

UMaine Today



CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE

SPRING 2010

So Small

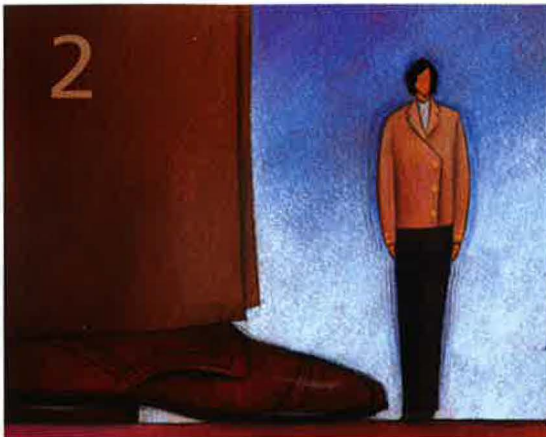
Reading the
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Broken Sleep

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Two worlds

Where's the social justice
in higher education?



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So Small

To philosopher Kirsten Jacobson, neuroses such as anorexia, agoraphobia or hypochondria aren't about food, crowds or symptoms. They're the result of a fundamentally problematic way of being in the world. A matter of body and space.

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Two Worlds

Nationally, the attrition rate for doctoral students is 43 percent. To higher education researcher Susan Gardner, that statistic is even more harrowing when taking into account that more than a third of the candidates are first-generation doctoral students at particularly high risk for dropping out.



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Broken Sleep

Neuropsychologist Marie Hayes studies sleep behaviors such as movement and arousal in the youngest of humans. Her work is contributing to our understanding of just how important sleep is in infancy and sheds important light on the implications of broken sleep in some of our highest-risk babies.

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versions of articles and a comprehensive editorial archive. More online stories will be added monthly, including answers to questions posed to our In the Know experts.

Photo gallery

Reading the Resources Constanza Ocampo-Raeder on the cultural footprints in the Amazon rainforests.

Hair A School of Performing Arts spring musical, directed by Marcia Douglas.

President's Message

THE *UMAINE TODAY* story about doctoral student attrition illustrates some of the challenges — and the rewards — associated with graduate education at institutions like the University of Maine.

Professor Susan Gardner's research, which she began at Louisiana State University and continues at UMaine, adds important context to discussions about the most effective ways to provide doctoral education and training. Doctoral graduates add tremendous value to our society and our institutions. They bring deep knowledge, experience and perspectives to their work, whether in academia or other settings. At the same time, as Susan points out so vividly, they face immense challenges in achieving their academic goals.

UMaine's new graduate center in Stodder Hall, along with other support programs under the leadership of Graduate Dean Dan Sandweiss, will help current and future UMaine doctoral students. Beyond that, it's important for us to affirm our commitment to all of our students, including those pursuing the most advanced degrees. That's a challenge we embrace, because our success will mean so much to the students themselves and all those they will influence in their lives and careers.



Robert A. Kennedy
Robert A. Kennedy
President



ON THE COVER: University of Maine higher education researcher Susan Gardner studies the first-generation doctoral student experience in the context of social justice, particularly for those in underrepresented populations with less social and economic capital. Read about her research on page 16.

Painting by Damon Sauer



THE MEDICAL AND PSYCHOLOGICAL communities take a fairly black-and-white approach to neuroses. Anorexia is an eating disorder. Agoraphobics fear crowds or open spaces. Hypochondriacs believe that real or imagined symptoms are far worse than they really are.

But for Kirsten Jacobson, a professor of philosophy at the University of Maine, these neuroses aren't about food. Or crowds. Or symptoms. They're the result of a fundamentally problematic way of being in the world.

Jacobson argues that these aren't "mere psychological problems." They're disorders of the body in space, and in each case, the afflicted make their world smaller by disengaging from the people, places and situations around them.

"They are, in a way, three species of the same problem," Jacobson says. "There's some sort of troubled relationship that agoraphobics, anorectics and hypochondriacs have that expresses itself as a constricted world."

Her research provides insight into the way in which these disorders could be treated. Her work has been well-received among her peers, especially those philosophers who are also practicing psychologists. They are interested in the way her

Kirsten Jacobson hopes that by looking at the spatial and family-relationship aspects of anorexia, agoraphobia and hypochondria, the field of philosophy can help inform and enhance current conceptions and approaches in medicine and psychology that, she argues, may be inadequately addressing the problems underlying the disorders.

work addresses the cause of these disorders, rather than just managing symptoms.

"The excitement has largely been around the fact that this way of analyzing these disorders is a departure from the current trend in the medical and psychological communities at large to treat disorders according to a medical model in which the body and the mind are largely treated as machines in need of tuning, whether by medication or behavioral modification," Jacobson says. "My approach calls for considering people in their existential situations, which means

considering how people's histories, their families, their communities are interwoven in their 'problem.'"

Jacobson's research is influenced by the works of Maurice Merleau-Ponty and Martin Heidegger, both of whom study how humans relate to, shape and are shaped by the space around them. More specifically, her interests lie in the nature of home and dwelling — not necessarily as a place, but as an existential structure — and how that influences interpersonal communication.

Though many think of space as a "rigid, fixed parameter" that exists outside a person — something easily quantifiable — Jacobson argues that space and home are "living" concepts that have consequences for the way we think of ourselves. They are intertwined with the very ways in which we carry out our lives and they are inherently open to development.

THINKING ABOUT space and humans' place in it has always been fascinating for Jacobson. Growing up in the Midwest, she and her family would often take long road trips during summer vacation.

"I spent a lot of time being bored in the back of the car, but these were times when I had a lot of ideas take shape," she recalls.

so small

A philosophical perspective on neuroses
as disorders of the body in space

By Kristen Andresen

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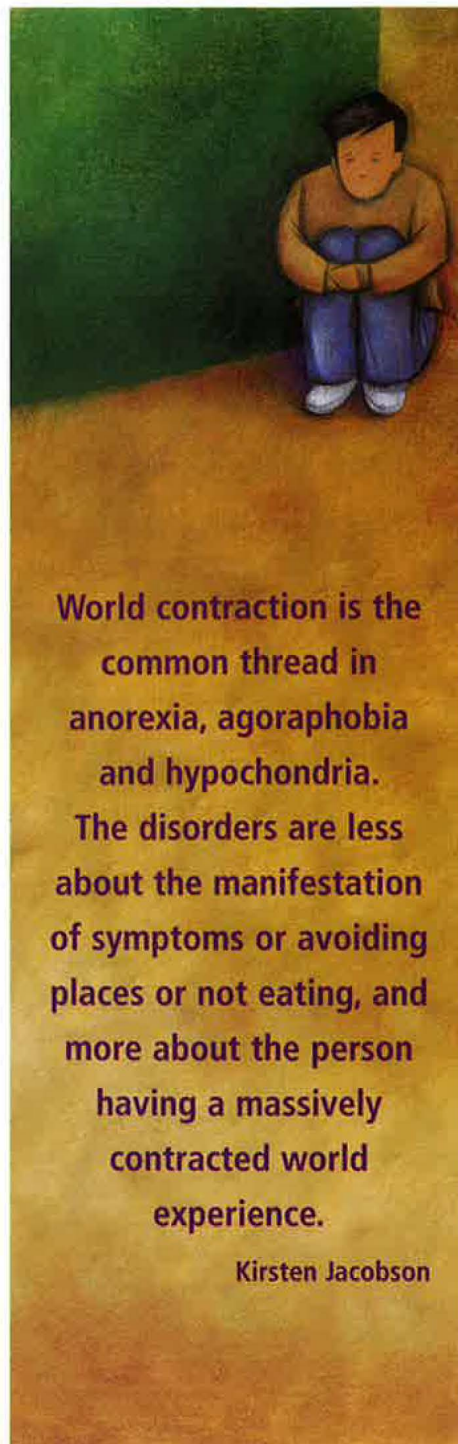
"Looking out the window at the stars, I got infinity. It totally scared me and exhilarated me. I could think about infinity and how little it made me feel and how big it made me feel at the same time."

Space provoked a sense of wonder in Jacobson, but she says for those with neuroses, their relationship with space may have become troubled as a result of a dysfunctional family dynamic. In many cases, the families of those with anorexia, for example, are enmeshed — people interfere in one another's lives to the point where it is difficult to distinguish between the individual and the group. Family members often speak for other family members — in a sense, stealing their voice. Conflict is avoided at all costs. Parents overnuture their children, undermining their ability to learn or discover things on their own.

Someone growing up in such a family may develop a constricted relationship to the world — one in which he or she feels uncertain about or even restricted from putting himself or herself out there.

"Anorexia must not be understood as merely an 'eating' disorder or even a 'body image' disorder," she writes, "but rather as a problem of one's overall way of spatial being in the world, a problem that is rooted in an ailing system of interpersonal communication, not in an isolated individual."

For the anorectic, whose sense of being in the world — in the shared family space — is already diminished, the disorder is a subtle way to claim power. Becoming



World contraction is the common thread in anorexia, agoraphobia and hypochondria. The disorders are less about the manifestation of symptoms or avoiding places or not eating, and more about the person having a massively contracted world experience.

Kirsten Jacobson

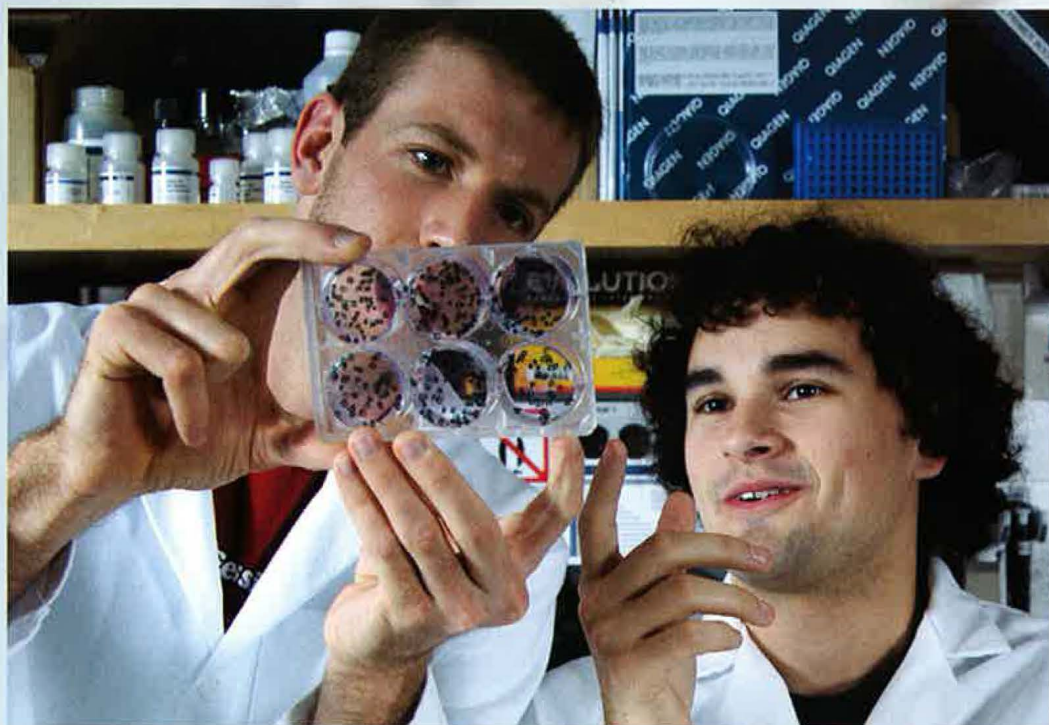
physically smaller and withdrawing even further from the world allows the anorectic to silently — yet boldly — communicate a powerful message.

"The anorectic is basically trying to reduce her world to nothing," Jacobson says. "She's shrinking her world in a very extreme way. The thing I'm seeing in all three disorders is a basic form of world contraction. It's less about the manifestation of symptoms or avoiding places or being wrapped up in not eating. In each situation, the person with each of these disorders is having a massively contracted world experience."

All three disorders have high relapse rates, even among those who have gone through treatment programs. It is Jacobson's hope that by looking at the spatial and family-relationship aspects of each disease, philosophy can help inform and enhance current conceptions and approaches in medicine and psychology that, she argues, may be inadequately addressing the problems underlying these disorders.

"In a way, this existential approach necessarily complicates the way in which treatment would be administered, because it demands that people be treated in their particular situations rather than as an instance of a field of equal test subjects. But given the current treatment failure rates, it seems that acknowledging the complications of people's situations is called for and relevant, even if not cost-friendly or easy." ■

Sophomores Jonathan Pelletier, left, and Aaron Perreault were selected for early acceptance to Tufts University School of Medicine through the Maine Track Early Assurance Program.



Medical fast track

Research a primary focus for two undergrads

UNIVERSITY OF MAINE microbiology major Jonathan Pelletier of Falmouth, Maine, and biochemistry student Aaron Perreault of Northfield, N.H., have received early acceptance to Tufts University School of Medicine through the Maine Track Early Assurance Program. Born of a partnership between Tufts and Maine Medical Center, this new program reserves a limited number of slots per year for sophomores and juniors from Maine colleges and universities. Perreault and Pelletier were accepted as sophomores.

"It does speak to the fact that we are

preparing students well for medical school," says Robert Gundersen, chairman of UMaine's Department of Molecular and Biomedical Sciences. "This lets (Jonathan and Aaron) approach the next two years focusing on what they need to learn, instead of all the other things they need to focus on in order to get into medical school."

Though they will still need to complete their course requirements, Pelletier and Perreault can skip the MCATs and the rigorous application process.

At UMaine, Pelletier researches arsenic in relation to mast cells in Professor Julie Gosse's lab. He is passionate about philanthropic medicine and plans to spend this

summer volunteering at an orphanage in Peru.

Last summer, he received a Rezendes Global Services Scholarship from UMaine's Honors College that allowed him to volunteer in a clinic in Pommern, Tanzania. Pelletier also will use the extra time afforded by Maine Track to pursue his passion for music.

Perreault works in Professor Carol Kim's lab, where research focuses on developing a zebrafish model for studying cystic fibrosis. Perreault's long-held interest in medicine was cemented by a presentation by UMaine alumnus and Nobel laureate Dr. Bernard Lown.

BROKEN

SLEEP. We know what happens when we don't get enough. We might plow through the day a little tired, cranky and maybe not at our intellectual best. But sleep does more than influence whether we have a good day. Its restorative nature is essential for a healthy mind and body.

Neuroscientist Marie Hayes has studied sleep neurophysiology and behavior, including movement and arousal, in the youngest of humans for more than 27 years. Hayes focuses on the consequences of prenatal exposure to alcohol, opiates and other drugs on the developing brain.

Infants of mothers with alcohol and opiate addiction show complicated sleep disorders that her laboratory has demonstrated to be associated with withdrawal syndrome, cognitive deficits and severe sleep deprivation. Her work is contributing to our understanding of just how important sleep is in the third trimester of gestation and the first few years of life, when the brain undergoes some of its most dramatic neuroplasticity development, organizing critical neural networks.

The research sheds light on the implications of sleep deprivation in some of our highest-risk babies, many born to socio-economically challenged families.

"Poverty and associated survival stress is the context in which addiction and poor maternal health emerge," says Hayes, a University of Maine psychology professor

and an allied senior research scientist with the Maine Institute for Human Genetics and Health (MIHGH) in Bangor and Brewer, Maine. "For the fetus, prenatal exposure to substances of abuse creates probabilistic risk for brain development dependent on genetic susceptibility, dose and timing."

The developing brain is vulnerable to cumulative effects of poor sleep, which manifests as sleep deprivation, a serious health condition that affects all physiological systems, says Hayes. Newborns typically require at least 16 hours of sleep daily, usually in a series of three- or four-hour periods the first few weeks, but continue to need 12 or more hours per day throughout and beyond the first year. Significant brain and body growth occurs during sleep.

Hayes and an interdisciplinary team have combined technological invention with human health research to break new ground in assessing infant sleep and the effects on neurodevelopment when sleep regulation is impaired. Her current research, the Maine Infant Follow-Up Project, is funded by a \$337,000 grant from the National Institutes of Health and involves collaborators from Eastern Maine Medical Center (EMMC) and Acadia Hospital, both in Bangor, Maine, MIHGH and UMaine.

The research focuses on a screening method to identify infants at risk for Sudden Infant Death Syndrome (SIDS),

Prenatal alcohol and tobacco exposure has been shown to affect infant sleep patterns, but less is known about the effects of opiate exposure on infant sleep. Establishing relationships between a mother's substance abuse and her infant's compromised development, or potential death, is moving the Maine Infant Follow-Up Project into new medical territory.

SLEEP

Understanding the importance
of slumber in infancy could
help high-risk babies

By George Manlove



which occurs in Maine at twice the national rate. SIDS remains the leading cause of infant death in the first year.

Of the 14,000 babies born in Maine each year, 80 typically die from SIDS, mostly within the first 28 days of birth, according to Maine infant mortality data.

"We've been pursuing the cause of SIDS for many years and we're not getting many clues," says Hayes, who worked closely with Dr. Paul Tisher, former chief medical officer and director of the Narcotic Treatment Program at Acadia. "We haven't made any progress since the 'Back to Sleep' campaign to encourage sleeping on the back. This resulted from the finding that SIDS victims were typically found prone (facedown) in their cribs, so the urgency is there."

Hayes' project involves about 150 mothers and infants from Penobscot and Washington counties in Maine, which have a disproportionately high incidence of drug and alcohol abuse. Hayes, with Ph.D. students Jonathan Paul, Beth Logan and Nicole Heller, and study coordinator Deborah Morrison, examine brain waves and motor movements during sleep of high-risk and well newborns, following the infants through their first year.

IN MAINE, opiate drug abuse and addiction have increased dramatically in the past decade. Now a crisis reaching "epidemic proportions," prenatal exposure to alcohol and opiates threat-

ens the health and lives of an increasing number of infants in a growing demographic population.

Of the 77 infants admitted to EMMC's Neonatal Intensive Care Unit with prenatal exposure to opiates in 2007, 90 percent were born to mothers in narcotics treatment at Acadia Hospital. Last year, almost a third of the infants in intensive care had opiate exposure, Hayes says.

Mothers who volunteer for Hayes' studies are from Acadia Hospital and EMMC's Center for Family Medicine — women who were or are in treatment for alcohol, drug and tobacco use, and those with a history of only tobacco and alcohol use.

In her research, Hayes found that mothers who were in a methadone withdrawal program when they became pregnant tended to have infants with less sleep fragmentation and better cognitive performance. Newborns of mothers not in treatment until after they became pregnant exhibited more interrupted sleep and poorer cognitive performance.

"The take-home message is mothers who enter treatment as early in pregnancy as possible and do not abuse alcohol during pregnancy stand a good chance for a healthy baby," Hayes says. "The best thing an opiate-dependent mother can do for her unborn child is to get into a methadone treatment program. It's going to protect the infant."

Seventy percent of babies born to mothers with opiate addiction, including those in

methadone programs, experience the same abstinence symptoms as adults. Withdrawal symptoms can begin in the first 48–72 hours after birth and last for weeks or months, interfering with neuronal and

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respiratory development, Hayes says.

In addition, the natural autonomic arousal systems that babies with immature respiratory systems develop to keep from falling into too deep — and potentially fatal — sleep can become suppressed with sleep deprivation. Sleep deprivation can produce exhaustion in the infant, resulting in decreased arousability, increased sleep apneas and decreased periodic sleep movements that regulate respiration.

Without sleep movement, an unattended, high-risk newborn may not wake

up readily during apnea. The depression of movements may also decrease cardiorespiratory vigor, Hayes says.

"We think this scenario develops cumulatively," she says, and is analogously "just like grandpa who sleeps through apnea and dies in his sleep."

In the first few days following birth, sleep-related motor-movement bursts are found to correlate with newborn sleep deprivation, and the functioning of sleep and arousal systems. Hayes' team also has found that high-risk infants show sleep fragmentation related to brain injury. The resulting sleep deprivation over time is associated with poor EEG-based cognitive performance.

In addition, with collaborator Dr. Mark Brown, chief of pediatrics at EMMC, the researchers are studying sleep movement and assessing neonatal abstinence syndrome, or opiate withdrawal.

Infants are followed for long-term neurocognitive assessment at Acadia Hospital. Hayes hopes the research will lead to developing new pharmacological treatments to protect neurological development in the newborn period.

Results of the work also are expected to inform better parenting skills for families in challenging socioeconomic environments who may be at risk for chemical or alcohol abuse, according to Hayes and Brown.

"These substances affect neural function," says Hayes. "We want to assess

infant risk for SIDS and brain injury related to prenatal exposures, but also assist in putting in place more interventions during the infancy period and beyond that would promote brain development for infants at risk for developmental disabilities."

USING STATE-OF-THE-ART sleep analysis techniques, including EEG, sophisticated wireless motion sensors, monitors, digital videography, new computer software and mathematical algorithms refined at UMaine and MIHGH, Hayes and colleagues analyze spontaneous movement during stages of infant sleep.

Hayes and her collaborators, including EMMC neonatologist Dr. Ramesh Krishnan and Ph.D. student Marcia Troese, have analyzed data on two fronts: the microstructure of sleep movements in high-risk infants, and the EEG signal in auditory neurocognitive performance.

The process of isolating and studying the comparatively weak infant brain waves presented a signal-to-noise problem. Conflicting signal noise can mask an infant's brain activity. With a NASA grant, UMaine electrical and computer engineer Ali Abedi, engineering physics graduate student Timothy Falkner and mathematician Andre Khalil addressed the issue by developing software to better isolate brain signals and enable in-depth assessments.

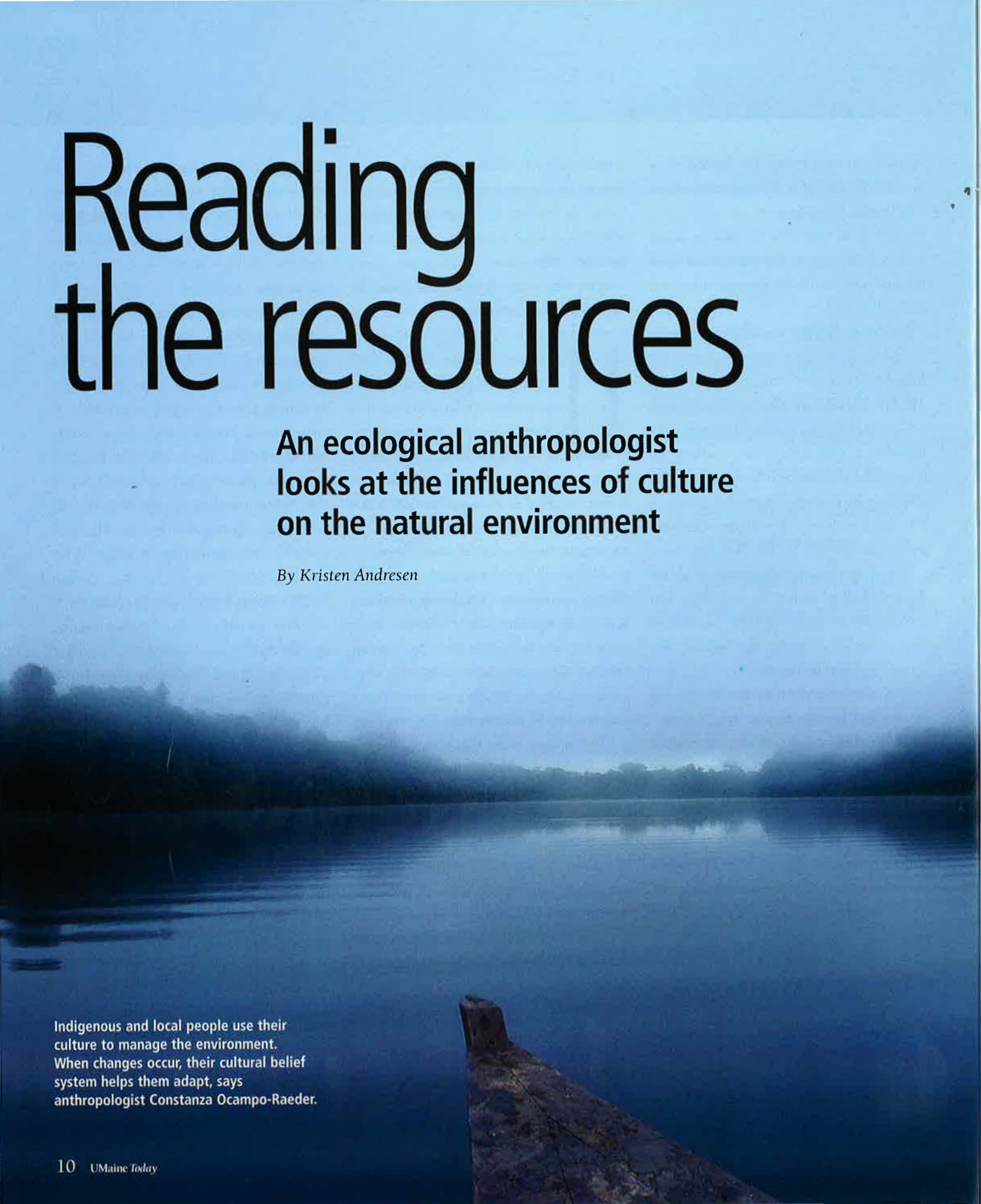
In addition, to improve the fidelity of sleep movement measurement, Hayes, Abedi and postdoctoral student Muhammad Arsalan developed a sensor system that more precisely measures sleep movement and arousal.

Ph.D. biomedical sciences graduate student Jonathan Paul is credited with helping advance development of the neonatal EEG assessment method to measure an infant's capacity to habituate to repeated stimuli, and differentiate between novel and repeated sounds. With the methods he developed, Paul found that maternal addiction patterns prenatally and sleep deprivation postnatally both impair task performance in the first month of life.

"No one has yet described spontaneous movements during sleep as having any specific function," Hayes says. "We have established that they may be important to general cardiorespiratory integrity because high-risk infants, infants with apnea and other groups, like alcohol- and opiate-exposed groups, have increased sleep fragmentation associated with the suppression of sleep movement.

"We believe that the integrity of the (autonomic) sleep movements pattern generator is damped by sleep deprivation and may represent a primitive arousal system," Hayes says. "Functional impairment in the vigor or intensity of movement bursts may increase SIDS risk." ■

Infants of mothers with alcohol and opiate addiction show complicated sleep disorders.

A full-page background image showing a calm body of water, likely a lake or river, under a soft, hazy sky. The water reflects the light from the sky. In the distance, a dark, silhouetted forest line is visible across the water. In the lower foreground, a weathered wooden post or part of a dock extends into the water from the right side.

Reading the resources

**An ecological anthropologist
looks at the influences of culture
on the natural environment**

By Kristen Andresen

Indigenous and local people use their culture to manage the environment. When changes occur, their cultural belief system helps them adapt, says anthropologist Constanza Ocampo-Raeder.

THE RAINFOREST that lines the Amazon River in southeast Peru is a tangle of lush green foliage, and to those who are unfamiliar with the region, it appears pristine. But the indigenous people who call this region home have left their mark on the landscape through agriculture, religious rites, hunting and gathering.

Anthropologist Constanza Ocampo-Raeder has traveled to the Peruvian Amazon since 1996 and spent two years living among the Ese eja people. Her research sheds light on the way cultural traditions influence the management of natural resources.

"There's all this meaning in the forest," says Ocampo-Raeder, an anthropologist at the University of Maine who has a joint appointment in the Climate Change Institute. "When we look at these 'pristine' forests, we actually start seeing resource management practices reflected in the vegetation that send a really important message for conservation: Humans can interact with the environment in a relatively positive way and there are a lot of societies that do. It's not the type of agriculture we do here. It's very selective."

Though Ocampo-Raeder got her start studying ways to "read the forest" in the Peruvian Amazon, she has also done extensive research on other human-nature interactions and the implications of market-based conservation strategies, such as ecotourism, in the American West, the Maya forest in Belize and, more recently, traditional fishing practices in the Andes and coastal Peru. All of her work provides cultural context in the debate about conservation, government interests and indigenous rights.

THE REGION where the Ese eja make their home has been a hot zone for such debate since the 1990s. The biodiversity in the Amazon is tremendous. One landmark study showed that a single tree from the area held more than 20,000 species of beetles. Armed with this knowledge, conservationists and government officials decided to create reserve zones and a national park, and a variety of sustainable development and ecotourism projects sprung up. Although the regional indigenous federation was involved in the decision-making process, the Ese eja were not significant participants in discussions that affect their traditional homeland. Ocampo-Raeder has a theory as to why.



IN THE Peruvian Amazon, Constanza Ocampo-Raeder, pictured above, lived among 35 Ese eja families. The Ese eja are used to dealing with

outside researchers. Nevertheless, the arrangement required extensive negotiations, since not all academic work directly benefits them. Though she did become close with several families, she says, "It can be very lonely in the field. It is a transaction in many ways, and you can't go into it thinking you're going to be friends with everyone you interact with."

Photos by Constanza Ocampo-Raeder, Aureliano Eguren and Jose Ignacio Rojas

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Photos by Constanza Ocampo-Raeder, Aureliano Eguren and Jose Ignacio Rojas



Reading the resources

"The Ese eja don't look like they're 'supposed' to. They wear Western clothing, they occasionally hunt with guns, so somehow, they're not 'indigenous' anymore to people making decisions," she says. "Outsiders want this whole 'noble savage' image, which is entirely wrong. Unfortunately, the perceptions of outside people are enough to keep indigenous people out of the conversation."

In the Amazon, 12 percent of the landscape is human-made, Ocampo-Raeder says. So what does that mean in terms of other ecosystem dynamics?

"If you construct little areas in a certain way that is culturally specific, that means you're also going to attract a certain type of animal to where you live," she says. "The Ese eja specifically planted things to attract animals that they like to eat. They cultivate plants to eat, medicinals, fibers for clothing. It's what I call the functional integration of resource management activities."

Though they may not approach sustainability the same way a Western conservationist would, the Ese eja have shamanic traditions that protect the wildlife they depend on for food. They believe that when their ancestors die, they are reincarnated as white-lipped peccaries, piglike creatures that are a major food source for the tribe. The Ese eja create bamboo forests to attract peccaries at critical times during the year.

"They're impacting the forest in order to ensure that the forest is giving them what they need to survive," Ocampo-Raeder says.

Ocampo-Raeder has also done extensive research on human-nature interactions, and the implications of changing socioeconomic and environmental conditions. Her research looks at the biodiversity of Peruvian markets, as well as traditional activities, such as artisan fishing and religious festivities like the San Pedro celebration pictured above — indications of active involvement in the market economy.



When hunters kill peccaries, they bring them back to the village, where the shaman “reminisces” with the spirits and brings news from the forest. In some cases, that news may be a message about a particular animal disappearing as a result of overhunting.

“It’s a really sophisticated kind of ecological knowledge,” Ocampo-Raeder says. “I’m constantly dealing with what indigenous rights mean today when dealing with conservationists and government. And as a researcher, I bring a whole different perspective that looks at the human factor through the lens of ethnography and anthropology’s theoretical frameworks.”

OCAMPO-RAEDER has brought her experience from the Peruvian rainforest to the American West, where she worked on a high-end ecotourism project that aimed to balance wolf conservation with traditional ranching practices. There, she was dealing with ranchers instead of indigenous people, but the issues were remarkably similar.

In Yellowstone National Park, the reintroduction of the gray wolf is considered a victory for conservationists — and a boon for the ecotourism industry. But the wolves don’t necessarily observe park boundaries, and when they wander onto cattle ranches, it’s a threat to herds. To further complicate matters, ranchers and wealthy, conservation-minded property owners often don’t see eye to eye. And though many tourists want to see the gray wolf, it’s actually harmful to the animals to interact with humans.

Ocampo-Raeder’s work at a Montana lodge aims to create a solution by educating visitors about the ecological and socio-cultural issues at play. They learn about the cowboys. They learn about conservation. They learn that it’s better if they don’t see a wolf, even though there’s a den on the property. Instead, guests can — and do — sleep in tents outside among the cattle to keep the herd safe from predators. Even though they’re paying hundreds of dollars a night for a luxurious room.

“Ecotourism is mostly focused on mitigating environmental impacts,” Ocampo-Raeder says. “But what about the social impacts? What about the social benefits? That was the first time I put all of my theories into practice and it worked.”

What does it mean to be a hunter-gatherer?

LAST FALL, groups of hunters quietly stalked their prey on campus. Armed with cell phones and wooden guns that use elastic bands as ammo, they tried to get within shooting range of gray squirrels and the occasional white-tail deer.

In general, the hunters were woefully unsuccessful, which didn’t bode well for their chances of survival. The elusive animals were unharmed. In fact, few were even inconvenienced.

The hunters were undergraduate students in Constanza Ocampo-Raeder’s conservation anthropology class. Their assignment? Simulate a hunt to gain a better understanding of the ecological knowledge necessary to seek food and live off forest resources.

The lesson is rooted in Ocampo-Raeder’s research with the Ese eja in the Peruvian Amazon who, like many indigenous people, use Western-style weapons. The exercise resonated with her UMaine students, several of whom said it shattered their preconceptions about conservation, indigenous rights and the environment.

To be hunter-gatherers, students need to know the biology of the animal, its territory and the ecosystem. They also need to negotiate space — in this case, all of campus — with other groups.

There’s another caveat: elastic-band guns are really difficult to aim, even if you only need to hit within a 3-foot radius of the target. And squirrels are more wily than people think. Besides, the average squirrel provides only 250 calories — hardly a full meal.

The students were so focused on shooting as many squirrels, frogs, birds and deer as possible, they overlooked one key thing.

“If you were really a hunter, if you did that, you’d deplete the resource,” says Amy Marchenault, an anthropology major from Waterboro, Maine. “The sustainability of squirrels, none of us ever thought about.”

Gathering is another key component to the exercise. Students come back with acorns, vegetables, grapes, bark and medicinal plants. Some bring flowers to trade or sell. They quickly learn that spending an hour rooting around for dandelion greens isn’t worth the effort.

Over the course of the semester, the hunter-gatherers learned valuable lessons about resource management, social costs, and the ways in which indigenous and local people interact with their environment.



Reading the resources

Most recently, Ocampo-Raeder has studied the impact of wildlife-human interactions among crawfish harvesting families in an inter-Andean river valley near Lima, Peru, and ocean fishing families in coastal villages of northern Peru.



OCAMPO-RAEDER has continued to study the impact of wildlife-human interactions, most recently among Peruvian fishing families in two locations; crawfish harvesting families (camaroneros) in an inter-Andean river valley near Lima and ocean fishing families (perscadores artesanales) in coastal villages of northern Peru.

In the valley, crawfish have been harvested since Pre-Columbian times using traditional techniques, including traps made of woven grasses. These families are so attuned to their environment that they can listen to the winds and look at rainbows to know the right time and place to harvest.

"We have these very traditional families trying to maintain their way of life and trying to make sure this resource doesn't disappear," Ocampo-Raeder says.

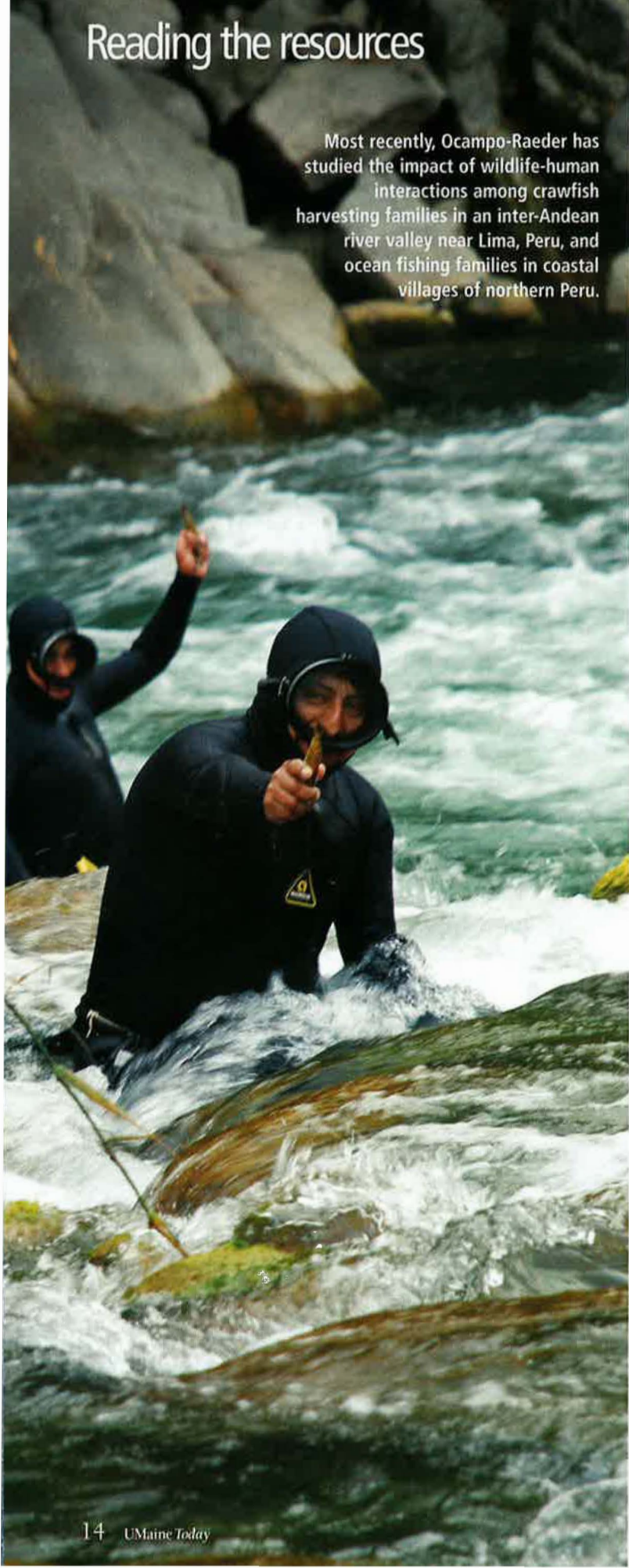
At the same time, the Peruvian government has built a large hydroelectric dam in the valley, which has affected the river's flow. Mining operations upriver have polluted the water.

The second field site where Ocampo-Raeder does her research, in the northern coastal region, is particularly significant to climate scientists because it's where the Humboldt Current and the tropical current meet. Here, ocean fishermen use the behavior of certain animals, which is based on the currents, as cues for prime fishing times. Their catch is half cold-water, half tropical fish.

A shift in the currents could change the region's climate considerably, but equally important, it could also change the culture.

"Peru's policy focused first on the Amazon, then it moved toward the Andes and with climate change, it's now going toward the sea," Ocampo-Raeder says. "Unfortunately, the government is not including the reality of the local people. They're starting to feel the impact of the policy, but they're not involved with it at all."

Ocampo-Raeder has spent two summers in the region and is applying for a National Science Foundation grant to further research what consequences these restrictions might have for Peru's traditions and resources. ■ [Online](#)



THE FEAR IS REAL. Debilitating. And if the fear becomes reality, it can change lives forever.

For many older adults, a fear of falling steadily decreases their physical activity, well-being and independence. At a minimum, their quality of life is jeopardized. At the extreme, the fear becomes a self-fulfilling prophecy.

"Falling is a fact of life. As we age, it's just what happens to us," says Deb Eckart, a University of Maine Cooperative Extension educator in Washington County. "That's why we're teaching practical strategies to prevent falling and reduce the concern. It's about feeling that you're in control of your life as opposed to letting nature take its course."

Eckart is the administrator for the Senior Companion Program, a statewide initiative of Cooperative Extension that enlists older adults as volunteers to provide in-home visits and assistance to homebound elders. Two years ago, when she heard about an award-winning fall prevention program, Eckart knew it could be an effective tool.

"We know older adults experience the fear of falling and, as a result, many curtail their activities," says Eckart. "Many who fall end up in long-term care facilities and never get home again."

Nationwide, more than a third of all adults 65 and older fall each year, according to the Centers for Disease Control. Among older adults, falls are the leading cause of injury deaths, and the most common cause of nonfatal injuries and hospital admissions for trauma.

In response, the program called "A Matter of Balance: Managing Concerns About Falls" was developed by Boston University and the New England Research Institutes with funding from the National Institute on Aging. Translation of the program using a lay-leader model was led by MaineHealth's Partnership for Healthy Aging.

In the eight-week, 16-hour class, adults age 60 and older are taught how to make changes in their environments to reduce risk, exercise to increase strength and balance, and set goals for increasing activity. Participants learn how to survey their living accommodations, looking for ways to improve safety and reduce falling fears. Simple exercises are done while sitting or holding the back of a chair.

"It's coping strategies that we're teaching," Eckart says. "The class also lets older adults know that what's happening to them happens to everyone."

Preventing falls

**An innovative program
helps older adults cope
with their worst fear**



Two worlds

UMaine researcher studies the needs of first-generation doctoral students within a framework of social justice

By Margaret Nagle

In a way, I'm kind of caught in between these two groups: the working-class group and the world of academia. I don't fully belong to either group anymore. I kind of have one foot straddling the line.

Kathryn, a doctoral student in psychology

First-generation doctoral students are less equipped than their peers with college-educated parents to navigate higher education. To know the ropes. To speak the language. To successfully meet the often unspoken expectations of graduate programs.

AS THEY HAVE FOR CENTURIES, doctoral programs provide a rigorous, intense academic and research experience steeped in something of a pay-your-dues tradition. As one doctoral student said, "If graduate school was easy, everybody would have a Ph.D."

But today, doctoral education also is facing one of its toughest challenges. The attrition rate for doctoral students in the United States is 43 percent, according to the Council of Graduate Schools. Researchers looking at the causes of the high rate find no single catalyst, but note that the incidence varies greatly according to academic disciplines — from as low as 24 percent in the biomedical and behavioral sciences to a high of nearly 67 percent in the humanities and social sciences.

Attrition at this level in higher education comes with a particularly high price tag for universities, the faculty and the students. A University of Notre Dame study found that it would save \$1 million annually in stipends alone if attrition were reduced 10 percent. As a result of what some are calling "the central issue in doctoral education in the United States today," researchers and institutions like the National Science Foundation and the Carnegie Foundation for the Advancement of Teaching have initiated studies to better understand the causes and consequences.

For higher education researcher Susan Gardner, the attrition picture is particularly harrowing when taking into account that 34 percent of doctoral candidates nationwide in 2008 were first-generation doctoral students, according to the Survey of Earned Doctorates (SED), conducted by the National Opinion Research Center.

"There's an assumption that once first-generation students graduate with their undergraduate degrees, they've figured out how higher education works," says Gardner, an assistant professor of higher education at the University of Maine. "But these students still

Two worlds

struggle as much or more in graduate school. They have no cognitive map. From popular culture they have a general idea how college works, but not how to be socialized to graduate school.”

First-generation doctoral students are often women and students of color from lower socioeconomic backgrounds. Because of their lack of what Gardner describes as economic, social and cultural capital, they have difficulty negotiating the graduate school environment and navigating the challenges, and are particularly at risk.

These first-generation students tend to have what Gardner calls “accumulated disadvantage” — lower degree aspirations; greater odds of dropping out or taking longer to graduate; less engagement with faculty and peers; and the need to work full time while in school to meet financial need.

“What’s glaring for me is these students have particular areas of need that are not being met,” says Gardner, who has written and co-edited two books on doctoral student socialization and development in the past year. “Students talk of isolation and the idea of having a foot in two worlds. They are loyal to their families, but their families don’t understand what they’re doing. Academia doesn’t understand where they come from. They feel alone and anguished about what they’re experiencing, not knowing the right questions to ask.”

The demographics have far-reaching implications for institutions with high percentages of first-generation doctoral students. The University of Maine is one of them. Nearly 48 percent of UMaine’s doctoral graduates are first generation — the second-highest population in the nation behind Wayne State University. Others in

the top 10: West Virginia and Temple universities; the universities of Alabama, Tennessee and Kentucky; Iowa State and Oklahoma State; and the State University of New York at Buffalo.



Painting by Breanna Brown

“There’s an implied understanding that in the last 50 years, we’ve worked toward opening doors for women and people of color in higher education,” Gardner says. “It’s taken for granted at the undergraduate level, but there’s benign neglect at the graduate level.”

GARDNER STUDIES the first-generation doctoral student experience in the context of social justice in higher education, particularly those underrepresented populations. Students in families or communities in which the college experience is common have more social capital and, therefore, know more implicitly how higher education works. Limited social capital is often related to less economic and cultural capital.

For second- and third-generation college students, the decision to pursue higher education often is an expectation they understand early in life.

“I’m looking at implicit and explicit messages that students get — and don’t get. What are we doing at the federal, state and community levels to inform students and families about how higher education works? Some of it has to do with stepping back and understanding how we know what we know, and ensuring that others learn it as well.”

Gardner takes a social constructivist approach in her research, interviewing the first-generation students still in graduate school to explore their perceptions of the Ph.D. experience, including attrition. Previous studies on doctoral student attrition focused on those students who had already dropped out of their programs.

For Gardner, who also is a first-generation college graduate, the students’ poignant stories about their Ph.D. experiences ring true. She remembers thinking she wanted to pursue a doctorate because she liked working in higher education (student affairs, at the time) and “a Ph.D. sounded interesting.”

“But I had no idea what it meant as a first-generation doctoral student. I didn’t know how research worked,” says Gardner, whose dissertation in 2005 at Washington State University focused on the socialization and disciplinary perspectives of doctoral student success.

As an undergrad, Gardner remembers her mother questioning the need to fill out FAFSA, the Free Application for Federal Student Aid. “She thought it was a scam, because on her cognitive map of the world,

there's no free money," Gardner says.

One graduate student Gardner interviewed told about her mother's reaction to getting the FAFSA notification of a financial aid award: Now that the family got this money, there was no need to go to college.

"We're coming from generations that asked why go to college when there are jobs at the mill with retirement," says Gardner. "Now that we've moved from that economy, how do we change that understanding of the options?"

IN HER INTERVIEWS with first-generation doctoral students nationwide, four themes emerged. The first she calls "breaking the chain," when students make the decision to separate from their past, moving beyond their socioeconomic or gender bias barriers.

Katrina, a doctoral student in education, said her parents' expectations were that her older brother would pursue college. "Their perspective was that he was a man and he would have to support a family and I, on the other hand, would get married and be supported," the student said.

Another talked of breaking the chain by, "looking at how hard my parents had struggled for such a long time. We're talking basic, entry-level, labor-intensive-type positions that both of them held during their lives. I didn't want to do that."

A second theme among the students is what Gardner characterizes as "knowing the rules." Even those students who wanted to didn't know how to access the higher education system and then, when they did, they didn't know how to navigate it.

"I didn't know you could go to school without football. That line of thinking was not in my world of knowledge and under-

standing," said Ryan, a doctoral student in social work.

First-generation doctoral students talked of studying twice as hard to learn how to maneuver in and out of the system.

"(Peers') parents are educated and have degrees so they kind of know what the system is and how to work it, and how to apply that directly to what was expected of them," said Kelly, a doctoral student in interdisciplinary studies. "For me, I kind of have to feel my way around and learn as I go."

The third and perhaps most intriguing theme that emerged is what Gardner calls "living in two worlds." She found first-generation doctoral students feeling alienated in academia and the world of their upbringing. Theirs is a dual culture.

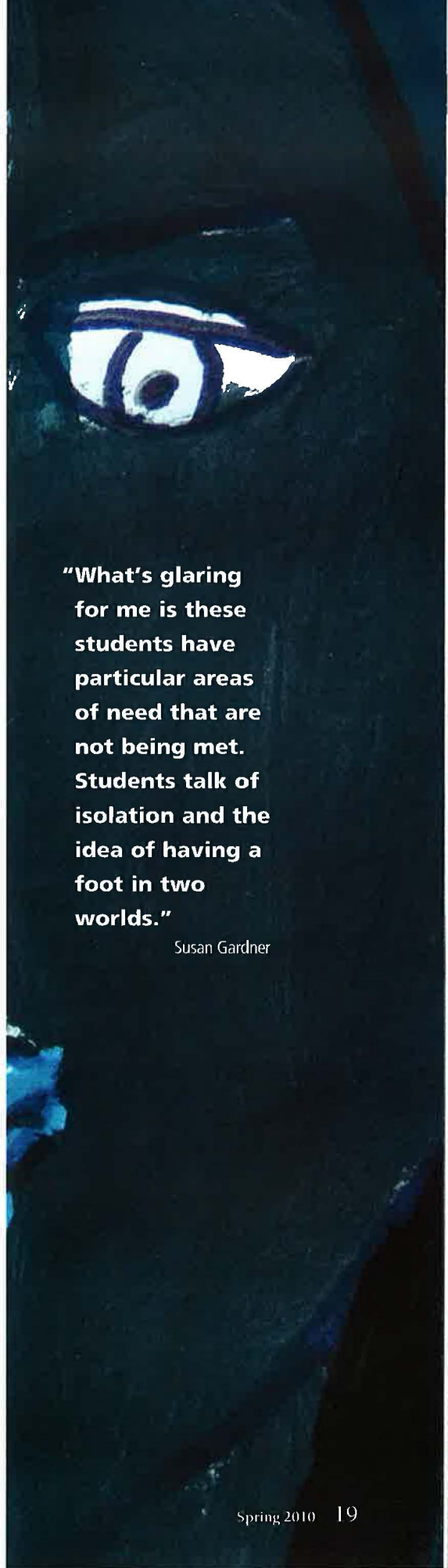
"They have no respect for what I'm doing," Melanie, a doctoral student in chemistry, told Gardner. "They say, 'You need to get a job and get out of college.'"

Brandy talked about not belonging in a doctoral program in terms of class, gender and race — symptoms of what psychologists call the imposter phenomenon.

The hardest part, said Claire, a doctoral student in English, is the self-doubt, "thinking that someone is going to find out that I really shouldn't be here, even though it is something that I have worked so hard for."

There's also disconnect with family — from feeling relatives don't understand the educational pursuits to the sense that the students, in essence, can't go home again.

"You can't really act educated when you go home, you know, because they think you are uppity. I actually had a couple of my cousins tell me that I don't even talk the same," said Jan, a doctoral student in political science.



"What's glaring for me is these students have particular areas of need that are not being met. Students talk of isolation and the idea of having a foot in two worlds."

Susan Gardner



Two worlds

“(Peers’) parents are educated and have degrees so they kind of know what the system is and how to work it, and how to apply that directly to what was expected of them. For me, I kind of have to feel my way around and learn as I go.”

Kelly, a doctoral student in interdisciplinary studies

GARDNER’S RESEARCH is raising awareness about the issues higher education must address if high-risk student populations are to succeed. In one of her most recent studies of the effects of academic discipline and institutional cultures on attrition, she interviewed 60 first-generation doctoral students and 34 faculty in six fields and found major disconnect between the two groups.

Faculty largely blamed attrition on students “lacking” what it takes to succeed, many noting that those students “shouldn’t have come” in the first place. Graduate students perceived personal problems as the chief reason their peers left their programs. They also cited departmental issues, poor advising, and inadequate institutional and faculty preparation to meet expectation. They said their peers who dropped out discovered they had the “wrong fit” with their programs, something they could not have known prior to acceptance.

While both faculty and students cited personal problems as the reasons for attrition, only students knew the specifics.

“Faculty responses were indicative of feeling removed from the issue of attrition, that it was largely a problem they attributed to students,” says Gardner. “Students were quick to point to programmatic, departmental and institutional issues as reasons for attrition. Such mismatched understandings of attrition may contribute to further erosion. Conversations among faculty and students about expectations and causes of departure should occur.”

The Ph.D. student produces original research and is expected to be a “steward of the discipline,” Gardner says. In the complicated socialization process, the candidate has to learn to be a student, researcher,

professional and leader to a degree not found on undergraduate or master’s degree levels. That’s why doctoral advising and mentoring are so important, Gardner says.


“It goes back to the idea of where we learn what we learn,” she says. “What do we teach students?”

Doctoral advising is a challenging, long-term commitment that requires one-on-one attention. Literature exists about effective advising for undergrads, but little about how to be a doctoral adviser. In her research, Gardner has found that faculty who had a good doctoral experience replicate it for their students; if their experience was poor, they try to offer the opposite or comparable, thinking it a matter of paying dues for the highest degree.

“For some (doctoral students), this is a hazing experience. Is that what we want?” says Gardner.

Reframing begins with recognizing that there may be different realities facing first-year doctoral students, Gardner says. For instance, first-generation doctoral students need skills in how to sell themselves.

The second step is socialization, engaging faculty and students in a discussion of logistics, rules and expectations — explicit and implied. The third step, Gardner says, is the reaffirmation of a university administration with a built-in supportive structure, such as a support group for first-generation students and counseling services.

“What’s going on in people’s lives and what institutions do to support them are real influences that ultimately encourage students to go on,” says Gardner. “Faculty also need to understand the difference an individual can make in the lives of first-generation college students.” ■ 

GROWING UP in Cape Elizabeth, Maine, Rachel Potter's favorite meal was pumpkin chicken curry. The recipe had been in her family for generations; her grandmother remembers her mother serving it. It was a "company dish," something reserved for potlucks or special occasions.

Rachel always looked forward to it. And now so do many of her peers at the University of Maine.

When UMaine's Black Bear Dining started the Recipes from Home program in fall 2008, Rachel submitted the recipe and won.

"It's definitely a recipe that's conducive for being adapted to a dining hall setting. You can make it for two people or you can make it for a huge crowd," says Potter, a graduate student in science education.

The program began in York Dining as a way to get better insight into student preferences and to find out what might be missing from current menus. It also makes students feel that their opinions matter and that UMaine truly is their home away from home.

"Sometimes I hear students say there's nothing to eat, but I figure there's actually something that isn't here," says Judy Smith, a cook in UMaine's test kitchen. "The staff is making an effort to find out what students like and what is comfort food to them."

Nearly 50 recipes were submitted in the first year of the contest. Some weren't serious, and some were cost-prohibitive. But a handful were featured for a whole meal period. The recipes range from simple casseroles to more complex dishes.

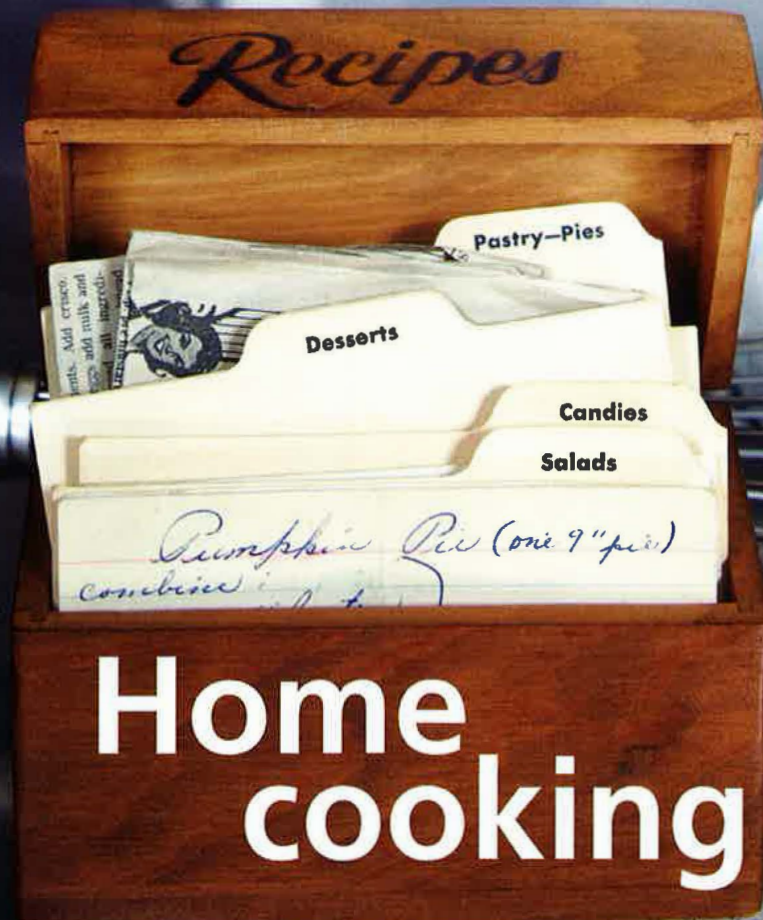
Several, including Potter's pumpkin chicken curry, are now in the menu rotation.

Secondary education major Liza Balzarini of Wareham, Mass., had two recipes chosen — the Liza Lou panini (apple, cheddar and turkey) and an Italian panini with chicken, roasted red pepper, onion, pesto and mozzarella cheese.

"People were high-fiving me," she says, "and when it's on the menu in Wells Dining, people will come up to me and say, 'They served your panini today.'"

A popular contest adds students' favorite dishes to the UMaine menu

Home cooking



Emergency SENSING



Improving situation awareness will help Maine prepare for the worst

By Margaret Nagle

IN HIS 13 YEARS of engineering work in such diverse parts of the world as Alaska and Missouri, the Marshall Islands and Iraq, University of Maine Ph.D. student Jake Emerson has seen the difference effective communication can make in disaster relief.

He also knows how difficult it can be to achieve.

"I've seen the difficulties engineers have when trying to understand dynamic environments, and emergency management is a perfect example," says Emerson, who spent eight years in the Army Corps of Engineers and five years in the flood warning industry in Colorado. "With so many things going on in the world, an individual can't understand it all at any one time. That's why we need to build systems that help with knowing, prioritizing and reacting to the environment to keep you safe. It's understanding that informs you how to behave."

When Emerson came back to Maine nearly two years ago, it was with the intention of applying what he's learned around the globe to help communities throughout the state like his hometown of Wayne.

"Emergency response happens at the local level, then goes up from there," says Emerson, who earned his undergraduate degree in mechanical engineering from West Point and his master's in environmental engineering from Missouri University of Science and Technology. "We do need to rely on state and federal governments to help us, but they are not the first lines of defense. If Maine can put together systems enabling towns and counties to share information so they can make decisions instead of waiting for others to make them, it will be better off."

GLOBAL RELIEF TECHNOLOGIES (GRT), headquartered in Portsmouth, N.H., and the University of Maine Department of Spatial Information Science and Engineering are helping the Maine National Guard, Maine Emergency Management Agency (MEMA) and other partnering first responder agencies create such an information system. In a 15-month, \$1 million project called SenseME, engineers are focusing on critical infrastructure sensor integration and logistical asset tracking to enhance the state's emergency management.

"Five years ago, this technology wasn't ready. Now integrated wireless sensors are ready for general applicability" to benefit humanitarian and environmental efforts.

Mike Worboys

A postal carrier makes his appointed rounds despite the tangle of trees and wires along his route in Bangor, Maine, during Ice Storm '98. Ice storms and flooding are two of the worst natural disasters emergency management personnel face in Maine.

Photo by Kevin Bennett, courtesy of the Bangor Daily News

"We need to build systems that help with knowing, prioritizing and reacting to the environment to keep you safe. It's understanding that informs you how to behave."

Jake Emerson

The goal is to improve situation awareness — what is happening in an emergency, and where, when and how the state is responding. The effort has the potential to address disasters indoors and out, including those with swift devastation, such as tornadoes or floods, or with evolving impact, such as pandemics. Using sensor technology, the researchers hope to develop a common operating picture built with real-time information to better equip civil and military emergency management responders.

U.S. Sen. Susan Collins helped secure \$1.9 million in funding for the Maine National Guard. The allocation funds development of a rapid data management system by GRT, which specializes in mobile computing technology using real-time data for use in emergency management, military operations, and relief and reconstruction efforts worldwide. SenseME is a component of that rapid data management system.

"The research being conducted by (the University of Maine and) Global Relief Technologies and the deployment of the Rapid Data Management System will improve the ability of our nation's soldiers and first responders to respond in times of crisis," says Collins. "As we have unfortunately seen from past disasters, a breakdown in communication will hamper the ability of first responders and emergency management officials to take action."

UMAINE'S SENSEME research team is led by spatial information engineer Mike Worboys. Also from the Department of Spatial Information and Engineering are team members Silvia Nittel, who specializes in database management, and Kate Beard-Tisdale, who contributes her research expe-

rience in modeling, analysis and visualization of spatio-temporal phenomena. Ali Abedi from the Department of Electrical and Computer Engineering focuses on wireless communication.

Emerson, now a second-year UMaine Ph.D. student in spatial information science and engineering, is a GRT liaison on the project. A recent spatial information science and engineering master's recipient, Jeremy Onysko, is a GRT project manager, and master's student Ben Weber is a GIS intern.

Also assisting in the UMaine project are two alumni — GRT's Art Cleaves, former MEMA director and, more recently, the regional administrator for the Federal Emergency Management Agency (FEMA) Region I in Boston; and Bruce Fitzgerald, former Homeland Security Division director at MEMA. Cleaves and Fitzgerald bring extensive, first-hand emergency management experience to the project, providing UMaine researchers with real-world examples of how the SenseME project could be applied to actual disaster response and recovery.

"The work being done to enhance the rapid data management system used by the Maine National Guard and MEMA will go a long way toward improving the common operating picture that all first responders and emergency managers across Maine can use to share situational awareness and make better informed decisions," Cleaves says.

TO PROVIDE TIMELY response and proper reaction to disasters, emergency management agencies must track the condition of all critical infrastructure and the availability of key resources locally, regionally and nationally, as well as ensure the ultimate return of equipment. One of the biggest

challenges is in coordinating data, information sources and responses among several agencies to improve the ability of emergency managers to make the most informed decisions.

Equally important, says Worboys, is having people trained to properly interpret and react to the integrated information in such an upgraded emergency operations center.

The first step in SenseME has been to identify critical infrastructure, such as bridges and dams, and the logistical assets, such as generators, cots and potable water that require monitoring as part of emergency management. That investigation was done in collaboration with state and federal agencies, including the Department of Homeland Security, Maine National Guard, FEMA and MEMA.

Maine does have some sensor systems, such as flood gauges maintained by the U.S. Geological Survey. But improved collection, mapping and distribution of the information from such existing and new technology could improve emergency management.

UMaine researchers are exploring the integration of even more sophisticated wireless sensor technology, such as video, radar, seismic, magnetic and passive infrared for aerial and ground-based monitoring. The goal is to provide a robust data stream-based management infrastructure that supports the efficient capture and convenient analysis of a variety of real-time data feeds. Informatics, or the complex management of information, can create a common operating picture for response and recovery operations.

"Once we have that picture of what's

going on in the world, then it's a matter of distilling that chaos into something manageable," says Emerson. "It's important for the Maine National Guard and the Maine Emergency Management Agency to understand what the different capabilities of the technology can bring them, and help them figure out when technology is useful and when it's not."

Such humanitarian uses for technology have implications beyond just managing emergency response in Maine's two largest natural disasters — ice storms and floods. The research also is expected to improve emergency management while maintaining control of sensitive information in the event of severe weather and mass care, sourcing and dispatching assets, border protection, disease surveillance and reporting, and monitoring of hazardous cargo.


SenseME is expected to serve as a springboard for the establishment of a UMaine Center for Spatial Computing in Emergency Management, focused on ubiquitous spatial computing methods and technologies to support emergency management in Maine and nationwide.

"Five years ago, this technology wasn't ready," says Worboys. "Now integrated wireless sensors are ready for general applicability" to benefit humanitarian and environmental efforts. ■



In May 2008, part of Fort Kent, Maine, was flooded when the Fish River spilled over its banks near the confluence with the St. John River.

Photo by John Clarke Russ, courtesy of the *Bangor Daily News*

A bioengineer with brown hair tied back is working on a laboratory device. The device has a white cylindrical body with a red internal component. The person is holding the device with both hands. In the background, there is a whiteboard with various hand-drawn diagrams of mechanical and biological structures. To the right, a blue control panel with a switch labeled 'ON' and 'OFF' is visible. The overall scene is a laboratory setting focused on bioengineering research.

**Bioengineering
research focuses
on optimizing
tissue regeneration**

Improving implants

“The application of cell-seeded biomaterials for regeneration of damaged tissues is not new. What we are trying to do in our lab is to optimize this process, which is currently based on the principle of trial and error.” Alireza Sarvestani

By Aimee Dolloff

THEY’VE NEVER performed surgery. They’re not bioengineers. But University of Maine undergraduate students Kara West and Amy Foley are hoping to make a difference in the medical world by exploring the use of cells as therapeutic agents for repairing damaged tissues — an alternative to conventional surgical therapies and implants.

Working under the direction of UMaine mechanical engineer Alireza Sarvestani, the students are investigating how to repair dysfunctional tissues by mimicking the way the body produces cells. The hope is that implants using stem cells infused with polymeric biomaterials could someday take the place of artificial implants.

“The application of cell-seeded biomaterials for regeneration of damaged tissues is not new. What we are trying to do in our lab is to optimize this process, which is currently based on the principle of trial and error,” says Sarvestani, whose research interests include the biomechanics of cell adhesion and locomotion.

The bioengineering research at UMaine, which uses bovine cells as models of human cells, focuses on implants made of bioresorbable materials instead of permanent implants that can sometimes be rejected by the body. The technology could

be particularly helpful in repairing cardiac endothelial tissue in patients who have experienced heart attacks or other cardiovascular-related damage, Sarvestani says.

“The (current implant methods) are permanent, but not good because they are not part of your body,” says Sarvestani. “In our project, host stem cells take over and the implant — the polymeric material — begins to degrade (when it comes in contact with water). As the stem cells proliferate, the implant will essentially go away.”

In Sarvestani’s lab, the bovine cells are injected with the polymeric material and grown in vitro to mimic the way similar cells would function and grow in humans. The goal is for the host stem cells to take over and form new tissue concurrent with degradation of the biomaterial implant, leaving the repaired host tissue in its place.

Sarvestani is focusing on the project’s mathematical portion — the formulas that help determine the optimized chemomechanical characteristics of polymeric material to use. And he’s investigating how the materials react with their environment — in this case, the human body.

Foley, a biochemistry major from Deer Isle, Maine, is focusing on the organic chemistry of compounds and processes occurring in organisms. West, a computer science major from Brentwood, N.H., is



Undergraduates Kara West, left, and Amy Foley both plan to pursue medical school as a result of their bioengineering research experience at UMaine, led by mechanical engineer Alireza Sarvestani. The students are exploring new ways to repair damaged human tissue.



Assistant Professor Alireza Sarvestani is hoping to refine surgical implants by making them with bioresorbable materials, ultimately reducing risk of rejection in the body.

electronically documenting and analyzing the process and structure of their research. Both now plan to pursue medical school.

By studying the mechanical properties of the cells and how they respond to stimulus, which is more about biology than engineering, Sarvestani thinks the outcome could be extremely effective in practical surgical situations.

Sarvestani's tissue engineering principles have the potential to be applied to many types of human tissue, as well as bone and cartilage. Although the project is still in its early stages, he hopes that the upcoming results will draw the attention of medical centers in Maine for future collaborations.

"Certainly when we're done with this part of the study, we would like to do more realistic testing," he says. "We'd like to be able to make the implants and try them in a real-life situation." ■

TO DETERMINE if an avocado is on its way to being guacamole or a peach is perfect for cobbler, you spend a few extra minutes in the produce section feeling the fruit for ripeness.

For surgeons, the same feeling process is needed to differentiate bone, cartilage and tissue. In recent years, advances in robotic surgery techniques have improved, with surgeons at workstations using joysticks and foot pedals to maneuver microscopic tools through the body. What's been missing is the ability for surgeons to physically feel what they're working on using robotic technology.

In the state's first biomedical engineering laboratory, University of Maine mechanical engineers Vince Caccese and Mohsen Shahinpoor, and a student research team are developing advanced robots for endoscopy and laparoscopy procedures. Their newest innovations include technology that allows doctors to have a sense of feel while they're operating with robotic instruments — a capability comparable to traditional, hands-on procedures.

The UMaine researchers are working

with electroactive polymeric nanosensors integrated into the tip of the robot. When the sensors touch something, an electronic signal is sent back to the joystick and gives the surgeon a sense of touch that can differentiate bone from tissue.

DM Technologies LLC of Sanford, Maine, is collaborating with Shahinpoor's robotics lab to develop the feel-sensing product.

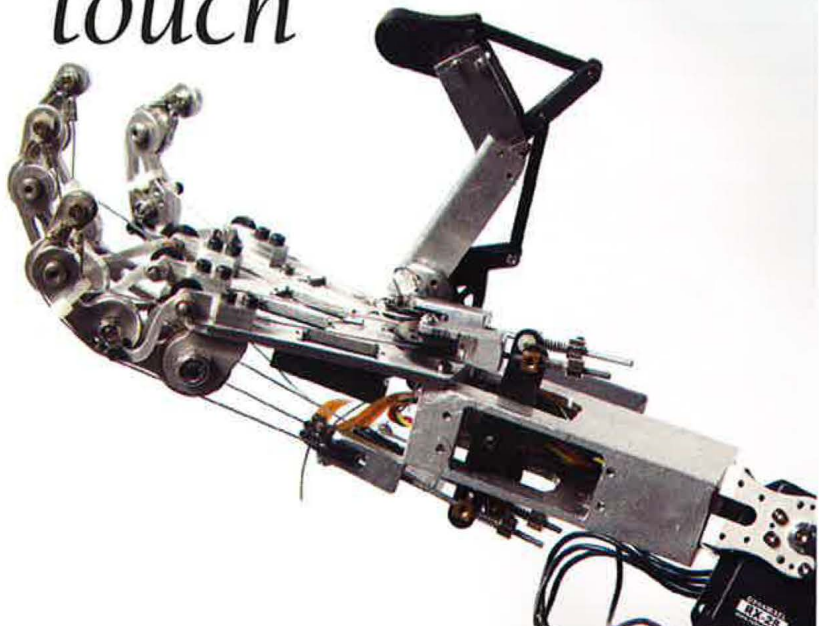
The lab also is developing robots made of environmentally friendly and economically feasible materials for disposal after one use, eliminating risk of contamination. Robots currently are too expensive not to reuse.

With a \$25,000 seed grant from the Maine Technology Institute, Shahinpoor and his team are prototyping the innovations in collaboration with two surgeons at Eastern Maine Medical Center in Bangor, Maine.

Shahinpoor, who chairs UMaine's Department of Mechanical Engineering, credits student researchers — six undergraduates and two graduate students — with the fast-paced innovation development in the robotics lab.

"You create that synergy from students and it really works well," Shahinpoor says. "They make quick and great progress."

Robotic touch



IT'S A BIG JOB carrying out the wishes of former Maine Gov. Percival P. Baxter, who donated more than 200,000 acres of Maine wilderness with the stipulation that they be held in perpetuity. But it also doesn't get any better, says University of Maine alumna Carol Redelsheimer.

"I'd say it's definitely the best forestry job in the state, and maybe arguably one of the best forestry jobs in New England," says Redelsheimer, who became Baxter State Park's forest manager in 2006 after working more than 20 years in the forestry industry.

Throughout three decades, Baxter purchased and donated the Katahdin region land that now is Baxter State Park. In 1955, he established a portion in the northwest corner of the park known as the Scientific Forest Management Area, which Redelsheimer oversees. He made his final land purchase in 1962.

"Knowing that the forest products industry was a large part of Maine's economy, Baxter gave about 30,000 acres to be used for forest management. He wanted the scientific principles of forest management to be put into practice there," says Redelsheimer, a 1983 UMaine graduate whose career has included work with Great Northern Paper and Champion International.

Baxter wanted to show that we can have beautiful, great forests and produce a crop of wood without depleting the resource, she

says. That means managing the land in a holistic manner.

"It's a very unique place not only in Maine, but in the country and maybe in the world," says Redelsheimer. "Two hundred years from now, I'm sure the park is not going to look exactly the way it does now, but Percival Baxter wanted sound scientific management and for foresters, that's what we're all about."

Redelsheimer has seen dramatic changes to the forestry industry, particularly when it comes to ownership and management.

"When I first began my career, land was basically owned by companies that owned manufacturing facilities, and there was a tie between the facility and the land," she says.

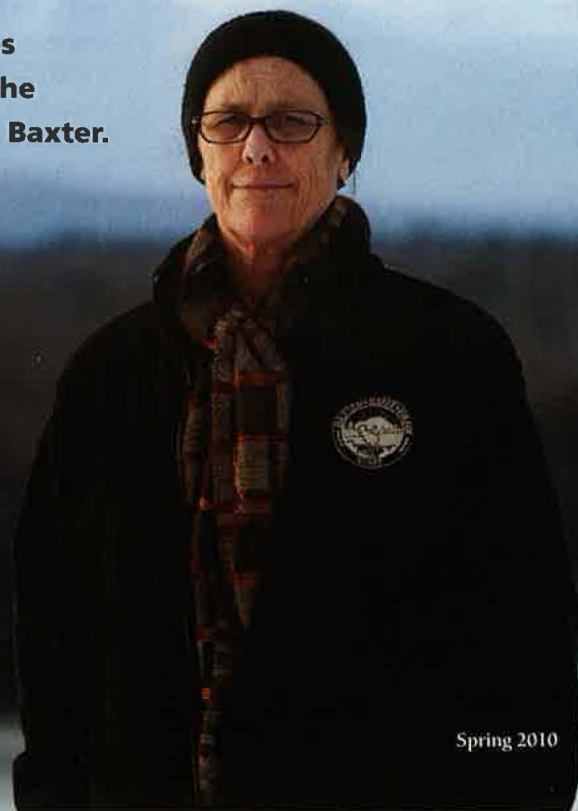
Changes in the economy have resulted in fewer corporate owners, which changes the way business is done.

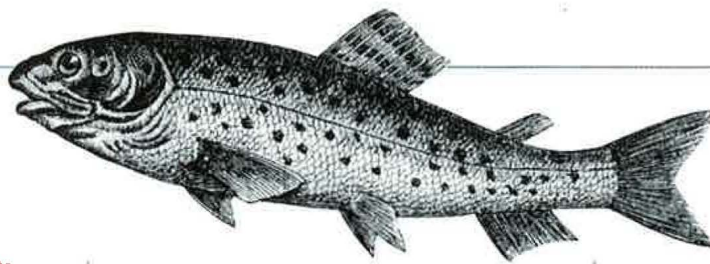
"I (also) think that there's a change in conception of forest products," Redelsheimer says. "We obviously don't live in a paperless society, but I think that is changing. Demand for newsprint and directory paper from mills in Maine hasn't only decreased because of the cost of distributing telephone directories, for example, but (because) a lot of people are now reading magazines and news online. The markets that are available for forest products and the way that forest products are used has changed, and I believe will continue to change."

A forester who graduated from UMaine in 1983 oversees the sustainable management of nearly 30,000 acres of the Great North Woods, helping fulfill the vision of Percival Baxter.

Tending the trust

Alumna manages Baxter State Park's forest





Stress eating

IN TIMES OF STRESS, many women turn to food for comfort. But for those who are overweight, stress could be compounded by anxiety about weight-related prejudice, ostracism and rejection. This, in turn, might lead to more stress-related eating — particularly of high-calorie, high-fat or low-nutrient foods — which leads to further weight gain, according to University of Maine psychologist Shannon McCoy. McCoy's most recent study is one of the first to demonstrate a causal link between weight prejudice and snacking behavior. McCoy, an assistant professor of psychology, is particularly interested in the psychological variables, such as perceptions of prejudice that might influence those links. McCoy's research, conducted in collaboration with colleagues from the University of California — San Francisco, University of California — Berkeley and graduate students at UMaine, looks at stress and eating behavior among the moderately overweight. McCoy says those who are overweight often are viewed negatively and blamed for not controlling their weight. Given its pervasiveness and severity, prejudice is likely to be a significant source of stress for overweight people.

Old salmon

UNIVERSITY OF UMAINE anthropologist Brian Robinson and colleagues are looking at archaeological evidence of Atlantic salmon to better understand the effects of global warming. The researchers found traces of Atlantic salmon from 400, 3,000 and 6,000 years ago, with the earliest periods being warmer than present and relatively wet. Current New England predictions are for increased year-round temperatures, greater late-summer

***Salmo salar* occurs in two varieties: landlocked salmon living year-round in Maine's deep lakes, and Atlantic salmon that live largely in the ocean and spawn in rivers.**

evaporation and increased precipitation in the spring, winter and fall. The good news is that salmon did occur in Maine when the climate was warmer, but that also was a time when Maine rivers were free of dams and fish could go farther upstream to spawn in cooler waters. If climate projections are correct, the ability of the Atlantic salmon to survive and reproduce may depend on timing of migrations and availability of upstream locales with sufficient flow and low enough temperatures to allow reproduction and feeding. The researchers' findings were published in the *Journal of Archaeological Science*.

Songbird shortcut

RESEARCHERS BELIEVE they may have discovered a previously unknown, but potentially important flyway that songbirds are using as a shortcut across the Gulf of Maine during fall migration, according to wildlife biologists with the University of Maine and U.S. Fish and Wildlife Service's Maine Coastal Islands National Wildlife Refuge. During a bird banding study on several national wildlife refuge islands last fall, more than 6,000 songbirds representing 75 species were captured, far exceeding the number captured at long-running banding stations elsewhere, says



Photo by Glori Berry

Rebecca Holberton, a UMaine biologist who collaborated on the study. The researchers estimate that up to a half million or more songbirds could be using the Metinic Island area on their way from the Canadian Maritimes to the southern Maine mainland. For the past two years, researchers from the Maine Coastal Islands National Wildlife Refuge and National Audubon Society have banded songbirds on Seal Island. The effort was expanded this past season (mid-August to mid-October) to the refuges on Petit Manan and Metinic islands.

The five most abundant songbird species caught on Metinic, Seal and Petit Manan islands in 2009: Myrtle Warbler, Savannah Sparrow, Common Yellowthroat (pictured above), White-throated Sparrow and Red-eyed Vireo.



Fishing bottom-up

A TEAM OF UNIVERSITY OF MAINE researchers led by marine scientist James Wilson is studying the relationship among competition, regulation and conservation in the fishing industry. The research will integrate cutting-edge computer modeling, and fishermen's and scientists' knowledge of three very different fisheries — lobster, sea urchins and groundfish. The purpose is to develop a rigorous bottom-up (rather than the usual top-down) understanding of the conservation problem. The project is funded by an approximately \$1 million grant from the National Science Foundation. Researchers will look at the way competition and cooperation among fishermen lead to private incentives and informal social arrangements that are — or aren't — consistent with conservation of the resource. These informal arrangements and incentives are important because they help explain how private interests reinforce or impair ongoing resource management and, consequently, the sustainability of coupled human and natural systems. The broad hypothesis behind the research is that fishermen's incentives, and the informal social structure that emerges from competitive and cooperative interactions, reflect the biological and physical circumstances of the species being fished. Other members of the research team include Jim Acheson, Yong Chen, Teresa Johnson, Robert Steneck and Liying Yan, all of the School of Marine Sciences.



Researchers will use computer modeling to mimic the way fishermen use their experience to refine their knowledge about their natural and social environment. The goal is to gain a bottom-up understanding of issues related to conservation and fisheries management.

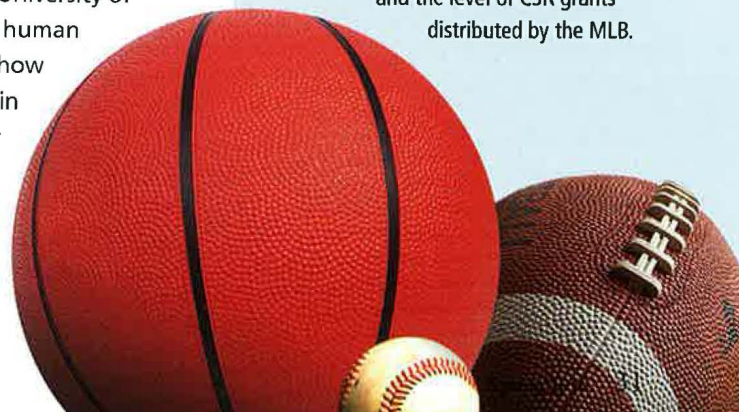
Playing ball

PROFESSIONAL SPORTS franchises and teams are increasingly taking a page from the business community's playbook and winning in the image game, according to two business management researchers at Boston College and the University of Maine. In the last decade, corporations worldwide have used Corporate Social Responsibility (CSR) activity as a business strategy, embracing volunteerism, ethics and "do-good" norms. So too have sports franchises, all in an effort to improve their image in light of public relations issues — from steroid use to player misconduct off the field and court. However, athletics in today's culture is uniquely positioned — from its youth appeal and mass media attention to positive health benefits — to employ CSR more effectively than traditional corporations, according to Richard McGowan of Boston College's Carroll School of Management and John Mahon of the Maine Business School. The researchers studied 92 teams in the National Basketball Association, National Football League and Major League Baseball from 2005–07 to identify the primary factors that influence a sports franchise's CSR involvement. Major League Baseball was more engaged in CSR than the other leagues, with the highest average revenues, grants and net assets, while the NBA had the lowest average in each category. In their statistical analysis, the researchers concluded that there also is a relationship between team performance and the level of CSR grants distributed by the MLB.

experts on topic



YOU SAY "potato," Mary Ellen Camire says "healthy." As the potato increasingly becomes a dietary staple, and as processed potato products edge out fresh, even small differences in the nutritional composition could have significant effects on the health of a population. Camire, a University of Maine professor of food science and human nutrition, has extensively researched how the nutrient and bioactive compounds in potatoes impact human health. Her latest paper detailing the health benefits of spuds was published in the journal *Critical Reviews in Food Science and Nutrition*.





Toxic algal detection

THE UNIVERSITY OF MAINE is one of the first to receive an international research partnership award, designed to link U.S. scientists and engineers with counterparts in Ireland. The BEACONS (biosafety for environmental contaminants using novel sensors) project aims to develop strategies for isolating and detecting algal toxins of significant concern as environmental and food contaminants. The project has received more than \$1 million in joint funding from the Science Foundation Ireland, Invest Northern Ireland Department for Employment and Learning, and the National Science Foundation. UMaine will receive about a third of the funding for its portion of the project. Research partners in the project include UMaine marine researcher Laurie Connell and electrical engineer Rosemary Smith, along with scientists from Dublin City and Queens universities, and NOAA.

Warming Antarctica

A TEAM OF WORLD-REOWNED researchers, including University of Maine Climate Change Institute Director Paul Mayewski, has released a report addressing several urgent questions about Antarctica. The continent is said to hold answers to many of the questions scientists have about what climate change means for the Earth. The findings of Mayewski and 100 world-leading scientists from 13 countries have been compiled in the first comprehensive review of the state of Antarctica's climate and its relationship to the global climate system. The report, *Antarctic Climate Change and the Environment*, was published by the Scientific Committee on Antarctic Research. The review focuses on the impact and consequences of rapid warming of the Antarctic Peninsula and the Southern Ocean; rapid ice loss in parts of Antarctica and the increase in sea ice around the continent; the impact of climate change on Antarctica's plants and animals; the unprecedented increase in carbon dioxide levels; the connections between human-induced global change and natural variability; and the extraordinary finding that the ozone hole has shielded most of Antarctica from global warming.



Wireless connection

WITH A TWO-YEAR NASA grant, the University of Maine will create an interdisciplinary research and education program focused on a wireless system to detect leaks in inflatable structures, such as lunar habitats, and domes and bridges used in defense and civilian situations. UMaine Professor Ali Abedi has received more than \$252,000, including matching funds from the Maine Economic Improvement Fund, for the project that starts in May and is expected to employ one doctoral candidate and 10 undergraduates. Various science and engineering fields are part of the project, including wireless communications theory, electronic chip design and microelectromechanical systems (MEMS). MEMS accelerometers will detect impacts on the inflatable structure and assist an intelligent chip in detecting leaks. Three investigators from Maine institutions — UMaine, University of Southern Maine and Jackson Laboratory — will work with NASA's Langley Research Center in Virginia to create the research and education program.

It's now easier than ever to stay connected with your alma mater, as well as UMaine friends and classmates. The University of Maine Alumni Association has a new Web site umainealumni.org featuring extensive class notes and pages, alumni features and alumni social communities.



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By using robotic floats and gliders, I can virtually be at sea all the time, even in remote locations. These autonomous platforms allow me to 'be there' 24/7 and to observe rare but important events in the ocean."

Mary Jane Perry
Marine Scientist



Photo by Dane Wojcicki



University of Maine marine scientist Mary Jane Perry has been at the forefront of float and underwater glider-based ocean exploration for more than a decade. But her recent research, a collaboration with colleagues from the University of Washington, Dalhousie University and a number of other institutions in the U.S. and Europe, has the potential to change the face of oceanography. Perry recently received a nearly \$620,000 special creativity award from the National Science Foundation — for a total of \$1.6 million — to extend her autonomous study of carbon fluxes in the North Atlantic spring bloom through 2012. The carbon dioxide uptake in the North Atlantic accounts for about a quarter of the global total, and the spring bloom is an important part of that. Perry and her colleagues are exploring a way to monitor the bloom that is more effective and far less cost-prohibitive than current methods.



Green engineer

CHRISTIANNAH HOLMES plans to pursue a career in civil and environmental engineering. She just isn't sure yet whether it will be in water resources or green design. Both are important in helping the environment and lessening our carbon footprint, says Holmes, a University of Maine senior from Machias, Maine.

The high school valedictorian received a UMaine Top Scholar scholarship award based on outstanding academic achievement. She came to UMaine for the quality of its engineering program. She chose civil and environmental engineering for the real-world applications of her academic experience.

For the past two summers, Holmes interned with the U.S. Public Health Service in Sacramento, Calif., and Seattle, Wash. This semester for her senior capstone project, she is the project manager for a six-student team that is redesigning a deteriorating road along the Souadabscook Stream in Hampden, Maine.

"It's an example of how civil engineers really give back to our community," Holmes says.

Many scholarships, research opportunities and academic offerings for University of Maine students are made possible by donations to **THE FUND**. Annual gifts give UMaine the flexibility to address its most pressing needs and to take advantage of new opportunities. Please consider a gift today.

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