

UMaine Today

CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE

SEPTEMBER/OCTOBER

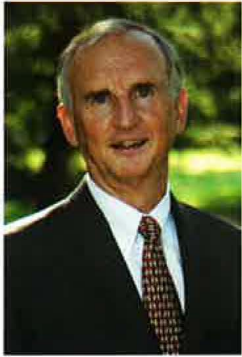
2005



IN A TRANSPARENT embryo the size of a pinhead grows a model organism with the potential to help solve human health problems. The zebrafish, which develops from a single cell to a complete vertebrate within 24 hours, has many biological traits that mimic those of humans. At the University of Maine, basic zebrafish research hopes to

**UNLOCK THE SECRETS OF INNATE IMMUNITY
IN THE ONGOING BATTLE AGAINST
INFECTIOUS DISEASE.**

President's Message




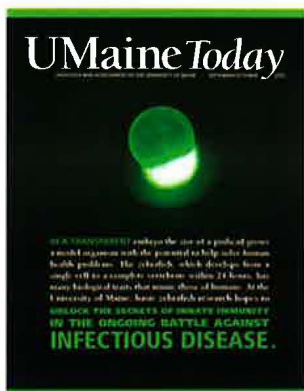
UMaine TODAY BEGINS its fifth academic year with the publication of this issue. It focuses on scholarly achievement at the University of Maine, featuring stories on the creativity and discovery that make UMaine an exciting, vibrant intellectual community. Each issue also includes features on students — stories that remind us of the wonderful contributions undergraduate and graduate students make to this university, in our classrooms and our labs, and in the various places all over campus where learning takes place in less formal ways.

UMaine is truly a student-centered university. It is our job to provide the means for students to have success while they are with us and after they graduate. First and foremost, we provide a high-quality academic experience that features meaningful interaction with our outstanding faculty. We also work hard to develop programs and activities that support the academic experience and help our students develop in ways that will serve them well throughout life.

I am excited about an innovative new program that we have been exploring and will continue to develop this fall in our residence halls. Over the coming year, each of our 19 student housing-facilities will be designated as a Living/Learning Center with a specific theme. For example, Hancock Hall residents will focus on social justice. Programs will feature faculty members, staff and even outside experts who will spend time with Hancock residents discussing important issues like racism and poverty. Other residence halls will have themes like environmental sustainability and outdoor recreation. If they wish to participate in this program, resident students will have the opportunity to select a hall where the theme reflects their personal interests. This will be a wonderful way to supplement the traditional academic experience with meaningful programming and activities.

Dean of Students Robert Dana and his staff are constantly looking for creative approaches like this one. Their efforts make a difference, and they are a significant reason that UMaine welcomes another excellent group of students this fall. Our enrollment numbers continue to be at the level we desire, and our new students bring outstanding qualifications. I am confident that they will have success at UMaine, and that they will develop as people who will contribute to society in meaningful ways.


Robert A. Kennedy
President



ON THE COVER: A transgenic zebrafish embryo in the early stages of development that incorporates a naturally fluorescent protein from a jellyfish (*Aequorea victoria*) can show scientists where specific proteins are being expressed in cells. For his studies of essential trace metal homeostasis, University of Maine Assistant Professor of Molecular and Environmental Toxicology Greg Mayer uses transgenic zebrafish that have incorporated a gene construct containing a green fluorescent protein that is turned on in response to heavy metals. Mayer is just one of several scientists using the UMaine zebrafish facility. A story on zebrafish research at UMaine begins on page 4.

Photo by Bill Drake

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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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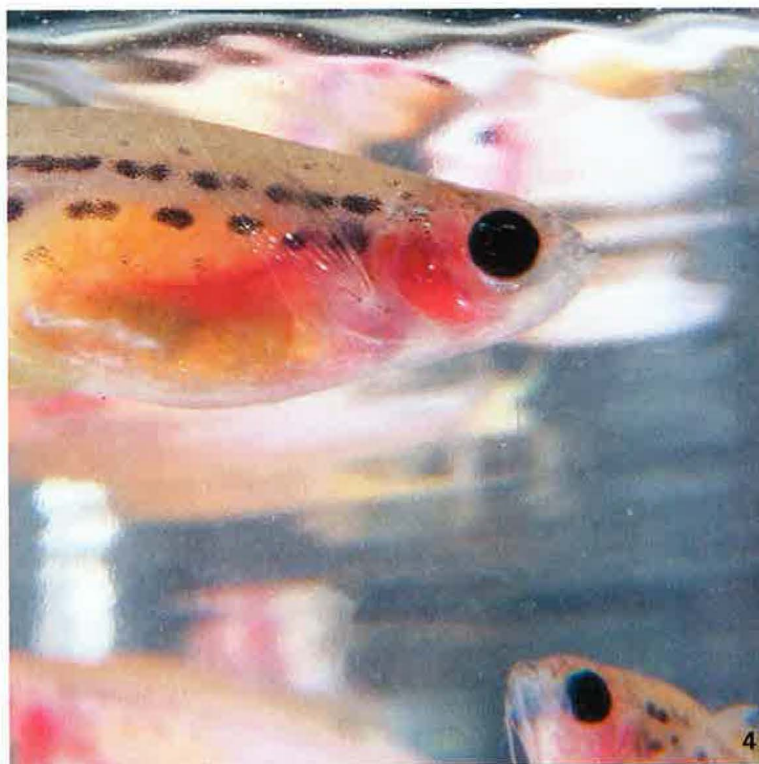
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Being a **daredevil**

Psychological study finds men and women differ in their attitudes toward risk-taking friends and mates

by George Manlove



W

HAT ARE WOMEN looking for in a potential mate? One answer may come as a surprise to men who think women are impressed by dangerous acts of derring-do.

According to a recent study conducted by University of Maine psychologist G. William Farthing, women prefer prospective mates who avoid extreme physical risks, and guys who show off with dangerous stunts tend to impress only one another.

In research into attitudes about physical risk taking, Farthing surveyed 48 men and 52 women, all UMaine undergraduate students under the age of 30, about the attractiveness of risk takers compared with risk avoiders as potential mates or as same-sex friends. The students evaluated hypothetical scenarios.

In selecting a mate, most women would avoid both daredevils and wimps. Most women prefer a male companion who is courageous but responsible, he concludes.

Both females and males do approve of "heroic" physical risk takers as mates, with the preference being stronger for females. Heroic risk taking would include actions like saving a child from a river or a burning building, or stopping a bully. Non-heroic risky behavior could include speeding in a car, challenging a rude stranger or skiing an expert trail with intermediate skills.

CONTRARY TO PREDICTIONS, when it came to "non-heroic" physical risks by possible mates, both men and women preferred risk avoiders rather than risk takers. But when judging same-sex persons as friends, males significantly preferred non-heroic risk takers, whereas females preferred risk avoiders.

In a second study, both males and females accurately predicted the opposite sex's preferences for heroic risk takers as mates, but young males incorrectly believed that women would prefer men who took non-heroic risks. In fact, women preferred prospective mates who avoided extreme non-heroic risks, Farthing says.

The results surprised him. "I predicted that women would be attracted to risk takers," says Farthing, an evolutionary psychologist with an interest in the thought process underlying risky behavior. "It turned out that the answers didn't support the hypothesis."

The results of his study, "Attitudes Toward Heroic and Non-heroic Physical Risk Takers as Mates and as Friends," were published in the March issue of the psychology journal *Evolution and Human Behavior*. It is one of the first studies of attitudes toward risk takers that specifically evaluates the attractiveness of people whose risk taking could be considered more reckless than courageous.

"There have been an awful lot of people who have died on Mount Everest," Farthing notes. "There also are an awful lot of

people who have climbed halfway up and turned back because of the weather. The risk just wasn't worth it."

The impetus for the study began with questions underlying the thought process in people considering physical risks, "questions about what is it that encourages people to take risks or not take risks, or the different degrees of risk, like people taking an expert ski slope," he says. "Then I made the connection between that and what people find attractive in a mate's risk taking."

The research also has Farthing wondering what roles biological factors and cultural conditioning play in inducing people to pursue risky activities that could result in injury or death.

"Evolutionary psychology looks at a possible biological evolutionary link that goes beyond cultural conditioning," he says. "The

question for both psychologists and cultural anthropologists is to determine if there is a universal human genetic connection that's modified by culture." The answer will require collecting data across different cultures, he says.

THROUGH THE LAST half-million years of human evolution, people made a living as hunters and gatherers. Taking physical risks often was necessary for survival, Farthing says. Women could be expected to be drawn to brave, athletic men who could bring home meat from the hunt or successfully defend them from marauders. And it's reasonable that other men would like such individuals beside them in hunting or in battle. The admired hunter-warrior presumably would have greater social status among his peers and little trouble finding a mate.

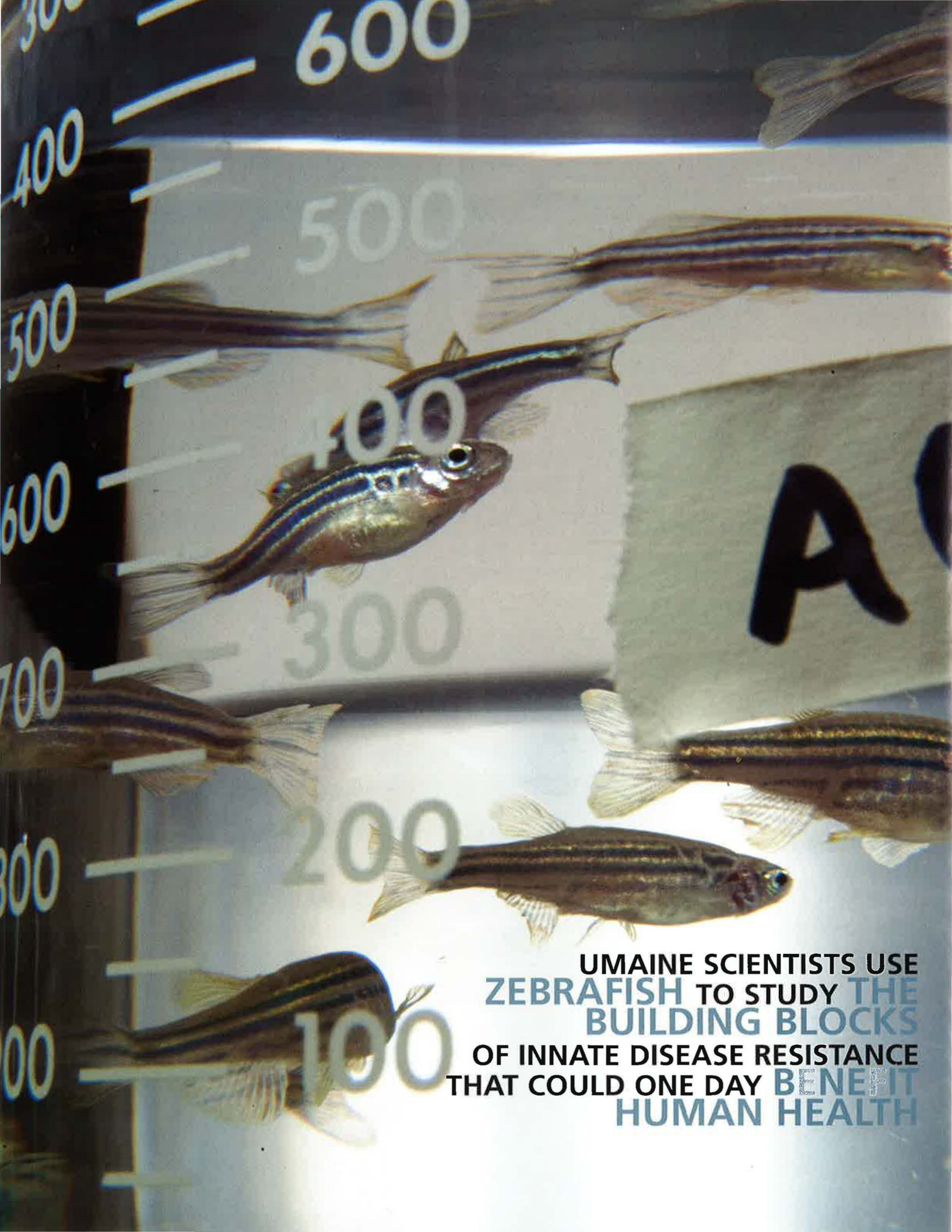
However, even today, women would choose a mate who would be a long-term protector and provider, according to Farthing's study. "If a woman is considering a man as a mate, she wants him to be a survivor and not going off taking foolish risks," he says.

Using modern examples of non-heroic risk taking in sports or recreation, Farthing allows that the degree of risk in an activity can be mitigated by the risk taker's skill and experience. A dangerous activity for one may not be a serious risk for another.

Farthing is further evaluating his research data to see what conclusions might be drawn about non-heroic risk taking when dangers range from small or moderate to very risky. Are there some conditions, for example, under which women prefer takers of non-heroic, non-practical risks as mates over risk avoiders? His recent research shows that women may approve of highly skilled experts taking larger risks, or moderately skilled mates taking moderate risks.

"Women don't want daredevils as mates, but they don't want wimps, either," Farthing says. ■

Contrary to predictions, when it came to "non-heroic" physical risks by possible mates, both men and women preferred risk avoiders rather than risk takers.



UMAINE SCIENTISTS USE
ZEBRAFISH TO STUDY THE
BUILDING BLOCKS
OF INNATE DISEASE RESISTANCE
THAT COULD ONE DAY BENEFIT
HUMAN HEALTH

SEEKING IMMUNITY



By Margaret Nagle

IN THE ROOM saturated in white light and the sound of rushing water, it's 82 degrees. In rows of shoebox-size tanks stacked five high dart slivers of silver — tiny fish no bigger than grains of rice, adults two inches long and all ages in between.

Even if it's been years since your last childhood trip to the store to bring home a plastic bag bulging with water containing an aquarium fish, the sight of more than 40,000 zebrafish in a laboratory at the University of Maine can still make your heart skip a beat. It all comes flooding back: the excitement and wonder of watching zebras native to India's Ganges River swimming just inches from your face.

Today, what's even more remarkable about this hardy, popular home aquarium fish is the splash it's making in basic science. Zebrafish as model organisms are now comparable in importance to mice and fruit flies in the study of genetics and disease prevention. Evidence of the research poten-

tial of the little striped vertebrates is in the prevalence of zebrafish labs at medical schools nationwide and the explosion of the resulting scientific literature being published.

Zebrafish are being studied to better understand such human conditions as congenital disease, cancer and aging. At UMaine, the zebrafish facility of Carol Kim, associate professor of biochemistry, microbiology and molecular biology, is a hub of activity, facilitating the initiatives of as many as five campus scientists conducting research in such areas as microbiology, toxicology, immunology, developmental biology and genetics. In her research on innate immunity and infectious diseases, Kim collaborates with scientists across the country and abroad.

Zebrafish hold the promise of very basic scientific and applied research breakthroughs for Kim, a faculty member in the Department of Biochemistry, Microbiology and Molecular Biology, with affiliations with the Functional Genomics graduate program

For researchers, two of the most important characteristics of zebrafish are their rapid and viewable development, and their biological traits that mimic those of humans. Zebrafish eggs are transparent. Under a microscope, scientists can watch the embryonic growth that occurs in two to four days following external fertilization. Development is so rapid that a single cell multiplies to take on a fish shape within 24 hours. In the images above, left to right, the zebrafish embryo is shown shortly after fertilization, then at 10 hours, 14.5 hours, 20 hours and 45 hours post-fertilization.

Microscope/camera details: Zeiss Axiovert 200M/Coolsnap camera/
10x objective at 6-minute intervals,
29 degrees C.
By Kristina Yu, ©Exploratorium,
www.exploratorium.edu

SEEKING IMMUNITY

offered by UMaine, Jackson Laboratory and Maine Medical Center Research Institute, part of the Graduate School of Biomedical Science. In her research, she is studying the biological factors that supplement and prolong the body's immune response to infection. Working on the molecular level, she is studying how cells respond to infection, contributing basic knowledge that could one day lead to disease prevention or more effective vaccines in humans, and in other mammals and fish species.

"We're using the zebrafish as a model for the immune response to infectious disease," Kim says. "The zebrafish is a powerful model system that will allow us to better understand the immune system and implement preventative measures against infection for humans, as well as fish."

ZEBRAFISH MAKE IDEAL model organisms in science for many of the same reasons they are popular in home aquariums. They are easy to care for and breed, and they are resilient, tolerating fluctuations in water temperatures. A female can lay up to 300 eggs each week. Zebras can live for up to five years.

For researchers, two of the most important characteristics of zebrafish are their rapid and viewable development, and their biological traits that mimic those of humans. Zebrafish eggs are transparent. Under a microscope, scientists can watch the embryonic growth that occurs in two to four days following fertilization. Development is so rapid that a single cell multiples to take on a fish shape within 24 hours.

Zebrafish can serve as models for human developmental biology, neurobiology, toxicology and genetic disease. While they are lower vertebrates, their genes, developmental processes, anatomy, physiology and behaviors bear similarities to those of humans, according to ZFIN, the Web-based Zebrafish Information Network of the Zebrafish International Resource Center at the University of Oregon.

"There are some differences in the zebrafish model; namely, that it is not a mammal," says Kim. "In UMaine's partnership with Jackson Lab (the world's largest mammalian genetic research facility, where the mouse is studied as a model for human disease), our zebrafish facility is complementary. I think that the zebrafish model

CAROL KIM STUDIES HOW CELLS RESPOND TO INFECTION, CONTRIBUTING BASIC KNOWLEDGE THAT COULD ONE DAY LEAD TO DISEASE PREVENTION OR TREATMENT.



Carol Kim's interest in applying molecular virology and microbiology to benefit the biomedical field and aquaculture industry brought her to UMaine in 1998, where she set up the state's first and now largest zebrafish facility.

system soon will rival the mouse system as more reagents, antibodies and cell lines are developed. It already rivals the mouse in developmental biology and toxicology.”

In recent years, scientists like Kim have turned to zebrafish as models for the study of immunity, and infectious viral and bacterial disease. Key to Kim’s work is the identification of the genes and molecular processes involved in innate immunity — the natural ability of multicelled organisms to ward off pathogens. Her studies of infectious disease in zebrafish bridge the biomedical and applied application fields because they have



the potential to lead to a better understanding of disease development, resistance, diagnosis and treatment in other vertebrates, including humans and fish.

Kim’s interest in applying molecular virology and microbiology to benefit the biomedical field and aquaculture industry brought her to UMaine in 1998, where she set up the state’s first and now largest zebrafish facility. Up to that point, much of the genetically based research involving zebrafish focused on developmental biology and neurobiology. Kim was among the first to use the zebrafish to study infectious diseases.

What started as a small laboratory with 250 brood stock has grown to a climate-controlled facility in the new wing of Hitchner Hall, housing more than 40,000 zebrafish at all stages of development.

KIM’S FOCUS IS on the role of toll-like receptor (TLR) signal pathways that are key to innate immunity. First identified in the fruit fly, TLRs are proteins found on the surface of certain cells. The receptors act as defense mechanisms, recognizing and binding with molecules of bacteria or viruses, and signaling the cell nucleus of the invading microbial infection. The result is an innate immune response — the release of infection-fighting molecules, such as cytokines.

Such innate response is a primitive physiological feature still shared among insects and vertebrates like the mouse, zebrafish and human. Unlike adaptive immunity that depends on virus- or bacteria-specific antibodies or vaccines, innate immunity as the body’s first line of defense provides an immediate, vigorous, nonspecific inflammatory response to pathogens. Indeed, the stronger the innate immune response in the mouse, zebrafish or human, the more vigorous the adapted immune response.

In their efforts to better understand how the immune system responds to viral infec-



Greg Mayer’s zebrafish research has the potential to help set environmental limits and find thresholds for certain chemicals in food, water and consumer products.

Metal Works

THROUGH THE AGES, arsenic has been known as a potent poison. More recently, it’s been determined to be a human carcinogen, yet it’s unclear how this element causes cancer.

“By uncovering the mechanisms underlying arsenic-induced carcinogenesis, we will be able to make better judgments regarding such varied subjects as human intake limits and what types of treatment regimes could ameliorate environmental problems,” says University of Maine toxicologist Greg Mayer.

Mayer came to UMaine two years ago from postdoctoral work at the University of Miami’s Rosenstiel School of Marine and Atmospheric Science, where he studied the zinc homeostasis and heavy metal toxicology in the squirrelfish, a coral reef species that has phenomenal zinc metabolism capabilities. His work there focused on a novel promoter region (a molecular on/off switch) of metallothionein, a protein that binds heavy metals. At Miami, Mayer also developed transgenic zebrafish as a tool to understand how exposure to metals alters expression of a cell’s DNA.

Currently, Mayer is using wild type and transgenic zebrafish in several other contexts in his laboratory. These include investigations of the role of metal responsive transcription factors during embryo development.

SEEKING IMMUNITY

Photo by Michael Mardora



Clarissa Henry, left, with undergraduate Chelsi Snow, is studying the molecular signals that prompt muscle fibers to elongate and attach to tendons on the skeleton.

Muscle Power

TO HELP FIND treatments for diseases like muscular dystrophy or traumatic muscle injury, researchers must first understand how muscle forms during early development.

One of the best way to do that, says University of Maine Assistant Professor of Biological Sciences Clarissa Henry, is to watch how muscle develops in transparent zebrafish embryos. In particular, Henry is looking at the two kinds of fibers — slow twitch and fast twitch — found in skeletal muscles. It's in these fibers that a molecular signaling process takes place, enabling short, round cells to suddenly elongate and attach to tendons, propelling force to the skeleton.

"We're studying how round cells become long, and how long cells both initiate and maintain the critical attachment to a tendon," says Henry, who came to UMaine a year ago from the University of California — Berkeley, where she was a postdoctoral fellow at the Miller Institute.

At Berkeley, Henry and her colleagues documented the first example of zebrafish slow muscle cells inducing a wave of fast muscle morphogenesis or differentiation.

"We still don't know what the signal is, but we know what cell it's coming from, and now we can start to ask questions about the molecular mechanisms that tell precursor cells to be active, functional muscle fibers," Henry says. The hope is that in five years, some of the molecular signals in the muscle cells will be identified.

tion, Kim and UMaine researchers Stephen Altmann, Mark Mellon and Daniel Distel had a major breakthrough in 2003. The scientists isolated and confirmed the function of a zebrafish gene that produces interferon, an infection-fighting protein known for its ability to inhibit the growth of virus.

The UMaine researchers were the first to document the presence of interferon in any fish species. According to the Web of Science, the report of their discovery in the *Journal of Virology* is among the top 1 percent of papers cited by other scientists in that field in the last two years.

Since then, Kim has been cloning in zebrafish the immunogene known as Mx, which is activated by interferon. First discovered in mice with an inborn resistance to influenza virus, Mx bears a 50 percent resemblance to antiviral Mx proteins in humans. The important diagnostic tool in assessing interferon activity has been cloned in a variety of mammal, bird and fish species, but not in zebrafish until research was completed by a team of scientists from UMaine, Cornell and Boston's Brigham and Women's, and Children's hospitals.

In an effort to understand disease-fighting responses in humans, more immune-related genes in the zebrafish need to be identified. Earlier this year, Kim and another research team focusing on the Mx and interferon proteins were the first to describe how an experimental infection of snakehead rhabdovirus developed and elicited an antiviral response in zebrafish. They focused on the symptoms of disease and the immune response in zebrafish embryos and adults.

Targeted gene disruptions can be used in conjunction with pathogen challenge to alter immunity to infection, according to the research team of scientists from UMaine, the

University of Hamburg in Germany and Dalhousie University in Canada, writing in the February 2005 issue of the *Journal of Virology*. Differences in mortality rates, pathogenesis and gene expression may provide clues about the role of genes linked to immunity.

KIM IS NOW collaborating with Nick Trede at the Huntsman Cancer Institute at the University of Utah to establish a transgenic (genetically modified) line of zebrafish that would have fluorescence to indicate activation of the TLR signaling pathways. When viewed using a special microscope, the mutant fish and their embryos have the

UMAINE RESEARCHERS WERE THE FIRST TO DOCUMENT IN FISH THE PRESENCE OF INTERFERON, AN INFECTION-FIGHTING PROTEIN KNOWN FOR ITS ABILITY TO INHIBIT THE GROWTH OF VIRUS.

potential to show scientists how the different proteins along the pathway function when the organism is compromised by disease.

Researchers also hope to identify genes that could improve or exaggerate the response of the TLR pathway.

"To identify what genes are responsible for such changes could mean that one day, we can identify humans with — or who are more susceptible to — disease," Kim says. "Using animal models, we're hoping to mimic the abnormality."

That approach is at the heart of Kim's most recent research project, funded by a more than \$405,000 grant from the National Institutes of Health (NIH). She is collaborating with Dartmouth Cystic Fibrosis Research Development Program researchers to develop a zebrafish model for studying cystic fibrosis.

According to NIH's National Human Genome Research Institute, cystic fibrosis is the most common, fatal genetic disease in the United States. About 30,000 people in the U.S. have the disease, which is caused by a single mutated gene — the Cystic Fibrosis Transmembrane Regulator (CFTR).

In normal cells, the CFTR protein serves as a channel, allowing cells to release chloride as part of the immune response system. However, in people with cystic fibrosis, the protein is defective and the cells do not

release the chloride, resulting in an improper salt balance and production of thick mucus.

In her lab, Kim will experimentally infect zebrafish with bacterial strains from cystic fibrosis patients in an effort to better understand why they are so pathogenic. The number of bacterial strains and the many CFTR gene mutations (more than 900, according to the National Human Genome Research Institute) make the microbiology portion of the project statistically strong. It

is basic science that will be arduous in its compilation and analysis, but valuable. The bacteria preferentially affects cystic fibrosis patients with chronic infection that causes chronic inflammation.

"We're hoping to determine some of the key factors of the innate immune response that contribute to the detrimental inflammatory response seen in cystic fibrosis patients," Kim says. "If we can establish a way to control inflammation, cystic fibrosis patients will have a better outcome." ■

From A to Zebrafish

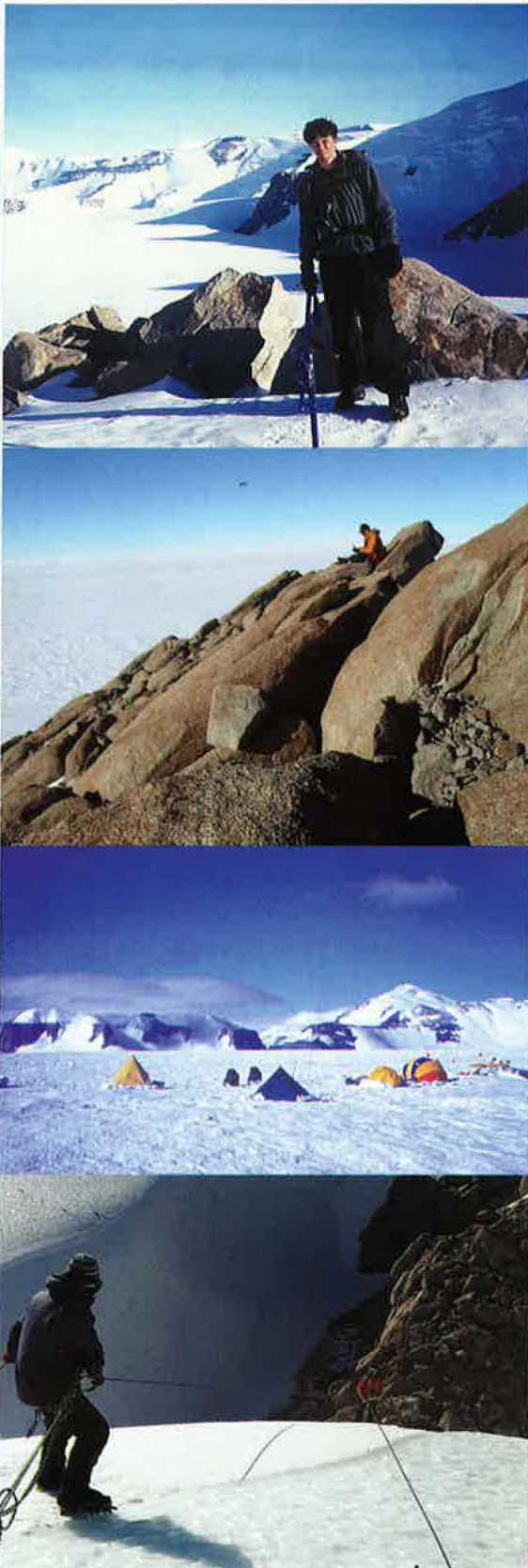
- Like their mammalian namesakes, zebrafish are striped for camouflage protection. When moving as a herd or a school, the stripes of the zebra and zebrafish make it difficult for predators to focus on a single individual.
- Zebrafish in the wild are found in the Ganges River, and in rice paddies in India and Burma. The late George Streisinger, a researcher at the University of Oregon, is widely considered to be the founding father of zebrafish development and genetic research.
- Zebrafish are hardy and can tolerate fluctuations in water temperature. They prefer water that's 28 degrees C, with 14 hours of daylight and 10 hours of darkness. The room temperature in the zebrafish facility is a constant 82 degrees.
- UMaine's zebrafish facility was started in 1999 with 250 zebrafish purchased from the University of Oregon, home of the Zebrafish International Resource Center. The brood stock was from a specially bred scientific line called AB. Today, the UMaine facility houses more than 40,000 zebrafish. They are kept in 648 small or 56 large tanks.
- Research assistant Mark Nilan manages UMaine's zebrafish facility. The native of Nebraska studied



aquaculture at UMaine, conducting research at the Center for Cooperative Aquaculture Research in Franklin. He joined the zebrafish lab in 2003 and helped design its intricate system that pumps UV-sterilized water to the self-cleaning, recirculating tanks. The water and filtration system are computer monitored, with a backup generator in case of power outage.

- Zebrafish are vertebrates with a less complex immune system than that of mammals, yet they have comparable structure. Scientists at UMaine are trying to identify factors that influence regulation of the innate immune response, focusing primarily on the molecular activity of what's called the Toll signaling pathway that goes into motion at the first sign of infection. Ultimately, researchers hope to learn enough about the innate immune response and its role in adapted immune response to begin to develop methods for intervention that can be applied to mammals and fish.
- Zebrafish make good models for studying aspects of mammalian and fish health because they reproduce and grow rapidly, and embryos are easily manipulated and propagated. Females can lay up to 300 eggs a week. Embryonic development inside each of the transparent eggs can be viewed under a microscope. Zebrafish grow from a single cell to a fish-shaped organism within 24 hours of fertilization; baby fish called fry hatch within 72 hours.

Where ice sheets meet



LAST WINTER, University of Maine master's student Aaron Putnam was in the TransAntarctic Mountains on an expedition that included some extreme rock collecting. He and members of a research team rappelled into wind-carved ice moats, scaled sheer cliffs and chipped away at boulders, looking for clues about the stability of the two ice sheets that cover Antarctica.

Their camp was in the Bottleneck, a critical junction between the East and West Antarctic ice sheets. Ice flows through this gap from east to west between the mountains. What scientists have yet to understand is whether ice on the west buttresses ice on the east. If it does, the Bottleneck could provide the only major passageway from one side of the continent to the other.

Furthermore, the fates of the two ice masses would be linked. The West Antarctic Ice Sheet is smaller and more vulnerable to collapse because it sits on bedrock below sea level. If rising seas caused it to disintegrate, scientists wonder what would happen to ice on the eastern side of the mountains. Could enough ice flow through the Bottleneck to destabilize the East Antarctic Ice Sheet?

PART OF THE ANSWER may lie in the rocks that Putnam and his team collected. At the height of the last Ice Age, Antarctic ice bulged through the mountain gap and, as it receded, left behind so-called "bathtub moraines," rocks and boulders layered in rings on the surrounding mountains. By determining when they were deposited, the scientists hope to define when and how

high the ice crept up the mountainsides, and how much the level of the ice has declined since then. That information could help determine if the Bottleneck serves as a wide open valve for east Antarctic ice or if ice flow is limited by the shape of the bedrock and surrounding mountains.

With Putnam on the expedition were Robert Ackert and Sujoy Mukhopadhyay of Harvard University, and mountaineer Peter Braddock. UMaine emeritus professor Harold Borns helped plan the expedition; Brenda Hall, assistant research professor in the Climate Change Institute, is Putnam's adviser. Support came from a \$130,135 National Science Foundation grant.

THE RESEARCHERS SHIPPED home about 1,000 pounds of rocks, most of them to Harvard, where they will be analyzed with cosmogenic dating to determine when the rocks were first exposed at the Earth's surface. As soon as rock is exposed to the sky, it is hit by cosmic rays that cause chemical changes in the minerals. These changes create by-products, forms of beryllium, neon and helium, for example. Just how much of these by-products have accumulated provides an indication of how long the rocks have been exposed.

At UMaine, Hall is setting up a lab to conduct cosmogenic dating on the rocks that Putnam sent to Orono. For his thesis in geology, Putnam is focusing on how the rock deposits may indicate how the climate in the Bottleneck region has changed over time.

Aaron Putnam of Chapman, Maine, top photo, spent two months as part of a four-person expedition studying the stability of the West Antarctic Ice Sheet. From their base camp in a remote area called the Bottleneck, the scientists made daily excursions, rappelling into ice moats and scaling sheer cliffs to collect rock samples.

More information about Aaron Putnam's research expedition is on the Web: www.climatechange.umaine.edu/Research/Expeditions/Bottleneck.html

Photos courtesy of Aaron Putnam



Top 10

Children's Nonfiction Books of the 1990s

By Rosemary Bamford and Janice Kristo

- 1 *The Book of North American Owls* by Helen Roney Sattler, illustrated by Jean Day Zallinger
- 2 *Cleopatra* by Diane Stanley and Peter Vennema, illustrated by Diane Stanley
- 3 *A Drop of Water: A Book of Science and Wonder* by Walter Wick
- 4 *G is for Googol: A Math Alphabet Book* by David Schwartz, illustrated by Marissa Moss
- 5 *The Great Fire* by Jim Murphy
- 6 *Hurricanes: Earth's Mightiest Storms* by Patricia Lauber
- 7 *Inside Dinosaurs and Other Prehistoric Creatures* by Steve Parker, illustrated by Ted Dewan
- 8 *Las Posadas: An Hispanic Christmas Celebration* by Diane Hoyt-Goldsmith, photographs by Lawrence Migdale
- 9 *The Magic School Bus Explores the Senses* by Joanna Cole, illustrated by Bruce Degen
- 10 *To the Top of the World: Adventures with Arctic Wolves* by Jim Brandenburg

Nonfiction





DOING ONLY HOMEWORK with your child during the school year can be limiting. So can reading Harry Potter.

A whole other world of learning awaits the child whose parents take time to share their interests through informational nonfiction books — “the power genre of the century,” according to two University of Maine experts on children’s literature.

“Getting at content is essential to life. Knowledge of the world and fantasy feed different parts of the brain. (Yet) we give a privileged status to fiction,” says Professor Emerita of Education Rosemary Bamford, who contends that the growing pressure on children to complete an ever-expanding volume of homework, even in the early grades, cuts into the time for them to explore interests at home.

Nonfiction literature for children embraces virtually every subject, from the water cycle to the life of Cleopatra. It is distinguished from fiction primarily by its purpose: to “make factual information accessible to the grade-level reader,” as Bamford puts it. In such literature, clear, accurate and engaging prose is complemented by lively visuals, not only in the form of pictures, but also charts, graphs, maps, glossaries, notes, captions, pronunciation guides, a list of Web sites or other learning tools — “access features,” as they are called by educators — that help a child deepen his or her knowledge of a subject.

The best nonfiction literature for children has clarity of style and presentation, accuracy, close attention to the organization of facts, use of analogies or metaphors to make information accessible, language appropriate to the subject, and any number of relevant supplementary materials. Parents should keep in mind that unlike books of fiction, nonfiction books don’t necessarily need to be read from beginning to end: They can be browsed and sampled by readers who can draw what they like from what they have to offer.

FOR BAMFORD AND Professor of Education Janice Kristo, national leaders in promoting the educational benefits of nonfiction children’s literature, early experiences planted the seeds of what would grow into their lifelong passion for the genre. Bamford, who has taught at the University of Maine since 1971 and authored eight books on children’s literature, including the classic *Making Facts Come Alive*, coauthored with Kristo, recalls that her interest in nonfiction children’s literature blossomed in her mechanic father’s grease pit. An oldest child, she spent a lot of time with her father learning how “things” worked.

Reading Reality

Nonfiction children’s literature is a top-notch genre waiting to be tapped

By Sandra Hutchison
Illustrations by Carol Nichols



Kristo, who came to UMaine in 1982 and has authored 10 books, tells a similar story. An only child, she also spent many afternoons with her father, following him to the library where he went to pick up manuals on such subjects as how to fix his 1954 Chrysler.

But in the 1950s, Bamford says, there was little nonfiction from which to choose. Factual books, often biased ones, with dry presentations of information were all that was to be had by the child seeking to learn more about subjects of interest.

In the past two decades, in response to teachers' demands, trade books began to supplant traditional basal readers in instruction and literacy programs. Before long, the trend toward reader-friendly, or what educator J.F. Baumann calls "considerate books," spread across the curriculum, and the textbooks once used to teach science and social studies were supplemented or replaced by trade books more likely to engage the interests of students.

"In the past," Kristo says, "(the genre) was boring. You had some good writers, but format, layout and design suffered because of lack of technology. Now, the visuals are so stunning anyone could become interested." Even for older children in the eighth grade, the picture book format, when well done, has appeal. And if accompanied by lively writing, the genre can even have value for adults.

ONLY SINCE THE 1990S has the genre of children's nonfiction come into its own. The decade saw the emergence of a host of distinguished nonfiction writers, such as Jim Murphy, James Cross Giblin, Russell Freedman, Jim Arnosky, Patricia Lauber, and Diane Swanson, whose *Safari Beneath the Sea: The Wonder World of the North Pacific Coast* Kristo considers "almost a perfect book."

Through their own writing, teaching, academic research and presentations at national conferences, Bamford and Kristo helped to change the stature of children's nonfiction literature in the past decade. For example, Bamford was instrumental in establishing the Orbis Pictus Nonfiction Awards, presented annually by the National Council of Teachers of English since 1990. (The award takes its name from a book published in 1657 by Johann Comenius, considered to be the first informational book written for children.)

Bamford cofounded, and both Bamford and Kristo are past presidents of, the International Reading Association's Children's Literature and Reading Special Interest Group.

Award-winning nonfiction author Penny Colman told UMaine graduate students during a recent visit to campus that Bamford and Kristo "position UMaine as a potential national center for the study and teaching of nonfiction."

Today, quality nonfiction children's literature is increasingly characterized by a scholarly rigor that rivals or exceeds that of some adult nonfiction; some adults Kristo knows turn to children's nonfiction first when exploring a new subject. "Children's nonfiction today is every bit as sophisticated as the adult genre," she says.

Yet there are still hurdles in getting nonfiction into the hands of young readers. Fiction still remains dominant because the cost of publishing nonfiction is very high. Printing visuals, buying permissions and doing on-site research — just to name a few of the expenses that can be incurred in publishing a nonfiction book — add up in ways that can be prohibitive for publishers.

In addition, some parents argue that childhood is the time to celebrate imagination. What can a book on the Great Chicago Fire give a child that Harry Potter cannot? For Bamford and Kristo, it comes down to critical thinking, learning how to process facts, and judge their truth and accuracy.

For example, comparing several different biographies of Martin Luther King Jr., for accuracy helps children develop their ability to make judgments about the flood of information they receive daily, not only in the classroom, but also through media and on the Internet. Such training, Kristo says, "helps them to resist the temptation to think all books are equal," or to believe that just because a fact is in print, it's true.

As important is the impact of nonfiction literature on the development of children's writing. While reading fiction is of value to the fantasy life of a child, how many children will write a novel in their lifetimes? the educators ask. But by reading nonfiction literature and by hearing it read aloud, children learn how to write the kind of prose they will be called upon to write most often as adults: expository prose that unfolds an argument or explanation. Teachers can use nonfiction literature as examples of how to write and as an aid to mastering other features of a good prose writing style.

Parents also need to recognize that they — not teachers — are the first educators of their children. If a parent can share a book with his or her youngster in the right spirit, reading together can become as pleasurable for the child as eating ice cream. ■



Education professors Janice Kristo, left, and Rosemary Bamford advocate nonfiction literature to boost children's critical thinking.

Photo by Bill Drake



New plants for Maine's cold climes

JAPANESE STEWARTIA is a landscaping tree coveted for its year-round beauty. In the winter, it shows off its multicolored, textured bark. Its summertime blooms look like camellias, and its fall foliage features shades of yellow and red. The biggest drawback for Maine gardeners: Stewartia grows best in USDA Hardiness Zones 6–8. Maine has Zones 3–5.

Researching ways to propagate stewartia in this state is the thesis project of graduate student Ajay Nair, part of ongoing collaboration among the University of Maine, an alumnus, and Maine's ornamental horticulture industry. Nair works with UMaine Associate Professor of Horticulture Donglin Zhang, whose research involves developing new plants to benefit Maine's horticultural industry.

Growing plants in Maine has many challenges, particularly their ability to overwinter. That's why the extensive cold hardiness research going on at UMaine is so important. For instance, recent cold hardiness studies demonstrated that five cultivars of mountain laurel and more than 20 of Atlantic whitecedar can be grown in Zone 4 in central Maine. Such research provides technical guidance for growers and increased consumer confidence.

NAIR AND ZHANG are working with one cold-tolerant clone named Stewartia UMaine (UMaine Silk Camellia), which has been growing well at the university's Littlefield Ornamentals Trial Garden. The tree has brilliant red fall color and biennial flowering. Nair has been experimenting with different rooting media and propagation techniques using seeds, tissue cultures and stem cuttings. He coauthored a paper, with Zhang and graduate student Dongyan Hu, on the rooting and overwintering of stewartia stem cuttings that won first place in the graduate student and presentation competition at the Northeast Regional Meeting of the American Society for Horticultural Science in Washington, D.C. earlier this year.



Stewartia UMaine
Photo by Michael Mardosa

"We hope to answer questions about propagation, especially the conditions needed for cuttings, so stewartia is easy to cultivate and more commercially viable," says Nair of the nonnative yet noninvasive species.

THE THREE RESEARCHERS have used DNA markers to determine the relativeness of Stewartia UMaine to 16 named Stewartia taxa. Working in cooperation with colleagues at Harvard University's Arnold Arboretum, the researchers found that Stewartia UMaine is a new cultivar that originated from a gene pool of *S. pseudocamellia*, *S. sinensis* and *S. koreana*. These molecular results will be used as guidance for future Stewartia breeding. Their paper on the discovery won third place in the national graduate student poster competition at the annual American Society for Horticultural Science conference in Las Vegas in July.

Nair, who came to UMaine last year from Kerala Agricultural University in India, also works with University of Maine Cooperative Extension Ornamental Horticulture Specialist Lois Stack on experiments with phlox and rubeckia. They are investigating the effectiveness of plant growth regulators in preventing powdery mildew diseases, which can cause significant losses to growers each season.

Horticulture, including floriculture, is the fastest-growing sector of American agriculture. In 2003, Maine ornamental plant sales were valued at \$100 million. Maine horticulture includes more than 780 firms, employing more than 10,000 people.



Landscape horticulture graduate student Ajay Nair is experimenting with ways to cultivate the ornamental Japanese stewartia in colder climes like Maine.
Photo by Bill Drake



FINAL DECISIONS

**UMaine bioethicist
works with those on the front lines
grappling with end-of-life issues**

By Dick Broom

IONS

Photo © Roger Ressmeyer/CORBIS

WHEN 41YEAR-OLD Terri Schiavo died this past March, 13 days after her feeding tube was removed and 15 years after brain damage left her in a persistent vegetative state, the nation was watching. Millions of people, whether proponents of right to life or death with dignity, will never look at end-of-life issues the same way again.

That's good, according to medical ethicist Jessica Miller. "There is a sense of being able to overcome anything that sort of permeates American culture," says Miller, a University of Maine assistant professor of philosophy and the clinical bioethicist for Eastern Maine Medical Center in Bangor.

"It's difficult for people to allow the end of life to occur, either for themselves or their loved ones. Some of the doctors I work with say that until we have a national conversation about death and our mortality, we are never going to resolve these problems."

In her experience, people who believe in an afterlife aren't necessarily more willing to let go of this life than those who believe this is all there is. And the end-of-life decisions are often more difficult than they used to be.

"Death has become much more complicated in many ways," says Miller, who studies the moral and ethical issues in medicine and medical research. "For one thing, we now have two different criteria for death. One is the traditional cardiopulmonary standard: If your heart stops and you stop breathing, you're dead. The other standard is brain death. This became possible because people could be maintained on ventilators after all brain function has ceased, and it facilitated organ procurement and donation."

The medical community accepts both definitions of death. But for the family of someone who is breathing — even if the breathing is being done by a machine and there is virtually no chance of recovery — it can be excruciatingly difficult to "pull the plug." It can be just as hard to withhold nutrition and water from someone who is in a persistent vegetative state or to refrain from performing

"More and more people are seeking to avoid being kept alive by artificial means against their will and, at the same time, to relieve their families of the burden of making end-of-life decisions for them."

Jessica Miller

CPR on a terminally ill cancer patient who has a heart attack.

Families often look to physicians or chaplains for guidance in making end-of-life decisions. Some of those decisions, such as whether to withhold treatment or remove a feeding tube, are fraught with ethical dilemmas. Miller's role as a bioethicist isn't to tell hospital physicians and staff what is right and wrong. Rather, she says, "I try to help them identify ethical issues and educate them about different ways of reflecting on ethical problems."

Her point is that no one has a lock on moral or ethical truths.

MILLER TEACHES ethics and bioethics at UMaine, and that makes her an especially valuable resource for hospital physicians and staff, says Rex Garrett, director of Chaplaincy Services at Eastern Maine Medical Center. "It is important to have someone from the academic arena, where both the old discussions and the current discussions are active and alive," he says. "Having that body of knowledge behind her, she can bring in the conceptual reality to help us understand the practical realities."

Every other month, Miller participates in the hospital's Bioethics Grand Rounds, an educational session in which clinicians present an actual case for a panel to discuss. In alternate months, Miller leads an ethics reading group that often includes physicians, nurses, social workers and chaplains.

"Sometimes we don't even get to the literature we had planned to discuss because a physician will come in and start talking about a case that is bothering him (or her)," Miller says. "Or something is troubling a nurse, but she (or he) isn't sure it should be a real concern. I facilitate the discussion and try to help them figure out what their uneasy feelings reflect and what ethical values are at stake."

Having someone to help clinicians grapple with complex ethical issues is much more important than it was even a genera-

tion ago, says Dr. Erik Steele, chair of EMMC's Code Committee and chief medical officer for Eastern Maine Healthcare Systems, which includes the medical center. "One reason is that our ability to keep people alive has outstripped our ability to make them well," he says.

"Also, for the past 20 or 30 years, people have had more interest in being able to make decisions about their care, including end-of-life care. So, there is an increasing role for somebody who can help guide us through the ethical, legal and clinical minefields of end-of-life decisionmaking. If I could have an ethicist and a lawyer in my pocket when I make rounds, that would be great. That's how often things come up."

Steele estimates that at least 80 percent of the ethical dilemmas that arise at Eastern Maine Medical Center involve end-of-life issues. Part of the reason is simply that the population is aging, and more people than ever are approaching the end of their lives.

"But it's also because death is so final," Steele says. "You know that if you make the wrong decision, it can have tremendous repercussions, so you work extra hard to get it right."

Steele says that anyone who would like to die in a way that doesn't require the involvement of a bioethicist should have a living will or other type of advance directive.

"When it comes to end-of-life decision-making, I think Dr. Miller would like to be like the Maytag repairman," he says. "The

"It's difficult for people to allow the end of life to occur, either for themselves or their loved ones. Some of the doctors I work with say that until we have a national cultural conversation about death and our mortality, we are never going to resolve these problems."

Jessica Miller

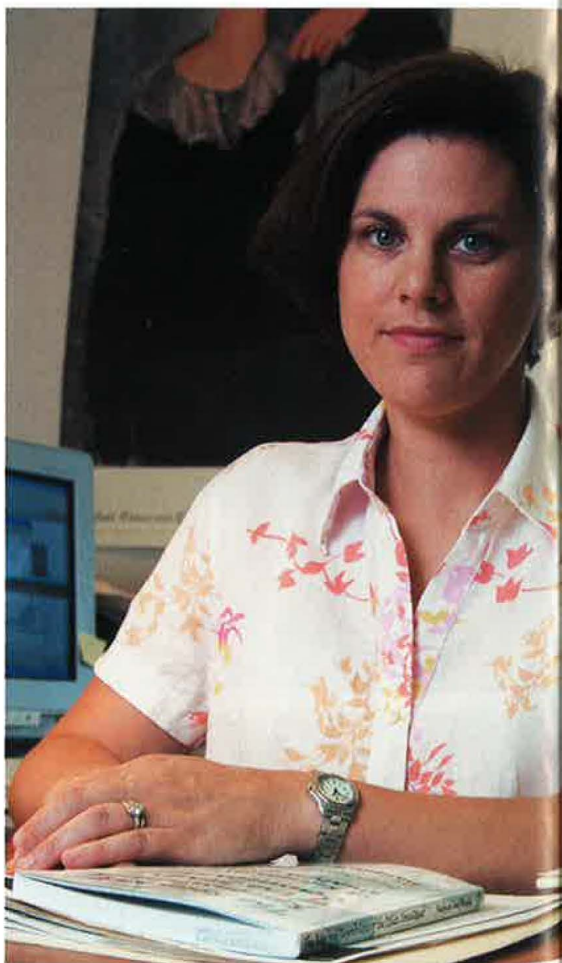
Photo by Bill Drake

day when no one needs her help with that would be a good day."

MORE AND MORE people are seeking to avoid being kept alive by artificial means against their will and, at the same time, to relieve their families of the burden of making end-of-life decisions for them. By filling out an "advance health care directive," a person can, Miller says, "project their autonomy into an incapacitated future."

The most common type of advance directive is a living will. It enables people to detail which treatment measures, if any, should be taken to keep them alive if they become debilitated and unable to make decisions or communicate their wishes. Living wills are adequate in most cases, but they do have shortcomings, Miller says. They don't always eliminate uncertainty or guarantee that one's wishes will be followed.

"Primary care physicians are being



encouraged to have young, healthy patients get living wills, but it's very hard for young people to know exactly which treatments they might want under certain conditions when they are older," she says. "Also, some living wills offer sort of an à la carte menu, so you can specify, 'Yes, I want CPR. No, I don't want antibiotics.' However, a choice like that could put a hospital medical staff in a bind because it might not make sense to resuscitate a person if they can't administer antibiotics to prevent infection."

DOCTORS AND hospital administrators can find themselves caught between the wishes of a patient, as expressed in a living will, and a relative who, as Miller puts it, "advocates forcefully in the moment" for doing everything possible to keep the patient alive.

A better type of advance directive, she says, is the durable health care power of

attorney, a legal document that names a proxy to make decisions on your behalf if you are unable to do so. It invests one person with the authority to give physicians and hospitals clear direction. However, if you want that direction to reflect your wishes, Miller says, you need to make sure your proxy knows what your wishes are.

"Whether you have a living will, a health care proxy or just an order about whether to perform certain life-sustaining measures, nothing really takes the place of thinking for yourself and meditating on what life means to you and under what conditions you would want to receive treatment," she says. "Then communicate that to your loved ones and physician."

Nothing that a person does in this life — drawing up a living will or giving someone power of attorney — can guarantee that family members or close friends won't argue about end-of-life decisions. Miller recalls a case in which two sisters had been taking care of their elderly mother for years before her condition dramatically worsened. They decided it was not in their mother's best interest to have more aggressive life-sustaining treatment and that she would not have wanted it.

"Then their brother flew in from another part of the country and said they were just being blinded by their exhaustion and motivated by a desire to be relieved of caregiving," Miller says.

Even if the mother had not designated a health care power of attorney, a living will could have been helpful. "A living will at least gives people a starting point," Miller says. "They can see what your wishes were when you were of sound mind and not incapacitated. Then, more often than not, a discussion in which everybody has a chance to have their say produces consensus if not unanimous agreement." ■

Since April, EMMC and the other hospitals of EMHS have offered advance directive forms on the Web (www.emmc.org). At last count, more than 10,000 had been downloaded. Maine residents also can find forms on the attorney general's site (www.state.me.us/ag/).



Code for Ethicists

DO MEDICAL ETHICISTS need a code of ethics?

Jessica Miller, a University of Maine philosopher and the clinical bioethicist at Eastern Maine Medical Center, thinks the answer is obvious.

"Aren't we beset by some of the same potential conflicts of interest that physicians might be?" she asks. "For example, some prominent bioethicists sit on the boards of pharmaceutical companies that do research on human subjects. The bioethicist has an interest in maintaining that connection because it's lucrative. But what if something is happening that the bioethicist doesn't think is ethical?"

In April, Miller took part in a national conference sponsored by the American Society for Bioethics and Humanities, which produced a draft model code of ethics. It will be published in the September issue of the *American Journal of Bioethics*. Miller was among a small group of bioethicists invited to write peer commentaries on the draft code.

"That's exciting," she says. "Philosophy is an old field. If you study Plato, you are standing on the shoulders of 2,000 years of people who have been studying Plato, and that is a rich, wonderful tradition. But it is also exciting to have part of my work involved with cutting-edge issues and to have a hand in defining this fluid, emerging field of bioethics."

It is already a high-profile field because ethical considerations are at the heart of the national debate over such contentious issues as stem cell research and human cloning, as well as end-of-life care.

"Bioethics," says Miller, "is a wonderful avenue for philosophical public engagement."





Oyster Gardens

Course cultivates shellfish lovers who want to grow their own

By Nick Houtman

AMBER TONRY has never eaten an oyster, raw or otherwise, but she will get her chance later this year when the oysters that she and her husband Rick are raising in the Damariscotta River get big enough. The Tonrys are taking a new University of Maine course that is teaching people how to grow the prized shellfish for their own use, just as they would raise tomatoes or lettuce in their kitchen garden.

University of Maine Cooperative Extension Associate Dana Morse, who is affiliated

with the Maine Sea Grant College Program, and Chris Davis, an oyster grower and director of the Maine Aquaculture Innovation Center (MAIC), are the instructors for the oyster garden course held in Damariscotta and Blue Hill. Starting in March 2004, they focused on oyster biology, water quality and aquaculture regulations. When the 18-month course ends this fall, students will have a broad view of how humans affect coastal ecosystems, and the practical skills to grow a valuable shellfish.

To help defray the cost to students, Maine Sea Grant, the Maine State Planning Office and MAIC provided financial

support, working in partnership with the Damariscotta River Association, Pemaquid Oyster Co., and Bagaduce River Oyster Co. The course is designed for noncommercial oyster growers; Davis teaches a separate course for people starting an oyster business.

The oyster gardening students bring a variety of experiences to the task. They include a commercial fisherman, a high school biology teacher, a retired university music professor, and a grandmother and her grandson. Morse remembers the excitement of the first class gatherings. "They wanted to get their babies in the water and watch them grow," he says.

In mid-summer, the students got their chance. They received about 1,000 spat, baby oysters less than a quarter-inch long that were produced at UMaine's Darling Marine Center in Walpole, Maine. Students placed their spat in containers, also called "bags," made out of sturdy, fine-mesh plastic. Attached to plastic floats, the bags are designed to stay on the surface of the water and provide oysters with constant exposure to their primary food source, the microscopic plankton that flow back and forth with every passing tide. Students were responsible for mooring their bags in an estuary or bay at a location specified in their short-term state permits.

For the next five months, students tended the bags weekly, keeping them free of fouling by algae and occasionally dividing their growing crop into new bags to avoid overcrowding. By late fall, the oysters had grown to nearly 2 inches long.

MORSE TRACES THE first oyster garden program to the Chesapeake Bay, where, in the 1980s, the goal was to restore overharvested reefs. Subsequently, the idea spread to North Carolina, New Jersey and New York's Long Island Sound. Some programs aimed at oyster reef restoration, while others served people who simply wanted to eat their own homegrown shellfish.

"One of the main things they (instructors) found was that it was really engaging to people," says Morse. "They were getting an education in biology and ecology." Among the topics covered in the UMaine course is phytoplankton. Sarah Gladu, coordinator of Cooperative Extension's volunteer phytoplankton monitoring program, taught students how to collect phytoplankton with a net and identify them with a handheld microscope.

For Amber Tonry, participating in the UMaine course seemed a natural extension of living by the shore. The Tonrys are lobstermen and operate their boat, the *Sea-*

ducktress, from their dock near Dodge Point on the Damariscotta.

Since the Tonrys were on the water on a daily basis, they were able to check on their bags regularly. During the 2004 Oyster Festival in Damariscotta, they also took people out to get a firsthand look at their crop. "It's amazing to see how easy it is. You have to tend them once a week, but they pretty much take care of themselves," says Amber.



Photos opposite page, clockwise left to right: Last summer in the Damariscotta River near Dodge Point, the novice oyster farmers aboard the *Seaducktress* deployed their spat in plastic floating trays. The tiny oysters, each less than a quarter-inch long, were held in the black trays by orange bags like the one being emptied by Lincoln Brown. By the end of the first summer, many of the oysters were nearly 2 inches long. They wintered in a wet lab at the Darling Marine Center before returning to the river this summer. Photo above: Retired professor Donald Huffmire and Savick Harvey check on the floating nursery.

Photos by Dana Morse and Linda Healy

Mark DesMeules, executive director of the nonprofit Damariscotta River Association (DRA), is also taking the class. DesMeules says his whole family, including his children, love to eat raw oysters.

THE OYSTER GARDEN course dovetails nicely with the DRA's mission to educate people about the health of the river and estuary, DesMeules says. "(The course) helps people become more knowledgeable about the river as an ecosystem and about the importance of clean water. We've had discussions about how land use affects

water quality and about invasive species. With this project, we're using a native oyster (the American or Eastern oyster, *Crassostrea virginica*). European oysters have been put into the river, and we don't really know if that could be a problem or not."

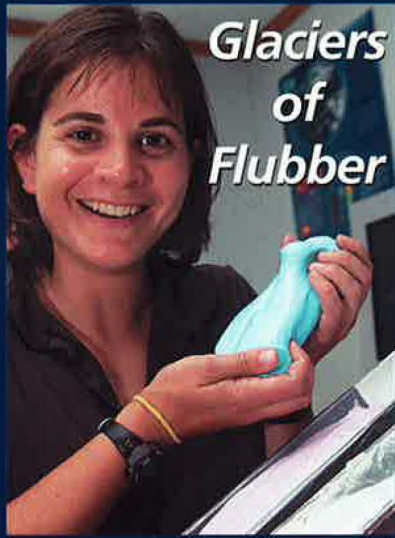
While raising oysters gives people a new understanding of the coastal environment, the course also has led participants to consider competing uses of the river. Among lobstermen, kayakers, shoreland owners, aquaculturists and others, the potential exists for conflicts. Coastal waters are a public resource, and students got a taste of how public policies address one aspect of this issue — oyster aquaculture — through the state permit application process.

"How many oyster leases can you have? You also have fishermen who need access to their docks. Shoreland owners like the views from their homes. Kayakers really don't want to be paddling through lots of oyster bags," says DesMeules.

OYSTERS GO INTO a period of hibernation during the winter, and growers typically remove them from the water or anchor them to the bottom where they are safe from ice and the occasional Arctic chill. Before ice began to accumulate on their bags last winter, most class participants stored their oysters in tanks at the Darling Center. Others put them in refrigerators or down on the sea floor.

By this past May, the young oysters were back in the sunlight at their lease sites, where they continued feeding and growing. Students were learning about oyster predators such as birds and the diseases that can threaten their crops before they mature.

This fall, the oysters should reach about 3 inches in size — and be ready to eat. While they could continue to grow (American oysters can reach up to 8 inches long), Morse and Davis plan to host an oyster feed to celebrate the students' success. ■



WATCHING GLACIERS MOVE can be tedious. Things don't happen very fast. But University of Maine graduate student Leigh Stearns has found a way to make the science lesson fun and understandable.

Stearns and four Maine teachers, all participants in UMaine's NSF GK-12 Teaching Fellows Program, won an award at an international scientific conference in Beijing, China, earlier this year for their poster describing the use of "flubber" to study glacier movement. Flubber is a homemade concoction of glue, Borax powder and water that, when mixed to the right consistency, can be used to demonstrate the slow but inevitable movement of ice sheets and mountain glaciers.

The international Climate and Cryosphere conference was sponsored by the World Climate Research Programme, April 11-15, hosted by the China Meteorological Administration.

In her research, Stearns studies the growth and decline of large ice sheets, such as those in Antarctica and Greenland. She uses data from satellites to determine changes in ice sheets over large areas. As an NSF GK-12 Teaching Fellow, she visited the classrooms of teachers who attended the conference to conduct science lessons.

"My goal is to help students realize that there are many different factors affecting how glaciers flow," she says.

Look for the **ECO** Label

FEW CONSUMERS take environmental factors into account when they buy a new vehicle, according to early results of a University of Maine research project.

With support from a nearly \$400,000 grant from the U.S. Environmental Protection Agency (EPA), researchers are conducting consumer panels and surveys, and testing the effectiveness of vehicle performance information for the public.

In particular, they want to know if an "eco-label," a sticker for cars and trucks that meet environmental standards, would help consumers make decisions.

According to the Maine Department of Environmental Protection (DEP), Maine cars and trucks are one of the largest sources of in-state air pollution. Nationally, the EPA says that car and truck tailpipe emissions account



Would an "Eco-label" sticker for cars and trucks help consumers?

for about one third of the air pollution.

The research team includes faculty members Mario Teisl and Jonathan Rubin, and students Alice White-Cyr and Caroline Noblet, all of the UMaine Department of Resource Economics and Policy. Collaborating on the project: the Maine Automobile Dealers Association Inc., Maine DEP and the Natural Resources Council of Maine.

Most participants in the consumer panels said they don't use the air emissions and fuel consumption information available online. They assume that vehicles comply with government regulations that roughly equalize air emissions among different vehicles. However, consumers have more than 120 options for vehicles that achieve better fuel economy and lower air emissions than competitors within the same class.

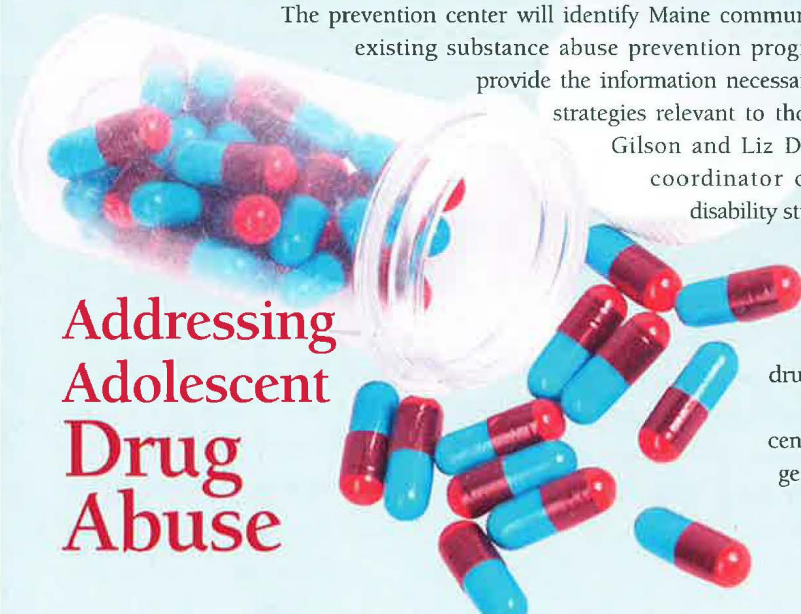
THE CENTER FOR Community Inclusion and Disability Studies has received \$650,000 to create a Prevention Center of Excellence at the University of Maine to study what is needed in Maine to prevent substance abuse and its consequences.

The project is a result of a cooperative agreement between the center and the state Office of Substance Abuse, which is administering a five-year grant awarded by the Substance Abuse and Mental Health Services Administration.

"The intent is to look at substance abuse for adolescents in the state of Maine," says Stephen Gilson, principal investigator and professor of interdisciplinary disability studies. "In addition to asking questions, we'll also look at the environments — the media, music, social, academic and virtual environments."

The prevention center will identify Maine communities underserved by existing substance abuse prevention programs. The goal is to provide the information necessary to craft prevention strategies relevant to those communities, say Gilson and Liz DePoy, professor and coordinator of interdisciplinary disability studies.

Strategies could involve policy changes in state, school or community drug programs, establishment of community centers and other ways to get educational information to young people.



Addressing Adolescent Drug Abuse

Crying for Consistency



TWO RESEARCHERS at the University of Maine, working in conjunction with colleagues in Japan, have found links between infant and child sleeping arrangements and the phenomenon of “yonaki” or nighttime crying. The research suggests how parents, infants and toddlers all can get a better night’s sleep by making bedtime arrangements as consistent as possible.

Marie Hayes, UMaine professor of psychology, and Michio Fukumizu, a pediatric neurologist from Tokyo, Japan, and visiting scholar at UMaine, with two Japanese coresearchers, have identified several factors in an infant’s first few months of life that can affect how he or she sleeps and how often he or she wakes in distress during the night. The results of their research were published in an article, “Sleep-Related Nighttime Crying (Yonaki) in Japan: A Community-Based Study,” in the journal *Pediatrics*.

The study involved interviews with the parents of 500 infants, toddlers and children at a well-infant clinic in Tokyo. It is customary in Japan for parents to bring infants and toddlers into their sleeping quarters — typically a mattress on the floor (tatami) — to nurse and fall asleep. Later, most infants stay with the parents, a practice termed “cosleeping,” which makes the child more accessible to the parent during the night. For a small percentage of infants, sleep occurs in a separate crib-like bed away from the parents, but in the same room.

The study’s findings suggest a critical factor contributing to night-waking is not as much cosleeping or separate sleeping arrangements, but rather changes in where the infant sleeps during the night and during naps. Neither the cosleeping nor separate sleeping quarters matters fundamentally, write the researchers.

“In other words, it is consistency in sleeping arrangements, from sleep onset until awakening, that appears to be critical,” Hayes says. “Infants and toddlers are disrupted when the sleeping arrangements, i.e. the site of sleep, are variable or changed between sleep onset and later in the sleep period.”

The study also found toddlers with frequent sleep-related nighttime crying were more likely to have irregular bedtimes and to have nonparental daycare than were those without sleep-related night crying.

Military STRENGTH

IN A \$6.2 MILLION U.S. Army research program, the University of Maine Advanced Engineered Wood Composites (AEWC) Center will conduct research on high-strength structures for military applications.

Among the projects under development: tent protective structures, high-performance air beams, rigidified inflatable structures, rapidly deployable bridges, and ballistic modular building components.

AEWC researchers will work with the U.S. Army Natick Soldier Center and the U.S. Army Corps of Engineers. The research will take advantage of a new, \$4.5 million expansion of laboratory space that was financed with a voter-approved bond in 2003.

The new facilities expand AEWC’s capacities to develop thick composites technologies, resin-infusion processes and polymer extrusion. The space accommodates an anticipated 35 additional research personnel, including engineers, scientists and support staff who will be funded through the new research program.



Inflatable arches provide structural support for a portable hanger. Illustration by Knife Edge Products

“UMaine is looking forward to developing advanced lightweight construction materials and structures that will better protect our troops, while providing unique learning opportunities for our students, and business procurement opportunities for Maine industry.”

AEWC Director Habib Dagher

Maine Writing

Looking for good books about Maine?

Some of the best are by Maine writers. We asked Margery Irvine, who teaches an English Department course on Maine authors, to list five of her favorites:

1 Country of the Pointed Firs by Sarah Orne Jewett

This classic has lost none of its value. It’s a beautifully written description of a coastal town on the cusp of great change and yet timeless in its humanity.

2 The Weir by Ruth Moore

Island life — unsentimental, unromanticized. Moore’s dialogue is brilliant, her characters live and breathe.

3 The Beans of Egypt, Maine by Carolyn Chute

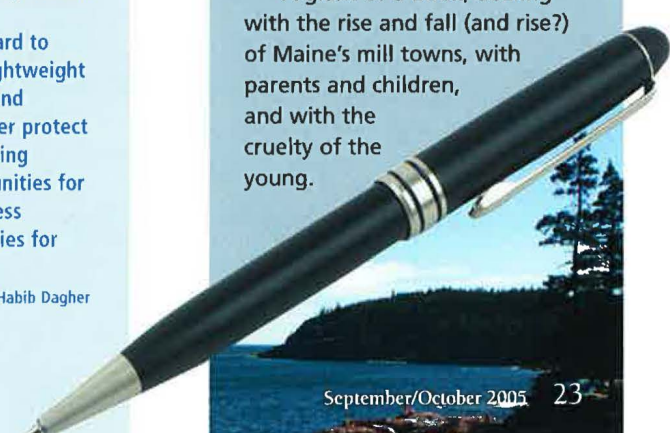
One of the first, and best, novels about the working poor. Chute’s prose is both brutal and beautiful, her story both tragic and funny.

4 The Weight of Winter by Cathie Pelletier

My favorite (so far) of Pelletier’s novels about Mattagash in the St. John Valley. Her characters are funny and heart-breaking, her depiction of northern Maine dead-on.

5 Empire Falls by Richard Russo

A giant of a book, dealing with the rise and fall (and rise?) of Maine’s mill towns, with parents and children, and with the cruelty of the young.



The View From Above



FOR SCIENTISTS, the view of Earth from space has never been better or more critical. Details about the planet's changing face are the raw data for monitoring the environment and anticipating the future consequences of human activity.

With a \$330,000 National Science Foundation grant, the University of Maine is New England's window on the planet as seen through the eyes of new satellites. The grant paid for the purchase and installation of a new 2.4-meter-diameter, 800-pound satellite tracking dish on the roof of Aubert Hall on campus.

"Directly receiving these data will allow us to address environmental issues closer to our coasts, in more detail, and with new approaches. Not only that, we'll be dealing with important problems in real time."

Andrew Thomas

According to Andrew Thomas, a professor in the School of Marine Sciences and principal investigator for the project, the dish will enable UMaine to receive data from the latest generation of Earth observation satellites operated by NASA, as well as those of other international space agencies.

The closest existing system for receiving the information is at Rutgers University. Institutions already lining up to take advantage of UMaine's data-receiving capabilities include the University of Massachusetts, Dartmouth; Bigelow Laboratory for Ocean Sciences, West Boothbay Harbor; and the Maine Department of Marine Resources.

More than 70 scientists have expressed interest in the new data for their research at UMaine, a NASA Center of Excellence in Remote Sensing.

Cataloging

Microbes

MICROORGANISMS in the sea hold important keys to understanding how marine ecosystems work and interact with the atmosphere. However, scientists are only beginning to catalog the bacteria, protozoans and other plankton in the ocean.

A team of researchers, including University of Maine microbiologist Gary King, has taken an important step by sequencing the genome of a bacterioplankton known as *Silicibacter pomeroyi*. The organism is a member of the marine *Roseobacter* clade, a group of microorganisms that comprises up to 20 percent of bacterioplankton in



Bacteria, protozoans and other plankton in the ocean can help scientists better understand how ecosystems work.

coastal and open-ocean mixed waters. The genes sequenced provide clues to the function and ecology of the organism.

Silicibacter pomeroyi uses inorganic compounds, including carbon monoxide and sulphide, and consumes products of marine algae. In taking up carbon monoxide, microorganisms remove carbon from water and, indirectly, from the atmosphere.

King, the Clare S. Darling Distinguished Professor of Oceanography at UMaine's Darling Marine Center, focuses on microbial processes and their influence on atmospheric trace gases.

Finding the Philharmonic

PIANIST PHILLIP SILVER has begun research that he hopes will one day reveal the yet untold story behind the founding of the Israel Philharmonic Orchestra.

Considered one of the best major symphony orchestras in the world, the 69-year-old Israel Philharmonic has an extraordinary history, according to Silver, a University of Maine associate professor of music who researches and performs music of the Holocaust era.

But while many popular international musicians and conductors have been associated with the orchestra, including Michael Taube, George Singer, Mark Lavri, Paul Ben-Haim and Leonard Bernstein, the founding members of the orchestra are not so well known. In addition, personal data on original members has been hard to find. Silver's research is one of the first comprehensive studies in English on the orchestra's formation.

"This is a very complex story, one which goes beyond purely academic interests because of the incredible personal stories of the musicians and the traumatic circumstances of their lives," he says.

Founded in 1936 in Tel Aviv by Polish-born Jewish violinist Bronislaw Huberman, the orchestra was designed to draw some of the best Jewish musicians away from the Nazi threat and impending Holocaust in Europe. According to Silver, it worked.

Huberman invited 75 musicians to join the orchestra in an undeveloped British-ruled territory that would become Israel in 1948. Initially it was named the Palestine Orchestra; the inaugural concert, Dec. 26, 1936 was conducted by Arturo Toscanini. Languages spoken by its members included German, Polish, Russian, Hungarian and Hebrew.

Many of the musicians were refugees and former members of the Cultural Association of German Jews, formed in 1933 after the Third Reich banned Jewish performers and artists from public employment. Silver wants to find stories about the original membership.



lasting impression



CAMPUS AS ARBORETUM: Last year, the Fay Hyland Arboretum on campus observed its 70th anniversary. The wooded 10 acres along the Stillwater River harbors plants from Maine and throughout the world, many cultivated by the arboretum's founder, renowned botanist Fay Hyland, to serve as a living learning tool for students and the public. Today, the Hyland Arboretum is part of an even larger living laboratory. This one is campuswide. With the help of the Campus Arboretum and Beautification Committee, UMaine's 600-acre campus is now managed as an arboretum for its educational and aesthetic value.





THE UNIVERSITY OF MAINE Center for Sport and Coaching is leading an effort to provide a philosophical guide for Maine interscholastic athletics, linking sports to the overall schools' missions and community values, while

supporting quality coaching education. One of its tools is *Sports Done Right: A Call to Action on Behalf of Maine's Student-Athletes*.

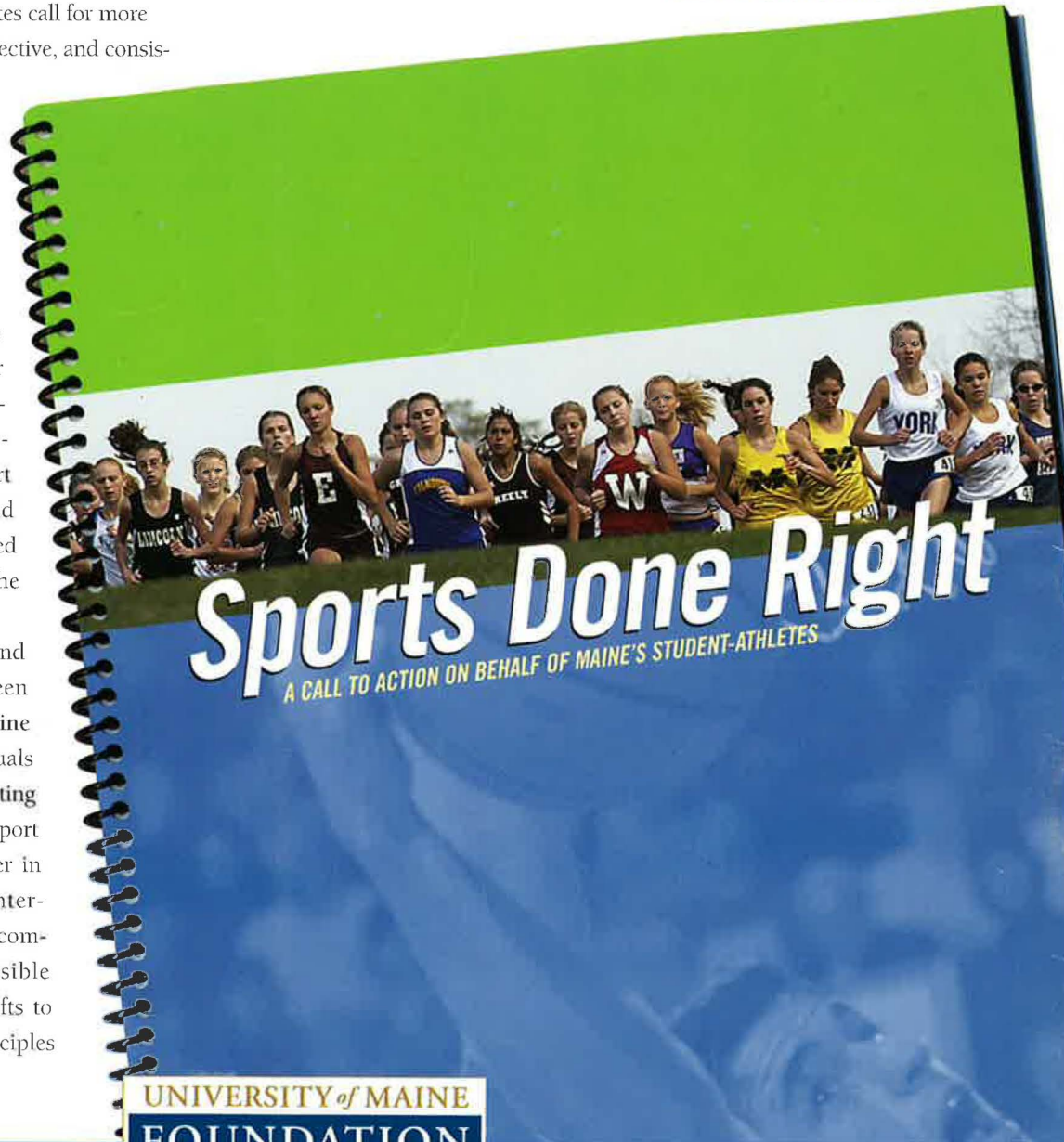
In *Sports Done Right*, student-athletes call for more fun in athletics, winning kept in perspective, and consistent and fair treatment of athletes of all abilities. They also identify practices detrimental to healthy sports experiences, such as negative comments and behavior by parents and fans, win-at-all-costs attitudes and coaches favoring the best players.

"Hearing the students' take on the problems only strengthened our commitment to promote this recalibration and positive change in interscholastic sports," says Dean Robert Cobb of the College of Education and Human Development, who co-chaired the statewide panel that produced the report.

Now a Maine Center for Sport and Coaching Endowment Fund has been established in the University of Maine Foundation with gifts from individuals and businesses dedicated to implementing *Sports Done Right*. The fund will support the center, which is a national leader in examining and defining healthy interscholastic sports, and presenting recommendations to shape the best possible environment for student-athletes. Gifts to the fund will help promote the principles identified in *Sports Done Right*.

"In Maine we have clearly seen that sports are important to developing the minds and bodies of our young people, but we also know we've strayed off course in connecting sports to the broader mission of schools in supporting learning and citizenship."

J. Duke Albanese '77, co-chair of the Sports Done Right statewide panel



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