

UMaine Today

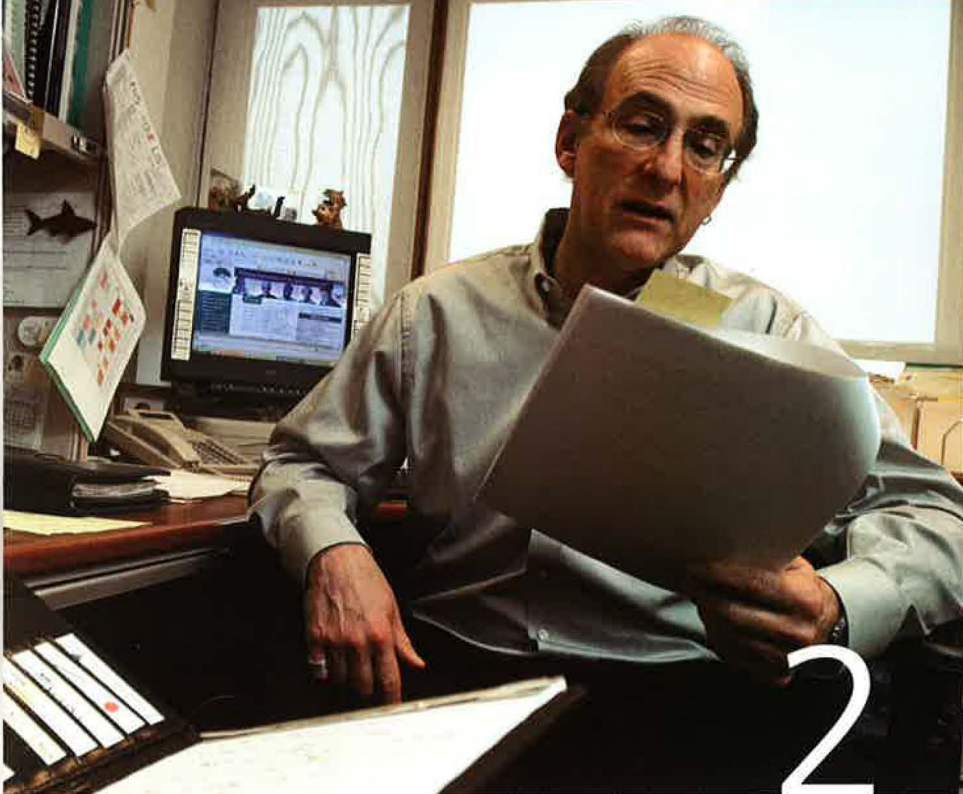
CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE

SPRING 2012



Making connections

How knowledge transfer is transforming the Maine economy



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Volume 12 Issue 1
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Approximately 76 million Americans are poised to turn 65 in the coming decades — an elder population explosion that will usher in more opportunities than problems, according to gerontological researcher Lenard Kaye.

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Through the Knowledge Transfer Alliance, Maine businesses are finding the keys to economic success by connecting to UMaine engineering, manufacturing and business expertise.



The First American West: The Ohio River Valley, 1750-1820
Courtesy Special Collections Research Center,
University of Chicago Library

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UMaine Today magazine's +Online provides Web-exclusive stories, video and audio clips, photo galleries, full-length versions of articles, and a comprehensive editorial archive.

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ON THE COVER: The Knowledge Transfer Alliance helps Maine businesses tap into multi-disciplinary expertise at the University of Maine and find greater success in a tough economy. See story on page 10.

A leading gerontological researcher argues society needs new perspective to meet the needs of older adults and to tap their expertise





THE COAST OF MAINE is dotted with quiet, out-of-the-way spots, far away from the hustle and bustle of the state's tourist attractions.

One such spot is Mariners Memorial Park. Nestled on the shores of Deer Isle, not far from the village center, the park is a peaceful getaway where visitors can walk paths winding past blooming shrubs and flowers, and follow the sounds of sea birds and surf down to the water's edge.

Places such as these don't just happen. Mariners Park is tended regularly by members of the local Evergreen Garden Club, who have worked over the years to care for the grounds — mowing, trimming and clearing brush — to keep the park in tip-top condition for the public. Among those volunteers is Marshall Rice Sr., a longtime Deer Isle resident, who has worked with the garden club for more than 50 years. Although the Island Heritage Trust, a local land conservation organization, oversees the property now, Rice, 91, and other garden club members continue to maintain the grounds, which the club still owns.

"We just try to keep the place in order," Rice says. "I like to do it. I've just been somebody who's been willing to do it. I'm still willing."

There are too few portrayals of elders as successful, powerful, engaged and making a difference. There are too many images of elders as victims. A more balanced perspective is needed."

Lenard Kaye

As a civilian working in Hawaii, Rice survived the Japanese attack on Pearl Harbor in 1941. He served in the U.S. Army during World War II and returned to Deer Isle, his adopted home, where he has worked in the plumbing and heating business. He built homes, a church fellowship hall and a Masonic center, and he and his wife built and ran a campground for almost a decade. But it has been the park that has been a constant project for him for more than half his life. He had been exposed to gardening as a boy and it wasn't long after his return from the war before he joined the local garden club.

"My grandfather was a nurseryman," Rice says. "This was a way to get my fingers back in the ground again."

In addition, a few years ago when the

garden club also began to tend the flower and vegetable gardens at the Island Nursing Home, Rice was right there to help, often encouraging the elder residents to join in.

"I'm physically fit," he says. "I've been active, I'm still active and I'm just tickled to death to be there doing something I think is useful."

THAT ATTITUDE is exactly the kind of thinking that will be needed in the coming years as more and more Americans reach retirement age, according to Lenard Kaye, a professor of social work at the University of Maine and director of UMaine's Center on Aging. With the coming of age of the Baby Boomers — the first class of boomers turned 65 in 2011 — the ranks of the elderly in America will grow substantially over the next few decades, posing challenges and opportunities for social workers, caregivers and older Americans themselves.

With approximately 76 million Americans poised to turn 65 in the coming decades, some see the rapid growth in the older population as an "elder tsunami" and raise concerns about how the nation will deal with the increasing numbers of older Americans. Kaye, however, rejects the term and the premise, arguing that this elder population explosion will create more opportunities than problems.

New aged

By Rich Hewitt

New aged

"I don't use the term elder tsunami," he says. "I don't like it. It implies a destructive force and that's just not the case. Too many people see the glass half empty; they believe that there are just too many (older) people with too many needs that will be too costly to be met. I don't believe it. I think the glass is more than half full in terms of what the future of aging is going to look like."

The concerns, he says, grow out of an older, outdated and nihilistic view of aging, which focuses mainly on the problems of aging. He argues that a new perspective is needed if society is to meet the needs of the "new aged" and to take advantage of much of their potential.

Kaye cites statistics indicating that, as a whole, the new aged will be healthier, more mobile, better educated, more politically aware and active, more outspoken advocates for themselves, and more interested in remaining active and productive than previous generations.

Without diminishing the problems and infirmities that come with aging, Kaye says that society for too long has focused on the disabilities of aging and ignored the abilities of the aged.

"There are too few portrayals of elders as successful, powerful, engaged and making a difference," he says. "There are too many images of elders as victims. A more balanced perspective is needed."

WE ALL HAVE been guilty of ageism on one level or another, he says, and all of us — social workers, caregivers, society in general and even the elderly themselves — will have to change our views on growing older as we come face-to-face with the



Geriatric social work's alternative perspectives on elders

Traditional / Productive

Nihilistic / Hopeful

Deterioration / Growth

Disability and dysfunction / Health and wellness

Dependence / Autonomy

Rigid resistance to change / Receptive to change

Unable to learn / Intellectual stimulation

Vulnerable, passive / Empowered

One-dimensional quality of life / Societal engagement

Community isolation / Community integration

Denial, avoiding challenges / Confronting challenges

The past and what might have been / The future and what can still be

Sedentary lifestyles / Activity and activism

Receiving / Giving, volunteering

new realities of aging. Rather than being a burden on society, Kaye says, the new aged will be a resource that can contribute to communities in many different ways.

"More and more, these people have been the movers and shakers during their lives, and they are not going to be content to retire and sit in a rocking chair on a porch," he says. "They want to remain engaged; they want to stay connected. They've been that way all their lives."

The challenge then comes in finding ways to help older adults remain active, involved, connected and productive. That challenge will require a new set of skills for social workers and others who regularly work with older populations. They will have to develop an expanded view of what living a productive life means.

For some, being productive means "gainful employment" — the ability to continue working for pay. And it is true that more and more older people are choosing to remain in the workplace after they reach retirement age. But, Kaye says, being gainfully employed contributes only partially to defining what it means to be productive.

Just as Marshall Rice's work at Mariners Park fulfills his desire to do something he considers important, productivity is in the eye of the beholder. Productive aging, according to Kaye, can be inner-directed, focusing on personal growth, such as spiritual, self-help, travel, recreation or educational activities. Or it can be outer-directed, focusing on activities that benefit society as a whole, such as employment, new job training and volunteering in the community, or simply helping other members of your family.

THE KEY IN the coming years, Kaye says, is to develop the infrastructure that will support older adults as they seek to remain productive, no matter what their definition of productivity is. To do that, social workers will need to find new ways to interact with the new aged outside of the conventional arenas. While they still will need to work to meet the needs of older adults who struggle with the infirmities of aging, they also will need to reach the new aged in different venues.

For Kaye, that means social workers will need to work more closely with community officials, employers, career counselors, financial planners, wellness promotion staff, lifelong learning administrators, volunteer activity planners and others who interact with active seniors.

The process will require that a community or region first conduct a “resource and needs assessment” to accurately identify the needs of its aging citizens, such as transportation, healthcare, and housing; and the potential community resources available to meet those needs, including the expertise and capacity that elders themselves can offer.

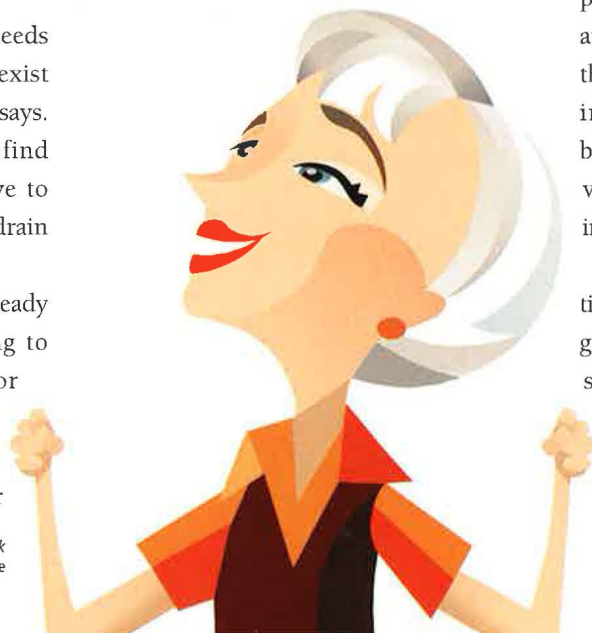
“You have to understand the needs and appreciate the resources that exist that can be brought to bear,” Kaye says. “Any town that can do that will find untapped resources. It doesn’t have to always require taxpayer dollars or drain precious public resources.”

Some communities in Maine already have begun the process, according to Kaye. The town of Bucksport, for example, has an active senior advisory committee that focuses on the needs and concerns of the older

62%
women in the U.S. older than 65 working part time.

8.1 billion
hours that 62.8 million older volunteers contributed in 2010, valued at \$173 billion.

4 out of 5
older adults reported getting together with friends and neighbors in the preceding two weeks.



population. Brunswick, he says, has won recognition as one of the best small communities to retire in because it has created an environment that is “age friendly,” making it easier for older residents to get around.

UMaine already is working to better prepare social work students to interact with the new aged generation, Kaye says. Through the Hartford Partnership Program for Aging Education, UMaine’s School of Social Work is training more students to work with older adults, using a specialized field education model. Many of their social work courses now include content on aging. And the UMaine students also get a new perspective through involvement in Center on Aging programs.

Through the years, the center has developed programs that provide opportunities for older adults to remain productive and involved in their communities, including the Senior College program, Retired and Senior Volunteer Program, and the Encore Leadership Corps (ENCORPS). Programs like these provide an opportunity to tap the abilities and enthusiasm of older adults in ways that keep them engaged in and contributing to their communities. With the burgeoning older population, more and varied programs like this will be needed in the future, according to Kaye.

“We have yet to realize the full potential of older adults,” Kaye says. “We have a great opportunity to take advantage of the skills, wisdom and capabilities elders have. It will be the greatest waste of untapped resources in history if we fail to do that.” ■

Source: *Perspectives on Productive Aging: Social Work with the New Aged*, edited by Lenard Kaye

Teaching ability

**Students of adapted physical education learn
the possibilities are endless**

By Kristen Andresen

Jessie Kaye-Schiess and Mikie





“You can’t underestimate these kids. They have the same potential, the same needs as any other student, and they can accomplish so much.”

Chloe Tinkler

“You can’t underestimate these kids,” says Tinkler, a native of Wabush, Newfoundland, who plans to become a physical education teacher and coach after graduation. “They have so much potential. They have the same potential, the same needs as any other student, and they can accomplish so much.”

Tinkler says this is the best class she’s taken at UMaine. That’s Butterfield’s



Chloe Tinkler and Claire

CLAIRE IS 4 years old. She wears peppermint-striped Nikes, tiny glasses and a glittery shirt to class. And she’s one of the toughest instructors at the University of Maine.

From Day One, she has challenged her student, Chloe Tinkler, to think on her feet. To find creative solutions to frustrating problems. To overcome major obstacles.

Claire has Down syndrome and is, for the most part, nonverbal. Chloe is one of 37 students in Stephen Butterfield’s Adapted Physical Education class, a requirement for kinesiology and physical education majors.

When they meet at UMaine’s New Balance Student Recreation and Fitness Center each Wednesday for motor and aquatics lab, they play catch and splash in the pool. It looks like a blast. But look a little deeper and you’ll see this isn’t just fun and games. Together, they’re learning and teaching each other important lessons about empathy, patience and ability.

Teaching ability

In the semester-long course, UMaine students work one-on-one with a child or adult who has physical or mental disabilities. Coursework includes behavior management, teaching techniques and the latest disability research. Pictured left to right, Patrick Powers, Dianah Shelley and Jamie, Tyler Cates and Ryan.



intent. He's been teaching the course for 28 years — it's modeled after a similar class he helped teach when he was a Ph.D. student at Ohio State University. And for each of those years, the class has been transformational for UMaine students.

"Ninety percent of them, after this experience, are better human beings," says Butterfield, a professor of kinesiology and physical education. "They come out of this stronger, more confident, with a deeper sense of humanity."

FOR A SEMESTER, students in the class work one-on-one with a child or adult who has physical or mental disabilities. Once a week, they meet in the fitness center, spending half of their time together in the pool and the other half in the gym, working on motor skills such as shooting hoops, playing catch, wheeling through an obstacle course or playing ping-pong. Butterfield and a fleet of teaching assistants — all of whom have been through the course before — observe and advise, when necessary.

In addition to gym time, coursework

includes behavior management, teaching techniques and the latest disability research. Many of the participants with disabilities have been involved with the program for years, through a variety of agencies and schools, and Butterfield has taught most of the UMaine students in previous classes. He takes great care with the pairings.

"If they match up well, personality-wise, they'll have a productive semester," Butterfield says.

Take Eric Custeau, a UMaine senior from Gorham, Maine, and Bradley, a student at Hermon High School. As they work together on a grasp and release exercise — Bradley sitting in a motorized wheelchair, Eric standing at his eye level, each grasping the opposite side of a rubber ring — it's clear that they're both intensely focused. Eric is quiet, patient, understated. Bradley has cerebral palsy and his mobility is extremely limited.

At the beginning of the semester, Eric threw himself into research to determine the best way to enhance Bradley's gross motor development, reading papers on

grip strength and rolling exercises. When they met, Bradley could barely move his legs up and down in the pool. By the end of the semester, he could do flutter kicks. It was a milestone for both of them.

"I've learned that Bradley can do pretty much anything he puts his mind to," says Custeau, who plans to become a physical education and health teacher when he graduates. "This class has definitely prepared me to incorporate students with adapted needs into my physical education classes. It's made me more aware of how to help them, whether it's one-on-one or participating with the whole class."

FOR UMAINE STUDENTS, the lessons come in stages, according to Butterfield. First, there's fear — of the unknown, of failure. Then there's anger at Butterfield, especially in the early, frustrating weeks. Next comes competence — the realization that they actually can do it. Then confidence. And finally, ownership.

"Most of them take the course and have an epiphany," Butterfield says. "At first, they're afraid, apprehensive, nervous,

“If you see students who took this class 20 years ago, they’ll remember the name of the person they worked with and be able to describe their experience in detail.”

Stephen Butterfield

but then they come around. They start to refer to their participant as ‘my’ student. If you see students who took this class 20 years ago, they’ll remember the name of the person they worked with and be able to describe their experience in detail.”

For Chloe Tinkler and Claire, the epiphany happened relatively early. Every time they went in the pool together, Claire would start sobbing after a few minutes, but because she’s nonverbal, she couldn’t tell Chloe why.

“I didn’t know what was bothering her so much and it tore me up inside trying to figure out what she needed, what was going on inside,” Tinkler recalls. “It was difficult.”

Working with Claire’s teachers at Green House Nursery School in Milford, Maine, she learned that Claire is terrified of water that is over her head. She also learned that Claire needs visual aids to understand what’s expected of her. So Chloe scoured the Internet and developed a series of laminated posters to show Claire exactly how to do certain activities. For example, the illustration that demon-

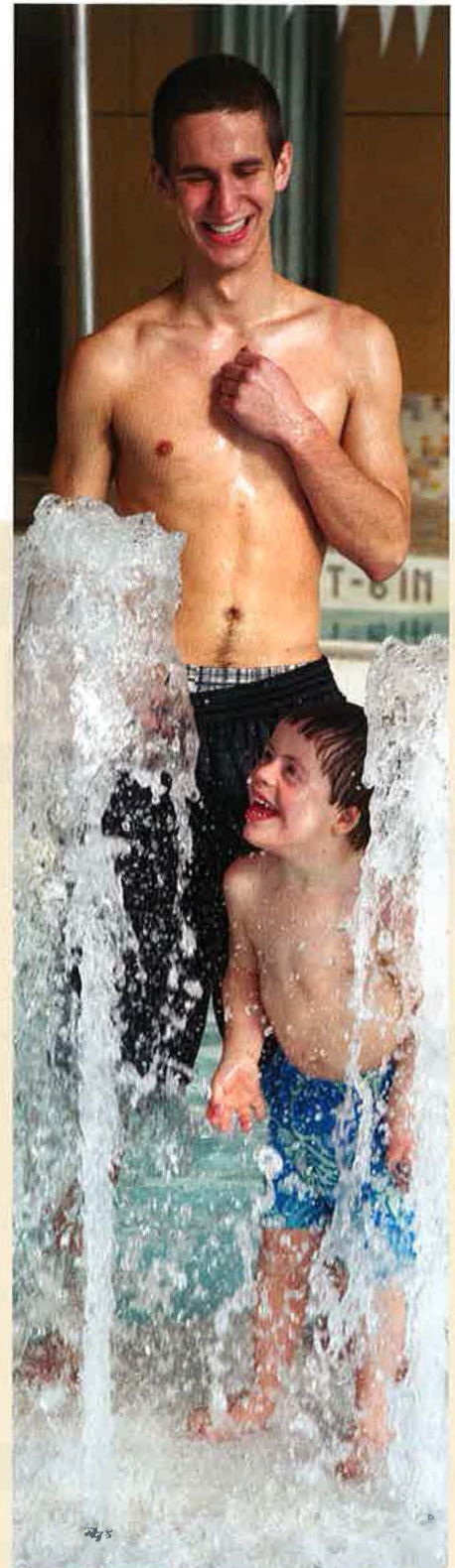
strates how to throw a ball shows where her feet should be and what the arm motion should look like.

By the end of the semester, it was clear that Claire loved the lessons that Chloe prepared for her. She put her whole body into a game of catch. She waded in the shallow end of the pool without fear. She walked through the gym, hand in hand with Chloe, beaming.

“These kids are very capable,” Tinkler says. “You need to make sure that the first thing you see isn’t their disability. You need to see what they’re capable of — that’s how you build a program around them, a program that meets their needs.”

And in the process of meeting their young charges’ needs, UMaine students also learn and grow.

“It’s rewarding to me to see the strides that these kids are making, but it’s even more rewarding to see the development of my students,” Butterfield says. “They will learn more about themselves as human beings over the course of a semester going through this class. That’s a lot of development over a short period of time.” ■





WHEN LOUISE Jonaitis and her business partners purchased the closed Saunders Brothers wood products company in Locke Mills, Maine, and assets of Moosehead Furniture in Monson in late 2010, one of their first questions was how soon the businesses could be back online. In particular, Jonaitis needed to know if the mills, closed for nearly four months, could recapture customers and scale up production to supply hundreds of thousands more hardwood rolling pins for three national retailers.

Jonaitis, a former social worker from Rumford, had no manufacturing experience, so she turned to the University of Maine School of Economics business consulting program, Knowledge Transfer Alliance (KTA). Alliance Director Hugh Stevens, a UMaine graduate student in financial economics, “was very quick to come to the scene and say, ‘Yes, you can do this,’” Jonaitis recalls. Stevens introduced Jonaitis to John Belding, director of

Inform to tr

Knowledge Transfer

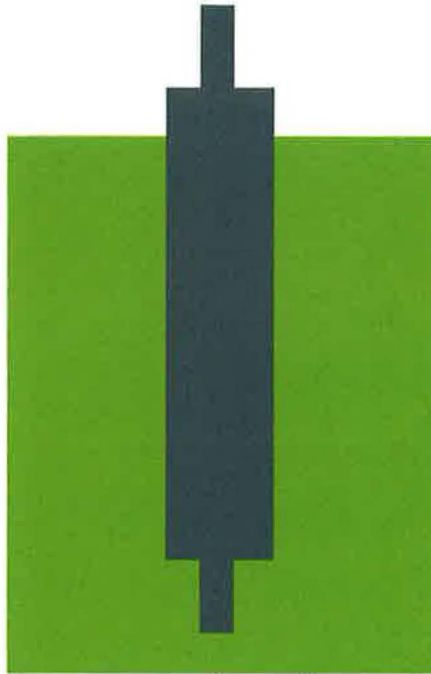
UMaine's Advanced Manufacturing Center, who assured her she could ramp up production with a few equipment modifications.

"It was like having a John Tesh for manufacturing," Jonaitis says. "I could just call Hugh or John and say this is what I need and within a week, I'd have the answer."

KTA's business and marketing skills were what Dr. Brooke Ligon needed. Ligon is a medical researcher whose small Hancock, Maine, company, Mitokine Bioscience, may have discovered how replenishing an amino acid can help diabetics recover the ability to produce insulin.

"My background is in medicine and neuroscience, and not business," she says.

Through KTA, Maine Business School professors Paul Myer and Jason Harkins, who are part of the team of experts participating in the free business assistance program, stepped in to help. Myer's extensive background in marketing and international business enabled him to serve as interim CEO while making introductions to funding sources and prospective investors. Harkins' experience with pharmaceuticals companies and product development also proved valuable.



Ramping up production with equipment modifications allowed Saunders Brothers to supply wooden rolling pins to Macy's and T.J. Maxx, and to enter talks with L.L. Bean.

"Jason helped write the executive summary for the business plan so we could start telling our story to potential investors and quickly give them an overview. He gave the business polish that I could not," Ligon says. "Paul raised our profile through basic marketing."

In addition, using advanced analytical instrumentation, Brian Perkins, a food science and human nutrition research assistant professor, developed a laboratory test to confirm the fermentation process Mitokine uses to artificially create the specific chemical it intends to mass-produce commercially.

Mitokine Bioscience is preparing to begin human trials this year, Ligon says.

THE KNOWLEDGE Transfer Alliance began in 2009 with a \$1.82 million U.S. Economic Development Administration grant. Initially, it was to help financially distressed businesses in rural Maine recover from natural disasters in 2008. Now it serves any business in Maine seeking engineering, manufacturing or business expertise.

The alliance includes a team of UMaine business and economics students working with up to a dozen multidisciplinary faculty members from business, economics,

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By George Manlove



Alliance connects small businesses with UMaine expertise

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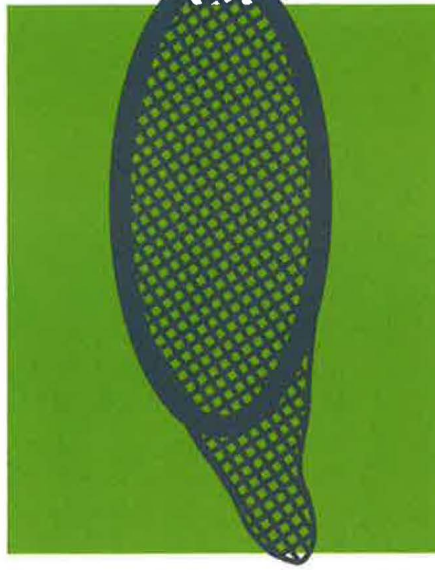
engineering, University of Maine Cooperative Extension, the Foster Center for Student Innovation and the Forest Bioproducts Research Institute. Now in its third year, KTA has matched university experts with some 250 businesses in agriculture, manufacturing, forest bioproducts, marine and hospitality industries, among others, leading to access to research and development grant funding, and investors.

Overseen by Stevens, School of Economics Director George Criner and Maine Business School professor John Mahon, KTA helps companies with business planning, production, accounting and managerial systems, and cost efficiencies. The services are intended to stabilize at-risk businesses and prepare them for revenue and workforce growth.

KTA does not compete with private-sector consultants, but often helps businesses identify the expertise they need to succeed and thrive.

"I can guarantee we've saved jobs," Stevens says. "If I had to estimate, the total impact of revenues is \$6 million in sales and 100 jobs stabilized or created (since KTA started in 2009).

"We work with new technologies and old technologies, and try to bring an innovative way of taking products to market," says Stevens, who has more than a decade of consulting and business experience. "This is taking the skill sets that are available at the University of Maine into the field and having a positive effect in this economy."



Market research, efficiency recommendations and plant organizational ideas enabled Wallace Brothers LLC to triple its output of fishing nets to Orvis, Cabela's and L.L. Bean.

THE MOST COMMON forms of assistance are business and operations analysis and accounting systems — a critical business component, says KTA Assistant Director Senthil Sockalingam, a graduate student in finance who has bachelor's and master's degrees in accounting from UMaine. KTA consultants are certified advisers for QuickBooks, the comprehensive small business accounting program that tracks profit, expenses and inventory management. If needed, KTA experts can analyze accounting programs and recommend alternatives.

"Sometimes they come in thinking they need a new accounting system to operate their business better," Sockalingam says, "but as we interview them further, we realize that instead of swapping accounting systems, they actually need better management practices or more marketing help."

The first step in the process, Stevens says, is to stabilize revenues and then assess job creation. "It really comes down to using any research we have — that's the knowledge transfer — to help them make better decisions," he says. "It's not always complex theory. It might be just a confidence builder. Some people just want somebody to talk to for reassurance."

While small businesses benefit from the KTA experience, students serving as consultants also benefit, according to Criner. Using graduate students in a professional manner is a win-win scenario, he says. "They get experience as a quasi-professional and our clients receive excellent work, which often includes some innovative ideas.

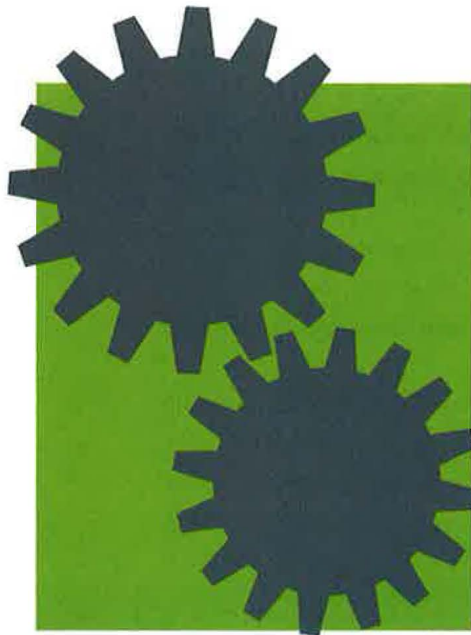
KTA has helped Maine businesses realize \$6 million in sales since 2009.

“As resources have gotten tighter while our activities have expanded, we needed our graduate students to take on more work,” he says. “We asked them to help with our economic development activities, and their response far exceeded our expectations. They have represented the university well and several have been offered jobs based upon their KTA work.”

Recent UMaine M.B.A. graduate and former KTA counselor Nicole Gogan, an economic development specialist with the Economic Development Office in Brewer, Maine, says her work with KTA clients added another dimension to her understanding of small business challenges. That improved her business development skills.

“I wish every M.B.A. could get that experience. It was great,” she says. “In business school, you learn about more big-picture, large corporate concepts, and through KTA, try to translate those concepts to mom-and-pop-type small businesses that are just trying to keep the lights on. It gave me another level of appreciation for the risk for their businesses.”

THE INFORMATION KTA provided to Louise Jonaitis gave her the reassurance and confidence that the companies could succeed with proper planning, which led to her rehiring about two dozen former employees. Timing was critical for her to get her mills up, running and supplying customers within an aggressive time frame of just weeks and months. She says she also saved time and money last spring after a



SnapSpace consulted with KTA when it planned to buy a former manufacturing plant and was aided in its introduction to Tempohousing based in the Netherlands.

Maine Business School class did a market survey and advised on which of her many wood products and furniture offerings consumers would buy online.

She now expects to hire more employees as business expands with anticipated new retail customers. Because of her quick and successful start up, Jonaitis has now contracted to supply Macy’s and T.J. Maxx department stores with rolling pins, and is talking with L.L. Bean.

Ligon, who has three patents pending on using an amino acid to treat diabetes, hopes to hire at least eight employees when federal grants are funded and up to 30 if the 6-year-old Mitokine Bioscience expands into the commercial manufacture of the amino acid.

KTA helped two other Maine companies — SnapSpace Solutions in Brewer and Wallace Brothers LLC fish landing net producers in Passadumkeag — with new business contacts and new clients, positioning the companies for substantial growth in 2012.

SnapSpace president Chad Walton consulted with Stevens and Belding when he planned to buy the 126,000-square-foot former ZF Lemforder manufacturing plant in 2011. SnapSpace now recycles and converts steel shipping containers to eco-friendly housing and offices through an assembly line process recommended by Belding, who worked as a Lemforder engineer before coming to UMaine.

Stevens introduced Walton to a Dutch-speaking Bangor business consultant, Bob Ziegelaar of Mainxpo Inc., which

Inform to transform

led to a meeting with representatives from Tempohousing in Amsterdam, one of the world's largest manufacturers of shipping-container housing. As a result of the introduction, SnapSpace Solutions recently became Tempohousing's North American container housing manufacturer.

Walton says Stevens arranged business connections that would have taken him years to establish. "With KTA, it's almost instant," he says. "I don't know how to express how valuable KTA has been to us, and I've been 30 years in start-up businesses."

Walton is confident that the Tempohousing partnership will generate dozens of new jobs as orders come in. A recently completed portable bunkhouse SnapSpace built for a northern Maine logging company provided work for more than 20 people. Walton also is negotiating several promising Maine-based contracts for shipping-container classroom additions and a prospective container-unit hotel.

Similarly, market research and efficiency recommendations by Stevens and colleagues, and plant organizational ideas from Belding, enabled the family-owned Wallace Brothers to triple its output to supply outdoors outfitters Orvis and Cabela's, in addition to existing client L.L. Bean, says co-owner Donald Wallace.

The 7-year-old company previously produced about 3,000 handmade, hardwood fish landing nets annually.

Stevens says KTA assistance can be straightforward and simple. Clients, he says, "are great at developing product, but they're struggling more with keeping the business open. It's a different skill set. Not everyone is born a salesman."

This, the final year of the federally funded program, will be a "defining moment" for KTA, Stevens says, "because some of these bigger projects are beginning to commercialize."

Stevens hopes KTA's track record of business stabilization and development success will be incentive for private contributions to allow the program to continue.

"We've had a significant impact with revenues — thus, job creation," he says. ■

Tapped in

THE KNOWLEDGE Transfer Alliance at the University of Maine has assisted a wide range of businesses in the state with business planning, production, accounting and managerial systems, and cost efficiencies. The services are intended to stabilize businesses and prepare them for revenue and workforce growth. Among the 250 companies:

Millinocket Fabrication and Machine Inc.

Presque Isle and Caribou Inns and Convention Centers Inc.

Green Thumb Farms Inc., Fryeburg

Sea & Reef Aquaculture LLC, Franklin

Olde Oak Farm LLC, Maxfield

Ocean Organics Inc., Waldoboro

Eastman Industries, Portland

Katahdin Friends Inc., Millinocket

One Stop Home Repair, Orono

Rose Bike Inc., Orono

OceansWide, Newcastle

Thermoelectric Power Systems LLC, Orono



On the trail of a killer

DNA sequencing research explores what makes MRSA so deadly

In December, alumnus Ryan Tewhey was in *Forbes* magazine's "30 under 30: Science" feature, highlighting the rising stars in science. Tewhey was cited for "using DNA sequencing to figure out what makes the MRSA super-germ so very deadly and hard to kill."



Ryan Tewhey

RYAN TEWHEY graduated from the University of Maine in 2005 with a bachelor's degree in molecular and cellular biology, and an additional major in biochemistry. This year, he completed a Ph.D. in biology at the University of California, San Diego, exploring the use of DNA sequencing to understand what makes MRSA — methicillin-resistant *Staphylococcus aureus* — so deadly.

The MRSA microbe is a growing threat in clinical settings, such as hospitals and nursing homes, as well as in some nonclinical environments.

His research earned him a spot in *Forbes* magazine's "30 under 30: Science" feature, highlighting high-achieving young scientists.

Tewhey is interested in the development and use of new technologies to read each individual base of an organism's genome. In one of the projects in which he's involved, researchers are looking at how microbes such as MRSA are changing over time.

"I am really interested in the idea of using DNA sequencing as

a way to diagnose an infection," he says. "Today, it can take up to 24 hours to identify a microbial pathogen and another day or two to have a reliable profile of which drugs will work on it. By using DNA sequencing as a clinical tool, you could identify a pathogen in a few hours. You also could determine, to an extent, which drugs may be the most successful for a specific patient."

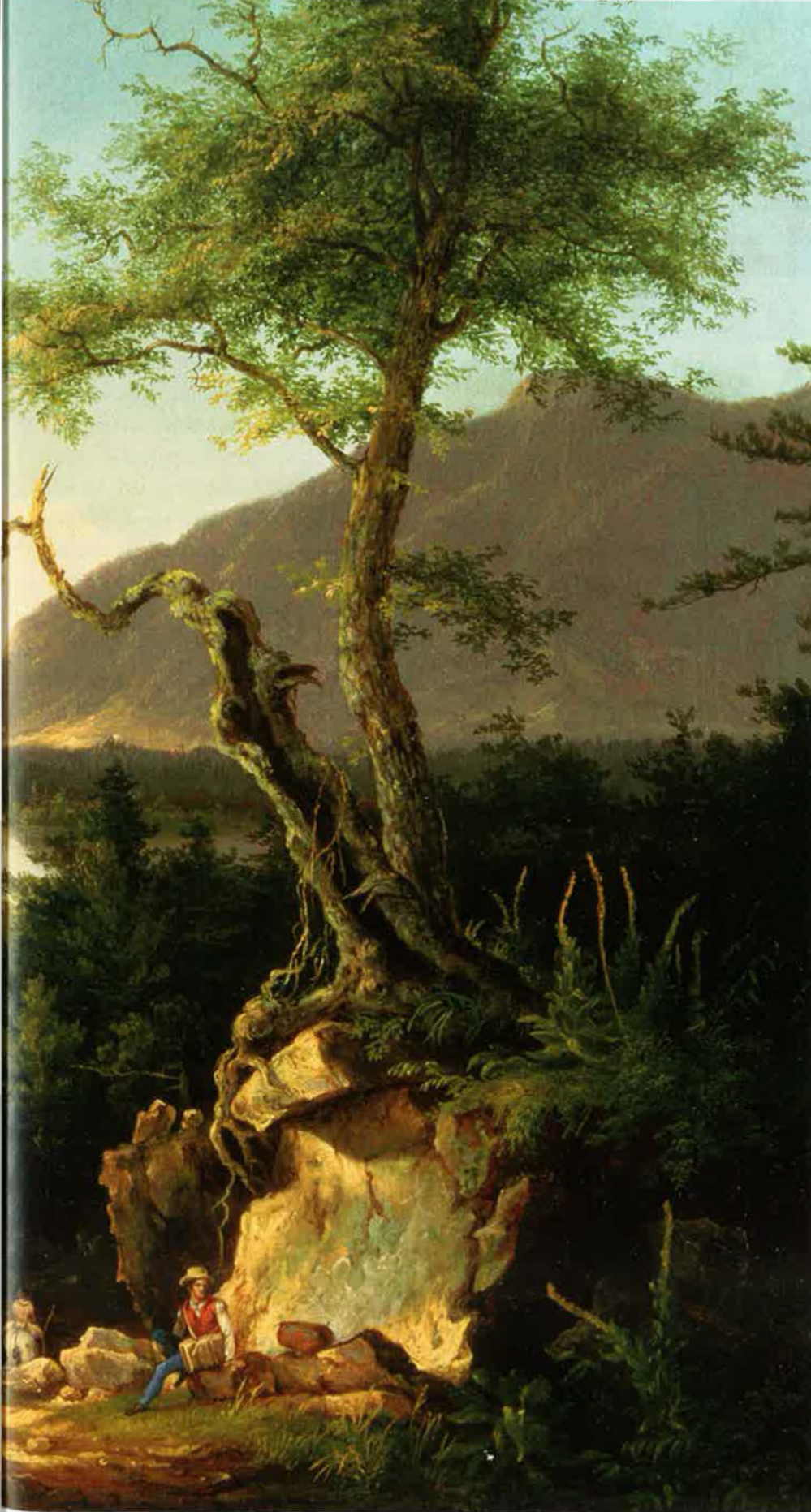
After graduating from UMaine, the Gorham, Maine, native spent two years at the Broad Institute of the Massachusetts Institute of Technology and Harvard, helping complete the first genome-wide scan for genetic risk factors for Type II diabetes. For the past four years, in conjunction with his doctoral work, he has conducted research at the Scripps Translational Science Institute.

"My previous work was developing ways to sequence thousands of genes in the human genome simultaneously and at a cost that makes it feasible to look at hundreds of peoples' DNA. The MRSA work is using some of these same techniques, but to analyze the genomes of pathogens instead," he says. ■



Cataloging Eden

**Pioneering work of early naturalist explorers
laid the groundwork for American conservation**



By Rich Hewitt

IN 1804, LEWIS and Clark set off to explore the lands west of the Mississippi River in search of a water route to the Pacific Ocean. Four years later, a young Englishman arrived in America who would follow in their footsteps, one of many New World naturalists who would help to reveal the natural history of the American Midwest.

Thomas Nuttall was an avid collector and an intrepid explorer who became a well-regarded botanist, despite a reputation for unorthodox field methods. He often wandered off into the woods, seemingly unmindful of the perils that awaited in the unknown wilderness, and had to be rescued by travelers and even the Native Americans he encountered. According to one account, when a group of traders with whom he was traveling found the barrel of his rifle filled with dirt, they became convinced he was insane. Nuttall, the story goes, had used the weapon to dig up plants.

“The thing that endeared Nuttall to me was that he was oblivious to the danger he was in,” says University of Maine historian Richard Judd. “This was still a wilderness, but it appears that he relied on everyone to help him out — the settlers, the Indians, the trappers. They all helped him. And I think that’s the kind of quality you need to do the kind of work he did.”

According to Judd, UMaine’s Col. James C. McBride Professor and chair of the History Department, the work that

Thomas Cole
Lake Winnepesaukee, 1827-1828
Courtesy Albany Institute of History & Art

Cataloging Eden

Nuttall and a large group of naturalist explorers like him did in the 18th and 19th centuries laid a foundation for future naturalists, conservationists and environmentalists.

Captivated by the expanse of untrammeled American wilderness that was opening to exploration and settlement between 1740 and 1850, they rambled across the Midwest observing, collecting specimens of the flora and fauna, and writing about what they found. Collectively, they built a comprehensive natural history of the region from the rocks up, and they fostered a way of looking at nature that went beyond the strictly utilitarian view prevalent in Colonial America.

According to Judd, it was a new view of nature that influenced later naturalist and conservationist thinkers, such as Emerson, Thoreau, Pinchot and Muir, and

it is a view that still echoes in conservation thinking today.

Some of these explorer/naturalists became icons of American exploration and natural history, such as Lewis and Clark and John James Audubon. Others, however, are lesser known outside scientific circles and, in the post-Darwinian age that followed their travels, have been largely ignored, not only for their scientific accomplishments, but also for the role they played in the development of conservation ideas.

Those ideas informed the thinking that led to American landmarks in conservation. The roots of conservation thinking in America go beyond the handful of writers, artists and naturalists usually credited with developing conservation ideals, and can be traced to these early explorers.

“By the start of the 20th century,

America was a leader in conservation,” Judd says. “We had all these firsts — the first national park, the first national forest. We pioneered every aspect of conservation and all of this is credited to the ideas of just four or five figures. (But) there’s got to be more to it than that. What led up to that?”

WITHOUT DIMINISHING the work of the later conservation thinkers, Judd says it’s important to look at the broad social and intellectual background of American conservation ideas that were being developed by naturalists such as Nuttall and the hundreds of others who worked and wrote in the century before America’s first national park was established in Yellowstone in 1872. In his newest book, *The Untilled Garden: Natural History and the Spirit of Conservation in America, 1740-*



Thomas Nuttall of Yorkshire, England, was 22 when he came to America in 1808. According to UMaine historian Richard Judd, “admiration and anticipation, sadness and solitude, and, above all, the exhilarating prospect of a primeval woods” shaped Nuttall’s documentation of natural history during the 30 years that he crisscrossed America on his scientific rambles.



American mangle.
Rhizophora americana

Flowers in common with those of the
the only American. (Nuttall)

Flowers, flesh yellow
Stalks, orange-yellow
Leaves in the garden with very small
leaves in the garden with very small
leaves in the garden with very small

Thomas Nuttall (1786-1859), in the style of Bass Otis (1784-1861)
Courtesy of Harvard University Portrait Collection, Gift of Professor Edward Tuckerman to Asa Gray for the University, 1865

Left: Plate 24: American Mangle
Rhizophora americana
Right: Plate 38: Osage Orange
Maclura aurantiaca
Original Drawings of Thomas Nuttall
From the Archives of the Arnold Arboretum
Courtesy of the Digital Collection of the Harvard University Herbaria

1840, Judd argues that “America’s conservation giants” drew on ideas that these early explorer/naturalists developed in their expeditions a generation before.

Those ideas included “a practical concern for protecting those species of birds, animals, and trees deemed useful to human society; a romantic appreciation for the beauty of natural form and primitive landscape; and a close understanding of the complex biological interdependencies that sustain all natural systems,” Judd writes in his book. “These themes — commercial utility, romantic attraction, and ecological necessity — became the foundation for turn-of-the-century conservation, and they are so ingrained in our environmental consciousness today that we hardly give them a second thought.”

Nuttall was at the forefront of this early naturalist movement in America and epitomized the zeal for exploration and discovery in a country whose borders were rapidly expanding. At 22, Nuttall arrived in America in 1808, four years after Lewis and Clark began their journey in search of a westward passage to the Pacific. He had little background in science, but possessed a strong interest in botany and an ardent desire to explore.

“He was curious,” Judd says, “not in the sense of being strange, but he was interested in everything.”

After initial tutoring under prominent Philadelphia botanist Benjamin Barton, he began traveling on collecting trips, first, to nearby Chesapeake Bay and eventually moving farther west into the frontier. One such trek alone covered more than 12,000 miles. Nuttall’s journeys took him from Arkansas to the Midwest and Pacific



“They made no distinctions in describing the people, the plants, the animals and their surroundings. This is the foundation of modern ecology. It’s all interrelated stuff. The role of the naturalist is to find that connection.” Richard Judd

Northwest. He even spent two winters collecting specimens in Hawaii.

Despite the traders’ earlier assessment of his sanity, Nuttall became a well-regarded botanist. Several species of American plants bear his name and he wrote several volumes on botany and ornithology. Even without a formal academic background, he held an endowed chair in botany at Harvard for more than a decade. But Nuttall did not enjoy academia, Judd says, and he left Harvard and went back into the field. By the time he returned to England in 1842, he had earned a reputation as “one of the great field naturalists of his generation.”

NUTTALL, HOWEVER, was not alone, and the work that he and his contemporaries did was as vast as the wilderness they explored. They produced a prodigious amount of scientific data about the American frontier, but Judd argues that to look only at the species they discovered and cataloged misses much of their value. They also documented the “psychic” part of it — how people reacted to the unfolding wilderness, Judd says.

“They were able to document nature as the Europeans found it. The Indians had made some changes, but they walked in these woods that had been that way for a thousand years; old growth forests before we began chopping the trees, tearing up the soil and digging up the minerals. They had the first, firsthand look at the expanse of America. And that’s something important,” says Judd.

Equally important, according to Judd, were the methods employed by the early naturalists. Often traveling on-foot, they supplemented their findings with information gathered by local people they met in the villages along the way. Where earlier settlers had cataloged species based solely on their uses, the new wave of naturalists took time to notice the surroundings, where they observed different species of trees, plants and animals, and took note of their relation to one another.

When they wrote, Judd says, they followed a tradition of the travel journal used by earlier explorers and set down things in order, as they encountered them. They regularly combined scientific data with their own reactions to the setting, and often noted the smell, feel and taste of a place in their observations.

Cataloging Eden

Many of these explorers had been sent to America by wealthy European collectors, and they took scrupulous notes on natural settings in which they found specimens so that they could be successfully transplanted to their patrons' gardens.

"They made no distinctions in describing the people, the plants, the animals and their surroundings," Judd says. "This is the foundation of modern ecology. It's all interrelated stuff. It all fits together in some form. The role of the naturalist is to find that connection."

This sense of connectedness was evident in the works these naturalists produced. Audubon, for example, not only posed and painted his birds in lifelike positions, he also painted those birds in their habitat, in nature, in a way that other ornithologists were not doing at the time, Judd says. He included the background to show the relationship between the individual bird and its surroundings.

Recognition of these relationships came during environmental changes along the Eastern Seaboard, home to the early colonies. In the decade after Maine became a state in 1820, with much of the New England forest cut over and the arable land depleted, settlers began to leave the region and move west seeking new, fertile lands.

As the naturalists watched the vast forests of the Midwest transform into farms and fields, they began to look at the land with a new understanding of these relationships. They not only saw nature as an interconnected whole, they recognized the innate value of the individual parts and the consequences of removing one element from the natural system.

THIS REVELATION was reinforced by contemporary religion and philosophical teachings. Although there often was tension between strict Biblical interpretations and the scientific discoveries of the era, this new view of nature coincided with the religious belief that there was



Plate XI: Figures. 1 & 2 cardinals, male and female (with red tanager)
Alexander Wilson, 1766-1813

The First American West: The Ohio River Valley, 1750-1820
Courtesy Special Collections Research Center,
University of Chicago Library

order, purpose and meaning in nature. The design of nature supported their view that the various species were linked not only to other species and their habitats, but also to their creator.

"They viewed nature as a manifestation of a benevolent God who created a world that fits together so well," Judd says. "They believed nature was a reflec-

tion of a divine being and that understanding nature would help to understand theology and God."

This view of nature influenced the Romantic Movement in America, the New England poets and the Hudson River School of painters, whose works reflected the concept of the divine presence in nature. The movement, Judd says, also provided an outlet for women naturalists who, barred from the professional work of science, found ways to portray their observations of the natural world by creating beautiful works of art that celebrated that world.

Nuttall and his contemporaries helped create in Americans a sense of the wonder that this new world offered — not only a balance in nature, but also a reflection of God's hand in nature, where all things are interconnected. Judd acknowledges that, in light of the subsequent Darwinian view, this spiritual and emotional response to nature became obsolete, even though their science was sound.

And though modern ecologists may reject the idea of balance in nature, Judd maintains the concept remains deeply embedded in the American psyche.

"They gave us the first real impression of nature in America that was full of questions about religion, God and nature; about divine balance and natural systems. They saw nature as a reflection of God's logic in putting the world together. This idea of divine balance is still a part of our environmental sensibilities," Judd says.

"When we protest development on the northern slope in Alaska, we're still seeking that balance. This is still a very real concept for us today." ■

Journalism giant



JAMES RUSSELL WIGGINS began his lifelong career in journalism in 1922. He was a Washington correspondent and managing editor of the *St. Paul Dispatch-Pioneer Press* before becoming assistant to the publisher of the *New York Times*. His distinguished career with the *Washington Post* began in 1947, where he served as managing editor, vice president, and editor and executive vice president. On his retirement, he served as a United Nations ambassador before buying the *Ellsworth American* in Maine in 1969. Wiggins was passionate about American history, economics, military history and foreign policy. He was a champion of press freedom and government accountability, and was instrumental in the passage of the 1966 Freedom of Information Act. In his two decades at the *Washington Post*, he influenced national public policy; in the last 20 years of his life, he was dedicated to issues related to Maine's quality of life. Fogler Library's Special Collections holds the James Russell Wiggins Papers — an archive of correspondence that provides a firsthand look at American political history, from the early years of the Great Depression to the Cold War and civil rights movements. On his death in 2000 at the age of 96, the *Post's* Katharine Graham remembered Wiggins as a “blood and guts” editor and “a thoughtful and sensitive hawk.” ■

Cuban Treasury Minister Rufo Lopez-Fresquet, left, James Russell Wiggins of the *Washington Post* and Cuban Prime Minister Fidel Castro chat before a luncheon at the American Society of Newspaper Editors convention in 1959, where Castro gave an address. The photo is part of Fogler Library's Wiggins Papers, a collection of materials dating from 1908 to 2000.

AT FIRST GLANCE, there's nothing remarkable about the rocky Maine blueberry field in which University of Maine graduate student Nancy Price does her research. But those rocks are crucial to our understanding about how faults work nearly 10 miles below the surface of the Earth. Indeed, that's where rocks are supposedly the strongest.

Price's findings suggest that geophysical assumptions about the strength of faults at different depths may need to be reevaluated. And if we better understand faults, we may be able to better predict the behavior that causes large earthquakes.

Price is studying the Norumbega fault

system, a line of ancient faults that cuts across Maine from Calais to Casco Bay. The now extinct faults were seismically active millions of years ago. Today, the Norumbega system is considered an ancient analog for major earthquake faults, such as the San Andreas fault in California and the North Anatolian fault in Turkey, which have produced some of the deadliest quakes in our time.

Like the San Andreas, the Norumbega is a strike-slip fault where only the shallowest parts are exposed or can be reached by drilling. To study deeper fault rocks, an ancient, extinct zone must be found where the depths have been exposed through exhumation and erosion.

Price is studying a part of the Norum-

Finding faults

Ancient fault rocks provide critical clues about modern earthquakes

“You can’t just look at the surface and ignore what is going on lower down, because the whole fault is a system.” Nancy Price

begs fault in Windsor, Maine, that more than 300 million years ago was situated about 10 miles below the surface, but is now exposed. In a strike-slip fault, two tectonic plates slide against each other. They do not slide smoothly and stress builds up as the plates snag on each other.

Close to the surface, where the rocks are relatively cold, the plates are brittle and rocks break, easily releasing the stress. Temperature increases with depth in the Earth, and at a certain temperature the rock weakens and stretches like chewing gum. The strongest part of the crust lies at the depth where the rock starts to stretch, but can also still crack, a region called the frictional-viscous transition. This is the depth level Price is studying.


“How this region behaves is the key to how the fault works,” says Price, who earned a master’s degree at the University of Massachusetts Amherst. “If we understood it, we wouldn’t have to rely on how often an earthquake ruptures. We could model the fault based on what we understand of the physics of how the rock will behave and predict what will happen.”

Working with geologist Scott Johnson, chair of UMaine’s Department of Earth Sciences, Price originally set out to model the fault using data collected from hundreds of rock samples that were once in the transition zone. These sheared fault rocks contain thin, gray veins called pseudotachylyte — evidence of ancient earthquakes.

But when Price’s samples revealed more pseudotachylyte than expected, she turned her attention to identifying how much of the rock contained these veins and how this might change assumptions of fault strength at these depths.

Price found the process of pseudotachylyte formation causes the size of the mineral grains in the rock to be smaller and the percentages of the minerals to change, causing the thin gray layer to be weaker than the rest of the rock. If enough pseudotachylyte from earthquakes is created over millions of years, the fault itself becomes weaker than is generally accepted.

“This change in perspective will help drive discussion,” Price says. ■



When an earthquake occurs, the rocks on either side of the fault slide so quickly past one another that the heat generated by friction along the fault surface causes temperatures in excess of 1400 degrees Celsius — high enough to cause flash melting of rock. When the movement stops, the thin vein of melt instantly freezes to glass, preserving the evidence that the earthquake occurred. For all their importance, these thin veins called pseudotachylyte are easily overlooked.

Arsenic exposed

Studying the element's effects on the cell

SCIENCE HAS LONG known that arsenic is toxic to humans. Exposure to high doses over a brief period can lead rapidly to organ failure and death. At lower doses over a longer time, arsenic exposure is associated with cancer, diabetes, impaired neurological development, behavioral changes and more.

But the mechanism of arsenic's toxicity is poorly understood. To complicate matters, it appears that some of the same qualities that make it so deadly may actually have a therapeutic effect in specific circumstances. And, importantly, since arsenic is all around us, most people have some exposure.

At the University of Maine's Department of Molecular and Biomedical Sciences, professors Carol Kim and Julie Gosse are learning more about arsenic and the ways it functions in the body. By advancing scientific understanding of its mechanisms, they hope to promote science-based environmental regulations and medical interventions that can mitigate arsenic's toxic effects.

Like its elemental cousins lead and mercury, arsenic (As) is found in naturally occurring deposits from which it leaches into water and soils. It also can be released more rapidly into the environment through natural processes, such as volcanic activity and erosion, and through human activity such as mining and agriculture.

Arsenic is found in manufactured products as well, including wood preservatives, paints, dyes, metals, soaps and medicines, and workers in these industries may be exposed. Arsenic-

containing waste is present in many landfills and dumps. In some cultures, arsenic in high doses has been used as an effective therapy for acute asthma attacks, although its mechanism has been poorly understood and its therapeutic value is offset by its long-term risks.

In Maine, arsenic is present in many public and private water supplies, most often at levels below the 10 parts per billion (ppb) cap designated as "safe" by the U.S. Environmental Protection Agency, following a 2001 rule change that took effect in 2006. Prior to this change, the EPA's allowable standard was 50 ppb.

Public water supplies are closely monitored for arsenic and that information is available to the public through individual water utilities and the governmental agencies that oversee them. But private wells are unregulated and may contain much higher levels. Concerns remain that exposure to arsenic over time — even at very low levels, perhaps below the current 10 ppb limit — poses a significant and pernicious risk to human health.

ARSENIC CONTAMINATION from both naturally occurring deposits and human-produced pollution is a problem across the country, but particularly in Maine and New Hampshire, says Carol Kim, director of UMaine's Graduate School of Biomedical Sciences, who has been conducting research since 1998 on innate immunity and infectious diseases, using zebrafish as a model organism.

Kim's most recent project studies the effects of low levels of arsenic — like those found in drinking

By Meg Haskell

water — on a healthy innate immune response and one compromised by the gene mutation that causes cystic fibrosis. Her study is funded by a \$1.8 million grant from the National Institutes of Health, part of an \$11 million NIH grant to Dartmouth Medical School. The principal investigator is Jason Moore, a computational geneticist at Dartmouth Medical School.

The project draws on the strength of two major milestones in Kim's lab: the development of a zebrafish model for studying cystic fibrosis, funded in 2005 with an NIH grant of more than \$405,000; and a 2007 discovery showing that arsenic exposure at levels deemed safe in human drinking water suppressed the overall innate immune health of zebrafish, causing increased susceptibility to viral and bacterial infections.

"We're trying to understand how arsenic exacerbates cystic fibrosis and the extent to which this effect is brought about by exposure to arsenic as an environmental toxicant," Kim says.

Cystic fibrosis is the most common fatal genetic disease in the United States, according to NIH's National Human Genome Research Institute. An estimated 30,000 people in the U.S. have the disease, which is caused by mutations in the Cystic Fibrosis Transmembrane Regulator (CFTR). Approximately 10 million Americans carry the defective CFTR gene.

In normal cells, the CFTR protein serves as a channel, allowing cells to release chloride and water into the lungs. However, in people with cystic fibrosis, the protein is defective and the cells do not release the chloride, resulting in an improper salt balance and less water on the lung surfaces, producing abnormally thick mucus.

The gene mutations cause increased susceptibility to *Pseudomonas aeruginosa*, a common bacterium in water and soil. *P. aeruginosa* is the cause of chronic infection and irreparable lung tissue scarring in 80

percent of cystic fibrosis patients in their late teens, Kim says. Yet the bacterium is not a common lung pathogen in people with healthy immune systems.

Kim's research has shown that the zebrafish's ability to resist bacterial and viral infection is compromised by exposure to arsenic. She hopes to identify genes and pathways involved in modulating innate immunity in response to arsenic exposure, as well as CFTR modulation. Her data will be shared with a Dartmouth-based biostatistician and a bioinformatics specialist to help identify sets of human genes and signaling pathways that contribute to the innate immune response, respond to arsenic and are influenced by CFTR.

With the NIH grant, Dartmouth Medical School will establish an NIH Center of Biomedical Research Excellence to advance-biomedical research and foster collaboration among scientists from UMaine, Harvard, Jackson Laboratory, Mount Desert Island Biological Laboratory, Maine Medical Center, University of New Hampshire, University of Southern Maine and University of Vermont.

"There is real potential to find genes associated with CF and to identify potential drug targets that could reduce or eliminate many of the debilitating effects of the disease," Kim says.

THERE HAVE BEEN a lot of recent studies about arsenic, says Julie Gosse, "but we need to fill in some of the gaps." Gosse specializes in the study of biochemical, molecular and cellular toxicology with the long-term goal of protecting humans from environmental health risks. At UMaine, she and her students are examining arsenic's molecular activity and its impact on the immune system.

Gosse is looking at mast cells, a type of immune cell found in most bodily tissues that plays a key role in triggering allergies, asthma and inflammation. Mast cells also protect the body from certain types

of parasites. By treating rat mast cells with arsenic, Gosse has determined that exposure inhibits the mast cell process known as degranulation, in which the cells release histamine and other chemicals into blood and tissue.

The result of normal degranulation is localized swelling, warmth, redness, itching and pain. In humans, degranulation can cause allergic reactions, such as asthma and eczema. But degranulation also triggers a healthy immune response that helps fight off parasites and other human pathogens.

Since arsenic is a known endocrine disrupter, Gosse says, it may inhibit normal degranulation by blocking estrogen signaling involved in histamine release. Or, as recent data suggest, the process may be taking place at an early step in the signaling pathway, such as by inhibition of tyrosine phosphorylation, an important signaling process in mast cells.

"We don't fully understand the molecular mechanism yet," Gosse says. She and her students continue to work with rat mast cells and now with human mast cells. In the future, Gosse plans to extend her arsenic research into zebrafish.

It is much too early to apply her findings to human health models, but Gosse says her research may help shed some light on the success of traditional Chinese healers in treating acute asthma attacks with high doses of arsenic. Although the inhibition of degranulation effectively calms swollen and inflamed respiratory tissues, the long-term results of this treatment often include serious chronic illnesses, such as cancer and neurological disorders.

And in populations where persistent intestinal parasites cause serious diarrheal diseases and anemia in children, such as in Bangladesh, consistently elevated levels of arsenic in drinking water supplies may be suppressing healthy immune response and promoting generalized muscle wasting and related disorders.

Gosse came to UMaine in 2008 after completing her post-doctoral work at Dartmouth Medical School. Her work here, funded by the PhRMA Foundation, the Maine Agricultural and Forest Experiment Station, and UMaine start-up funds, builds on recent studies at Dartmouth that first identified arsenic as an endocrine disrupter.

"Someday, this could point to a drug target," Gosse says of her research. She envisions a safe medical alternative that would mimic arsenic's valuable suppressive effects for disorders such as asthma or autoimmune disorders, without undermining overall immune response — and without arsenic's potentially lethal risks. ■

Arsenic (/rɪs ˈn ɪ k/ ar-s -nik) is a chemical element with the symbol As, atomic number 33 and relative atomic mass 74.92.

Arsenic in Maine

ABOUT 40 PERCENT of the people in Maine get their drinking water from private wells and, in general, most people are satisfied with the quality of their well water. However, scientists have discovered that many wells in Maine contain low, but harmful, concentrations of arsenic. Drinking water that contains arsenic may cause illness. As a result, public health agencies have set a maximum safe limit for arsenic in drinking water of 10 parts per billion (10 ppb). In order to help us understand and find ways to manage this problem of arsenic in well water, the Maine Water Resources Research Institute in the Senator George J. Mitchell Center at the University of Maine has funded research and outreach projects. Among the facts about arsenic in Maine's groundwaters compiled from this research:

- Arsenic in Maine is associated with well water (groundwater), not rivers or lakes.
- Arsenic in drinking water has no specific taste or odor. It can only be detected through laboratory analysis performed by certified drinking water testing laboratories.
- If arsenic is detected in your well water, there are qualified contractors available who can install treatment systems to remove it.
- Almost all of the arsenic in groundwater comes from rocks, where the element occurs naturally in certain minerals contained in the rock. Drilling a new well is not likely to solve an arsenic problem.
- Some arsenic-containing compounds were used in the past as pesticides for apples and blueberries. Past use of pesticides may be a contributing source of arsenic in certain agricultural areas.
- The different types of rocks in Maine that may contain arsenic are so widespread that all homeowners using private wells should have their water tested. Wells should be retested every few years or when there is a change in how the water looks or tastes.

If you are concerned about the effects of arsenic in your drinking water or need guidance on dealing with arsenic in your well water, contact the Maine Center for Disease Control and Prevention. (maine.gov/dhhs/mecdc/environmentalhealth/water/resources/arsenic.htm)

When Leigh Johnson was 12, her mother was diagnosed with cancer. For Leigh, who already had dreams of becoming a doctor, the experience underscored the importance of patient advocacy and the possible benefits of alternative medicine. She plans to bring that focus to her own practice for a holistic approach to women's health.

Leigh Johnson, Yarmouth, Maine
Psychology, Pre-Med

Jenny MacDowell's quest for knowledge has taken her around the world, most recently to New Zealand, where she spent a semester at the University of Auckland. While she's drawn to the operating room, she wants to learn as much as she can about other specialties before choosing one.

Jennifer MacDowell, Littleton, Mass.
Biochemistry, Pre-Med, Honors

As a fourth-generation Mainer, Erica Hidu has a deep-rooted commitment to the state and its unique needs. "I try to be realistic about becoming a healthcare professional. We have legitimate problems and issues we need to understand to become better physicians."

Erica Hidu, Hampden, Maine
Microbiology, Pre-Med, Honors

As part of the Maine Mentor program, India Stewart shadowed neonatologist Kumar Akilesh. The first time she witnessed a birth, she was hooked: "I felt completely in my element. I was determined to support this woman and eliminate her fears of natural birth in a hospital setting. That is my goal."

India Stewart, Verona Island, Maine
Biology, Pre-Med, Honors



Doctor's orders

UMaine pre-med students find success in Tufts Maine Track

BORN OF A PARTNERSHIP between Tufts University School of Medicine and Maine Medical Center, Maine Track Early Assurance reserves a limited number of seats per year for sophomores from University of Maine System institutions, and Bowdoin, Bates and Colby colleges. The program was established in 2008 (the first round of students was accepted in 2009) with the hope that a significant number of its graduates will go on to practice medicine in Maine. Since then, 10 UMaine students have been accepted into the program, including the most recent group (above). ■



UMaine Extension is dedicated to ensuring the success of the Maine food system

Farm t

TODAY IN the Maine economy, a traditional sector is growing. While it is age-old, it has a great new image, renewed public support and bright prospects for the future.

Let me reintroduce you to farming.

Once thought a dying industry, farming is realizing a renaissance. In the past decade, 1,000 farms have been added in Maine, where more than 1.3 million acres are in agricultural use. This success is dependent on a well-functioning food system in which policy, research, production,

processing, commerce, nutrition, and food security and safety are integral and interrelated. And that's where University of Maine Cooperative Extension comes in.

UMaine Extension is a significant part of the food system in Maine, which has the largest and most diverse agricultural economy in New England. Sales from farms were over \$614 million in 2010, led by potatoes, milk, poultry and livestock, eggs, greenhouse/nursery, wild blueberries, and other fruits and vegetables. In each of these commodity areas, UMaine Extension provides research-based information from reliable experts that experienced farmers and new growers alike can trust.

UMaine Extension faculty and staff also provide essential background infor-

o fork

By John Rebar, executive director of
University of Maine Cooperative Extension

Photo illustration by Michael Mardosa

mation to policymakers, legislators and others as they decide issues related to the food system, including the regulation of pesticides, licensing of food producers and processors, and ways to stimulate the Maine economy for the future.

Many of the recommendations to Maine's agricultural community come directly from research conducted at UMaine Agricultural and Forest Experiment Station farms. This research-Extension partnership has been working for almost 100 years and is as vital today as it was early in the 20th century

According to the U.S. Department of Agriculture, more than 95 percent of Maine farms are classified as small — operations that lack the resources and expertise to manage all the challenges they face. UMaine Extension experts help them reduce risk and manage threats, such as diseases, pests and weather.

The same is true for the larger agricultural industries. With UMaine's assistance, the wild blueberry industry tripled its production in the past 25 years. The potato industry saves more than \$20 million annually with UMaine's help in managing late blight disease. Maine's maple syrup industry has increased its product quality and profitability, and strawberry, potato and sweet corn growers have been introduced to new varieties to attract customers.

But producing a quality crop isn't enough in our complex economy. UMaine Extension also supports the business portion of the Maine food system, including the development of new and value-added products and food processing improvements. UMaine Extension even offers a Recipe to Market program in which entrepreneurs learn how to launch food-based businesses.

Through its multifaceted support of the Maine food system, UMaine Extension champions and contributes to the success of a growing sector of the state economy.



And because food safety is a major concern for everyone, UMaine Extension provides essential education to producers, processors and consumers. Working in partnership with state and federal regulators, UMaine Extension offers technical information, product testing and problem solving for science-based solutions to food safety.

Similarly, UMaine Extension is committed to using education to address

two of Maine's most urgent challenges: hunger and childhood obesity. It is estimated that two-thirds of Maine adults and more than a quarter of high school-aged youths are overweight or obese — a reality that has serious implications for the health of Maine people. In addition, the USDA estimates that 200,000 Mainers don't have enough to eat.

That's why UMaine Extension is committed to initiatives such as Maine Harvest for Hunger, an effort to grow fresh vegetables and fruits to donate to food pantries and soup kitchens. Horticulture education leads to better gardens and nutrition education provides information on how to prepare healthy meals.

Extension also conducts an education program for SNAP (Supplemental Nutrition Assistance Program) recipients to help them learn to stretch their resources and better feed their families, make wise dietary choices and develop healthier lifestyles. This successful program exists in every county in Maine.

Through its multifaceted support of the Maine food system, UMaine Extension champions and contributes to the success of a growing sector of the state economy. It's a natural role for Extension, a part of Maine's land-grant university. Now more than ever, University of Maine Cooperative Extension is making a difference people in the state can taste. ■

MAINE'S BEECH trees have been under attack for decades by beech bark disease that typically appears as disfiguring cankers on a tree species that's supposed to have a smooth and silvery bark. Affected trees grow slowly and can survive for years. But the diseased beech produce few beechnuts, a loss of an important food source for the Maine black bear.

According to University of Maine researcher William Livingston of the School of Forest Resources, warmer winter temperatures from 1999 to 2002 allowed populations of the invasive, bark-feeding scale insect to explode and incite a more lethal stage of the disease. Insect feeding and the severe drought at that time weakened the trees' resistance to fungal infection, and many trees died, including those along the Quebec border that were previously unaffected by the disease.

Livingston and Matthew Kasson, a former UMaine graduate student now at Pennsylvania State University, reached these conclusions after sampling hundreds of trees in the affected area. After 2002, typical sub-zero winter temperatures and normal summer rains returned, and the scale populations disappeared. However, the damage was done and beech died from 2003 to 2005, say Livingston and Kasson, who published their findings in the journal *Forest Pathology*.

**Fatal
beech
weather**



Archival photo (above) of UMaine folklorist Edward "Sandy" Ives at the tape recorder taking an oral history — one of the 3,000 audio recordings, 10,000 photographs and 325,000 transcript and manuscript pages that will be part of the Library of Congress collection.



Nearly half a century ago, a folksinger came to Maine to teach English and pursue music. The rest, as they say, is history.

National treasure

A NEW COLLABORATION between the University of Maine and the Library of Congress will preserve a unique archival collection that documents the history and traditions of Maine, other New England states and Canada's Maritime Provinces. The collection, known as the Northeast Archives of Folklore and History, was developed over the course of decades by legendary UMaine professor and folklorist Edward "Sandy" Ives (1925–2009).

The collaboration will lead to preservation according to the highest possible standards, while dramatically expanding access to the collection's audio and video files, photographs and other materials. The library will acquire the collection, preserve it at its state-of-the-art facilities and provide research access. Digital copies will be available at the Maine Folklife Center on campus.

Northeast Archives of Folklore and Oral History contains unrivaled documentation of community life, traditions and iconic occupations of the region, including commercial fishing and logging. Materials include more than 3,000 one-of-a-kind audio recordings of interviews with ordinary people about their lives.

Facilitating the collaboration were UMaine Folklife Center Director Pauleena MacDougall and alumnus David Taylor, head of research and programs at the American Folklife Center at the Library of Congress. Taylor, a Fairfield, Maine, native who graduated in 1974, studied anthropology and worked closely with Ives.



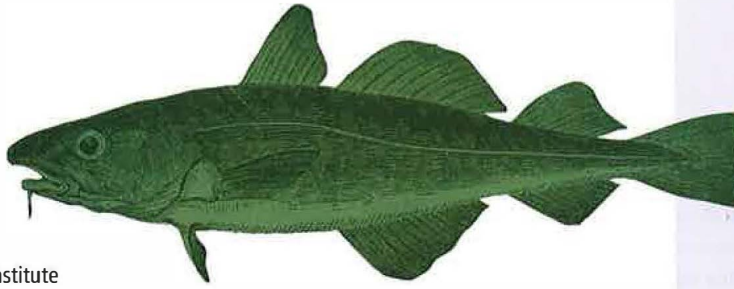
The invading fungus *Neonectria*, responsible for killing beech weakened by insect feeding and drought.

Big Fish

ARE BIGGER fish better? That question is at the root of a collaborative research effort by scientists at the University of Maine and the Gulf of Maine Research Institute (GMRI). The project will look at how changes in the sizes of fish in a given population influence overall health and ability to resist external pressures, such as fishing and climate change.

Andrew Pershing, a UMaine associate professor and ecosystem modeler at GMRI, will lead the study, which has received a three-year, \$215,000 grant from the Lenfest Ocean Program. Pershing will be joined on the project by GMRI fisheries ecologist Graham Sherwood and UMaine researcher Walt Golet.

The team will build a series of computer models to examine the consequences of what is known as "fishing down the size spectrum." The researchers will tailor their models to Atlantic cod and northern bluefin tuna.



"As an animal gets bigger, its metabolism becomes more efficient. Consequently, removing one large fish may have a larger impact than removing the same weight of smaller fish."

Andrew Pershing

Advancing red tide monitoring

UNIVERSITY OF MAINE Research Professor Laurie Connell will lead a team of researchers investigating methods that would provide early warning detection of toxic *Alexandrium* blooms, also known as red tides, in the Gulf of Maine.

In the three-year, \$574,028 project funded by the National Oceanic and Atmospheric Administration (NOAA), UMaine will receive more than \$201,000 in the first year.

Some species of *Alexandrium* algae produce toxins that can become concentrated in shellfish tissue. Eating shellfish tainted with these toxins can lead to paralytic shellfish poisoning (PSP), a potentially fatal human illness.

The research will allow scientists to detect and measure levels of toxic *Alexandrium* cells in water samples, providing Maine officials with an early warning of increased potential of PSP contamination in shellfish.

The project could pave the way to similar projects in other regions affected by harmful algal blooms.

HUMILITY TRUMPS arrogance when it comes to offering assistance to others, according to a University of Maine psychology researcher.

In a three-part research project involving 310 students at Baylor University, UMaine psychology lecturer Jordan LaBouff and colleagues found that people determined to be humble were more willing to donate time and resources to a hypothetical student in need. The results held true even when researchers controlled the study for potential influencers, such as empathy, agreeableness and other personality traits.

LaBouff says the finding is particularly surprising since nearly 30 years of research on helping have demonstrated that the situation — not the person — tends to predict whether someone in need will receive assistance.

The research builds on a growing body of evidence that humility is an important trait that results in a variety of pro-social and positive outcomes, says LaBouff, the lead author of an article on the study, published in *The Journal of Positive Psychology*.

Humble and helpful



CLAMS OF all kinds are big business in New England, but the razor or jackknife clam, while worth between \$2.50 and \$6 per pound, has not been a focus of clamdiggers. The elongated, elusive, edible bivalve is hard to dig and usually is only accessible at extremely low tides, resulting in an inconsistent supply. Market demand would likely increase if a steady supply of quality razor clams could be developed.

Paul Rawson of the University of Maine School of Marine Sciences is leading an effort to develop ways to grow razor clams on shellfish farms. With a more than \$93,000 award from the Northeast Regional Aquaculture Center, Rawson will work with Dale Leavitt of Roger Williams University, Diane Murphy of Woods Hole Sea Grant and Cape Cod Cooperative Extension, and Dana Morse of Maine Sea Grant and University of Maine Cooperative Extension.

In previous work, Leavitt evaluated the equipment and techniques needed to culture razor clams. While the approaches showed promise, Leavitt reached a bottleneck in the hatchery. The team hopes to produce 1 million juvenile razor clams in 2012, working at the University of Maine Darling Marine Center, the Roger Williams University Blount Shellfish Hatchery, and the Aquacultural Research Corp., in Dennis, Mass.

Gaining a razor's edge



Helping preserve political research

THE UNIVERSITY of Maine is now operating and maintaining the Margaret Chase Smith Library in Skowhegan, Maine, on behalf of the Margaret Chase Smith Foundation.

Since its opening in 1982, the library has been operated under the auspices of Northwood University of Midland, Mich. On Jan. 1, the Margaret Chase Smith Foundation, an organization established by Sen. Margaret Chase Smith in 1983 to support the library, assumed ownership and responsibility of the library.

The Margaret Chase Smith Library is recognized as one of the premier Congressional research libraries in the United States. It has a four-fold mission of serving as an archive, museum, educational facility and public policy center.

Margaret Chase Smith was first elected to the U.S. House of Representatives in 1940 and to the U.S. Senate in 1948, where she served until January 1973. She was one of the most successful politicians in Maine history, the first woman in the United States to be elected to both the House and Senate, and the first woman from Maine to serve in either chamber. She became the first woman to have her name placed in nomination for the U.S. presidency at a major party's convention in 1964.



Margaret Chase Smith was the first woman in the United States to be elected to both the House and Senate, and the first woman from Maine to serve in either.



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AS I SHARED WITH the campus in my October Community Conversation, the UMaine family has embarked upon a planning process this academic year that will be characterized as inclusive, substantive and innovative to produce a bold yet pragmatic plan for our future.

We're calling this the Blue Sky Project, and with good reason. A blue sky symbolizes clarity, opportunity and hope. Blue sky ideas are necessary when the difficult problems that we are facing require "thinking outside of the box." Blue is the color of Maine and the University of Maine. It is also the color of success, which we will achieve, together, through creative thought and action.

Dr. Linda Silka and the Margaret Chase Smith Policy Center are facilitating this planning process with the Strategic Planning Leadership Team and the President's Cabinet. We will be diligent about seeking your input through the convening of a number of focus or cluster groups to clearly identify the current strengths of and challenges facing UMaine (who we are today), the right vision and opportunities for UMaine (where do we want to be in five to seven years) and how we achieve our vision (a financially sustainable strategy).

I invite you to fully participate in this process through one or several of the venues being provided by the planning process. We sincerely desire to achieve a consensus-based vision and plan to unveil in April 2012. I hope you will join us in this effort.

A handwritten signature in black ink, which appears to read "Paul W. Ferguson". The signature is fluid and cursive, with a long horizontal line extending to the right.

Paul W. Ferguson
President

"SPIFFY alumni Matt Bouchard and Anh Do joined us for dinner. They are prime examples of successful Maine graduates who are now working on Wall Street. Their first-person perspectives on breaking into the industry and living in the city were the highlight of the trip for me."

SPIFFY co-president Jacob Day, accounting and finance major, Byram, N.J.



Mike Boyson of Morgan Stanley Smith Barney (from left) meets with SPIFFY vice president Paul Brown, Jimmy Smith of Morgan Stanley Smith Barney, UMaine Finance Professor and SPIFFY adviser Bob Stong, SPIFFY vice president Hoang Nguyen and SPIFFY co-presidents Christopher Burrell and Jacob Day on the New York Stock Exchange trading floor last November. Photo by Michael Lisnet

The SPIFFY Endowment Fund was established at the University of Maine Foundation in 2003 to provide general financial support to UMaine's Student Portfolio Investment Fund. Principal from the SPIFFY Endowment Fund supports such endeavors as an annual trip to New York, where student investors meet with Wall Street consultants and visit the New York Stock Exchange trading floor. At UMaine, these students gain invaluable experience by managing a \$1.6 million real-money portfolio. But for many, the Wall Street trip brings their career aspirations into sharper focus. An investment in the SPIFFY Endowment Fund is an investment in the future of finance. Please consider making your gift today.

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