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UMaine Today

CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE

WINTER 2011

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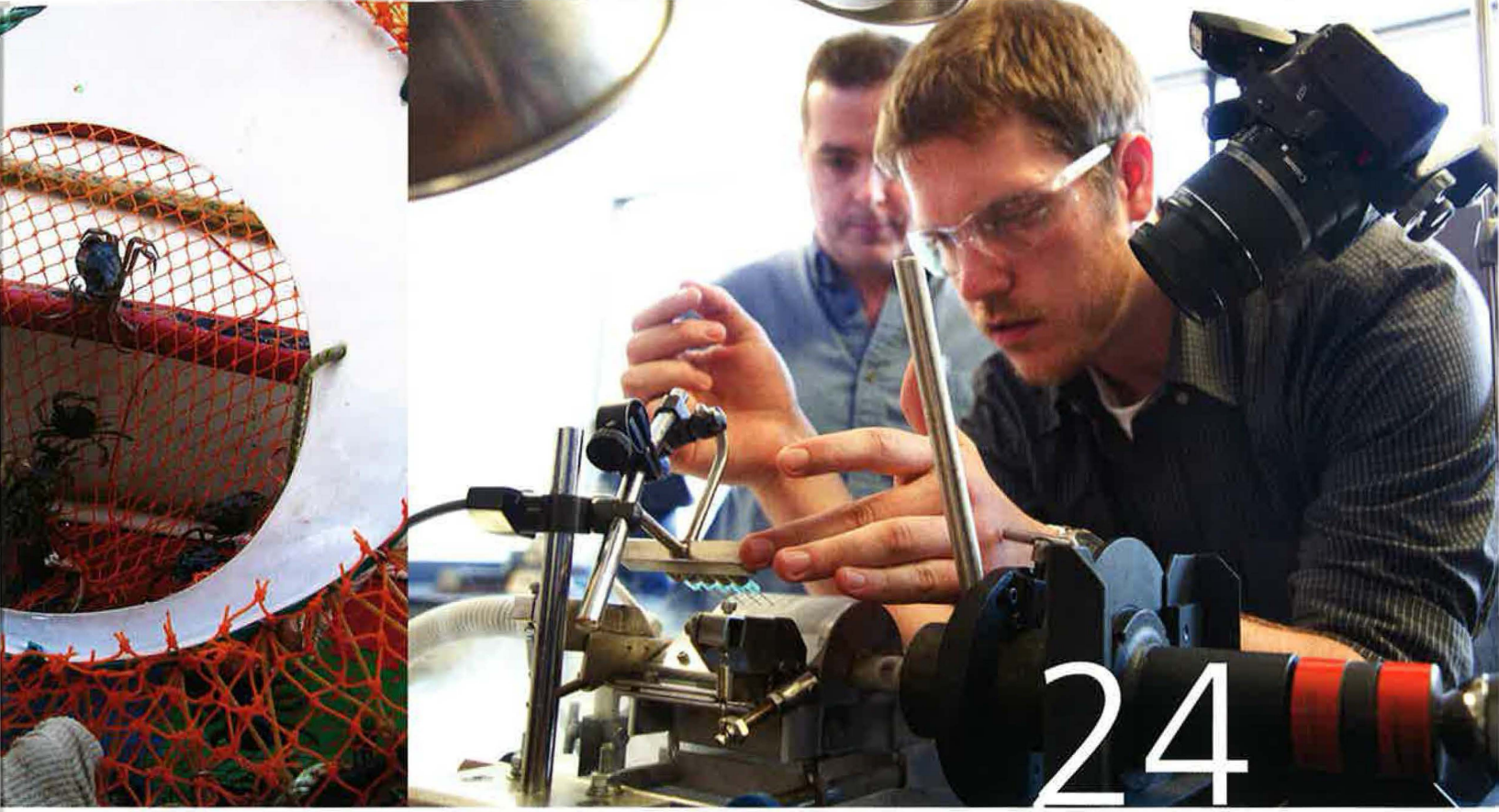

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David Neivandt has a reputation for finding brilliant — often simple — answers to complex questions, many outside his discipline. Need a biodegradable golf ball or safe home for larval lobsters? No problem.

ON THE COVER: What if the U.S. military could lower its fuel costs with a biofuel made from woody biomass? At UMaine, research is under way to show how 1 ton of dry woody biomass per day can be converted into a barrel of biofuel that can be upgraded for use in military jets. See story on page 16. Photo by Jim Wark

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You want a piece of me?

Research explores the potential of making a Maine invasive a main ingredient

By Brian Brown

CONSIDER AN industry that uses only 20 percent of its raw materials and throws the rest away. Not a very economically and environmentally efficient business model, but one that is employed out of necessity by Maine's crab processing industry, which thrives by steaming or boiling the raw crustaceans and handpicking the sweet, succulent meat from the legs, body and claws.

While the cooked crabmeat is destined for the consumer market, the rest of the crab — approximately four-fifths of its body weight — is bound for the nearest landfill or compost pile.

For food scientist Denise Skonberg, those numbers don't add up. That's why she's been exploring other options for that 80 percent of cast-off crab deemed unusable and undesirable by the food processing industry.

Skonberg, an associate professor in the University of Maine Department of Food Science and Human Nutrition, focuses her research on seafood quality evaluation and the utilization of crustacean processing by-products. In particular, she has looked at ways to utilize a chemical derived from crab shells for use as a food coating to extend the refrigerated and frozen shelf life of seafood. She also is using a mechanical process to extract bits of meat from shells to produce crab mince or paste, which is typically used as a filler or flavor enhancer in the restaurant industry.

But Skonberg's crab research doesn't end with the Jonah crab *(Cancer borealis)*. In addition, she has turned her attention to the European green crab *(Carcinus maenas)*, an invasive species that pesters the lobster industry by eating bait out of traps, but one for which there is currently no commercial fishing industry. Green crabs are about a third the size of Jonah crabs and, therefore, make for even more difficult meat extraction.

University of Maine graduate student Joseph Galetti completed his master's thesis last December on the mechanical processing of the European green crab and the potential use of the mince in a value-added product — crab patties. Galetti, a graduate of Johnson & Wales University, is now pursuing a Ph.D. at UMaine in food and nutrition sciences.

That's something Skonberg hopes to change by taking the same mechanical process that harvests mince from Jonah crabs and applying it to the smaller species. Together, her two areas of crab research could one day be used to improve the efficiency of the state's processing industry, as well as create an entirely new fishing industry while alleviating a nuisance to lobster fisherman.

Talk about nothing to crab about.

"There are a lot of potential opportunities," says Skonberg. "The crab industry focuses on the 20 percent of the body weight of the crab that is the easily extractable meat. It's the highest value portion and the whole reason the industry exists." But there is other stuff inside the crab that is useful.

"The green crab opportunity is really exciting. They are easy to catch, but for the lobstermen they are a nuisance. If there was a market for them, they could easily be targeted."

SKONBERG HAS BEEN doing crustacean by-products research since 1998. Her crab experiments are the latest in a long line of by-products research at UMaine where, in the last three decades alone, food scientists have explored potential uses for Maine-based by-products such as potato peels, salmon and lobster mince, and unripe (red and green) blueberries. The goal of the department's by-products research is to probe areas that might be of benefit to industries and specialty food producers that play a significant role in the state's economy.

"We're creating opportunities for businesses to make profits on something that may have been a waste disposal issue," says Mary Ellen Camire, a UMaine profes-

You want a piece of me?

sor of food science and human nutrition, and a fellow of the Institute of Food Technologists. "We're not getting things ready to be sold in stores. We develop concepts, then it's up to the industry to take the next steps."

But finding a business willing to make a significant financial commitment to implement one of the university's food by-products concepts can be difficult, especially in current economic times when profitability is more critical than ever.

"Trying to get things picked up by industry is always a challenge," Camire says. "The trick is, if a company wants to use a by-product concept, it has to make economic sense for them."

The economics of by-products research also extends to supply and demand. Take the department's research on potato peels in conjunction with the McCain Foods potato facility in Easton, Maine. More than two decades ago, peels from Aroostook County's cash crop were used as cattle feed before interest spiked in their antioxidant value, as demonstrated by researchers such as Camire.

But there is only a finite number of potato peels to go around and the availability of them is directly tied to the production of the main product, which is the challenge with all food by-products.

"Here we have this invasive species that is eating clams and oysters, and bait out of lobster traps. It's not good for our fishing industry. But if we can use them as a food resource, we could develop an industry."

Denise Skonberg

SKONBERG HAS LITTLE doubt there is enough Jonah crab by-product and whole green crabs to support new or expanded industries in Maine and beyond, and her research focuses on making that possible.

"Here we have this invasive species that is eating clams and oysters, and bait out of lobster traps. It's not good for our fishing industry," says Skonberg. "But if we can use them as a food resource, we could develop an industry."

Freeing meat from these small, pesky crab shells requires mechanical extraction equipment originally developed for the poultry industry. The cooked green crabs are tossed into a giant hopper and the extractor grinds them under high pressure, separating the meat from the shell.

The result is what Skonberg describes as a crabmeat mince or paste that, while visually unappealing, has the same taste, fat content and nutrient values as the pre-extracted cooked crabmeat.

In UMaine's Consumer Testing Center, Skonberg and graduate student Joseph Galetti have conducted consumer taste tests to determine a viable use for the crab mince. The winner was a crab empanada using the mince as a filling, similar to the traditional South American variety with a spicy beef mixture. More than half of the taste test participants indicated they would purchase the value-added product if sold in stores.

But don't go running to the nearest supermarket just yet. The crab empanadas proved there could be a food product use for the invasive green crab, but there's got to be a market if there is ever going to be an industry based on the species.

"Fishermen can catch the crab, but they need to have someone willing to buy them," Skonberg says. "In order to buy them, people need to have an end market established."

THE VALUE-ADDED potential of Jonah crabs — the 80 percent of the crustacean traditionally tossed by the processing industry — holds even more promise for the right entrepreneurial food producer. Using the mechanical extracting process, bits of meat deemed too time consuming to extract are ground up and used to make a crab appetizer in the testing center.

The crab appetizer features crab mince preformed into nuggets, seasoned with different flavorings, then battered or breaded. In taste tests, the Italian flavor

Jonah crab, far left, and European green crab

was most popular, and again more than 50 percent of taste test participants indicated they would buy the appetizer in stores.

Skonberg also has experimented with food-related uses for crustacean shells and chitin, a carbohydrate biopolymer similar to cellulose found in the protective covering. Chitin can be converted to chitosan, a compound used in weight loss supplements because it can bind to dietary fat, preventing absorption in the body.

Skonberg isn't interested in the diet fad, but rather what chitosan can do as an antioxidant and antimicrobial when applied to fresh seafood. Chitosan can be made into a powder for coating fish filets or salmon steaks.

Skonberg found that the antimicrobial properties of chitosan coatings slow bacteria growth on refrigerated seafood, extending its life at premium quality for several days.

She also discovered the coating can extend the freezer life of seafood because its antioxidant properties slow the oxidation of the fat in fish. Skonberg says the chitosan coating has the potential to make a significant impact on the industry by extending the shelf life of seafood.

But like much of the food products developed in the testing center, the chitosan coating won't be available on fresh seafood in the United States anytime soon. The reason: It requires Food and Drug Administration approval, even though countries in Asia and the European Union have signed off on the use of chitosan in food products.

"We hope a company will come along, look at the research that's been done and take it from there," she says. ■

In Maine, the European green crab *(Carcinus maenas)* is an invasive predator that threatens the health of marine ecosystems. It also is a by-catch species of the lobster industry. As part of her research on seafood quality evaluation and the utilization of crustacean processing by-products, University of Maine food scientist Denise Skonberg is investigating ways to use the meat from cooked green crabs to make a mince or paste for use in value-added food products. Photos by Joseph Galetti, Denise Skonberg and Michael Mardosa

War OF

Battle of Ball's Bluff near Leesburg, Va., Oct. 21, 1861
Currier & Ives lithograph, courtesy of the American Antiquarian Society

words

UMaine English professor provides a new view on Emily Dickinson's Civil War-era poetry

By Kristen Andresen

HERE'S WHAT we know about Emily Dickinson: She had a burst of creativity between 1861 and 1865 — exactly the same time frame as the American Civil War. Her distant cousin, Francis Howard Dickinson, was killed in the Battle of Ball's Bluff. Frazar Stearns, a dear family friend, died in the Battle of New Berne. The poet wrote personal letters about the war and the death of Stearns.

But here's the tricky thing: Most of her poetry isn't so direct. Oblique language is her trademark.

"Her work is so resistant to definitive interpretations that there can be a controversy over what she intends or even what's plausible to imagine as the subject of the poetry," says Ben Friedlander, a University of Maine associate professor of English and one of the driving forces behind UMaine's National Poetry Foundation and New Writing Series.

That's one of the reasons why there's no shortage of research and guesswork on Dickinson. But Friedlander's scholarship — including a recent article in the journal *Publications of the Modern Language Association*, "Emily Dickinson and the Battle of Ball's Bluff," and a book in progress — brings something new to the conversation.

"One big question I felt people haven't answered is, 'Why does she respond to the war the way she does?'" Friedlander says. "I'm trying to understand the significance the war had for her in light of the fact that most of her responses are not clearly about the war."

In the early 1980s, when Friedlander was an undergraduate, it was widely accepted that while Dickinson wrote prolifically during the Civil War, she took scarcely any notice of it. Then there was a paradigm shift, and suddenly scholars did acknowledge that the war had a place in her work. The nature and extent of that place are still open to debate.

Though the academic community now acknowledges Dickinson's place in the canon of Civil War writing, Friedlander provides a deeper analysis of that connection by exploring the war's place in her consciousness and her imagination. That analysis requires a detour into psychological research.

AS A STUDENT, Friedlander had an inkling that the war was a key to understanding Dickinson's work — a belief that grew stronger through his correspondence with poet Beverly Dahlen. In 1985, Dahlen wrote an essay on Dickinson that was published alongside a photo of corpses at Antietam. Friedlander read it and immediately reached out to Dahlen, telling her how glad he was that she, too, saw

War of words

Photo courtesy of Amherst College Archives and Special Collections

Those -- dying then,
Knew where they went --
They went to God's Right Hand --
That Hand is amputated now
And God cannot be found --

The abdication of Belief
Makes the Behavior small --
Better an ignis fatuus
Than no illume at all --

Emily Dickinson

references to the dead in Dickinson's work. Dahlen responded to Friedlander, expressing her regret in including the photo and calling it "a frivolous juxtaposition."

"In trying to convince Beverly that she had been right, I started articulating my ideas in a more persuasive way, to try to convince someone," Friedlander recalls.

That correspondence informed Friedlander's dissertation, but when he came to UMaine in 1999, he turned his attention to other work. He earned a name for himself editing a 2008 collection of Robert Creeley's poems, which was reviewed favorably in the *New York Times*, as well as a book of experimental criticism on modern and contemporary poetry. He's also well-regarded as a small-press poet.

But Dickinson has always been his muse. He now has a hefty manuscript-in-progress that offers three frames: history, poetics and psychology.

Friedlander maintains that the war allowed Dickinson to understand her own experience better — that the war was not really what was most important. Instead, it was a way for her to understand herself.

"By writing about the war, she was able to write about her own psychological experiences without giving anything away, without speaking about the unspeakable," Friedlander says. "One of the great things about Emily Dickinson's work is her ability to write about inner experiences without relying on subject matter for us to be able to appreciate it. People tend to express suffering by describing what caused it. But Dickinson doesn't do that."

FRIEDLANDER'S RESPONSIVENESS to "hidden suggestions" in Dickinson's writing is informed by the fact that his father is a Holocaust survivor. He learned that survivors either talk about survival or are silent about it. His father, a historian, spoke about the Holocaust in historical terms, but he didn't talk about what the experience felt like or what it was like to live with that knowledge.

"I think I became very well attuned to intuiting things that were unspoken," Friedlander says of his childhood. "These are the types of things that are crucial about Dickinson's work. You don't get the Civil War as a historian would tell it — as you would in Herman Melville, to be sure."

Yes, there are a few poems that are clearly about the war, as evident in this excerpt from "It feels a shame to be Alive":

It feels a shame to be Alive --
When Men so brave -- are dead --
One envies the Distinguished Dust --
Permitted -- such a Head --

But unlike celebrated Civil War poets such as Melville, who referenced specific battles and individuals, and Walt Whitman, who referenced the pain and triumph of war in general terms, Dickinson's references are usually indeterminate.

This doesn't just apply to her war poetry. In a poem about arthritis, there's no mention of aching joints. Instead, she describes it as being "Like a Panther in the Glove."

Dickinson was a master of abstraction, of writing about states of mind and experiences without giving any cause for them. Scholars always question whether her work was autobiographical, but Friedlander believes that she couldn't describe pain, grief and regret so powerfully without having experienced them herself. What we can't know is the degree to which she experienced them, nor their impact on her capacity to cope with the everyday demands of life.

"I've read as much about the literature of trauma as I can, and have been struck by how many of Dickinson's descriptions of psychological states fit with what psychologists see in victims of trauma," says Friedlander, who received a UMaine Summer Research Grant for his work.

THAT DOESN'T necessarily mean Dickinson was traumatized; rather, she may have known people who were traumatized by the Civil War and seen a resemblance between their experience and something she had felt.

"Her poems are trying to find proportions between two things. There are poems where she's measuring her grief against something — one grief in relationship to another," Friedlander says. "In my view, she was trying to find the proportions between her own experience and the experience of war."

So much about Dickinson is a mystery. Many of her manuscripts — some 2,500 poems and 1,000 letters, according to the Emily Dickinson Museum — were both untitled and unpublished, yet there was something "amazingly scrupulous" in the way she recorded her work in small, handmade booklets called fascicles.

She began writing in earnest around 1858 or 1859, at the age of 28 or 29 — not young, in those days.

"From her letters it was clear that she was talented, so why begin then?" Friedlander asks. "My conjecture is that she had some kind of crisis whose meaning we can't know."

Perhaps it was a theological crisis, a realization that the universe isn't orderly and that things don't necessarily happen for a reason. Friedlander points to Dickinson's poem "Those -- dying then," as an example.

Lt. Frazar Stearns
Photo courtesy of Ben Friedlander

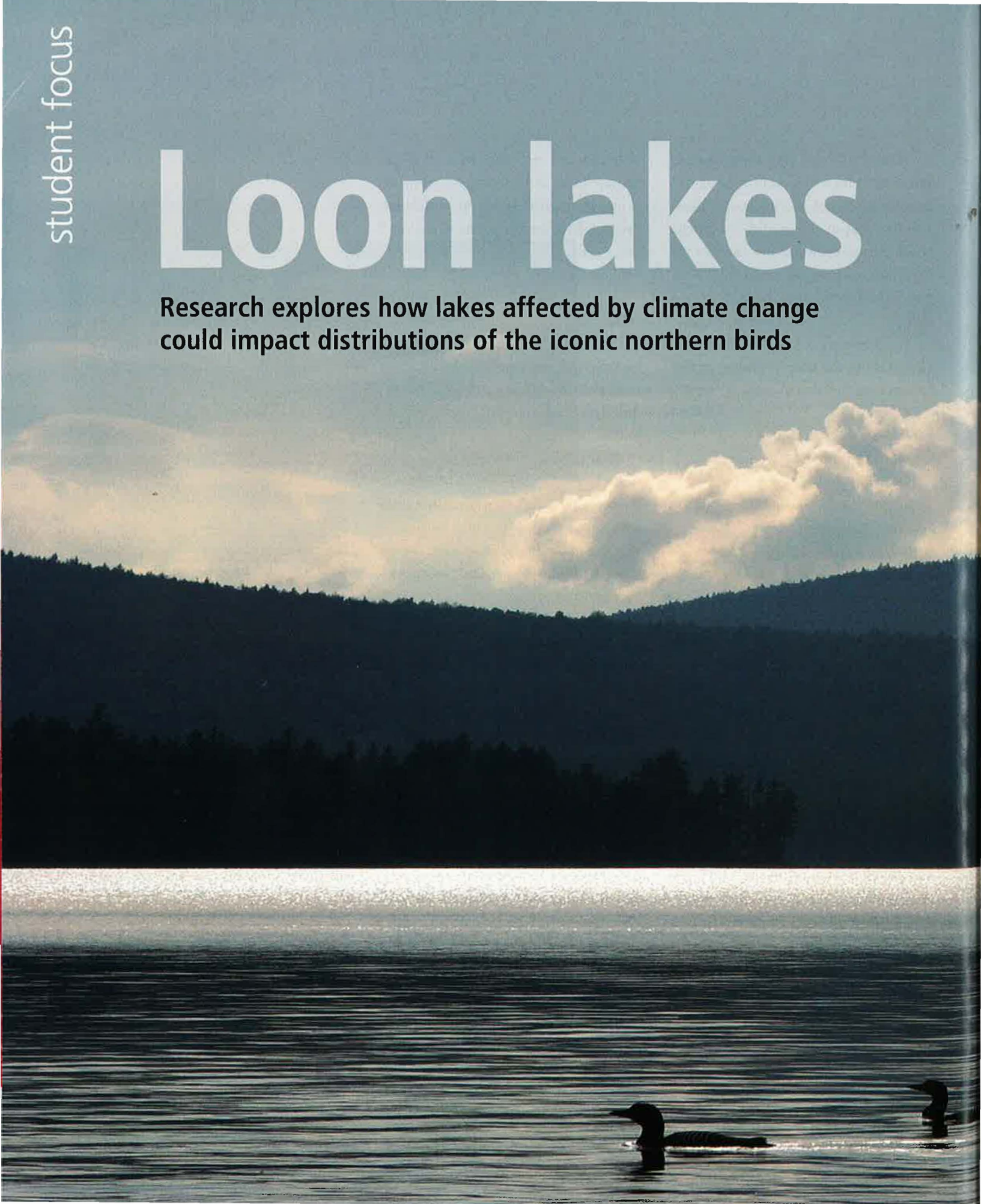
"The war coincides with a crisis for her. Which doesn't mean that the war itself was the crisis, but perhaps it brought something out — perhaps a loss of faith in God," Friedlander says. "It makes such sense in relation to the war to me. What kind of experience could lead her to write a poem like 'Those -- dying then,'? War would be an obvious one."

It's not Friedlander's intent to unlock the secret to Emily Dickinson, nor does he have any interest in "diagnostic criticism." Rather, he strives to shed light on the different factors that may have informed her poetry.

"We know from her poems that she understands the experience from inside, but she doesn't tell you what caused the experience. That's why there's such rampant guesswork." ■

Loon lakes

Research explores how lakes affected by climate change could impact distributions of the iconic northern birds



TWO YEARS AGO when Allison Byrd came to the University of Maine to begin her graduate research on loons, she didn't know much about the large birds.

She quickly found out that's not true for Mainers.

"Everybody in Maine has a loon story or has seen them," Byrd says. "(Loons) are so iconic and well-loved. Even when I first came to Maine and stopped at a rest stop, there was a big picture of a loon.

"To be honest, I was a little intimidated at first. (Then) I realized, OK, I'm really going to have to know my stuff."

Two years later, Byrd has gotten closer to more loons in Maine and around the country than most people ever will. Working under UMaine assistant professor Brian Olsen, Byrd is studying the potential effects of climate change on the loon population in Maine and the nation.

Loons — in Maine the species is the New England common loon (*Gavia immer*) — are not endangered, but there is much value in data about them. A loon can live more than 30 years, which is relatively long for a wild bird.

"It's important to understand population dynamics as the long life span of a loon makes it harder to detect declines in abundance," says Byrd, who graduated from the University of Rhode Island with a degree in wildlife biology. She went on to do fieldwork on black bears and had a job in a fish hatchery in her native New Jersey, worked as a zookeeper in Boston, and did fieldwork with birds in Australia, Mexico, Panama and the U.S. before coming to UMaine to work on her master's in ecology and environmental science.

INITIALLY, BYRD WAS interested in loons because of their unusually aggressive behavior. Loons will kill each other in fierce territorial clashes, which brings up a key question: Why defend one's territory to the death when moving to another lake would seem simpler? That leads into Byrd's research on why loons settle where they do, and how vulnerable the birds are to changes in their habitats and the climate.

"In Connecticut, for example, there are suitable lakes and habitat, but there are no loons," she says. "There is something that's limiting the edge of their range, whether it's water clarity, lake surface temperatures, fish assemblages or dissolved oxygen levels. The question is: Are those the same things that are predicted to be affected by climate change?"

The research combines demographic analysis, physiological measures and behavioral observations of loons across a range of climatic conditions to predict how changes to lake characteristics could impact loon distributions.

To that end, Byrd spent the past two summers banding loons on lakes in the areas of Rangeley and Greenville in western Maine. She also traveled to Montana and Washington state, and recruited biologists in other regions with loon populations to gather behavioral observations of territorial loons.

Byrd will combine her more than 2,000 recorded observations with analyses of lakes — both with and without loons — to build a model that shows why loons locate where they do. That model will indicate what will happen to loons if there are climate change-related shifts to lake characteristics.

THE PROCESS OF loon banding presents a challenge even before a loon is ready for

a band on its leg. If threatened by something such as an approaching boat, a loon will dive underwater, making it impossible for researchers to grab the bird. However, if a loon has chicks that are too young to dive, the adult is more likely to stay on the lake surface. Banders work at night, approaching quietly in the darkness, before turning on a spotlight when they close in on the loon. The light is so bright that the loon cannot see the boat, and the loon is scooped up with a net.

"It's important to understand population dynamics as the long life span of a loon makes it harder to detect declines in abundance."

Allison Byrd

If a loon looks as if it might dive despite the light, banders imitate or play sounds of chicks in distress. The sounds momentarily confuse the loon, which will likely stay on the lake surface rather than abandon its chicks.

"Everything is very quiet and calm to that point, but things get a little more hectic when you scoop it up because the loon is huge and strong and fighting," she says. "Then you get it into a position where it can't hurt itself, hold it, take blood samples. If it's not (already) banded, you put bands on it, and take bill measurements and other measurements for body size. You release the adult and chick together."

Banding and behavioral observations gave Byrd two key statistics. First, she was looking at questions of presence/absence — where loons are living and successfully having chicks, and where they are living but not pulling off young. Second, she considered site fidelity — how likely loons are to return to the same lake year after year.

"Thanks to banding, I can look at how often birds come back to a territory, which is going to help understand if that's a preferred habitat," Byrd says. "If there's one lake with a different bird every year, we can start to guess that that's not a good territory or conversely, it's a great territory and they're fighting hard every year and every year someone is getting kicked out. But that's a little less likely because loons are good at maintaining their territory."

BYRD TOOK blood samples from loons in Maine, New Hampshire, Montana and Washington state. Part of Byrd's funding and her long-term dataset, which contains historical banding records and site fidelity information, comes from the Biodiversity Research Institute (BRI), a Gorham, Maine-based nonprofit whose mission is to assess emerging threats to wildlife and ecosystems through collaborative research. Byrd uses the blood samples to look at metabolite measures that indicate how well an individual loon is preparing for its winter migration. BRI is also interested in assessing the effects of mercury on ecosystems.

Because loons are usually near the top of the food chain in their environment, they are a good bioindicator of the accumulation of mercury in a system.

Spending so much time around loons, Byrd has learned something else about the species. Those loon calls we associate with the tranquility of summer on a Maine lake are actually, for the loon, an indication of something a lot less tranquil.

"When they call out in the middle of the night, it's thought that they're doing that because it's quieter or the sound will travel farther, saying, 'Here's where I am, this is my territory,'" Byrd says. "If you hear the yodel, that beautiful sound that is so iconic, and if you look around, there might be another loon or an eagle flying overhead. They even respond sometimes to low-flying airplanes. What they're saying is, 'I'm ready to take you on if I need to.'" ■ Online

Paper trail

IN 1897, THE MAINE Legislature granted a charter to Charles Mullen and other Bangor lumbermen and timberland owners for development of waterpower on the West Branch of the Penobscot River in Millinocket, Maine. They formed Northern Development Co., which, in 1899, became one of Maine's leading 20th-century companies — Great Northern Paper. The Millinocket mill was constructed that year and began producing newsprint in 1900. The company also acquired a mill in Madison, Maine, and built one in East Millinocket in 1907. In addition to its mills and timberland, Great Northern owned several farms, vessels and a hotel. By the 1940s, it held more than 2 million acres of timberland. In 1962, Great Northern was instrumental in organizing Great Southern Land and Paper Co., in Georgia, and the two merged three years later. A second merger in 1970, this one with Nekoosa-Edwards Paper Co., in Wisconsin, began a tumultuous three decades that included multiple changes in ownership and bankruptcy in 2002. Fogler Library's Special Collections holds an extensive archive of the first 103 years of Great Northern Paper Co. history, complete with executive, financial and sales records, and photographs. ■

Workers inside Great Northern Paper Co.'s mill in Madison, Maine, circa pre-1910. Special Collections in Fogler Library holds an archive of Great Northern Paper Co. records dating from 1889 to 1992.

bystanding

Awareness program trains students to intervene for the greater good

A UNIVERSITY OF MAINE student was sitting outside his residence hall one recent Saturday evening, working on homework and people-watching, when another young man walked by, then stumbled and fell onto the lawn.

Rather than packing up his books and heading inside to avoid involvement, the student went to the man's aid and quickly determined an ambulance was needed.

The student who intervened had been through UMaine's Bystander Intervention Training Program, which teaches members of the university community to speak up or get involved in a meaningful way if they witness or have knowledge of something that bothers them.

"I spoke to that student afterward and he was very grateful that someone had called for an ambulance," says Lauri Sidelko, the director of UMaine's Alcohol and Drug Education Programs (ADEP). "He had taken some medication earlier in the evening, didn't know how it was going to affect him, and he blacked out. The student who intervened really helped him and could have saved his life."

by•stander
\bī-stan-dər\ *noun:*
one present but not taking part in a situation or event : a chance spectator

Merriam-Webster

Bystander intervention programs are gaining popularity at universities nationwide. At UMaine, a host of organizations and departments — including the Safe Campus Project, Alcohol and Drug Education Programs, Athletics Department, the UMaine Counseling Center, Peer Education Program and Residence Life — formed the Bystander Intervention Network in 2009. Sidelko says ADEP team members Bud Walkup, an education specialist, and Rebecca Davison, a graduate student assistant pursuing a degree in higher education, have been especially helpful in putting together the program.

Trainees learn bystander intervention isn't about putting on a cape to be Superman to swoop in when there is a life-or-death situation, Sidelko says. At UMaine, bystander intervention is as important in small-scale moments that may not be as dramatic, but contribute to the general atmosphere on campus. Heroism can come in the form of telling a friend he has food stuck between his teeth, or a stranger emerging from the restroom that she has a piece of toilet paper stuck to her shoe.

"We want to focus on how we can enhance what it means to be here at UMaine, how we can watch out for the other people here in our community because we care about them," says Carey Nason, program coordinator of Safe Campus Project. "We want you to care about UMaine and care about the people around you."

The network was launched with a $1,000 grant from UMaine's Department of Student Affairs and the slogan "I've Got Your BACK." BACK stands for: be aware, accept responsibility, consider the consequences, and know what to do and do it.

UMaine's training program takes some cues from national efforts, such as the NCAA's Step UP! program, but also focuses

"We want to focus on how we can enhance what it means to be here at UMaine, how we can watch out for the other people here in our community because we care about them." Carey Nason

on campus-specific issues. An important emphasis area is substance abuse, which is a major concern on college campuses.

This year, UMaine's Bystander Intervention Training Program is expanding with the help of a $10,000 grant awarded to Safe Campus from the Avon Foundation for Women's "m.powerment by mark." campaign against dating and domestic violence. The grant will allow UMaine to introduce "Find Your Voice," a second-level program for trained participants to become qualified to lead sessions.

To date, around 400 people have gone through "I've Got Your Back" training, including small groups of interested students and members of organizations, such as honor societies, UMaine's resident advisers and first-year students in UMaine's Explorations Program.

It's particularly important for first-year students to go through the program when they arrive on campus, Sidelko says. Many come from small towns where they know everyone in their high school class and are living for the first time with strangers. Young students new to campus may feel uncomfortable confronting a situation.

"College is a big place and it can be hard to figure out," she says. "Nobody wants to make a mistake, so they just don't get involved."

The two-hour training involves short videos, including some produced by UMaine graduate student Mike Maberry; a presentation led by a trained facilitator; and a lot of back-and-forth, frank group discussion.

"We get feedback on their own examples of bystander intervention, things they've seen work well, along with problem solving and brainstorming for the times that don't work well," says Nason.

Those in the training sessions discuss how to trust one's instincts in a situation and the resources available for dealing with such issues as sexual assault, eating disorders, nervousness about grades and online gaming addiction.

Maberry, who is working on a master's degree in higher education and student development with a concentration in campus climate, frequently comes into contact with students who have mixed feelings about bystander intervention training.

"It's very tenuous for them," says Maberry, who graduated from UMaine with a history degree. "They want to be able to intervene but they don't know how at times. But they're very curious and they want to know more. They want to know how they can help their friends." ■

From the green forest to the wild blue

Will wood-based biofuel take off?

By Jessica Bloch

Illustration by Michael Mardosa

FILLING UP OUR vehicles at the gasoline pumps, we often sigh and shrug at rising fuel prices. We might try to limit our travel, lower driving speeds or find other ways to save every gallon.

But for the U.S. military and its fuel needs for transportation, skimping often isn't possible. In fact, according to recent remarks by U.S. Secretary of the Navy Ray Mabus, every time the price of a barrel of oil goes up a dollar, it costs the Navy $31 million in extra fuel costs. When the price of oil rose at the start of the Libyan political crisis, the Navy's fuel bill went up $1 billion.

It's no wonder that the military is very interested in alternative fuels — in particular, the wood-based biofuels being researched and produced at the University of Maine. Three methods, or pathways, to producing biofuel for use in military jets are being explored by UMaine chemical and biological engineers affiliated with the university's Forest Bioproducts Research Institute (FBRI). The pathways all aim to produce what are known as drop-in fuels — those that can be used easily in a number of fuel tanks and pipelines.

FBRI Director Hemant Pendse was recently awarded a two-year, $1 million

grant from the Logistics Research and Development Program of the Defense Logistics Agency (DLA) — the Department of Defense's largest logistics combat support agency — for a wood-to-jet fuel program. The funding will be used to develop a business case for transforming existing forest products manufacturing infrastructure to enable coproduction of military fuels and other chemicals as by-products.

The DLA funding supplements a $1.8 million renewal award from the Department of Energy's EPSCoR program and another DOE Office of Biomass-funded project.

"In an integrated fashion, the federal departments of Defense, Energy and Agriculture are looking into renewable sources of jet fuel, so this is going to be a major new effort for UMaine," says Pendse. "We started with wood, which is readily available in Maine because of the certified sustainable wood supply. The wood-based drop-in biofuel technologies being developed here have broader applications, much beyond wood to jet fuel."

THE ECONOMIC ANALYSIS will show how 1 ton of dry woody biomass per day can be converted at a technology validation facility in Maine into a barrel of biofuel that can be upgraded for use in jets. In Maine, some of that woody biomass is in the form of slash — the treetop residue from the forestry industry.

When the 1 dry ton-to-1 barrel per day evaluation is proven, Pendse says, FBRI will approach Maine landowners about scaling up to 50 or even 100 times that amount for small-scale technology demonstrations.

"In general, landowners are telling us they are interested in pursuing this opportunity," says Pendse, who also chairs the Department of Chemical and Biological Engineering. "We're working with several landowners to see where in Maine we can provide sufficient woody biomass, for small-, medium- and large-scale commercial biofuels production facilities. Then we will work with some existing wood processing sites and see who wants to participate in taking wood to jet fuel, while preserving current uses of sawlogs and pulpwood."

Beyond the wood used by pulp and paper mills, there is biomass to spare. According to a 2008 Maine Forest Service assessment of sustainable biomass availability, Maine has around 5 million green tons per year of additional biomass.

Utilization of this native Maine biomass can support 100 million gallons per year of drop-in biofuel production in the state. The Department of Energy estimates that nationally, forest and agricultural biomass is 100 to 200 times that of Maine.

FOR NOW, UMAINE'S research on the three wood-to-jet fuel pathways is still at the laboratory and bench scales. There is a long way to go before any biofuel can meet the military specifications for jet fuel in terms of density, energy, boiling range, smoke point and other variables.

However, UMaine chemical and biological engineers G. Peter van Walsum and M. Clayton Wheeler, who have spearheaded the research, have had promising results.

Van Walsum's research is in two pathways. The first, which he has conducted with Wheeler, is known as mixed-acid fermentation and has the potential of being a relatively inexpensive route to biofuel, but has not yet produced jet fuel. The second, called lipid accumulation, requires more expense, but has shown to produce jet fuel.

Wheeler is investigating the third pathway, which he calls UMaine thermal deoxygenation (TDO). UMaine TDO is wholly unique to the university, and may be the most promising revolution in drop-in biofuel research nationwide.

From the green forest

Here's a look at each pathway, which all have as a starting point woody biomass — that is, anything with cellulose. In Maine, that means trees.

Mixed-acid fermentation

WHEN WOOD ARRIVES at a pulp mill, it goes through extraction to remove liquids from the solids. The solid material is used in the pulping process, transforming it into some form of paper. The liquid extract is the jumping-off point for mixed-acid fermentation.

Mixed-acid fermentation has not been proven to produce jet fuel. But with hydrogen upgrading, it can produce crude gasoline. It's attractive as a pathway because it doesn't require a clean feedstock — meaning, anything that contains cellulose can feed the process.

Van Walsum, who has worked on biofuels production for decades, including several years in private industry, has even made fuel precursors from seaweed and seaweed processing waste from a plant in Rockland, Maine.

In many fermentation processes, van Walsum says, a clean feedstock is necessary because the organisms engineered to consume sugars and degrade the liquid are particular about what they ingest. In mixed-acid fermentation, the organisms consume anything from proteins and fats to cellulose and starches.

Another benefit to the "dirty" process, as van Walsum calls it, is lower production cost because the fermentation does not require a stainless-steel reactor or clean, genetically engineered nutrients. In van Walsum's lab, the process is done in a plastic tub.

"A very highly engineered organism would probably want to have glucose and that's a refined sugar, mostly from corn or sugar cane, so right away you're looking at food sources," van Walsum says. "What we can do is take raw wood or garbage wood or wastes and not use a sterile culture, but rather completely open mixed cultures, like a septic tank — anything that will grow on what will feed it. But what we do is constrain the growth conditions so they only produce the type of product we can use, which is an organic acid."

At the fermentation stage, the organisms anaerobically digest the liquid extract, decomposing it to produce a mix of organic acids, including acetic, lactic, propionic and butyric acids. Calcium carbonate, or limestone, is added to the fermentation stage to neutralize the acids.

The acids are then dried, which is one sticking point for this pathway. Drying is energy-intensive, van Walsum says, and therefore expensive.

At this stage, the acid has been transformed into a dry salt, which then goes into a process known as ketonization. In a reactor, the salt is constantly stirred and heated to 450 degrees Celsius (842 degrees Fahrenheit). The reaction turns the salt into a liquid fuel.

The liquid resulting from ketonization will burn, but not in the way it needs to in order to serve as jet fuel. Following hydrogen upgrading, however, the mixture could be used as gasoline.

"We've managed to get relatively good conversion on our mixed culture to organic acids," says van Walsum, who can produce the fuel on a bench scale. "It's very robust and can handle a dirty stream

Peter van Walsum's research is in two pathways. The first, which he has conducted with Clayton Wheeler, is known as mixed-acid fermentation and has the potential of being a relatively inexpensive route to biofuel, but has not yet produced jet fuel. The second, called lipid accumulation, requires more expense, but has shown to produce jet fuel.

because everything ultimately biodegrades one way or the other. The trick is to keep it making these acids, and that's not too hard to do."

Lipid accumulation

ALTHOUGH organic acids are welcome in the mixed-acid fermentation pathway, the opposite is true for lipid accumulation, a second pathway van Walsum researches.

The pathway starts again with liquid extract, but here it is concentrated and cleaned of organic compounds — additional steps that add to the cost of the process. The microbes that are key to the pathway prefer a clean foodstock without organic matter.

UMaine researchers use a strain of microbes developed at the Massachusetts Institute of Technology.

In their normal life cycle, the microbes grow and multiply, then they start over again. But as lipid organisms, the microbes actually have a different phase imposed on them. In the first part of their life, they grow; in the second, researchers change their nutrient mix so that the microbes start to store energy and accumulate lipids, or fat molecules.

"That's what we want them to do," van Walsum says. "They don't want to do that. They'd rather keep multiplying because it's in their interest to multiply and propagate their DNA. So we let them grow for a little while, but then we cut off the nutrients they need to make more DNA so they can't make more cells. But they can store energy so that when the food disappears, they can survive longer. It's a survival strategy."

When the microbes have stored enough fat molecules, a stage known as lipid fermentation, their cell bodies are separated and ruptured. While the cell bodies themselves are waste and could be used as compost or a similar nutrient source, the accumulated lipid — similar in appearance to vegetable oil — is the basis for biofuel.

With hydrogen upgrading, the lipid oil takes on the properties of jet fuel.

"Hydrogen upgrading is the downstream part, and it's relatively easy," van Walsum says. "The challenge has been to get the microbes to grow quickly and without having to clean up everything too much. So far, we've only fed the microbes very clean, very well-treated extracts. And the act of cleaning it up to get all the different contaminants out probably makes it too expensive to be viable. But we like it because it's been demonstrated to make jet fuel."

There may be ways to bring down costs for lipid accumulation. Van Walsum says the microbes are very adaptable and because of that, researchers may be able to find ways to make the process go faster. There are also cyclic fermentation processes van Walsum has done in the past that can increase productivity two to three times.

UMaine thermal deoxygenization (TDO)

MIXED-ACID FERMENTATION and lipid accumulation are pathways that are well known to researchers around the world. The pathway Wheeler and the undergraduate students in his lab have developed in the last two years is something new to the biofuels canon. The process is promising not only for its relative simplicity, but also for its end result.

Clayton Wheeler is investigating a pathway called UMaine thermal deoxygenation (TDO). UMaine TDO is wholly unique to the university and may be the most promising revolution in drop-in biofuel research nationwide.

The pathway starts again with woody biomass. As with mixed-acid fermentation, any and all dirty (or clean) cellulose is acceptable. A batch of the UMaine TDO fuel was even made from grocery store shelving, boxes and produce.

Rather than break down the biomass in a biological process, Wheeler's pathway uses a chemical process. The biomass is heated in sulfuric acid and water to around 200 degrees Celsius (392 degrees Fahrenheit), which breaks down the cellulose fibers into molecules. The molecules

decompose further into what is known as mixed-carboxylic acids, which are neutralized to form a salt, which is then dried and heated in the same ketonization reactor as that used in mixed-acid fermentation pathway.

But unlike ketonization, thermal deoxygenation reaction removes nearly all the oxygen from the salt — a key step that distinguishes Wheeler's biofuel from other processes. Oxygen is removed as both carbon dioxide and water, without the need for any outside source of hydrogen. Therefore, most of the energy in the original cellulose source is contained in the new oil.

"Biomass has a lot of oxygen in it. All of that oxygen is dead weight and doesn't provide any energy when you go to use that as a fuel," Wheeler says. "If you're going to make a hydrocarbon fuel, one of the things you have to do is remove oxygen from biomass. You can do it by using hydrogen, but that's expensive and also decreases the energy efficiency of your process. So if there's a way to remove the oxygen from the biomass chemically, then you've densified it significantly.

"Our oil has less than 1 percent oxygenates. No one else has done anything as simply as this."

The fuel has a number of other properties that make it superior to many hydrocarbon fuels being widely researched and even those currently on the market. In early analysis, the UMaine oil was found to have boiling points that encompass those of jet fuel, diesel and gasoline. It also has low acidity levels, making it more stable and less corrosive than other biofuels.

Not only is the fuel remarkable, but so are the amounts of the liquid being produced in Wheeler's lab. Where some researchers are excited about creating a test tube of biofuel from a lab, Wheeler can produce several liters per month.

"The speed with which Clay got his results (on TDO) speaks to the simplicity of that technology and with that, the likelihood of success goes up," says van Walsum. ■ Online

The thrill of discovery

SERENDIPITY LED to one of the greatest discoveries of Paige Case's budding career in chemical engineering.

In the fall of her junior year at the University of Maine, Case asked to join UMaine chemical and biological engineer Clayton Wheeler and his research team that was developing a cellulose-based biofuel. A few months later, the team did produce a biofuel, but it wasn't one that anyone anticipated.

"We thought we would have to get to some sort of fuel through upgrading," says Case, who is the lead author on a paper on liquid hydrocarbon fuels from cellulosic feedstocks, appearing in the journal *Green Chemistry*. "We ended up with a product that is a lot better without being upgraded. It was really an aha moment."

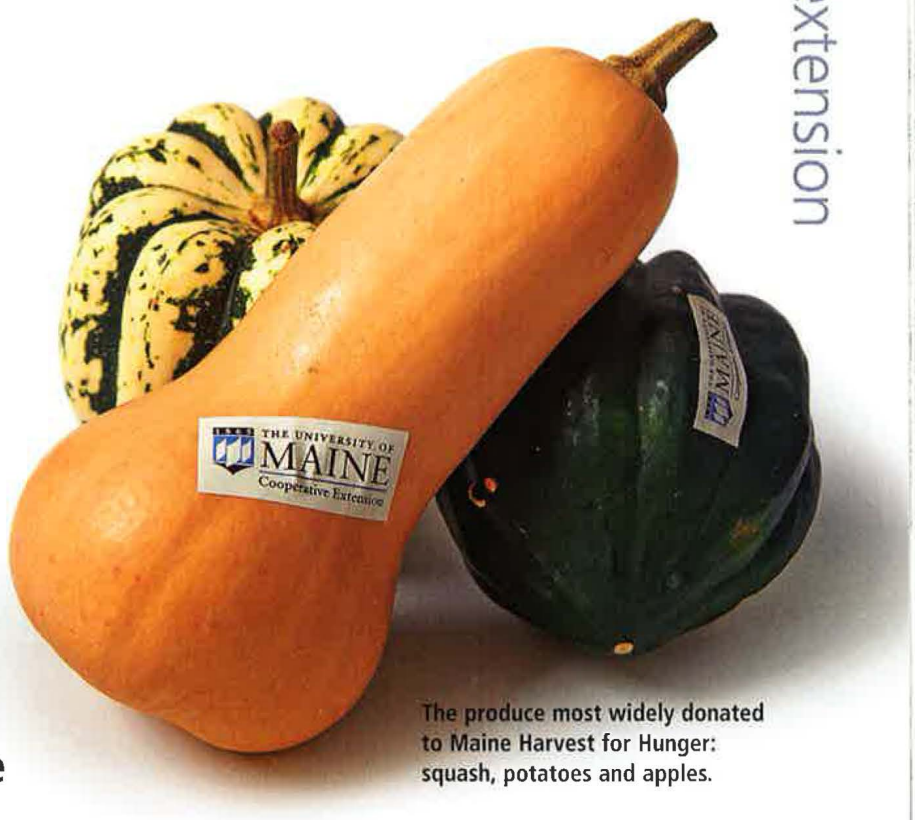
Case grew up in the small Down East Maine town of Lubec and knew from the start she wanted to major in chemical engineering at her mother's alma mater. As part of her engineering experience at UMaine, she did summer co-ops at the Verso Paper Corp. mill in Bucksport. But it was the thrill of the research discovery that became a watershed moment for Case, who graduated from UMaine this past May and is now in the chemical engineering Ph.D. program at Georgia Tech.

"It was really exciting to be a part of something that was completely new. I think one of the reasons that I got so into the research was because we were doing a project that was making progress and making a difference," Case says. "I had a research job that was not just doing one procedure over and over again. I actually got to come up with my own ideas for reactions and write papers. I actually got to learn for myself.

"I realized how much I love doing research and how neat it is to be the first one doing something or the only one to know something."

Harvesting for the hungry

A growing commitment to stem an ever-increasing need in Maine



The produce most widely donated to Maine Harvest for Hunger: squash, potatoes and apples.

IN AUGUSTA, MAINE, weighing in on state-related matters typically occurs in the State House and the adjacent State Office Building. But on one crisp morning this past October, there was a weigh-in of another sort just across the street from the legislative chambers and hearing rooms. In a garden behind the governor's mansion known as the Blaine House, University of Maine Cooperative Extension Master Gardener volunteers joined Ann LePage, Maine's first lady, in harvesting winter squash — 258 pounds of butternut and acorn — to address one of Maine's most serious issues: hunger.

The squash was donated to Maine Harvest for Hunger, a statewide initiative coordinated by the UMaine Cooperative Extension Master Gardener Volunteer Program. In 15 counties, the volunteers grow and donate produce to aid Maine's fight against hunger. They also work with home gardeners, small farmers and commercial growers to get their surplus to local soup kitchens and food pantries.

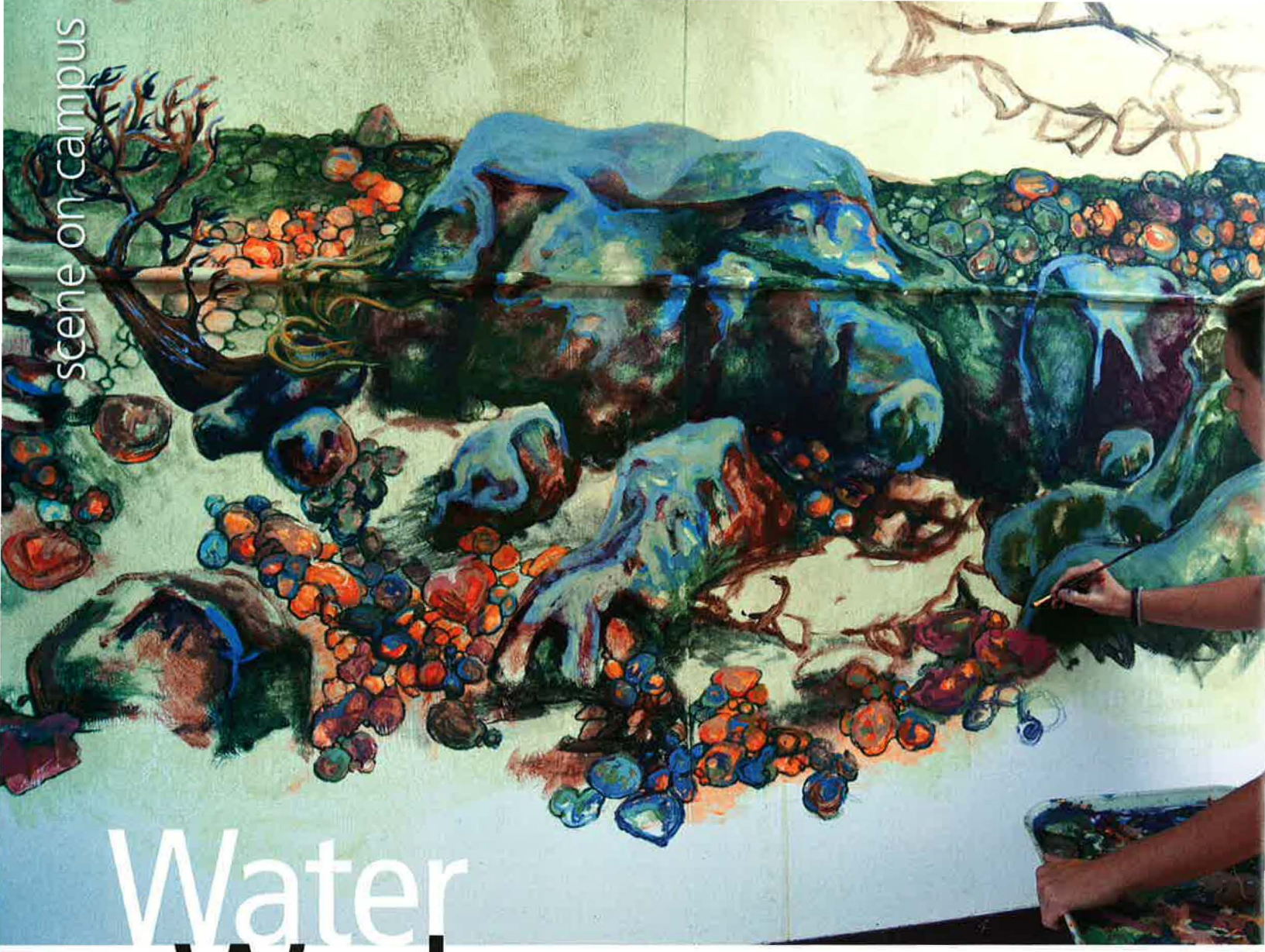
Maine Harvest for Hunger grew out of the Plant a Row for the Hungry campaign that Cooperative Extension introduced in the state 13 years ago. The name change a year ago reflects the growing commitment — literally and figuratively — statewide to stem hunger, according to Barbara Murphy, an Extension educator based in Oxford County and the chair of Maine Harvest for Hunger.

Maine Harvest for Hunger donated fresh produce to 114 food pantries this year.

"The new, broader name reflects the multifaceted ways food is captured — through gleaning commercial fields, community gardens and small farms setting aside areas, and individual gardeners donating surplus," Murphy says. "The need for fresh produce is very high. It's not readily available at most food pantries and it makes a huge difference in people's diets. It's a missing link."

This year, Maine Harvest for Hunger collected more than 176,000 pounds — 88 tons — of fresh fruits and vegetables for distribution to more than 114 food banks and soup kitchens. Just as important, there were more calls than ever before from growers hoping to donate, Murphy says, and more community organizations tapping into the collected produce.

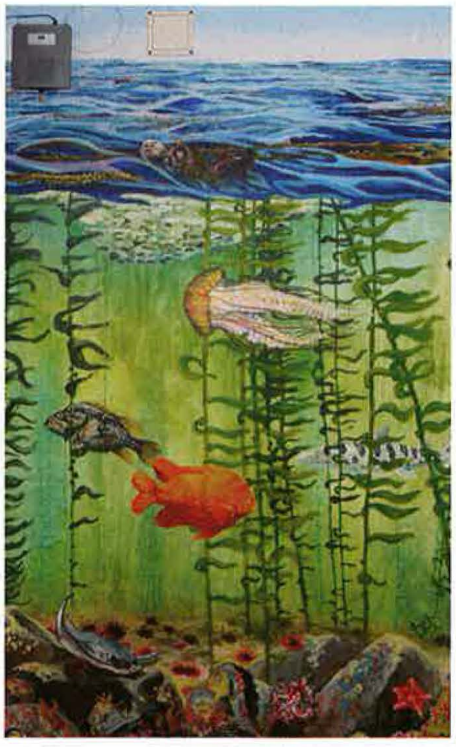
Next year to further its success, Maine Harvest for Hunger plans to ramp up its nutrition education programming. ■



Water Works

The artistry of the marine world comes to life in new campus murals

FOR THE PAST year, University of Maine student Sonja Allen of South Burlington, Vt., has used her double majors in marine science and studio art to create seascapes in the lobby and halls of UMaine's Aquaculture Research Center, a popular educational destination for schoolchildren visiting campus. Allen, who graduated in May, completed the network of murals this fall. In collaboration with Neil Greenberg, director of aquatic operations for UMaine's Aquaculture Research Institute, she painted creatures that are the focus of research at the center, as well as their intriguing habitats, ranging from a Maine tide pool to a California kelp forest. Allen's passion is her marine sculpture, which was displayed earlier this year on campus.



Sonja Allen started work on the murals in the UMaine Aquaculture Research Center in October 2010. She began with paintings of a squid and octopus, then moved on to abalone and striped bass. Schoolchildren touring the facility find paintings of their favorite sea creatures, then go look for them in the tanks.

How do marine science and studio art intersect for you?

I look at something like a river and see color in the fish, the water, the rocks. It's all about color. Scientifically, what is color? It's all about how we see light waves. That's another reason I like art and science. Mixing paint is all about chemical reactions. So the two go hand in hand.

How was this intersection fostered at UMaine?

Professor Malcolm Shick was an incredible mentor for me while I attended UMaine. He put an incredible amount of effort into the classes he taught, and the passion he felt for learning and knowledge has yet to be matched by anyone I've met thus far in my life. I worked in his lab scanning coral, and he recommended books for me to read when I mentioned a particular art project I was undertaking. His support and encouragement led me to eventually gain the confidence to undertake a capstone that combined my studies in marine science with my work in painting and sculpture. Malcolm and I have remained close even though I've graduated, and he continues to aid me in pursuing a career in marine artwork.

How did sculpture come into your life?

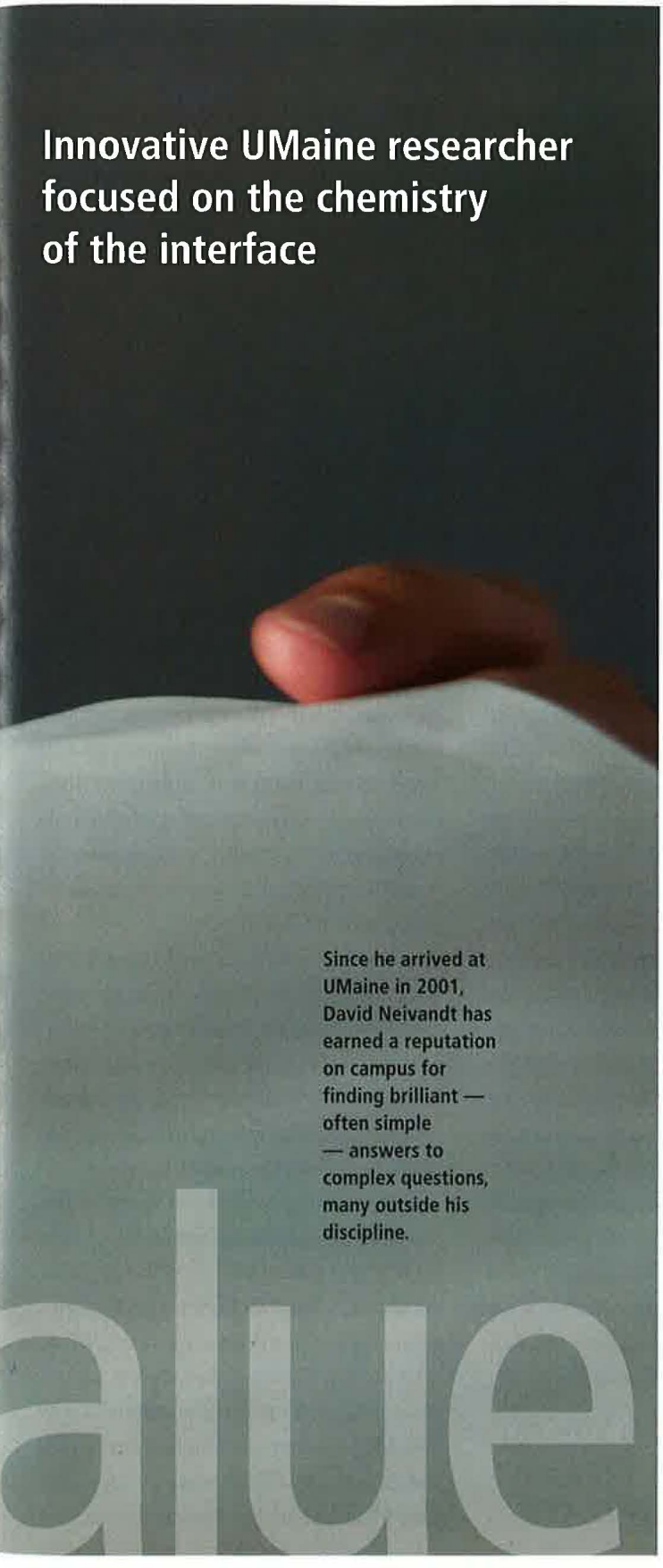
Sculpture was something I discovered during my junior year at UMaine. I had never done any sculpture, but I fell in love with welding. My sculpture has a lot of contour lines and is very black and white. I don't use color, but I love color, so in the murals, some of my favorite passages are rocks, where I used as many colors as I could think of. I would say the upper-level sculpture classes I took at UMaine were the most helpful in preparing me for my future career. Beyond being interesting and engaging, the UMaine sculpture studio offers a phenomenal array of tools and equipment for students to experience creating sculpture.

Where are you headed in your career?

I was able to make connections through the UMaine Art Department that have led me to various galleries that have offered to show my sculpture work. I have work in a gallery in Northeast Harbor, and it wants more work next spring. I'm also going to go to different science museums in Vermont to see if they need a muralist. Near the end of my college career I was eager to graduate, but I came back to the university and continued to paint murals because I wanted to keep and cultivate the connections I'd made. UMaine has given me the skills I needed in the arts, as well as the connections I needed to give me confidence and a direction in which to head. ■ +Online


surface v

Innovative UMaine researcher focused on the chemistry of the interface



Since he arrived at UMaine in 2001, David Neivandt has earned a reputation on campus for finding brilliant — often simple — answers to complex questions, many outside his discipline.

By Kristen Andresen

FOR MACGYVER, a Swiss Army knife and duct tape were enough to solve any problem. Extinguishing an inferno in an oil well? Done. Thwarting an angry drug lord? No sweat. Outwitting an escaped — and psychotic — convict? Piece of cake.

For David Neivandt, research isn't exactly the stuff of prime-time TV drama. There's no dynamite to defuse, no kidnapped journalists to free. But the chemical and biological engineer does have a bit of MacGyver in him. Which is why he has become one of the most popular go-to guys whenever someone at the University of Maine needs an innovative solution to an unusual science-related problem.

Neivandt's primary research focuses on the transport of certain proteins linked to cancer and other diseases across cell membranes. If Neivandt and his colleagues can better understand that movement, there is the potential to design therapeutics. You'd think searching for a cure for cancer would be enough to satisfy his curiosity. But you'd be wrong.

Since he arrived at UMaine in 2001, Neivandt has earned a reputation on campus for finding brilliant — often simple — answers to complex questions, many outside his discipline: How can we improve the survival rate for larval lobsters? How can we create a biodegradable golf ball using crushed lobster shells? How can we turn a by-product of the papermaking process into prized — and pricey — carbon nanofibers?

"On the surface, these all look extremely disparate," Neivandt says. "But actually, there are similarities. A lot of things come down to surface chemistry — manipulating materials and processes to get a specific result. Surface chemistry applies to everything from cosmetics to biological applications. Anytime there's an interface, there's chemistry going on."

Surface value

But there's also something else going on — something that goes beyond chemistry or engineering or biological processes. For Neivandt, research is a way of life. That quest for answers, for discovering something new every day, is what drives his work.

"What I love about engineering is the ability to solve problems people haven't attempted to solve before or to solve them in a different way, in a way that might be more effective or more elegant," he says.

IT'S HARDLY SURPRISING that he came to engineering in an atypical way. Neivandt studied chemistry as an undergraduate and doctoral student at the University of Melbourne, Australia. As a postdoc at the University of Cambridge, where he held a prestigious Oppenheimer Research Fellowship, Neivandt started working with corporations to help them solve formulation issues.

"I had what you might call an epiphany," he says. "I realized what I actually enjoyed was using chemistry to solve problems. As opposed to pure science — pure chemistry — which is based on discovery, I found I derived greater interest and pleasure solving problems using science — problems that mean something to somebody, problems that benefit society. One is based on discovery, and that's important, but I also think the application of that knowledge is important."

He could've gone into industry, but he loved the freedom and variety of the academic environment. Here he can research a range of interests, so long as he lands grant support and his projects are in line with the university's mission.

So far, that hasn't been a problem. In the last 10 years, he has been principal investigator or co-PI on some 28 major state, federal and industrial grants. His share alone has been more than $2 million. Beyond that, he has filed 13 patents and has published 28 papers in peer-reviewed journals.

"To my mind, it has to be innovative. Otherwise, you're walking the path others have walked before," Neivandt says. "The hope is that all the returns filter back to the university and the state."

THAT'S WHAT HAPPENED when Neivandt and colleague Joseph Genco teamed up to perfect a technique to make papermaking more efficient. By combining Genco's expertise in pulp and paper science and Neivandt's expertise in chemistry, they found a way to more effectively trap fine cellulose and filler particles in a forming sheet of paper, thereby decreasing cost and increasing profits for paper companies. UMaine licensed the technology to industry and collected royalties.

"David is quite intuitive," Genco says. "You can give him a problem and he can tear it apart."

"To my mind, it has to be innovative. Otherwise, you're walking the path others have walked before. The hope is that all the returns filter back to the university and the state." David Neivandt

Case in point: his recent groundbreaking solution for lignin, an age-old problem of the paper industry. Essentially, lignin is the glue that holds the various components of wood together, which is great if you're a tree, but it gets in the way when you're trying to make paper. So it is extracted in the pulping process, and the result is called black liquor, which most mills burn for fuel.

"Lignin is 30 percent of the tree that enters the mill, and that's 30 percent going up the smokestack," Neivandt says.

He and his research group have created a way to harness that 30 percent and turn it into a product with exponentially higher value: carbon nanofibers.

These fibers are known for strength, thermal and electrical conductivity, and the ability to store large amounts of gases, such as hydrogen. In the marketplace, they can fetch anywhere from $300 to several thousands of dollars per pound. Neivandt predicts that the material developed by his team — a nonwoven mat of fibers as opposed to discrete fibers — will be available at a lower price point than other carbon nanofibers on the market

David Neivandt's team has explored ways to create hatcheries for larval lobsters from clam shells (from left); use crushed lobster shells to make biodegradable plant pots and golf balls; and recycle runoff from the papermaking process to make valuable carbon nanofibers.

— a commodity rather than a specialty product — with many potential uses.

"This could open up new markets for lower-cost materials and new applications," Neivandt says. "My hope is paper mills will take a stream of their black liquor, which may or may not need to be cleaned up, and use it as a feedstock for the creation of a value-added material."

FINDING VALUE IN waste is one of Neivandt's specialties, and when he found a way to turn lobster shells — a by-product of lobster processing facilities that usually ends up in landfills — into golf balls, the world took notice. UMaine's biodegradable lobster shell golf ball, which made headlines and attracted interest from commercial partners in the United States and abroad, combines ground lobster shell with a natural binder. It breaks down rapidly in water, which makes it ideal for use on cruise ships.

The idea for the ball came from Carin Poeschel Orr, who earned a master's in marine bioresources at UMaine. She mentioned it to Bob Bayer of the Lobster Institute, who tried to make a prototype in his basement. He soon realized he was in over his head, so he called Neivandt, who recruited Alex Caddell, an undergraduate bioengineering student — and golf aficionado — from Winterport, Maine, to work with him on the project.

Bayer had previously worked with Neivandt, undergraduate Ryan Dawes and Brian Beal of the Downeast Institute for Applied Marine Research & Education on another problem — one that threatens the sustainability of Maine's famous fishery.

Larval lobsters have a survival rate of less than 0.1 percent in the first three months. Aquaculturists have tried to raise crustaceans in captivity, but they're cannibalistic, and it's cost-prohibitive to keep the babies separated. Neivandt's team used discarded clamshells as small-scale hatcheries, sealing them with a biodegradable polymer and etching them with notches to allow the flow of food — algae.

"He's a great problem solver, as are all good engineers, but we work particularly well together because he really seems to enjoy working on unique — and some would say 'off-the-wall' — ideas," Bayer says. ■

National Arboretum conifers a focus for UMaine summer intern

Ever green

THIS PAST SUMMER, Hannah Yovino of Tenants Harbor, Maine, took her passion for horticulture to Washington, D.C., where she did an internship at the National Arboretum. The University of Maine senior is majoring in environmental horticulture with a concentration in landscape design. She plans to go on to grad school and have a career in sustainable design.

Tell us about your internship at the 446-acre National Arboretum in Washington, D.C.

I started my internship in the Gotelli Dwarf and Slow-Growing Conifer Collection at the National Arboretum in late May and went through mid-August. In the collection I did a lot of typical maintenance like weeding and pruning, plus lots and lots of watering. I was also involved in propagating some of the conifers. The arboretum is constantly changing. I helped with some of the inventory of the collection to allow it to be completely accurate and current in its signage.

How did the experience inform your perspective on horticulture?

Before my internship, I only had experienced landscaping and your typical gardening. I wanted to learn more about plants, especially those not typically found in New England.

How did your UMaine training prepare you for the internship?

Before the internship I was a little nervous because I didn't know how I would stack up to the other interns. I was pleasantly surprised with how much I knew from the courses I have taken at UMaine. ■

Hannah Yovino grew up in what she describes as a "nature-based" family. In her summer internship at the National Arboretum, she worked with horticulturist Mariya Navazio in the Gotelli Dwarf and Slow-Growing Conifer Collection. Photo courtesy of Hannah Yovino

Matt Ciampa, left, Owen McCarthy and James Morin.

Taking up the challenge

Three alums focus on encouraging student entrepreneurs and small businesses

WHEN THEY were students at the University of Maine, Owen McCarthy and Matt Ciampa joined Sigma Phi Epsilon fraternity, where one of the tenets was WIN — what's important now.

Their friend James Morin had a similar philosophy and shared it with the world on his license plate: liv2win.

"None of us are the type to be content to be good," McCarthy says. "We want to be great at all that we do."

The three graduated in 2010 and their careers took them in different directions — McCarthy and Morin into sales for Fortune 500 companies, and Ciampa into graduate work in the UMaine School of Economics. But their passion for their UMaine experience — and for Maine — never waned.

This year, the young alums partnered with the Maine Business School and the Foster Center for Student Innovation on campus, with support from the Class of 2010, to create a competition for UMaine student entrepreneurs hoping to start a business. Together they pledged to donate $5,000 for the cash prize to be awarded to the winner of the Maine Business Challenge, along with $5,000 in in-kind consulting services. The first of what they hope will be an annual challenge will be in April.

The goal, say the three, is to give collegiate entrepreneurs the support needed to transform their business dreams into reality, and to contribute to the long-term growth of Maine's economy and its small businesses.

The three, who are all from Maine, have been inspired by the mentoring from UMaine faculty members and generosity of members of the Class of 1944, legendary for its contributions to the university for more than 60 years.

McCarthy, who earned his degree in biological engineering, lives in Boston and works for Ashland Inc., a specialty chemical company. He was recently promoted to account representative for Ashland Hercules Water Technologies and now covers New England.

Morin, who has a degree in biology, lives in Portland, Maine, and serves as a sales associate in that part of the state for Stryker Orthopaedics, which specializes in medical technology.

Ciampa, who has a degree in financial economics, is in his second year of a master's in the same field. He has an assistantship with the university's Knowledge Transfer Alliance and shares his business acumen with some of the hundreds of small Maine start-ups that have come to the program for help streamlining operations during the recession. ■

Dairy in adult diets improves cognitive function

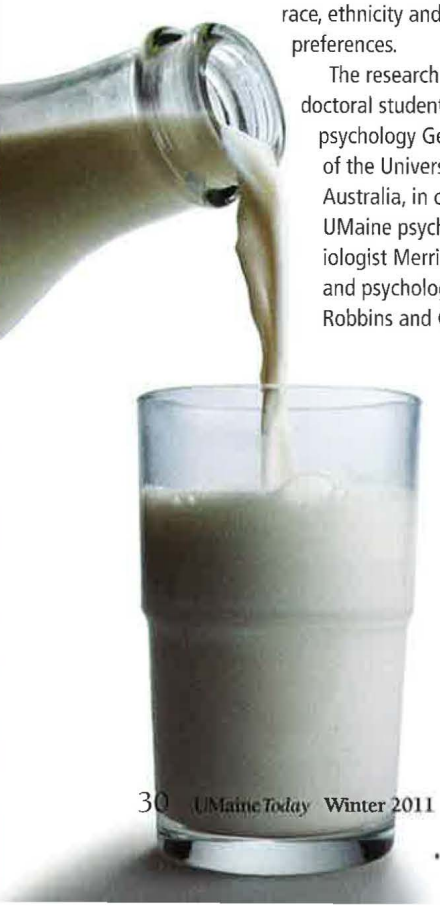
ADULTS WHO consume dairy products at least once daily perform better on cognitive tests than those who rarely or never drink milk or eat dairy foods, according to a new study by researchers from the University of South Australia and University of Maine.

Those who consumed the most dairy products had the highest scores in an extensive cognitive test battery that included multiple measures of visual-spatial ability, verbal memory, working memory, reasoning ability and executive functioning (the ability to plan, organize and integrate cognitive functions).

Those who seldom or never consumed dairy performed lower than average for this study population.

One cannot conclude that using more dairy caused better cognitive performance, the researchers say. It is not yet clear what characteristics shared by dairy users versus nonusers underlie the association between dairy use and cognitive functioning, although the study adjusted for many possible variables, such as medication, education, age, race, ethnicity and other food preferences.

The research was led by doctoral student in nutrition and psychology Georgina Crichton of the University of South Australia, in collaboration with UMaine psychologist/epidemiologist Merrill "Pete" Elias, and psychologists Michael Robbins and Gregory Dore.



Record of stability

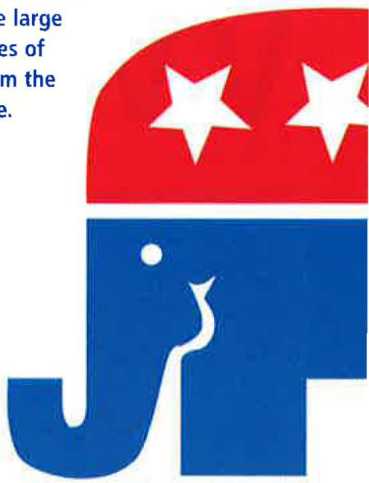
THE FIRST HIGH-RESOLUTION glaciochemical record of West Antarctica's last interglacial period between 140,000 and 102,000 years ago indicates that the warming episode was extremely stable compared to other ice age activity and ended after a long, gradual cooldown.

A team of researchers from the Climate Change Institute at the University of Maine, led by Elena Korotkikh, a Ph.D. candidate, analyzed a 42-meter ice core record from the Mt. Moulton Blue Ice Area. The ice contains a suite of 27 measurements, including major and trace elements, dust and temperature records.

According to the researchers, the Mt. Moulton record does not hint at any of the dramatic climate-related changes now projected for Antarctica. The interglacial period that was studied is an analog for how our modern climate era would have progressed under full natural forcing of the climate system. The data is further demonstration that current changes in Antarctic climate are being impacted by human activity, according to the researchers.

The team's findings were published in the journal *Quaternary Science Reviews.*

In the Blue Ice Area, a horizontal trench is cut to sample large volumes of ice from the surface.



Happiness is — being Republican

EVEN WHEN THEIR political party is not in the White House, Republicans are happier than Democrats, according to a new study by University of Maine economists examining the effects of political affiliation on happiness. In addition, during a Democratic presidential administration, members of both parties report happiness, supporting earlier evidence that people are happier when their nations are governed from the left, the researchers say. What the research failed to find was compelling evidence that Americans are happier when their political party is in power. Using 34 years of data from the U.S. General Social Survey, UMaine economists Todd Gabe and Bernardita Silva looked at the connections among happiness, a person's political party and the U.S. president's political affiliation by analyzing data on more than 38,000 Americans from 1972 to 2006.

Piloting cellulose nanofibrils

THE UNIVERSITY OF MAINE's Forest Bioproducts Research Institute is building a pilot-scale plant for manufacturing cellulose nanofibrils (CNF), a wood-based reinforcing material that is increasingly of interest to researchers worldwide looking for super-strong materials that could replicate synthetic plastics.

The pilot plant, which is being funded by a $1.5 million grant from the U.S. Forest Service, will be the only one of its kind in the nation, and will serve as a source of the material for those who want to explore the uses of CNF. Currently, researchers and industrial companies who want to buy the material purchase it from sources in Japan and Germany.

Last April, UMaine and the Forest Products Laboratory of the national Forest Service began a research collaboration on conversion of wood components into novel nanomaterials, incorporating an array of nanomaterials into forest products to increase their functionality, durability and end-use performance; and developing new generations of high-performance wood-based materials.

UMaine will be the sole supplier of CNF to researchers in a consortium of universities — Georgia Institute of Technology, North Carolina State University, Oregon State University, Pennsylvania State University, Purdue University and University of Tennessee.

Applications for the CNF material include automobile components, paint and coating additives, and water filters. Commercialization of cellulose nanofibrils and development of cellulose nanocomposites have been hampered by the lack of availability of CNF material in sufficient quantities to conduct commercially meaningful technology demonstrations.

Building a better clothespin

WITH ASSISTANCE from the University of Maine Advanced Manufacturing Center, an inventor from Winterport, Maine, has redesigned the traditional clothespin and is producing the patent-pending red, white and blue plastic clips for worldwide commercialization.

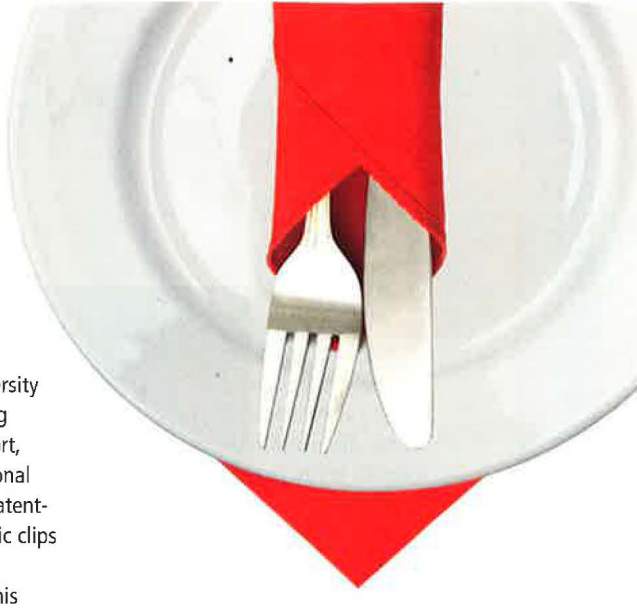
Designer Charley Earley calls his thin, round, 3-inch diameter, multiuse clipping device EKLIPSE.

"When you look at a traditional clothespin, there are disadvantages, which are widely accepted," Earley says. "With a traditional clothespin, you need to provide energy to pinch it. Fifty percent of the commonly accepted products have nothing to do with holding anything, which to me represented waste."

Spring-loaded clothespins can pop apart and the standard clothes peg without a spring is "weakest where it needs to be strongest," whereas EKLIPSE is one piece, opens only as much as it has to and never has to be squeezed.

AMC staff and students created a CAD design of EKLIPSE, produced an ABS plastic prototype and conducted fatigue tests to be sure it works in both hot and cold environments.

Photo by Nina Earley



Balanced advisories

TO FULLY ENABLE at-risk people to make healthy decisions about eating fish, government-issued advisory messages need to balance information about mercury-related health risks with details about health benefits, according to a new study by economists and health policymakers.

The researchers, led by University of Maine economist Mario Teisl, examined the effects of a statewide advisory issued by the Maine Center for Disease Control and Prevention about benefits and risks of fish consumption to at-risk women who are pregnant or nursing, or who may become pregnant, as well as children under age 8.

As a result of the Maine CDC advisory, some women reduced their fish consumption for a short time, often for only the duration of their pregnancy. But most importantly, women who read the advisory changed their eating habits, consuming more fish low in mercury, such as light tuna, while decreasing their intake of highly contaminated fish, such as white tuna.

Accelerating innovation

AN INITIATIVE called Blackstone Accelerates Growth, designed to build regional innovation hubs supporting entrepreneurship and job creation, has been launched with a $3 million grant from Blackstone Charitable Foundation. Among the local partners in the initiative is the University of Maine, which will prepare a cadre of student interns who have had Innovation Engineering coursework offered through UMaine's Foster Center for Student Innovation. These students will support companies involved in innovation and entrepreneurship. In addition, UMaine's Innovation Engineering/Jump Start Program, created by inventor alumnus Doug Hall, will provide intensive coaching programs for companies looking to grow and transition to be part of an innovative economy.

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The gilded trap

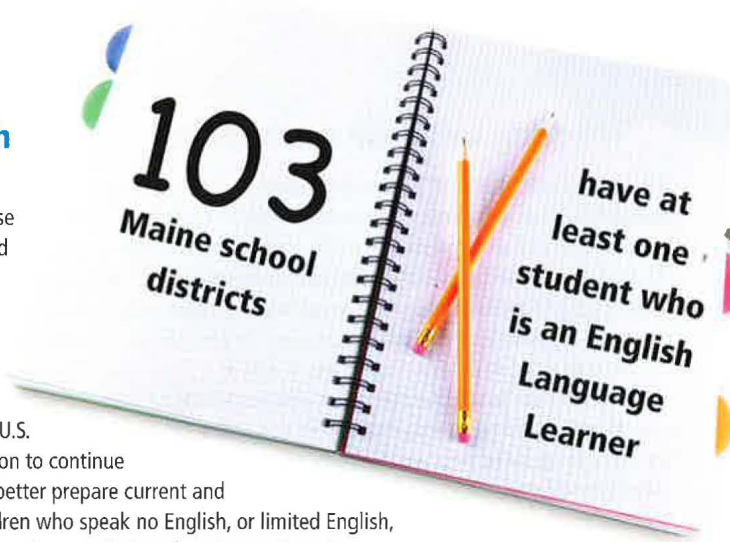
IN THE PAST two decades, the diversity of income from the fish and seafood harvested in Maine has declined by almost 70 percent, leaving an American lobster monoculture that makes up the vast majority of the state's marine resource value.

Fortunately, lobsters have remained abundant in the Gulf of Maine, yielding an increase in value of nearly 400 percent since 1985.

But the current success of Maine's lobster fishery is a gilded trap that could threaten the coast's social and economic underpinnings, according to a team of international researchers, led by University of Maine marine scientist Robert Steneck.

The researchers define gilded traps as social constructs in which collective actions resulting from economically attractive opportunities outweigh concerns about social and ecological risks or consequences. Avoiding or escaping the gilded trap created by reliance on one or a few high-value species requires resource management focused on increasing biological and economic diversity — a difficult process when profits remain high in the pre-crisis mode, say the researchers from the United States, the Netherlands and United Kingdom, Canada, Sweden and Australia. Biodiversity thus becomes a way to increase economic diversity, which could reduce the ecosystem/social system's tendency toward booms and busts — with ever-increasing serious consequences.

Project Reach



THE UNIVERSITY OF Maine's Margaret Chase Smith Policy Center and the College of Education and Human Development have received a $1.8 million grant from the U.S. Department of Education to continue and expand efforts to better prepare current and future teachers of children who speak no English, or limited English, or Franco-American or Native populations for whom culture is embedded in language. The project also will study the impact of its teacher training efforts and contribute to a growing body of scholarship on STEM (science, technology, engineering and mathematics) and ESL education through a longitudinal study.

The number of schoolchildren in Maine for whom English is a second language — some 4,800 — increased in the past year by 53.3 percent, while K–12 populations in the state declined by 8 percent in the same period, according to state education data. Of the 179 school districts in Maine, 103 of them have at least one English Language Learner (ELL), a federal term for what the Maine Department of Education refers to as English as a Second Language (ESL) students.

Heading Project Reach are Laura Lindenfeld, the grant's principal investigator and an associate professor in the Margaret Chase Smith Policy Center and the Department of Communication and Journalism, and Shelly Chasse-Johndro, the Project Reach director who teaches ESL classes on campus and statewide for working and future teachers.

As many as 285 practicing teachers will undertake Project Reach training in the new five-year grant cycle. Of those, 250 will receive some sort of education through workshops in their districts or though UMaine courses.

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ON VIRTUALLY EVERY page of this magazine, you will find examples of a striking and pervasive UMaine characteristic — the spirit of innovation. Despite its relatively small size, the University of Maine is a powerhouse because its faculty, students and staff are as creative as they are determined to make a positive difference in the world around us. This spirit is part of our culture, and it's a key reason why UMaine's people are so accomplished and so effective.

Moreover, the people of Maine are taking notice and our statewide collaborative efforts are capturing the attention of organizations like the Blackstone Charitable Foundation. Based in New York, that organization recently invested $3 million in a broad-based initiative, with UMaine at its hub, to accelerate our state's economic growth. Blackstone has now made these investments in three states: North Carolina, New York and Maine. We are in good company, and that organization's commitment speaks volumes about Maine's innovation infrastructure and its commitment to knowledge-based growth.

Initiatives like this only work in states where there's a dynamic research university fostering the collaborative efforts that maximize the resources necessary for success. At UMaine, we are proud to bring our innovative spirit and creativity to bear in helping catalyze these efforts.

Paul W. Ferguson
President

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The Maine Spirit Fund was established at the **University of Maine Foundation** in 2007 to provide stable, long-term financial support for student groups at the University of Maine. As the university's goodwill ambassadors, student organizations bring entertainment and spirit to events on campus, throughout the state and beyond. Income from this fund supports those student groups and organizations in such endeavors. Investing in today's students is an investment in the future. They deserve our support.

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