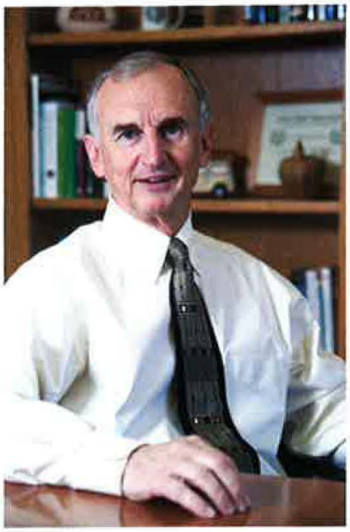
UMaine Today
CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE MAY/JUNE 2008

Living dangerously

What price do we pay for ignoring the warning signs?

Sea Current
Finding the Words
Good Returns
The Making of Figaro

President's Message



THE REACH AND IMPACT of a comprehensive public university can take many forms. At the University of Maine, we take pride in the profound effect our institution has on people throughout our state. Of course, we educate students from all corners of Maine and well beyond our borders. Cooperative Extension and other outreach activities bring UMaine people and programs to Maine communities, and our alumni are business and community leaders statewide.

Two stories in this issue of *UMaine Today* remind me of another way to measure the breadth of that impact. They are two examples of UMaine research and outreach changing the lives of children. Economist Mary Davis' research on the impact of secondhand smoke in motor vehicles has led to public policy that protects children from those dangers. The faculty and students at UMaine's Conley Speech, Language and Hearing Center are doing remarkable things to help young children with communication difficulties, opening new opportunities for those youngsters to enjoy happy, fulfilling lives.

All of the UMaine faculty, students and staff members involved in these scholarly pursuits are committed to using their skills and knowledge to help others. Their success in that regard is personally rewarding, and it provides another measure of the value of the University of Maine to our state and its citizens, from the youngest to the oldest.

I offer my best wishes to each of you for an enjoyable summer. *UMaine Today* will return in September, and we look forward to sharing more news about UMaine and the accomplishments of its remarkable people.

Robert A. Kennedy
President

ON THE COVER: As an environmental health economist, Mary Davis looks at the impact of the environment on the development of human diseases. She believes that in order to understand the economic cost of exposure to airborne pollutants or the policies that address such public health concerns, she has to learn firsthand the nature of that exposure. In her most recent studies, she has been collecting data on truckers' exposure to diesel fumes, the safety practices of Maine's commercial fishermen and the effect of secondhand smoke on children in cars. Her findings shed light on the price we pay for ignoring the warning signs of danger in our everyday lives. See related story on page 2.

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University of Maine profile

Located in Orono, Maine, the University of Maine is the state's land-grant and sea-grant institution. UMaine serves its home state through its explicit statewide teaching, research, and public service outreach mission. Offering 86 bachelor's, 92 master's and 29 doctoral degree programs, UMaine provides the most varied and advanced selection of programs available in Maine. The Carnegie Foundation for the Advancement of Teaching classifies UMaine as a Doctoral Research Extensive University, the highest classification.

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UMaine environmental health economist studies the costs of being on the road and the seas

Safety in num

By Tom Weber

DRAPED OVER A CHAIR in Mary Davis' office at the University of Maine is a pair of bright orange nylon coveralls bearing the insignia of the Maine Marine Patrol.

A nearby duffel bag holds an orange neoprene cold-water survival suit, also the property of the water-based law enforcement wing. Both are standard-issue equipment in Davis' most recent line of work, which involves gathering safety-compliance data aboard Maine commercial fishing boats.

On a bookshelf sits a well-used air monitor that allowed her not long ago to measure the particle pollution drifting from the cigarettes she reluctantly puffed on a car trip from Bangor to Bar Harbor while researching the costly effects of secondhand smoke on children.

Not exactly the tools of the typical economists' trade, perhaps, but Davis doesn't think of herself as a typical economist.

"I would say it's rare to do this type of active sampling in economics," says Davis, an assistant professor in the School of Economics. "Most economists would rely on data that already exists."

As an environmental health economist, drawing on the natural and the social sciences, Davis looks at the impact of the environment on the development of human diseases. She believes that in order to understand the economic cost of exposure to airborne pollutants or the policies that address such public health concerns, she has to learn firsthand the nature of that exposure and whether it causes illness.

"I start with improving the underlying scientific knowledge regarding the health effects of disease," she says, "before I try to make policy recommendations or cost assessments from an economic perspective."

Being able to access large collections of data can be a valuable tool in economic research. But the issues Davis tackles in Maine don't necessarily offer an abundance of preexisting data. Sometimes, as in the case of her ongoing study of safety practices in Maine's dangerous commercial fishing industry, there are no statewide data sets available. The only way to get the data she needs is to go out and collect it herself.

"My work is looking at what's actually being done by fishermen to mitigate risks on an individual level," she says, "so that we can more efficiently determine the best course of action to prevent accidents and deaths among commercial fishermen in the state."

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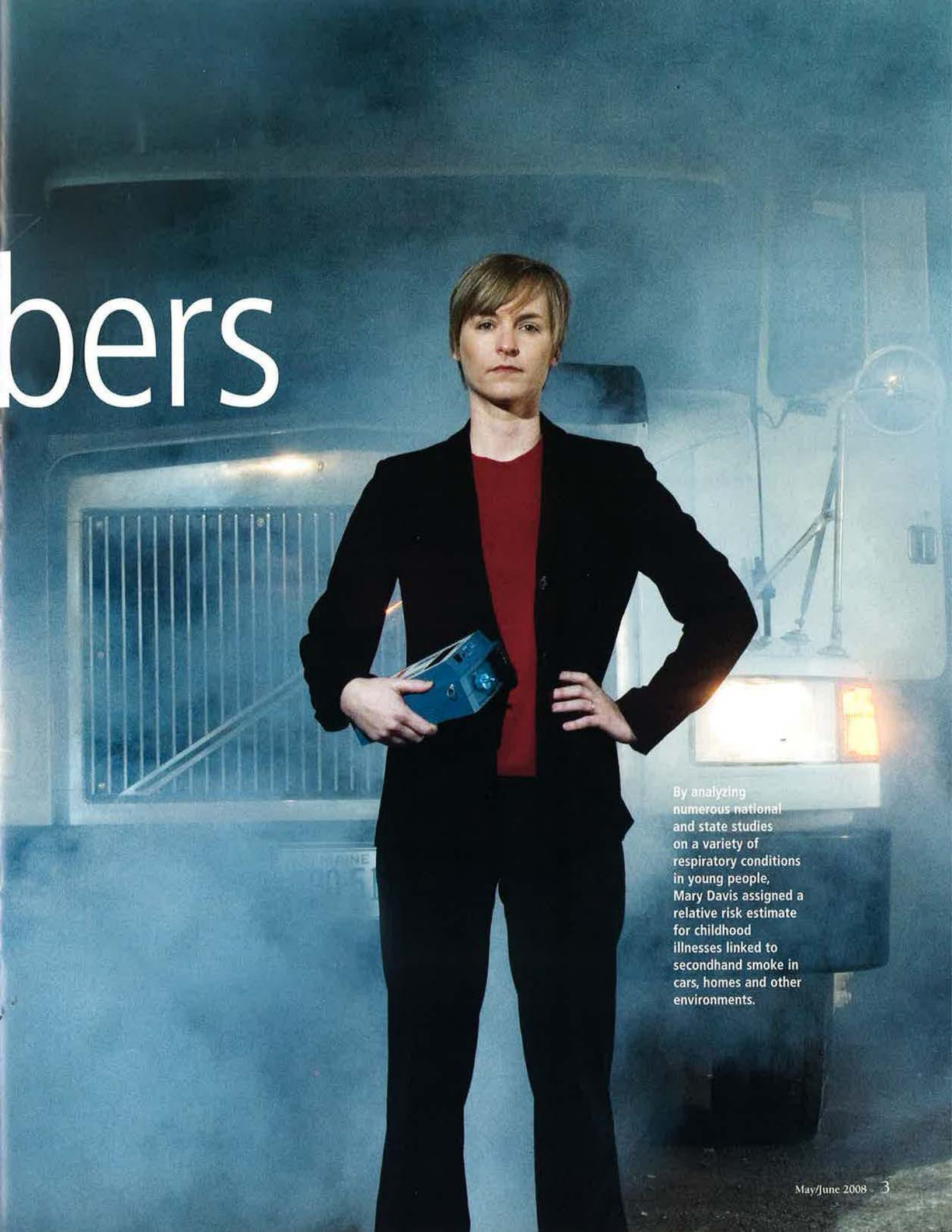


By analyzing numerous national and state studies on a variety of respiratory conditions in young people, Mary Davis assigned a relative risk estimate for childhood illnesses linked to secondhand smoke in cars, homes and other environments.

Safety in numbers

"Diesel exhaust is now considered to be a probable carcinogen. But no one has ever done so large and comprehensive a study as this. Our hope is that we can refine the risk estimates and move diesel from a probable to a known carcinogen."

Mary Davis

AFTER GETTING A bachelor's degree in economics and international studies in 1998 at the University of Miami, Davis worked as a U.S. Customs inspector at the city's busy airport.

"I was a drug interdiction officer, which meant I was constantly arresting people and putting my life in danger over drugs," she recalls. "I was also their data person, collecting and cataloguing information. It was a life-altering experience, I'd have to say, but it wasn't for me."

Davis eventually shifted her economics focus from international to environmental, and got her doctorate in economics in 2003 from the University of Florida. For her dissertation, she examined the economic factors that influence state environmental policymaking, and developed a model to predict those decisions. She determined, among other things, that a state is more likely to adopt stricter environmental standards when compliance does not come at great economic expense.

In 2003, Davis began studying at Harvard for a second master's degree, this one in biostatistics, but changed her plans when she got a chance to do postdoctoral research for a project in environmental health at the university's School of Public Health. The project, which she is involved with still, is a comprehensive examination of the connection between elevated lung cancer rates and exposure to diesel exhaust fumes among some 55,000 unionized truck drivers.

With an epidemiologist, a physician and an occupational hygienist, Davis helped to collect and analyze 5,000 air samples from 36 trucking terminals nationwide. She is now working to create an exposure model to predict the risk of lung cancer for employees in various aspects of the trucking industry, including drivers, diesel forklift operators and loading dock workers.

Davis says the information is relevant not only to truckers, but to the public that lives, commutes or works near diesel-fueled traffic or trucking terminals.

"It's definitely an ongoing project," says Davis, who came to UMaine in 2006 and maintains a visiting scientist appointment with Harvard. "Diesel exhaust is now considered to be a probable carcinogen. But no one has ever done so large and comprehensive a study as this. Our hope is that we can refine the risk estimates and move diesel from a probable to a known carcinogen. Increasing the level of certainty allows people who make policy to be better informed in their decisions."

LAST SUMMER and fall, Davis did a study that put an eye-opening number on the economic impact of secondhand smoke on children in Maine. The idea for the research came from Bangor pediatric dentist Jonathan Shenkin, who led a successful effort to get the Bangor City Council to prohibit smoking in vehicles carrying passengers 18 and younger, and then pushed to have a similar ban enacted statewide.

By analyzing numerous national and state studies on a variety of respiratory conditions in young people, Davis assigned a relative risk estimate for childhood illnesses linked to secondhand smoke in cars, homes and other environments. The annual price tag for the increased doctor visits, hospitalization, medication and work time lost to parents who care for sick children, Davis calculated, is more than $8 million.

Davis says she prefers not to legislate personal responsibility, and doesn't usually feel comfortable in an advocate role. But she is willing to make an exception when it comes to a statewide ban on smoking in cars with children present. For Davis, the numbers simply do not lie.

"I was able to identify a clear risk regarding secondhand smoke and children," she says. "Nonsmoking adults have a choice to

not be around secondhand smoke. Children don't have that choice, not if their parents smoke at home or in the car, and the car is certainly a peak setting for exposure."

To further drive home that point, Davis strapped the real-time air particle pollution monitor to the backseat of her car, roughly where a child's head would be, and took a ride from Bangor to Bar Harbor. Davis rolled down the window a bit and lit up in the name of science. As she smoked, the monitor registered 10 times the allowable level of particle pollution. When the cigarette was out, the particles from the smoke dropped to negligible levels after a few minutes.

Although her work examined the effects of secondhand smoke on children in general, and was not specific to cars, Davis says she did the driving experiment to emphasize the dangerously high particle levels that can build up in small spaces where children are so often confined.

With an epidemiologist, a physician and an occupational hygienist, Davis helped to collect and analyze 5,000 air samples from 36 trucking terminals across the country. She is now working to create an exposure model to predict the risk of lung cancer for employees in various aspects of the trucking industry.

HER HARVARD connection also led Davis to her most recent field study, and the reason for all that bright orange seagoing gear in her office. Funded by a $200,000, two-year Maine Sea Grant, Davis has teamed up with Ann Backus, director of outreach for the Harvard School of Public Health, and the Maine Marine Patrol on a first-ever assessment of the rate of safety compliance among Maine commercial fishermen.

Although fishing is one of the most dangerous occupations, Davis says there is currently no way of knowing how many Maine fishermen are actually complying — and to what degree — with the regulations intended to keep them safe. Her research will be used to create an economic model of the cost of compliance, which can then help industry regulators better understand the impact of imposing new federal safety laws in the future.

Davis, the project's lead investigator, and Greg Blackler, a Damariscotta lobsterman who is pursuing his master's degree in economics at UMaine, began boarding vessels last November to gather data from the fishermen themselves. Their goal for 2008 is to board 300 vessels working in a variety of fisheries along the Maine coast. The initial response from fishermen was encouraging; the researchers were welcomed aboard each of the first 30 lobster boats they encountered about 10 miles off Rockland.

Davis, Blackler and Backus, who is a member of the Maine Commercial Fishing Safety Council, always begin by assuring fishermen that the survey will not lead to citations, even if safety violations are found. All information is anonymous, Davis says, and neither the fishermen's names nor the identities of the boats are ever recorded.

The survey is brief — less than 10 minutes — but thorough. There are general questions concerning the fishermen's lives and work history, as well as the lengthy list of safety equipment they're required to carry, at their own expense, by the Commercial Fishing Industry Vessel Safety Act of 1988. To avoid a fraudulent and thereby worthless collection of data, the fishermen are asked not only if they have, say, the correct number of life preservers or fire extinguishers aboard, but if they might be kind enough to show them to the researchers.

"Truckers and lobstermen are similar in some ways," says Davis. "They both tend to be rough-and-ready, independent people. There's a wide variety of types among fishermen. Some of them are all about getting help regarding safety issues, and there are those out there by themselves on rickety boats who worry that we're going to catch them doing something wrong. But we assure them that we're not out there to mess with them."

The Maine Marine Patrol, which transports the researchers to the sampling sites, are grateful for the data, Davis says.

"They're sincerely interested in safety, and would like to know what things are really like on the water," she says. "This has never been done before, in any state, and by the end we'll have a broad, one-of-a-kind understanding of safety compliance. Maybe we could use this information to develop safety-education programs. And finding out which fishery or area of the coast is least compliant can help the Marine Patrol to best use their resources."

Davis, a member of a National Academy of Sciences panel studying air pollution issues, plans to focus her considerable number-crunching skills — and that handy air particle monitor — on wood smoke in Maine at some point.

"I really like getting out there and collecting my own data whenever possible," she says. "It's exciting for me, and more the kind of thing you'd see in the natural sciences." ▮

Finding the word

UMaine speech-language pathologists offer early intervention and preliteracy skills

By Margaret Nagle

"GORGEOUS."

Brenda St. Amand was driving when she clearly heard the word spoke by the only other person in the SUV that day, her 5-year-old grandson, Brendon.

She couldn't believe it.

"What did you say?" she asked.

"Gorgeous."

"Who is?"

"Memé is gorgeous," the youngster responded.

The three words left St. Amand speechless.

"That was our moment," says St. Amand, remembering the conversation that took place the previous day. "I said to myself, 'This is what this is all about.' It was not only that he said the word, but that he was able to associate the word with a person or object. It meant now he is able to have opinions."

"Brendon is one of those children who can do more than people give him credit for. From one-, two- or three-word utterances, he now is doing analogies and giving me two full sentences. He remembers and learns so quickly. The more he talks, the more tools he'll have."

Emilie Nichols

For youngsters like Brendon with autism spectrum disorder (ASD), communication and social skills are key to helping them develop to their full potential. Children with ASD have developmental disabilities that impair their social interaction and verbal and nonverbal communication, and cause repetitive behaviors or interests, according to the National Institute of Mental Health (NIMH).

The Centers for Disease Control and Prevention estimates that as many as 1 in 150 children has ASD, which is four times more likely in boys than girls.

Despite evidence in the past 15 years that intensive early intervention in optimal educational settings for at least two years during the preschool years results in improved outcomes in most youngsters with ASD, NIMH estimates that only half of the children are diagnosed before kindergarten.

As the result of his grandparents' advocacy, Brendon is one of them.

AS A BABY, Brendon would sit contentedly in silence for long periods. By 18 months, he still hadn't uttered a word, but his behavior had morphed into repetitive spinning on the floor and rocking on all fours in bed.

"Each time my daughter took him to his pediatrician, the message came back that I was an overreactive grandmother," St. Amand says. "I remember my frustration, hurt and disappointment. At a year and a half, I put the pressure on and eventually made the phone call to have him tested and was told he has autism."

Emilie Nichols, a master's student in communication sciences and disorders, provides speech-language therapy for Brendon twice a week at the Conley Speech, Language and Hearing Center on campus and at the Green House Nursery School and Child & Family Center in Milford. Together, they work on a number of prereading skills, such as word associations. Nichols' work is supervised by Conley Center speech-language pathologist Lorriann Mahan, pictured below, sharing a celebratory high five with Brendon.

Photos by Michael Mardosa

Finding the words

The state Department of Education's Child Development Services referred the St. Amands to the University of Maine's Conley Speech, Language and Hearing Center, staffed by faculty and students in the Department of Communication Sciences and Disorders, and directed by speech-language pathologist Judy Stickles. Conley offers audiology and speech-language clinics featuring diagnostic services and family-based treatment involving evidenced-based practice.

"I remember the first day we took him to Conley two and a half years ago and he could not speak a word," says St. Amand, who, with her husband, Don, is Brendon's primary caregiver. "When he was moving around too much to sit in a chair, we sat on the floor. I remember thinking, 'How are they going to make this child talk?'"

For Lorriann Mahan, a Conley Center speech-language pathologist and UMaine faculty member, Brendon was a nonverbal preschooler with ASD and no time to waste. Mahan, the clinical supervisor of graduate students in clinical practicums at Conley, developed a speech-language therapy regime for Brendon. She and Conley's grad students have worked with Brendon and his grandparents twice a week since then to help the youngster understand and be understood.

His first words were verbs, like running and crying. Then came his association of words with emotions.

"We crossed such a hurdle when he was able to understand what we were asking or telling him, and he was able to communicate with us," says St. Amand. "When someone says a child is going to Conley for speech therapy, it's not just for speech but for an education (in how to live in) the real world."

Without all the interventions of such providers, says St. Amand, "we probably would not have been able to take care of him. He'd probably be in an institution."

THE CONLEY CENTER is where Brendon first met Emilie Nichols, a master's student in communication sciences and disorders who took over his therapy under Mahan's supervision. The learning is reciprocal between the student pathologist and youngster with special needs. Brendon provides instant feedback, especially in his display of happiness at the smallest of achievements, like word associations using flash cards and full-sentence responses to questions.

"Brendon has a willingness to do anything you ask of him, even if it's hard stuff. He's so loving and has a wonderful support system. Working with people like that in this field reminds me why I'm doing what I'm doing," says Nichols, who was a speech-language assistant in a preschool prior to starting her master's work.

UMaine and state and private agencies facilitate the inclusiveness of the Green House by providing onsite services where youngsters need them most. Lynn Faerber

In a recent survey of speech-language pathologists by Pennsylvania State University researchers, published in the January issue of *Language, Speech, and Hearing Services in Schools*, a majority of respondents reported that "they could have benefited from additional training in the area of autism." Through Conley and placements like the Green House Nursery School and Child & Family Center, and Stillwater Montessori School, UMaine graduate students in the Department of Communication Sciences and Disorders get hands-on training.

In her five months working with Brendon, Nichols says the biggest changes have come in his expressive language abilities. "He is one of those children who can do more than people give him credit for," she says. "From one-, two- or three-word utterances, he now is doing analogies and giving me two full sentences. He remembers and learns so quickly. The more he talks, the more tools he'll have."

NICHOLS SEES Brendon in her clinical practicum at Conley and at her placement site at the Green House Nursery School and Child & Family Center. The Green House, founded and directed by Lynn Faerber, opened in 1983 as an inclusive, community-based preschool, where up to a third of the youngsters may have identified disabilities. Soon after it opened, the UMaine Department of Communication Sciences and Disorders collaborated with the Green House to set up a supervised placement site to deliver speech-language services.

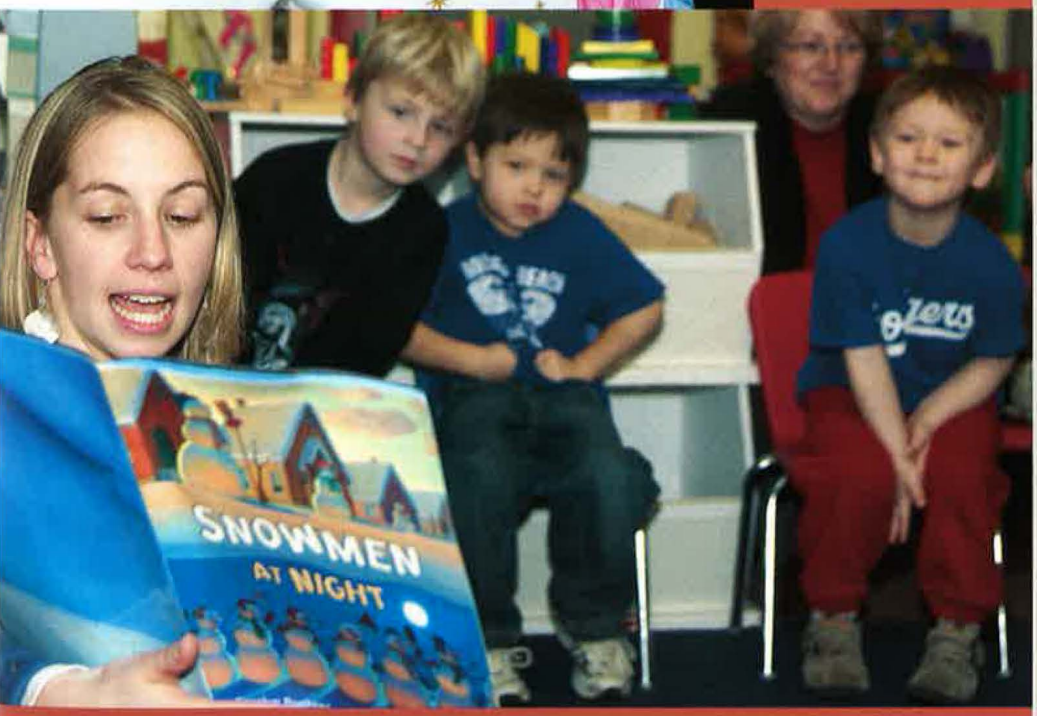
Today, graduate students in communication sciences and disorders also are in placements at Holden Elementary School, and assist in speech-language evaluations at local public schools.

In her placement at the Green House, Nichols provides one-on-one speech-language therapy to Brendon and two other children with developmental disabilities. A parent, grandparent or guardian is encouraged to sit in on the session as part of the family-centered approach to continuing speech-language lessons at home. Also sitting in are educational aides for the youngsters with disabilities, helping maintain consistency by integrating the clinicians' communication ideas and strategies when the youngsters are in the classroom.

Weekly Nichols and Mahan meet with the Green House teaching staff to talk about learning strategies and educational goals.

"Children on the spectrum learn best with an extremely cohesive team," Faerber says. "One of the hallmarks of the syndrome is the language disorder piece. It's critical

Communication skills to aid social interaction with her typically developing classmates are a focus for 5-year-old Selina, who doesn't effectively articulate her wants and needs. UMaine graduate student Emilie Nichols gives Selina the language to help her navigate social situations with her peers. For 5-year-old Kyle, diagnosed with a developmental delay, the therapy focus has been on social and language issues, including his articulation. Maintaining focus also is an issue.



In her placement at the Green House Nursery School and Child & Family Center, graduate student Emilie Nichols provides one-on-one speech-language therapy. She also takes preliteracy lessons into the classroom, leading story time once a week to focus on skills like rhyming, and she interacts with all the preschoolers, ever-ready to encourage effective communication that translates into good social interaction among all children.

that the speech-language pathologist be part of ongoing, daily communication with the team. That collaboration has been key."

UMaine and state and private agencies facilitate the inclusiveness of the Green House by providing onsite services where youngsters need them most, says Faerber.

"We have a huge network of expertise and support out there and, as a result, the outcomes for our kiddos are extremely positive," Faerber says. "Things that people didn't think were possible for kids do happen here. We need more people out there thinking outside the box. Every child deserves to be in his or her community school, and we're proof that it can be done through collaboration with the university and others."

THE INCLUSIVE best practices modeled at the Green House are what parents and grandparents hope to find when their youngsters with special needs enter elementary school. One of the keys is in giving children with disabilities the confidence in their communication and social skills to walk into a new environment and succeed.

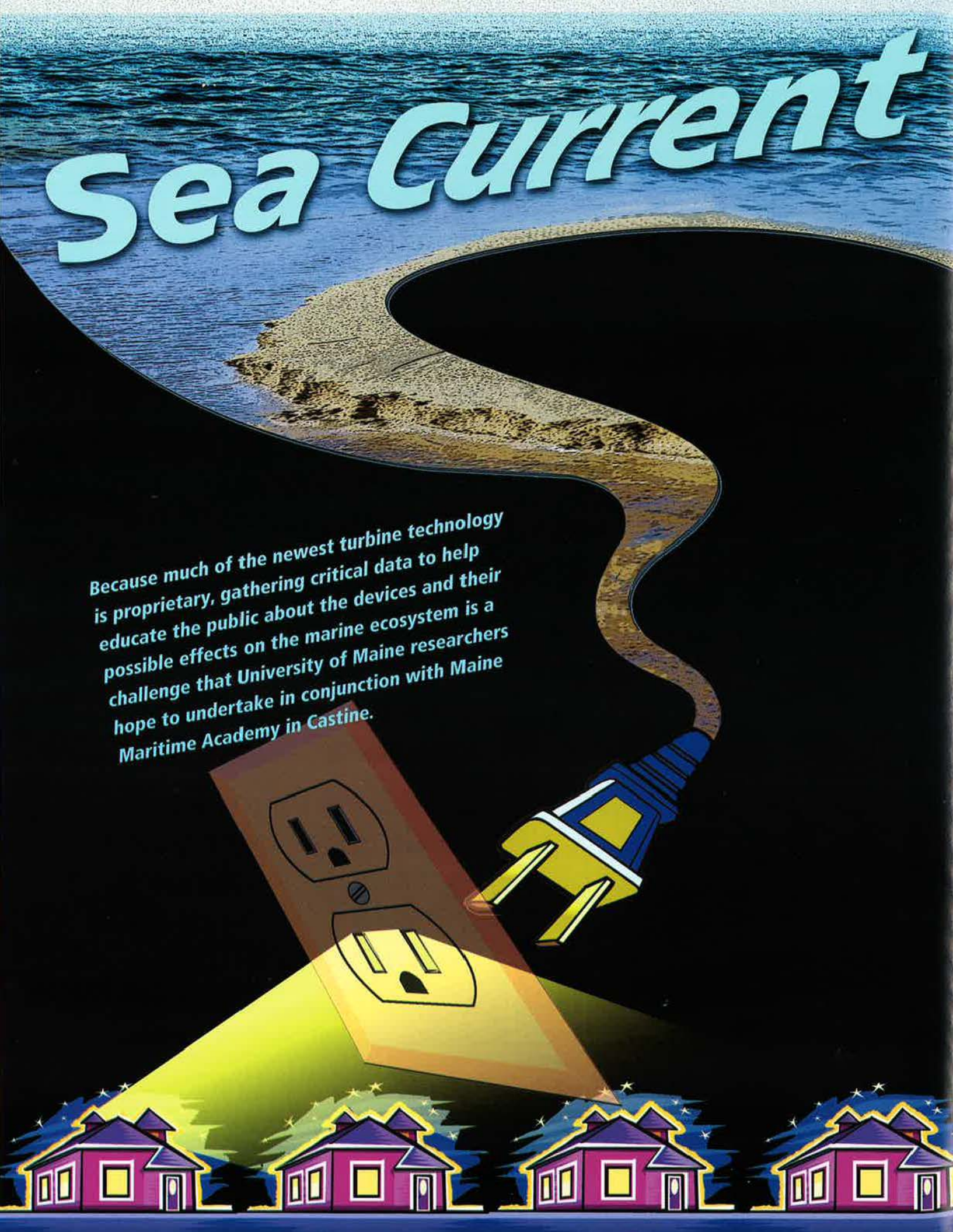
Brendon is headed to kindergarten in the fall, and St. Amand already knows she will again ratchet up her advocacy, this time with the local school, to get the transitional and placement services he needs and is entitled to by law. And even after he starts school, Brendon will continue to receive speech-language therapy at Conley.

"My hope is to see him in a regular classroom, learning like other children," she says. "Academically, I think he's going to be OK. I'm just concerned about (social) activities."

In the past three months, it's as if a switch has been flipped in Brendon. "He's able to sit on the sofa and keep occupied," St. Amand says. "He's able now to sit and watch a movie. We're able to sit and have dinner together.

"We can't wait for the word 'why' to come up in his vocabulary. We can't wait for the day we can hold a conversation with him. We can't wait for him to start the conversation." ▮

Sea Current



Because much of the newest turbine technology is proprietary, gathering critical data to help educate the public about the devices and their possible effects on the marine ecosystem is a challenge that University of Maine researchers hope to undertake in conjunction with Maine Maritime Academy in Castine.

Maine researchers study the state's potential for tapping tidal power

By Tom Weber

THE TIMELESS TUG of the moon on the sea has long been a source of personal and professional fascination for Huijie Xue.

The University of Maine oceanographer grew up in Zhejiang Province, a coastal region of China that is home to that country's largest tidal range. The extraordinary surging tides of the Qiantang River, comparable in magnitude to those of the Amazon, every year draw thousands of people to witness this magnificent natural spectacle.

"I've always been very interested in tidal power. It is what got me started as an oceanographer," says Xue, who is now leading a group of UMaine researchers who are eager to explore the many facets of tidal power generation. Their hope is to make UMaine a leading source of public information about the nascent technology and its role in the larger energy picture for the state and the nation.

"The University of Maine is uniquely positioned to approach this kind of work," says Michael "Mick" Peterson, Libra Foundation Professor of Engineering and a member of the campus initiative. "We've got all the pieces right here. I don't think I've seen another issue that uses our combined strengths as well as this."

Their timing could not be better.

People have long dreamed of the energy-generating potential of tides. In the 1930s, President Franklin Roosevelt backed an ambitious scheme to build a series of tidal power dams between Maine and Canada, but the project was eventually scuttled by a skeptical Congress.

But now, with concerns about record-high energy costs, our nation's dependence on imported oil and the dire implications of global climate change, developers from Maine to California are scrambling to refine new, greener technologies that could turn the tides into sources of clean, renewable, predictable and relatively low-cost energy.

Last year, a study by the California-based Electric Power Research Institute (EPRI) of several potential tidal plant sites in North America determined that some of the most promising are off the coast of Washington County in Maine, specifically Cobscook Bay and the Western Passage of Passamaquoddy Bay, an inlet of the Bay of Fundy.

According to study project leader Roger Bedard, Maine's "world-class tidal resource," with its enormous range of 9 feet to 30 feet, is capable of producing electricity at a cost of 4.2 cents to 6.5 cents per kilowatt hour.

The report sparked a torrent of interest in the region among would-be tidal power developers, including the Passamaquoddy tribe, an engineer from Trescott, Maine, and Florida-based Ocean Renewable Power Co. (ORPC), which began testing its one-third scale prototype turbine in December in the powerful tidal flows of the Western Passage near Eastport.

ORPC received a $300,000 development

A good idea then — and now

PERHAPS THE ONLY truly new aspect of the plans to harness energy from the enormous tides of Down East Maine is the sophisticated technology that might actually make it happen this time around.

A hydraulic engineer from Minnesota named Dexter Cooper, a summer visitor to Campobello Island, had the same idea back in the 1920s as he pondered the power potential in the 70 billion cubic feet of seawater that coursed into Passamaquoddy Bay with each incoming tide.

According to various histories of the Passamaquoddy Tidal Power Project on the Web, Cooper's ambitious plan involved damming both Passamaquoddy and Cobscook bays to generate some 3 million megawatts of electricity annually. The incoming tide would be trapped in Passamaquoddy Bay, then released in a continuous flow through turbines into Cobscook Bay. Water would then be released back into the Bay of Fundy.

In 1935, Cooper's Campobello neighbor, President Franklin Roosevelt, thought enough of the energy-producing scheme to secure $10 million in relief funds to begin construction. That year in Eastport, a workers' village was built that included a school, hospital, machine shops and more than 100 houses.

But less than a year later, the massive New Deal project ended when federal funding was cut over concerns about the environment, fisheries, where a suitable market might be found for all that electricity and how it would be transmitted.

Quoddy Village was later used for the National Youth Administration and then as a training base for Seabees in World War II. The houses are now privately owned, and a dike built for the project supports Route 190 from Eastport to Perry.

The Quoddy Maritime Museum in Eastport houses the original working scale model of the Passamaquoddy Tidal Power Project.

Illustration by Valerie Williams

Sea Current

award from the Maine Technology Institute to engineer its $1 million turbine module prototype, which the company thinks can generate as much as 25 kilowatts of power in a 6 knot current.

ALTHOUGH ONE of the proposed projects involves the use of a tidal dam or barrage, reminiscent of FDR's abandoned Depression-era project, the others are banking on a newer technology known as tidal in-stream energy conversion. A relative newcomer to the renewable energy field, it uses submerged turbines with blades turned by the currents in much the same way that wind moves turbines on land. Unlike wind or solar power, however, tidal power is entirely predictable; the position of the sun and the moon tells you just how much energy will be available, and when.

Yet because the technology is still in its infancy, similar to where wind power was two decades ago, tidal power poses many economic and environmental questions that scientists and regulators will have to answer before commercial projects can be successfully added to the renewable energy mix.

For instance, what turbine designs and materials are best suited to withstand the force of Maine's ocean tides? How will they be anchored to a seafloor whose composition can vary greatly from site to site? While one turbine submerged in a channel might not have a significant effect on the tidal flow and the local marine life it supports, what about an array of 200 or more that might be needed to generate enough power to make a commercial project economically viable?

Because much of the newest turbine technology is proprietary, gathering critical data to help educate the public about the devices and their possible effects on the marine ecosystem is a challenge that UMaine researchers hope to undertake in conjunction with Maine Maritime Academy in Castine.

MMA was recently issued a three-year preliminary permit by the Federal Energy Regulatory Commission to pursue its plans to establish a Tidal Energy Device Evaluation Center and to set up associated educational and research opportunities for students and faculty. The center would allow scientists to study what effects the turbines might have on the animal and plant life in the Bagaduce River in Castine, and perhaps apply that knowledge to other marine waterways where tidal energy projects are proposed.

"We're trying an extensive collaboration. Science to technology may take two to three years of vigorous work, but then we'd have the software that companies could use. This could bring new industry and jobs to Maine."

Kiran Bhaganagar

"People are rushing to build right now without having the basic science," says Jarlath McEntee, the center's interim director. "With its focus on marine engineering and marine science, and its business school, MMA can bring certain skill sets to the table. But the research and development efforts are more appropriate for the University of Maine."

AT UMAINE, Huijie Xue began using sophisticated 3D computer models to examine the circulation characteristics of Cobscook Bay. Her goal was to determine how waste from aquaculture operations and oil from a tanker spill might be dispersed.

When EPRI was doing its survey of potential commercial tidal power sites in Maine, Xue and her student, Danya Xu, provided maps outlining the areas of highest density where turbines would be able to extract the most energy. Xue also is running longer-term computations for New Brunswick, Canada, energy officials to show how density distribution in the Quoddy region changes over time and how often it peaks.

"All of this is important to industry so they can set the system operation schedule for optimal power generation," Xue says.

EPRI estimates that about 15 percent of the tide's energy can be safely extracted without disrupting the current flow and, as a result, the marine life in it. But a real-world tidal power operation, perhaps with rows of submerged turbines turning in a channel, could complicate the picture in ways that science has yet to understand.

"We should investigate whether slowing the current in the Western Passage, for example, would change flows in other passages in the Quoddy region," Xue says.

And that's where Kiran Bhaganagar comes in. An assistant professor of mechanical engineering, she is one of only 20 or so people in the world skilled in a computer modeling technique called direct numerical simulation (DNS). Using a geometrical mesh, with some 10 million grid points, DNS allows her to simulate flow around physical structures. In her lab, a supercomputer running nonstop for two or three days can determine the velocity of fluid motions, despite severe turbulence, from which power is extracted.

Turbines can then be introduced into the equation to determine how they alter the character of the current.

"We got interested in this because no one had looked before at how flow is affected around a turbine," Bhaganagar says. "In reality, there is much large-scale mixing and activity going on. This is very critical for fish, so we're looking at what would be an optimal turbine system."

She believes that coupling her data with Xue's ocean circulation model would create an extraordinarily valuable resource for the development and teaching of tidal energy.

"Everyone here at the university now wants to look at the same problem from all different angles," she says. "We're trying an extensive collaboration. Science to technology may take two to three years of vigorous work, but then we'd have the software that companies could use. This could bring new industry and jobs to Maine."

In Mick Peterson's lab, mechanical engineering graduate student Ronnie Oliver, who is being advised by UMaine mechanical engineer Michael Boyle and Rich Kimball of MMA, is working on a computer model of a propeller design that can be adapted for use as a tidal turbine. Undergraduate students used the model to build a turbine and test its power-generating potential in a 120-foot tow tank.

Meanwhile, at the Advanced Engineered Wood Composites Center, Robert Lindyberg, the assistant director for boatbuilding and composites, is working with his industry partners to identify tidal generation systems with the potential to use composite materials in their designs.

"When you consider global warming and the finite supply of oil, renewables will dominate the energy discussion in the years to come," Peterson says. "It's important now for the University of Maine and Maine Maritime Academy to contribute to and benefit from this new direction." ▮

The charge for the future

SINCE LAST FALL, Jacob Folz and five other mechanical engineering students have been working on the design, construction and testing of a tidal turbine propeller, a critical component of renewable energy technology that many people believe could one day help reduce our crippling dependence on imported oil.

Folz, a fifth-year senior from West Paris, Maine, and a starting guard and tackle for the UMaine football team the past two seasons, happens to be one of those believers.

With completion of the senior capstone project and graduation this semester, Folz is preparing to move to Texas, where he'll begin his new job as a field engineer with a company that makes high-temperature sensors for . . . oil drilling operations.

"Oh, yeah, I certainly can see the irony in that," Folz says with a grin after a long afternoon of tidal turbine engineering work in Crosby Laboratory.

Having read about harmful greenhouse gases and the various renewable energy sources that could help curb them one day, Folz is practical enough to realize that a transition to cleaner power will be a long and challenging process.

"There is no one silver bullet," he says. "Wind power is fine, but it clutters up the skyline. The efficiency of solar panels is low. So there has to be a combination of lots of small things, and it will be a long time before we can rely on them enough to significantly reduce our dependence on oil."

A 2006 energy study that determined Maine to be a "world-class tidal resource" has generated excitement among would-be developers and hopeful state energy officials eager to explore its potential. Yet the technology necessary to harness the power of the tides is still in its infancy, which adds significance to the tidal turbine research of the UMaine engineering students.

Scott Lessard and Russell Dunn made up the turbine construction team, while the testing and application of the device fell to Folz, Eric Martin, Richard Peale and Patrick Bates. The turbine propeller was tested in the university's tow tank using a dynamometer to measure drag force. Folz wrote the data acquisition system that will take raw voltage data and convert it into force, or rpms, to determine how much power can be extracted from a given flow of water.

Building a device durable enough to withstand the storms of the Fundy region and the debris that might be sluicing through its tidal currents is an important element of the students' work.

The project required them also to consider several factors that are not directly related to the mechanics of designing the components themselves. There are critical environmental issues, such as the turbine blades' possible effect on marine life, and questions about whether the device would interfere with shipping lanes or commercial fishing and recreational boats.

"One of the main obstacles is that there's so little data available," says Folz, who has also studied internal combustion engines and thermodynamics while at UMaine. "The power is in the water, we know that. The problem is how do we harness it without harming the ecosystem or the fishing industry. A lot of questions remain."

Black Bear Food Guild cultivates community-supported agriculture

Good returns

IN EARLY APRIL, the first of the verdant seedlings were sprouting in a University of Maine greenhouse and in May, the two acres of fields out at the university's Rogers Farm were dry enough to begin planting. The 35 full shares in the Black Bear Food Guild were sold and other subscribers hoping to be part of the summer's community-supported agriculture project had to be turned away.

All was going according to plan, based on the fundamentals of sustainable agriculture. But looking out over the tilled fields, not a green shoot in sight, the guild's student manager Hayley Williams was feeling the pressure.

Then the new potatoes started coming up.

"In the greenhouse, it seemed hypothetical," says Williams. "(The first signs of growth in the field) made it all feel a lot more real."

Williams had just finished her sophomore year, and Britta Jinson and Elonnai Hickok their first year when the three took over operation of the Black Bear Food Guild last summer. The guild's close connection between food producer and consumer drew the sustainable agriculture majors to the project. That connectedness also sustained them through Maine mud and blackfly seasons; the 12-hour summer days, working dawn to dusk; and even the one major crop failure — early tomatoes to blossom end rot.

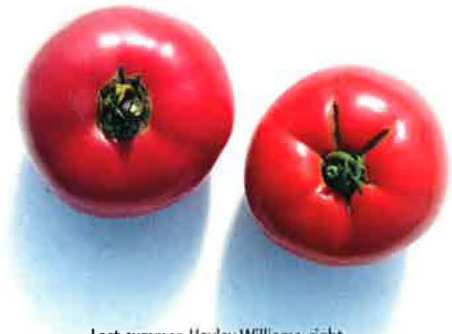
"It was very challenging and very fulfilling," says Hickok. "It's really hard work and stressful because you don't have control over the outcome. If a field fails, you have to take it as it comes.

"I learned perseverance and teamwork," Hickok says. "And I gained a greater understanding and respect for the whole process of farming."

From June to October, the guild supplied subscribers twice a week with fresh, organically grown produce ranging from salad greens and radishes to winter squash. At the height of the growing season and harvest, nearly 700 pounds of produce a week was available. The guild also donated to the Plant a Row for the Hungry program, coordinated in the state by University of Maine Cooperative Extension.

"The interaction with members made us really proud of the work we did," Williams says. "We learned that they didn't just want fresh vegetables, but a program condoning local values and interconnectedness.

"It was one of the most intense experiences of my life. We were working so hard and had so much self-responsibility. The time just flew by. It was completely overwhelming — and life-changing." ▮

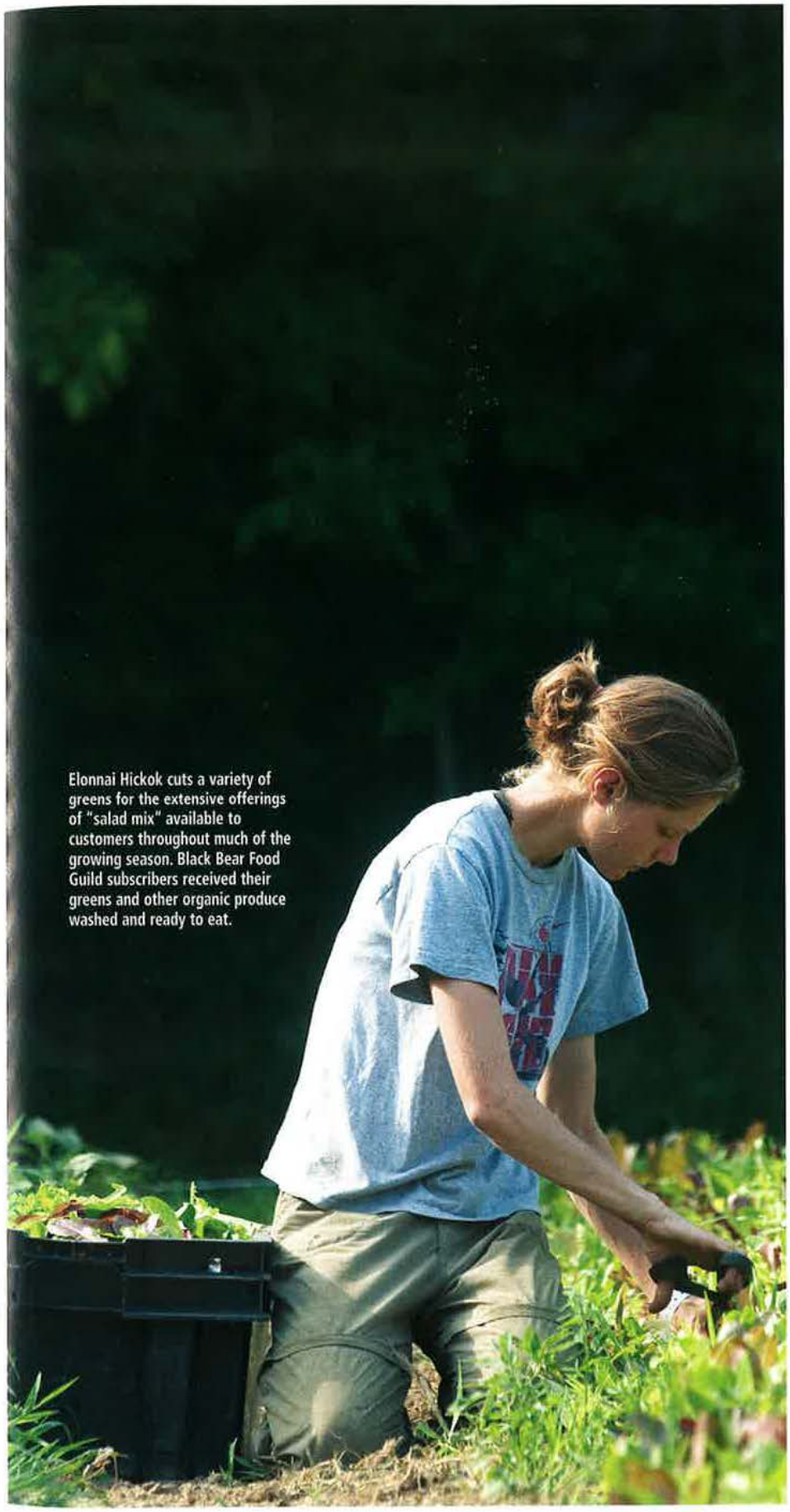


Last summer, Hayley Williams, right, was the student manager of the Black Bear Food Guild. This summer, she's headed back to northern California to work in an organic vineyard. Her goal is to one day have her own farm collective in Maine with a community-supported agriculture component.

By Margaret Nagle
Photos by Michael Mardosa

Good returns

Planning for the Black Bear Food Guild's two-acre plot at UMaine's Rogers Farm began in March last year. Seeds were started in a campus greenhouse, then seedlings were transferred to a hoop house on the farm prior to transplanting. The hoop house also provided a protected planting area for mizuna and other salad greens. By May, the fields were dry enough to fertilize with fish emulsion and plant early potatoes. Hayley Williams, upper left, and Britta Jinson, lower left, kept the earliest crops covered in the fields for the first few weeks in what proved to be a cool start to the growing season. "The three of us wanted to see the direction that we wanted to take in our major," Williams says. "We wanted to experience the amount of pressure and work it took, and the good interaction with coworkers and members, the feeling of being dedicated to (sustainable agriculture)."



Elonnai Hickok cuts a variety of greens for the extensive offerings of "salad mix" available to customers throughout much of the growing season. Black Bear Food Guild subscribers received their greens and other organic produce washed and ready to eat.

Good returns

In addition to fresh produce, Black Bear Food Guild subscribers had the opportunity to buy feta and other cheeses made from milk supplied by UMaine's Applied Dairy Cooperative of Working Students (UMAD COWS) at the J.F. Witter Teaching and Research Farm. The free fresh flowers were grown at UMaine's Rogers Farm by University of Maine Cooperative Extension Master Gardeners. "Sustainable agriculture brings communities together," says Elonnai Hickok, a member of the UMaine track team whose interest in international agriculture prompted her to spend this spring semester studying sustainable development in Senegal. "It provides for them and is environmentally healthier. In the global perspective, it's crucial to survive. We overlook it a lot with quick fixes and, as a result, we're seeing economic and political problems arising."

Black Bear Food Guild harvests went until mid-October. Among those on hand for the final field cleanup was sustainable agriculture major Stephanie Sosinski, lower right photo, who will conduct this summer's guild with UMaine students David Merrill and David LaMarche. The Black Bear Food Guild, established in 1994, is an initiative of UMaine's Sustainable Agriculture Program, coordinated by Associate Professor Marianne Sarrantonio. UMaine's program was one of the first in the country to offer an undergraduate degree in sustainable agriculture. More information about the Sustainable Agriculture Program is on the Web (www.sag.umaine.edu).

Business plan competition helps launch energy-saving start-ups

The green edge

JUSTIN JAMISON admits he's always been a little obsessed with dairy production and how it fits into a sustainable food economy.

"For thousands of years, cultures have revolved around some kind of dairy industry," says the University of Maine graduate student in business administration. "And what I really love about dairy are the different products you can make from it as part of sustainable agriculture."

Jamison's vision is to one day have an organic microdairy as part of a natural foods retail store, specializing in local produce and products. He shared his entrepreneurial spirit and enthusiasm for local food production and promotion with MBA classmate Brooks Einstein and, together, they developed a business plan for launching a microdairy to supply local organic milk to the Bangor area.

In February, their concept for Local Food Solutions got one step closer to reality with a $5,000 top prize in the 2007–08 Green Products Business Plan Competition, sponsored by UMaine's Foster Student Innovation Center.

In the Green Products Business Plan Competition, participants describe the commercialization of a green product made from biobased, recycled or recyclable materials, or a technology that reduces environmental pollution or produces renewable energy. The top three winners receive money to launch their start-up businesses with the guidance of the Foster Student Innovation Center.

Last year, the debut of the contest, civil engineering graduate student Jeremy Labbe and his partner, UMaine graduate Adam Paradis, won for their plans to establish an ethanol plant fueled by cull potatoes and other agricultural waste.

"I'm always thinking of a thousand cool things I could do, but I try and be as efficient as possible, seeing opportunities and doing what fits," says Jamison, who graduated from UMaine's Sustainable Agriculture Program in 1996. "I've been successful at farms with that philosophy, and only hope that it will work in starting a business."

Jamison has spent the past dozen years working on three of UMaine's farms. He was superintendent of Highmoor Farm in Monmouth before returning to Orono in 2004 to manage the J.F. Witter Teaching and Research Farm and Rogers Farm.

Einstein has retail experience working for Whole Foods Market, one of the largest retailers of natural and organic foods.

Jamison's days overseeing the student dairy cooperative at Witter and his work with an organic dairy farmer in Charleston, Maine, inspired him to look into supplying a local market with local product.

"The majority of organic milk in stores is processed out of state and shipped back," Jamison says. "The advantage of microprocessing is to not only keep the milk local, but to keep individual farms' milk separate. That really allows people to identify where their food comes from."

The prize money from the Green Products Competition will fund market research to determine such critical factors as the extent of the consumer base and how much organic milk the facility would have to process annually to be viable.

"Local Food Solutions could be like Tom's of Maine for local foods," says Jamison, who will resign his farm management duties in June to pursue his graduate studies and the business plan full time.

"I plan to stay involved in business and agriculture. I like being able to tell the story about the farming system and the people who help make it." Justin Jamison

Senior Companions

In Somerset County, Delmar Cook, left, and Senior Companion Edward Morrissey share their love of music. The Senior Companion Program of University of Maine Cooperative Extension links limited-income volunteers ages 60 and older with peers in their community who are homebound or isolated. The Senior Companions provide friendship and nonmedical support — from running errands and helping with home management to providing advocacy. Extension staff provide monthly professional development training for the volunteers, including information on nutrition and wellness, eldercare, consumer fraud and emergency preparedness. Through the program, Senior Companions also receive small stipends, helping them, in turn, remain active and maintain their quality of life.

Photo by Edwin Remsberg, USDA

IN 2006, a handful of low-income senior citizens in Maine volunteered their time to help 53 of their peers ages 90 and older continue to live independently, in their homes, rather than in long-term care facilities.

The estimated cost saving to the state by the University of Maine Cooperative Extension Senior Companion Program that year was more than $4.2 million.

"This is a subset of the Senior Companion Program participants who are at high risk and would likely have to have long-term assistance if not for this program," says Jim McConnon, an Extension business and economics specialist, and a professor in the UMaine School of Economics. "Associated costs would likely be borne by the individuals (or their families) or the state, or some combination of the two."

McConnon and three coauthors — Todd Gabe, an associate professor in the School of Economics, and Debra Eckart and Ann Swain with Extension's Senior Companion Program — recently released an economic impact study that shows that, for 26 years, the Senior Companion Program has offered a cost-effective solution to help Maine's older adults remain in their homes instead of moving into costly assisted-living facilities.

"The program makes a huge difference because it helps people maintain their independence, staying in their own homes and continuing their lives in their own communities, where their connections are," says Eckart, an Extension educator in Washington County. "The home visitations are peer to peer, like having a friend coming to help out."

> **"The numbers indicate that by investing in a program like this, we can save a lot of money and provide a better quality of life for people."**
>
> Debra Eckart

In the past quarter-century, 426 Senior Companions helped meet the needs of more than 12,550 Maine elders. In 2006, 105 Senior Companions served 501 clients and volunteered 82,260 hours.

The program's statewide operating budget that year was approximately $560,000, primarily in federal and state funding.

Nearly 10 percent of the clients in 2006 would likely have lived in long-term care facilities if not for the Senior Companion Program. The estimated nursing home cost savings for those 53 clients would have been more than $4.2 million.









Photos, clockwise from upper left: *The Marriage of Figaro* music director Lud Hallman, left, and director Tom Mikotowicz; musicians Francesca LeVigne and Justin Davis in rehearsal; student stage manager Lydia Dawson; orchestra rehearsal conducted by Professor of Music Lud Hallman; Jason Wilkes as Count Almaviva, posing with a piece of scenery by designer Laura McPherson; Joe Donovan developing construction drawings from the set design model; a lighting check in Hauck Auditorium; set construction by Kevin Jewett and Chris Wolf; Seth Grondin in a light moment during a rehearsal; Stacey Kendall painting one of the geometric pieces of the set. Photo right: Costume director Lucia Williams-Young with Maria Talbot.

By Margaret Nagle

THE MAKING OF FIGARO

Opera returns to the UMaine stage in a major student production

IT WAS A WEDDING unlike any other at the University of Maine, melding the inspiration of a class book with the institution's operatic roots. The School of Performing Arts production of Mozart's *The Marriage of Figaro,* sung in English, mobilized upward of 100 students in theater, music and dance in the six-month run-up to the two weekends of performances this past February. And as a "class opera," it served as a springboard for cross-discipline academic dialogue campuswide about history, culture, philosophy and the French language.

The last major operatic production at UMaine was *Die Fledermaus,* staged in 1996 for the opening of the Class of '44 Hall, home of the School of Performing Arts. Since then, UMaine theater professor Tom Mikotowicz says he has been waiting for the right time to produce another opera.

THE MAKING OF FIGARO

"When you open students' minds to other possibilities in a demanding way and see them rise to the occasion, that's the most exciting part."

Tom Mikotowicz

An annual, full-scale operatic production was once a mainstay of UMaine's academic performing arts season. Longtime theater professor Al Cyrus and music professor Lud Hallman directed many of them. Among their last collaborations in the late 1980s was *The Merry Widow.*

The Marriage of Figaro was the first UMaine opera Hallman coproduced in the early '70s, shortly after the baritone joined the UMaine community to teach voice and be a choral director.

In February, Hallman conducted a 35-piece orchestra and Mikotowicz directed a cast of 28. Some roles were double and split cast to allow as many students as possible to perform. Student crews and four theater classes were involved in the many behind-the-scenes activities, such as costuming, stage set craft and lighting.

Professional scene and lighting guest artists led the design team, including New York-based lighting designer Burke Brown and scenic designer Laura McPherson from Providence, R.I.

Early on, it was a challenge to sell an opera to students, who perceive the genre as staid and static, admits Mikotowicz. But by opening night, music students were asking "why we don't do opera more often," he says. Theater students said they never thought they'd have so much fun in an operatic production.

What they discovered, Mikotowicz says, was 18th-century musical comedy. ▮

Photo, left: The wedding scene from *The Marriage of Figaro*. Photos right, clockwise from upper left: Josh Davis as Antonio and Jason Wilkes as Count Almaviva; Tina Burns preparing for her role as Countess Almaviva; Rebecca Bailey as Susanna; Victoria Comer putting the finishing touches on a costume; a scene from Act II ; orchestra member Shannon Buccieri; dancer Megan Nunnelly; cast members taking a quick technology break before stepping into their 18th-century roles.

A strong coat

CONSTRUCTION PANELS with a lightweight coating that gives them the strength to withstand bomb blasts and hurricane-force winds are being prototyped at the University of Maine for the U.S. Army Corps of Engineers.

The composite coating, developed by UMaine's Advanced Engineered Wood Composites (AEWC) Center, was applied to wood framing and sheathing panels used to construct a 12-foot by 20-foot building that can be raised by a dozen people in approximately 90 minutes. Such a blast-resistant structure could have military and homeland security applications, and residential uses in areas prone to severe weather.

Blast testing of the modular structure at Fort Polk in Louisiana last August found the coated construction material to be up to seven times more energy absorbing than conventional wood structures.

The coated wood is the second type of blast-resistant building material developed by AEWC in the past two years. Ballistic panels that fit inside tents to protect soldiers in combat zones were developed in AEWC labs and are now being field-tested in Iraq and Afghanistan. That technology was recognized by the American Composites Manufacturers Association as the "Best of the Best" in 2007, signifying its status as the year's top composites technology innovation.

100,000 years of climate change

Scientist Rebecca Anderson of the Desert Research Institute examines a section of the WAIS Divide ice core recovered from a depth of 500 meters.

Photo courtesy of Kendrick Taylor

AS PART OF AN UNPRECEDENTED, multiyear effort, researchers have retrieved the first section of an ice column in Antarctica that could provide the most detailed record yet of greenhouse gases in Earth's atmosphere during the last 100,000 years.

Working as part of the National Science Foundation's West Antarctic Ice Sheet Divide (WAIS Divide) Ice Core Project, a team of scientists, engineers, technicians and students from multiple U.S. institutions recovered a 1,900-foot ice core — the first section of what is hoped to be a 11,360-foot column of ice detailing 100,000 years of climate history, including a precise annual record of the last 40,000 years.

The dust, chemicals and air trapped in the 2-mile-long ice core will provide critical information for scientists working to predict the extent to which human activity will alter Earth's climate, according to the chief scientist for the project, Kendrick Taylor of the Desert Research Institute of the Nevada System of Higher Education.

Researchers at the University of Maine have received a piece of the WAIS Divide ice core for analysis of the physical and chemical properties of the trapped atmospheric dust. In collaboration with colleagues at the New Mexico Institute of Mining and Technology, the group plans to use the information to examine changes in atmospheric circulation, volcanic eruptions and the impact of dust deposition on ocean biogeochemistry.

INCREASING THE "dose" of behavioral interventions — the use of verbal and tangible rewards, self-monitoring and stimulus control — and parental involvement can enhance the effectiveness of established diet and exercise regimes for combating childhood obesity, according to psychology researchers at the University of Maine, who conducted a meta-analysis of 13 years of treatment studies.

The meta-analysis of 11 published studies conducted since 1994 provides new information about the effectiveness of existing treatments for childhood obesity by identifying patterns among the therapeutic components. The meta-analysis, started four years ago as a class project in a graduate course on child and adolescent treatments, introduces a variation of the commonly used statistical techniques that allow for the direct comparison of active treatment components. It is the first of its kind in the social science or medical literatures, says Professor of Psychology Douglas Nangle, one of the study's six coauthors.

The analysis showed that the already established comprehensive interventions combining diet/decreased sedentary lifestyle/increased exercise components could be even more effective through enhanced behavioral interventions — rewards such as praise and incentives — for meeting goals, as well as teaching children to better self-monitor their eating and exercise patterns, and stimulus control, such as making healthy foods easily accessible and identifiable.

The study also found the involvement of parents — from providing nutritious foods in the home and parental weight loss to modeling healthy eating habits and active lifestyles — key to helping youngsters battle obesity. Results of the analysis will be published in the *Journal of Clinical Child and Adolescent Psychology.*

Fighting childhood obesit

UMaine on iTunes U

IN JANUARY, UMaine was one of 37 higher education institutions nationwide to become, as Apple describes it, "a campus that never sleeps."

UMaine now is on iTunes U, a free, Web-based content distribution system hosted by Apple that enables colleges and universities to make audio and video material from lectures, interviews, books and other sources more available with the ease of the iTunes Store.

Users can download the free content to their Mac or PC, transfer the information to their iPod or other MP3 player, and listen to or view university-related information anywhere and at any time. For UMaine, the initial content will include *UMaine Today* magazine features and institutional videos.

iTunes U will allow the University of Maine to reach a much larger audience of prospective students — as well as current students and alumni — via Apple's popular iTunes interface.

Without borders

LAST YEAR, University of Maine civil engineering majors Heather Martin and Lee Rand joined a group of other UMaine students visiting a small, poor community in Honduras during spring break as part of a Spanish language service-learning class.

While some in the group led by Spanish professor Kathleen March worked with orphans, handed out toothbrushes and toothpaste in schools, and volunteered in nursing homes and health clinics, the engineering students looked at water and sanitation problems in the tiny village of Dulce Vivir, part of the community of Dulce Nombre in central Honduras.

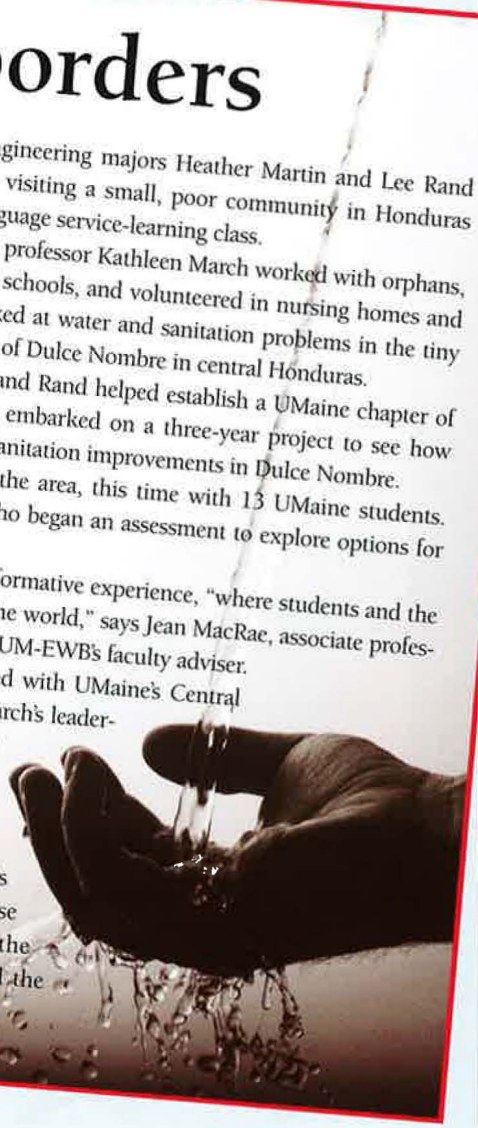
When they returned to campus, Martin and Rand helped establish a UMaine chapter of Engineers Without Borders (UM-EWB) and embarked on a three-year project to see how UMaine students could help with water and sanitation improvements in Dulce Nombre.

This spring, March led her fifth visit to the area, this time with 13 UMaine students. They included four members of UM-EWB, who began an assessment to explore options for improving water quality and sanitation.

UM-EWB offers an opportunity for a transformative experience, "where students and the rest of us get to see what is really going on in the world," says Jean MacRae, associate professor of civil and environmental engineering and UM-EWB's faculty adviser.

For this spring's trip, UM-EWB collaborated with UMaine's Central America Service Association (CASA). Under March's leadership, CASA has been participating in service projects in the community since 2004, which included supporting the construction and development of a library and a healthcare clinic.

In addition to the efforts of the engineers this spring, nursing students offered medical expertise and the Spanish language students provided the communication bridge between their peers and the community.



Insightlite

Pack your intergalactic bags

THE SUMMER travel season is fast approaching. And just in case your plans include space travel, we asked University of Maine Professor of Physics Neil Comins to list 10 of the top hazards every orbiting tourist should know. Comins is the author of numerous books on space, including the most recent, *The Hazards of Space Travel: A Tourist's Guide.* According to Comins, the following hazards are just the tip of the "spaceberg."

- Bone and muscle mass loss
- Radiation poisoning from a solar flare or solar mass ejection
- Rapid degrading of medicines in space
- Early (i.e. soon after launch) onset of nausea
- Early inability to digest food
- Interpersonal issues among space travelers, and between space travelers and people on the ground
- Hardware failures
- Impacts from particles in space
- Claustrophobia
- Dust from surfaces of the worlds you visit

John Vetelino

An **NSF** notable

A SENSOR developed by a University of Maine engineer to detect the presence of dangerous chemical and biological agents has been chosen as one of the National Science Foundation's notable achievements for 2008.

John Vetelino, a professor of electrical and computer engineering, is one of the world's leading researchers in sensor technology. An expert in microsensors, microacoustics and solid-state electronics, Vetelino is one of the founding members of UMaine's Laboratory for Surface Science and Technology.

With NSF funding about four years ago, Vetelino and his research team focused on development of a sensing element for certain chemical and biological agents that pose a serious health threat in high concentrations.

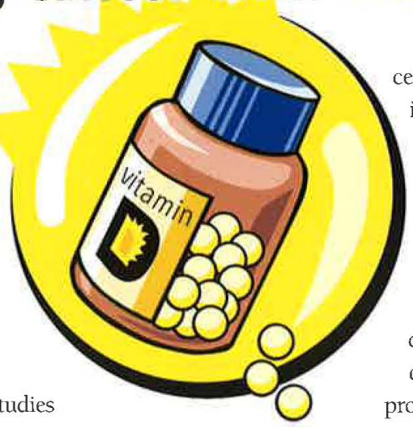
The UMaine-patented sensor can detect an organo-phosphate pesticide known as phosmet, which is similar to chemical-warfare agents. It also senses a particularly virulent strain of E. coli, as well as saxitoxin, the worst of several toxins released during the seasonal algae blooms known as red tide.

David Frankel, LASST senior research scientist, was part of the sensor research team, along with Carl Tripp, professor of chemistry, and Paul Millard, associate professor of chemical engineering.

Vetelino's sensor project led to two more NSF grants, totaling $250,000, to continue his work with E. coli detection. He also received $400,000 in September from NSF to develop a sensing element to detect peroxide-based explosives that can be made with common household ingredients.

NSF will use Vetelino's sensor work, along with other noteworthy research efforts nationwide, to demonstrate the importance of federally funded scientific activity.

Fighting cancer with vitamin D



HEALTHY LEVELS of serum vitamin D provide significant protection against several cancers, according to University of Maine researchers, who did a literature survey of vitamin D studies conducted in the past 37 years.

"These studies find that the higher the UV exposure, dietary intake and serum level of 25(OH)D, the lower the incidence and mortality from cancers of the breast, colon, lung, pancreas, prostate, melanoma and Hodgkin's lymphoma," write UMaine researchers Betty Ingraham, Beth Bragdon and Anja Nohe in the journal *Current Medical Research and Opinion*.

Vitamin D, obtained from diet, supplements and sunlight, is essential in cell growth and function. In particular, calcitriol, an active form of vitamin D, has a critical role in regulating cellular mechanisms involved in cancer.

But while preclinical, epidemiological and clinical trials show overwhelmingly that calcitriol can prevent cancers of the colon, breast, prostate, pancreas and ovary, as well as Hodgkin's lymphoma, nearly all studies indicate that most people have below-normal levels of serum vitamin D.

The clinical research community is now revising upward recommendations for levels of optimal serum and sensible sun exposure. The last time that the recommendations were made in 1997, the Food and Nutrition Board of the Institute of Medicine set daily adult dietary intake of vitamin D at 400 IU. Since then, most researchers in the field believe that, for optimal wellness, intakes between 1,000-4,000 IU would lead to a more healthy serum level.

Ancestral alewives

A GENETIC STUDY of alewives living in landlocked lakes in Connecticut found that the popular baitfish evolved from a common anadromous rather than a freshwater ancestor.

The research found no evidence to uphold a common belief that all Connecticut landlocked alewife populations are nonnative, the result of intentional stocking years ago to provide forage for game fish.

The landlocked populations examined diverged from a common anadromous ancestor between 300 and 5,000 years ago, according to Eric Palkovacs, a postdoctoral researcher in the University of Maine School of Biology and Ecology, and his colleagues at Yale University. This time frame overlaps with the onset of human dam construction in Connecticut.

The study of genetic and phenotypic divergence between anadromous and landlocked alewife populations was conducted as part of Palkovacs' dissertation at Yale. It was published in a recent issue of *Molecular Ecology*.

Like other anadromous fish such as Atlantic salmon and sturgeon, alewives make annual runs up freshwater streams to spawn, then return to the sea. They can be found in the coastal waters from Labrador to North Carolina.

But landlocked alewives have lost the marine phase of their life cycle. The researchers found that foraging traits have evolved in the landlocked populations in Connecticut to allow them to survive by eating smaller zooplankton.

last impression

AT THE UNIVERSITY OF MAINE, biotechnology creates new products and solves problems. Applications are found throughout UMaine's research in agriculture, forestry and fisheries. UMaine engineers have developed sensors to warn of chemical and biological agents, and a foam metal implant prototype for use in reconstructive surgery. In chemistry, research using specialized molecular isolation techniques could one day identify the biomarkers of ovarian cancer in human breath. A hub of biomedical research on campus is UMaine's zebrafish facility, where the model organisms support the work of a number of UMaine scientists studying such areas as immune responses to infectious diseases, toxicology and muscle development. At UMaine, biotechnology is a key to improving Mainers' quality of life and growing the state's economy.

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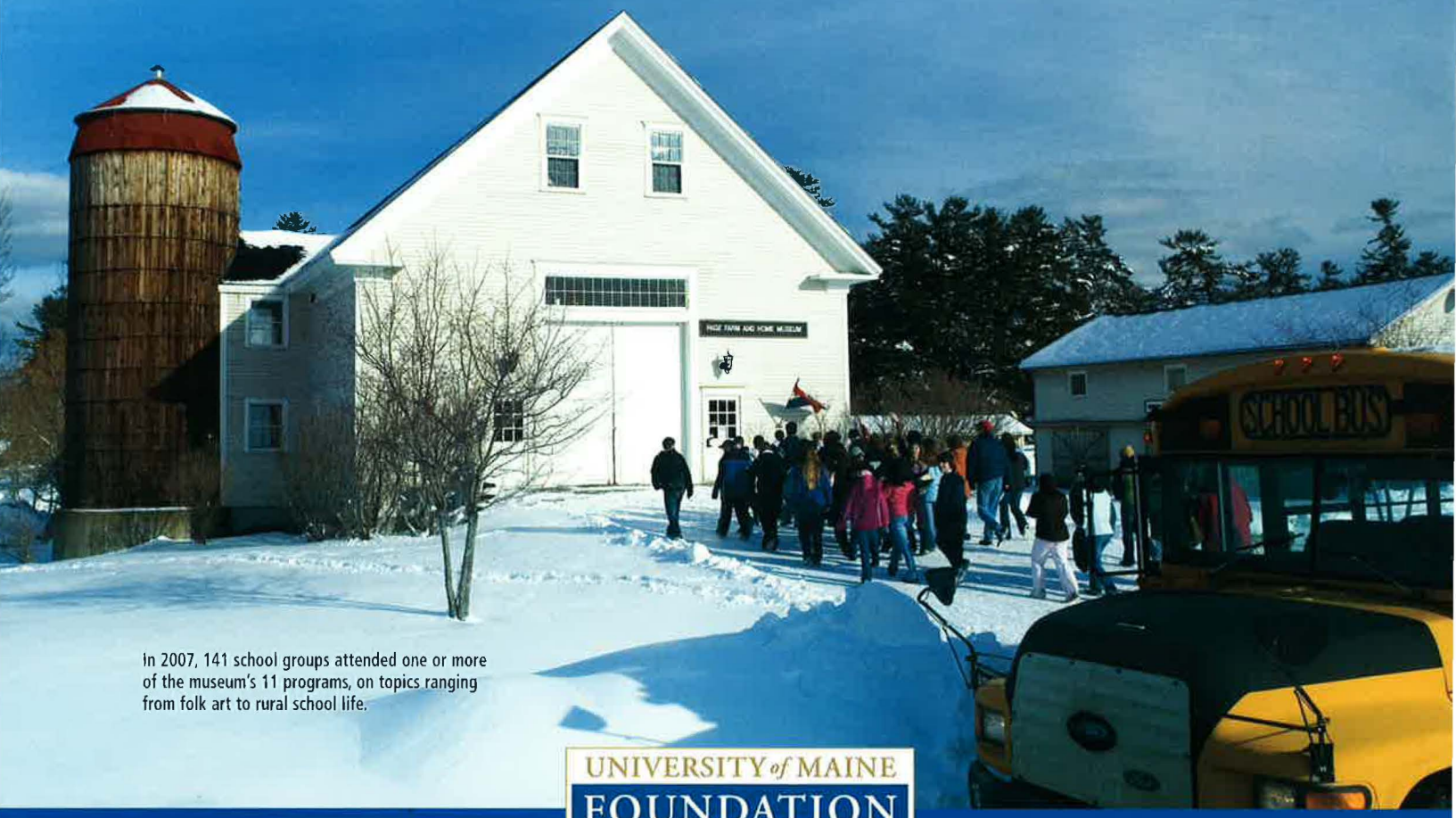
Rural insights

SINCE IT WAS FOUNDED in 1994, the Page Farm and Home Museum has become a valuable resource for the University of Maine and the state. It houses Maine's most important collection of technologies and artifacts relating to farms and farming communities between 1865 and 1940.

Of the thousands of people who tour the museum every year, perhaps the most important are the young students who arrive in busloads from schools across Maine. In 2007, 141 school groups attended one or more of the museum's 11 programs, on topics ranging from folk art to rural school life. Once here, they are drawn into a celebration of the values of families, community, farm, school and home in the 19th and early 20th centuries.

The Page Farm and Home Museum Endowment Fund was established in the **University of Maine Foundation** in 1995 to support and maintain the museum and its mission. Gifts and bequests to the Page Farm and Home Museum Endowment Fund ensure that future generations will gain valuable and practical insights into Maine's rural past.



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