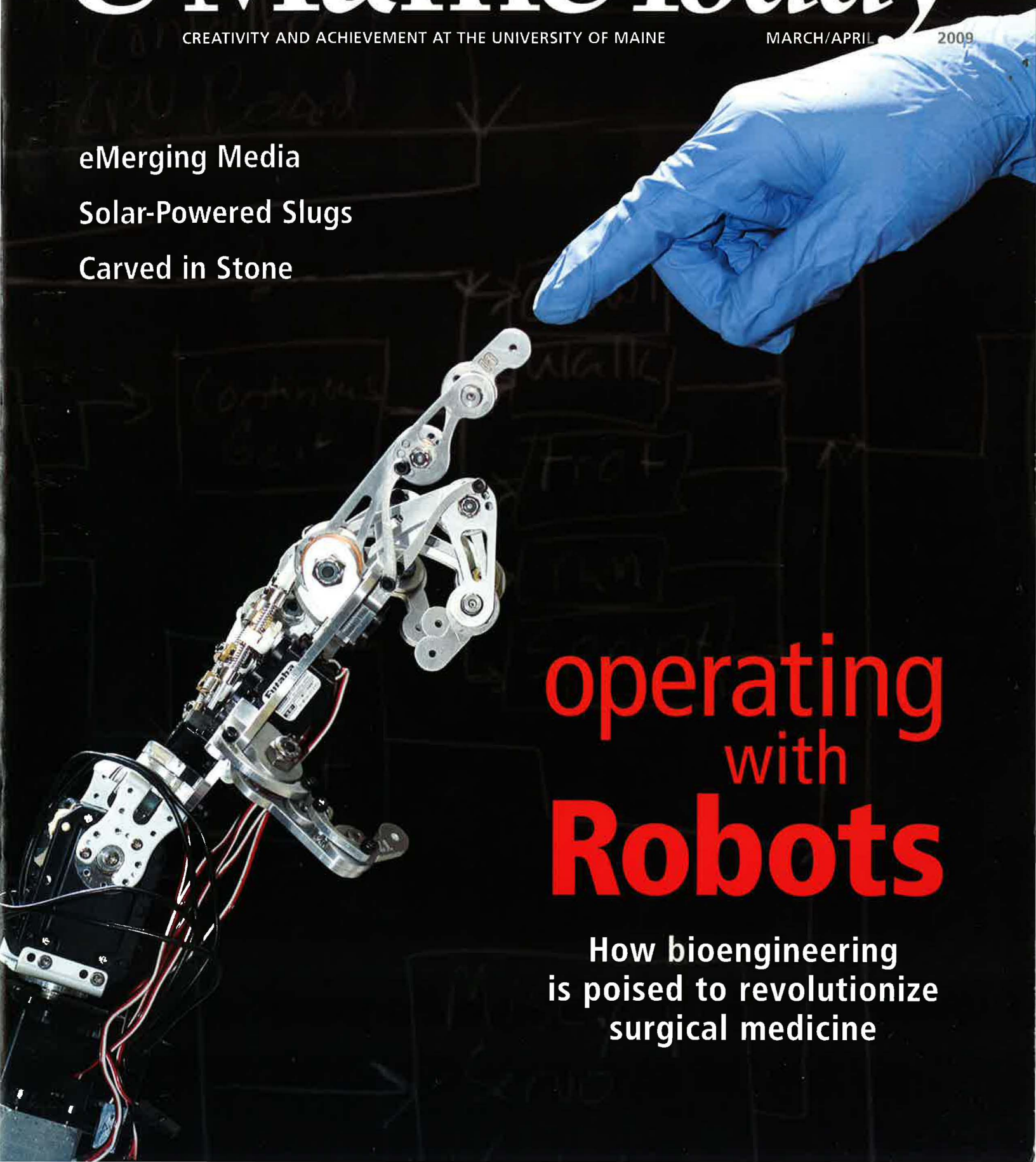
UMaine Today

CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE MARCH/APRIL 2009

eMerging Media

Solar-Powered Slugs

Carved in Stone



operating with Robots

How bioengineering is poised to revolutionize surgical medicine

President's Message

THIS ISSUE OF *UMaine Today* shines a bright light on one of the most important aspects of the University of Maine student experience — the vast opportunities our undergraduates have to truly engage in the learning process through activities that occur beyond the classroom. These opportunities, where students and faculty members work closely together to deeply explore issues and — frequently — make discoveries together, characterize the UMaine experience. They are instrumental in helping our students make the most of their studies and graduate as educated citizens, ready for professional and personal success.

Whether it's managing a real investment portfolio during a period of dramatic market uncertainty, working with an innovator in biomedical engineering research or exploring artistic expression using processes that are constantly changing, UMaine students are fully engaged in learning and taking advantage of the incredible opportunities that exist within our community.

We are proud of our students and they tell us that the UMaine experience is living up to their expectations. Based on the input of our students, Princeton Review has chosen UMaine as one of America's top universities four years in a row. We are certain that UMaine's enrollment continues to grow to a large degree because our students are telling their family members and friends about all that is available at UMaine, and because faculty members are committed to our students' success. The stories in this issue exemplify that commitment and help to demonstrate the enduring value of a UMaine education.

Robert A. Kennedy
President

ON THE COVER: In a University of Maine mechanical engineering laboratory, robots of all shapes and sizes serve as the building blocks of technology. Led by Mohsen Shahinpoor, a pioneer in the field of artificial muscle, undergraduate and graduate students are involved in robotics research that has the potential to revolutionize human surgical procedures. See related story on page 14.

UMaine Today

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University of Maine profile

Located in Orono, Maine, the University of Maine is the state's land-grant and sea-grant institution. UMaine serves its home state through its explicit statewide teaching, research, and public service outreach mission. Offering 89 bachelor's, 92 master's and 30 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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1865 THE UNIVERSITY OF MAINE

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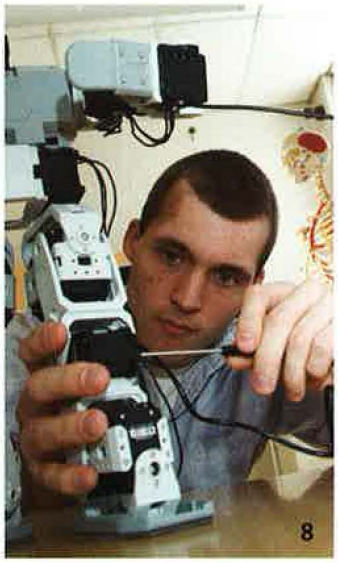

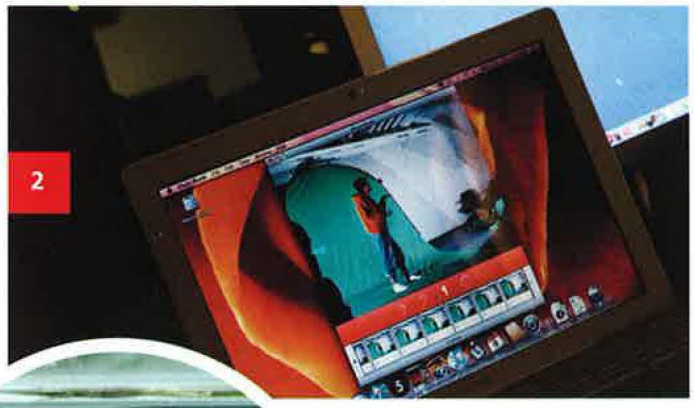

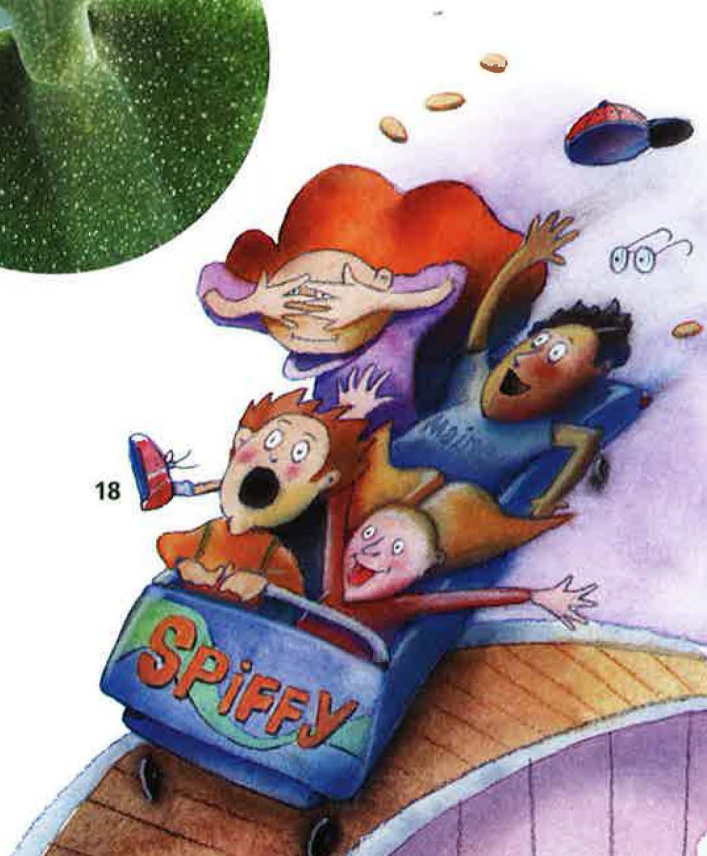

departments

+Online
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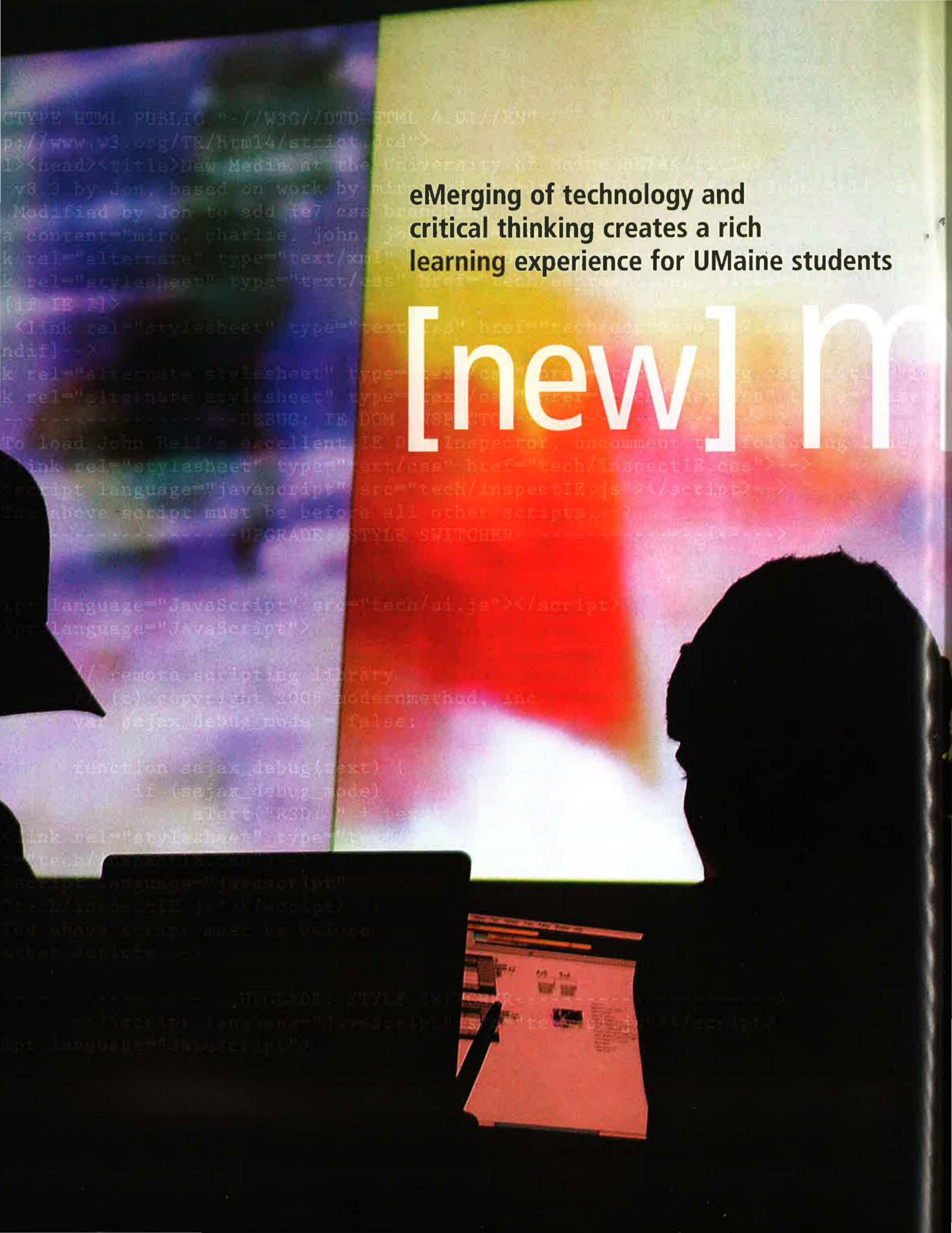
Look for +Online throughout *UMaine Today* magazine. It indicates the availability of a wealth of additional content — Web-exclusive stories, video and audio clips, photo galleries, full-length versions of articles and a comprehensive editorial archive.


eMerging of technology and
critical thinking creates a rich
learning experience for UMaine students
[new]

edia savvy

By Kristen Andresen

Trying to define the term "new media" is like:
(a) Herding cats.
(b) Catching raindrops in a net.
(c) Stopping time.
(d) All of the above.

The answer, of course, is d. Part of the conundrum lies in the very essence of the term: What is new is always changing. And in the fickle world of media, new becomes old very quickly.

Is it film? Game design? Vector graphics? Art? Documentary? Does it involve Web sites and social networks? Animation and art? Is it a new way of looking at traditional media?

In a word, yes. But at the University of Maine, new media is so much more than that.

"The way I look at new media is as a frame of mind, as opposed to a field of technology," says Eryk Salvaggio of Ogunquit, Maine, who is working toward a double degree in new media and journalism. "The program is really focused on innovation and creativity, and you really can apply that to everything."

Salvaggio hopes to use the lessons he's learned in innovation and creativity to help traditional journalism thrive through the use of technology.

"Traditional storytelling is at the heart of journalism," says Salvaggio, who, when he's not in classes, works for the *Bangor Daily News* and the University of Maine's student newspaper, *The Maine Campus*. "New media gives a new set of tools to tell that story and engage people."

A new media installation, featuring a moving image and sound performance, in Wells Dining Center.

Photo by Jon Ippolito

New media major Derrick Cameron of Lamoine, Maine, shoots footage during the New Media Department Capstone Night presentations on campus.

Photo by Bill Kuykendall

[new] media savvy

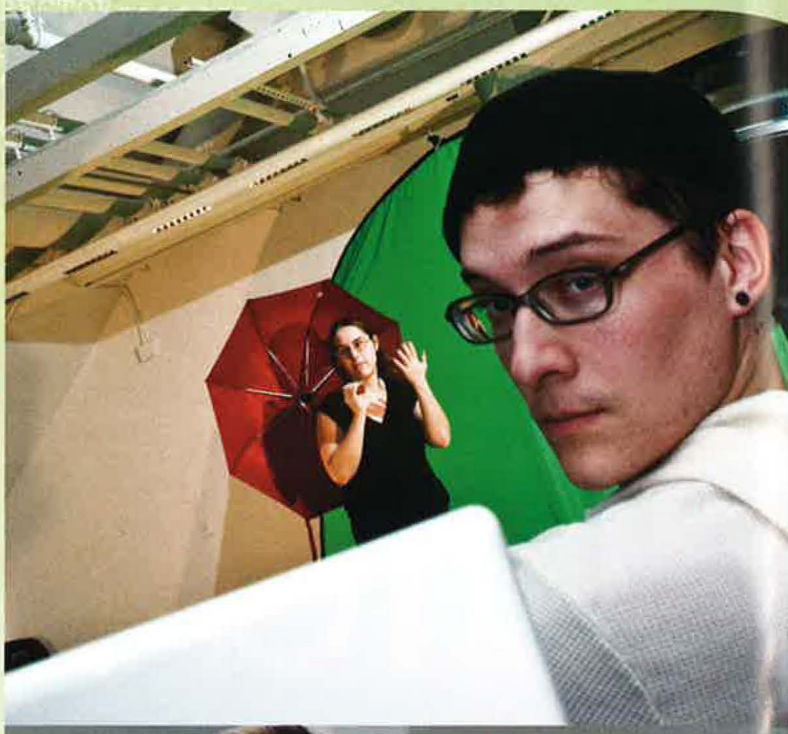
Those tools always are in flux. Software updates happen every six months, on average, and while new media has some of the most cutting-edge technology on campus, the ways students use technology are ever-changing. But the message behind the media has remained constant since the program's inception.

The seeds of UMaine's New Media Department were planted in the early 1990s, when a group of faculty members collaborated to introduce cross-disciplinary studies in computer science, the arts and humanities. It started as a minor and blossomed into a major in 2000.

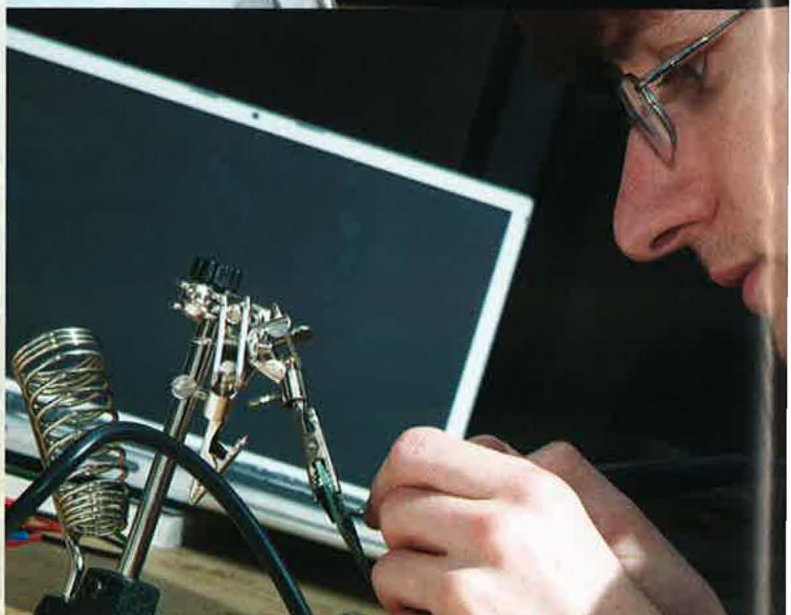
"It really was unique, not only in the state of Maine, but in many ways, the country," says Owen Smith, chair of UMaine's New Media Department and a professor of art. "It truly was interdisciplinary."

It still is, although the course of study is more formalized now than it was in its "Wild West" phase, as Smith calls it. Today, students choose two of five sequences: digital reporting and documentary production; information and interaction design; digital narrative and hypertext; time art and design; and networks and distributed creativity. The project-based curriculum allows students to tailor their studies to their own interests.

In new media, learning takes a variety of forms. Last fall, students in Sheridan Kelley's motion graphics class filmed footage for a 3-D animation in front of a green screen. Over the course of the semester, they used that as a starting point for short films. Students in Mike Scott's interactive Web development class created programmable patches that can be sewn into clothing. When the wearer walks by someone who has programmed in similar interests, both patches light up. The technology can be used for everything from matchmaking to conference planning. Last summer, when professor



Students in a motion graphics class shoot video in front of a green screen. The footage was used as the basis for 3-D animated short films.



Sophomore Jolene Belanger is designing a Web proposal for an on-campus arts group as part of her work at ASAP, the new media and Internet technologies lab.

In an interactive Web development class, Timothy Howe of York, Maine, solders an element of a wearable, programmable patch that lights up when the wearer walks by someone with similar interests.

Raphael DiLuzio was traveling through Europe, he used iTunes U to teach an online course in which students could interact with European artists in real time.

"New media is not a Web site," says Mike Scott, a lecturer in the department who directs ASAP Media Services, the new media and Internet technologies laboratory. "It's a moment in time and its implication on a moment."

This spring's more popular offerings include a class in which students build iPhone applications and a game-design course. Though the coursework spans the gamut, from sound documentary to designing a video game, the core message remains the same.

"We can't predict the future, but what I can predict is that the technology will be different," Smith says. "Important concepts and ideas form the core of innovative, creative and critical thinking. We bring these things together in a way that helps students envision and create the future. That's why our students have been so successful."

The success stories are impressive. Take Jeff Ma, who worked at ASAP long before new media was a formal major. He created the interface for TiVo and is one of the inventors of Apple TV. And then there are the class projects that were so right-on that someone else commercialized them and made a ton of money in the process. Tyler McPhee, a recent graduate, developed an online social networking site called Le Picture Book for his senior capstone project. It was a dead ringer for Facebook, which was developed a year later.

For her capstone, Erin LeBlanc developed "Pedometer Wars," which allowed users to track how much they walked and compare it with their friends. Nike and Apple launched a similar system not long afterward. And Joe Raymond called his project Podshare, in which you could wirelessly share music with your friends. That's the concept behind the Zune's success, as well. These companies didn't steal UMaine new media students' ideas; rather, UMaine new media students were developing similar networks, products and programs simultaneously — or ahead of the curve.

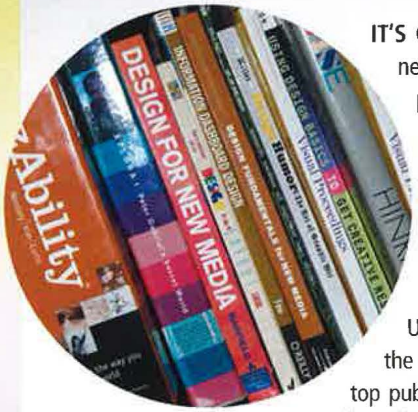
"It gives you a sense of how good their ideas are," says Joline Blais, a new media associate professor and cofounder of Still Water, a research lab devoted to studying and nourishing network culture. "We can't build an iPod until we imagine it. New media allows us to imagine and play at the world we want to live in. It creates the world in an image we want it to be, and that activity is so amazing."

For Blais, new media's biggest strength is its capacity for self-empowerment. She says the world is in transition. The traditional structures of power in government and mass communication are collapsing, and technology provides the opportunity for new, community-based structures to rise up in their place.

"The real power of new media comes when you can take the

In war room-style brainstorming sessions, ASAP students are encouraged to dream up bold, innovative solutions to projects.

New media in action



ASAP Media Services is essentially the research and development arm of UMaine's New Media Department.

IT'S ONE THING to learn Web design, network theory, graphic design and programming in the classroom. It's quite another to put those skills to work at a real-world, hands-on business with paying clients.

That happens at ASAP Media Services, a new media and Internet technologies lab at the University of Maine. What started in the mid-1980s with a focus on desktop publishing has grown into a thriving learning lab for students in new media and other disciplines.

Student employees work closely with clients from on and off campus who, essentially, become collaborators. The students strive to challenge clients by developing projects based on cutting-edge technologies.

"We want to develop sustainable systems and tools to allow the clients to maintain and manage their organizations' information themselves, without the need to have the deep technical knowledge," says Mike Scott, ASAP's founder and a new media lecturer. "Students who come to ASAP and succeed not only walk out of here with a degree, but with a critical aspect of what companies are really looking for: people who can collaborate, people who can conceptualize, people who can critically think."

Sometimes the ideas work, sometimes they don't, but the process is invaluable either way.

"It's really important to be willing to go out and make mistakes," says Jolene Belanger, a sophomore new media major from Glenburn, Maine, who is in the process of designing a Web proposal for an on-campus arts group. "The worst thing that can happen is you can fail, but it would be unfortunate to do a less challenging project and be satisfied."

[new] media savvy

lessons of playing in this virtual space and bring them into the real world," Blais says.

Freeware, open-source software and the borderless Internet have broken down hierarchies in the media and beyond. Digital cameras, the Internet and cheap, easy-to-use audio/visual equipment have all influenced the ways in which people communicate.

In some ways, these advances in technology have brought us back in time. Blais and new media associate professor Jon Ippolito argue that the networks of today are organized in a similar fashion to the tribal structures of indigenous peoples. On the media side, Bill Kuykendall, a former journalist who heads up the department's digital reporting and documentary production sequence, says the tenets of good journalism are more important than ever — even if the medium is in flux.

"The Dig," created by recent new media graduates Ryan Schaller and Jason Walker, allowed users to "dig" through the layers of a 3-D animation on a multitouch screen.

A documentary photograph by new media major Jolene Belanger.

A vector self-portrait in Adobe Illustrator by sophomore Zev Eisenberg.

Though many of his students are drawn to new media more for "its artistic and engineering appeal" than any journalistic interest, Kuykendall tries to instill a sense of responsibility in his students. As traditional media decline, it is his hope that a new generation will preserve "the essential role that the communications media have provided to free societies."

"What I teach within the frame of new media is that the traditional skills, values and ethics deserve to be preserved," Kuykendall says. "They work just as well with the tools we have today as they did with the tools we had in the early 20th century. Then I try to look at what's different. What our new horizons are. Are they broader and more exciting or are they shrouded in mist?"

For Zev Eisenberg, a sophomore new media major from Peaks Island, Maine, who had considered studying engineering at MIT, those horizons are broad, exciting and ultimately practical. When he started taking new media classes at UMaine, he thought they would focus on the "tools," but he was pleasantly surprised.

"It's a lot about thinking about the things we create, why we create them and what we can do," Eisenberg says. "With new technology, we have new ways of thinking about things that seem commonplace, new ways of interacting with information, and we try to figure out practical, inventive uses for new technology."

Those uses may be clever and fun, like the light-up wearable patch, but UMaine's new media students have learned to go deeper, to not just use technology for technology's sake. For his senior

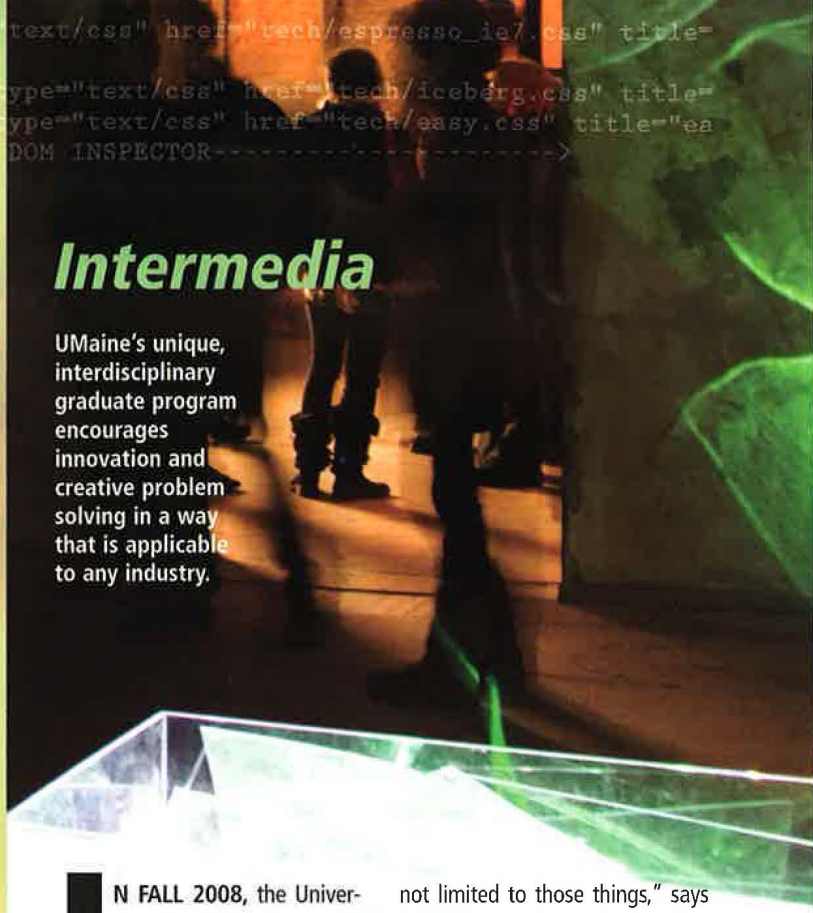
capstone project last year, Maxwell Terry created an alternative to money called AUX. It works as "a kind of universal receipt" for Web-based exchange of goods and services. Though Salvaggio's career aspirations involve journalism, his current focus in new media is a Facebook-style social networking site that connects nonprofits with potential funders. Sophomore Jolene Belanger of Glenburn, Maine, used her Web skills to create an online "hacktivism" project that questions why a college education can't be free for everyone.

"When I think of new media, I think of a small microphone capable of reaching many ears in the digital realm of the Internet — the greatest concert ever invented," says Belanger, whose interest in graphic design drew her to new media. "New media is the language of my generation. It is the voice of the individual in a society serving the masses. It is the modifier of old media and developer of the new.

"It is the process of development and the intent that feeds an idea. It can be framed in a gallery or engineered for practical use. Redefining is the function of new media; that's why we find it most challenging to define."

Indeed, depending on whom you ask, there are varied answers to the question, "What is new media?" But that's part of the appeal. It's new. It's constantly inconstant. And students and faculty define and redefine the term every day.

"In other disciplines, students learn the canon and become masters of the canon," Blais says. "(In new media), our students create the canon." ▮ Online



Intermedia

UMaine's unique, interdisciplinary graduate program encourages innovation and creative problem solving in a way that is applicable to any industry.

IN FALL 2008, the University of Maine introduced a master of fine arts degree program in intermedia, the only full-time residency MFA in the state.

The student-driven program blends arts courses with research in such disciplines as forestry, engineering, business, social sciences and new media.

"For us, intermedia is a way of thinking, a means of engaging in innovation and creative research production," says Owen Smith, the program's director. "It's taking the 'thinking outside the box' we often associate with the arts and applying it to other fields."

The term intermedia was coined by Fluxus artist Dick Higgins, who believed that the most interesting work of his time was happening across and between the traditional borders of artistic media — where painting and film come together, for example. UMaine's approach to intermedia takes the concept a step further.

"Higgins was talking about multiarts. We're drawing from and responding to traditional media and disciplines, but (we're) also not limited to those things," says Smith, a UMaine professor of art and chair of the Department of New Media. "What is creativity? It's not something that only happens in art. It happens in all fields."

MFA student Dan Flannery is an award-winning musician who has worked in the field of children's new media since 2001, when he began writing and producing music for a children's hip-hop project called MeeWee.

"In the MFA program, I am developing some new ways of approaching kids' media other than the books and records that I had been making in the past," Flannery says. "My ambition is to start working on something of a Web-based children's intermedia space where they are the artists and collaborators."

Creating that interactive, creative space — whether in quilting, songwriting, engineering or physics — is the driving force behind intermedia. It's an interdisciplinary approach that provides a rich experience for students.

"This is about exploration, innovation and experimentation," Smith says.

Operation

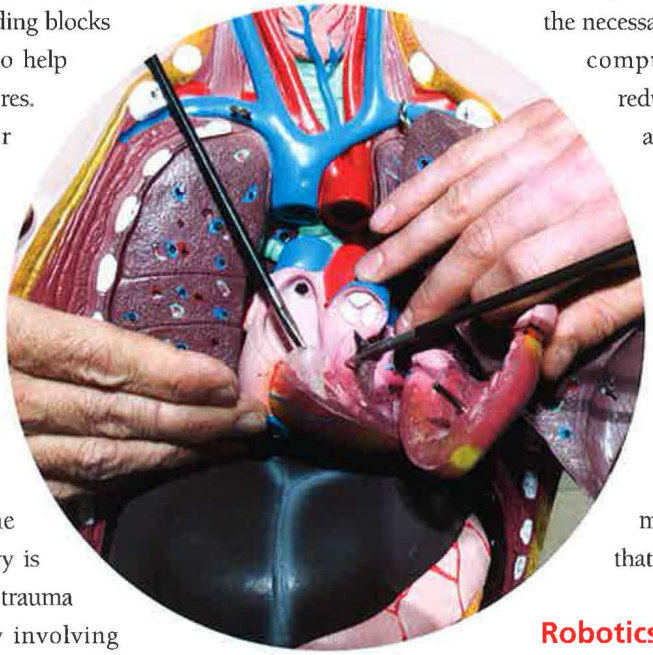
UMaine research in biomedical

By Margaret Nagle and Tom Weber

A SPIDER-LIKE MECHANISM the size of a small terrier scuttles seamlessly across the linoleum on four legs. Beside it, a green-eyed, foot-tall figure rights itself from a prone position and trudges off. A pint-sized version of a lunar vehicle tracks along a tabletop.

From computers ringing the laboratory, University of Maine student engineers program their every move.

In this, Maine's first biomedical engineering laboratory, these devices are the robotic building blocks of technology that has the potential to help revolutionize human surgical procedures. Mechanical engineering researcher Mohsen Shahinpoor, who directs the lab, admits that robotic surgery is in its infancy. But what he envisions for it is far-reaching.



Shahinpoor's focus is on the development of advanced robots for endoscopy and laparoscopy procedures that are less invasive and traumatic than traditional surgeries.

"A revolution is occurring in the medical surgical field. Robotic surgery is eliminating almost 90 percent of the trauma associated with traditional surgery involving cutting people open," says Shahinpoor, chair of the UMaine Department of Mechanical Engineering. "Eleven years ago when I was an assistant to a neurosurgeon, the skull had to be removed to get to a brain aneurism, and even then it required further penetration to get to the site and perform the necessary surgery. Heart surgery required cutting the sternum."

Today in endoscopic robotic surgery, the surgeon makes three or four small incisions, a few millimeters in length, in the abdomen. Via the tiny incisions, optical fibers and associated electronics control the lighting and imaging of the internal body organs, while robotic forceps and other surgical instruments perform the necessary surgery. The surgeon sees it all on a computer screen. Such robotic surgery reduces a patient's trauma, recovery time and risk of infection.

"I remember when no one knew what was going to happen to the patient after major brain or heart surgeries," says Shahinpoor, who is now dedicated in his own research to developing smart materials to aid in the prevention of heart failure. "Now with robotics developed by mechanical engineers using smart materials, surgeons are more confident that patients are going to make it."

Robotics offers surgeons precision movement, eliminating the inherent unsteadiness of the human hand. That same automated precision will one day soon make it possible for surgeries to be performed by doctors at a distance — even half way around the world, Shahinpoor says.

"In Japan, surgeons have operated on patients who were miles away," he says. "The implications of such surgery for the military are tremendous. Robotic surgery also would be truly tremendous for remote areas where there isn't healthcare access. In cases when even

robot

engineering poised to help revolutionize surgical procedures

Operation robot

transporting a patient may be fatal, robotic surgery can revolutionize patient treatment."

However, what the robotic hand or instrument lacks is tactile sensing capabilities, which Shahinpoor hopes to address with the help of his pioneering research in artificial muscles.

"When you put your hand in your pocket, it's as if you have eyes on the tips of your fingers," Shahinpoor says. "What we need and don't have yet is tactile sensing for robots, to be able to tell the difference between hard and soft tissues."

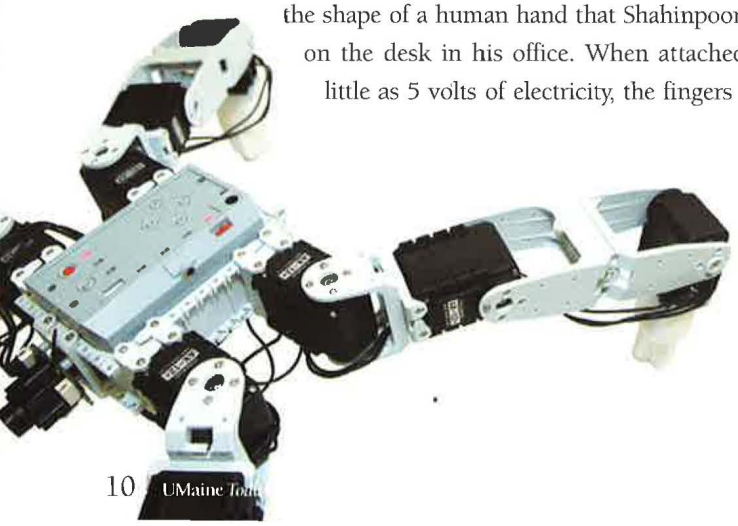
Shahinpoor and his students also are exploring how to build robotic devices with disposable parts, thereby reducing the incidence of infection. The key to such disposable robotic surgery tools is to make them cost-effective and as environmentally friendly as possible, while still maintaining accuracy, he says.

"Development of this kind of technology can really impact the economy of Maine," says Shahinpoor. "No one can deny that this is the way (surgeries) are going."

Shahinpoor's research into intelligent robotics systems began in the 1980s at the University of New Mexico, where he was the Regents Professor in the Department of Mechanical Engineering and professor of surgery and biomedical engineering in the School of Medicine. He studied the biomechanics of mammalian muscle, in which bundles of fibers contract in response to electricity from nearby nerves. By 1993, Shahinpoor's research led to a patent for the first electroactive polymer — a charged material called an ionic polymeric gel that deformed when placed in an electric field.

Within a few years, his intelligent materials lab in New Mexico was a breeding ground for artificial muscles that squirmed and writhed like living things with the help of two thin electrodes surrounding a soft plastic saturated with lithium ions. The artificial muscles move when low-volt electric current sends positively charged ions shuttling toward the negatively charged foil, bending the material and exerting force.

Take the wisp of shiny metal — a piece of flexible ionic Teflon sandwiched between platinum electrodes — snipped into the shape of a human hand that Shahinpoor keeps on the desk in his office. When attached to as little as 5 volts of electricity, the fingers on the cutout stir to life, clenching and releasing without the help of gears, levers, pulleys or bearings. Charged ions in the polymer migrate, distorting the shape of the material. Reverse the current and the artificial muscle bends in the opposite direction.



Shahinpoor envisions a day when life-size hands or legs made of supple artificial muscles attached to electrodes are transformed into noiseless prosthetics for amputees. He sees great promise in using plastic muscle to assist in the pumping of a diseased heart, and already holds patents for a multifingered band of electrically controlled artificial muscle that could compress a congestive heart.

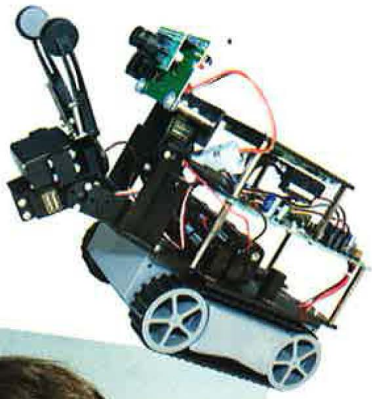
Because they flex, artificial muscles could also be used to make pumps for delivering drugs, such as insulin, to the body, Shahinpoor says, and to drain the liquid from a swollen brain or from inside the eye of a person with glaucoma. They could be used in orthopedic applications to enhance joint movements, or for humanlike prostheses controlled by the brain.

"There are many needs in medicine that could benefit from this," says Shahinpoor, whose research has led to multiple patents, hundreds of papers and a book in the artificial-muscle field. "My goal with this technology is to help people."

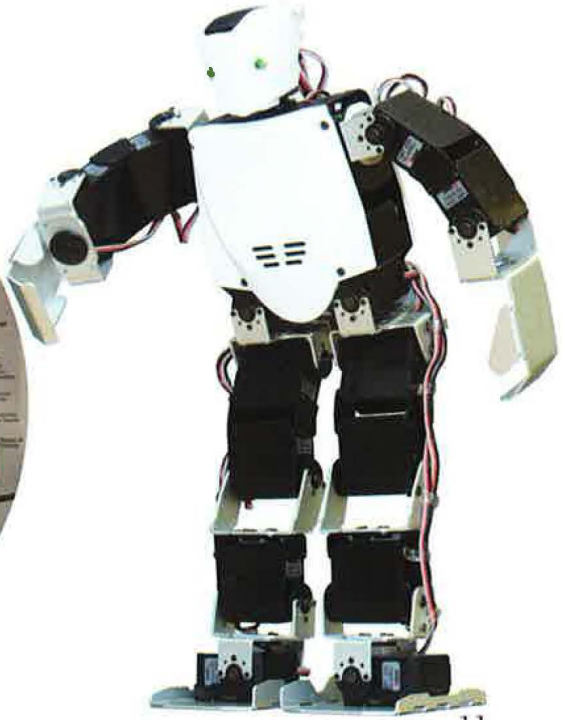
At UMaine, Shahinpoor hopes to make his biomedical engineering lab into a center of innovation and learning, where faculty and students can work with the state's medical institutions to solve problems using robotics and artificial muscles.

"It would be a synergy of engineering and medicine that may lead to many inventions that could revolutionize medicine," says Shahinpoor. "And that's what motivates students when they get involved in these areas. They know what they're researching may impact people through health engineering." ▮ +Online

"Development of this kind of technology can really impact the economy of Maine. No one can deny that this is the way (surgeries) are going."
Mohsen Shahinpoor



Mohsen Shahinpoor, chair of the University of Maine Department of Mechanical Engineering and director of the state's first biomedical engineering lab, and senior Mark Liimakka of Old Town, Maine, demonstrate the use of robotic forceps in heart surgery. Mechanical engineering junior Eileen Gatewood of Belfast, Maine, holds a five-fingered robotic hand being developed in the lab to perform more complex surgery. Junior Remi Jaouen of Lannion, France, interned in the lab this past summer. Senior Xibei Ding of Gorham, Maine, works on design and development of a robotic surgical arm.



Vietnam's other story

DEEP IN THE MISTY mountains of Vietnam, there are stories to be told. They are the stories of women who helped shape the southeast Asian country over the last several decades through social revolutions that eventually turned political.

But as the women grow older, the chance also grows that the world will never hear the truth. University of Maine history professor Ngo Vinh Long is afraid that soon, there won't be anyone left to recount the incredible tales of what happened in 20th-century Vietnam. That's why, for more than 30 years, he has been racing against time to capture those memories through interviews with the women of Vietnam.

"If you want to understand any society, how can you ignore half of that society?"
Ngo Vinh Long

"Women are important," Long says. "Women in Vietnam happen to be in the forefront of most social movements, and the social movements, of course, move into political movements."

For example, the National Liberation Front, formed in 1960 to overthrow the South Vietnam government and reunite the country, included people from a variety of religious and political groups.

"Ninety percent of Vietnamese were peasants. In the past, when people talked about Vietnam, they never talked about the peasants," says Long, who has written several books and articles from the standpoint of both women and peasants. "They talked about kings and sometimes they talked about queens, but they did not talk about (a large) percent of the population: the women. What happened to them? If you want to understand any society, how can you ignore half of that society?"

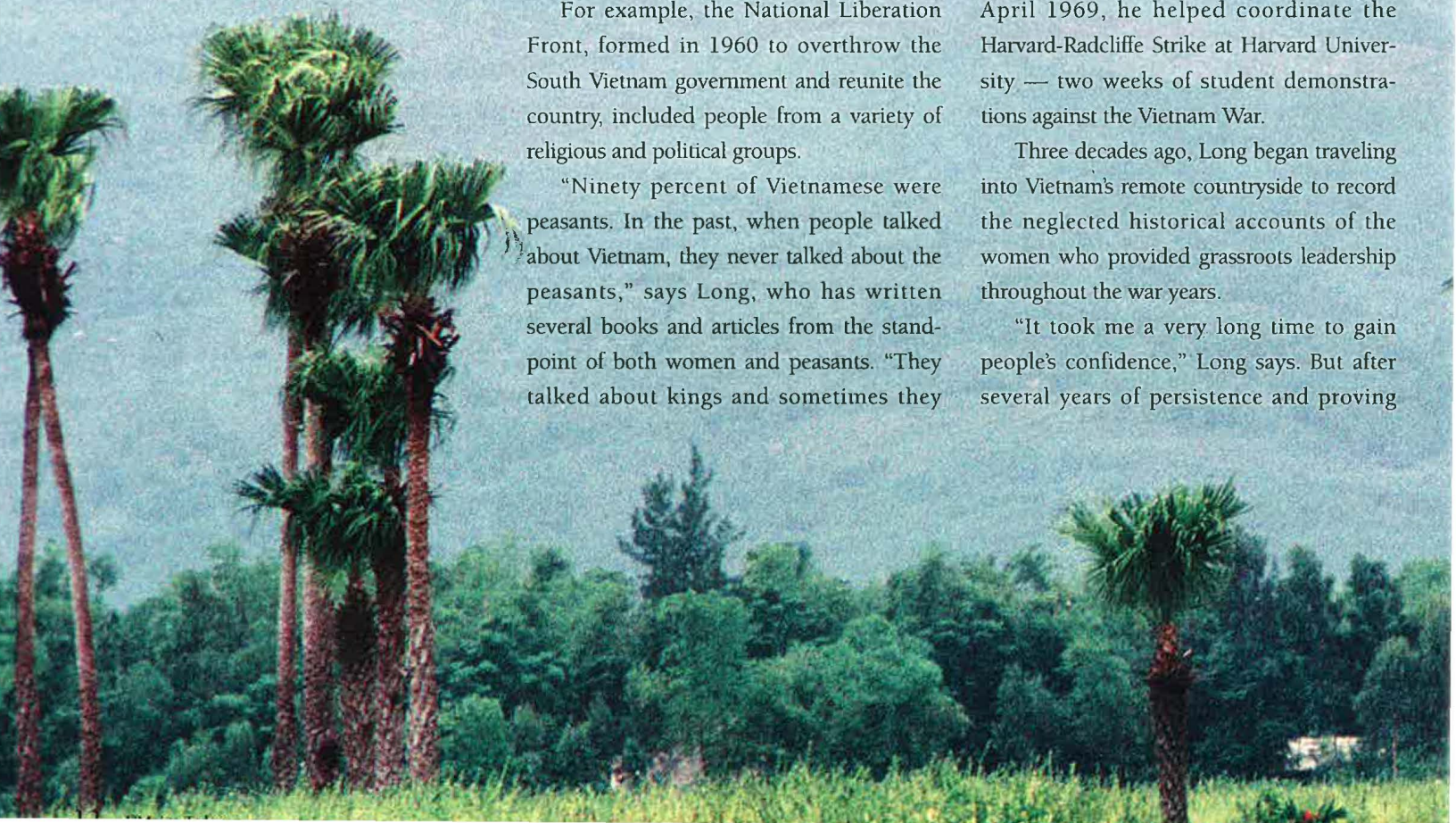
Countries that experience prolonged wars become very polarized, Long says. Women in Vietnam organized many social movements to help each other, the poor and others in need. The groups ranged politically from the left to the right in their beliefs, but all had similar missions.

Long is no stranger to conflict, and understands the workings and makings of such groups. From late 1959 to mid-1963, he was a military mapmaker for the United States, charting almost all of southern Vietnam, and borders of Laos and Cambodia.

After coming to the United States in 1964, he began telling Americans about the war and he organized several teach-ins. In April 1969, he helped coordinate the Harvard-Radcliffe Strike at Harvard University — two weeks of student demonstrations against the Vietnam War.

Three decades ago, Long began traveling into Vietnam's remote countryside to record the neglected historical accounts of the women who provided grassroots leadership throughout the war years.

"It took me a very long time to gain people's confidence," Long says. But after several years of persistence and proving



himself, Long has been able to break through the political barrier.

Long has spent many years building relationships. For example, just prior to his death in June 2008, former Vietnamese Prime Minister Vo Van Kiet led Long through the countryside, introducing him to key revolutionary leaders and activists.

Kiet has been regarded by most people as the best prime minister of Vietnam since 1945 because of the reforms he helped carry out during his tenure (1988–97), and his respect for intellectuals, democracy and human rights, Long says.

Such relationships have helped Long with one of the most difficult aspects of recording history — finding the right people to talk to.

"First of all, you have to know the history of the area," Long says. "You don't need to interview the most important people, but you need to know the most important people so they can show you the people you need to talk to."

Technology also has aided Long's quest.

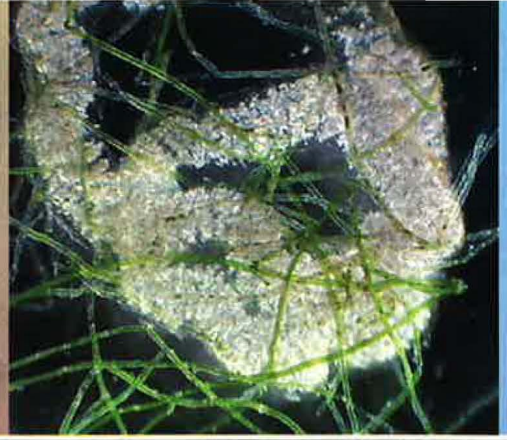
"People in Vietnam are not like people here. They're not used to being on camera," Long says. "In the past, I've used a tape recorder, but with the video, you can see the emotion of the people."

In the countryside where Long does the majority of his interviews, he needs his equipment to be able to run without electricity, sometimes for days at a time. With more than 5,000 hours of interviewing completed and more to come, Long also needs a computer with the memory capacity to store all of those hours of discussions.

"Sometimes I can talk with one person for about 10 hours," he says.

Long now records his interviews in high definition for use in the classroom, to post on the Web, and to archive for future generations of historians and students. Through his research, Long hopes to change the way women are viewed in some societies.

Three decades ago, Ngo Vinh Long began traveling into Vietnam's remote countryside to record the neglected historical accounts of the women who provided grassroots leadership throughout the war years.
Vietnam photo by Ngo Vinh Long


the big swi

Sea slugs living as both animals and plants could provide clues to innate immunity

By Aimee Dolloff

IT'S BEEN SAID that you are what you eat. If that truly were the case, some of us would resemble hamburgers or greasy slices of pizza, while others would look more like granola bars or glasses of soy milk.

For one tiny creature, however, the idea of becoming what you eat isn't that far off base.

Referred to as the "solar-powered" sea slug, *Elysia chlorotica* has fascinated scientists for years because of its ability to retain "stolen" chloroplasts and carry out photosynthesis as if it were a plant.

Although they are slugs, these small green creatures aren't the yellowish-brown slimy garden variety. Rather, they are emerald green marine molluscs that look like a plant leaf, and only need to eat early in their life cycle.

Photo by Mary Rumpho-Kennedy and Dan Lineberger

tcheroo

Sea slug eggs are produced in a mucus mass, where embryos hatch into veliger larvae. Juveniles are brown with red pigment spots prior to feeding. When they eat the alga, *Vaucheria litorea*, the sea slugs turn green by putting algal chloroplasts into their gut cells. Research by University of Maine plant physiologist and biochemist Mary Rumpho-Kennedy focuses on the endosymbiotic relationship between plant and animal, resulting in photosynthetic sea slugs.

Sea slug photos by Mary Tyler; portrait of Mary Rumpho-Kennedy by Michael Mardosa

Since 1987, University of Maine biochemistry professor Mary Rumpho-Kennedy has been studying *Elysia chlorotica* found in saltwater marshes along the East Coast from Nova Scotia to North Carolina, and sometimes as far south as Florida.

Rumpho-Kennedy's recent groundbreaking research offers insight into the potential for evolution of photosynthesis in an animal through symbiosis and gene transfer.

What makes this sea slug different is that it acts more like a plant than an animal. It even looks like a leaf and reacts to sunlight in much the same way as a plant, opening up when exposed to sunlight.

But how do sea slugs get that way?

AS THEIR FIRST MEAL, sea slugs suck out the cellular contents of their algal prey and retain the green chloroplasts in cells lining their digestive gut. This transforms the molluscs from a reddish-brown to a green color. Rumpho-Kennedy hypothesizes that the algal nuclei also go through the sea slug's gut and are most likely broken open, releasing the algal DNA.

This DNA, if not digested, may be either taken up freely floating by cells lining the gut or transferred by some type of vector, possibly a virus. The foreign DNA then becomes part of the animal nuclear DNA, transferring genetic information from the algal nucleus to the sea slug.

This DNA contains the genetic information to make chloroplast proteins essential for photosynthesis to continue. Animal DNA does not contain these genes and, thus, cannot support photosynthesis.

With this special type of symbiosis, sea slugs never need to eat again. Instead, they survive for months on sunlight and air — just like a plant — by carrying out photosynthesis.

"When you eat lettuce, chloroplasts go through your gut, but the enzymes chew them up and digest them," Rumpho-Kennedy says. "With the sea slug, the chloroplasts aren't digested and the animal turns green. They must acquire these chloroplasts early in development or they die."

Animal cells don't have chloroplasts, so the sea slug has to get them from the algae in order to photosynthesize to produce enough energy to survive.

Scientists have long studied a phenomenon called vertical gene transfer, in which genetic material (a copy of one's DNA) is

Slugs in school

IN ADDITION to her work in the lab, University of Maine biochemist Mary Rumpho-Kennedy hopes eventually to have the funding and resources to provide classroom teachers with sea slugs and curriculum she is developing with professor Mary Tyler in the School of Biology and Ecology.

"We get requests all the time from people wanting sea slugs," she says. "These intriguing animals serve as excellent teaching tools."

Their Web site, SymBio, is filled with information for teachers to use in the classroom, including diagrams, photos and videos.

She currently is working with an advanced biology teacher at Upper Arlington High School in Ohio to provide sea slugs to use for a variety of classroom projects. The students got so excited after viewing SymBio, they decided to make class T-shirts featuring the sea slug.

Rumpho-Kennedy also allows area teachers and students to tour her lab. Younger students enjoy watching the sea slugs be sucked into the syringes (actually, turkey basters), while older students want to learn how an animal can act like a plant.

passed on from an organism's ancestor to the next generation.

They've also studied horizontal gene transfer between prokaryotes (typically a single-cell organism that lacks a nucleus that contains its genetic material), or from a prokaryote to a eukaryote (that has a nucleus that contains its DNA), or, more rarely, between two closely related eukaryotes. But the idea of horizontal gene transfer between two unrelated multicellular eukaryotes — from an alga to a mollusc, in the case of the sea slug — is something new.

"Your immune system should kill it," Rumpho-Kennedy says. "We can eat all kinds of plants and we don't become plants."

Humans have more sophisticated immune systems than slugs, she says, but the tiny molluscs still should try to attack the foreign chloroplasts and DNA in their bodies.

RUMPHO-KENNEDY ULTIMATELY hopes to discover how the sea slug is able to get the algal DNA into its system and make it work, determine the minimal requirements for photosynthesis, and understand how the foreign material avoids destruction in the sea slug.

It will take more research to determine why the sea slug's immune system doesn't attack the foreign chloroplasts or DNA, but the discovery could lead to breakthroughs in understanding immunity and disease.

If scientists can determine how the chloroplasts are able to avoid detection in the sea slug, they may be able to determine how parasites are able to attack humans.

Continuation of her research is made easier now that Rumpho-Kennedy and her students have the ability to raise sea slugs through the entire life cycle in the lab and conduct more extensive DNA testing.

"New technology allows us to sequence massive amounts of DNA," Rumpho-Kennedy says. "We want to see to what extent there's been gene transfer from the alga to the slug."

In addition, understanding how the algal DNA gets integrated into the animal will unravel a lot about how the expression of genes is controlled, Rumpho-Kennedy says.

Symbiosis leads to the evolution of new traits, such as lichens that are a combination of fungi and algae. With symbiosis occurring between an animal and a plant, the result is an animal that can photosynthesize and live like a plant.

"What I think way down the road is that the chloroplasts and algal genes in the sea slugs will be inherited," Rumpho-Kennedy says. ▮ +Online

Undergraduates Helen Mattsson, left, and Susan Devine, right, collaborate with postdoctoral associate Karen Pelletreau on National Science Foundation-funded research in Mary Rumpho-Kennedy's laboratory.

The company you keep

IN PROFESSOR Mary Rumpho-Kennedy's lab, seniors Helen Mattsson, a molecular biology major from Scarborough, Maine, and Susan Devine, a microbiology major from Richmond, R.I., are studying the relationship between bacteria and the sea slug, *Elysia chlorotica*. For their honors thesis, they are characterizing the diversity of microorganisms living in association with the sea slug by sequencing the DNA from the bacteria found on or in the marine mollusc.

Mattsson is conducting tests on sea slugs gathered in Halifax, Nova Scotia, while Devine's originated farther south at Martha's Vineyard.

Because the slugs eat only once and remain alive by photosynthesizing, scientists believe they must obtain additional nutrients from other sources. In addition, the bacteria may aid in the production of novel secondary metabolites by the sea slug, including anticancer compounds.

"We think the bacteria might be providing essential nutrients to the sea slugs that the slugs aren't getting themselves because they're not actually eating anything," Devine says. "There are certain nutrients, like vitamins, that the sea slugs can't get from photosynthesizing, so we're hoping to find what bacteria give these to the sea slug."

Dirigo Flyers

Michael Browne

HOUSTON, WE DON'T have a problem.

In fact, if Michael Browne and Benjamin Freedman have anything to do with it, we may have a solution. Or, at the very least, a better understanding of the way toxic chemicals affect human cells in microgravity and hypergravity.

Browne and Freedman, students in the University of Maine's Chemical and Biological Engineering Department, participated in NASA's Microgravity University at the Johnson Space Center in Houston. Their Dirigo Flyers team included adviser Michael Mason, a UMaine chemical and biological engineering professor, along with students and faculty from the University of Southern Maine. Mason provides specially engineered gold and silver nanoparticles for use in John Wise's USM toxicology lab, making the student-driven research a natural collaboration.

Microgravity University (MGU) allows undergraduate students — about 30 teams over three sessions — to conduct research aboard the Weightless Wonder, a modified McDonnell Douglas DC-9 aircraft that flies a series of parabolic maneuvers to produce periods of micro- and hypergravity.

"Every kid dreams of being an astronaut. It's an experience most people don't get to have in their lifetime," says Browne, a junior from Winslow, Maine.

Their experiments focused on the uptake of known toxins in human lung cells during periods of enhanced and reduced gravity. Astronauts experience both conditions for extended periods, and with NASA's push to colonize on the moon by 2024, the health implications will be of even greater interest.

The Dirigo Flyers' research was funded in part by donations from the Maine Space Grant Consortium, the University of Maine and UMaine alumnus Doug Hall, who runs the Eureka! Ranch innovation think tank in Ohio.

The Dirigo Flyers hypothesized that the gravity conditions experienced in space flight would cause cells and DNA chromosomes to become more susceptible to damage. The team was the first in MGU's history to experiment using live cells, which required special precautions onboard and extensive preparation on the ground. Because of their unique research, they also were allowed access to cutting-edge biochemistry laboratories at Johnson Space Center

"It really opens your perspective, not only to the research being done, but the resources that are out there, seeing as an undergraduate to what extent you could be involved."

Benjamin Freedman

"Hands-on experiences always serve to illustrate to students the link between classroom work and real-world application," Mason says. "Often it is a positive research experience which helps promising students make the decision to go on to graduate school."

For Browne and Freedman, a senior from Caribou, Maine, MGU cemented their decision to continue down the research path. They still have a way to go on their NASA research, but their early findings look promising. They also have started doing educational outreach on campus and in area high schools.

"It was a unique experience, meeting all these other talented students from big universities and being on the same playing field as them," Browne says. "Even though it's the small state of Maine, we still have a great program at UMaine, and there are opportunities out there if you take them. The research we're doing at Orono is at the same level as other, larger universities, or better."

A Wild Ride

Student investors learn important lessons on the Wall Street roller coaster

By Kristen Andresen
Illustration by Eric Zelz

IT'S A LITTLE AFTER 5 on a November evening and a group of undergraduates has gathered in the Corbett Business Building at the University of Maine to discuss the morning's headlines: From the *New York Times,* "Forecasters Look To Read Wall Street's Political Tea Leaves"; CNN, "Economists See Recession Through 2009"; PBS, "The Auto Industry Takes a Devastating Financial Hit."

As managers of the University of Maine Foundation's Student Portfolio Investment Fund, or SPIFFY, they oversee a $1.2 million real-money portfolio that took a hit in the previous months — to the tune of $90,000. Yet the students are surprisingly calm, in part because their portfolio is outperforming the S&P 500 by 10 percent.

"Yes, we did lose some money, but probably there isn't a portfolio that hasn't," says Alexandra "Sasha" Misan, copresident of SPIFFY, which is open to any undergraduate interested in finance. "In a lot of respects, now is a time to invest, because even though a lot of the companies are down, we would expect them to go up in the future. We buy stocks which we think have potential, but we're also selling some of our positions so that we cut our losses."

SPIFFY has been dealing with the fallout since August, when a Cleveland-based bank in the portfolio started to fail. The group's online message boards were abuzz before the fall semester. No one knew how long the downturn was going to last. It was a tough decision to sell, but sell they did.

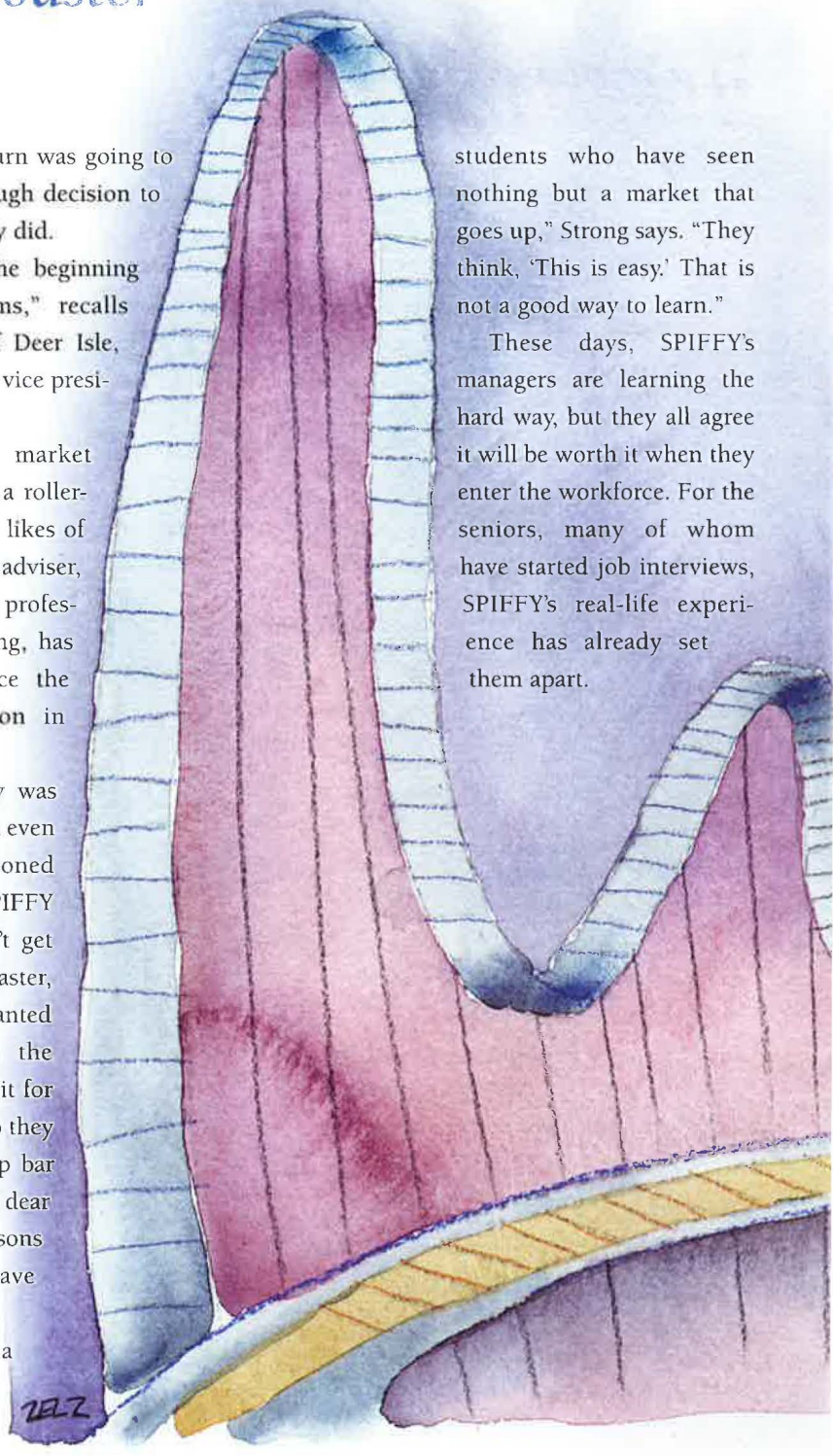
"That was the beginning of our problems," recalls Derek Hardy of Deer Isle, Maine, SPIFFY's vice president of finance.

The stock market quickly became a roller-coaster ride, the likes of which SPIFFY's adviser, UMaine finance professor Robert Strong, has never seen since the group's inception in 1993.

The volatility was enough to spook even the most seasoned investors. But SPIFFY students couldn't get off the roller coaster, even if they wanted to. They, like the portfolio, are in it for the long haul. So they tightened the lap bar and held on for dear life. And the lessons they learned have been invaluable.

"We've had a generation of students who have seen nothing but a market that goes up," Strong says. "They think, 'This is easy.' That is not a good way to learn."

These days, SPIFFY's managers are learning the hard way, but they all agree it will be worth it when they enter the workforce. For the seniors, many of whom have started job interviews, SPIFFY's real-life experience has already set them apart.



"Employers are usually pretty surprised to hear the amount of money we have invested and that it's all student-run," says Alisha Albert of Winslow, Maine, a senior business administration major and SPIFFY's vice president of accounting.

"I think it definitely helps," adds Misan, who hails from Irkutsk, Russia, and plans to stay in the United States to work in finance. "I can base my conversations around it. When people ask what I would do in a certain situation, I actually did it and can back up what I'm saying."

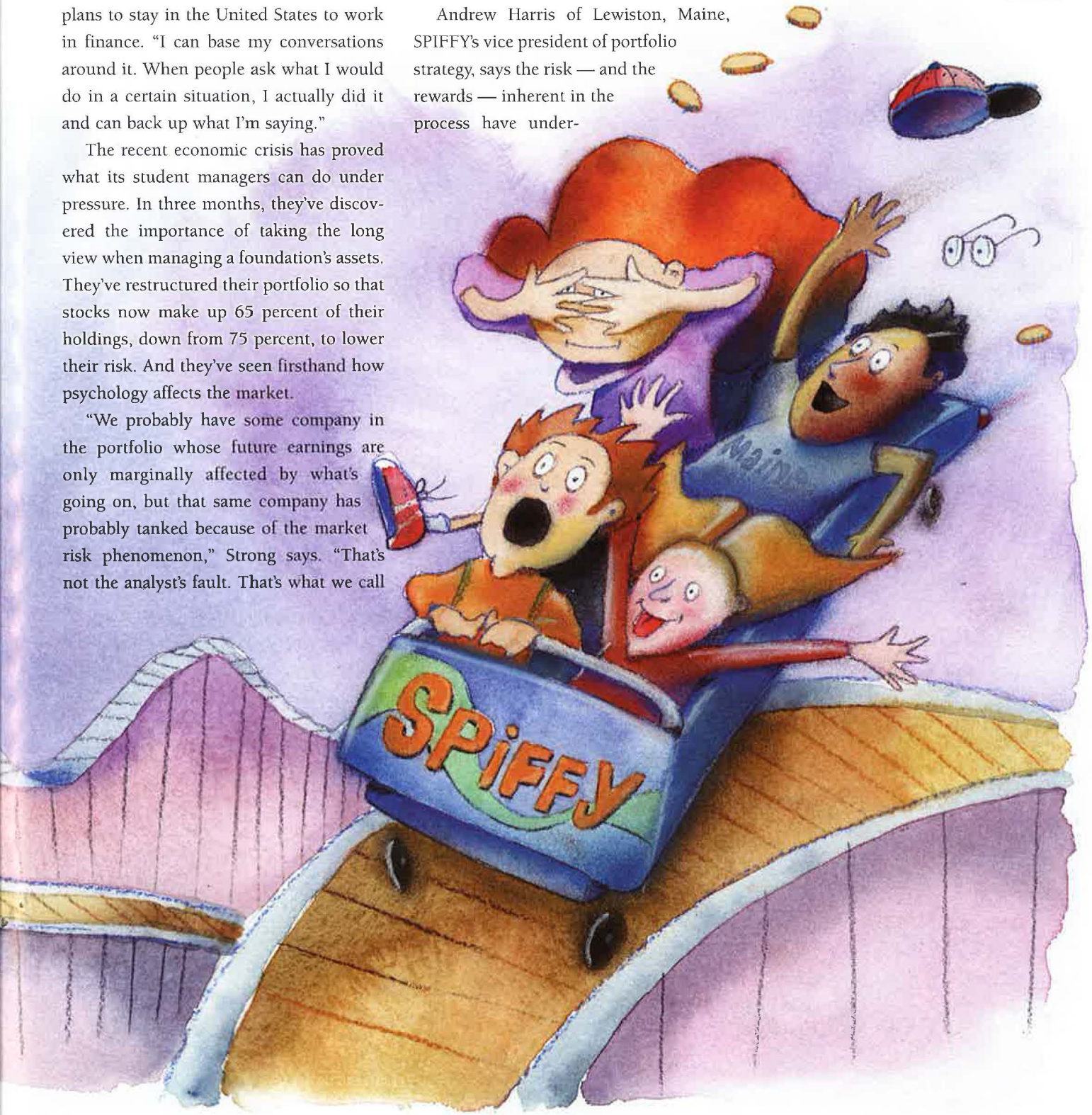
The recent economic crisis has proved what its student managers can do under pressure. In three months, they've discovered the importance of taking the long view when managing a foundation's assets. They've restructured their portfolio so that stocks now make up 65 percent of their holdings, down from 75 percent, to lower their risk. And they've seen firsthand how psychology affects the market.

"We probably have some company in the portfolio whose future earnings are only marginally affected by what's going on, but that same company has probably tanked because of the market risk phenomenon," Strong says. "That's not the analyst's fault. That's what we call beta risk. If you're in the market, you bear that risk."

Because this is a foundation portfolio, there is no need for liquidity today or in the foreseeable future. So the students are willing to ride out the market uncertainty, tweak their strategy and glean everything they can from the volatile market.

Andrew Harris of Lewiston, Maine, SPIFFY's vice president of portfolio strategy, says the risk — and the rewards — inherent in the process have underscored what he has learned in the finance classroom. Ultimately, that will benefit him, his classmates and future investors.

"Things that may not have seemed as necessary when the market was good are absolutely essential now," Harris says. "And I think that's going to make us better money managers." ▮ +Online



@Apple

OGHENEOVO "OVO" Dibie has an eye for an iPod.

Last summer, the University of Maine junior majoring in computer science scored an internship with Apple, building the databases that help make the popular media player better.

At the National Society of Black Engineers job fair in Florida, Dibie made connections that led to interviews with Facebook, Goldman Sachs, Liberty Mutual and Morgan Stanley. Apple was his final interview — and perhaps the most intimidating.

"I was a bit scared. At first felt like I'm not good enough to go there. (I feared) that I'd be out of place or out of touch," says Dibie, a native of Nigeria who transferred to UMaine in 2007 from a small school in New Mexico.

"There are a lot of smart people at Apple, but they're just like everyone else. And after having technical discussions with them, I realized I'm not far behind."

The internship included regular lectures by Apple executives and technical wizards, including Apple CEO Steve Jobs. When Dibie had the chance to meet him, he, too "was just like everyone else."

"He eats lunch with everyone else in the cafeteria, he's very friendly, very straightforward, very natural, very charismatic," says Dibie, who specializes in database and Web development. "So are all the other executives at Apple."

"I now have a clear sense of what is expected of me. I need to be sharp. I need to know what to do and when to do it. I need to know how to communicate with my managers and colleagues."

Ovo Dibie

During his internship, Dibie created a database that tracks errors users encounter with iPod. The data are used by software developers to improve hardware or software.

He also worked on another Web-based project that graphically represents tests run on iPod software. With this representation, software developers can pinpoint errors and what each version accomplished.

A third project involved fine-tuning the wireless capabilities of the iPod touch. At the time, the devices interfered with each other when connecting to a wi-fi network. He carried out a series of controlled wi-fi tests that helped zero in on the source of the error.

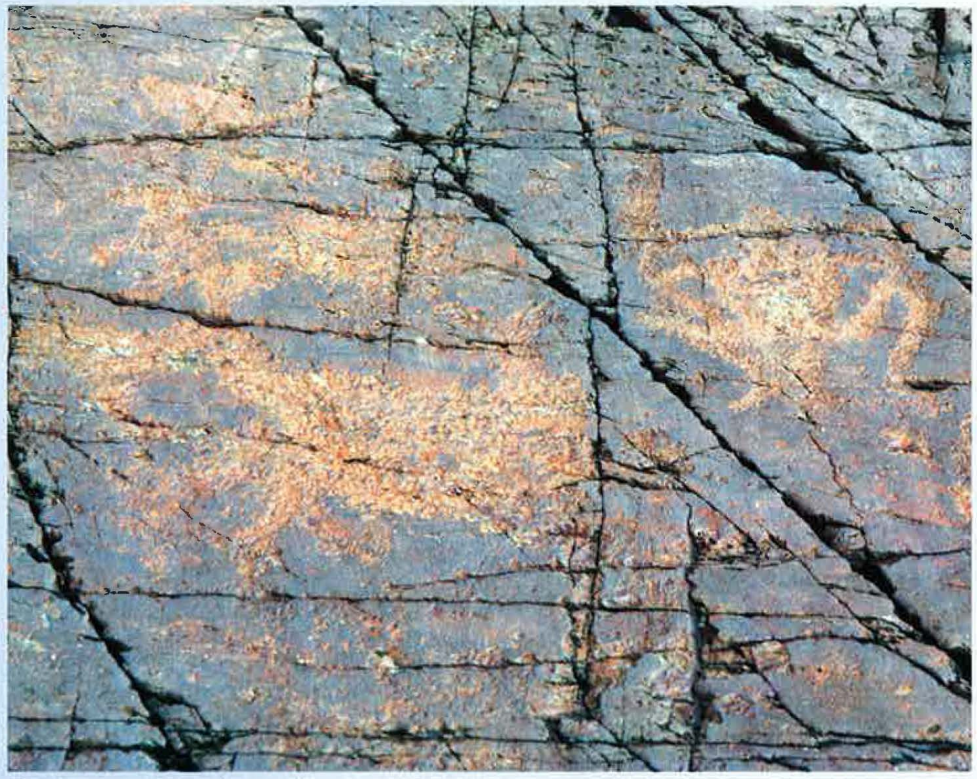
Dibie admits he didn't come into his internship knowing everything there is to know about MySQL, PHP, database building and software troubleshooting. But his experience at UMaine gave him one key skill.

"I was prepared to learn," he says.

Beyond the technical aspects of the job, Dibie found the experience of working in a fast-paced corporate culture invaluable.

"If I want to get a job as a professional software developer, I now have a clear sense of what is expected of me. I need to be sharp. I need to know what to do and when to do it. I need to know how to communicate with my managers and colleagues. I also need to know the resources around me. People around me were always ready to help."

Photo by Michael Mardosa



The Passamaquoddy Tribe is working to document and develop a management plan for the centuries-old petroglyphs found along Machias Bay — the largest site of such artwork in the Northeast. Helping them do that is University of Maine archaeologist Brian Robinson. The glyphs, created by pecking with a sharp stone to create tiny pits that form a design, depict moose, deer, a shaman and the arrival of European settlers in their sailing ships.

Photo used with permission of the Maluhsi-hikon Petroglyph Foundation

Photos by Michael Mardosa and William Drake

UMaine and tribal experts collaborate to save Maine's rare petroglyphs on Machias Bay

By Aimee Dolloff

BURIED AND ENGRAVED along Maine's coast are valuable pieces of the region's past at risk of being lost forever. But before they're gone, researchers at the University of Maine are collaborating with members of the Passamaquoddy Tribe in an effort to learn, preserve and share as much as they can.

Each gravel sample, small fragment of seal and fish bone, and discarded clam shell is a piece of the larger puzzle spanning several thousand years, from early tribal occupants to the more recent mix of tribal, French and English settlers of the last 400 years.

Combine that with the largest petroglyph site on the Northeast coast of the United States, and you've got rich and rare history that tells its own story through images that were carved

Carved in stone

thousands of years ago into the rocks of Machias Bay. In addition, it provides an exceptional connection between the Passamaquoddy and their ancestors.

"In archaeology, these sites are important for what we can learn from them," says Brian Robinson, a University of Maine assistant professor of anthropology. "For the Passamaquoddy, they are sacred places, directly connected to their heritage."

"It's easy to forget that archeology pertains to people who are still alive. You're actually studying their ancestors."
Gabe Hrynick

Robinson coauthored a Maine Academic Prominence Initiative (MAPI) Grant from the university that funds a four-week summer field school for anthropology students. Last summer marked the second of three field schools.

The goal is to provide students, primarily undergraduates, with hands-on experience excavating endangered shell midden sites on Maine's coast, while at the same time working with the modern Native communities whose ancestors lived there.

Last summer also proved valuable when the Passamaquoddy Tribe received its own grant from the National Park Service to document and begin creating a management plan for the petroglyphs. Project director Donald Soctomah, the Passamaquoddy Tribal Historic Preservation Officer, enlisted Robinson to direct test excavations, working with Passamaquoddy tribal members Stephanie Francis, Scott Francis and Kani Malsom, all students in the University of Maine System; Natalie Dana from Washington County Community College; Joseph Francis and David Soctomah. Dana and David Soctomah also participated in the UMaine field school.

They were joined by some of the other UMaine field school students, who volunteered to stay on to work on the petroglyph project.

Cooperation between UMaine and the Passamaquoddy Tribe has benefited both. The Passamaquoddy received technical assistance through UMaine expertise and resources, while students learned directly from the Native communities rather than an abstract historical account.

"The students learn basic techniques, but they also learn them in the context of Native values and interests," Robinson says. "You can't do that in many places."

UMAINE ANTHROPOLOGY major Gabe Hrynick of Benedicta, Maine, worked at both sites and is conducting research on items unearthed. His anthropology thesis will focus on two gravel floors discovered during the field school and at the petroglyph site.

Using carbon dating and artifacts, Hrynick hopes to determine how long it's been since the sites were occupied. The UMaine junior now is sifting through ziplock bags of gravel samples taken from the floor sites to see what they contain.

"Hopefully we can use them as a window into the past of the hunter gatherers of the region," Hrynick says.

Such hands-on learning makes coursework very relevant, says Hrynick, who is interested in anthropology and archeology, particularly as they pertain to living communities.

"More than just reading about it, it synthesizes all the coursework," he says. "It's easy to forget that archeology pertains to people who are still alive. You're actually studying their ancestors."

While worldwide there has been some contention between archeologists and tribal members, Hrynick says having Passama-

UMaine anthropology majors Gabe Hrynick, a senior, and Sarah Niemic, a sophomore, participated in the archaeology field school, then volunteered to stay on to work on the petroglyph project.

quoddy Tribe members involved in the excavation work helps take away some of the ethical concerns of the past.

"For some time, anthropology treated Native American communities and individuals as the objects of anthropological and archaeological research. Now, we see the relationship as one of mutual benefit, collaboration and partnership," says Lisa Neuman of UMaine's Anthropology and Native American Studies departments.

Neuman, who coauthored the field school MAPI grant, stresses the importance of creating a partnership between the university and the tribes.

"This was a great example of cooperation for a common goal," she says.

TODAY, WHAT MANY fear is that the rising sea level soon will wash away all remnants of the remaining shell middens and history will be swept out to sea. In just the last three decades, many shell middens formerly tested by UMaine archaeologist David Sanger have already been destroyed by erosion and construction.

"A lot of us suspect that these shell middens will be a thing of the past in the next half-century or century," Robinson says.

The same is true of the petroglyphs. If not managed properly, they face the same harsh weather conditions, and potentially could be damaged or ruined by careless or disrespectful visitors to the site.

That's one reason why the specific locations of the carvings are held close to the hearts of the Passamaquoddy and the

Petroglyphs can be used to share Wabanaki history. UMaine archaeologist Brian Robinson stands in stocking feet (a preservation method) on a ledge that contains more than 250 petroglyphs spanning 1,000 years.

researchers hoping to learn from the ancient artwork. Access to the ledges is now limited as the Passamaquoddy explore ways to both protect and share their heritage.

"One rock ledge has 250 petroglyphs spanning 1,000 years, Robinson says. "They're fragile. They've survived very well mostly because they're isolated."

Many of the images created by the Passamaquoddy ancestors can be interpreted from the oral traditions of the Wabanaki and broadly distributed Algonquian people. Some of the most recent depict sailing ships.

The petroglyphs have been studied for 30 years by archaeologist Mark Hedden, who worked with Donald Soctomah and others who obtained the recent grants.

The Machias Bay area where the glyphs are found was in dispute between the English and the French up until the Revolution, and served as a refuge for a variety of groups during those years, Robinson says.

"They selected that bay for 3,000 years," Robinson says. "The tradition being carried on was spiritual and artistic. It shows strong evidence of continuity that's difficult to get sometimes in other parts of archeology."

Exactly why the site was chosen as a place to record history remains a mystery that Robinson hopes archeological evidence can help solve.

Through the combined efforts of the tribe, local landowners and the Maine Coast Heritage Trust, the first step toward ensuring that the Passamaquoddy will be able to properly care for the site came when it was transferred from private ownership to the tribe in 2006.

The next step is development of a plan to manage this disappearing piece of their past that still holds many secrets and has the potential to serve as a breathtaking educational tool.

"They want to use the petroglyphs to share their past," Robinson says. "They know that they're eroding. They know that they're not going to be there forever.

"What they're doing is a great project," Robinson says. ▮

The art of research

"I liked that we were bridging the gap between student and faculty through research."

Aya Mares

Painting by Gail Page, *Reconciliation*, acrylic on board

THE DECISION BY Aya Mares and Mimi Killinger to embark on a collaborative research project at the University of Maine was an artful move.

Mares, a first-year art student from Orono in UMaine's Honors College, had an intense interest in art therapy, collectives and activism. Killinger, a faculty member in the college, had just begun researching The Garden Artists, a Houston-based women's art collective from the 1970s. Their interests were so in sync that last spring they embarked on a joint research effort.

"We came to the project with shared research interests," says Killinger, the Rezendes Preceptor for the Arts in the Honors College. "Rather than my delegating, we were cooperating, taking equal responsibility for our work. Aya's enthusiasm for the subject reinvigorated my study, and sharing my research with a student in an authentic way propelled my own research."

In the course of several months, they interviewed artists such as Robert Shetterly, Gail Page and Lydia Cassatt; members of the Machias-based Beehive Collective; and Bangor art therapist Fran Clukey to explore the variety of ways that art can help people — from therapy to activism.

"I think the most important thing was talking to these people and seeing they had similar concerns as me," Mares says. "They're invested in something, they're doing something about it."

Mares may use her findings as the basis for her honors thesis. In addition, last fall she and Killinger presented at the National Collegiate Honors Conference on collaborative undergraduate research. They are now writing a paper on their research process for a scholarly journal.

NOT HOME ALONE

FOR CHILDREN AND TEENS of deployed military personnel in this state, University of Maine Cooperative Extension has four words: You are not alone.

For the past four years, Cooperative Extension has coordinated the Maine chapter of Operation Military Kids, part of the 4-H/Army Youth Development Project to provide community-based support through programming and services for youngsters and youths with military guard and reserve parents. Funding comes from the Department of Defense.

"Depending on their ages and coping mechanisms, military kids can be at risk," says Karen Gagne, a 4-H Extension educator based in Kennebec County. "They can face separation anxiety and fear for their parents' welfare, which can manifest in a range of behaviors, including anger and acting out, depression and physical ailments that cause them to miss school.

"Operation Military Kids is about recognizing what the children and teens of deployed military personnel are going through, and helping meet their needs."

Operation Military Kids takes advantage of technology to keep children and youths as connected as possible with deployed parents. With a wireless mobile technology lab, Gagne and other volunteers help children and their families learn how to share their lives in photographs, video and audio.

"By giving them tools to help them cope and share, they're engaged and staying connected," says Gagne, who organizes Operation Military Kids programming, often in conjunction with other military support efforts for soldiers and their families.

Operation Military Kids also distributes Hero Packs to youngsters — backpacks that include stationary, books, disposable cameras, resource materials and a handwritten note of thanks from a volunteer for their strengths and sacrifices.

For teens 13 and older, wilderness survival camps at Bryant Pond emphasize team building, leadership development and service learning.

"A goal is to help them be a kid again, finding time just for them," Gagne says. "Many times teens of military parents take on more roles at home. In the camps, we help them find their strengths and gain new skills so they can be resilient."

Beyond the camps, the older children continue to connect electronically with peers in Operation Military Kids. They become involved in Speak Out for Military Kids, an outreach initiative in which teens share their views and experiences, raising awareness in their schools and communities.

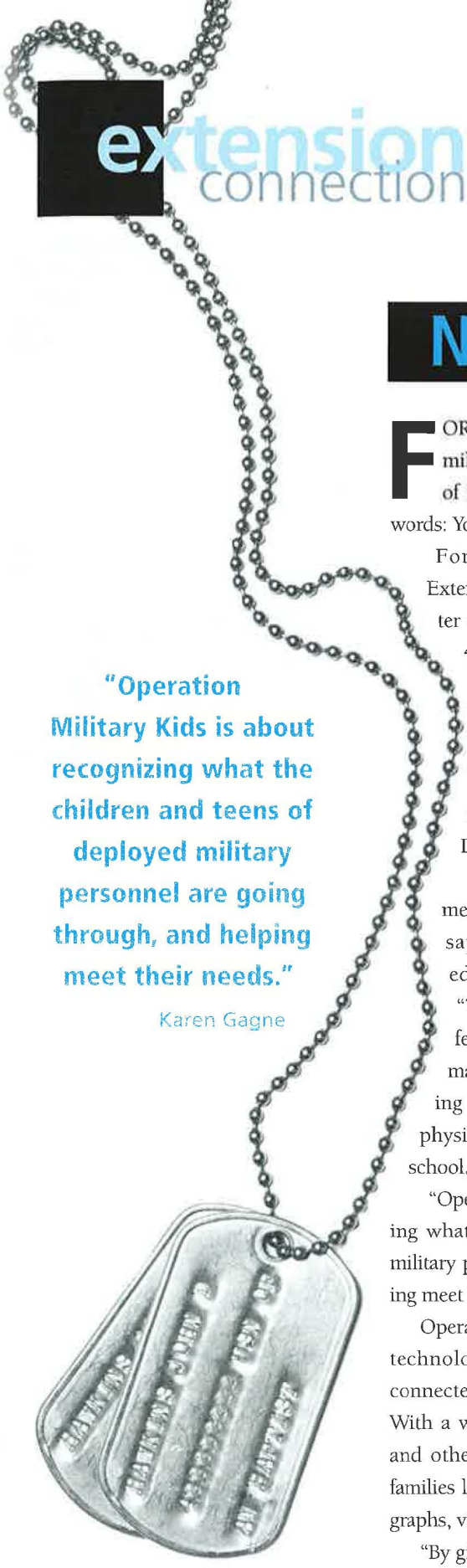
Once engaged and supported by their own peers, the teens often mentor younger military children, Gagne says.

In communities and schools statewide, Operation Military Kids organizes training sessions like "Ready, Set, Go!" designed to recruit volunteers and raise awareness of the needs of military children. The goal is to provide support networks.

"The feedback we've received from parents and kids is phenomenal," Gagne says. "Kids have told us they can't believe they received something — from a Hero Pack to a weekend at camp — because up to that point, it was all about mom and dad."

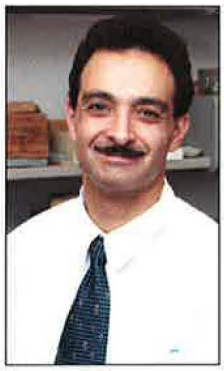
"Operation Military Kids is about recognizing what the children and teens of deployed military personnel are going through, and helping meet their needs."

Karen Gagne



experts on topic

Habib Dagher



IN THE SEARCH for alternative sources of energy, the University of Maine's AEWC, Advanced Structures & Composites Center, is exploring offshore wind turbine technology. Such technology development is particularly pertinent in Maine, where an estimated 80 percent of the state's residents use heating oil.

AEWC Director Habib Dagher is collaborating with companies on the design, manufacture and testing of floating wind turbine technology in deep waters 60–900 meters offshore. Such turbines would feature 300-foot towers with 200-foot blades.

Dagher's deep-water wind research has made national headlines. Last July, he testified on Capitol Hill on the nation's potential for offshore wind energy before the U.S. Senate Homeland Security and Governmental Affairs Committee.

PROTEIN focus

WITH THE HELP of a newly invented microscope system, scientists at the University of Maine are taking a close look at a protein from influenza virus that allows infection to occur.

The microscopy system, called FPALM (Fluorescence Photoactivation Localization Microscopy), was invented to enable scientists to look at the molecular organization of cells by imaging samples labeled with a special kind of fluorescent marker.

Influenza uses the protein hemagglutinin (HA) to infect healthy cells. In the first step of infection, HA enables the virus to attach to the membrane of a healthy cell.

It is believed that the arrangement of individual HA molecules in the membranes is crucial for infection to occur. Until now, the limited resolution of conventional microscopes made it impossible to create images of such molecules on a small enough scale to test the biological models that predict how they may be organized.

The recent extension of FPALM to include 3-D imaging and provide information about the orientation of single molecules will help address important biological questions. Already, the ability to image living cells has helped UMaine scientists disprove several existing models of membrane organization.

The UMaine researchers, including Samuel Hess, a FPALM coinventor, along with colleagues at the Albert Einstein College of Medicine in New York and the National Institute of Child Health and Human Development in Maryland, published their findings on HA in the journal *Nature Methods*.

The FPALM microscopy system breaks a fundamental limit on the resolution of lens-based microscopes, known as the diffraction barrier, which has existed for more than 100 years.

tallyingticks

WILDLIFE ECOLOGY senior Katelyn Andrle spent Maine's moose hunting season at the weigh stations to do a count, not of hunters' prey but of one of their pests — winter ticks.

As an independent study project, Andrle assisted Maine's Department of Inland Fisheries and Wildlife in tallying ticks that pose a health risk to moose.

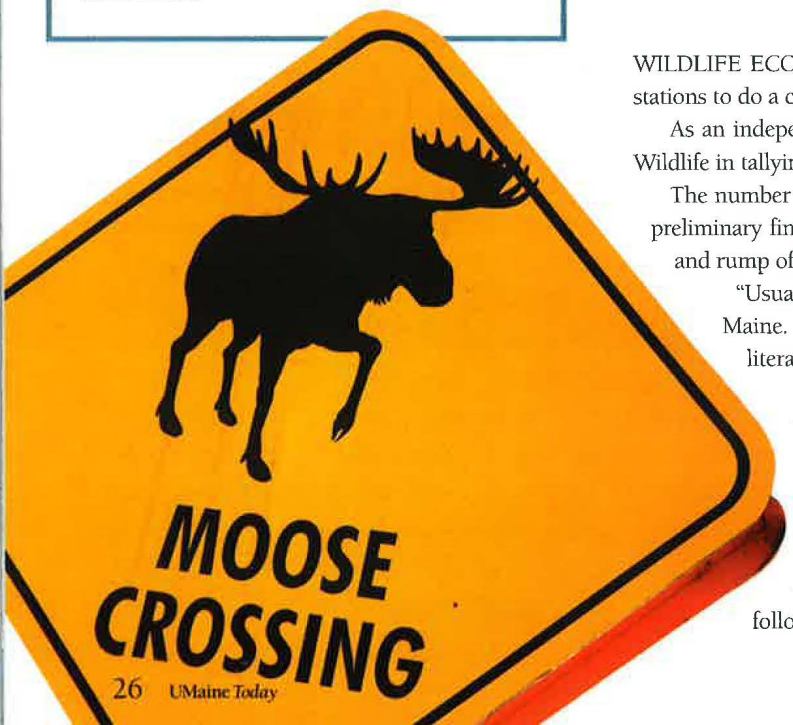
The number of ticks on moose appears to be increasing with climate changes. But Andrle says preliminary findings on data collected from the back of the neck, base of the rib cage, shoulder and rump of the moose harvested last fall show that tick loads weren't excessive.

"Usually there are more ticks on calves than adults," says Andrle, who is from Clifton, Maine. "It's becoming a major problem in a lot of areas. They're finding some calves have literally been sucked dry."

Winter ticks typically attach themselves to moose in September and October when the fall chill begins. Calves' bodies naturally are closer to ground vegetation, where they easily can pick up the winter pests.

Andrle intends to write a proposal explaining the need to collect weather data, such as temperature and snowfall.

"From there, we can establish a longer-term project," Andrle says. "Then we can use the weather data to try and predict winter tick loads for moose for the following year. That could lead to the prediction of moose mortality rates."



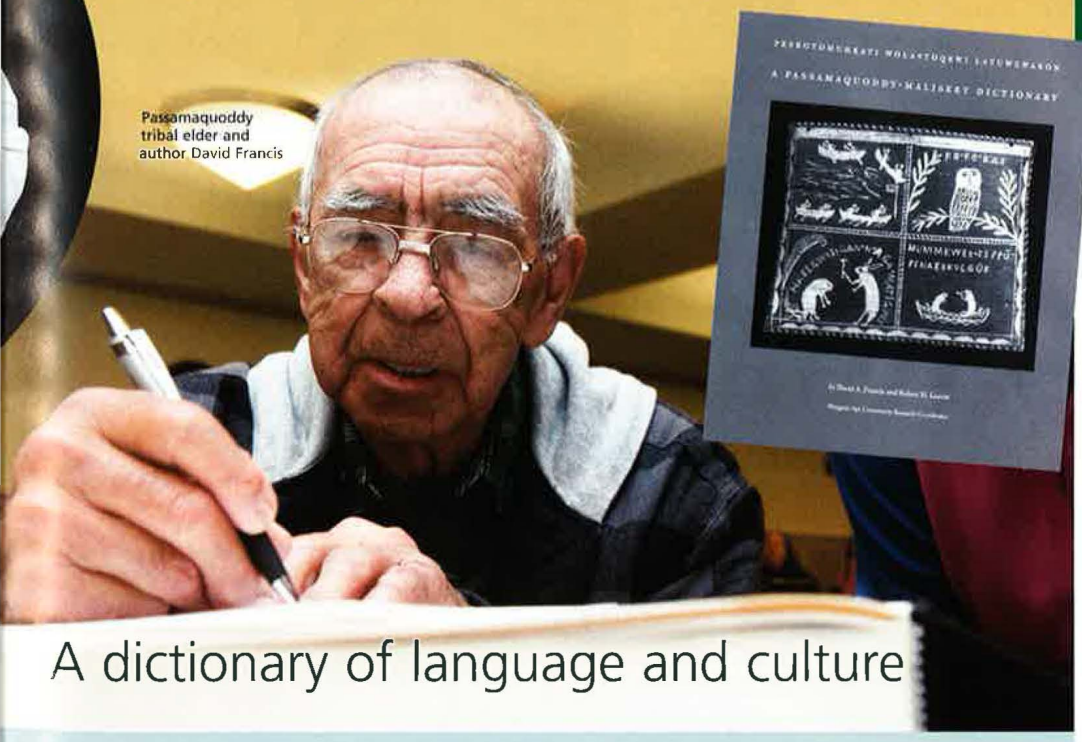
A dictionary of language and culture

MORE THAN THREE decades of collaborative research by members of regional Native American communities, educators and linguists have culminated in the compilation of the first-ever Passamaquoddy-Maliseet dictionary, published by University of Maine Press.

The 1,200-page volume with 18,000 entries was written by Passamaquoddy tribal elder David Francis; Robert Leavitt, former director of the Mi'kmaq-Maliseet Institute at the University of New Brunswick, Fredericton, Canada; and Margaret Apt, community research coordinator and Passamaquoddy language teacher at Shead Memorial High School, Eastport, Maine.

The dictionary is based on the language spoken in Maine and New Brunswick that has been passed down primarily through oral tradition, with little formal documentation.

Each entry in *A Passamaquoddy-Maliseet Dictionary* includes sample sentences from both traditional and contemporary conversation, and provides details of the tribes' "thought and culture, personal attitudes, humor and linguistic ingenuity."



Passamaquoddy tribal elder and author David Francis

Unsound sleep

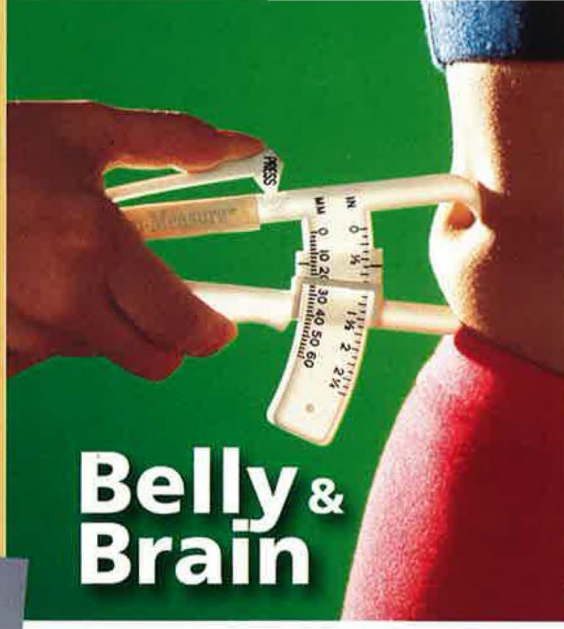
NEWBORNS WHOSE mothers abuse alcohol during pregnancy have disrupted sleep that results in chronic accumulation of sleep debt when compared to normal infants, according to a new study by researchers at the University of Maine and Japan's National Center of Neurology and Psychiatry.

Previous studies have shown that infants prenatally exposed to alcohol are at increased risk for Sudden Infant Death Syndrome.

In this study, maternal drinking patterns predicted infant sleep fragmentation; in particular, more frequent and longer waking after the onset of sleep and decreased REM sleep. The study also found that prepregnancy rates of alcohol consumption, including binge drinking, predicted decreased infant alertness and increased irritability.

Women were interviewed about their substance use, including alcohol consumption and cigarette smoking, before and during pregnancy. At 6–8 weeks of age, their infants were monitored for brain activity, sleep and arousal, and sleep-related spontaneous motor movements.

The findings of the research team, led by UMaine Professor of Psychology Marie Hayes, who is affiliated with the Maine Institute of Human Genetics and Health, were published in a recent issue of the journal *Early Human Development*.



Belly & Brain

BELLY FAT IS related to decreased cognitive functioning, according to researchers in the University of Maine Department of Psychology.

The cure? Physical activity, which the researchers say has a measurably positive influence on mental ability and cognitive functioning.

In a recent study of more than 900 people in an ongoing, 34-year-old research project, the Maine Syracuse Longitudinal Study, psychology graduate student Greg Dore and UMaine psychology professors Merrill "Pete" Elias, Michael Robbins and Penelope Elias, and Marc Budge of the Australian National University Medical School, found study participants with less belly fat performed better in a large battery of mental tests than those who carried extra pounds around the middle.

Further, the newest study revealed that participants who got regular exercise performed better on the tests, regardless of their weight.

The researchers do not define the amount of exercise needed to mitigate effects of excess belly fat. Current findings in the literature indicate that any activity and exercise is better than none. The Centers for Disease Control recommends about 30 minutes a day of moderate physical activity.

The researchers' findings were published recently in the *Annals of Behavioral Medicine*. They are now pursing the hypothesis that lack of exercise in obese persons, rather than belly fat per se, may explain relations between belly fat and cognitive functioning.

Unmasking a killer

SCIENTISTS AT the University of Maine may have found a treatment for a bloodstream infection that kills more than 30 percent of the patients it infects.

UMaine Assistant Professor of Microbiology Robert Wheeler and his team study a fungus, *Candida albicans,* commonly found on human skin and in the gastrointestinal tract, that can be deadly for people with compromised immune systems.

The fungus, which typically stays dormant, has developed a sort of camouflage that prevents the immune system from eliminating it. At the same time, the immune system is able to prevent the fungus from creating an infection.

A special sugar, ß-Glucan, is found in the protective coating of *Candida albicans.* The human immune system has developed a receptor for ß-Glucan, providing immunity for the fungi when it's activated. However, when a person's immune system is too weak, the fungus can be deadly.

In addition to being the fourth most common cause of bloodstream infection, Candida can cause vaginitis in healthy women, and thrush in newborns and AIDS patients.

Wheeler and colleagues at the Whitehead Institute for Biomedical Research are now working to develop a drug to remove the camouflage and unmask ß-Glucan, allowing the immune system to recognize and fight the infection.

Their findings were published in the Public Library of Science's *PLOS Pathogens.*

Early talk of reading disability

The research provides a perspective on how speech and language deficits may manifest during spontaneous verbal interactions between young children and adults.

YOUNG CHILDREN who are later found to have reading disabilities use slower, shorter speaking turns with more pauses, according to speech-language researchers at the University of Maine and Lehman College.

In a longitudinal study of 27 prereading youngsters at ages 2 and 3, the researchers measured fewer syllables per second in the nine children subsequently identified in grade school with developmental reading disability, a disorder that runs in families. Those youngsters also demonstrated significantly different patterns of pausing between speakers, and shorter turns at speaking, as compared to their peers who later learned to read normally.

The researchers — Allan Smith, Susan Smith and Jane Bennett of UMaine, and John Locke of Lehman College — looked at early speech in ages 2–3, a developmental time associated with rapid language development. For instance, in a year's time, youngsters without later reading disability demonstrated a sharp growth in syllables — from three to seven — per speaking turn, and a decrease in between-speaker pausing.

Their findings were published in the *Journal of Speech, Language, and Hearing Research.*

Powerful promise

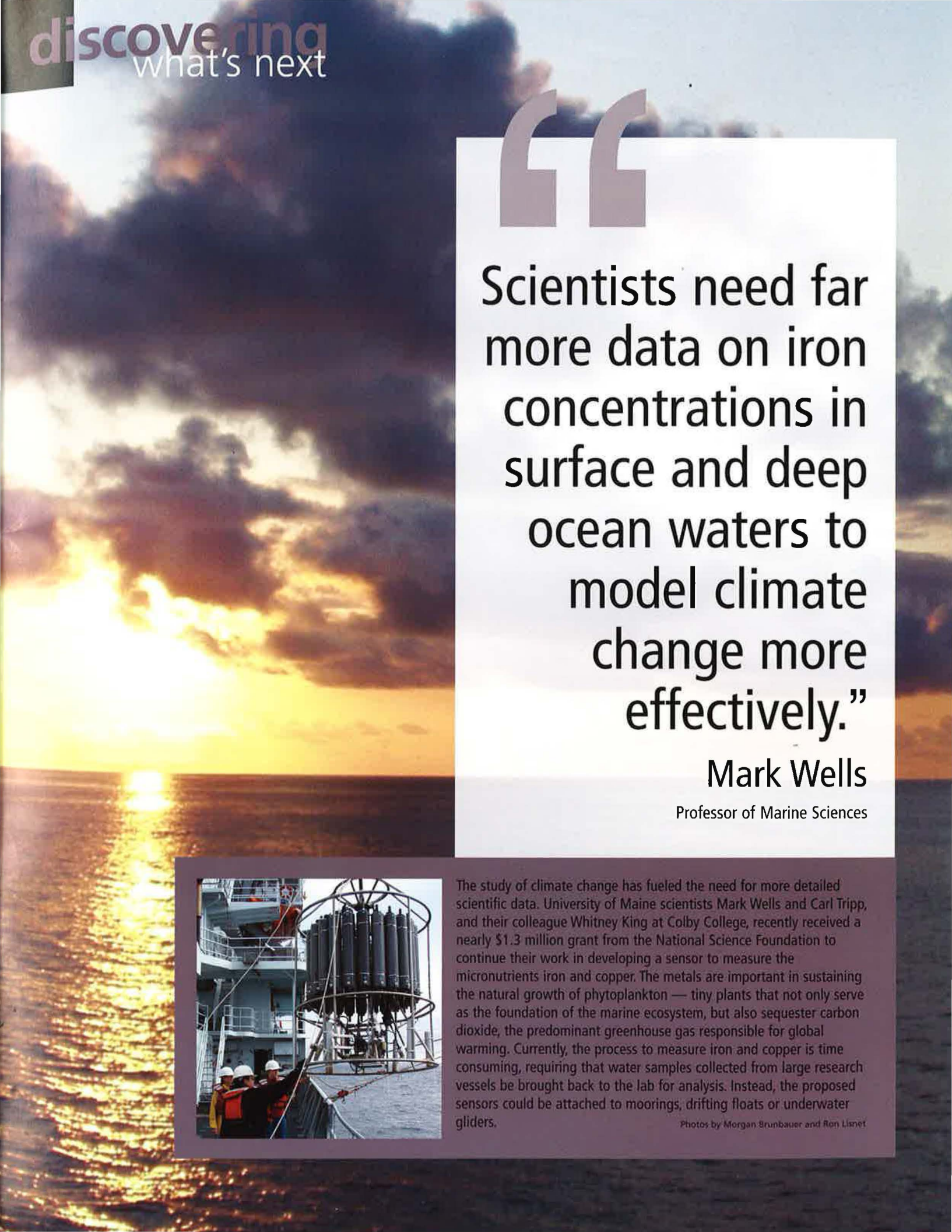
IN A DAVID VERSUS GOLIATH matchup, University of Maine senior Christopher Look of Jonesboro, Maine, went up against some of the world's renowned technology companies with his invention to aid soldiers in the field. And while he didn't win the $1 million United States Department of Defense Wearable Power Prize (the DuPont/Smart Fuel Cell (SFC) team took top honors), Look was a top 20 finalist out of the 170 teams that entered the international competition.

Last spring, Look, an engineering physics major and a specialist in the Army National Guard, began working with UMaine professor Charles Hess on his capstone project to create a system to provide soldiers with lightweight, wearable power for their combat equipment. Such portable "Land Warrior" devices power cell phones, portable water filtration systems, ventilators, mapping equipment and temperature-regulated clothing.

On an average four-day mission, a soldier carries about 20 pounds of batteries to power such equipment. That's why the military is working to reduce the weight and size of the power supply.

Look's design is an unassuming black box, about the height and width of a legal notepad, about 3 inches thick, with nylon straps that attach to a soldier's vest. The device weighs 8 pounds and lasts longer than the current battery packs used by soldiers.

Look continues development on his invention, and has received requests from the U.S. Navy for more information on his design.



"Scientists need far more data on iron concentrations in surface and deep ocean waters to model climate change more effectively."

Mark Wells

Professor of Marine Sciences

The study of climate change has fueled the need for more detailed scientific data. University of Maine scientists Mark Wells and Carl Tripp, and their colleague Whitney King at Colby College, recently received a nearly $1.3 million grant from the National Science Foundation to continue their work in developing a sensor to measure the micronutrients iron and copper. The metals are important in sustaining the natural growth of phytoplankton — tiny plants that not only serve as the foundation of the marine ecosystem, but also sequester carbon dioxide, the predominant greenhouse gas responsible for global warming. Currently, the process to measure iron and copper is time consuming, requiring that water samples collected from large research vessels be brought back to the lab for analysis. Instead, the proposed sensors could be attached to moorings, drifting floats or underwater gliders.

Photos by Morgan Brunbauer and Ron Lisnet

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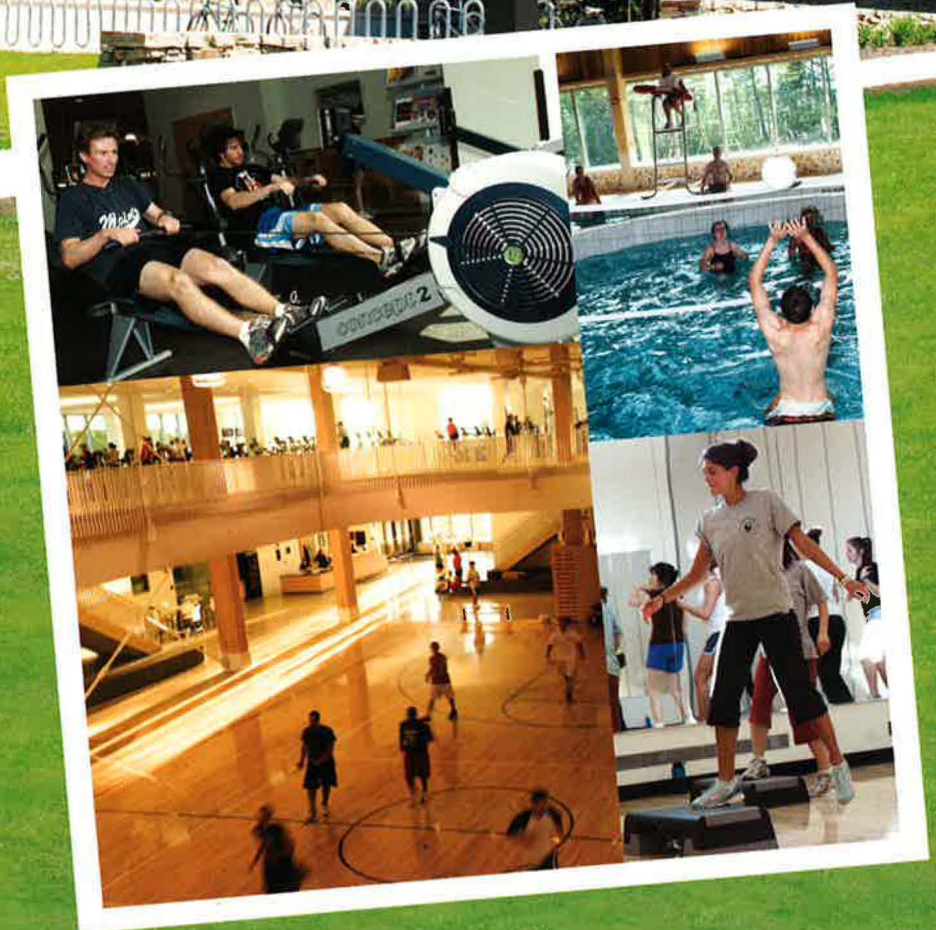

THE STUDENT RECREATION AND FITNESS Center at the University of Maine is a campus focal point. Since it opened in August 2007, more than 500,000 people have used its state-of-the-art fitness equipment, participated in diverse recreational programs — from intramural and club sports to pick-up games of volleyball — and taken advantage of health and wellness services, including personal training, group exercise classes and a large selection of exercise equipment.

All UMaine students are automatically members of the center, where daily they use the indoor track, pool and sauna, hardwood courts and other features. The cardio and weight equipment areas are particularly popular.

The Student Recreation and Fitness Center is conveniently located next to Hilltop, the site of UMaine's first-year student housing and dining facilities. For all students, the center is THE place where friends meet to work out and have fun. It has become an integral part of their UMaine experience.