2006

UMaine Today

University of Maine, Division of Marketing and Communications

Choosing to Forgive

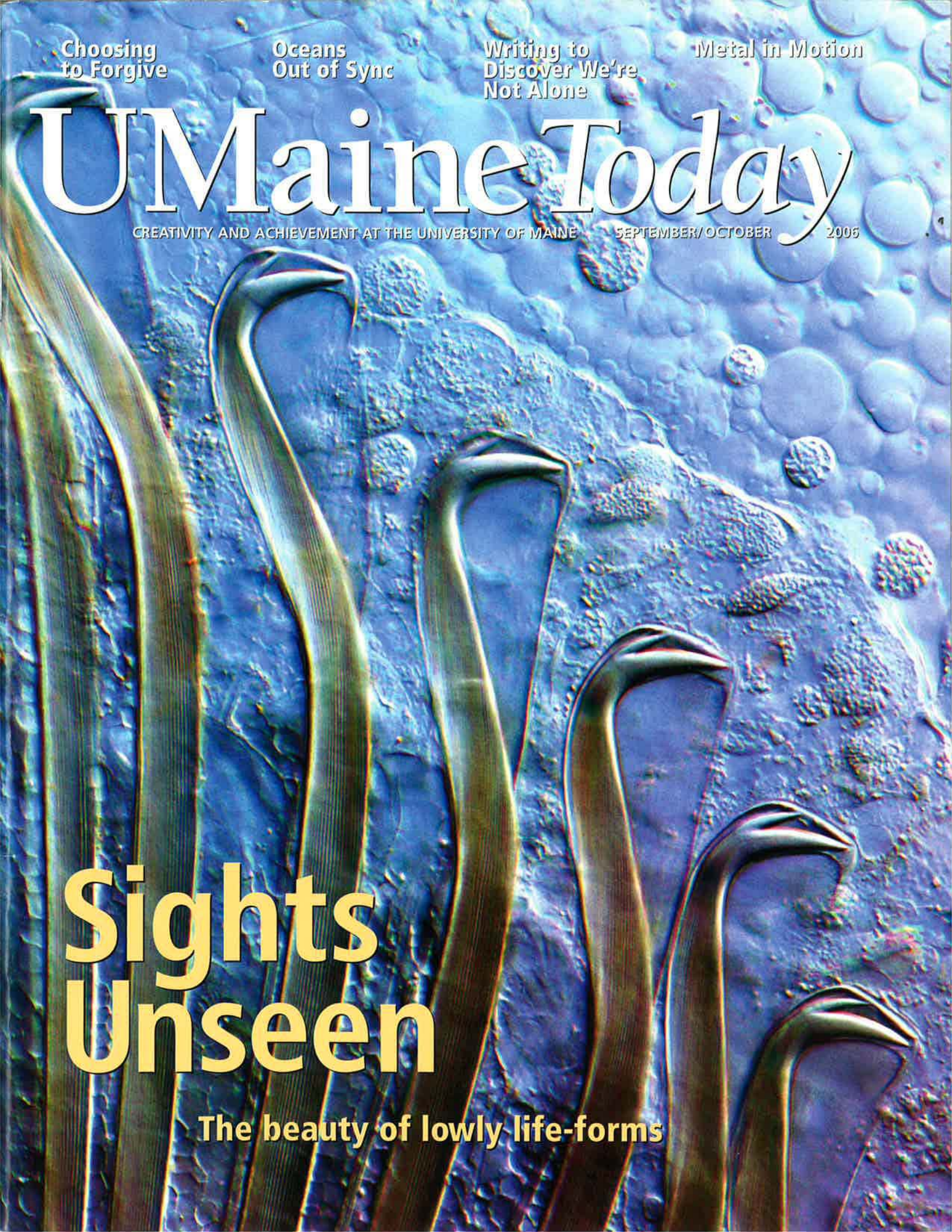
Oceans Out of Sync

Writing to Discover We're Not Alone

Metal in Motion

UMaine Today

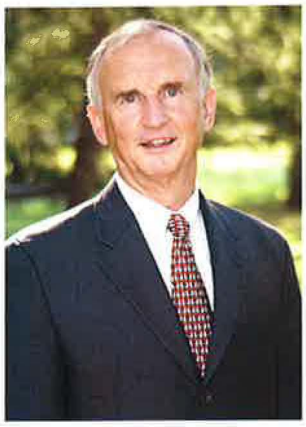
CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE SEPTEMBER/OCTOBER 2006



Sights Unseen

The beauty of lowly life-forms

President's Message



THIS ISSUE OF *UMAINE TODAY* includes a wonderful story by David Munson highlighting University of Maine professor Bob Steneck and his research-based perspectives on ocean fisheries management issues. Bob is one of a great many UMaine faculty members with international stature in various academic disciplines, and his work is of extreme significance. His suggestions of new ways to look at managing delicate marine ecosystems put him at the forefront of contemporary academic thinking about the future of the world's oceans.

With its cutting-edge teaching, research and outreach activities, UMaine's School of Marine Sciences is one of the largest academic units of its kind anywhere. Its work is particularly important in Maine, where much of our state's well-being and future prosperity are inextricably linked to the sea. UMaine's high profile in marine sciences is evidenced by the fact that scientists from three other countries and 20 other states spent part of the summer working with UMaine students, staff and faculty members at our Darling Marine Center in Walpole — a UMaine facility that is known worldwide as an outstanding place for scientists to work collaboratively in an environment that supports those who aspire to advance knowledge in these areas.

Marine sciences have a long history at UMaine, and I daresay they will always be an important part of what we are as a land- and sea-grant university. As we look to the future and explore ways to maximize the impact of our work, partnerships like our growing relationship with the Gulf of Maine Research Institute in Portland, where two recently appointed UMaine faculty members will be located, will help to ensure the University of Maine's ongoing, positive effect on the understanding of marine environments. It is no exaggeration to say that the world's environment depends on a healthy, robust system of oceans, and UMaine will make a real difference in helping secure that system's future.

Robert A. Kennedy
President

ON THE COVER: In her research, University of Maine Assistant Professor of Marine Sciences Sara Lindsay studies the sensory systems of spionids, also known as mudworms. In particular, she looks at how the marine worms can regenerate their heads, appendages and bodies. The microscopy involved in her research also led to a unique pastime: creating artistic images. The dramatic photo on the cover shows a spionid worm's specialized bristles. Known as hooded hooks, the bristles help anchor the worms in their tube homes on the ocean floor. The photomicrograph (magnification 400x) earned Lindsay an honorable mention in the 2005 Olympus BioScapes International Digital Imaging Competition.

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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 88 bachelor's, 64 master's and 25 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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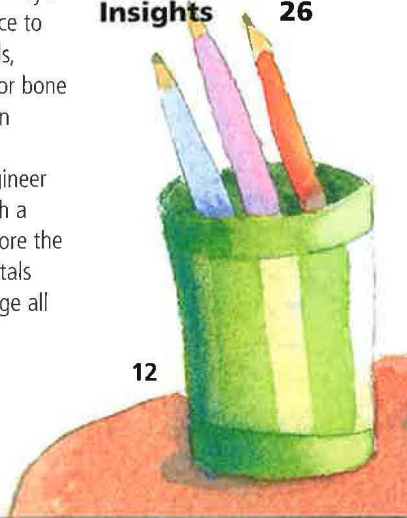

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Choosing to Forgive

UMaine course emphasizes human compassion as a tool for building a culture of peace

By Margaret Nagle

Eleven years ago, the unspeakable happened in the small town of Redding, Conn.

Firefighters responding to a residential blaze found the bodies of five young men — three roommates and two of their friends, all between the ages of 21 and 25. All died of gunshot wounds to the head, the result of a landlord-tenant dispute gone horribly wrong.

One of the tenants was David Froehlich.

"He was so pure," says Andrea Carlson of Hampden, Maine, remembering her younger brother, a foster child born with birth defects whom her parents adopted. "He loved trucks and he was at that age when he was into hanging out with his friends. The boys had just decorated their apartment for Easter."

Three years later, landlord Geoffrey Ferguson was sentenced to life in prison without the possibility of parole. With his imprisonment, Carlson says she closed the door on the murderer who tore asunder the stable, safe, happy life her family knew.

"In my mind, I felt he was put away and no longer a threat," Carlson says of her years of grieving. "With him in prison, I could reject him as a person. I wouldn't even write his name because I thought it would give him credence."

This past spring, nearly 11 years to that April 18 day that David and his four friends were slain, Carlson spoke of the unspeakable — even the murder's name.

She was able to do it because she had learned a new definition of forgiveness in a peace studies class at the University of Maine.

Forgiveness depends on the depth of the human spirit by which we connect with other people while still holding them accountable, according to Phyllis Brazee and Barbara Blazej.

Collateral Damage by Beverly Stessel
acrylic on canvas 2005

"Up to now, my definition of forgiveness involved both people in dialogue, with one apologizing and one granting forgiveness," says Carlson. "I didn't differentiate between the action and the person. I resisted changing that definition of forgiveness throughout the semester because it had the implication of letting (the offenders) off the hook and not holding them accountable.

"I now realize that you can separate the deed from the person," she says. "You don't forgive the deed; it was done and it was wrong. But you can forgive the person and what made him or her so angry. Events in their lives shaped them, drove them to the decisions they made."

Carlson was one of 20 UMaine students on campus and throughout the state who signed up for PAX 491, an online course, Forgiveness: Creating a Culture of Peace and Reconciliation. The class is a research-based exploration of forgiveness using academic, personal, historical and cultural perspectives. It is offered every spring, one of eight courses each semester in UMaine's Peace Studies Program. The classes are designed to help students understand the "culture of violence" much of the world is locked into today and to equip them with tools, such as heightened self-awareness, to build a "culture of peace."

"All of our courses involve looking at the difficulties of our current world and envisioning a new world built on a culture of peace," says program director Phyllis Brazee, who coteaches the course on forgiveness. "Creating such a new world is hard work, not the Pollyanna notion of peace that has been around for the last 50 years."

Students like Carlson often take the forgiveness class to continue their work in peace studies. Others, including nondegree students, enroll to inform their lives.

Choosing to Forgive

"Sometimes they are drawn to it because they have things they personally want to work on," says instructor Barbara Blazej of those who enroll. "They know that forgiveness can play an important role in their lives."

In online discussions and reflection papers, students share their experiences and emotions. They write of their anger over parents divorcing and remarrying, high school friendships lost over grudges, the untimely death of a parent, abuse.

One described forgiveness as "a foreign language." Another said forgiveness was about "making a conscious choice that you aren't going to live as an angry victim."

"The turning point for me was when I realized (Geoffrey Ferguson) is just a person, that there must have been something in his life that made him feel powerless when faced with adversity," Carlson says. "He did what he did because he had no tools to deal with his rage, except acting violently. I still can't fathom his actual actions — what he carried out — over those hours. I still can't imagine why he couldn't step back."

UMaine's course in forgiveness was first offered in 2000, the year the United Nations launched its International Decade for a Culture of Peace and Nonviolence for the Children of the World. A catalyst for the class was Peace Week '99 on campus, which was highlighted by a talk by former Mideast hostage and journalist Terry Anderson, speaking on "The Search for Forgiveness: Returning to the Den of Lions."

Anderson's appearance was followed in subsequent years by other major figures speaking at UMaine on forgiveness, reconciliation and healing, including John Artis, who was imprisoned with Rubin "Hurricane" Carter for murders they didn't commit, and Zev Kedem, a Holocaust survivor and one of the more than 1,100 on Schindler's List.

Little did Blazej and Brazee know when they launched the course that the Sept. 11 terrorist attack in 2001 would make their classes even more timely — and challenging.

According to Brazee and Blazej, even after an international, politically charged tragedy like 9-11, the nation had an opportunity to resist automatic revenge and to practice seeking the "whole" truth of what happened. In the class, they cite the research of Donald Shriver, who explores what forgiveness could look like on a political level, as part of a reconciliation process between communities or nations in conflict.

In addition to truth-telling and forbearance (resisting revenge), Shriver speaks of empathy, the attempt to deeply understand — not necessarily agree with — where one's enemy is coming from, how he or she sees the world and then acts on that worldview.

In other words, say Brazee and Blazej, the goal is to know "why they hate us," but not in a simplistic, superficial sense. Demonizing the perpetrators as evil, sick monsters enables people to more easily go to war against them, yet such action offers no understanding of the very real human motivations that led to the violence in the first place.

"You can choose to feel hopeless, to see enemies, wars and evil people at every turn, or you can take a different view of humanity, realizing that even your worst enemy is still human. Seeing all people as human is a hopeful way of looking at the world and the potential we all have."

Barbara Blazej

The course moves from international to personal perspectives on forgiveness within the framework of nonviolence and peace. The first required reading is Simon Wiesenthal's powerful Holocaust story, *The Sunflower: On the Possibilities and Limits of Forgiveness*. The students then consider a more recent conflict in *A Human Being Died That Night: A South African Woman Confronts the Legacy of Apartheid* by Pumla Gobodo-Madikizela

"A lot of people begin not only with a misconception of what forgiveness means, but also with individual pain that they carry," says Blazej, who has made professional presentations on forgiveness, including a 2001 workshop in Russia at the 9th Annual International Conference on Conflict Resolution. "We 'ease' them into studying forgiveness by first exploring two historical events — the Holocaust and Apartheid. In this way, they become open to many views on forgiveness and are better prepared to apply what they learn on a personal level later in the course."

To forgive, one must develop an underlying belief in the fundamental goodness and value of humanity, and the possibility and potential for healing and moving on. It depends, according to Blazej and Brazee, on the depth of the human spirit by which we connect with other people while still holding them accountable for wrongdoing.

The lessons strike a chord with most, but not all, students in the course. Over and over throughout the semester, says Blazej, students ask how it's possible to forgive acts like rape or atrocities against humanity. The key is in learning how to forgive the person, not the offending word or deed.

"It's not a simple forgive-and-forget formula, dismissing the act or about letting the person go. You still need justice," Brazee says. "Forgiveness is about reframing or rehu-

manizing, not about focusing solely on the (offending or horrific) act. It's important to see (the perpetrators) as human, as being more than the terrible acts they committed. When we start dehumanizing, we start down a path that leads to a culture of violence."

Reframing — seeing the forest for the trees — frees a person from intense emotions, including fear. Letting go of bitterness and hatred is essential to gaining the inner peace needed to move on with one's life, Blazej says. Personal healing begins when negative energy is replaced with compassion and empathy, which are at the heart of forgiveness.

Throughout the semester, students write about their efforts to try to "see people differently" and to employ compassion in their daily lives. They are encouraged to "practice daily forgiveness" so that it can become "a way of life." Above all, forgiveness is a process that one does over and over, peeling back pain and fear like the layers of an onion in order to reach a transformative moment.

"I see so many people in the world and in our classes with so much anger," Brazee says. "They need to understand that they have a choice whether to be angry. For many people, learning that they can choose how to respond is a new life skill."

A culture of peace is not without conflicts, Brazee says. "What's important is how you use conflict as a creative process for growth — an opportunity with potential for inner peace. The more you engage in forgiveness work and the more inner peace you achieve, the more joy you'll have in life. It has to do with rechanneling energies."

The hope is that UMaine's peace studies students will become "active agents of change," helping create a culture of peace that could transform society and the world.

"It's about choosing to see the world in a different way," according to Blazej. "You can choose to feel hopeless, to see enemies, wars and evil people at every turn, or you can take a different view of humanity, realizing that even your worst enemy is still human. Seeing all people as human is a hopeful way of looking at the world and the potential we all have."

Carlson says the most important lesson she learned in the class is that "forgiveness is something we give to ourselves."

"We make the choice to heal and can then take the steps to move through the process," she says. "There are many relationships in my life that could be healed through forgiveness."

Yet for Carlson, the biggest challenge remains in finding peace with Geoffrey Ferguson. Her journey is complicated by the fact that Ferguson only served eight years behind bars before committing suicide in his prison cell.

Since the class, Carlson has imagined writing a letter to Ferguson's widow and hoping for a response.

"There's the pressure to let sleeping dogs lie, but I also know that writing would be cathartic," she says. "I'm not sure I'd ever do it, but the fact that I can now imagine the route I'd take is something I'd never considered before."

But while a new definition of forgiveness is now part of Carlson's life, she also recognizes the realities of the world around her.

"I haven't broached the subject with my parents," Carlson says. "Forgiving is seen as weak and mushy and not standing up for yourself. It's seen as identifying with the perpetrator, which makes you a traitor. It's almost a taboo in society."

For the instructors of PAX 491, removing this long-standing taboo that shrouds forgiveness is essential for resolving conflicts at all levels and moving toward a culture of peace. ▮

Forgiveness: Creating a Culture of Peace and Reconciliation

Required reading for the peace studies course

The Sunflower: On the Possibilities and Limits of Forgiveness
by Simon Wiesenthal

A Human Being Died That Night
by Pumla Gobodo-Madikizela

My First White Friend: Confessions on Race, Love and Forgiveness
by Patricia Raybon

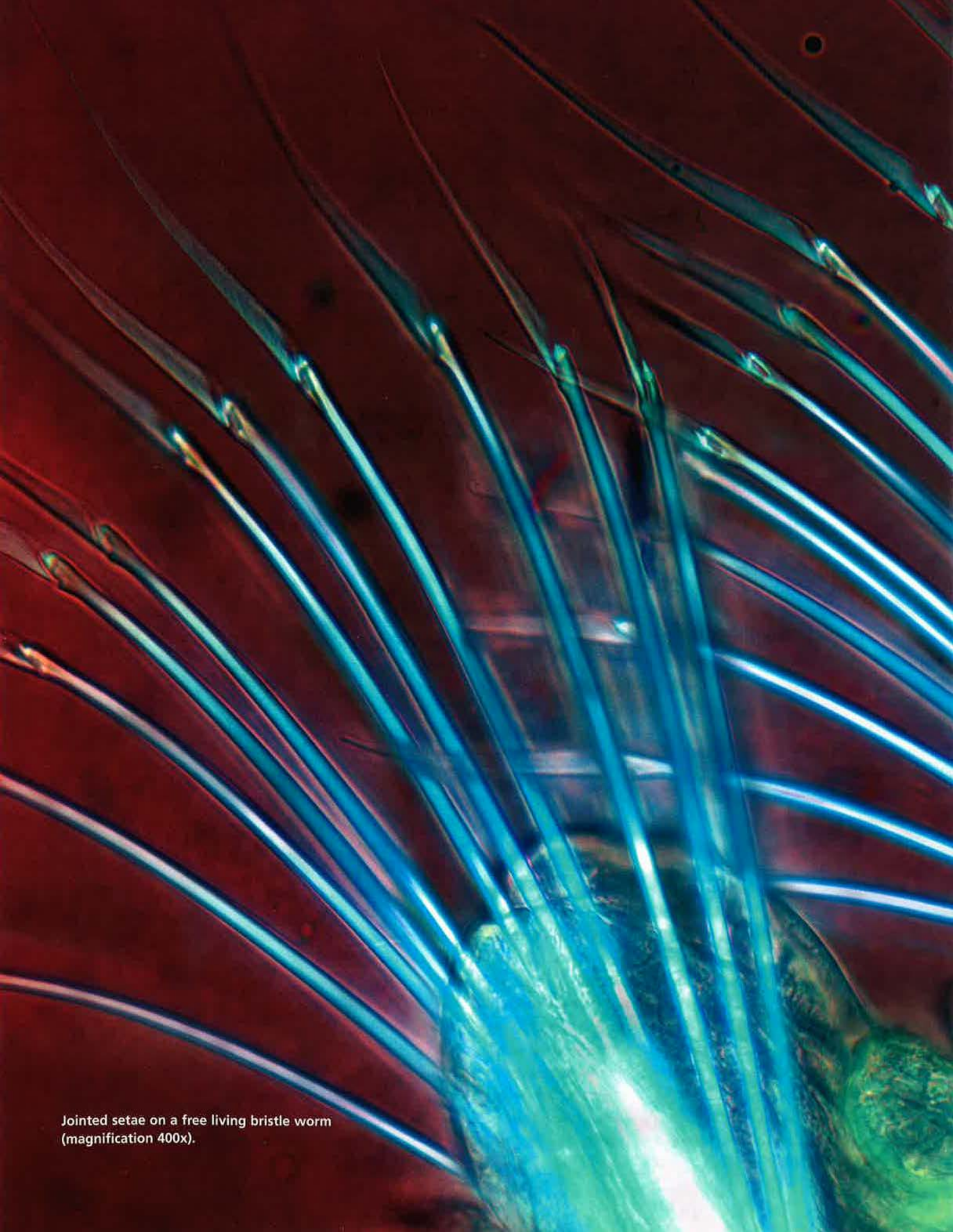
Forgiveness: A Bold Choice for a Peaceful Heart
by Robin Casarjian

Recommended reading

An Ethic for Enemies: Forgiveness in Politics
by Donald Shriver

No Future Without Forgiveness
by Desmond Tutu

Exploring Forgiveness
edited by Robert Enright and Joanna North



Jointed setae on a free living bristle worm (magnification 400x).

sciartful science

UMaine professor's award-winning photos complement her groundbreaking research

By David Munson

It's not easy being a spionid. Drab, squishy bottom-feeders, they spend the majority of their lives sifting through the ooze of the ocean floor, piecing together whatever's left behind by more free-spirited animals that swim, glide and drift through the waters above. As if that weren't enough, spionids live under the near-constant threat of losing their heads — literally — to any hungry crab or foraging fish that comes along. Seldom recognized and rarely respected, members of the family Spionidae are the backwater cousins of the flashier polychaete worms, living out their humdrum lives in quiet anonymity.

Enter University of Maine researcher Sara Lindsay. For the better part of a decade, Lindsay has studied the surprisingly complex behaviors and physiology of the marine worms, probing past their rather unremarkable first impression to discover an animal that is remarkably resilient, ecologically significant and, surprisingly, beautiful.

Lindsay began her work with spionids while still a graduate student at the University of South Carolina, examining how the worms and other sediment dwellers respond to injury and determining the



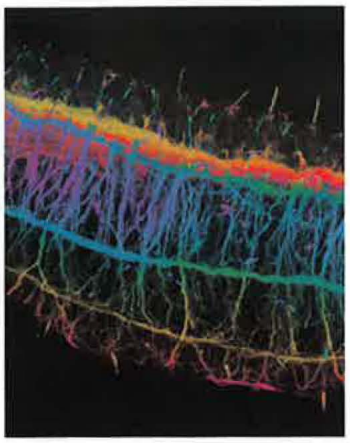

Photomicroscopy images above, left to right, eggs and red blood cells inside the body cavity of a capitellid worm (magnification 400x); jointed bristles on a larval sandworm (400x); cross section of a spionid worm, showing muscles and setae (400x); the head of a larval sandworm (200x), the image that won the 2006 Buchsbaum Prize.

Photos by Sara Lindsay

Images below, left to right, show a spionid worm (magnification 20x); an electron micrograph of a spionid's head and feeding palps (scale bar = 0.1mm); two tiny ciliates hitching a ride on a spionid's feeding palp (400x); and a depth coded image of the nerves and cilia inside a spionid feeding palp (630x).

Photos by Skip Forest and Sara Lindsay



impact of injury on the population dynamics of the ocean floor. After joining the research faculty in UMaine's School of Marine Sciences in 1998, she decided to continue her research into the spionid clan. Her early research led to some exciting discoveries, not the least of which was the spionids' uncanny ability to regenerate their heads, with some species sprouting a new noggin in less that 10 days.

"Once I had the opportunity to do my own thing, I wanted to try to answer those questions that came up in grad school," says Lindsay, examining an electron micrograph of a spionid's head on her computer screen. "The feeding palps make these guys look like the horror movie version of Bugs Bunny, but the really interesting thing is their ability to regenerate their palps, and their heads, in a short period of time."

Working with a small group of graduate and undergraduate researchers, Lindsay set out to answer several critical questions about the spionid's unique techniques for dealing with decapitation, examining rates of regeneration, nervous system implications, molecular cues and the physiological costs associated with the regrowth of a new head. Her research led to several important insights into the physiology and behavior of several spionid species, increasing scientists' knowledge of this little-understood family of the so-called sandworms.

From former graduate student Tim Riordan's work identifying how the worms' sense of smell influences their feeding behavior, to graduate student Skip Forest's research establishing the pathways between the sensory organs and the brain, to current graduate student Marlene Tsie's ongoing research into the molecular basis of the worm's sensory signals, Lindsay's team has taken a comprehensive approach to studying the spionid, and it's paying off.

By building a comprehensive framework of knowledge regarding the spionids' sensory systems, Lindsay and her team are helping to determine how chemoreception — sensory response to a chemical — influences feeding rate and bottom disturbance, factors that are critical to the overall ecology of the ocean's sediments.

"No one else has done this in these worms. Describing the nervous system in this detail just hasn't been a priority, but it is providing important linkages in our understanding. We are building a nice, integrated story about chemoreception," Lindsay says.

Lindsay's study of the spionids' unique physiology also led to an unexpected discovery: polychaetes can be pretty.

"In general, my research focus is aimed at determining how marine invertebrates see, smell and perceive their environment. One of the first questions I had to answer about these worms was: what are their sensory structures and how do they work? That's what led me to microscopy," she says.

Using a scanning electron microscope, Lindsay examined localized patches of tiny hairs, or cilia, located on the worms' feeding palps. As the worm uses its feeding palps to feel its way around the murky bottom outside its tube-shaped home, the rhythmic beating of its cilia helps to guide tiny food particles back to its hungry mouth.

To establish the connection between the worm's feeding behavior and its little-understood nervous system, Lindsay and Riordan used antibodies to help identify what cells were activated by smells associated with food. Pursuing the sensory pathway even

Sara Lindsay and her father, David, share some microscope time in her lab in Murray Hall. A longtime biology professor at the University of Georgia, David Lindsay retired in 1998 to pursue his passion for photography in earnest, often helping his daughter to identify the artistic value of the images she creates.

further, Forest applied another technique, laser scanning confocal microscopy, to highlight the pathways between the worm's sensory systems and its brain.

Between the two techniques, Lindsay built a collection of images that are scientifically meaningful and aesthetically striking.

"It was my father who first helped me to discover the artistic side of the work," says Lindsay. "Because he is a biologist as well, he knew where I was coming from in my research (and) he encouraged me to look at the images from the perspective of an artist and photographer."

What began with the tweaking of a few images soon became a rewarding hobby for Lindsay. Stepping outside the constraints of her research, she may spend hours at her home computer, digitally weaving together layered micrographs, and manipulating hue and contrast, to create images that can stand alone as works of art. From the subtle textures of a tiny worm's fringe of bristles to the explosive rainbow of fluorescence revealed by a three-dimensional study of its nervous system, the abstract beauty of each image often hides a scien-

tific significance that makes the art all the more intriguing.

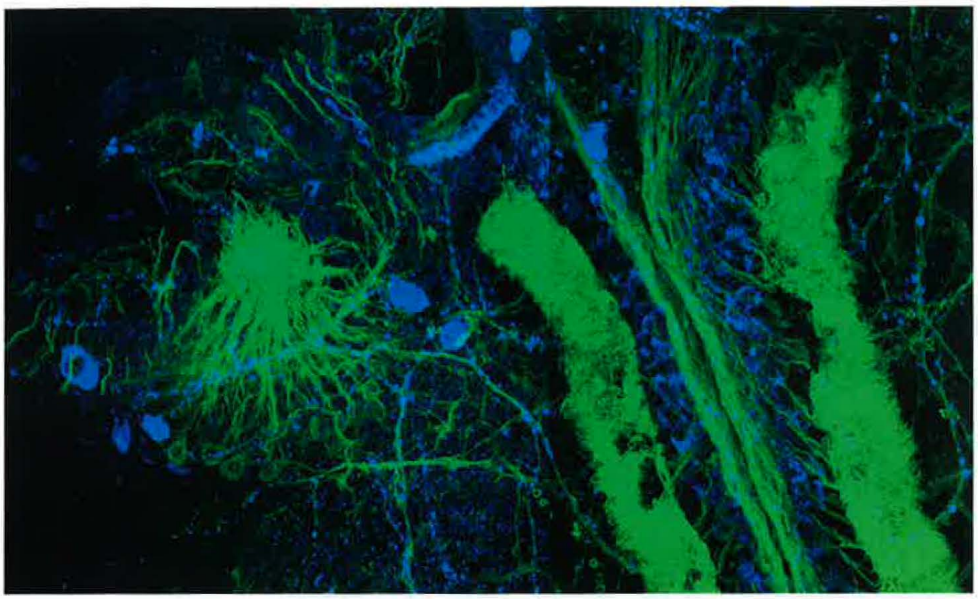
During annual visits to Maine by her father, David, Lindsay gets a fresh perspective on her work. This past June, the pair examined a new image highlighting the saber-like setae of yet another species of marine worm. Talk of hue and contrast intermingled with a passionate discussion of the animal's physiology, revealing the researchers' unique connection as family members and colleagues. Their scientific and artistic sensibilities complement one another, allowing Lindsay to draw out the full potential of each image.

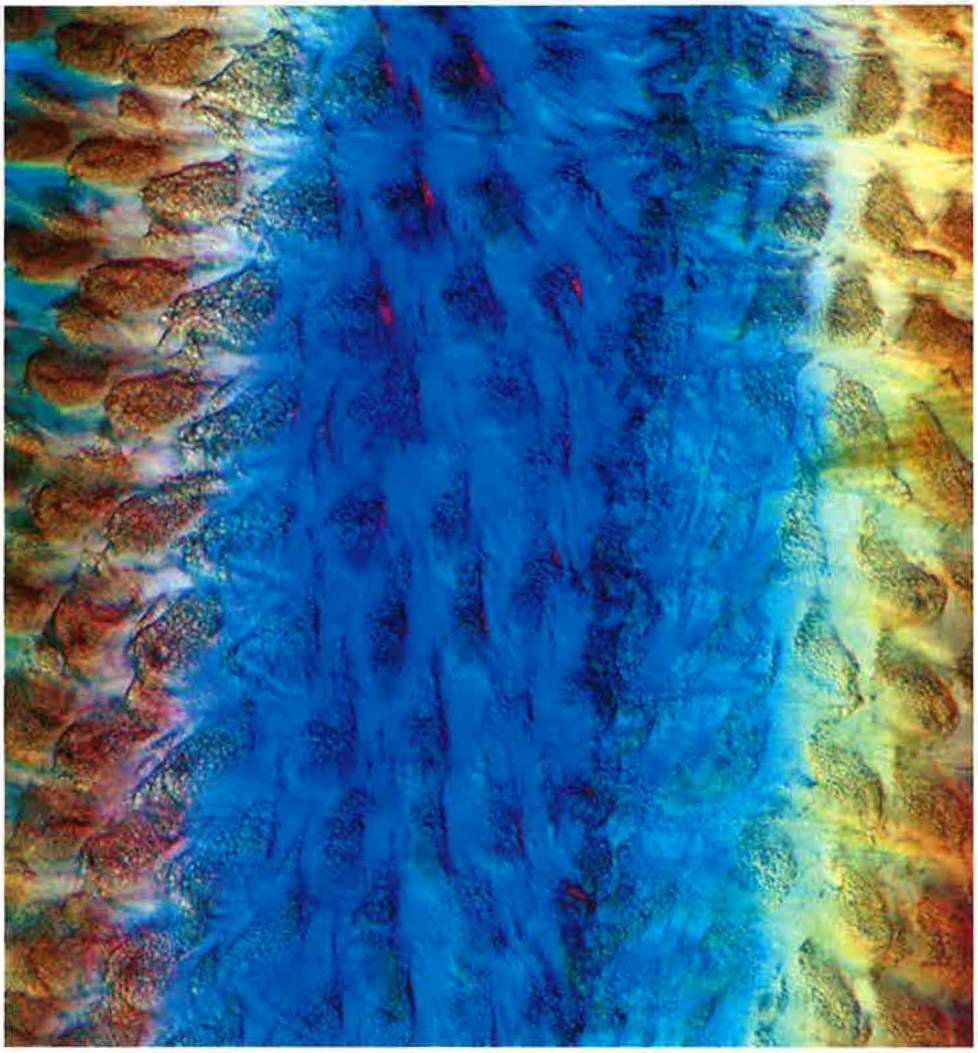
"I think that there are always those germinal images, the ones that represent both a high point and a starting point for something more, but in order to discover them you need not just the images themselves, but also an eye and a mind willing to see them," says David Lindsay. "Sara is able to see those images and present them in a way that others can see and appreciate them as well, and appreciate the science behind them."

Lindsay's talent for discovering the beauty in her work earned her two awards: the 2006 Ralph and Mildred Buchsbaum Prize for Excellence in Photomicrography from the American Microscopical Society and honorable mention in the 2005 Olympus BioScapes International Digital Imaging Competition.

Taking award-winning photomicrographs is not a point-and-shoot endeavor. It requires a high level of skill with the microscope, an intimate understanding of lighting and staining techniques, extensive expertise in digital photo manipulation, and boatloads of patience.

"You just never know where you will find that next beautiful image," she says. "The thing that excites me most about all of this — the research, the photos, everything — is how interconnected everything is." ▮





A confocal image of a spionid's sensory organs in green and its neurotransmitters in blue (magnification 630x).
Photo by Skip Forest

Differential interference contrast microscopy highlights the teeth lining the pharynx of a goniadid polychaete (magnification 400x).
Photo by Sara Lindsay

Mapping development

A LANDOWNER in Hampden, Maine, stopped by the town office complaining that his neighbor's new driveway was encroaching on the property line. To determine if a boundary had been breached, town officials printed off a state-of-the-art computer-generated map, created by combining aerial photographs, global positioning system points and databases.

In the coming year, that same detailed information about any parcel in the 39 square miles of the central Maine community will be available online.

"The town is way ahead of the curve in terms of using GIS (geographic information systems)," says Gretchen Heldmann, Hampden's newly appointed GIS and information technology specialist who stepped up to help direct the town's efforts. "Many towns contract out for GIS and most only have black-and-white, hand-drawn parcel maps made by the assessors that are then digitized. Hampden has invested in taking its maps to the next level of accuracy by contracting out for high-resolution, Earth-referenced aerial photos that will be used as our base map."

Heldmann has spent the past year helping the town get up to speed on GIS mapping and digital data management. Her stint started with a summer internship in 2005 that involved working as a member of a team to produce more accurate, user-friendly tax maps. Heldmann then helped her assessing and code enforcement coworkers in the municipal office learn how to use specialized mapping software.

Working part-time for Hampden throughout her senior year at the University of Maine as a forestry major, Heldmann tackled the town's computer system — or lack thereof. She developed a five-year, cost-saving action plan to phase in new equipment and improve consistency of the 50 computers scattered throughout the town — from the municipal building to the public library.

Another of her major projects this past summer was developing better maps to aid the police and fire departments.

"Towns like Hampden need one IT person for consistency," says Heldmann, who started working on computers at age 5. "Individual people working for the town don't have time to learn the more in-depth (computer) stuff, and they shouldn't have to."

"Maine has such a great land use history. I don't want Maine to become like Connecticut."

Gretchen Heldmann

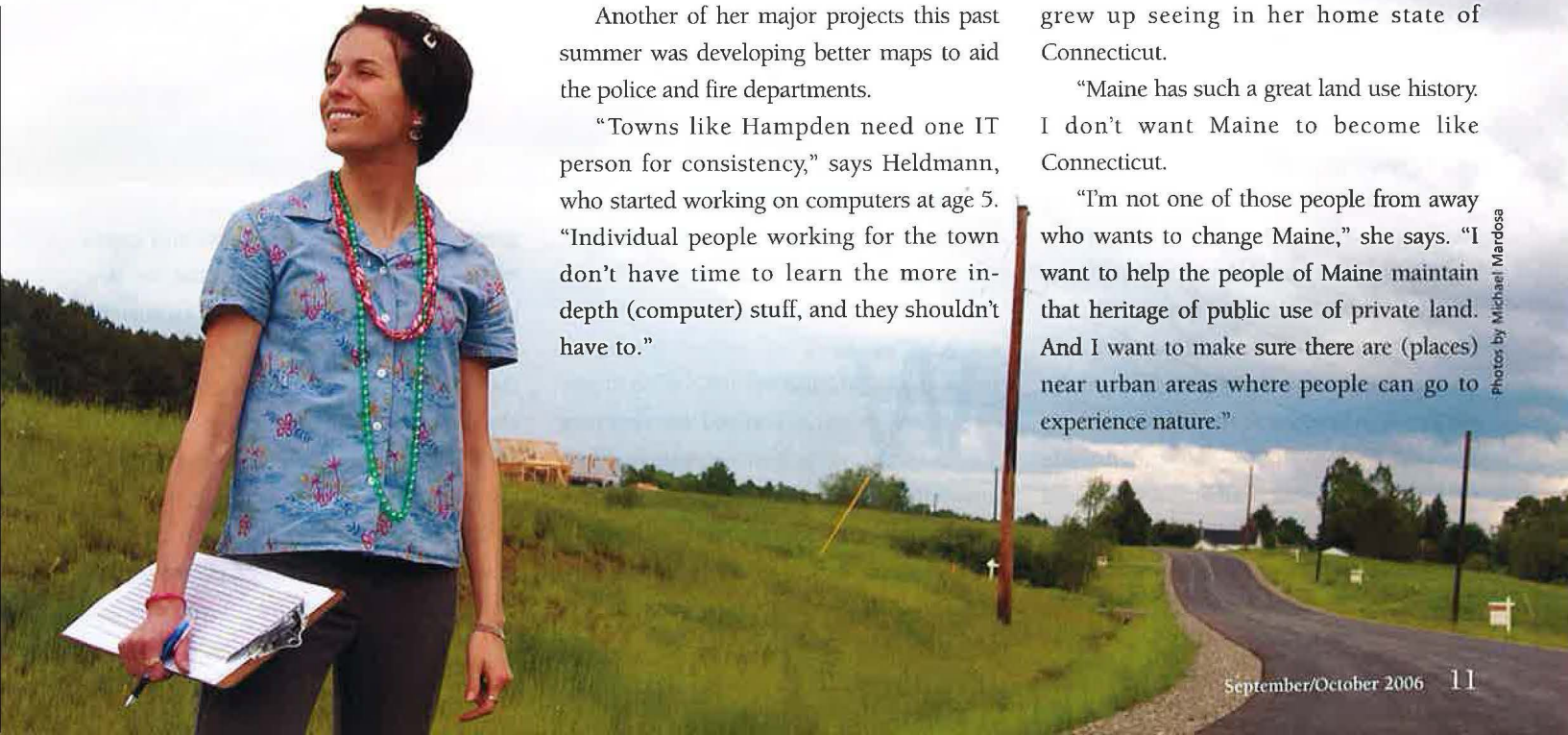
Heldmann gained her GIS know-how at UMaine, where courses in the technology are required for forestry majors. With her computer savvy, GIS came naturally to Heldmann. It also fit nicely with her desire to work in forest policy and management.

This fall, Heldmann is in UMaine's master's program in forestry, conducting research on land use change in the state. By surveying landowners and collecting such information as agricultural use, tree growth and tax payments on property, Heldmann plans to create a GIS model to characterize the likelihood of parcels being developed.

For years, Heldmann has been interested in how forests can be managed to coexist with urban development. She is driven to find the answers because of the heavily developed areas she grew up seeing in her home state of Connecticut.

"Maine has such a great land use history. I don't want Maine to become like Connecticut.

"I'm not one of those people from away who wants to change Maine," she says. "I want to help the people of Maine maintain that heritage of public use of private land. And I want to make sure there are (places) near urban areas where people can go to experience nature."



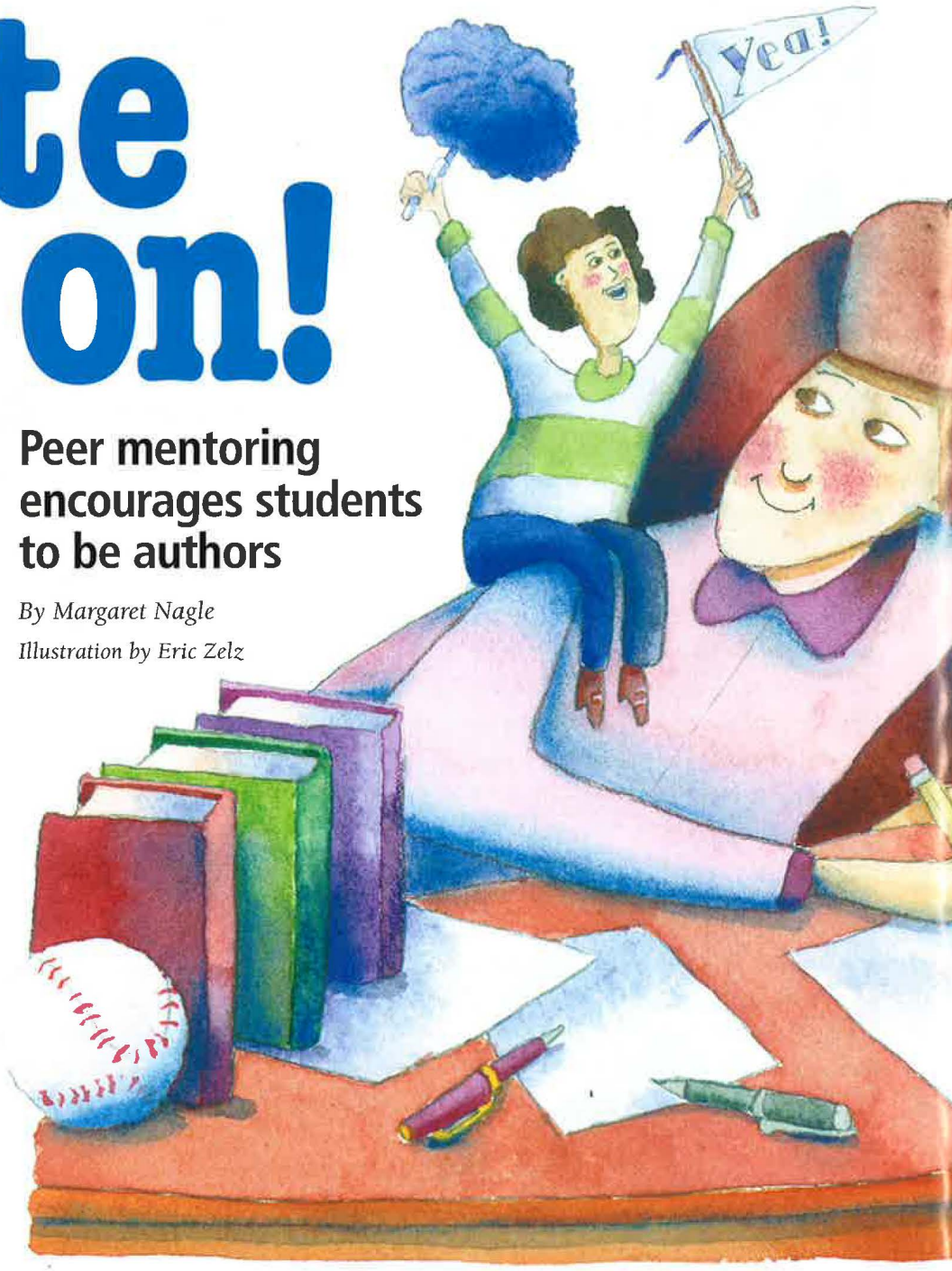
Photos by Michael Mardosa

Write on!

Peer mentoring encourages students to be authors

By Margaret Nagle

Illustration by Eric Zelz



HE WAITED UNTIL the last minute and now the final report was due in his child development class. Despite the hours invested in writing the paper, he was concerned. He needed a good grade.

That's when he knew what he had to do. He picked up the phone to arrange a tutorial at the University of Maine Writing Center.

At the designated hour, he was fully prepared to surrender his paper and endure the red slashes of an editor's pen. Instead, he participated in constructive dialogue about the strengths and potential of his work. The student tutor, English major Rosalie Sullivan, asked him to read his report out loud to her. She then talked about ways to improve both his mechanics and his structure. Stressing the value of writing clearly and concisely, she showed him that his 24-word sentence could convey the same meaning with half the words.

"He was shocked — and happy," says Sullivan, relating the tutorial she had that morning. "He said his paper made more sense and was so much better. He actually had a great paper."

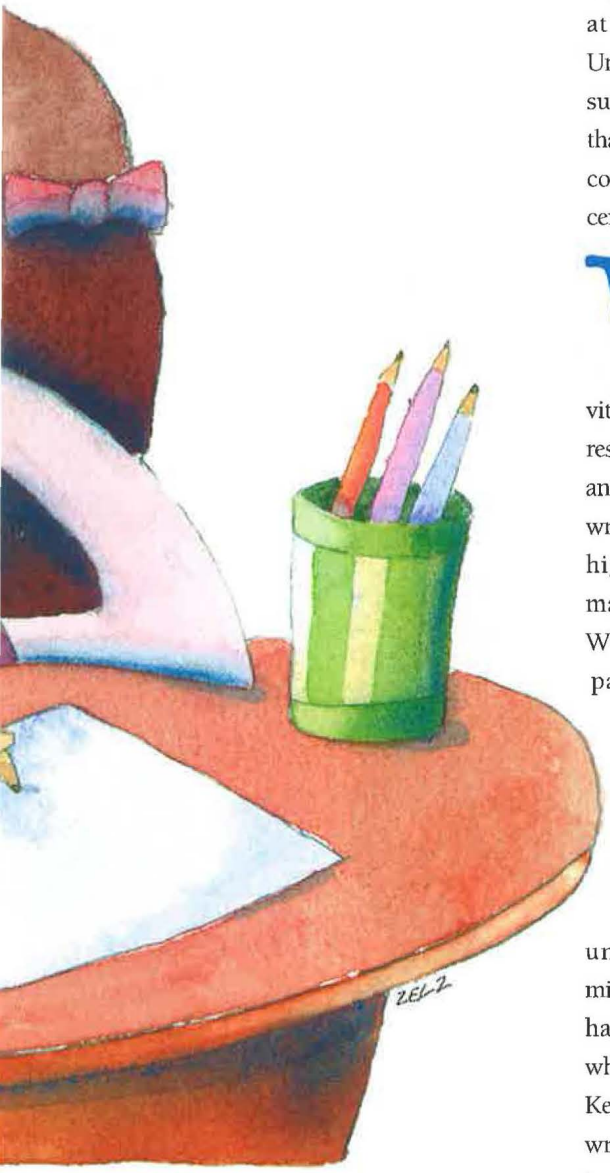
Sullivan is one of up to 20 student tutors working each semester in the UMaine Writing Center. Every academic year, up to 600 members of the UMaine community — mostly students — use the center for one-on-one feedback — not proofreading or editing — to become better writers.

"Our philosophy is that students can take each other seriously as writers and tutors, and learn from each other. It's about marshaling peer influence, bringing students into the educational experience in a positive way," says Professor of English Harvey Kail, who, in 1980, established UMaine's Writing Center in the English Department.

WRITING CENTER tutors are trained as writing coaches, helping students look holistically at their pieces — the beginning, middle and end. At UMaine, there is a minimalist or hands-off approach through discussion. Tutors help writers tackle paragraphs, "look inside" sentences and examine words. They demystify the writing process, helping authors "develop, organize and express their ideas more clearly." The learning is punctuated by "a series of small aha moments" for the writers.

It all begins with the tutors pointing out the parts of the writing that "sing."

"A tutor's job is really about building relationships. Not unlike an effective classroom teacher, tutors question, guide and



listen, with the goal of keeping the writer engaged in the process," says Richard Kent, UMaine assistant professor of education and author of the new book, *A Guide to Creating Student-Staffed Writing Centers, Grades 6–12.*

UMaine tutors like Rosalie Sullivan and Jason Dodge are mentors to their peers and active learners regarding their own writing.

"You become conscious of your own writing and readers," says Dodge, a double major in English and philosophy. "The goal of the center is to develop autonomous writers. In my own writing, I worked on unity development, style and coherence."

Two years ago, in an attempt to fathom the long-lasting benefits of the writing tutor experience, Kail collaborated with colleagues at the University of Marquette and the University of Wisconsin - Madison to begin surveying alumni. Alumni tutors reported that listening, analytical, communication and collaboration skills they gained in writing centers continue to serve them.

WRITING AS a powerful way to learn and to become a more effective reader is a vital skill in today's society, says Kent, whose research focuses on improving the teaching and learning of writing using such tools as writing centers and portfolios in middle and high schools. "We write to make meaning of our lives. When we do that, we feel a part of something greater. Even with an audience of one, the writer walks away feeling he or she has something to say in the world."

Unlike most colleges and universities today, many middle and high schools don't have writing centers. That's why education researchers like Kent advocate for places where writers work with each other in an effort to develop ideas, discover a thesis, overcome procrastination, create an outline or revise a draft.

"At a writing center, those generative conversations that take place over time don't start with the mechanics of writing, but with the writer, the text and the promise of the text."

Richard Kent

"For those kids on the fringes, disenfranchised in some fashion, a writing center can often be the one place in school where they're heard," Kent says. "In the end, tutors help all writers share their stories. What could be more powerful?"

The opportunity to instill young writers and tutors with a sense of caring is what spurred American literature teacher Ian Carlson to suggest starting a writing center last spring at Brewer High School. As a UMaine student, Carlson had used the campus Writing Center a couple times. He knows the trials of being a young writer, and the difference a writing center can make.

"Many kids in high school and college are so busy, they don't put any real thought into their writing," says Carlson, who is in his second year of teaching. "Writing is not a math equation. It's an art. You need to have discussions about ideas and understand that writing is a process."

THE NEED for schools to focus more on encouraging and improving student writing is now a call to action nationwide. In its 2003 report to Congress, "The Neglected 'R': The Need for a Writing Revolution," the College Board's National Commission on Writing for America's Families, Schools and Colleges called for a "cultural transformation that will improve writing in the United States." Among its recommendations: The amount of time and resources devoted to student writing should at least double, and writing should be taught in all subjects and grade levels.

"The quality of writing must be improved if students are to succeed in college and in life," said the 20-member commission, chaired by C. Peter Magrath, president of the National Association of State Universities and Land-Grant Colleges.

Writing centers, Kent says, can be key to addressing such nationwide concerns.

"With dialogue about a piece of writing, students begin to negotiate their places in the world and their futures," he says. "Ultimately, we write to discover what we want to know about others and about ourselves. We write to discover we are not alone." ▮

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Invasive species like the green crab are just one of many problems facing the health of marine ecosystems and the sustainability of marine fisheries. By feeding on native shellfish and other organisms, and competing with native crabs and lobsters for food and shelter, green crabs and their imported brethren have been a scourge along both coasts of North America.

Underwater images courtesy of Bob Steneck

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A leading UMaine marine scientist says better management is needed to save the world's oceans that are drastically out of sync

By David Munson

IN 1982, THEY WERE EVERYWHERE. Thousands of mushy, globular bodies attached to tens of thousands of tiny, tubular feet, each moving slowly across the ocean floor with clear, instinctual determination. Driven by the urge to eat and defended by a dome of stubby spikes, Maine's population of green sea urchins (Strongylocentrotus droebachiensis) were the miniature versions of so many punk rock buffalo, grazing their way across the Gulf of Maine in seemingly endless, insatiable herds. Fast forward to 2002. In less than 20 years, the gulf's vast, prickly carpet of urchins was reduced by hundreds of millions of animals by overfishing, the survivors sprinkled far and wide along Maine's ragged coast. But the urchins' story is not as simple as it might seem. Like so many other organisms that have been harvested from the waters of the Northeast, the urchin is just another character in a very long and complicated story — a story marked by intricate plot twists, shocking irony and a conclusion that is shaping up to be downright terrifying.

WITH MORE THAN a quarter-century on the front lines of marine research, Bob Steneck is a man who knows when to fish and when to cut bait. The University of Maine School of Marine Sciences researcher has spent his career unraveling the intricacies of the world's marine ecosystems, and his "big picture" approach to conservation and fisheries management has helped to tie the oceans' many divergent plot lines into a single, unified tale of global turmoil and anthropological excess. From searching for fish bones in 2,000-year-old trash heaps to studying Caribbean corals with the help of high-tech diving gear, Steneck has gathered considerable evidence that suggests that the coming years may be particularly critical for many marine ecosystems as they exist today.

The story is still being written, but Steneck, for one, is bent on creating a happy ending.

"I'm generally an optimist at heart, but there are some serious threats to the world's

a balancing act

Lost World

MORE THAN 20 years ago, in an attempt to assess the ecological impacts of the cod's disappearance in the Gulf of Maine, Bob Steneck spent months monitoring predator-prey interactions along an undersea mountain known as Cashes Ledge. Free from groundfish draggers that hauled millions of pounds of cod elsewhere in the gulf, the area was home to a relic population of big cod that dominated the ecosystem. In this lost world, the pressure of predation kept the number of small lobsters down, leaving only the fittest to grow large enough to avoid being eaten. The large predators kept the populations of smaller species in check and the system in balance.

Steneck used the data from Cashes Ledge as a springboard for archeological research, conducted in collaboration with colleagues from Bates College. By sifting through fish remains in an ancient midden discovered on an island just off the Maine coast, he discovered evidence that suggests that changes in the marine ecosystem caused by humans may have begun to have an effect on cod populations much earlier than previously thought. Bones collected from the midden show a dramatic change in the early inhabitants' eating habits, switching from a diet almost exclusively of cod to one that included smaller species like flounder and sculpin. The change could reflect a localized impact by humans on the marine ecosystem nearly 2,000 years ago.

The two projects offer insights into just how much the Gulf of Maine ecosystem may have changed since humans began hauling fish from its waters.

From kelp forests to coral reefs, Bob Steneck has studied the factors that lead to population collapse, identifying the nature of the ecological thresholds that determine a population's breaking point. Urchins are one of the main consumers of kelp and other algae in the Gulf of Maine, making changes in urchin populations critically important to the health of kelp forests. By helping to better

oceans," Steneck says. "We tend to look at the planet, and in particular the oceans, as this stable, permanent, nurturing source of life, but as science peels back the layers, what we see is a global ocean in trouble."

POINTING TO a growing list of health threats to the world's oceans, Steneck describes a common pattern of slow, incremental overload and sudden collapse, suggesting that the Blue Planet's ability to absorb the insults of human misuse have clear limits. The notion of ecological thresholds is at the core of Steneck's assessment of the seas. As pressure on the marine environment continues to grow, these thresholds are being met — and surpassed.

A classic example of the threshold phenomenon can be found in the sad tale of the green sea urchin. Prolific and plentiful across the Gulf of Maine, urchins spent decades

understand the complex scenarios that lead to population collapse, Steneck hopes to find ways to protect other organisms from the same fate. The photos below, left to right, show an urchin barren on the ocean floor, taken in 1980. At that time, the urchin population in the Gulf of Maine exploded, stripping bare underwater habitats. More than two decades later, after the collapse of the urchin population, healthy kelp and red algae have rebounded, changing yet again the nature of the marine ecosystem in the Gulf of Maine.

quietly munching at the Atlantic's undersea salad bar, unaware of the socioeconomic tsunami on the horizon.

As urchin populations in other parts of the world were rapidly depleted by overfishing through the 1970s and '80s, a seemingly insatiable Asian market turned its hungry eyes toward Maine, creating a boom-and-bust fishery that crashed a multimillion urchin population in less than two decades.

Steneck used the urchin story to illustrate the effects of roving bandits in a paper he coauthored with UMaine marine scientist Jim Wilson and others, recently published in the journal *Science*.

"The urchin story is classic overfishing. Because of the globalization of fisheries, the Japanese were able to deplete the global stock. They could afford to pay top dollar in places like Maine, but they had no stake in the health of our local ecosystem. Harvesters who move into a fishery and deplete the resource without any kind of investment in the ecosystem's long-term health are the definition of the roving bandit," says Steneck, who is based at the Darling Marine Center in Walpole, Maine.

"The collapse of the urchin fishery was marked by a cascade of ecological and socioeconomic effects. We can see the effects of surpassing the economic thresholds in the fishery: processors and distributors pull out, harvesters go out of business, but the effects of surpassing the ecological threshold are unknown.

"We don't know the implications of targeting the Gulf of Maine's most significant herbivore. But we do know that there is more seaweed sprouting in the Gulf of Maine than there's been in decades."

THE PREQUEL to the urchin story adds yet another twist to the tale: the urchin's preharvest heyday itself was due, at least in part, to yet another case of overfishing. For millennia, the Gulf of Maine was ruled by the mighty cod. The powerful carnivore's mustached mouth gobbled untold thousands of crabs, lobsters, shrimp and, of course, urchins during its tenure as dominant predator. But cod proved to be too tasty for its own good, quickly becoming the target of an international race to capture the most fish.

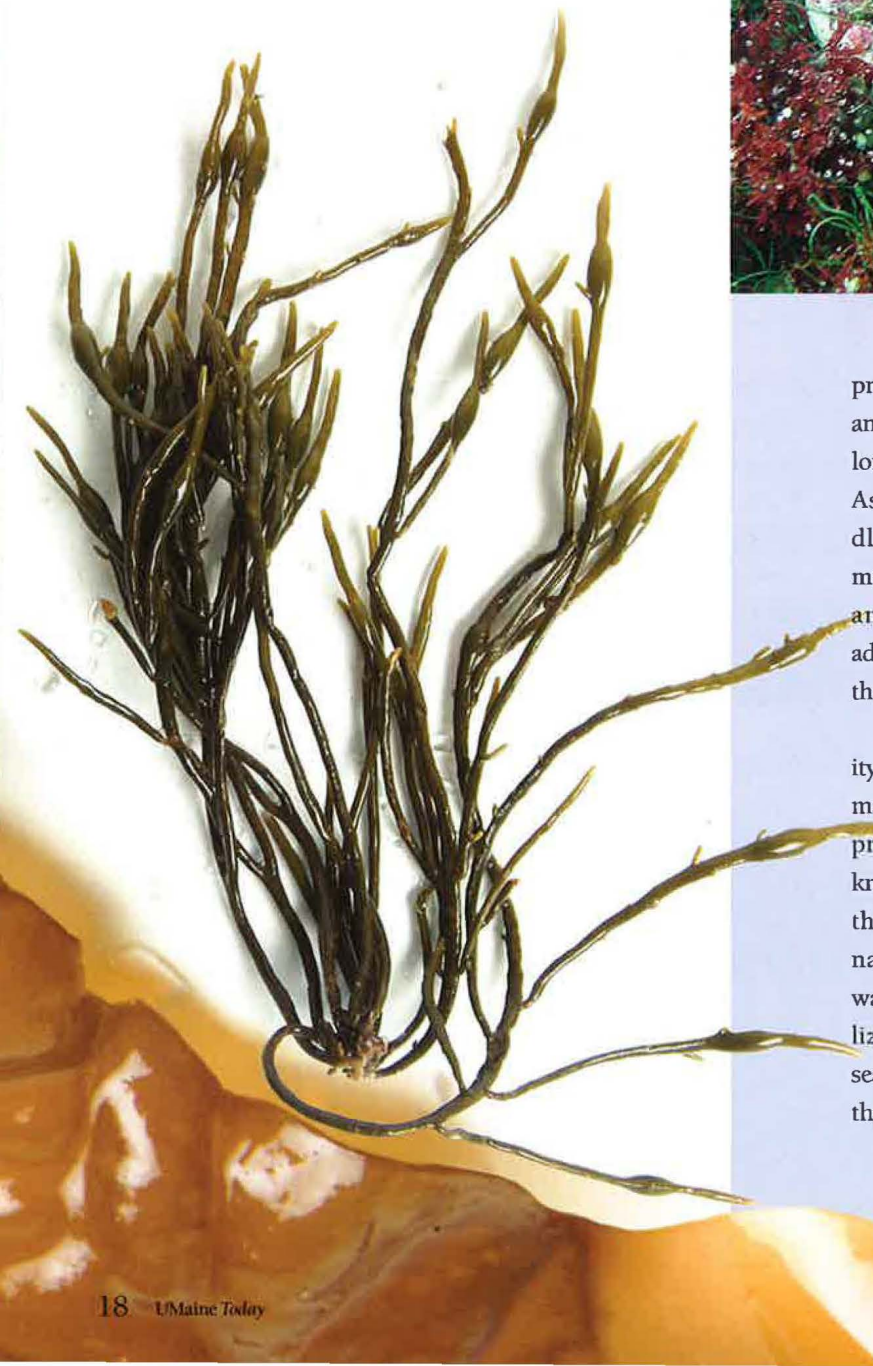
Humankind's appetite for salted cod, dried cod, boiled cod and cod chowder inspired a race for more traps, bigger nets, more powerful boats and so on. The technological onslaught

a balancing act

Dynamics of Diversity

FROM MICROSCOPIC mudworms to 100-pound cod, all marine organisms are part of a complex web of interdependence that forms the foundation for the system's overall health. As an ecosystem loses its biodiversity, it loses its resilience as well, making the organisms that depend on it more susceptible to disease, pollution, invasive species, overfishing, environmental changes and other threats. Professor of Marine Sciences Bob Steneck hopes to find new ways to preserve and restore biodiversity in the marine environment, an effort he hopes will not only strengthen damaged ecosystems, but stabilize fisheries as well.

In sustainable fisheries management, the focus is on the midsize, leaving the smallest and largest of the population in the sea. It's been a successful strategy for the lobster industry, and may help bring back important predators like Atlantic cod and other groundfish. Below, left to right: a large Jonah crab and an adolescent lobster.



proved too much, putting cod and other groundfish on Maine's long list of collapsed fisheries. As the cod population dwindled, the urchin population mushroomed. And now, kelp and other algae are taking advantage of their freedom from the urchin's hungry herbivory.

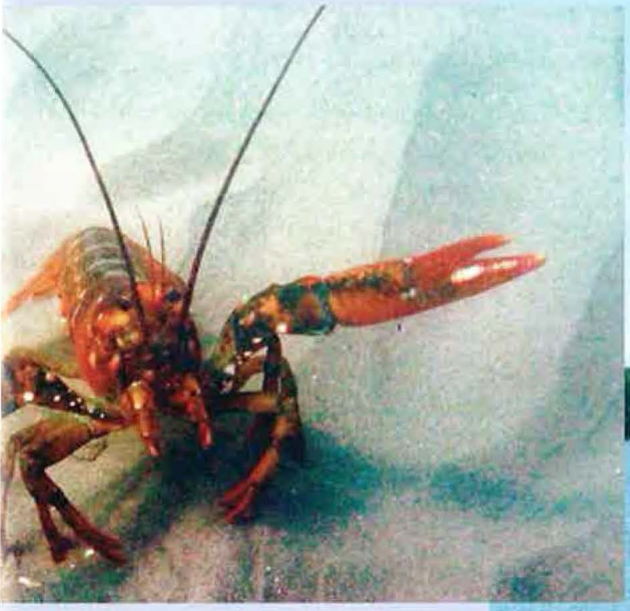
With their big-brained ability to find new ways to exploit marine resources, humans have proven again and again their knack for surpassing ecological thresholds and upsetting the natural balance beneath the waves. Steneck hopes to stabilize our relationship with the sea by finding new ways to fish that work more harmoniously with natural processes.

"Following the evidence drawn from marine research over the years is like watching an episode of *CSI*: The science is very good at telling us what made the victim die," says Steneck. "What we are learning is that the role of consumers, or predators, in marine ecosystems is much more significant than it had been considered in the past.

"Loss of large predators from the system has a much greater impact than nutrient run-off or invasive species or any of the other factors threatening ecosystem health. One could argue it is the biggest issue facing fisheries management."

"A diverse ecosystem is a stable ecosystem. Other factors, such as outbreaks of disease, are just symptoms of a lack of diversity and a lack of resilience in the system."

Bob Steneck



STENECK MAINTAINS that marine ecosystems are structured by their large predators, and that the lack of large predators due to overfishing can cause the populations of other organisms within the system to fluctuate uncontrollably. After nearly 400 years of intense groundfishing in the Gulf of Maine, declines in the cod population led to increases in the number of shrimp, lobster, urchins and other prey species.

While some might argue that an increase in lobsters or other species humans find tasty is a good thing, the population swings of prey species represent a system out of balance, and it is

a balancing act

Bob Steneck's interests in global biogeography, the study of why populations of different species inhabit some areas and not others, has led him beneath the waves in locations around the world. With the looming threat of global climate change largely beyond the ability of humans to control, conservation efforts and changes in fisheries management techniques may be our last best hope to preserve the health of the world's oceans.

that balance that is so important to maintaining healthy ecosystems and sustainable fisheries.

Worldwide, many marine species once abundant are now rare, and dramatic increases in populations are often the precursor to disease outbreaks. In Maine, where fishermen once split their efforts between several different species throughout the year, fully 80 percent of the state's fisheries income now comes from a single species: the American lobster.

To put that into perspective, there are more than 50 other marine species that split the remaining 20 percent of Maine's commercial fisheries income. Sales of bloodworms for fish bait contribute more to the state economy than cod.

"We need to manage our fisheries in a way that will bring back the dominant predators to restore diversity. A diversified ecosystem can support diversified fisheries, and that is the only way to maintain sustainable harvests," Steneck says.

With 80 percent of Maine's fishing economy riding on lobster, a disease outbreak could devastate the state's socioeconomic fabric. That's what happened in Rhode Island, where lobster shell disease collapsed the industry. Fishermen know the danger of depending too much on one species, says Steneck, who advocates broad changes in how fisheries are managed.

"When I first began doing research and working with fishermen, there was open hostility between managers, fishermen and scientists. Just in the past five years, fishermen have gone from being in denial to openly admitting there's a problem."

Steneck hopes to reinvent fishing by changing the way we look at harvesting and management. Almost all commercial fishing has aimed at capturing the biggest individuals of the target species, leaving smaller, younger animals to replenish the stock. But to increase a fishery population, it isn't enough to increase mesh sizes or minimum lengths, Steneck contends.

As part of the natural process, predators take the bite-size and injured, often leaving the biggest, healthiest, reproductive animals. Steneck says it's important to do the same in fisheries management by preserving the largest and smallest of the species.

"If we could change our focus to target the intermediate-size animals, our fisheries would be more sustainable and the ecosystem would benefit," says Steneck. ▮

The heat is on

WILLIAM SULINSKI is putting in another 14-hour day. The latest version of his start-up company's business plan is due on Monday. It's the third he's written in the last seven months, not out of indecision, but because of out-and-out entrepreneurial success.

"When you're talking about a start-up, everything changes and becomes clearer with each day that goes by," says the Dedham, Maine, native, president and CEO of the recently incorporated Consumer Energy Research Corp. (CERC), newly headquartered at Target Technology Center in Orono, Maine.

Sulinski is working with Matthew Rodrigue of Wilton, Maine, who is providing advising and consulting services to the company. Rodrigue was the nation's top electrical engineering student in 2004. For the past year, the pair has collaborated to take CERC from the drawing board to the boardroom.

Early on, Sulinski also had assistance developing CERC's business plan from his brother, James, and from University of Maine student Brigham McNaughton.

Benchmarks of their success include winning two major business plan competitions: in March, a $25,000 prize — $10,000 cash and $15,000 in legal consulting and other services — from the Center for Entrepreneurship at the University of Southern Maine School of Business; and last December, $5,000 in the Canadian Imperial Bank of Commerce Business Plan Competition.

In the spring, the new company also received a $5,000 seed grant from the Maine-based Libra Future Fund.

This past summer, CERC was invited by *Fortune* magazine to enter its national business plan competition to vie for the top prize of $35,000.

With investor funding, Sulinski hopes after Jan. 1 to beta test the company's first product, Heat-Safe, a wireless device to improve the efficiency of home heating oil delivery. A patent application is in the works. Enercon Technologies in Gray, Maine, will prototype the device.

And, oh yeah, the two entrepreneurs still have college courses to take. Sulinski, a UMaine senior, will graduate in December with an undergraduate degree in financial economics. Rodrigue, a 2004 UMaine graduate and, most recently, an engineer team leader at Woodard & Curran Inc., a consulting and operations firm, begins his first semester at Harvard Business School this fall.

"Heat-Safe will be our first product, but I don't expect it to be the last," says Sulinski. "We'll be doing research on other devices, but just now, we're working with oil industry efficiencies that have a bearing in Maine. We're planning to sell our product throughout the Northeast and Midwest."

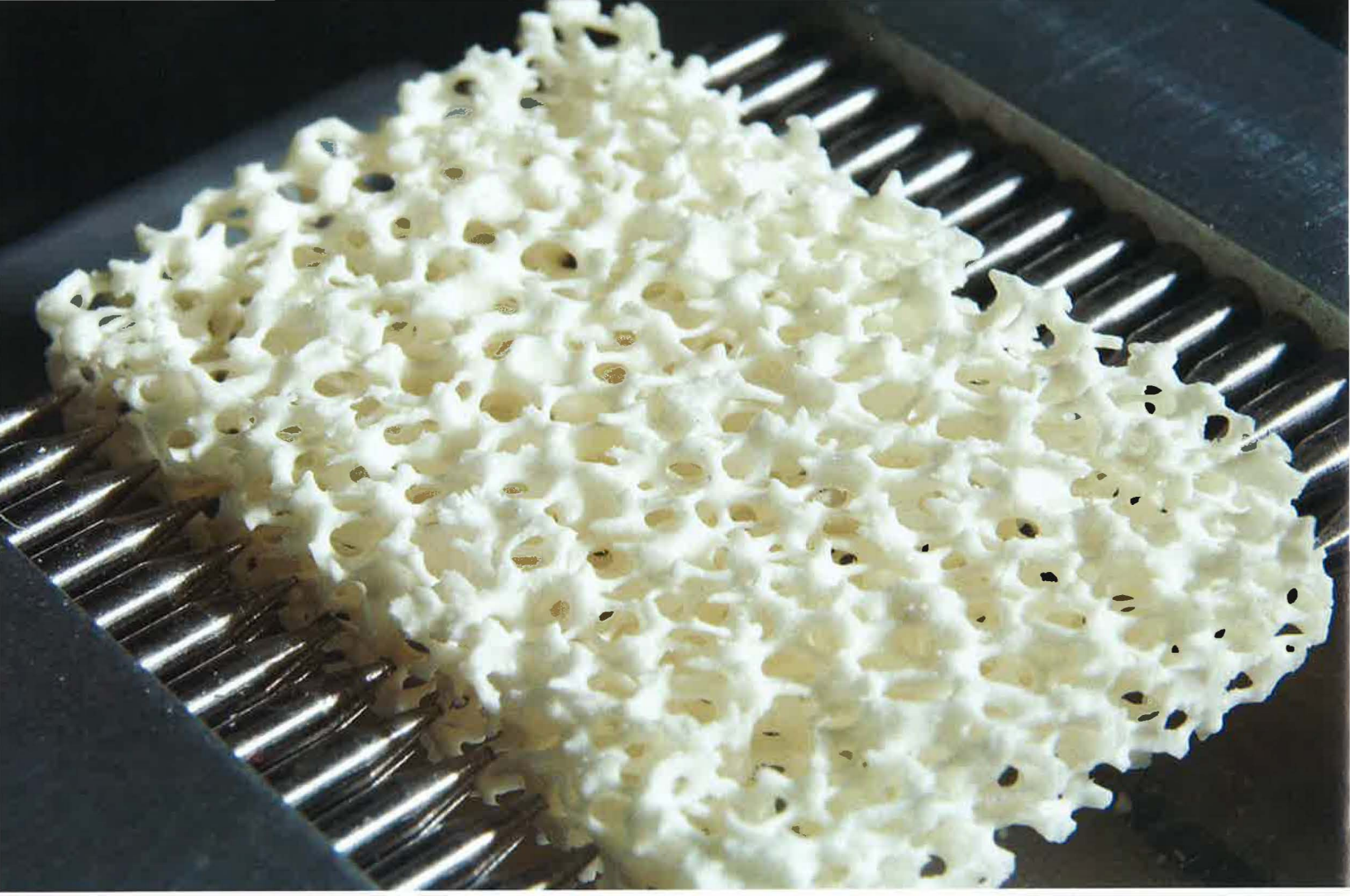
Sulinski, whose family is in the heating oil business, had the idea for Heat-Safe. He developed the invention with the help of Rodrigue and the expertise of Target Technology Center and UMaine's Office of Research and Economic Development.

"What made this idea successful so far has been hard work and the generosity of people at the university, Target, the Maine Patent Program and all of our outside counsel who want to help out," Sulinski says.

But the bedrock of Sulinski's entrepreneurial nature comes from his father. "He worked 15-hour days, but he enjoyed it and has something to show for it," says Sulinski, who was 13 when he started doing accounting work for the family business.

"The first thing I learned from my father, who built his business over 16 years into a fair-size company, is that anything is possible."

Matthew Rodrigue, left, and William Sulinski



Metal in Motion

By David Munson

UMaine researchers find that, when it comes to bone repair, foam metal may be just what the doctor ordered

At first glance, it's hard to imagine the drab lump of hardened metallic froth held by reconstructive surgeon Dr. Ian Dickey as anything important, much less a medical breakthrough. But placed inside the human body, it could be a wonder to behold.

The lightweight, pored material is a sample of foam metal. From aluminum-ceramic sleeves to sponge-like titanium discs, foam metals have been used in industrial applications for decades, primarily as insulators and filters. Working with Professor of Chemical and Biological Engineering Darrell Donahue and a team of other University of Maine researchers, Dickey is testing the potential of foam metals in medicine, and the preliminary findings have been nothing short of astounding.

The need for better implants in human reconstructive surgery continues to grow. Each year in the United States, more than 600,000 surgeries are performed to repair knee and hip injuries alone. Approximately 1 percent of those surgeries fail, leaving 6,000 patients with few recovery options. Research on foam metal implants being conducted at the University of Maine could change all that.

"The results of our initial studies have been outstanding. Not only does one get bone growth into the material, but we had soft tissue ingrowth as well," says Dickey, who began a collaboration with Donahue in 2004 that examined the strength and compatibility of foam metal implants in animals. "This level of compatibility with an implant is really exciting. We haven't seen anything that works like this."

Because of the body's natural resistance to foreign materials, implants used for bone repair have been fraught with difficulties. Slow recovery times, costly and painful second surgeries, and imperfect results often leave patients less mobile and more prone to future complications. In most cases, the problems associated with medical implants like replacement hips and bone-strengthening pins have to do with compatibility — the body's tissues recognize the implant as foreign and treat it like any other invader, walling the implant off from the living cells for protection. Because no biological connection is established between the living and nonliving material, traditional implants are often weak and prone to infection.

Without the possibility of real, biological attachment between the implant and live tissue, scar tissue can form.

Tests have shown that foam metal washers used for repairs at the rotator cuff can be stronger than other surgical repairs at four weeks and as strong as a normal joint by six weeks. At 30 months, the attachments not only stayed strong, they were 20 percent stronger than a healthy, uninjured joint.

The added strength comes from the living bone and soft tissue growing in the porous structure of the foam metal, fed by tiny blood vessels that also form inside the implant. Where traditional implants caused the formation of scar tissue that weakened the repair, foam metal implants provide a kind of biological scaffolding for new tissue growth.

DICKEY WAS CONDUCTING research at the Mayo Clinic in Rochester, Minn., when he started working with Donahue, an expert in bone biomechanics. The collaboration eventually brought Dickey to Eastern Maine Medical Center in Bangor.

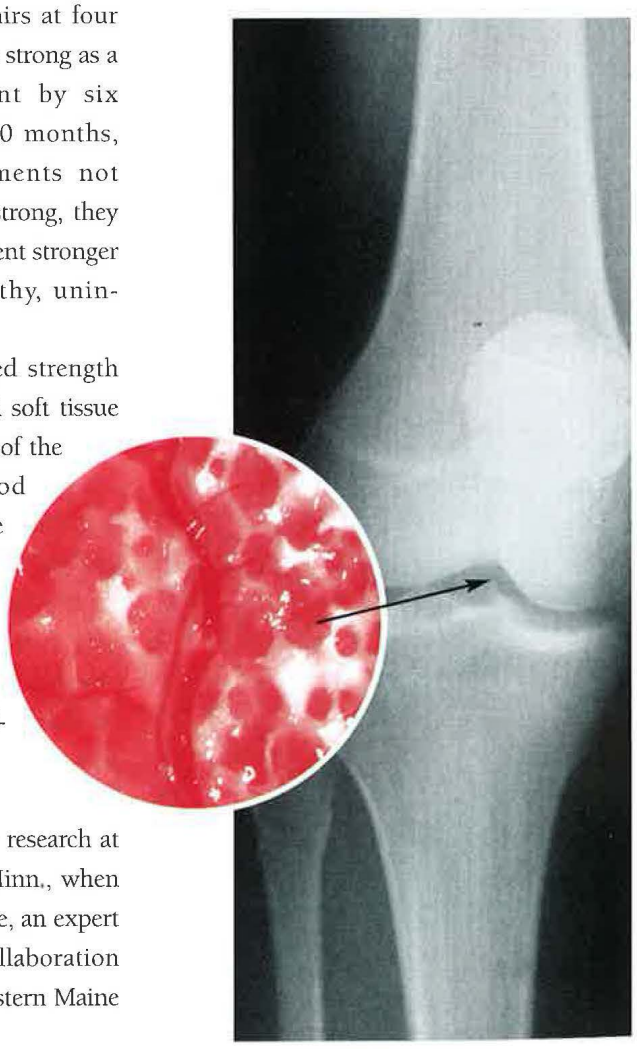


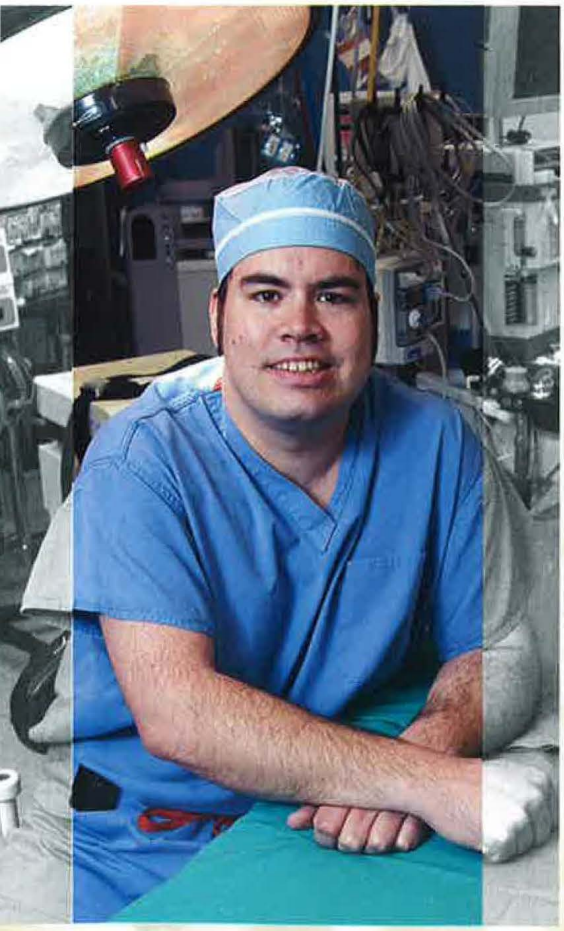
Photo left: Close inspection of an aluminum-ceramic foam metal sample reveals hundreds of tiny pores. The complex structure of the material forms a kind of biological scaffold for the growth of bone and soft tissue. Foam metal research offers exciting possibilities for use in joint replacements and other types of bone-repairing implants. The inset photo below shows how live tissues, including small blood vessels, are able to fully integrate into the foam metal material, creating a stronger and more natural repair.

Inset photo courtesy of Dr. Ian Dickey

As their research into medical uses for foam metals continued, Donahue and Dickey tapped into additional resources at UMaine, recruiting Scott Collins of the Laboratory for Surface Science and Technology (LASST), Anja Nohe and Michael Mason of the Department of Chemical and Biological Engineering, and Andre Khalil of the Department of Mathematics and Statistics. Their ultimate goal is not only to prove that foam metal implants work, but to find out why.

"My role in the project is relatively simple, but it's critical to understanding how well the implant interfaces with living tissue," says Mason, who, together with Khalil, is conducting a highly specialized mathematical analysis of foam metal samples that have been used as experimental implants. "Our goal is to develop reliable image analysis tools so that we can determine how the tissue responds to pore size, surface coatings and other factors. The challenge is finding methods that can separate the biological material in the image from the foam metal substructure."

Just down the hall from Mason, Nohe is applying her expertise in biological systems to develop new ways to test engineered samples in vitro, allowing the team to look at tissue growth in foam metal in a more precisely controlled laboratory environment. More effective methods for culturing tissue in foam metal samples will facilitate quicker, more reliable analysis of test samples and implant prototypes.

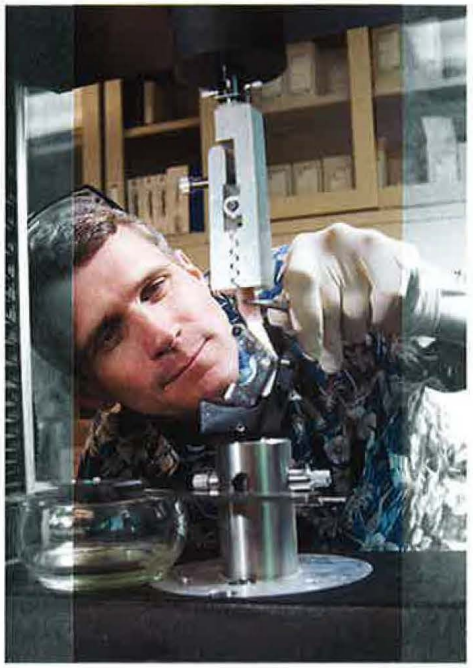


In addition to conducting research, Dr. Ian Dickey specializes in reconstructive surgery at Eastern Maine Medical Center.

WHILE MASON, KHALIL AND NOHE perfect new methods for testing foam metal samples and interpreting research data, Collins is manipulating the material itself, creating precisely engineered versions of foam metal implants to help determine how different physical characteristics in the metal affect its ability to integrate with living tissue.

"They needed to control the geometry of the pores down to the nanometer scale," says Collins. "By creating the material in a very controlled way, we can help determine whether the growth of tissue into the holes is a function of the length or the diameter of the pores, and we can also gather information on the topology of the surface and other characteristics so that they can set up manufacturing of the material accordingly."

Together, the researchers are developing a high-tech tool kit for the study of foam metals in an effort to better understand what makes the material so effective as a medical implant. Their discoveries will help foam metal manufacturers to develop a new line of products that will improve patients' lives.



UMaine engineer Darrell Donahue will use specialized equipment to measure the strength and efficacy of foam metal implants.

Drawing on the energy, experience and equipment available through LASST, the Institute for Molecular Biophysics and other resources, the research team is pursuing public and private funding that could expand their research efforts. Foam metal projects also are being considered for UMaine internal R&D funding as an area of new and emerging research benefitting the state.

UMaine could take a leadership role in this area of medical technology akin to what has been done in pulp and paper research, says Dickey, an adjunct professor in UMaine's Department of Chemical and Biological Engineering.

"This stuff rebuilds bone. How often does a new technology come along where the initial data on its use is so overwhelmingly positive?" Dickey says. "We have an amazing opportunity to become a leader in foam metals research, not just with one project or with one material; we could define the whole genre." ▮

Recognizing labor

Photos by Michael Mardosa

William Murphy

Title: Director of the Bureau of Labor Education
Research focus: Occupational health and safety, leadership development, employment law, collective bargaining and contract maintenance
Years with UMaine: 32
Milestones: Author or coauthor of 16 publications on employment law, occupational health and safety, and labor relations. This is the Bureau of Labor Education's 40th anniversary.

Question: How do you characterize the state of the U.S. labor market and labor movement?

Answer: In recent years, there have been tremendous changes in the United States labor market and the labor movement. These include major transformations in the U.S. and world economies; new innovations in the workplace and on the worksite; intense international competition among nations, employers and organizations; significant evolution in U.S. political and legal environments; and dramatic change in labor relations, such as major organizational upheaval within the labor movement itself. A remarkable aspect of organized labor in the U.S. is its continued ability and potential to adapt to these changes.

Question: What's important for the public to know about Maine labor?

Answer: Maine labor has a diverse and unique history. In addition, labor continues to play an influential role in the state's economy, particularly in its major employment sectors involving shipbuilding and repair, pulp and papermaking, construction, government, healthcare and education on all levels. Of equal importance, Maine's labor organizations carry out their legal rights and responsibilities by representing members in the workplace concerning wages, hours and working conditions.

Question: What's one of the biggest misconceptions about American labor organizations?

Answer: One of the biggest misconceptions about U.S. labor organizations is that they are autocratic, undemocratic institutions run by "union bosses." Overall, if one studies the history, functions and activities of labor unions and the labor movement, this is largely incorrect. Like any other large institution, there is no denying that there have been, and still are, some autocratic leaders within the labor movement. However, the vast majority of unions on the local, state and national levels are run openly and democratically. This not only is because union members have a right to demand and expect this; the law also requires it. Specifically, the law requires all unions to be run democratically, for members to have a voice in running the union, and for the periodic election of union officers to be done through secret ballot. Another positive development for union democracy involves the significant number of women, and men of color who are joining unions.

Question: What should people keep in mind on Labor Day?

Answer: Labor Day is a time to celebrate and recognize the contributions of workers and their organizations. In particular, it's important to remember the significant role of labor unions in this nation's political process and in the formation of public policy. For example, in the area of employment law, organized labor has played a vital and strategic role in the enactment of legislation involving wage/hour protections and improvements; family and medical leave rights; occupational health and safety; human rights, equal opportunity and protections against employment discrimination; collective bargaining and the right to organize; whistleblower protections; workers' compensation; and unemployment insurance. Passage of laws in these areas benefit both organized and unorganized employees. In addition, by raising the standard of living for those working in the U.S., these statutes have served to improve the economy and quality of life in the nation.

The end of the Big Chill

A NEW STUDY of glacial retreat shows that much of the world emerged from the last ice age simultaneously, according to two leading climate change scientists at Columbia University and the University of Maine. The exceptions were areas of the North Atlantic, which remained in a deep freeze 2,500 years longer.

The end of the recurring, 100,000-year glacial cycles is one of the most prominent and readily identifiable features in records of the Earth's recent climate history. Yet one of the most puzzling questions has been why different parts of the world, most notably Greenland, appear to have warmed at different times and at different rates after the end of the last ice age.

The new study, reported recently in the journal *Science*, suggests that most of the Earth did, in fact, begin warming at the same time, roughly 17,500 years ago. In addition, scientists suggest that ice core records from Greenland, which show that average temperatures there did not warm appreciably until about 15,000 years ago, may have remained in a hypercold state largely as a result of events triggered by warming elsewhere.

The research, led by Joerg Schaefer from the Lamont-Doherty Earth Observatory, a member of the Earth Institute at Columbia University, and George Denton of UMaine's Climate Change Institute, relied on a method known as cosmogonic or surface-exposure dating, which enabled the scientists to determine how long rock surfaces have been exposed since the glaciers retreated.

As cosmic rays penetrating the Earth's atmosphere strike the scoured rock, they form an isotope of the element beryllium at a known rate. By measuring the minute amounts of beryllium in rock samples from glacial moraines in California and New Zealand, and comparing these data to previously published results from Wyoming, Oregon, Montana, Argentina, Australia and Switzerland, the scientists were able to narrow down when glaciers around the world began to retreat. Additional studies from tropical South America and southern Tibet also produced similar results.

Photo courtesy of George Denton

Tiny trouble

MARINE SCIENTIST Peter Jumars wants to learn how centimeter-long opossum shrimp carry out their daily, round-trip migrations from the shelter of the ocean floor to open water.

So does the U.S. Department of Defense.

Jumars, a University of Maine professor of marine sciences and oceanography at the Darling Marine Center in Walpole, Maine, has a grant from the military's Defense University Research Instrumentation Program to continue his groundbreaking work in the utilization of sonar technology to establish reliable techniques for monitoring the movements of opossum shrimp.

Jumars' research has revealed some exciting data about the biology and ecological importance of the fast-moving shrimp, which are a major source of food for small cod and other fish.

The research is important for national defense purposes because the movements of large numbers of opossum shrimp and other small organisms can interfere with the military's use of sonar for detecting and identifying underwater mines.

"I basically study what the people who identify undersea mines call noise. Their noise has become my signal," said Jumars.

"Office of Naval Research Program officers have been impressed by how dense the swarms of migrating shrimp can be. This is definitely not a small problem when it comes to using acoustics for local area search, and the shrimp are certainly something cod care about."

Photo by Mei Sato

EXTREMELY SMALL tumors are notoriously difficult to detect and pose a potentially lethal threat to cancer patients, even after surgery. But by using an amazingly tiny technology being perfected by University of Maine researchers, doctors may soon be able to pinpoint even the most miniscule cancerous cells while the patient is still on the operating table.

Tagging cancer cells

Michael Mason and his team will provide the foundation for cellular and tissue trials that will be conducted later this year by Dr. Peter Allen at Memorial Sloan-Kettering Cancer Center in New York, which funded the UMaine research.

UMaine Chemical and Biological Engineering Assistant Professor Michael Mason is developing an improved screening technique in which nanometer-size metal particles are used to "tag" cancer cells, allowing surgeons to identify cancerous tissue more quickly and efficiently. Metallic nanoparticles are guided by attached biomolecules that are attracted to specific molecules on the surface of cancer cells. The technique is sensitive enough to reveal even a single cancer cell.

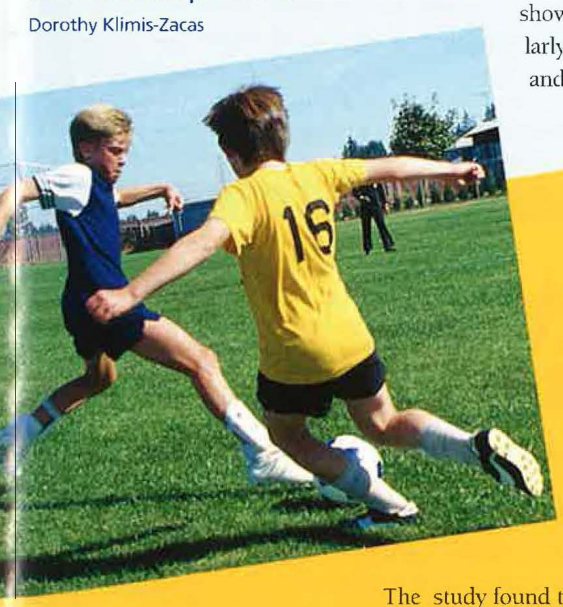
Wild at heart

MAINE'S WILD blueberries continue to prove that they are more than just a splash of tasty color in muffins and pancakes. Research conducted at the University of Maine suggests that a serving of wild blueberries can go a long way toward a healthier heart.

Research conducted by UMaine Professor of Clinical Nutrition Dorothy Klimis-Zacas and her team — postdoctoral fellow Anastasia Kalea and graduate student Kate Clark — shows that compounds found in wild blueberries may reduce the chances of cardiovascular disease by altering the composition and structure of arterial components, which may prevent LDL cholesterol from binding to blood vessels. By decreasing the vulnerability of the arterial wall to stress and inflammation, antioxidants in wild blueberries may help to create a less favorable environment for fatty buildup that can cause reduced blood flow and heart attacks.

The study, published in the *Journal of Nutritional Biochemistry*, is the latest of several research projects by Klimis-Zacas that examine the effects of colorful, antioxidant-rich foods like wild blueberries on human health. Her previous work has shown that Maine's favorite berry, when eaten regularly, also may play a role in helping arteries relax and in reducing hypertension.

"Our investigation of the potential of natural antioxidants like those found in wild blueberries to combat the precursors to cardiovascular disease is part of a broader research movement to gain better understanding of the role of diet in disease prevention."
Dorothy Klimis-Zacas



In physical education
A is for aerobic

PHYSICAL EDUCATION in grades 4–8 can increase youngsters' aerobic capacities, no matter their age, sex or level of participation in sports, according to preliminary findings of a study conducted by University of Maine researchers.

Aerobic capacity has been linked to reduced incidence of high blood pressure, coronary heart disease, obesity and diabetes.

The study found that students achieved high levels of aerobic performance with two physical education classes a week. Their increased performance continued even in the winter months.

"Increased performance continued right through the terrible Maine winter, when kids are supposed to be much less active," says UMaine Professor of Education and Special Education Stephen Butterfield. "In fact, our follow-up data show a leveling off during the summer, with improvement a couple months after (students) return to school in the fall."

The study by Butterfield and his UMaine College of Education and Human Development colleagues Robert Lehnhard and Craig Mason was done in collaboration with physical education teacher Robert McCormick at Blue Hill Consolidated School in Maine.

During a nine-month school year, the aerobic performance of more than 100 students in grades 4–8 was tested five times using a portion of the Fitnessgram, a series of activities to assess fitness in children. The researchers administered the Progressive Aerobic Cardiovascular Endurance Run (PACER) Test to measure the children's aerobic capacity.

"It is possible that regularly testing children on the PACER teaches effective pacing strategies, thereby substantially improving performance on this key fitness component," the researchers wrote in their paper, presented earlier this year at the national convention of the American Alliance for Health, Physical Education, Recreation and Dance.

Maine's biggest creepy crawlers

Most insects we know are minuscule. Theirs is a small world, after all. Yet, there are giants among them. We asked University of Maine entomologist Stephen Woods, who oversees the more than 100,000-specimen UMaine Insect Collection, to list six found in Maine.

Giant waterbugs — More than 2 inches long, oval in shape, with a piercing beak that can inflict a painful bite if handled carelessly. These predators of insects and small fish in ponds are attracted to lights at night.

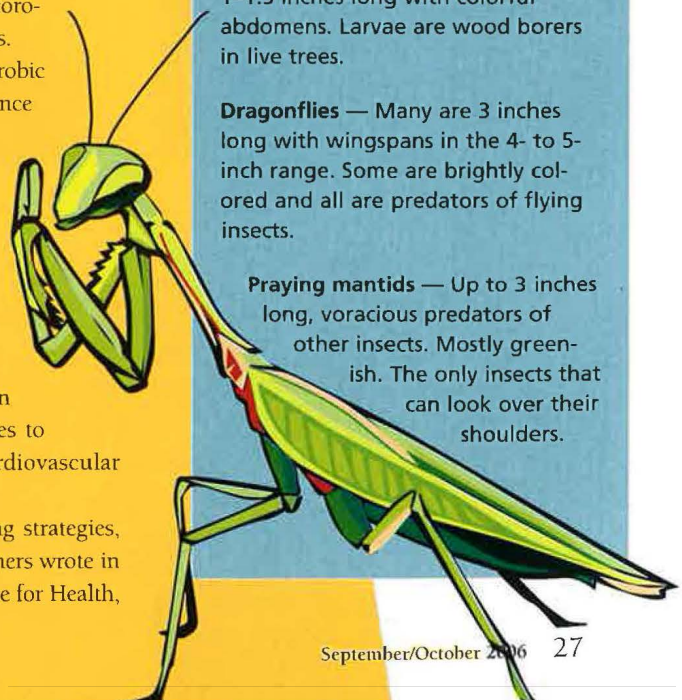
Giant silkworm moths — Beautiful, heavy-bodied moths, with 4- to 5-inch wingspans. One type, the luna moth, is pale green. The moths are attracted to lights at night.

Dobsonflies — Males are about 3 inches long with mandibular tusks that are quite scary, but harmless. The immatures, called hellgrammites, are aquatic, preying on other insects in streams.

Horntails — Stout-bodied sawflies, 1–1.5 inches long with colorful abdomens. Larvae are wood borers in live trees.

Dragonflies — Many are 3 inches long with wingspans in the 4- to 5-inch range. Some are brightly colored and all are predators of flying insects.

Praying mantids — Up to 3 inches long, voracious predators of other insects. Mostly greenish. The only insects that can look over their shoulders.



Sea scallop scrutiny

BETTER UNDERSTANDING of the relationships between different scallop populations along the Maine coast could help fine-tune management strategies, according to two University of Maine marine scientists.

Associate professor Paul Rawson and Ph.D. student Erin Owen are studying the ecology and genetics of sea scallop populations in the context of various environmental factors. Their research is funded by a two-year NOAA grant.

In particular, Rawson and Owen will determine whether the Cobscook Bay sea scallop population is a separate stock from the population found in Penobscot Bay.

Scalloping is an economically important fishery in the state, but the harvest has been steadily declining in recent years. Scallop landings in Maine dropped in value from more than $15 million in 1981 to less than $1 million in 2004.

Windows on Maine

SCHOOLCHILDREN ACROSS the state can explore Maine history and environmental science using Windows on Maine, an interactive Web site featuring an ever-increasing collection of multimedia resources — video, images, documents, sound files, maps and simulations.

Windows on Maine is a tool for experiencing and creating new media — digital image, sound and video. It is intended to help teachers and students learn and become fluent in new forms of communication and expression — 21st-century literacy, according to project director Marilyn Lutz of the University of Maine. UMaine partnered in the project with the Maine Public Broadcasting Network and the Maine State Museum.

Users can access two MPBN series — "HOME: The Story of Maine" and "QUEST: Investigating Our World." Windows on Maine also offers primary resources from distinguished Maine cultural collections that enrich the broad themes: forestry and lumbering, fishing and fishermen, hunting and fur trading, shipping and ship building, and Native American studies.

Collaborators in the project include members of the Digital Maine Learning Group — Maine State Archives, Northeast Historic Film, the Maine Historical Society, and the Maine Folklife Center.

Academ-e

Early College Distance Education Program

MAINE'S FIRST early college distance education program begins this fall with the introduction of Academ-e, 14 University of Maine courses open to high school seniors via online, videoconferencing and in-person teaching.

Among the scheduled courses are Calculus, Introduction to Geology, General Psychology, Survey of Dramatic Literature and Fundamentals of Music.

Most of the 560 Academ-e students are from public high schools. Also eligible are students who are home schooled, in adult education diploma or GED programs, or from independent high schools.

School principals, teachers and guidance counselors nominate qualified students, according to a formula based on school enrollment (five slots for the largest schools; three slots for small schools). UMaine Academ-e scholarships cover half the tuition for each course — currently $552 for three credits by an in-state student, $736 for four.

Grants from the National Governors Association and Bank of America partially pay the tuition balance.

With Maine's rural nature and its changing demographics, state officials are paying close attention to the uses of technology in the delivery of education throughout Maine. Education Commissioner Susan Gendron says that technology helps to ensure that equal opportunities are provided every student.

last impression

ON THE THIRD FLOOR of the Bryand Global Sciences Building at the University of Maine is one of the largest Antarctica rocks in North America. The 300 million-year-old, nearly 1,000-pound granite boulder has been sculpted by the Antarctic winds to produce smooth edges and deep hollows. It is art that climate has made.

In 1989, the boulder was removed from Antarctica under the supervision of UMaine Professor of Glacial and Quaternary Studies Harold Borns. At the time, Borns also served as program manager for polar glaciology at the National Science Foundation, which had been asked by the family of Rear Adm. Richard Byrd to select a "typical" rock from Antarctica that could be placed at the Arlington National Cemetery grave site of the legendary naval aviator and polar explorer. When plans changed, the rock was loaned by the Byrd family to UMaine, home of the internationally recognized Climate Change Institute.

In 1960, Borns was the first of many UMaine faculty members to participate in the U.S. Antarctic Research Program. Today, more than 40 UMaine researchers are involved in scientific investigations at the South Pole and around the world. Their focus is the Quaternary Period, a time of numerous glacial/interglacial cycles and abrupt changes in climate, from the present to nearly 2 million years ago.

UMaine is the home of the U.S. International Transantarctic Scientific Expedition, led by Paul Mayewski, director of the Climate Change Institute.

Byrd (1888–1957) led five Antarctic research expeditions between 1928–56. He played a major role in promoting research in and peaceful use of the southern continent. Byrd rose to international hero status when he undertook a flight to the North Pole in 1926, for which he and his pilot were awarded Medals of Honor. Three years later, the explorer was the first to fly over the South Pole.

"I am hopeful that Antarctica in its symbolic robe of white will shine forth as a continent of peace as nations working together there in the cause of science set an example of international cooperation."

Rear Adm. Richard Byrd
Inscription on the Byrd Memorial at McMurdo Station, Antarctica

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A focus on ethics

UNIVERSITY OF MAINE SENIOR Anne Mathieson won the 2006 John M. Rezendes Annual Ethics Essay Competition with an extensive paper on ethics in the public domain.

Mathieson completed her UMaine coursework in June and plans to continue her studies at Northern Arizona University.

In her essay, the philosophy major from Montville, Maine, examined a topic that is both intriguing and important to her: the classification of humans according to perceived differences and the resulting aversion to what is considered "other." In our culture, such prejudice is expressed in sexism, racism, homophobia and other forms of discrimination.

The Rezendes Award was established by Dennis Rezendes, Class of '57, in honor of the strong ethical values and beliefs of his father, for whom the award is named. The essay competition, which awards a $2,500 prize and an engraved commemorative sculpture, is made possible by the **John M. Rezendes Ethics Fund** in the **University of Maine Foundation.**

Through the annual award and a lecture series, the fund provides learning and teaching opportunities focused on ethical values. The goal is to help students in all academic disciplines make ethical choices in their lives and careers.

Photos by Michael Mardosa

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