper Mississippi River. Nakato was frustrated that the effort did not include the area around Muscatine, once so prolific with freshwater mussels. He worked tirelessly to convince the government to include this part of the river. "Finally, they said, 'Nakato is right.'" The legislation was signed on Oct. 1, 2007, and on Oct. 2, Nakato and his team got to work. Three months before his retirement, Nakato helped reintroduce Higgins Eye mussels to the Mississippi River near LACMRERS. He still volunteers with mussel propagation projects on several Midwestern rivers.

Nakato's dedication to tornado-related volunteer work blossomed in 2008, when Parkersburg, Iowa, was hit by an EF5 tornado on Memorial Day weekend. "Whenever a tornado comes or a hurricane comes, I'm ready to go," Nakato says. "I'm an old man. I cannot carry a huge log, but … I try to help people."

Nakato's son, Ken, has been a frequent partner on the volunteer trips. Nakato and his wife Sharon have three children: Ken and two daughters, Misa and Kimi. "Iowa has been really great for us," he says.

IIHR Research Engineer Emeritus Tatsuaki Nakato triumphantly holds up samples of the endangered Higgins Eye mussel.

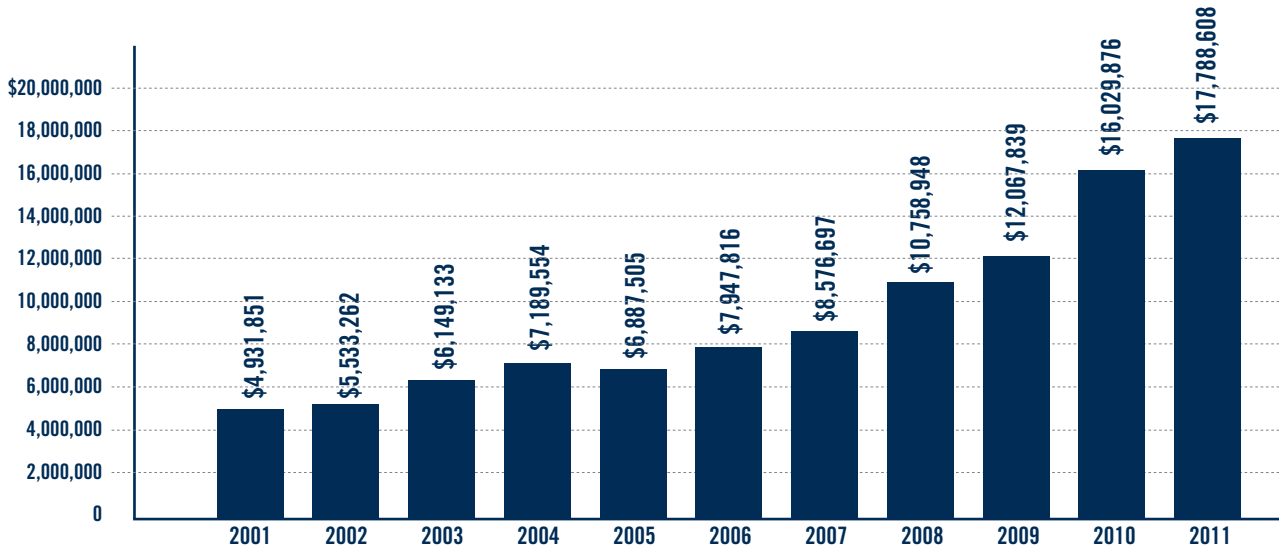
The Fiscal Year 2011 In Review

One of the keys to success for IIHR is the institute's healthy blend of funding sources. Fiscal year 2011 (July 1, 2010–June 30, 2011) included 63 percent state and federal funding, 24 percent private and commercial support, and 13 percent from other sources. These numbers have fluctuated over time, depending on the economy, the nature of IIHR's current projects, and other factors; but blended together, they provide a stable financial foundation.

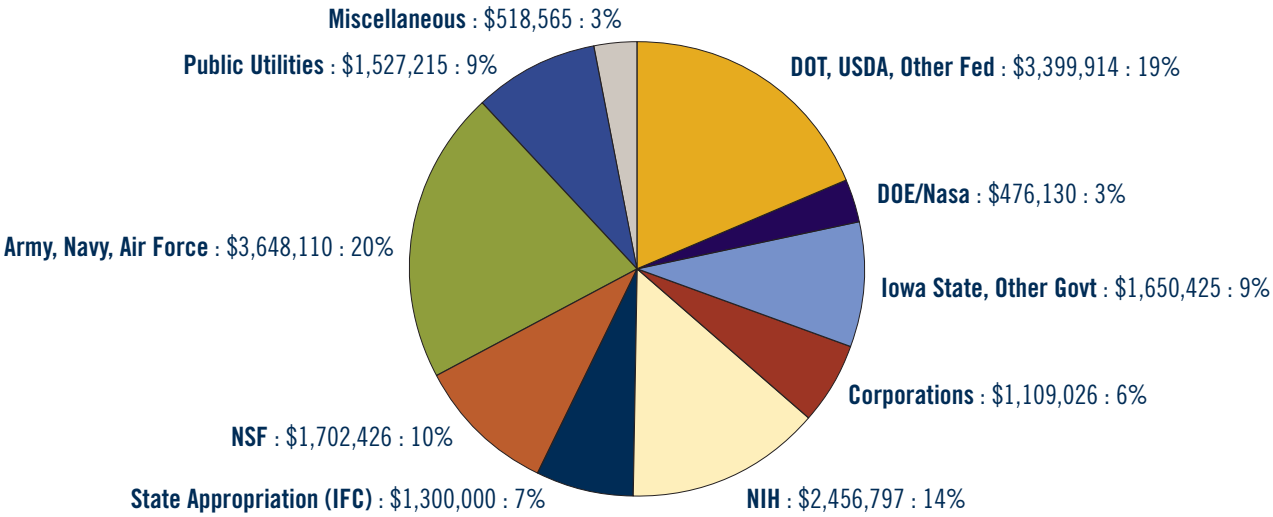
As some of IIHR's major multi-year, multidisciplinary research programs approach their natural conclusions (such as the Grant County Public Utility District project), the institute continues to seek new long-term sources of funding. Looking ahead, IIHR's strategic initiatives include projects such as the National Science Foundation and NASA's Experimental Program to Stimulate Competitive Research (EPSCoR); the Iowa Flood Center, which derives funding from the state of Iowa and other sponsors; watershed-scale research funded by the U.S. Department of Housing and Urban Development and other sources; and biofluids projects with support from the National Institutes of Health.

As befits a leader in scientific innovation, IIHR is constantly re-inventing itself to stay current and relevant. Now more than ever, it is important that the institute remains a prominent center for education, research, and service.

Fiscal Year 2001 to 2011 External and Internal Research Funding



Fiscal Year 2011 External Funding by Sponsor ($17,788,608 Total)



IIHR Internal Investments in Fiscal Year 2011

Graduate Students	$369,560
Postdoctoral Associates	$85,749
Research Engineers	$367,378
Facilities & Equipment	$363,385
TOTAL	**$1,186,072**

Major Funding Announcements in Fiscal Year 2011

Behavior of Iron Nanoparticles Michelle Scherer	$259,884	National Science Foundation
CNH: People, Water, and Climate David Bennett, Jerry Schnoor, Nandita Basu, Marian Muste, and Andrew Kusiak	$1,011,832	National Science Foundation
Iowa Flood Center Witek Krajewsk, Larry Weber, and Nathan Young	$1,300,000	State of Iowa
Iowa Flood Center Watershed Project Larry Weber, Witek Krajewski, and Nathan Young	$8,000,000	U.S. Department of Housing and Urban Development/IDED
Living-Learning Community Craig Just	$873,318	U.S. Department of Education's Fund for the Improvement of Post-Secondary Education
NASA EPSCoR Grant for Ag Soil Erosion and Carbon Cycle Observations in Iowa Thanos Papanicolaou	$642,000	National Aeronautics and Space Administration

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IIHR Advisory Board, October 2011: (front, l to r) HY Lee, Chuck Gipp, Carmen Langel, Marcela Politano, Kevin Richards; (back, l to r) Pat Brezonik, Jennifer Filipiak, Larry Weber, John Engel, Thanos Papanicolaou, and Eric Paterson.

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IIHR Hydroscience & Engineering

Our Mission

To be a leader in fluids-related fundamental and applied research; to provide interdisciplinary education for future leaders in science and engineering; and to advance knowledge in support of sustainable natural and engineered systems.

Our Vision

To be an international leader among academic institutions in hydroscience and engineering research recognized for integrating laboratory, field- and simulation-based experimentation, and participatory interdisciplinary education.

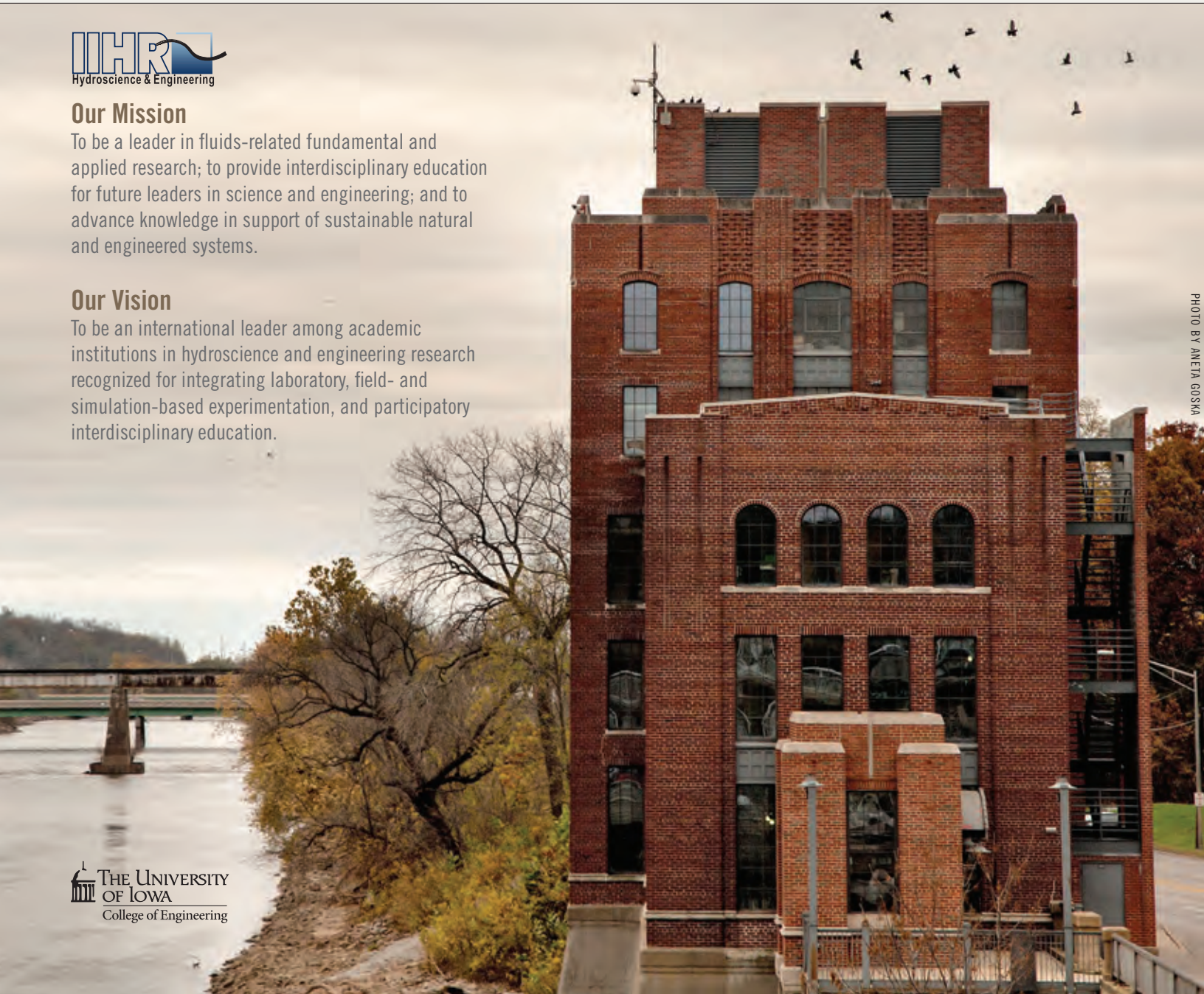

PHOTO BY ANETA GOSKA

The University of Iowa College of Engineering