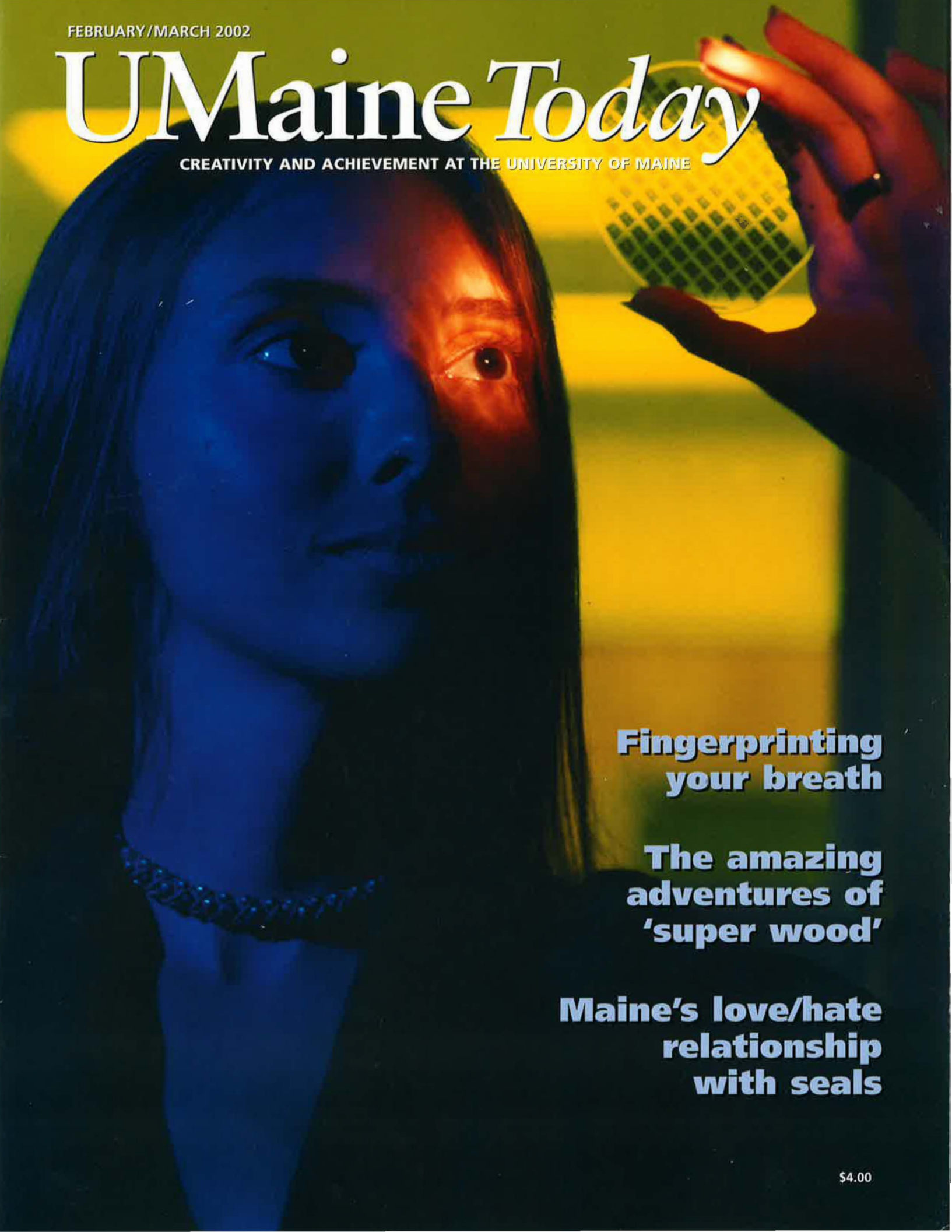
FEBRUARY/MARCH 2002

UMaine Today

CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE



Fingerprinting your breath

The amazing adventures of 'super wood'

Maine's love/hate relationship with seals

$4.00

From the President

ONE OF THE University of Maine's most distinctive qualities — and, from an educational and economic standpoint, one of its most important — is UMaine's role as a research university. Of the 3,800 accredited universities and colleges in the U.S., UMaine is one of just 145 schools to hold the Carnegie Foundation for the Advancement of Teaching's top classification — "Doctoral Research Extensive University." No other institution in Maine qualifies for this category.

Sometimes people think the term "research" refers only to the physical sciences and engineering. In fact, research encompasses all forms of academic scholarship, including that which involves the arts, humanities, social and behavioral sciences, and professional disciplines. While UMaine maintains an impressive national reputation in science and engineering, its reputation in those other research areas is equally strong — and as vital to the needs of our state.

Photo by Kathy Rice

In the last few years, Maine policy leaders and voters have expressed a deeper commitment to all aspects of University-based research and their interrelationship with liberal education, job creation, and economic growth. Policy makers increased state appropriations for higher education following years of budget cuts and flat-funding during much of the 1990s. State leaders also created the Maine Economic Improvement Fund to help the University leverage federal and private research funds, opening learning and discovery opportunities for students and faculty alike — not to mention the economic benefits that millions of dollars in federal matching funds provide.

In 1998 and in 2001, Maine voters approved, by wide margins, two bond proposals to improve higher education's ability to educate people and to create new economic opportunities for businesses, entrepreneurs, and job seekers. Through those bond issues, Maine voters sent a clear signal to policy makers: the public values higher education, and wants the state to invest in higher education as an economic growth strategy.

And the investment is paying dividends, even in the midst of the current economic recession. At UMaine, enrollment continues to grow impressively, both in quality and quantity. The faculty's performance as teachers and scholars receives high marks by all measures of quality. Our graduates are having no trouble finding employment or being accepted to graduate school. More and more businesses and entrepreneurs are turning to UMaine for help developing products or growing market share.

This issue of *UMaine Today* offers a good cross section of the many ways The University of Maine is addressing today's educational, cultural, social, and economic challenges. That's the essence of our mission as Maine's flagship university, and as Maine's center of learning, discovery, and service to the public: making a difference for Maine and its people.

Peter S. Hoff
President

1865 THE UNIVERSITY OF MAINE

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Located in Orono, Maine, The University of Maine is the state's land-grant and sea-grant institution. UMaine serves its home state through its explicit statewide teaching, research, and public service outreach mission. Offering 90 four-year, 61 master's, and 24 doctoral degree programs, UMaine provides the most varied and advanced selection of programs available in Maine. The Carnegie Foundation for the Advancement of Teaching classifies UMaine as a Doctoral Research Extensive University, the highest classification.

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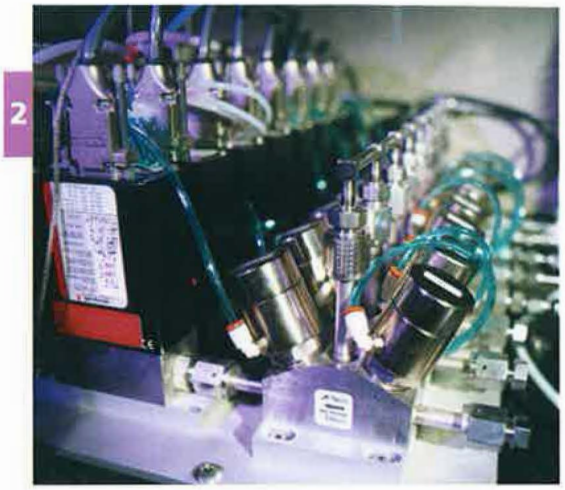

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Cover Photo by Larry Ayotte ©

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Photo by Toby Hollis

LASST Research Scientist George Bernhardt, right, and physics graduate student Luke Doucette build sensors by depositing a precise coating of tungsten oxide on the surface of a sapphire crystal wafer. By adjusting the coating's thickness and composition at the atomic level, the researchers can improve the sensor's performance.

Every breath you take

LOOKING FOR A CHEMICAL FINGERPRINT IN HUMAN BREATH

YOUR BREATH SAYS MORE about you than what you just had for dinner.

Scientists have known for years that there are hundreds of chemicals in what we exhale. Until now, however, they have not been able to distinguish them clearly. At The University of Maine, scientists are studying human breath to understand its chemical components and what those compounds can tell us about the health of our bodies. The result of such research could produce powerful new medical tools, including techniques for early identification of disease, and, ultimately, detection of exposure to biological warfare agents, such as anthrax.

One of those tools is under development in the UMaine Laboratory for Surface Science and Technology (LASST). Physicists, chemists and electrical engineers are developing new sensors and analytical methods that may one day lead to practical hand-held devices for monitoring chemicals in the breath, much like a thermometer registers temperature. Their focus is on the technology to detect nitric oxide.

In the body, nitric oxide has many functions. The gas is an important molecular regulator. Nitric oxide actively regulates the body's immune, central nervous and cardiovascular systems. Its action on the relaxation of blood vessels is critical to the effectiveness of medications such as nitroglycerin and Viagra.

Accurate measurement of nitric oxide levels is important because it is known that certain amounts of the gas are associated with the presence of infection, Alzheimer's and other diseases.

"Nitric oxide has been a hot molecule in the medical community for a number of years now," says Robert Lad, professor of physics and director of LASST. "You can buy a detector (to measure nitric oxide in breath) for about $30,000. It weighs 80 pounds. Every major hospital probably has one or two of these instruments."

While these detector systems work, they need to be calibrated frequently to help prevent errors. Moreover, they are too heavy and expensive to be routinely used in the field by emergency personnel.

Not only must the technology to monitor human breath be efficient and effective, it also must be capable of distinguishing one chemical in the breath from another. For instance, while we can measure alcohol in breath with enough accuracy for legal purposes, identifying other components such as nitric oxide is still expensive and prone to error.

UMAINE'S RESEARCH EFFORTS in breath analysis grew out of a project funded by the National Institutes of Health (NIH) at the Sensor Research and Development (SRD) Corp., in Orono, Maine.

NIH's goal was to develop a less expensive and more reliable way to monitor nitric oxide in breath. Subsequently, the Defense Advanced Research Projects Agency funded nitric oxide research focused on detecting exposure of military personnel to biological weapons.

The availability of a consumer product that could provide an early warning of illness requires many more years of research. While much of the fundamental science behind such a device is complete, some important issues for routine use in the field have not been resolved. Lad estimates that it would take several years of product engineering and perhaps as much as 10 years of biomedical research before a practical device could reach consumers.

Photo by Toby Hollis

"We would like to identify markers that will tell us something about the health status of a person," says Chemistry Professor Touradj Solouki. "We can use the presence or absence of identified biomarkers in a breath sample to determine if a person is healthy; moreover, we can develop sensors to detect identified biomarkers we think are important."

However, milestones are being realized.

LASST has succeeded in demonstrating to the Defense Advanced Research Projects Agency a stable and sensitive system for detecting nitric oxide. At the heart of the system is a microelectronic chip, about the size of a quarter, that operates like a miniature hot plate. It literally burns gases, indicating the presence of nitric oxide by monitoring a change in the chip's electrical properties.

"In terms of nitric oxide in human breath, we're very close to having something that works quite well," says Lad. "Now if you want to couple it with another sensor that provides additional health signatures in breath, such as a sensor for ketones (the result of glucose metabolism), that adds complexity."

One of the technological hurdles is selectivity. "If you can make these little metal oxide sensors selective, you've got a home run. They're inexpensive and highly sensitive. The problem is that they're sensitive to everything," says Carl Freeman, president of SRD, one of UMaine's private-sector partners.

LASST is addressing that problem by modifying the sensor surface and filtering the breath before it gets to the sensor. Compounds that might confuse the sensor are removed.

ACCURATELY IDENTIFYING chemicals in breath is the focus of research by Touradj Solouki, an assistant professor in the UMaine Department of Chemistry. Solouki is leading a team of scientists in creating a "breath print" of a healthy person.

"We would like to identify markers that will tell us something about the health status of a person," Solouki says. "We can use the presence or absence of identified biomarkers in a breath sample to determine if a person is healthy; moreover, we can develop sensors to detect identified biomarkers we think are important."

Candidates for such biomarkers include compounds found to be potential indicators of health problems, ranging from diabetes and cancer to high cholesterol.

Solouki uses highly accurate technology that separates molecules on the basis of atomic properties. Far too heavy and expensive for work under battlefield or emergency response conditions, such tools are nevertheless creating the foundation for development of practical, lightweight sensors.

Eventually, Solouki hopes to develop a breath analysis method that, because of its accuracy and reliability, is accepted by government agencies and research laboratories as the standard protocol for research purposes.

One day, a small nitric oxide sensor for human breath might become part of a multi-sensor array about the size of a cell phone that could be used for a variety of health and environmental purposes.

ONE DAY, A SMALL nitric oxide sensor for human breath might become part of a multi-sensor array about the size of a cell phone that could be used for a variety of health and environmental purposes. Technicians could install many sensors on a single chip, and the user could decide which ones to select. In emergency situations, medical rescue personnel could adjust the device to measure a variety of vital signs in human breath and quickly determine whether immediate treatment is needed.

Rapid response may be the greatest benefit of the developing sensor technology. "Many of the applications for which there are existing technologies are not (in) real time," says Freeman. "You go out, take samples and process them. Three hours later — or three days later — you get the highly accurate result. That's hardly acceptable. (We're) looking for accurate, real-time sensors. There is real promise with this technology."

by Nick Houtman

Plugging R&D

INTO MAINE'S ECONOMIC DEVELOPMENT FORMULA

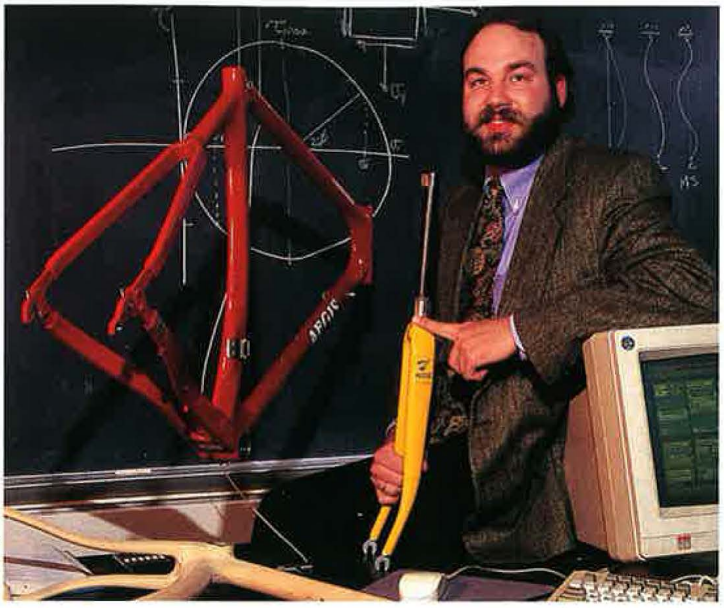


Photo by Michael York

Jake Ward is instrumental in linking higher education with Maine business and industry

IF MAINE'S ECONOMY was a single company, Jake Ward would be its chief of research and development. He would be identifying industrial research needs, seeking investment in new product ideas and promoting the development of business opportunities.

In his real-life role as director of The University of Maine Department of Industrial Cooperation (DIC), Ward performs many of these duties for UMaine and the University of Maine System. He is a chief liaison between higher education and the state's business community.

"How The University of Maine interacts with business and industry is critical to Maine's current and future economy," he says. "We have the intellectual and laboratory resources at UMaine to solve problems and evaluate ideas. We work hand in glove with the private sector to apply the knowledge that faculty have gained through their research.

"Ultimately, we want to help existing companies grow and new companies become competitive," Ward says. "The bottom line is a strong economy with jobs for the graduates of our technical colleges and universities."

Ward meets frequently with Maine private business owners, public and non-profit agency officials, and investors. He stays tuned to what companies need and envisions what entrepreneurs require to develop tomorrow's products and services.

Among the recent collaborations in Maine, the University has worked with Kenway Corp., Augusta; Applied Thermal Sciences, Sanford; and Houlton Photonics.

Last year, DIC administered about 150 UMaine projects with $1.8 million in contracts in areas ranging from pulp and paper manufacturing and damage detection in the composite hull of a NASA spacecraft to evaluation of voice-activated software benefitting the wood products industry.

Through these and other efforts, DIC helps to solve the day-to-day problems of the companies that drive the state's economy. Companies contract with DIC, which then hires the faculty and students, and leases the facility to do the project.

To avoid competing with businesses, Ward makes sure a company's needs cannot be met in the private sector. If they can, he seeks to apply University resources to fill any gaps. In all cases, businesses pay for UMaine support.

While Ward focuses on serving today's businesses, he also is laying the foundations for new enterprises that may help to guarantee Maine's economic future. He is quick to point out that the path from the laboratory to the marketplace is long and uncertain, but it is a road that the state must travel if it is to remain competitive in the global economy.

There are plenty of potential potholes. Financial commitments are required. Collaboration must be arranged between scientists and businesses. Patents must be secured, and innovative ideas must be developed for economic success. Technical skill on the one hand must be matched by entrepreneurial commitment on the other.

Maine's R&D strategy focuses on so-called incubators, facilities that bring businesses and scientists together under one roof. Ward has been instrumental in marshaling support for two new incubators — the Center for Cooperative Aquaculture Research in Franklin and the Target Development Center in Orono. In addition, he has supported other incubators for composite materials, biotechnology and environmental technology.

"These facilities bring researchers together with business people to refine technology and the business practices that are necessary to translate that technology into a commercially viable product. The goal is for the enterprise to outgrow the incubator and move into the commercial sector on its own," Ward says.

by Nick Houtman

Genome ('jē nōm) n. an organism's genetic material.

The Genome Puzzle

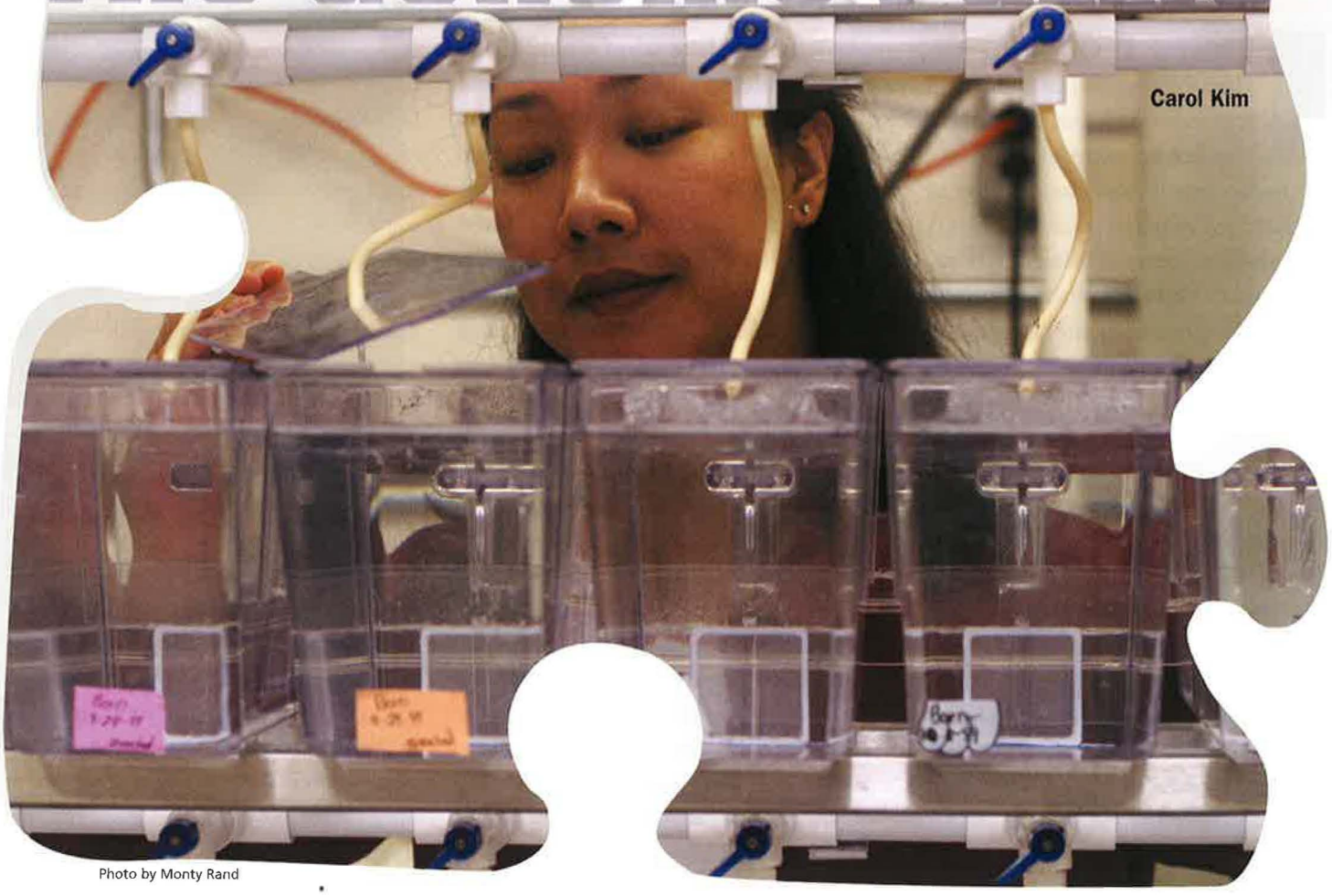
SEQUENCING OF THE HUMAN GENOME has provided scientists with the genetic blueprint of the human body — profound knowledge with "immense new power to heal."

But many complex challenges remain as researchers seek to understand how information encoded by the 3.1 billion DNA letters of the human genome can be translated into therapies and prevention strategies for human disease. The vast new field of functional genomics probes the interrelationships between the approximately 30,000 genes in the genome and their complex expression in human cells.

"We're at the point of learning a new language," says Keith Hutchison, professor of biochemistry and molecular biology at The University of Maine. "You've got all the letters, but you don't know what the words mean. How does a word function in a sentence, in a body of text? What are the grammar rules? The genome sequence is only the beginning in understanding gene function."

Success in deciphering the "book of life," as the genome sequence has been called, depends on cross-disciplinary research. Cooperation will be required among geneticists, biologists, physicists, chemists, mathematicians, engineers and computational scientists. New analytical tools must be developed, and model organisms such as the mouse and zebrafish are essential to enable the study of human disease genetics.

UMaine is catching this next wave of the genetics revolution, implementing a model organism program and building on its strengths in physical sciences to collaborate



Carol Kim

Photo by Monty Rand

with non-profit and academic biomedical research organizations statewide. Biophysics, biochemistry and computational biology programs have been identified as key "bridging disciplines" that can enable biomedical discovery, enhancing research strengths in mammalian physiology, genetics, genomics and bioinformatics at the state's non-profit labs.

Collaborating with UMaine researchers are Maine Medical Center Research Institute, Mount Desert Island Biological Laboratory, The Jackson Laboratory and the University of Southern Maine.

The following projects are part of this developing biomedical research network, helping to put UMaine on the genomics map.

Zebrafish

In Hitchner Hall, Assistant Professor of Molecular Biology Carol Kim presides over one of UMaine's favorite model organisms. The 1- to 2-inch-long zebrafish, a popular aquarium fish, provides insights into developmental biology, neurobiology, genetics and toxicology. Like the mouse and fruit fly, the zebrafish can serve as an experimental surrogate for studying the molecular basis of disease in humans.

The zebrafish offers researchers a rapid reproductive rate, abundant offspring, hardiness in the laboratory, and a transparent embryo in which development can be followed. Sequencing of the zebrafish genome by an international consortium should be completed in 2002. This will facilitate comparative genomics research, in which pinpointing disease-causing genes in a model organism can lead to identification of genes with similar functions in humans.

Future research may include a large-scale project to chemically induce genetic defects in zebrafish, modeled on projects in mice at The Jackson Laboratory. These new models are needed to help identify underlying complex disease physiology.

In other genomics research, Hutchison; Rebecca van Beneden, UMaine professor of marine sciences; and Barbara Knowles, director for research at The Jackson Laboratory, plan to compare gene expression in zebrafish and mice to determine if the same genes are responsible for activation of the embryonic genomes.

Computational biology

Genome research creates huge amounts of data requiring powerful computational techniques to verify, interpret and compare content. Several UMaine collaborative projects are addressing this challenge.

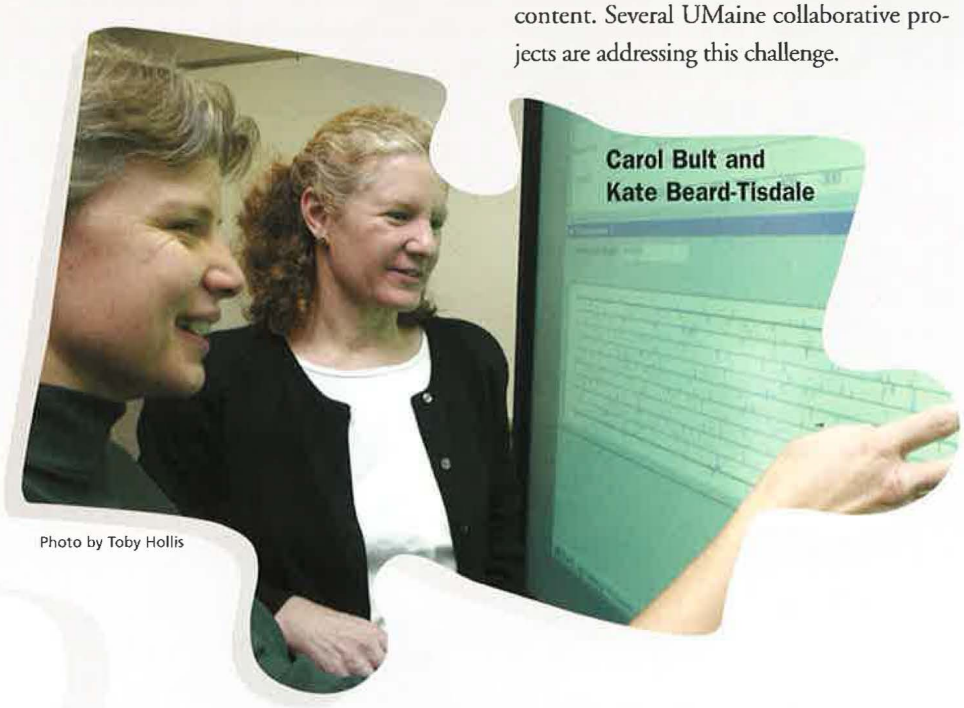


Photo by Toby Hollis

From simple zebrafish

TO SOPHISTICATED SUPERCOMPUTERS, UMAINE SCIENTISTS PIECE TOGETHER A PICTURE OF HUMAN DISEASE GENETICS.

The GenoSIS (Genome Spatial Information System) project marries the expertise of Kate Beard-Tisdale, UMaine professor and chair of the Department of Spatial Information Science and Engineering (SISE), and Carol Bult, associate staff scientist in bioinformatics at The Jackson Laboratory. With SISE Professor Max Egenhofer, they are building a tool that could find wide use in genomics research.

The goal is to use computer software to visualize data, recognize patterns and adapt techniques developed for the analysis of geographic-scale data to the big biology datasets.

The GenoSIS researchers are working to graphically visualize spatial relationships in genes, to develop a streamlined query system and to make the resulting maps interactive and scalable.

"Taking into account space and time in the analysis of gene expression will be like the difference between video and still photos," says Bult, who is extensively involved with the design and development of the mouse genome information databases at The Jackson Laboratory.

"Being able to analyze and compare the dynamic nature of gene expression patterns should provide insights into gene regulation and cellular biology that aren't possible using current analytical methods," according to Bult.

Rapid data interpretation

Mohamad Musavi, UMaine professor of electrical and computer engineering, and colleagues are applying their expertise in computer software development to improve the accuracy and accessibility of genomics data.

His laboratory specializes in the design of intelligent systems, using high-powered mathematical techniques like artificial neural networks "to make computers smarter and faster at their tasks, to give them a kind of human-like intelligence and some ability to learn," he says. Past projects include automating the classification of mouse chromosomes.

His team, including Research Associate Professor Cristian Domnisoru, tackled the human genome sequence after deciding they could improve on a critical step in data interpretation using improved pattern recognition and filtering software that incorporates a technique known as adaptive learning feedback. The goal is to reduce the error rate in identifying the four-letter bases of the rungs of the DNA double helix.

Biophysics

The newest "bridging discipline" between the physical sciences and genomics research is rapidly gaining the attention of scientists and funding sources nationwide. Based in the Laboratory for Surface Science and Technology (LASST), the UMaine biophysics initiative holds great potential for collaborations with research institutions statewide.

A planned zebrafish project taps the biosensor expertise of Paul Millard, assistant professor in LASST and the Department of Chemical Engineering, particularly his use of fluorescent

Keith Hutchison

Cristian Domnisoru

probes to track gene expression. The team, including Carol Kim and Touradj Solouki, assistant professor of chemistry, will use fluorescence detection and mass spectrometry to identify subtle changes in biochemistry and physiology that might normally escape detection in developing zebrafish embryos. A long-term goal is to apply these non-invasive biosensing approaches to mice.

Physicist William Unertl and chemist Carl Tripp plan a project to improve the performance of gene expression microarrays, addressing problems of data inconsistency caused by characteristics of array surfaces. The improvements are to be tested on mice and zebrafish.

Planned collaborations include a project with the Center for Molecular Medicine at the Maine Medical Center Research Institute to develop biomaterials to aid the center's research efforts in cell growth used for tissue repair and organ replacement. Another with The Jackson Laboratory involves miniature biosensors for measuring such features as intraocular pressure in the eyes of mice.

Education

Some of the most promising initiatives in UMaine's collaborative biomedical research effort are in graduate education. They include the Cooperative Ph.D. Program in Molecular Genetics and Cell Biology, established in 1999, and the proposed Interdisciplinary Ph.D. Program in Functional Genomics of Model Organisms.

Faculty in the cooperative programs come from UMaine, University of Southern Maine, The Jackson Laboratory and the Maine Medical Center Research Institute. Other participating institutions include Eastern Maine Medical Center, the Foundation for Blood Research, and Mount Desert Island Biological Laboratory. The program is coordinated at UMaine by Hutchison and at The Jackson Laboratory by Knowles.

The long-term result of these cooperative education programs will be stronger research ties between institutions statewide.

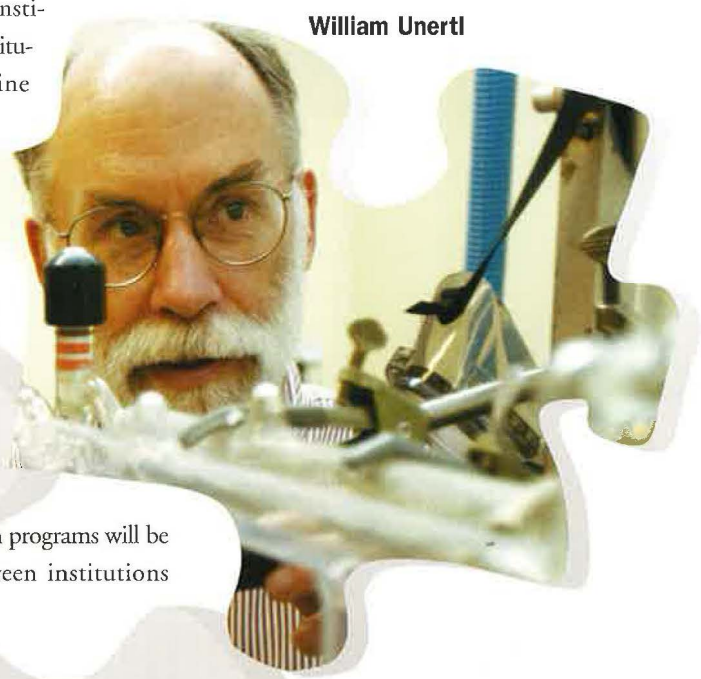
"These students will be a part of the state's biomedical research network from the very beginning of their careers," says Hutchison.

"They can serve as ambassadors between UMaine and the institutions where they studied and conducted research, and they can help lead the effort to build bridges between disciplines."

by Luther Young

Photos by Toby Hollis

William Unertl



THE PROPOSED INTERDISCIPLINARY PH.D. PROGRAM IN

Functional Genomics of Model Organisms

WILL TRAIN STUDENTS TO WORK IN A VARIETY OF FIELDS TO UNLOCK THE MYSTERIES OF HOW THE HUMAN GENOME FUNCTIONS.

Not Business as Usual

Management professor helping companies think through unsettling questions in unsettling times

John Mahon — Photo by Toby Hollis

AS ONE OF THE nation's preeminent scholars of business strategy and policy, John Mahon has long been recognized for his ability to help CEOs tackle the most difficult, unsettling questions.

But since Sept. 11, businesses large and small are more than ever reconsidering how they operate. Major corporations located in our largest cities — and the most obvious targets for future attacks — are reevaluating everything from how they store records to where they locate their offices.

It is no longer business as usual.

"The timeframe in which business operates and makes decisions has continued to shorten, and executives know this," says Mahon. "But the requirements of running global — and even local — businesses are straining 'managerial' resources.

"Executives need to think faster, act quicker and consider new threats to business as usual — or find new ways to deal with them. These threats can include terrorist acts like those that occurred Sept. 11, rapid downturns in economic activity as a result of growing interdependent economies, or the sudden and unexpected loss of personnel, data or information. Survival of the fittest may not be the appropriate term, but rather survival of those who are flexible and prepared for 'abnormal' contingencies. This requires some new thinking on the part of executives and a willingness to think out of the box on issues that have not taken up much time in the past.

"The question, 'How well prepared are we?' takes on new urgency here, as the response, 'Prepared for what?' has new and broader meaning," Mahon says.

A PROFESSOR OF MANAGEMENT, Mahon came to The University of Maine School of Business in 2001 as the first John

M. Murphy Chair of International Business Policy and Strategy. His responsibilities include enhancing the study of international business and strategy, and working closely with the University's William S. Cohen Center for International Policy and Commerce.

For 23 years, Mahon served on the faculty of the School of Management at Boston University. He has published more than 80 articles and 75 cases. In his writing, he examines corporate political strategies, public affairs and business, management theory, and the politics of healthcare. He co-authored *Industry as a Player in the Political and Social Arena: Defining the Competitive Environment*, as well as a series of textbooks on management.

Last summer, he brought together business leaders and educators from Arizona, Maine, New Mexico and New York with counterparts from Canada, the Netherlands and the United Kingdom for a two-day conference, "Conversazione 2001: Public Affairs, Issues Management and Political Strategy." Participants discussed how business and industry could shape governmental policy to improve their competitive climate.

In his current research, Mahon is studying states as competitors — how they attract business, and, in turn, more and better-paying jobs. He holds up Tennessee as a model. And he has begun to look at Maine.

"In the next five or seven years, Maine's going to have to figure out where it's going," he says. "Is it going to be a place for campgrounds and retirement communities? Or is it going to be something else as well?"

He questions what he perceives to be an absence of a plan for broadening the diversity of the state economy. Without more attention to diversification, he says, Maine is in trouble.

"If you don't like high taxes, and if you don't want your children to continue leaving the state for good-paying jobs, you'll need a broader-based economy than you have now. You'll need a plan to get it done," he says.

"And time is not an ally."

ON SEPT. 11, the Massachusetts-based parent company of the clothing retailer T.J. Maxx lost five top executives when hijackers flew two airliners into the World Trade Center. The international investment firm Cantor Fitzgerald, headquartered in the Twin Towers, lost 700 employees in the attack.

In the aftermath, businesses grew hungry for ways to make their operations safer. Suddenly, the terms "strategic planning" and "crisis management" took on a greater level of complexity. And, Mahon says, recommendations assume greater poignancy.

In his current research, Mahon is studying states as competitors — how they attract business, and, in turn, more and better-paying jobs.

"I can't help but think Europeans, despite the horror of the attack, might look at all this with a wry smile. Northern Ireland, England, Germany, Spain, Italy, Greece; Europe has been living with this sort of thing for years. We've always thought it can't happen here.

"In corporations, we have strategic planning," Mahon says. "We believe a plan will insulate us. A plan might make us feel good, but it doesn't protect against everything."

Sept. 11 has forced us to reconsider questions such as how we deploy our workforce and how we store our records, Mahon says. For years, the question of data and storage was: What happens if the method of storage goes bad or wears out?

"But we never gave thoughtful consideration to the question, 'How do we survive without it?'" he says.

SURVIVAL OF A COMPANY is tied to how it responds to crisis, Mahon says. Crisis could be a terrorist attack. Or a car accident that kills the top management team, or a warehouse fire that destroys inventory and critical records.

"I ask executives to think about these things. They want to turn away. They say, 'Go away, Satan, you remind us of our own mortality.'"

But it's precisely these reminders, Mahon says, that force a new look at a crisis plan that "was written in 1964, that names deceased or retired people as contacts and lists phone numbers that no longer exist."

To adapt adequately to the new business climate, Mahon says an important next-step is the consideration of basic questions. What do most people want in life? Chances are they want to make a contribution to society, and they want to live comfortably, and without fear.

Safety, unfortunately, no longer is limited to concerns about garden-variety auto theft, assault or an apartment break-in. In post-Sept. 11 America, the young business-school graduate might well love the opportunity and financial package a recruiter offers. But she rejects it because she won't work on the 78th floor of the Sears Tower.

"Any reasonable CEO is thinking about decentralization," Mahon says. "Is it smart to have (an) entire organization in one or two sets of buildings? What reasonable measure should (a CEO) be driving for?"

Just as important as the threat of more terrorist attacks is the perception that more attacks are coming. And if you don't believe the power of perception, take a look at the recent financial losses suffered by the airline, travel and hospitality industries, Mahon says.

If executives intend to spread out their operations, they are shopping for new locations.

"Let's be realistic. The chances of being hit (by terrorists) in a place like Maine are extraordinarily low," Mahon says. "It sounds like we're suggesting ambulance chasing, but we're discussing a reality. If businesses are going to be looking for places to move, why not encourage a move to Maine?"

There's a question for state economic developers to consider.

by Gregory Reid

Reading Boys

Leading educators find disconnect between boys' literacy in and out of the classroom

YOUNG READERS ARE wild about Harry. Harry Potter, that is.

When J.K. Rowling introduced the young wizard to the world in 1996 in the first of four books, she unleashed the magic of reading for boys and girls. Suddenly, parents and educators found themselves in the midst of a reading phenomenon, looking hard at the power of literacy both in and out of the classroom. Especially for boys.

But boys' interest in reading is nothing new to literacy professors Jeffrey Wilhelm of The University of Maine and Michael Smith of Rutgers University, who have long shared concern over media reports and public perception generalizing boys' social and academic shortcomings.

In their collaborative new study, the researchers found that there's more to the perceived plight of boys' literacy. That's despite standardized tests that show that the widest gender gap in learning achievement is in literacy, with boys' scores in reading far below those of girls, and continuing to slide.

The findings of the research by Wilhelm and Smith soon will be in a book, *Reading Don't Fix No Chevies: The Role of Literacy in the Lives of Young Men.*

Wilhelm and Smith followed a diverse group of adolescent boys, examining their favorite activities, as well as their attitudes toward reading. The researchers looked at how boys' literate behavior plays into their interests.

What Wilhelm and Smith found was a total disconnection between in-school and out-of-school literacy. Boys considered to be problem or highly reluctant readers in the classroom had very rich literate lives outside of

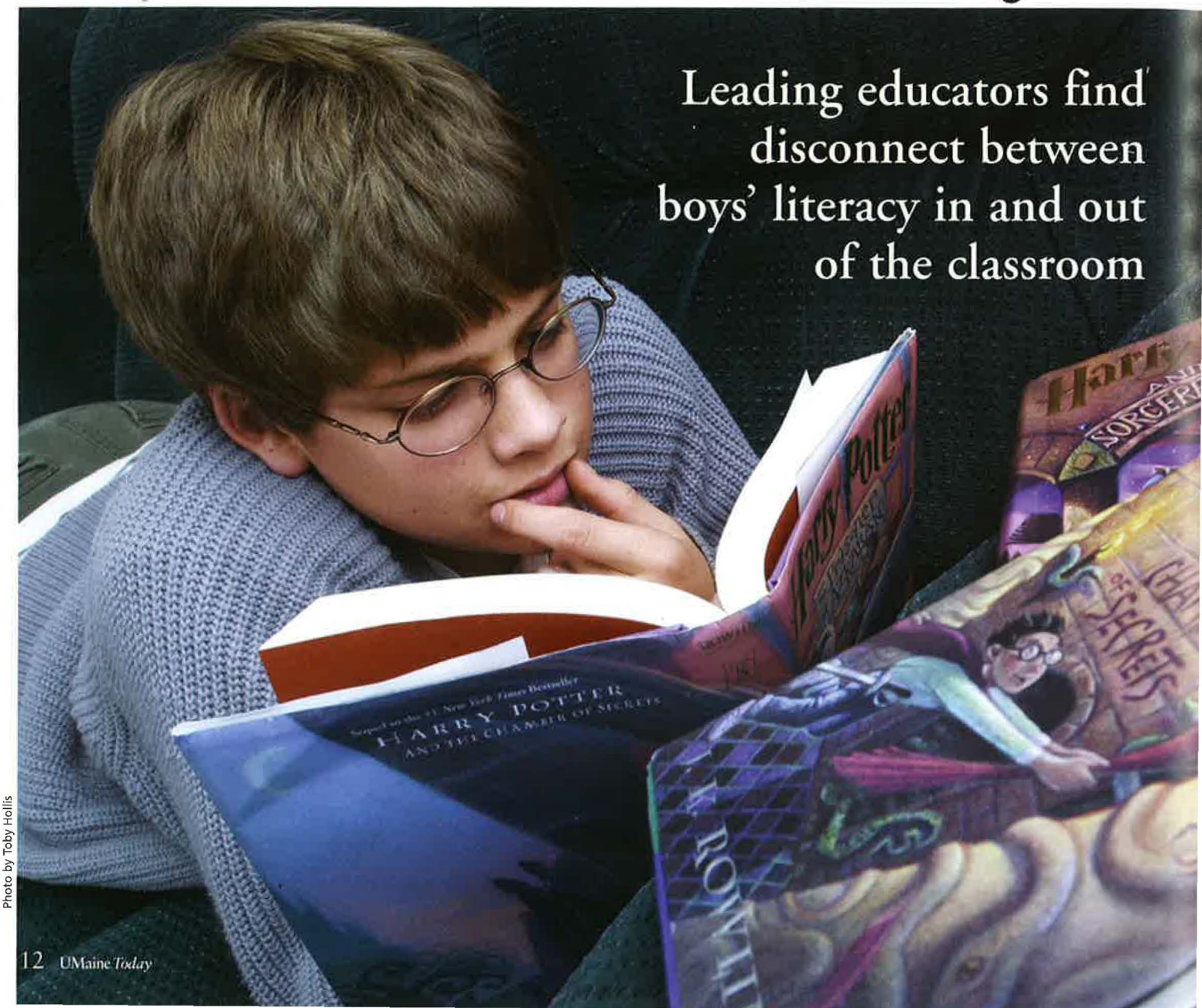


Photo by Toby Hollis

school, and used various forms of literacy to pursue their interests and goals.

As educators, Smith and Wilhelm are particularly concerned that the focus on boys' generalized problems overlooks individuals and obscures strengths that schools and communities could build on. They also worry that assessment of boys' literacy achievement is weighed entirely by their success in school.

The study both supports and challenges teachers to involve students' interests and the ways they use extracurricular literacy in school to a greater extent.

"We've just made teachers' jobs harder by suggesting that they should conceive of curriculum as inquiry, not content, and that you can't teach kids unless you know them, care about them and address them at their point of need and interest," says Wilhelm.

THE YEAR-LONG STUDY, supported by the Spencer Foundation, involved 49 sixth – 12th grade boys of different ethnicity, social class and school success at four diverse sites in three states: an urban high school; a comprehensive suburban high school; a rural school; and a private all-boys school. Approximately one-third of the boys were regarded as high achievers, one-third as average achievers and one-third as low achievers.

The boys, who chose pseudonyms for the project, ranged from Mick, a non-reader who subscribed to trade magazines about cars and mechanics, to Zach, an honors student whose literacy activities outside school focused on an elaborate role-playing game with friends.

The researchers' findings defy the broad social and academic categorization of boys:

- Instead of being totally disinterested in school, the boys recognized the necessity of schooling for future success and the real-life goals they desired — freedom, possibilities and achievement.
- The boys valued the information they took from their reading, but not necessarily the experience of reading.
- Rather than floundering, the boys were goal-oriented and accomplished in various areas of their lives. For many, literacy was part of that accomplishment. They enjoyed popular culture texts, including comics and cartoons. They knew and talked about music. They liked video games, movies and TV shows. Many read sections of daily newspapers to keep up on their areas of interests, subscribed to specialty magazines, searched the Internet and communicated electronically with friends.

IN ESSENCE, NONE of the boys in the study rejected literacy. What they did almost universally reject was "school literacy."

For example, Rev, an 11th grader, maintained that he hated school so much that it depressed him to attend, and he dismissed English as being about "nothing." Yet he watched the Discovery and History channels, and wrote music in a different style for the three bands in which he played.

"Literacy construed broadly had an important place in the lives of all the boys in the study," says Smith. "Unfortunately, the ways schools use literacy don't align with the ways boys use it."

Most of the boys expressed a dramatic contrast between school reading and life reading. For instance, school reading was assigned, unconnected to their interests, too long and hard, and involved mostly literature; life reading was freely chosen, built on their interests, and was usually short texts that they felt competent to read.

WHILE emphasizing their own belief in the importance of the traditional role of literacy and literature in the classroom, Smith and Wilhelm advocate teaching literacy in a framework of inquiry — question-oriented instruction designed to motivate, engage and sustain student interest. Through inquiry, they say, students can call on their own experience, identify problems, hear and critique other perspectives, and use what they learn.

"People think teaching is telling because that's what has been done, not because that's the way it has to be. Research clearly shows that it is not the best way," Wilhelm says.

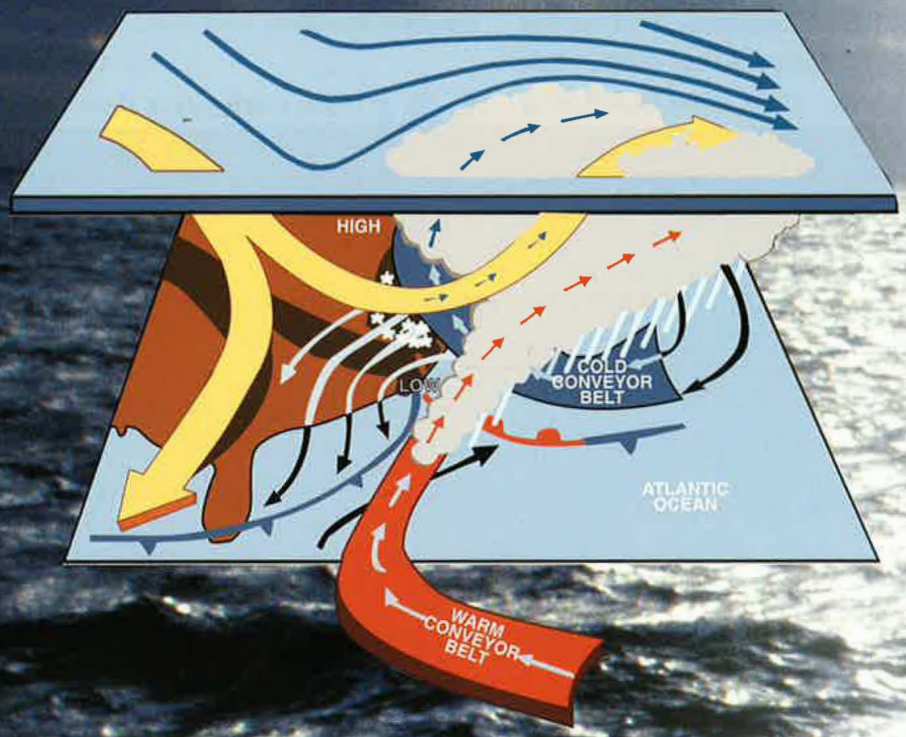
The researchers recommend that teachers expand their view of what counts as worthwhile reading; offer a choice in what students read; connect literacy instruction to the interests boys value; create lessons that are active, social and visual; teach before students read the text rather than after to give them a sense of competence going into the reading; and work to develop home-school connections to get to know students as individuals.

Smith and Wilhelm say they, too, are challenged to redefine and broaden their definition of literacy. The educators are taking a closer look at how they help aspiring teachers in their own classes clarify their goals for students.

by Kay Hyatt

Where the Sea Meets the Sky

Ocean Modeling Could Lead to More Accurate Weather Forecasts



UNIVERSITY OF MAINE oceanographer Huijie Xue loves a good nor'easter.

For her, the excitement is in seeing how sea and sky come together at the inception of such stormy weather. It's that little-understood interaction that Xue is modeling in the research laboratory.

It is basic science that one day could build the foundation for more accurate weather forecasting.

Working with computer models, Xue and her colleagues have already seen how cold winds can draw heat and moisture out of the water, modify water circulation patterns and push the Gulf Stream farther offshore. The net result is a transfer of heat from the ocean to the atmosphere — a major factor in storm development, she says. In fact, the largest sea-to-air transfer of heat ever measured occurred over the Gulf Stream.

Xue is a member of the ocean modeling group and an associate professor in UMaine's School of Marine Sciences. Ultimately, her work will help scientists to understand how the ocean and atmosphere work together to produce day-to-day weather, as well as long-term climate.

Schematic Representation of Airflow Through a Northeast Snowstorm

Figure courtesy of NASA/GSFC, used with permission of Louis D. Uccellini. From *Snowstorms Along the Northeast Coast of the United States: 1955 to 1985*, American Meteorological Society, 1990.

Photo by Bill Silliker Jr.

Oceanographer Huijie Xue Photo by Toby Hollis

Every winter, masses of cold, dry Arctic air slide south across the North American continent before encountering a river of warmth from the sub-tropics, the Gulf Stream. The resulting collision tends to create some of New England's most dramatic weather.

As a specialist in scientific modeling, Xue and her colleagues turn theories into sets of equations that are run on some of the world's fastest supercomputers. Their models can reveal details of the natural world that might otherwise remain hidden. They have shown, for example, that heat drawn out of the sea by cold winds can cool the ocean to a depth of more than 100 meters.

In collaboration with some of New England's top marine scientists, Xue has applied her scientific skills to studying the circulation of Penobscot Bay and the Gulf of Maine.

Xue graduated from one of China's leading oceanography programs before coming to the United States in 1986 to earn a graduate degree at Princeton University. It was there that she began to work with researchers who created the Princeton Ocean Model, one of the world's premier ocean circulation models. Later, as a post-doctoral researcher at the University of North Carolina, she worked with scientists who were applying that model to understanding the Gulf Stream and the weather.

In terms of the Gulf Stream's role in climate, Xue says, there's still a lot we don't know. The Gulf Stream carries heat northward, but how much and how it varies with time is poorly understood.

"During the winter when you have polar air coming from Canada — dry and very cold when it hits the ocean — it generates a lot of heat and moisture flux," she says. "The heat and moisture add fuel to the atmosphere cycling system and create very strong storms. That's why we often see a low-pressure system develop along the mid-Atlantic coast just south of New England.

"That's the region where we find what is called an 'explosive development cyclone,'" says Xue, who has adapted a mathematical model developed at the University of Oklahoma to study tornadoes.

Direct weather observations over the open ocean are key to validating the accuracy of scientific models. However, data collection is expensive, and only two major projects in the last decade have generated data on air and sea temperatures, humidity, wind speeds, cloud cover and other details that could aid researchers.

When conditions are right, scientists on research cruises see water rising like chimneys into the clouds. It's a stunning example of just how close the sea and sky are related, says Xue.

"What we see are chimneys of water vapor rising into the air. Most of the time, the boundary between the air and water is clear-cut, but during those events, the water is exchanging rapidly. The chimneys go from the ocean surface to the bottom of the cloud, and you see a lot of them. It's a stunning scene," she says.

by Nick Houtman

THE AMAZING ADVENTURES OF SUPERWOOD

Composite Research Is Adding Muscle to Maine's Mild-Mannered Timbers

Technology at The University of Maine is transforming the state's lower-grade wood species into "super wood" — new value-added building materials.

Engineers and wood scientists at UMaine's Advanced Engineered Wood Composites Center (AEWC) are developing new materials by combining wood with space-age plastics, such as fiber-reinforced polymers (FRPs). The goals: stronger, cost-efficient construction materials to build structures that withstand natural disasters, such as earthquakes and hurricanes; marine piers that resist decay and pest infestation, such as shipworms; and strong bridges that last longer, offering an alternative to traditional spans of steel and concrete.

Wood composites will help the country address a variety of problems, according to Habib Dagher, AEWC director and a professor in the Department of Civil and Environmental Engineering, whose confidence in wood composite technology stems from years of testing in both the laboratory, and in existing bridges and piers.

Assistant Director of AEWC Steve Shaler, top photo, works with scientists and engineers who are laying the foundation for new materials by studying how wood and polymers interact at the levels of individual cells and molecules. Photos by Toby Hollis and Monty Rand

"Our research has already demonstrated the potential for wood composites to lower costs, increase efficiency and improve the performance of structures. Our goal is to demonstrate the reliability of new applications and move as quickly as possible to the marketplace," says Dagher.

Insurance industry figures put the annual average cost of natural disasters in the United States (in damages to property and loss of life) at about $50 billion, he says. Meanwhile, according to the National Partnership

for Highway Quality, 25 percent of the nation's bridges are deficient, and wooden poles and pilings need to be replaced because of rot and insect infestations.

In pursuit of its goal, AEWC opened a 33,000-square-foot laboratory for building and testing wood composite materials in 2000. Formal partnerships have been created with industry, government research labs and other universities. Research by AEWC scientists has already led to three patents, and two more applications are pending.

"In the last five years, we have focused on building a world-class laboratory. Now that we have achieved that, we are turning our attention to research and economic development," Dagher says.

At its core, the laboratory is a teaching facility where students work with faculty to develop new technology. They use sophisticated computer models to determine what happens to wood as it breaks or as adhesives permeate pores and bind the wood to other materials. They build structures that they shake, bend and twist to simulate years of wear and tear.

Working directly with the business community is John Fiutak of UMaine's Department of Industrial Cooperation. Before coming to UMaine, Fiutak ran a manufacturing facility for Willamette Industries in Albany, Ore., a major producer of engineered wood building materials. He has been meeting with landowners and managers in Maine's forest products industry to lay the groundwork for a facility in the state to make laminated wood beams, known as glulams.

One focus of Fiutak's efforts has been a product that could be Maine's first step into the engineered wood products industry. It takes advantage of low-grade red maple, hard maple, birch and beech already being produced as a residual in some mills. AEWC research has shown that when these materials are glued together into beams, they can out-perform industry standards for strength upward of 30 percent. Red maple is Maine's most abundant hardwood, but it has little commercial value.

Habib Dagher, (right) AEWC director and professor in the Department of Civil and Environmental Engineering, has long stressed the importance of using technology to transform Maine's abundant timber resources into new, value-added products.

AEWC is working on revisions to building codes to include this product, says Fiutak.

More than 75 million board feet of glulams were sold in the Northeast and Canadian Maritimes for the residential construction market in 2000, he points out, but the closest manufacturing facility is in New York state. Moreover, that facility specializes in high-end softwood products. Fiutak's vision is for a plant

Photos by Toby Hollis

Wood composites products under study

- Structural beams
- Building panels
- Furniture
- Skateboards
- Marine pilings
- Rot-resistant decking
- Highway guardrails
- Utility pole crossbeams
- Bridge decks and girders

to turn out hardwood beams that will be custom cut to almost any length and delivered to a contractor's specifications, reducing labor costs at the building site.

While hardwood laminated beams are close to reality, the future lies in products that take advantage of the low cost and flexibility of wood and the high strength of FRPs. "Wood is one of the best materials available from the perspective of strength to cost," says Robert Lindyberg, AEWC research engineer, "but it suffers from a perception as a low-tech material. We are working to change that. Wood composites are very much high-tech."

Research by AEWC scientists has already led to three patents, and two more applications are pending.

Photos by Toby Hollis

AEWC engineers and scientists are attacking that problem on several fronts. In the laboratory, they are subjecting wood composite materials to stresses and strains that are more severe than what they might actually encounter in a structure. Samples of composites are repeatedly drowned in water and dried out. They are run through freeze-thaw cycles, bombarded with ultra-violet light and subjected to constant pounding and bending.

At issue is not only the integrity of the wood and FRP. The glue line between the two is critical. Failure there could drastically reduce performance and cause a structure to become dangerously weak. Researchers now are taking a microscopic look at how well different adhesives keep wood and FRP together.

In addition to laboratory studies, AEWC has created a network of demonstration projects to monitor the performance of bridges and piers in actual use. Most of the projects are located in Maine, but others exist in Pennsylvania and Ohio, and more are planned across the country as part of collaboration with state departments of transportation and the Federal Highway Administration.

One of those projects, a commercial marine pier in Milbridge, Maine, met performance requirements with a composite structure weighing a third as much as a conventional one made of reinforced concrete. Today, trucks drive over a deck made with laminated wood and sheets of FRP applied at AEWC.

Also in Milbridge is a two-lane road bridge built with timbers that are strapped together with half-inch thick FRP cables, a technology known as post-tensioning. The bridge has proven its worth by requiring less maintenance than a similar AEWC-built structure in Gray, Maine, that uses standard steel rods in place of the FRP. Whereas the steel rods have to be retightened frequently, the FRP cables do not.

During the first two-and-a-half years of service, the FRP cables lost 14 percent of their tension strength compared to a 67 percent loss in the steel rods. Both bridges were built to be safe even without the tensioning. UMaine has received a patent on the FRP cable technology.

An AEWC project in Pennsylvania shows that futuristic wood composite products can even have a role in historic preservation. A timber structure partially built with composite beams now carries the Delaware Canal, originally constructed in the 1830s, over Tohickon Creek. Lindyberg worked with the aqueduct's owner, the Pennsylvania Department of Conservation and Natural Resources, and the U.S. Forest Products Laboratory to design the structure.

Another AEWC project, a road bridge scheduled for construction in Crenshaw County, Ala., uses the same approach as a smaller AEWC bridge in Medway, Maine. The

large load-bearing beams that support the structure will be made of laminated planks with an FRP layer on the bottom of each beam. Repeated tests at AEWC show that an FRP layer nearly doubles beam strength, even when lower-quality woods are used.

The AEWC's FRP technology also has been applied to the concrete pillar of a highway overpass in Bangor, Maine. The goal is to determine if the material can extend the life of the pillar by protecting it from road salt.

At all of the demonstration sites, AEWC engineers monitor structural performance under a variety of operating conditions. Much of the work is simple and straightforward. Researchers load dump trucks with sand, drive the trucks onto bridges and measure how far the structures sag. They also visually inspect beams and decks, and in some cases, use strain gauges to make precise measurements.

Their data show how wood-FRP hybrids perform under a range of temperatures, humidity levels and loading stresses. With more composite bridges planned in the next few years, AEWC is working with the Federal Highway Administration to develop national engineering standards for the use of wood composites in highway infrastructure.

While these structures provide a foundation for AEWC research, new ventures are giving students and faculty other opportunities. For example, in the last year, stress tests have been run on building panels strengthened with FRP. The goal is to create a product that will effectively withstand the stresses of hurricanes, earthquakes and other disasters, saving money and lives. That work is supported by a grant from the National Institute of Standards and Technology.

Repair or strengthening of existing wooden structures is another avenue that AEWC researchers have explored. In one experiment, solid beams were cut nearly in half, then patched with FRP. Tests showed that the patches restored the beams to full strength.

Through contracts with private companies, AEWC technicians now are evaluating wood composite designs for skateboards, furniture, decking, home construction materials and shelving. In each case, they are testing the ability of wood-FRP technology to add value to products used in daily life — and to meet the nation's building needs in the 21st century.

by Nick Houtman

Photo by Monty Rand

Photo by Michele Stapleton

Composite cables were used to strengthen a "post-tensioned" timber bridge in Milbridge, Maine, pictured above, left. UMaine's composite research is made possible by state-of-the-art equipment, both in the laboratory and on the floor of the Advanced Engineered Wood Composites Center. Photo by Toby Hollis

UMaine wildlife ecologist keeping count of the state's growing seal populations

The Bold and

LOOK BEYOND THE endearing coal-black eyes, whiskered face and soft short fur and you'll find a carnivorous wild animal with sharp claws and teeth. Look into the depths of the complex marine ecosystem and you'll find culpability is not black and white when it comes to seals.

Wildlife ecologist Jim Gilbert says the realities about seals lie somewhere between two opposing views of the marine mammals. And he should know. He's studied seal populations for almost 30 years.

For many landlubbers, seals are imbued with marine mystique. Adult seals in the Maine wild draw sightseers while stranded pups on beaches spark all-out rescue efforts. The most famous of Maine's harbor seals was André, whose life is immortalized in a children's book, film and a marble statue. However, for those who make their living from the sea, seals can be the bane of their existence. Since 1972, seals have been under the Marine Mammal Protection Act, but little protects fishermen and fish farmers from the damage seals do to equipment, such as fishing nets and aquaculture pens.

Lobstermen claim seals steal bait from traps and eat shedding crustaceans. Seals are blamed for hurting Maine's Atlantic salmon industry by preying on farm-raised and wild stocks. The recent dramatic decline of cod has been linked to the increasing seal populations in Maine. But it's not that simple, says Gilbert.

"One could also argue that cod and seals are competitors for a

Photo by Bill Silliker Jr.

the Beautiful

common food source," he says. "When cod decline, seals increase. The marine ecosystem is more complex than the classic food chain."

Gilbert's research focuses on population studies of large mammals. Throughout his career, he has traveled to some of the most remote corners of Alaska, Russia and the Antarctic to conduct population surveys that inform wildlife conservation and management methods and policies. He also has worked to develop effective methods for censusing marine mammals. He has studied brown bear and moose, bottlenose dolphin and harbor porpoise, polar bear, and gray and white whales. Pacific walrus are Gilbert's long-time preoccupation. Seals have been the mainstay of his research.

"I had never seen a seal until I went to Antarctica," says Gilbert, who, as a gradate student, eventually spent two seasons on the continent studying four species of seals. "Prior to our trip, only a dozen Ross seals had ever been sighted. On our two-week trip, we saw 50."

In his wildlife population studies, Gilbert has witnessed a number of awe-inspiring sights. On a 1989 survey undertaken in cooperation with Russian scientists, he saw a quarter of the world's gray whale population. Once on a walrus study in the Chukchi Sea in the Arctic Ocean, an opening in the ice revealed the presence of 5,000 white whales.

Such unexpected sights in nature make even the most veteran scientist involved in wildlife population studies stop and take in the beauty. That curiosity and fascination also are behind Gilbert's decades of research. No matter how many thousands of harbor, ringed or gray seals

Photo by Steve Renner

IN THE MARINE WORLD, Marcy Lucas is the equivalent of a law enforcement profiler. She is studying the modus operandi of the most wily, slippery predators known to Maine's Atlantic salmon industry — harbor seals.

"Seals have individual personalities," says Lucas. "Some are very aggressive and others will let you scratch them under the chin. I actually have a lot of respect for them."

In January 1999, Marcy Lucas began work in the aquaculture section of the Maine Department of Marine Resources (DMR), based in Boothbay Harbor. That fall, she enrolled as a part-time graduate student in wildlife ecology to pursue research directly related to her work in marine resources.

Lucas is capturing and radio tagging harbor seals found near aquaculture pens. In her research, Lucas seeks to understand whether the same or different harbor seals are showing up at the fish farms to prey on stock. She also is studying the proximity of these seals' favorite haul-out spots to the aquaculture sites.

In Maine, more than 60 percent of farm-raised fish that escape from aquaculture facilities are the result of harbor seal predation. Such releases cost the industry thousands of dollars and threaten Maine's wild Atlantic salmon, which were recently put on the endangered species list.

Along the coast, there are 44 aquaculture sites leased through the state Department of Marine Resources. As part of her research, Lucas is surveying 35 of the farms about seal predation problems and the preventative measures employed at the sites. She follows up the mailed questionnaires with site visits.

Lucas' research will help determine the effectiveness of predation prevention methods now in use. She also will look for site characteristics and management practices that make some farms less vulnerable than others.

"To help them protect their investment, the (Atlantic salmon) industry needs a better understanding of the nature and frequency of predation. The Department of Marine Resources is interested in reducing escapes. Understanding the nature of the interaction between seals and farm-raised fish will allow us to mitigate the problems in the long run," Lucas says.

he's counted, there are still more data to collect and questions to be answered. Especially in Maine.

"Off the coast of Maine, the big questions have to do with the increasingly complex seal populations," Gilbert says. "We don't just have harbor seals born in Maine any more. Colonies of gray seals have been established. In the winter, we have harp and hooded seals in the Gulf of Maine in numbers that never used to be there."

HARBOR SEALS HAVE BEEN part of Maine's marine ecosystem for centuries. Early Native American middens in the state include the bones of harbor seals. Gray seal bones also were found in middens. However, there has not been any indication they were pupping in Maine prior to 1994.

Today, it is estimated that 250 gray seal pups are born off the coast annually. "It may be that some from Canada are moving down," Gilbert says. "On Sable Island (Nova Scotia) fewer than 200 gray seal pups were born in 1962; the breeding site has now broken 20,000 pups each year."

Gilbert has been involved in tagging seals off the Maine coast since 1981. He also has done more than a dozen aerial surveys of seals since that time.

It takes almost six days to do an aerial survey of the Maine coast. That involves hours of continuous flying in a small aircraft, usually repeatedly circling areas for the best photos of seals at altitudes as low as 600 feet.

Along the Maine coast there are more than 3,000 islands and ledges of varying size, including those only exposed at low tide. Such ledges are haul-out sites where seals sleep, pup and molt, and researchers get the best census opportunities.

The two annual peaks in harbor seal haul-out numbers occur during the pupping and molting seasons in May – early June and in late July – early August, respectively.

In 1981, Gilbert's first seal survey in Maine found a harbor seal population of 10,450; by 1997, there were 30,990. These were actual counts; some seals are always in the water and not counted.

As the population increases, researchers predict that harbor seal pupping areas will expand in the near future, making the sea mammals residents rather than visitors on the coasts of states south of the Maine – New Hampshire border.

More seals mean more damage to fishermen's harvests and aquaculture pens. And while harbor seals are the primary raiders of fish farms, gray seals may join the vandalism as their colonies become more established.

"In the Atlantic salmon issue, many people blame the growing number of seals for problems with predation, including damage to equipment and release of farm-raised stocks," Gilbert says. "But when you look at seals' food habits, they have little to do with salmon. However, two or three seals at the mouth of the river catching wild salmon are like a fox in a henhouse. That's not a population problem but an animal damage problem caused by a handful of individuals."

GILBERT'S NEWEST RESEARCH focuses on the predation by seals at the mouths of Maine's wild Atlantic salmon runs. One of his graduate students, Marcy Lucas, is working with commercial aquaculture facilities in the state, where the majority of the escapes of farm-raised fish are attributed to harbor seal predation. Graduate student Steve Renner is studying the interaction between harbor and gray seals.

In spring 2001, the three were involved in a seal tagging and population survey project, working in cooperation with the National Marine Fisheries Service in Woods Hole, Mass., and Maine's Department of Marine Resources. Twelve seals were radio tagged in Cape Cod, and another 17 were tagged in Rockland, Maine. The seals each received two radio tags, one glued to the lower back, another on a rear flipper.

The radio tags last about six months before they are lost in late-summer molting.

The tagging operation is designed to help scientists determine the fraction of the population in the water when aerial surveys occur. While the latest data are still being compiled, it appears that any aerial counts of seals should be multiplied one-and-a-half or two times, Gilbert says.

Increases in population size, including a rising number of pups, are indicators of a lot of good food for these animals. In this year's survey, Gilbert saw more seals on ledges along the Maine coast than ever before.

"It could be because they have more protection, more food or fewer competitors, or that there's less pesticide contamination in the ecosystem," he notes.

One question to be answered in Maine concerns the distinction of seal colonies within a species. Determining the distinct groups of seals living along the Maine coast could shed new light on such dynamics as survival and reproductive rates — and their future relationship with people in the state.

by Margaret Nagle

Photo by Marcy Lucas

ON A THREE-AND-A-HALF-ACRE island off the coast of Maine, Steve Renner spends weeks at a time recording the behavior of the inhabitants. He wants to know how the island's two sets of neighbors — longtime resident harbor seals and the relative newcomers, gray seals — get along.

It's quite a sight, says The University of Maine graduate student, who studies 1,200 seals on the tiny island, watching and recording their behavior — from their periods of sleep to acts of aggression — in such a remote, natural setting.

Mount Desert Rock, 15 miles off the Maine coast, is the site of a College of the Atlantic research station. With the college's cooperation, Renner uses the pristine location to conduct research on the interaction between the two seal species.

His findings will shed light on how the growth of the gray seal population in Maine waters is affecting the long-established colonies of harbor seals, and what implications the two resident species will have on marine resources management.

"I'm looking at direct interaction, including competition for particular ledges, and whether harbor seals behave differently with gray seals sharing the same haul-out ledge," says Renner, a native of Philadelphia, Pa.

Renner has spent several weeks during the past three summers on Mount Desert Rock. Using a camouflage blind, he conducts his population studies during the seals' peak haul-out periods. He uses both a scan survey to observe the seals and their activities, and videotaping of small groups of the marine mammals.

He not only records the behaviors exhibited, but the duration and stimuli of the activity. Renner also makes note of the age, gender, sex, size and coloration of the seals.

Unlike harbor seals that can weigh up to 250 pounds, adult gray seals can weigh up to 1,000 pounds. Both species pose problems for fisheries, Renner says.

"Harbor seals affect salmon fisheries. And seine fishermen say they avoid Mount Desert Rock because of gray seals. With gray seals more numerous," Renner notes, "there may be marine resources policy challenges."

Winter Blues

WINTER BRINGS SMILES TO THE FACES of skiers, snowmobilers and ice fishing enthusiasts. But it also can be a season of dread for people who get the blues as the days get shorter.

Studies show that up to 30 percent of the population may experience symptoms of a type of depression known as Seasonal Affective Disorder, or SAD. Of them, 10 percent have debilitating symptoms, and most are women.

University of Maine psychologist Sandra Sigmon and her students are working on new treatments to bring relief. In their research, the scientists are going beyond traditional light therapy to explore behavioral, psychological and social treatment alternatives.

"There are very successful cognitive and behavioral treatments for non-seasonal depression," says Sigmon. "If SAD and non-seasonal types of depression have similar symptoms, perhaps we can extend those treatments to SAD."

Symptoms of SAD include lack of energy, mood changes, sleep disruption, craving for carbohydrate-rich foods, weight gain and difficulty making decisions. What distinguishes SAD from other types of depression, Sigmon says, is the seasonal timing — the switch that flips as the leaves change color and clocks are turned back in the fall.

Exposure to special lights is the first and only recognized line of defense against SAD. However, such treatment is effective for only about half to three-quarters of those who experience symptoms, says Sigmon.

Psychologists have other techniques for treating non-seasonal forms of depression. They work with their clients to change behaviors by including such activities as exercise and social interaction. They try to modify thinking patterns that are related to moods, such as a common tendency to dwell on negative thoughts. There also are medications.

To determine if cognitive and behavioral treatments for depression also can be effective in combating SAD, Sigmon began conducting studies in 1995, with promising results.

Although she cautions that the studies need to be repeated with larger groups of subjects, Sigmon says that the results show that cognitive and behavioral treatments, such as keeping diaries focused on positive thinking, do work for people with SAD. People with minor and major SAD symptoms showed improvements after receiving cognitive and behavioral treatments.

The extent of the improvements, Sigmon adds, was similar to the benefits of conventional light therapy.

Two graduate students working with Sigmon, Nina Boulard of New York City and Stacy Whitcomb of Newburgh, Maine, are now doing SAD studies as part of their UMaine Ph.D. degree programs. Boulard is focusing on the relationship between SAD and activity levels. Whitcomb is looking at cognitive aspects of SAD.

In addition to the benefits for treatment, UMaine SAD studies are contributing evidence for a broader understanding of depression.

by Nick Houtman

Photo by Toby Hollis

Shawn Fraver's work in Maine's Big Reed Forest Reserve offers a rare glimpse of tree growth and decline.

A Life Story

Trees tell the history of one of New England's largest old-growth forests

IN ORDER TO READ a tree's life story, Shawn Fraver extracts a pencil-thin core from the trunk, then sands the wood to a fine sheen to expose the growth rings. Each ring reveals a year in which the tree took advantage of ideal conditions to grow rapidly, or in which the tree grew very little, saving its resources to survive drought or insect attack.

Fraver, a University of Maine Ph.D. student from Old Town, Maine, is studying tree growth in the Big Reed Forest Reserve in northern Piscataquis County. Owned by The Nature Conservancy, Big Reed constitutes one of the largest tracts of old-growth forest in New England.

With support from a nationally competitive U.S. Environmental Protection Agency STAR fellowship, Fraver is delving into the cycles of growth and disturbance at Big Reed. The goal is to describe how the forest responds to environmental changes year to year.

In the UMaine Department of Forest Ecosystem Science, Fraver is working with Associate Professor Alan White, who coordinates the research project at Big Reed.

The results will yield benefits to forest managers who increasingly look for guidance in natural patterns of forest growth, Fraver says.

Understanding the scale and frequency of natural disturbances also will contribute to future decisions about forest reserves.

Fraver has found that most of the older trees at Big Reed are around 200 years old, although he also has found quite a few that exceed 300 years.

"It seems apparent that there was a catastrophic disturbance — perhaps a hurricane — that wiped out many of the trees in the late 1700s and allowed a large new group of trees to become established," he says.

Working for NASA on the West Antarctic Ice Sheet

OVER THE NEXT FEW YEARS, scientists will be working hard to determine conclusively if the world's ice sheets and glaciers are shrinking, growing or remaining unchanged. Their results will have significant implications for the debate over global climate change.

At the heart of that discussion will be research by Vandy Spikes, a University of Maine Ph.D. student in geological sciences.

Spikes will use a fellowship from the National Aeronautics and Space Administration (NASA) to establish precise elevations for points on the West Antarctic Ice Sheet. His results will help to interpret data from a new ice monitoring satellite launched by NASA.

Spikes is working with Gordon Hamilton, a research assistant professor in UMaine's Institute for Quaternary and Climate Studies, and Steven Arcone of the Cold Regions Research and Engineering Laboratory in Hanover, N.H.

"The Antarctic ice sheet is changing, and while it is getting thicker in some places, most evidence suggests it is generally getting thinner," Spikes says. However, the evidence collected so far comes from elevation measurements at widely scattered points on the ice, he adds. The picture that has emerged is rough.

When data start coming from ICESat, a NASA satellite launched in December, the picture will come into better focus. The raw data must be adjusted to account for a variety of factors, such as the temperature and humidity of the atmosphere, and the position of the satellite. Spikes will work with NASA to perform those calculations.

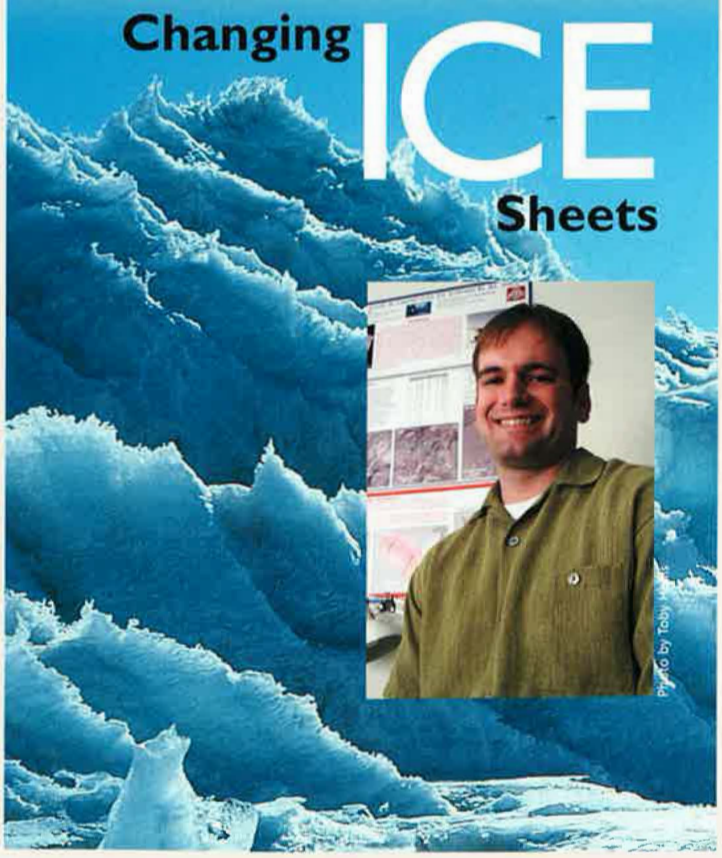


Photo by Toby Hollis

BATTLEFIELD SENSORS

THE LEARNING ENVIRONMENT for University of Maine physics undergraduate Wendy Kresge goes far beyond the classroom. For the past two years, she has worked at UMaine's Laboratory for Surface Science and Technology (LASST), which is nationally recognized for its research on products that are vital to the government and the industrial sector.

Kresge is helping to develop chemiresistive sensors to detect the presence of chemical and biological agents on the battlefield.

The senior from Gilbert, Pa., says she feels privileged to be contributing to the development of a technology that may one day save lives. But she knows that she wouldn't have had that opportunity without the unique learning experience that has been available to her at LASST.

"It's a fantastic working environment. LASST provides a teaching environment, so it's more than just a professional lab that develops products. It has allowed me to connect the theory I learn in class to hands-on experience," Kresge says.

Kresge fabricates sensors by using one of two processes to grow a thin film on a surface: sputtering or electron beam evaporation. These processes take place in an ultra-high vacuum and involve knocking off or evaporating individual atoms from a high purity metal source and depositing them onto the surface of a sapphire crystal to produce a pattern.

Kresge says she plans to build on the knowledge and experience she has gained at UMaine by pursuing a master's degree in physics. (Kresge also is pictured on the cover of this issue.)

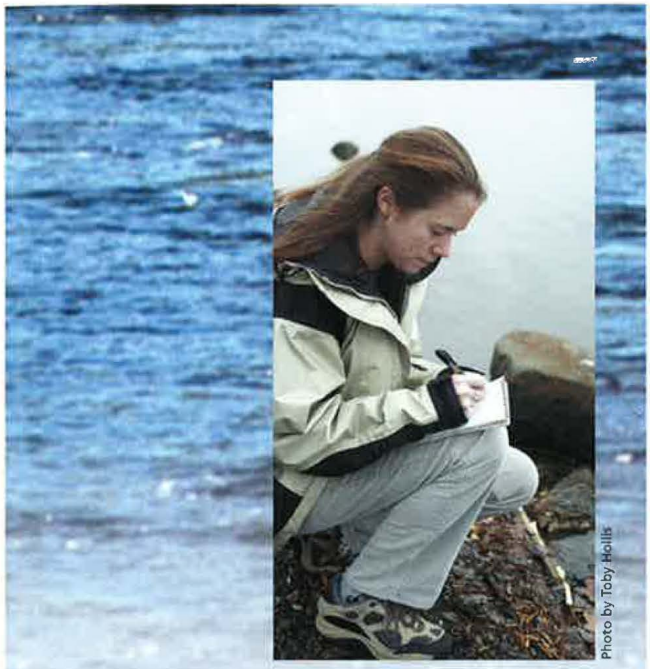


Photo by Toby Hollis

Guarding the welfare of water

WE EXPECT THE WATER coming out of our faucets to be clean and healthful. To help Maine water suppliers keep it that way, the Senator George J. Mitchell Center for Environmental and Watershed Research at The University of Maine is working to address new federal regulations that could be a burden, especially for small, rural water systems.

Spearheading the work are Catherine Schmitt, a master's degree student in the Ecology and Environmental Sciences Program, and John Peckenham, interim director at the Mitchell Center. Nine Maine water utilities, the Maine Water Utilities Association and the Maine Drinking Water Program also are participating in the project, which focuses on protecting ponds, streams and other surface water sources.

Consulting on environmental matters is nothing new for Schmitt, a native of Glen Rock, N.J. Before coming to UMaine, she worked in Massachusetts on issues related to development around wetlands.

In her academic program, she is researching issues related to the use of chlorine to disinfect drinking water. By disinfecting water with chlorine, water suppliers create unwanted by-products harmful to health. Schmitt's research will address the possibility that, in some circumstances, drought conditions may lead to an increase in the harmful compounds generated by disinfection.

Schmitt and Peckenham plan to produce a report on watershed protection for water suppliers in 2002.

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Microscopically Going Where No One Has Gone Before

UMaine mycologist plays critical role in investigations of amphibian die-offs worldwide

IN THE SUMMER of 1997, a successful project to raise blue poison dart frogs hit a snag at the Smithsonian National Zoological Park in Washington, D.C. During metamorphosis, the change from tadpole to frog, the amphibians native to South American rainforests were dying of unknown causes.

The only clues were spherical bodies inside the skin cells of the dead animals.

The search for answers led the zoo's veterinary pathologist to University of Maine mycologist Joyce Longcore, one of the few scientists in the world who studies the Chytridiomycota (known as chytrids), a type of aquatic fungi.

Photos by Monty Rand

Joyce Longcore (standing)

"Frogs are an integral part of the ecosystem. To have species go extinct is a terrible thing."

Joyce Longcore

"As soon as I saw the photographs, I knew (the culprit) was a chytrid," says Longcore. "I had spent the last 10 years isolating chytrids and growing them in pure culture. The blue poison dart frog was the first (amphibian) from which I isolated this particular chytrid, then we showed that it is capable of causing disease and death."

The same summer, scientists in Australia found the organism decimating populations of species in the wild. In addition, a researcher doing frog surveys in Central America one year returned the next year to find the rainforest eerily quiet and frogs dead along the streams.

"The scientists didn't know what the disease organism was at the time; now we know it was a chytrid," she says.

Longcore is quick to point out that she is not looking for the cure. Yet she is key to the investigation because she is providing invaluable chytrid cultures that other scientists need for experimental research.

Aquatic fungi are everywhere — in water and soil, even in the rumens of cows. Yet aquatic fungi have been little studied because, as microscopic parts of the ecosystem, they seemed to have little economic importance. But with the increase of aquatic agriculture, and deaths of amphibians in captivity and the wild, aquatic fungi like chytrids are increasingly under the microscope.

"When we first found it, we thought the chytrid would kill all it infected. Now we know it doesn't," Longcore says.

With National Science Foundation funding, researchers across the country are collaborating with Longcore and using her cultures to study the systematics, taxonomy and phylogeny of chytrids. She also is training a new generation of researchers to pick up where she will leave off in isolating cultures.

Longcore started isolating chytrids into pure culture in the mid-1980s. Now with more than 300 isolates, 80 of them of the chytrid pathogen from frogs and toads found in California, Colorado, Wisconsin, Quebec and Maine, she has the most comprehensive collection of the chytrid phylum in the world.

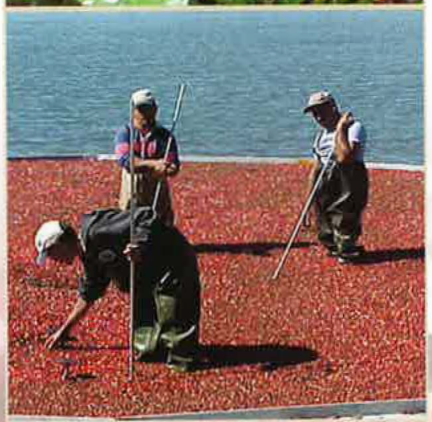
"I isolate cultures so someone else can use them and determine answers to the big questions," Longcore says. "For me, the thrill is in going microscopically where no one else has gone before."

Throughout the Northeast, and especially in Maine, Longcore has studied frogs and toads, and found the "frog chytrid" statewide.

The big questions have to do with what the deaths mean environmentally and ecologically. Are frogs that are dying of chytrids harbingers of a yet unseen shift in the ecosystem, much like a canary in a coal mine? Or is this an invasive disease that has spread from a different continent?

Longcore predicts that in 10 years, we'll understand where the chytrid that attacks amphibians came from and how it is distributed. Perhaps that will help us prevent die-offs.

by Margaret Nagle



Photos by Charlie Armstrong

Cranberries
IN DOWN EAST MAINE

IF TURKEY WAS on your winter holiday menu, chances are it was served with cranberry sauce. Perhaps you strung fresh cranberries for decoration or baked them in bread.

But is that the extent of cranberry consumption until next year?

No way, say an increasing number of consumers in Maine, including visitors to the state. The dark red berries traditionally relegated to the November-December holiday season are being rediscovered in Maine, and that's good news for the state's fledgling cranberry industry.

"There is increasing interest in buying Maine cranberries year-round because of their health benefits and the many ways they can be prepared," says Charlie Armstrong, a cranberry expert with The University of Maine Cooperative Extension, who provides growers with the latest information on integrated pest management and other innovations.

In 1989, two Maine cranberry farms were established in Jonesboro and Trenton. Today, there are 38 cranberry farms in the state, most of them in Washington County, scattered from Cherryfield to Calais.

With many of the cranberry beds now reaching maturity, growers are more than doubling their harvests. This season, roughly 18,000 barrels (1.8 million pounds) were harvested, worth an estimated $360,000.

Most of the 5.5 million barrels of cranberries produced nationwide are grown in Massachusetts, Wisconsin, New Jersey, Washington and Oregon. But Maine growers are finding their niche in the market.

Maine cranberries are sought-after for their quality, particularly their deep crimson color. Like their close relative, the blueberry, the state's cranberries contain a healthy amount of cancer-fighting antioxidants.

In addition, many Maine farms planted a hardy variety of cranberry that produces fruit that can grow to the size of cherries.

Growers are increasingly successful in selling fresh-picked berries at roadside stands and in local grocery stores. Some are offering pick-your-own opportunities during harvest season in early October. Unlike wet-harvested cranberries that must be immediately processed, hand-picked cranberries stay fresher longer.

Members of Maine's cranberry industry also are marketing value-added products in their shops, local stores and on the Internet. One grower in Columbia Falls makes cranberry vinegar; another in Jonesboro sells dried cranberries and gourmet specialty foods — cranberry fudge, and chocolate- or yogurt-covered dried cranberries.

As small businesses, cranberry farms allow growers to diversify their crops and interests. For instance, one grower is a lobsterman; another is an apple grower, who now markets apple-cranberry juice.

"There are still exciting things to come from Maine's cranberry industry," says Armstrong. "They are part of Maine-grown produce that is a cut above the rest."

by Margaret Nagle

The secrets of **sea slugs**

IT SEEMS SEA SLUGS HAVE THE BEST OF BOTH WORLDS. They get energy from eating small marine plants, and from the sun through photosynthesis by absorbing parts of plant cells.

Essentially, they become part animal and part plant.

Mary Rumpho, a professor in The University of Maine Department of Biochemistry, Microbiology and Molecular Biology, is delving into the genetic nuts and bolts that underlie this phenomenon. With support from a $400,000 National Science Foundation grant, she is using the tools of biotechnology to determine exactly how part of a plant cell — in this case the chloroplast that carries out photosynthesis — can successfully mesh with the machinery of an animal cell.

Photo by Mary Rumpho

In her Hitchner Hall laboratory, Rumpho maintains three aquaria with slugs that are native to coastal marshes from Florida to Nova Scotia. Some of the animals crawl on the sides and bottoms of the tanks, and look like typical slugs. Lying among them are what appear to be leaves of an exotic plant. Close inspection reveals these leaves to be other slugs that have unfurled their green tissues almost as butterflies open their wings.

The focus of her work is the DNA in the chloroplasts. Plants and animals don't normally share genes, and yet, the slug shows that it is not only possible but that it works quite well.

Rumpho is trying to identify the mechanisms contributing to the long-term survival and functioning of the chloroplasts and their genes.

Basking in the light yields energy for sea slugs, which carry out photosynthesis as though they were plants.

Photo by Toby Hollis

BIOMECHANICAL STUDY LOOKS AT ARTERIES

AN APPLE A DAY may be a simple recommendation for healthy eating. But when it comes to trace elements in the diet, the guidelines get a little more complicated. So it is with manganese, an element that is critical for cardiovascular health, according to a team of University of Maine researchers.

In 1998, research led by Associate Professor of Clinical Nutrition Dorothy Klimis-Zacas of the UMaine Department of Food Science and Human Nutrition reported evidence that the trace element may be important to biochemical processes in blood vessel walls. Now, she and her students have turned to mechanical tests of arteries to determine if indeed a lack of manganese paves the way for deterioration of arteries.

Last summer, the researchers fed rats diets that had varying levels of manganese. Their goal is to test the ability of the rats' arteries to contract and relax when exposed to two stimulants, epinephrine and acetylcholine.

In another aspect of the study, blueberries were added to the rats' diets to see if they have any effect on the mechanical properties of arteries. Since blueberries are high in antioxidants and manganese, the research team wants to see if adding the fruit will protect the arteries from damages related to a low manganese diet.

The federal government has not established guidelines for manganese in the diet. The UMaine research could provide the basis for doing so.

EVIDENCE OF EL NIÑO IN ANCIENT PERU

A TEAM OF RESEARCHERS has found that the climate phenomenon known as El Niño may have been a contributing factor in the rise and fall of ancient civilizations in Peru.

Using archaeological evidence from sites along the Peruvian coast, scientists from The University of Maine, Yale University, University of Pittsburgh and University of Miami suggest that the fate of organized Peruvian societies may be related to environmental changes caused by flood cycles starting about 5,000 years ago.

"We found that there was a change in the frequency of El Niño events about 3,000 years ago, and that correlates in time with cultural change," says Daniel Sandweiss of the UMaine Department of Anthropology, and the Institute for Quaternary and Climate Studies.

Changes in El Niño frequency, and the construction and abandonment of monumental temples in this region, suggest that climate and culture are linked.

Early complex, temple-building cultures in coastal Peru began just after the apparent onset of El Niño about 5,800 years ago, and collapsed between 2,900 and 2,800 years ago. The longest lasting of the temple sites is the only one in which evidence of flood mitigation has been found.

"By doing something proactive about El Niño, the leaders of this site (Manchay Bajo) appear to have been making an appropriate response to changes in their environment. Whether it really worked for the most serious effects of El Niño we can't say. But if it did, that could have given them more long-lasting control," Sandweiss suggests.

Learning to ♡ math and science

THE UNIVERSITY of Maine is helping teachers get across two of the toughest subjects for many schoolchildren — mathematics and science.

The Center for Science and Mathematics Education Research, established with a $1.2 million grant from the U.S. Department of Education, will conduct research and train master's-level teachers to bring the latest techniques to the classroom.

"One of the greatest challenges we face as a nation is to interrupt the downward spiral in math and science literacy in our students," says Rebecca Eilers, dean of the UMaine College of Liberal Arts and Sciences. "To break the cycle, we must equip future science and math teachers with new tools to inspire, stimulate and excite children's natural tendencies to want to understand the natural world."

The center combines instruction and practice in exemplary teaching methods, content and research findings, including effective use of technology. A new Master's in Science Teaching Program will focus on practicing teachers, as well as recent graduates, scientists, engineers and mathematicians who want to pursue a teaching career.

Research on how students learn science and math is at the core of the center's activities. The research findings will inform student teachers at the University and teachers in the classroom.

Directed by University of Maine physicist Susan McKay, the center will draw from ongoing research in UMaine's Physics Education Research Laboratory, and projects in the departments of Chemistry and Computer Science. Participants also will include faculty in the College of Education and Human Development, and the departments of Mathematics and Statistics, Geological Sciences and Biological Sciences.

Competitive Family Farms

AMERICAN FARMS HAVE GROWN larger and more industrial as they specialize in one type of livestock or certain crops. However, new agricultural technologies, combined with integrated cropping and livestock systems, could provide a boost to smaller, family-run farms, according to Stewart Smith, University of Maine professor of sustainable agriculture.

Smith is administering a $2 million competitive research grant from the U.S. Department of Agriculture to study this issue with colleagues in Maine, Michigan and Iowa.

The project will study integrated farms — dairy and potato operations in Maine and Michigan, and hog and feed grain farms in Iowa. Farmers are helping to evaluate the performance of these systems.

Scientists are looking at factors such as profitability, marketing, and effects on rural communities and ecosystems. They also are considering what motivates farmers to adopt or shy away from integrated farming strategies.

What's all the buzz in the blueberries?

MOST BLUEBERRY GROWERS spray insecticides to control harmful pests, such as beetles and flies that can damage crops. But sometimes the chemicals harm the growers' most important allies — the bees that help make the fruit possible.

In the last four years, University of Maine entomologist Frank Drummond has been working with growers to find new ways to protect native bees and honeybees. More bees mean more berries.

In his research, Drummond has learned where native bees nest and where they forage when blueberries are not in bloom. Keeping sprays away from those important bee habitats, he says, is one step that growers can take.

Drummond also found that once some insecticides have been sprayed and allowed to dry, they pose little danger to bees. Growers could avoid spraying during the times bees leave nests and hives.

Drummond and Constance Stubbs, assistant scientist in UMaine's Department of Biological Sciences, have been using automated bee counters to keep track of when bumble bees and honeybees forage for nectar.

Eventually, Drummond would like to produce a set of recommended "best management practices" for blueberry growers. The information, he says, could be extended to farmers who grow other crops that depend on bees, such as strawberries, cranberries and apples.

Saving the corner store

AMID NATIONAL chains and big-box stores, small and independent neighborhood groceries are struggling.

With a grant from the U.S. Department of Agriculture's Fund for Rural America, Gregory White of The University of Maine Department of Resource Economics and Policy is looking at factors that could help small and independent stores develop a market niche and be more competitive.

"Nationally, grocery store sales are up about 30 percent over the last decade, but the number of independent and small stores decreased by 17 percent and 35 percent, respectively, over the same period," says White.

In the study, White will be joined by other UMaine scientists, as well as by storeowners, farmers, the Maine Grocers Association, and state and federal agencies.

While the project will be conducted in Maine, the researchers expect to apply the results throughout the country.

In search of

ancient deep-sea corals

in the Gulf of Maine

WE TYPICALLY THINK OF CORALS as living in the warm waters of the Caribbean or the South Pacific. But these reef-building animals — some hundreds of years old — also are found in the cold Gulf of Maine.

Now scientists are studying these little-known yet ancient deep-sea corals to shed light on the ecosystems and natural resources off the East Coast. What they find also could provide a glimpse of a diverse underwater ecosystem that has been dramatically altered by human activity.

Les Watling, a professor in The University of Maine's School of Marine Sciences, and graduate student Anne Simpson are studying coral communities as part of a three-year federally funded project known as Deep East.

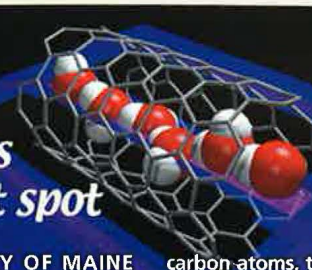
Last September, they started looking in areas just outside the Gulf to find corals unaffected by human activity. They and other scientists used the U.S. Navy's deepest diving submersible, the *Alvin*, to explore two canyons that plunge toward the Atlantic Ocean bottom just south of Georges Bank.

"We were looking at the distribution of coral communities and the animals that live on them," says Watling, who believes corals were once pervasive throughout the Gulf of Maine. "We were surprised to find species that are related to animals in the Antarctic. We know that relatives of Antarctic species can live in the deep water off the East Coast, but we didn't expect to find them here."

In the rocky walls of one canyon, the researchers found corals that provide a home for brittle stars, worms and other animals. The trip to the muddy slopes of the second canyon failed to find corals.

This year, Watling and Simpson will dive in the shallower water at the mouths of the canyons — areas they expect to be more favorable for coral communities. In 2003, they will explore areas within the Gulf of Maine itself.

The National Oceanic and Atmospheric Administration is conducting the Deep East project.



Water molecules in a tight spot

TWO UNIVERSITY OF MAINE chemists and a scientist at the National Institutes of Health (NIH) have used computer simulations to discover how water molecules behave in tight spaces.

Their findings, reported in the journal *Nature*, have implications for medical research and may contribute to an understanding of how water behaves in the pores of cell membranes.

Jayendran Rasaiah and Jerzy Noworyta of UMaine's Department of Chemistry collaborated with Gerhard Hummer of NIH. Rasaiah's research was supported by a National Science Foundation grant.

They used computer simulation to generate a tiny tube of carbon atoms, then placed it in a virtual pool of water. The simulations provide dynamic information that goes beyond static pictures of conventional structural biology, Rasaiah says.

From previous research, the scientists expected that water would not enter such tubes, known as carbon nanotubes. However, they found that the chains of hydrogen-bonded water molecules, only a single molecule wide, move through the tube in short bursts.

How water is conducted in biological channels is important, says Rasaiah. For example, the heart depends on concentrations of calcium in water; movement through cell membranes may help balance calcium.

New apple varieties coming to a Maine farmstand near you

Got a taste for fortune? How about gingergold?

UNIVERSITY OF MAINE researchers are conducting field trials and taste tests for six new apple varieties that may expand opportunities for the state's apple industry and offer new choices for consumers.

The University's Maine Agricultural Center is sponsoring the research. The focus is on the hardiness, disease resistance and other growing characteristics of arlet, cameo, fortune, honeycrisp, gingergold and yataka apples.

Renae Moran, tree fruit specialist at The University of Maine's Highmoor Farm in Monmouth, manages the experimental orchard and works closely with apple growers.

Moran also monitors fruit for quality and storage characteristics. On campus, she works with UMaine food scientists to conduct consumer preference tests of each variety.

Based on early findings, apple growers in the state have added some of the varieties to their orchards.

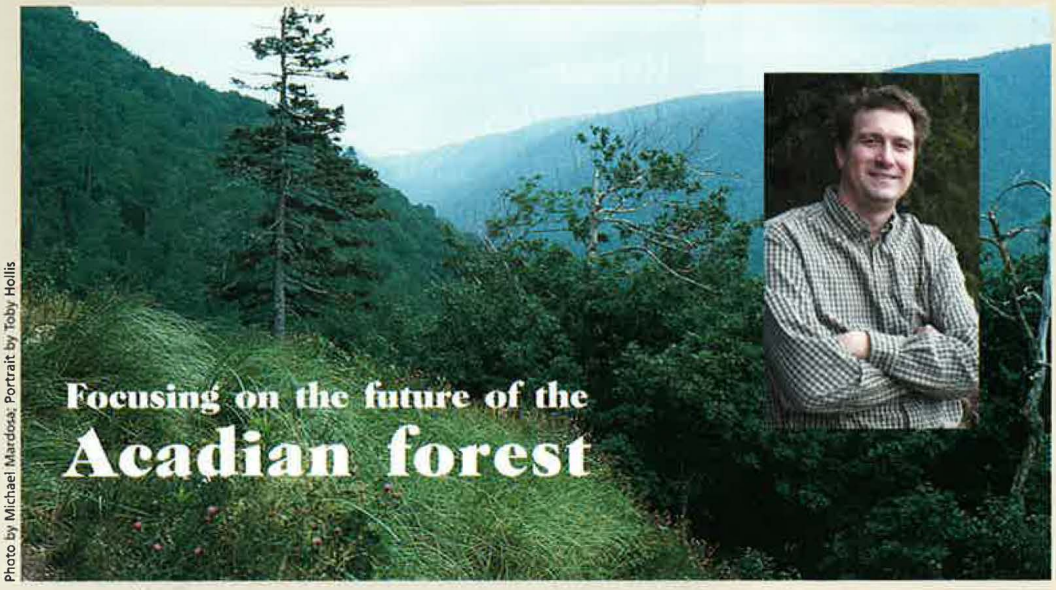


Photo by Michael Mardosa; Portrait by Toby Hollis

Focusing on the future of the Acadian forest

JEREMY WILSON, a specialist in forest landscape management, is the new Irving Chair of Forest Ecosystem Management and an assistant professor in the Department of Forest Management at The University of Maine.

Wilson's work in Maine will echo his efforts on the Landscape Management Project at the University of Washington. "The project evolved out of forest crises like the spotted owl controversy," he says. "Traditionally, much of forestry deals with individual forest stands. However, it is difficult to address the complex goals associated with watershed protection, wildlife habitat and aesthetics using this approach.

"What you do in a particular stand has implications for what you're going to do in other stands around it. The Landscape Management Project set out to think about techniques and tools for managing at larger scales, ecosystems and landscapes."

Wilson will use a software system he and his colleagues produced to evaluate the consequences of forest management alternatives at scales from individual stands of trees to large landscapes. It allows planners to analyze and compare the implications of management issues, ranging from wildlife habitat and economic returns to risk of disturbances.

"Technology is the only way forest managers can effectively address the ever-increasing number of goals being placed on forestland," he says.

The Irving Chair is funded by a $1 million endowment established by J.D. Irving Limited, through the University of Maine Foundation. The position focuses on research in support of science-based management of the Acadian forest ecosystem.

SNACKS from the sea

"PASS THE CRAB CHIPS, PLEASE" could be a request heard in gourmet restaurants and health-conscious households as a result of a University of Maine food science research project.

Denise Skonberg, assistant professor in UMaine's Department of Food Science and Human Nutrition, is developing a snack chip using powdered crab shell and mince, the bits of meat that are left on the shell after processing.

With support from the Lobster Institute at the University, Skonberg and her graduate students have developed prototype chips. Crab mince is mixed with corn meal, potato flakes, spice and other ingredients, and then subjected to steam and pressure in an extruder. The final product is a crispy snack food that has the consistency of a puffed corn breakfast cereal.

Such sea snacks are value-added foods, making use of underutilized seafood by-products. The marine munchies also are healthy snack alternatives; powdered crab shell contains chitin, a natural substance high in calcium.

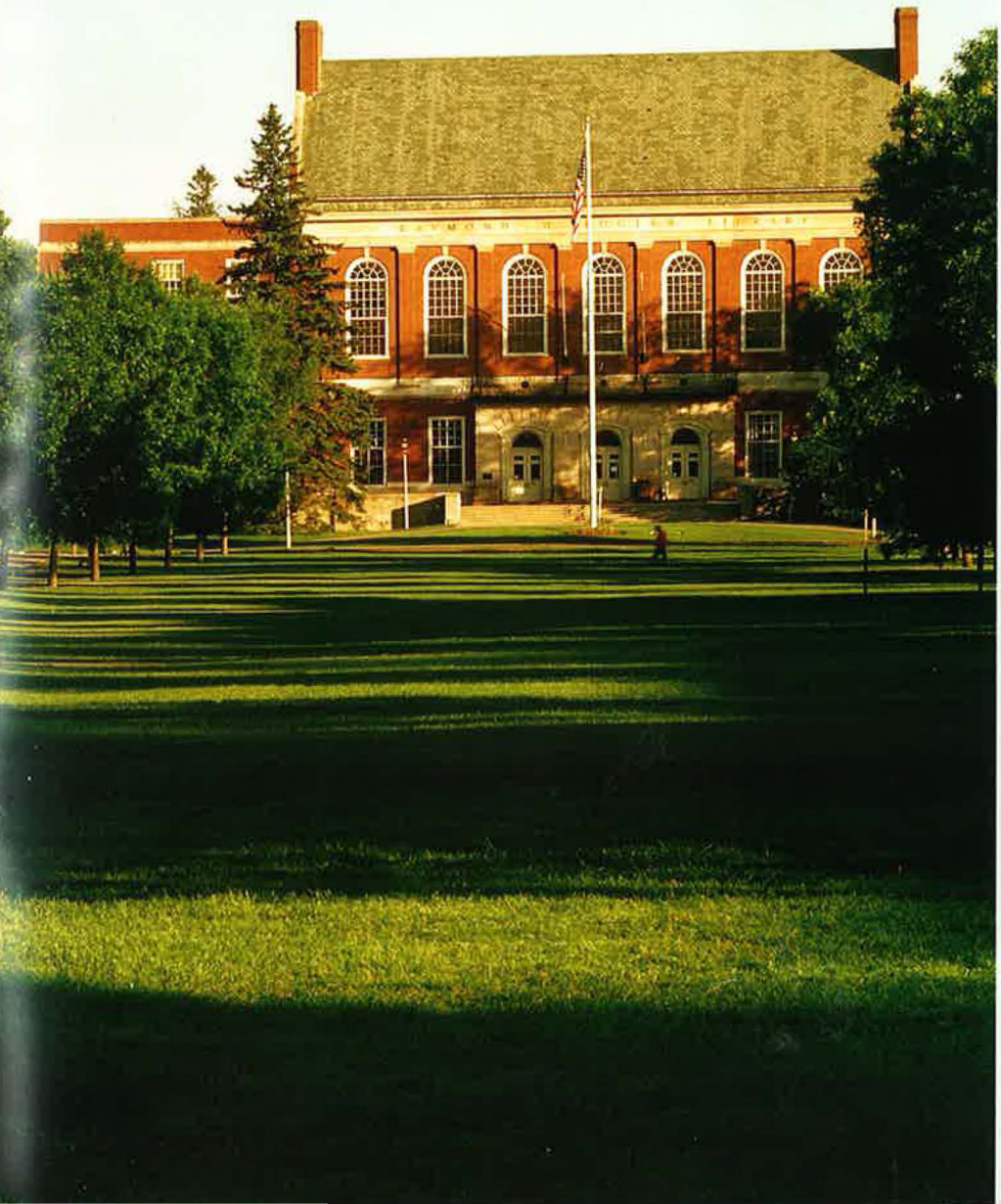
East *meets* West in education reform

CULTURALLY distinct, industrialized countries in the East and West have taken different paths to educational reform in the past two decades. Yet, if implemented successfully, these policies would make two distinctive educational systems more alike, according to Jaekyung Lee, UMaine assistant research professor specializing in comparative education and educational policy analysis.

Lee examined major school reform in Japan and Korea, with highly centralized school governance systems and homogeneous educational values. In the United States and England, he studied school structures with decentralized educational governance and relatively heterogeneous educational values.

Western policy makers saw their school systems as fragmented and student outcomes mediocre. They focused on raising standards, and tightening curriculum and assessment. Policy makers in the East saw their system as deficient, with too much weight on standards and high-stakes testing hindering creativity. They emphasized diversifying curriculum and assessment, and enhancing whole-person education.

According to Lee, the research challenges the view of school reform as a routine cycle or tinkering within a national boundary. It presents a new perspective of reform — dynamic efforts to assess needs and attain optimal education with reference to the world.



THE UNIVERSITY OF MAINE'S Raymond H. Fogler Library is the largest research library in Maine, with collections and services supporting UMaine faculty, students and staff, as well as residents of the state. It is named for alumnus Raymond Fogler, in recognition of his service to the University.

After earning a degree in biology from UMaine in 1915 and a master's degree from Princeton two years later, Raymond Fogler launched his career as one of the country's leading corporate executives.

In 1919, the Maine native moved to New York to work for W.T. Grant Co. For the next 13 years, Fogler held various jobs — from stock boy to director of personnel and real estate. Fogler then was hired by Montgomery Ward in Chicago, where he worked his way up to the presidency in six years. In 1940, he returned to W.T. Grant to be its president.

After 12 years of overseeing W.T. Grant's 500 department stores, Fogler retired, only to be tapped by the Eisenhower administration to be assistant secretary of the U.S. Navy.

Throughout his career, Fogler often returned to UMaine. For more than 80 years, he led or actively participated in every major fund raiser, including those to build Memorial Gym and the library.

All seven of his children graduated from UMaine.

In 1996, Raymond Fogler died at his home in Exeter, Maine. He was 103.

In each issue, "Lasting Impression" features a memorable person or event in UMaine history.

Raymond H. Fogler, 1915
Photo courtesy of Fogler Library Special Collections

1865 THE UNIVERSITY OF MAINE
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A Pioneer in the Field

EDITH MARION PATCH was hired in 1903 to establish an entomology department for the Maine Agricultural Experiment Station at The University of Maine. As one of the few female entomologists of her day, her appointment met with considerable criticism from skeptics who scoffed that she would not be able to climb a tree or catch a grasshopper.

It took only a year — a year in which she worked without salary — to clearly demonstrate her worth as a lab and field scientist.

In 1904, she was officially appointed head of UMaine's Entomology Department, a position she held for more than 30 years. She earned a master's from UMaine in 1910; her Ph.D. from Cornell the following year.

Patch became a world-renowned expert on aphids. She was consulted by agricultural agencies, academic institutions, and commercial growers in Maine and around the world.

She was elected the first woman president of the Entomological Society of America in 1930, and was nationally recognized for her nature writing for children and the general public.

Patch was a generation ahead of Rachel Carson in promoting ecological awareness and warning about unrestricted use of chemical pesticides.

Patch retired from the University in 1937. She died in 1954 at the age of 78.

The Patch home, built around 1840, is among UMaine's oldest buildings and one of the state's important women's history sites. A volunteer group, Friends of Dr. Edith M. Patch, has established an endowment fund at the University of Maine Foundation to renovate the home and establish the Edith Marion Patch Center for Entomology, the Environment and Education. For more information on The Edith Marion Patch Center Fund, contact the University of Maine Foundation, 207-947-5100.

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