Invisible Vulnerabilities
How improved infrastructure can keep the O.R. virus free

Hospital Builders
Alums in careful construction

Higher-Ed Hydrology
Water research at Purdue
As we finish a busy fall semester, I am pleased to present another issue of **Civil Engineering Impact**. In this magazine, we are focusing on health-care issues and the contribution of civil engineers—from educators and students to researchers and practitioners—to that important area.

Our industrial partners continue to tell us of their tremendous need for more civil engineers. Our challenge, beyond successfully graduating a sufficient number of engineers, is to renew efforts to recruit students to our field. Our “Engineering 103” class has been redesigned to excite freshmen about careers in civil engineering (see page 14).

We are extremely proud of the students who graduate with a Purdue civil engineering degree. They are changing the world in a myriad of ways. I hope you’ll read about a few of our successes and continue to share your accomplishments with us.

M. Katherine Banks
Head, School of Civil Engineering

A couple readers responded to the last issue’s cover story while taking a chance to write about their own work as water-resource engineers. One, handwritten, came from a 91-year-old alumnus. The other was e-mailed from a Purdue engineer who’s trying to deliver expertise through the World Wide Web. Snippets from both letters follow.

**Civil Correspondence**

I just read the latest issue of Impact and was impressed with the idea of Purdue trying to look toward water-related engineering. I am moved to try and offer up a further perspective for your audience. For the past 10 years the focus of my work, at no salary, has been on humanitarian efforts in the developing world. I have six sons, all engineers, so I need not seek any more money.

I have worked all over the world helping with mostly water supply, but from time to time I have taken on total town designs (all infrastructure): from wastewater treatment for mountain villages to creating bridges. Day to day, 90 percent of my help to these people has come via e-mail. I am “in the bush” a few months a year, but for sure the lion’s share of what I do best is over e-mail.

Why not have Purdue offer a course in applied humanitarian engineering? Why not involve students in projects to help communities throughout the world via e-mailed expertise?

**Todd Stong (MSCE ’66)**

I was pleased to see the interest in water problems in your Spring/Summer issue of Impact. I received my BSCE in 1937 at Purdue University and was employed by the Corps of Engineers for 36 years (1939 to 1975)...

During the time I was with the Corps of Engineers, I believe much was accomplished in the planning and use of one of our most important natural resources—water. I am most grateful that you are continuing this interest.

**Gerald Zuck (BSCE ’37)**

With the help of 30 local volunteers, Todd Stong (center) helped build a 264-foot bridge over a crocodile-infested river in Nigeria.

Send your e-mails to peimpact@purdue.edu

Cover illustration by Susan Ferringer • iStockphotos
UP FRONT

The head’s message and letters to the editor.

COMING UP

What’s coming up down the road in civil engineering.

AROUND CE

Faculty kudos, promotions, and other news.

IN MY VIEW

A perspective on the civil engineer’s crucial role in raising healthcare facilities.

COVER

Researchers are working to detect invisible threats.

UP CLOSE: ALUMNI

Why one alum chose to design hospitals over banks.

UP CLOSE: FACULTY

Two professors, new to Purdue, are making waves in water research.

UP CLOSE: STUDENTS

How one senior is helping recruit freshmen to civil engineering.

ALUMNI NEWS

Class notes and a Ross Camp reunion.

CAMPAIGN UPDATE

Civil Engineering’s smashing success in the Goodwin Challenge.
Construction on a new commons area of the Civil Engineering Building will begin in May 2007. The welcoming area with more than 1,000 square feet is expected to be complete and dedicated by Homecoming 2007.
Appointments

Inez Hua has been appointed as the interim head of the newly created College of Engineering Division, Environmental and Ecological Engineering.

Rao Govindaraju was selected as the Christopher B. and Susan S. Burke Professor of Civil Engineering. Govindaraju (see cover story) specializes in hydraulics and hydrology, fields in which engineers work to prevent floods; supply water for cities, industry, and irrigation; treat wastewater; protect beaches; and manage and redirect rivers.

Srinivas Peeta has been named the director of the new NEXTRANS center at Purdue. The Research and Innovative Technology Administration of the U.S. Department of Transportation plans to establish and maintain one University Transportation Center in each of the 10 standard federal regions. The purpose of the centers is to advance U.S. technology and expertise in the many disciplines comprising transportation through the mechanisms of education, research, and technology transfer.

Honors and Awards

Ernest “Chip” Blatchley received certification by eminence in the environmental engineering field as a Board Certified Environmental Engineer by the American Academy of Environmental Engineers.

Jon Fricker received the 2006 Harland Bartholomew Award from the American Society of Civil Engineers for his contributions to the field of urban planning and transportation development.

Robert Frosch received the Harold Munson Outstanding Teacher Award. This award is given to a faculty member who

Inez Hua (in red) will lead the newly created Division of Environmental and Ecological Engineering. Shown here in the field with colleague Chad Jafvert (left), a professor of engineering, and Juan Bezares, a PhD student, she is studying how certain chemicals will react when exposed to sunlight.
Fresh Starts
A new director of development and an internal promotion will help redirect Civil Engineering’s future.

John Dinkens comes to Civil Engineering with 15 years of major, planned, and annual giving experience. Most recently, he worked with the Kiwanis International Foundation where he served as director of development and was responsible for all fund-raising related to annual and major gifts. He led two capital campaigns that generated more than $21 million through major and/or planned gift expectancies to fund Kiwanis family programs and initiatives.

Prior to his work at Kiwanis, Dinkens worked for several years with the Boy Scouts of America and as a stockbroker with Charles Schwab where he was awarded the coveted Chairman’s Award.

Dinkens earned his B.A. in business management at Carson-Newman College in Jefferson City, Tennessee. While at Carson-Newman, he was an active member in student government and served as the senior class president.

John Underwood

Congratulations to Cindy Lawley on her new position. She was recently promoted to director of external relations for the School of Civil Engineering.

In this new capacity, Lawley will continue to work with alumni and donors as well as take the lead on the school’s communications and marketing presence. In addition, she will work with outside architects and engineers on upcoming building and renovation projects.

Lawley received her BS in business administration from Mississippi University for Women, her MS in education from the University of Alabama, and is currently pursuing a doctorate in higher education administration at Purdue. She expects to graduate in May 2007. In addition to her civil engineering responsibilities on campus, she teaches “Ethics and Law” for the School of Technology in the Department of Organization Leadership and Supervision as an adjunct professor.
The Building Blocks of Healthcare

Many things are driving the expansion of the healthcare industry: the aging population, the need for more efficient operations, advances in technology, and population shifts. All of these variables have created the opportunity for our company, Elford, Inc., to develop a strong healthcare and eldercare client base. Because Elford, Inc. depends on repeat business in the private market sector, it is important that we partner with the project team from preconstruction through final completion, closeout, and warranty.

As construction managers and general contractors, the engineers on our staff are involved with healthcare projects in the early planning and design phase. On an urban site, discussions may include piling or tie-back systems, utility relocations, and foundation options. For more open sites, water retention release, site grading, and wetland issues come into play.

During design, constructability reviews are held to help control costs. Understanding the cost impact of conceptual ideas requires an engineering understanding of design and construction practices. Structural concepts may need to be modified to accommodate the many pieces of heavy equipment or those that require lead or concrete shielding. Bid packages may need to be tailored to fit the schedule or manpower and materials available.

As a builder, the civil engineer needs to know how to schedule a project so that it can be built within a specified timeframe. This means not only knowing how to read drawings and understand the work of the various trades, but also knowing the scheduling software being used, and how to produce the desired results. A keen eye for detail is important because hospitals are complex.

The schedule needs to be compressed. Many times, the most important thing is to ask the right question. The hospital will have two levels below grade, so how do we hold back the walls of the excavation? Can we speed up the concrete pour sequence? Does the pour rate and tie size-spacing give us an opportunity to pick up some time? Can we break more cylinders and possibly load or re-shore sooner?

One of the advantages a civil engineer has in the field is the understanding of loads and their impact on a structure. Questions that often come up involve the moving of heavy loads, such as rooftop air handlers across bays that may not be designed to accommodate the load. The decisions needed may include structural load issues, cranes, rigging, and safety. Although the civil engineer may not know the specific design answer, he or she is expected to raise the question to the right level of awareness so that the appropriate person can respond.

Civil engineers can play another important role on a hospital construction project: the role of a leader. The project team on a hospital project is made up of a group of people with diverse professional training, including doctors, nurses, architects, engineers, computer technicians, specialty equipment vendors, and contractors, to name a few. As a project manager, the civil engineer can facilitate the communications between all of these people with varied interests, always keeping in mind the goal is to reach consensus and advance the progress. A good combination of engineering and communication skills is a must.

The population of the United States will reach 300 million in the very near future. I expect to see a strong demand for civil engineers in healthcare construction for many years to come. Individuals who develop the skills referenced above will certainly be in demand.

Jeffrey Copeland, BSCE '69
CEO and Chairman, Elford, Inc.

As principal in charge, Jeff Copeland is responsible for day-to-day company operations. He oversees company and client project management, including the engineering, estimating, personnel, finance, and marketing functions. In addition to his BS in civil engineering from Purdue, he earned a master’s degree in business administration from Xavier University. He is a member of the Ohio Society of Professional Engineers, the National Society of Professional Engineers, the National Academy of Forensic Engineers, and the American Society of Civil Engineers. He is a past president and board member of the Builder’s Exchange of Central Ohio.
Dulcy Abraham (foreground) worked with PhD students Major Victor Nakano (in uniform) and Carlos Arboleda on minimizing the effects of imperceptible threats—both natural and manmade—that could turn a hospital into a disaster zone.
If you were an injured earthquake survivor, or needed medical attention during the onslaught of a major hurricane, or fell victim to a biological or chemical terrorist attack, you would instinctively want to get to a hospital. Hospitals and other healthcare facilities are considered components of the critical infrastructure systems of any community. But these facilities we depend on in times of need are not themselves immune to the natural and human-wrought havoc that drives patients in through their doors. “We wanted to study the interdependencies between infrastructures,” says Dulcy Abraham, a professor of civil engineering. While all the many behind-the-scenes systems that make hospitals run have been studied before, Abraham believes the idea of taking a broad look at the interplay between internal and external factors is novel. Abraham and Carlos Arboleda, who earned his PhD in August 2006, used as their test bed St. Vincent Hospital in Indianapolis to examine the impact of these external systems on the hospital’s internal capabilities to achieve its primary mission: to care for patients.

Arboleda, now a visiting assistant professor at the University of Illinois, notes, for example, how surprisingly critical the road infrastructure is to the functioning of a hospital. “Everybody assumes that this network will be in place no matter what type of disaster event occurs. Hurricane Katrina showed that the disruption of the road network [because of the flooding caused by the broken levees] creates significant impact in the operation of hospitals. Patients cannot be evacuated nor admitted; it is not possible to re-supply pharmaceuticals, water, food,” says Arboleda. Medical services provided at the hospital suffer because damaged roads impede the normal pattern of staff turnover. If doctors and nurses can’t pass the baton to a freshly rested team in a reasonable timeframe, productivity is reduced and patient safety is potentially compromised.

continued on next page
As new hospitals are built and existing ones strive to augment their emergency preparedness measures, they may want to consider some of the findings in Abraham and Arboleda’s project, like locating electric power plants within hospitals in places other than the traditional flood-prone basement; incorporating redundant components in the infrastructure networks, so that the flow of necessary commodities within the hospital can be rerouted as required; establishing special contracts with utility companies to give special priority to the hospital in case of a disaster; and mobilizing medical teams within the hospital during a disaster response to expedite patient flow.

Most importantly, the work pioneered at Purdue has established useful methodologies to integrate the vulnerability analyses of external infrastructures and internal capabilities of healthcare facilities so that future studies can be conducted.

It is a grim reality of the new century that hospitals must also be protected against human acts of malice, and that’s where the work of Major Victor Nakano comes in. Another PhD student under Abraham’s advisement, Nakano was sent to Purdue by the U.S. Army to study ways to mitigate the threat of chemical and biological (CB) attacks within critical infrastructures like hospitals. His work represents a joint collaboration between Purdue and the U.S. Army Engineer Research Development Center’s Construction Engineering Research Laboratory in Champaign, Illinois.

For a terrorist to breach the security of an emergency room’s waiting area would be horrifyingly easy. His deadly weapon might look like a common water bottle, which he could easily bring past guards and use to release a CB agent surreptitiously into an air return vent. Nakano traces the destruction from there: “Most buildings utilize an air handling system with numerous supply and return air points all connected to a central air handling unit [AHU] via the ductwork. Contaminating one point of the system will cause the CB agent to spread quickly and will eventually propagate throughout the facility.”

Nakano and Abraham have used a software program to run simulations involving chemical agents (VX, sarin, and hydrogen cyanide) and the biological agents anthrax and ricin. “Different agents have unique properties and require specialized mitigation strategies,” notes Nakano. “Speaking in general terms, the best strategies to mitigate a chemical attack are the use of dilution ventilation (increasing the amount of outdoor air versus recirculated air used), the use of charcoal/carbon filters, or shutting down the AHU. For biological agents, the strategies include the use of minimum efficiency reporting value particulate filters, ultraviolet germicidal irradiation, and, again, shutting down the AHU.”

The way people move about a facility after it has been contaminated also merits close scrutiny. How, for instance, do you lock down an emergency room and still give first responders the access they need? When evacuating a hospi-
tal emergency room, the escape route chosen can mean life or death. Nakano describes a simulation that tested this idea: “We released a [simulated] chemical agent next to a return air vent in the corridor that adjoins the lobby. From the interior of the emergency room, the lobby happens to be the most direct evacuation route to the outside versus going through the main hospital. Evacuating through the lobby resulted in a lethal dose of the chemical agent.”

Nakano looks ahead to the next phases of his research: “In the future, we will investigate CB protection strategies and technologies, such as sensors. However, there can be significant costs associated with each of these advancements. It becomes a trade-off between an additional financial cost versus a higher level of CB protection.”

As for Abraham, her work in safeguarding hospitals continues with Mark Lawley, a professor of industrial engineering, and his team who are racing to prepare hospital infrastructures for a health crisis like the predicted bird flu pandemic. The solutions to future healthcare crises must begin by thinking ahead to the unthinkable and taking steps to understand and prepare for it now.

What lies beneath

Rao Govindaraju, a professor of civil engineering, is focused on the ins and outs of livestock dietary habits. Literally. His research on the fate and transport of contaminants arises from the ongoing debate about the use of growth hormones and antibiotics for livestock. “These are used with the good intention of keeping livestock healthy,” Govindaraju says, but where do they go from there? Once the chemicals make their way through the cows, the problem becomes apparent. What the livestock excrete is applied to the fields and leeches into the water table. Hormones have been detected in very small quantities in surface and ground water. Once they are in the water, these substances enter the food chain. Fish take in the water, and people eat the fish. And no one knows for sure yet how much of the administered hormones and antibiotics ultimately end up in the water table, which vexes researchers like Govindaraju. “This is an important human health problem,” he says.

Govindaraju is part of a group of researchers devoted to diving deep into these mysteries. He works with thinkers like Linda Lee, a professor of agronomy; Bernard Engel, a professor of agricultural and biological engineering; and John Harbor, a professor of earth and atmospheric sciences. “We are pooling our expertise to make a much stronger team,” says Govindaraju. They base their interdisciplinary research at the Animal Science Watershed, a roughly 5 sq. km. parcel within the Little Pine Watershed Project of the Purdue Animal Sciences Research & Education Center, located continued on next page

A collaborative effort among researchers from agronomy, agricultural and biological engineering, civil engineering, and earth and atmospheric sciences is taking place at the Little Pine Watershed Project. The students here are gathering water samples to test for contaminants.
**Something in the Water**

A new named professorship in civil engineering will foster a family’s interest in hydraulics and hydrology.

When Megan Burke receives her bachelor’s degree from Purdue this December, she will be adding her name to a long line of civil engineers. Both her grandfathers were in the business, and a Burke family picnic looks like a Boilermaker civil engineering reunion: Uncles, aunts, cousins, and great uncles have amassed an impressive collection of civil engineering degrees from Purdue.

And then there is, of course, Megan’s own dad, Christopher Burke, class of 1977. His name is on the undergraduate hydraulics lab in which she studied. “Probably two people in the whole class put Megan together with the name,” says Burke. “She prided herself on flying stealth-like through the school.” It would have been no small task for Megan to maintain a low profile; Christopher and Susan Burke have sponsored prizes and scholarships honoring her grandparents and were involved in the fund-raising efforts for Purdue’s Robert L. and Terry L. Bowen Laboratory for Large-Scale Civil Engineering Research. He has worked on civil engineering’s Advisory Council since 1992. Plus Burke, whose master’s and doctorate are from Purdue, also returns to campus annually to participate in a storm water drainage seminar. For his expertise and contributions in environmental and water resources, Christopher Burke received the Distinguished Engineering Alumnus Award in 1998 and the Engineering Alumni Associate Presidents Lifetime Award in 2001.

Now Burke has extended his longtime philanthropic involvement with his alma mater by sponsoring the Christopher B. and Susan S. Burke Professorship in Civil Engineering, which focuses on a father and daughter’s shared interest: hydraulics and hydrology. The gift was the first response by any Purdue alum to the Bindley Chair Challenge, a matching gift program offered by alumni William and Mary Ann Bindley of Indianapolis. This program allots $22.5 million to match endowed chair pledges. Now the School of Civil Engineering can attract national academic talent to two new posts.

And when the recently named Burke Professor (Rao Govindaraju; see page 6) assumes the new chair, he may well be teaching a student whose name will be hard to forget. Megan Burke hopes to attend graduate school at Purdue, where she’ll dive into her father’s favorite field. ■ G. V.

**G. V.**

Rao Govindaraju (in tie), the recently named Christopher B. and Susan S. Burke Professor of Civil Engineering, works with students in the hydraulics lab.

in the northwest portion of Tippecanoe County, Indiana.

The profile of the land is well-defined: the kind of crops grown and what fertilizers and pesticides are used to grow them, the kind and number of cattle, swine, and other livestock supported, rainfall patterns, soil types, the location of drain tiles. “If all the chemical and physical properties are given, and if we know what kind of soil we are dealing with, we should be able to predict how much contaminant will show up in the water table,” Govindaraju reasons.

Govindaraju and his team are in the early stages of tackling this controversial issue. Initial studies are trying to map which soils are more vulnerable than others. Can characteristics of soil types be identified, for instance, that can lock contaminants in, preventing their passing through to the ground water? “We are pooling whatever knowledge exists,” explains Govindaraju, touting the benefits of the team’s multidisciplinary nature. They are laying the groundwork for the next steps: to design good experiments, to establish proper measures and improve measurement techniques, and to scale up their work to study watersheds statewide. “We are positioning ourselves to answer really important questions that will have a direct benefit on human health.”

Ultimately, the goal of Govindaraju’s painstaking slogging through soil and water samples in one Indiana watershed will be to help clear up some controversial human health problems, such as stubborn bacteria that resist antibiotic treatment and troubling early onset puberty rates that are on the rise. Perhaps downstream of this point in their research, Govindaraju and his team may one day be able to make recommendations for just what—and what not—to feed our nation’s livestock. ■ Gina P. Vozenilek
Many civil engineers leave Purdue with the structural design background that serves them well in positions where they oversee construction projects: roads, bridges, and all assortments of buildings. That was the initial path of Dale Jacobs (BSCE ’63), who after a stint in the Air Force as a construction officer started an engineering consulting firm designing educational buildings, retail facilities, banks, subdivisions, and so forth. But in 1983 he decided he wanted to build facilities that contributed more to mankind.

Enter architecture and engineering firm BSA LifeStructures where today he is a principal and vice president of program management services and quality control. The long road to BSA LifeStructures may have begun 25 years earlier when the Cambridge City, Indiana, native switched his studies from electrical engineering to civil engineering in his freshman year. “After four years in the Air Force, I entered public service for a few years as a city planner and city engineer,” Jacobs says.

He spent another 13 years with a business partner in engineering and architectural design before making the jump to BSA LifeStructures. “I was tired of designing little boxes, and I wanted to do something that had more of an impact on people,” Jacobs says. “The healthcare industry happened to be the one I found. We’re doing all kinds of special facilities that are targeted to helping people get well.”

But how different can designing a hospital be from designing a bank? “It’s totally different,” Jacobs says. “When you design a commercial building it’s basically a skin, and then you fit out the office space inside. In a medical building, there are special restrictions and requirements that must be considered. Part of it has to do with seismic structural design. There are also requirements for life safety, fire protection, emergency communications systems, radiology suites, and MRIs, which require shielding, and other strategic components.”

Operating rooms (ORs), Jacobs says, are a particular challenge and difficult to design. “There are separate requirements for medical gases, air, and all of the support systems necessary for a surgical operation.”

And unlike the typical office building, a hospital is like a little city. “It has its own power plant, restaurant, laundry services, administrative offices, procedure rooms like ORs and MRI suites, and often a helipad on site,” Jacobs says.

Perhaps Jacobs’ early experience as a city planner has served him well on much of the work he’s done for hospitals such as St. Vincent, Hendricks Regional Health, and Deaconess Hospital. One major project he oversaw in the 1990s was the Roudebush Veteran Affairs Center in Indianapolis. “We added some 380,000 square feet of major space and renovated 170,000 square feet of existing space,” Jacobs says. “The project value in those days was about $100 million, and right now would be about $150 million.”

Now BSA LifeStructures is adding two more floors to a tower that the company designed at the same Veteran Affairs complex in the last decade. Repeat business such as that is a big part of BSA LifeStructures’ business. “Approximately 85 percent of our projects are for return clients,” Jacobs says.

With repeat business that surely stems from a client-focused mission statement and a building philosophy that carefully considers the future patients who will inhabit these facilities, BSA LifeStructures looks to continue to provide a strong presence on the healthcare front. The firm also works in higher education; BSA LifeStructures designed the new biomedical engineering building at Purdue University. And for a former Purdue student who cut his teeth on campus in structural design when Kennedy was president, Dale Jacobs’ impact on humanity continues to mark his career path. ■ William Meiners
Ending Water Shortages

A professor, new to Purdue, takes on the challenge.

Venkatesh Merwade has seen pervasive poverty, hunger, and thirst in his Indian homeland. In the United States, he’s witnessed a much greater abundance. While the two countries may seem poles apart economically, he’s found they do share a common, basic struggle: a shortage of adequate water supplies.

Rich or poor, it’s a problem for all countries, even though about three-fourths of the earth’s surface is covered in water. And worldwide, Merwade knows, more than 1 billion people lack access to safe drinking water. Those startling truths spawned Merwade’s thirst for answers and his career.

“There are issues related to water wherever you go. I want to do something towards solving that problem,” the May 1997 graduate of Shivaji University in India says. “I want to help make sure there’s enough water for everyone in this world.”

After earning his undergraduate degree, Merwade worked two years at Montgomery Watson Harza in India, where he designed water distribution systems.

He next earned a master’s in engineering hydrology from the National University of Ireland in 2000, then a doctorate in civil engineering at the University of Texas (UT) at Austin in 2004. He stayed on two years, in post-doctoral work at UT’s Center for Research in Water Resources, where his research included hydrologic information systems, flow and stage network optimization, assessment of groundwater and surface water interactions on the quantity and quality of water in Texas, and in-stream flow studies.

Now, at 30, he’s joined the civil engineering faculty at Purdue, where he’s applying Geographic Information Systems (GIS) to water resource problems and building a research team. In spring 2008, he’ll begin teaching courses in hydrology, hydraulics, and GIS applications in water resources.

“The main focus of my research until now has been on river channels, describing their three-dimensional structure and coming up with techniques to model the channel bathymetry,” he says. “Such information can be used for hydrodynamic modeling, to better understand how the water flows in rivers, and to learn more about in-stream flows.” He’s also expanding his work to include remote sensing techniques in hydrology.

Interdisciplinary opportunities attracted him to the post at Purdue, a place he considered for his doctoral studies. “I will get to work with more people, and I can expand my boundaries by working with them,” he says. “I see a lot of good opportunities.”

Solving the global challenge water supply problem wasn’t Merwade’s first interest. As a child in Kolhapur living with grandparents, parents, uncles, aunts, and cousins in “one big house with about 20 family members,” he enjoyed building houses out of paper and boxes.

“That’s how I became interested in engineering and inclined to civil engineering,” he says. “But as I grew up, I chose environmental engineering because water is a main problem back home. We don’t get tap water 24 hours a day, and a lot of Indian rivers are polluted.”

He’s the only member of his family who left India, where he says, “I always felt secure, had a lot of support, and education was a big part of my growing up.”

He maintains close ties to his country and family, and he volunteers for the Association for India’s Development. The nonprofit raises funds and sponsors projects in India on education, women’s empowerment, social development, and other issues related to rural India.

He also maintains a connection through a favorite pastime, cooking with his wife, Shilpa. North Indian vegetable curries and south Indian snack items are among their favorites.

“We start from scratch,” he says. “It’s not quick and easy.” Much like his career challenge in water resources.

Kathy Mayer
Pictures of breaking waves from the lab experiments of Cary Troy (left), an assistant professor of civil engineering, show a heavier fluid (colored blue) beneath a light fluid (colored red). The wave travels along the interface between the two fluids.

Water Ways

A young researcher hopes to transform his curiosity for what lies beneath surface waters into breakthroughs for a healthier environment.

The ocean and other bodies of water have long held promise for Cary Troy. Family vacations along the Mississippi River and a study abroad program that allowed him to live on an Australian beach while attending the University of New South Wales instilled within him a natural curiosity about what goes on beneath the surface of those flows. Troy will bring that curiosity to Purdue IN January 2007 to begin research in the hydraulics lab in the environmental fluid mechanics area.

“We are trying to tackle the complex things you see in nature with mathematics,” says Troy, who studied flows in lakes and worked on stream bank stabilization as an undergraduate at the University of Illinois. There, his first environmental fluid mechanics course and independent study work in the hydraulics lab put his future in the direction of waterways. “I also liked working in the laboratory.”

As a young man, Troy headed west to receive a master’s (1997) and PhD (2003) from Stanford. He’s been doing post-doctoral research at Stanford since 2004.

Along with a vested interest in the Midwest (he has family on the south side of Chicago) Troy is anxious to take what he’s learned in the field and apply it to local bodies of water. “There are contamination issues with the Wabash and the White River,” he says, “and I’ll also get to study Lake Michigan.”

Intensely interested in what happens inside oceans and lakes, the incoming assistant professor is also focused on internal waves. Even a trip to Starbucks can stir his imagination. Troy suggests looking to the latte, where less dense fluid (milk) rests atop heavier fluid (coffee), to get an idea of that interior action. “Temperature differences caused by the warming of the sun can result in lakes and oceans becoming density-stratified, where warmer water sits atop colder, denser water,” he says. “Just as you can see the milk-coffee interface sloshing slowly in your coffee cup as a wave, internal waves slosh around in oceans and lakes, riding the thermocline that separates the two water masses.”

These waves can reach enormous sizes, Troy says, eventually breaking and mixing the nutrient-rich deeper waters of oceans and lakes with the surface waters. “My research on internal waves hopes to improve our understanding of the mixing caused by these underwater waves so we can better predict the vertical movement of nutrients, pollutants, and biota within the water. These waves can affect the quality of drinking water taken from large lakes like Lake Michigan.”

Troy will arrive on campus in February 2007, dig into his research, and begin teaching in the following fall semester. “It’s an exciting time to come to Purdue with all the expansion they’re doing within engineering, and there are a lot of people I’m excited to work with,” he says.

He’ll hope to add to the expansion by building a new facility in the hydraulics lab. And in addition to civil engineering colleagues such as Dennis Lyn and Rao Govindaraju (see story on page 6), Troy will also be working with researchers from mechanical engineering, earth and atmospheric sciences, and the new Division of Environmental and Ecological Engineering.

An avid scuba diver, Troy plans on diving right in at Purdue. His underwater research could result in applications that could make both for a better environment and better health of the people and animals within it. And that’s the type of impact that can make a real splash.

W. M.
For Matt Wilson, a self-described “super senior” who plans on receiving his degree in civil engineering in December 2006, the question of whether to be or not to be an engineer never seemed to hold much of an option for him. The honest answer, he says, is that his mother repeatedly told him that he was going to be an engineer throughout the first 18 years of his life.

True to his mother’s forecast, and with his love for the outdoors and his disdain for a cubicle future, Wilson made his way from Winfield, Illinois, to Purdue and the School of Civil Engineering. As an ROTC student, he’s committed to spending the next four-and-a-half years in the U.S. Army. But he did want to do something to help recruit students to civil engineering before he left.

Working under the direction of Jason Weiss, an associate professor of civil engineering, Wilson responded to a call to create learning modules for an “Engineering 103” class. Since the start of last summer, he’s created three such modules to teach freshman students the basic concepts of civil engineering. One module—a bridge built from a model train set—allows students to perform a forensic-type investigation of a real-life viaduct collapse. “Each of the four legs leads to a scale, and we’re able to induce a wind load and study what causes the collapse,” he says.

Wilson also helped create scenarios where students would build bridges out of LEGOs, and even work out the logistics of the construction process. “They can actually sell back the pieces they don’t use,” Wilson says. “It’s a lot like scheduling on a construction site and figuring out efficient practices.”

Matt Wilson, a senior in civil engineering, demonstrates a bridge built from a model train set that allows students to perform a forensic-type investigation of a real-life viaduct collapse.
Amy Smith, a senior graduating in May 2007, and Ray David, a junior graduating in December 2007, both worked co-ops at HTNB in downtown Indianapolis. Smith is pursuing a civil engineering degree with a structural emphasis, and David is focused on environmental engineering.

Circle City Co-ops

Cooperative students in Indianapolis are gaining work experience early.

Near the end of June, Bryan Hubbard and Linda Higgins left the relative calm of summer’s campus for a road trip to Indianapolis. Their purpose: to drop in on several civil engineering cooperative students and touch base with their employers.

Beginning the day with a visit to students working near Monument Circle, Hubbard, whose slew of director roles includes that for industrial relations, civil engineering co-op and internship programs, as well as construction engineering and management internships, was eager to see how the students were adapting to the real working world in some extended time away from the classroom. Higgins is the undergraduate administrative assistant who has worked with many of these students since their first days on campus. The trip also allowed her to see some civil engineering graduates now at the start of their careers.

“There are currently many firms around the country looking for co-op students,” Hubbard says. “We are working very hard to recruit more students into this excellent program, which provides significant experience so the students can hit the ground running when they graduate.”

Wilson’s replica of a “smog eating” cement showcases a product that can reduce big-city pollution.

Finally, Wilson ended his summer building a replica of a miniature city to showcase a new product that can radically reduce big-city pollution. “Smog Eating” (or titanium dioxide) cement has the potential to reduce carbon monoxide and nitrogen dioxide pollution in cities by up to 50 percent. “Smog actually attaches itself to a building,” Wilson says. “Through a photo-chemical process with the sun and the concrete, the ‘smog eating’ cement eats that organic material, in effect making it a self-cleaning building.”

Wilson’s miniature city made of the same self-cleaning cement will be sprayed with a red dye, and students will be able to see the buildings go from white to red and back to white. And for a student like Wilson, who intends on practicing his engineering expertise in the great outdoors, there’s not much cooler than a building that eats smog.

■ W. M.
Ross Camp Revisited

Shared stories and a Homecoming weekend help revive memories of the summer surveying camp.

Approximately 100 people attended the Ross Camp Reunion as part of the Civil Engineering Breakfast and Homecoming weekend. The event included a bus tour through the Ross Camp Park. To follow are some of the photos and a few reflections about bygone summers at the camp.

I am from the Ross Camp summer of 1950 during which the Korean War erupted right in the middle of the session. We lost one party member immediately, and he never did return to Purdue.

I also was on a roofing crew putting on a new roof on one of the main hall buildings. I had a short fall backward off the edge of the roof line, but luckily was uninjured. To this day I still crawl up and down ladders cleaning out second-story gutters, making minor roofing repairs, and trimming trees. I am still nimble at age 80.

Hubert Kleasen (BSCE '53, MSCE '54)

I transferred into the Purdue Civil Engineering School from the Colorado Schools of Mines at the beginning of my sophomore year and attended Ross Camp during the following summer in 1956.

I was sorry to read that the Ross Camp has been discontinued, but I suppose the “modern engineer” has

Class Notes

Michael Grimaldi (BSCE ’74) has been appointed president and chief executive officer of GM Daewoo Auto & Technology Co. Grimaldi began his GM career in 1976 and has held several management positions prior to this promotion.

Mark Swatek (BSCE ’75, MSCE ’77) was selected as chief executive officer of Southwest Water Company. The company provides a broad range of services including water production, treatment and distribution; wastewater collection and treatment; utility billing and collection; utility infrastructure construction management; and public works services.

Carlos Hernandez (BSCE ’76) has been named general counsel and company secretary of International Steel Group. In this role, he is chief legal officer for the company.

James Kiefer (BSCE ’77) has been promoted to vice president of engineering at Great Traditions Land & Development Company in Blue Ash. For 25 years the company has been creating many of Cincinnati’s most successful lifestyle-oriented, master-planned communities.

Dario Santana (BSCE ’77) was selected as president and chief executive officer of Buzztime, Inc., a leading developer and distributor of interactive entertainment games and technology.

James Richard (BSCEM ’84) has been named president of global operations at Primex Wireless, Inc. Primex is a world leader in GPS Wireless synchronized tie systems.
little use for the practicalities of field surveying and other hands-on courses like we took back in the ’50s, such as heat treating, gas and electric welding, and foundry casting. I have used my knowledge of surveying quite extensively in my homebuilding and land development activities and my welding skills on my Christmas tree farm.

H. Robert Schoenberger, Professional Engineer (BSCE ’58)

And Leonard Hasse (BSCE ’63, MSCE ’66) shared this from his autobiography:

Our August 1960 surveying course was the 43rd annual, and final, surveying camp. The students were organized into four-man teams. Our team, “party 5,” consisted of me, Leonard Hasse, Larry Smith, Jim Iverson, and Per Solberg, a student from the Netherlands.

We started the day by raising the flag and then having breakfast. We would get our assignments then go out in the field to do our surveying or leveling, taking notes of our readings. We would break for lunch then go back out in the field until the end of the day when we would return to camp. We would transcribe our notes in the evening, do the plotting, and write our reports. The terrain at Ross Camp was very rugged. We learned to use all current surveying instruments, running topographic surveys, leveling, geodetic surveys, taking sights off the stars, earthwork computations, etc. We dressed lightly, me in a tan pith helmet or fatigue cap, fatigue pants, combat boots, web belt, and canteen of water. I normally went shirtless and finished the camp with a very dark tan and a beard.

**Wade Miquelon** (BSCE ’87) has been appointed executive vice president and chief financial officer of Tyson Foods. He will have responsibility for the company’s worldwide finance and accounting functions.

**W. Troy Roder** (BSCE ’89) has been appointed president and chief executive officer of Foster Wheeler USA Corporation, part of the Global Engineering and Construction (E&C) Group.

**Jeff Hagerman** (BSCEM ’93), president of GDH and executive vice president of Hagerman Construction, was named to Indy’s Best & Brightest Under 40 list at a luncheon benefiting Junior Achievement of Central Indiana.

**Keith Kowalkowski** (PhD CE ’05) has joined Ruby + Associates, a structural engineering firm based in Farmington Hills, Michigan. Kowalkowski is a member of the Committee on Fabrication and Inspection of Metal Structures for the Transportation Research Board and is also on the newly formed Sustainability Committee for the Structural Engineering Institute, a community of structural engineers within the American Society of Civil Engineers.

We are always interested in featuring recent news about our alumni. To have your accomplishments included in this magazine and share them with fellow alumni, please e-mail information on awards/honors/recognition, promotions, and related matters to Cindy Lawley (lawley@purdue.edu). Please be sure to include the year(s) and Purdue degree(s) you have received.
With four of the 20 endowed professorships, Civil Engineering makes a strong showing in the Goodwin Challenge.

With monies matched dollar for dollar from the estate of a civil engineering alumnus, the School of Civil Engineering will benefit from four new named professorships. That’s four of the 20 university wide, valued at $30 million. “Meeting this challenge is a major success not just for our Campaign for Purdue but also for the entire university,” says Purdue President Martin Jischke. “The professorships it will create empower us to recruit and retain the best faculty, the key to every great university.”

So far, Purdue has raised $198 million to help fund 100 new endowed professorships as a result of the $1.5 billion Campaign for Purdue. The campaign to date has raised $1.45 billion and will conclude on June 30.

A challenge match to create 20 endowed professorships was made possible through a $15 million unrestricted estate gift from George Goodwin, who died in 2002. Money from the estate was used to match dollar for dollar every new $750,000 gift, and the combined total of $1.5 million will fund each professorship.

Goodwin, who was born in New Castle, Indiana, received a bachelor’s degree from Purdue in civil engineering in 1930. After he retired as executive director of the Indiana Department of Transportation, he made his residence in Venice, Florida. He was a member of the Purdue Research Foundation since 1967 and was a lifetime member of the Purdue Alumni Association. He also was a member of the President’s Council for many years and the council honored him with its Distinguished Service Award in 1997.

The 20 Goodwin professorships have been created in departments and areas across the university, including engineering, education, liberal arts, pharmacy, nursing, veterinary medicine, and science. The four from civil engineering include the following:

**The Indiana Chapter of the American Concrete Pavers Association** provided funds for the Concrete Paving Industry Professorship in Concrete Pavement and Materials Science in the School of Civil Engineering. Members include paving contractors, cement companies, equipment manufacturers, material and service suppliers, ready-mixed concrete producers, allied associations/organizations, bonding and insurance companies, consulting firms, and other allied organizations and individuals.

**Robert and Terry Bowen of Indianapolis** provided funds for the Bowen Engineering Head of Civil Engineering. Robert Bowen earned a bachelor’s degree in civil engineering at Purdue in 1962 and is chairman and chief executive officer of Bowen Engineering Corp. in Fishers, Indiana. Terry Bowen is president of the Bowen Foundation. The couple also has funded Purdue’s Robert L. and Terry L. Bowen Laboratory for Large-Scale Civil Engineering Research, the Bowen Foundation to provide scholarships to Marion County students, and Science Bound, a Purdue program to encourage eighth-grade to 12th-grade students from Indianapolis Public Schools to pursue careers in the sciences and technical fields.

**Jack and Kay Hockema of San Juan Capistrano, California** contributed funds for the Jack and Kay Hockema Professorship in Civil Engineering. Jack received a bachelor’s degree from Purdue in civil engineering in 1968 and a master’s degree in management from the Krannert School in 1970. He is chairman, president, and CEO of Kaiser Aluminum Corp. in Foothill Ranch, California. They are both Lafayette natives and are graduates of Lafayette Jefferson High School.

**The Pankow family of California** provided funds for the Charles Pankow Professorship in Civil Engineering. Pankow, who died in 2004, was a South Bend, Indiana, native and a 1947 graduate in civil engineering who received an honorary engineering doctorate from Purdue in 1983. He was the recipient of the national Chi Epsilon Award, the organization’s highest individual honor. Pankow founded his own construction company, Charles Pankow Inc., in the garage of his Altadena, California, home in 1963. The company builds commercial office buildings, multifamily housing, mixed-use developments, hotels, hospitals and parking structures.

**Kim Medaris**
Members of the Indiana Chapter of the American Concrete Pavers Association, some of whom are shown in the smaller photo (above) visiting Purdue’s Robert L. and Terry L. Bowen Laboratory for Large-Scale Civil Engineering Research, responded to the Goodwin Challenge. The association is providing funds for a professorship in civil engineering.
Cultured neurons are growing on a biomaterial surface designed to function as an interface between the cells and the electrodes of an implantable device. Together the neurons and the electrical device will be implanted into regions of the brain that are responsible for seizure. See page 13 (college side) to learn more about this Purdue Engineering research.