

A Fusion of Art

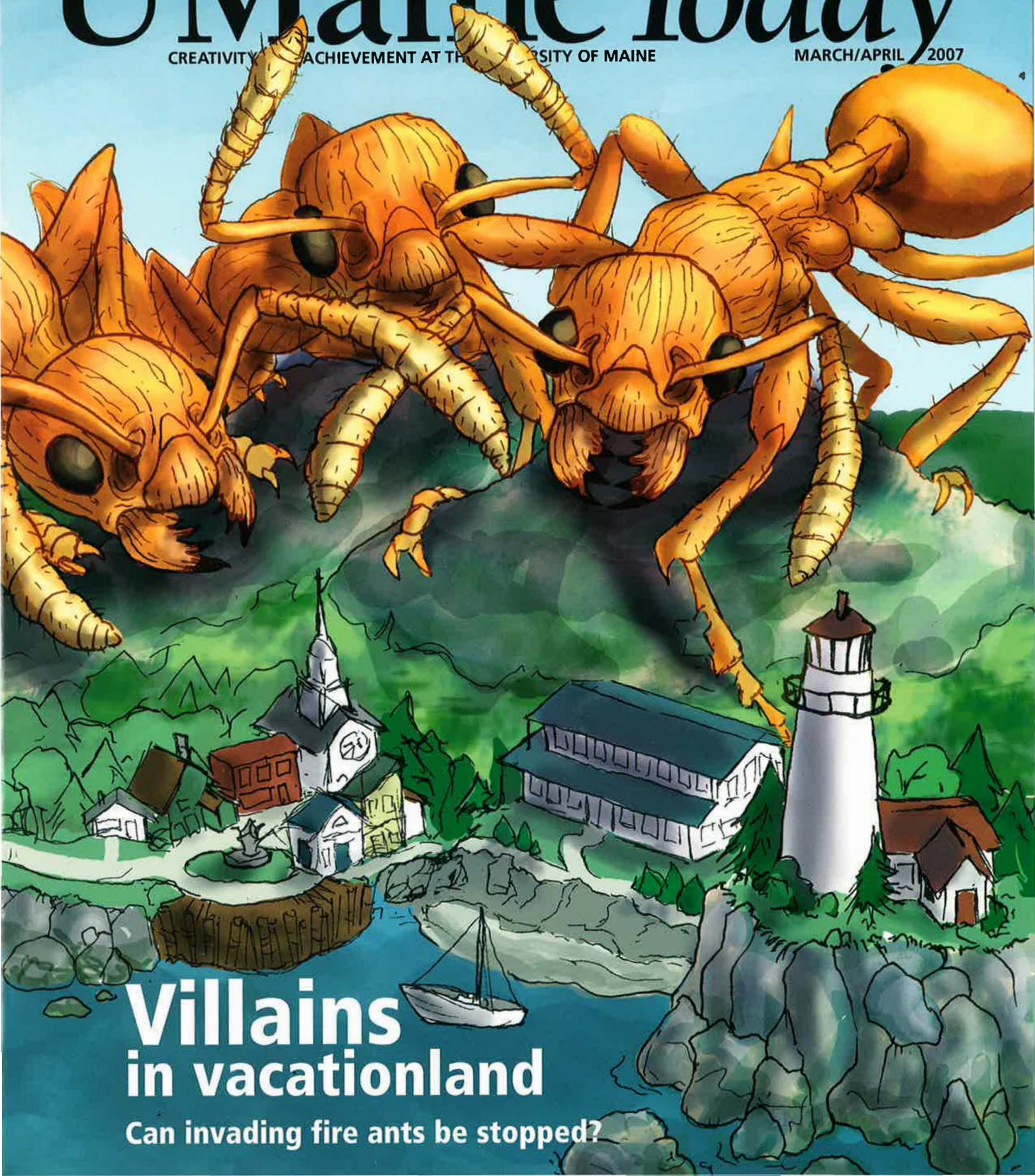
Understanding  
Islamic Fundamentalism

Natural Warning Light

# UMaine Today

CREATIVITY ACHIEVEMENT AT THE UNIVERSITY OF MAINE

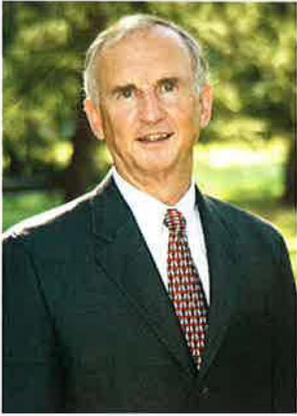
MARCH/APRIL 2007



## Villains in vacationland

Can invading fire ants be stopped?

## President's Message



THE RECENT ANNOUNCEMENT of the University of Maine's new School of Policy and International Affairs (SPIA) marks an important milestone in UMaine's recent history. Much like our highly successful Climate Change Institute, Honors College and School of Marine Sciences, SPIA is an organizational entity that brings together members of our community from various academic areas. Its structure provides opportunities for collaboration among the more than 80 UMaine faculty members who are already teaching and conducting research in areas related to policy and international issues. The collaborations and shared energy that will result from this new arrangement will help to crystallize these efforts, leading to higher profiles for UMaine's scholarly activities, with more opportunities to help inform the important policy decisions that will help to define the future of our state, our country and our world.

The new school will complement the efforts of UMaine's two major, long-established policy areas — the William S. Cohen Center for International Policy and Commerce, and the Margaret Chase Smith Policy Center. SPIA will also help us coordinate UMaine's extensive related academic programs for more effective communication, outreach and service.

As much as any state, Maine depends on its economic and cultural connections to other countries. To be effective leaders in the future, our students will need a real understanding of the connections among policy, international affairs and business. When nations make changes in areas like environmental policy, economic policy and trade policy, the implications are significant and far-reaching. The ability to understand those implications will grow even more critical as the world continues to change, and the students and others who benefit from SPIA will be well equipped to meet those challenges.

UMaine's new School of Policy and International Affairs will provide another important way for us to fulfill our land-grant university responsibility of applying our knowledge and resources to creating a brighter future for our students, our state and the world around us.

Robert A. Kennedy  
President



ON THE COVER: The original art on the cover and accompanying the related story on European fire ants is by scientific illustrator Carrie Graham, who received her master's degree in entomology in December from the University of Maine. Her thesis addressed the funeral behavior of the invasive ants and their response to fungal pathogens. Graham, originally from Ann Arbor, Mich., lives on Mount Desert Island, where much of the fire ant research has been focused. Graham has presented her research at several regional, national and international entomology meetings. She received an honorable mention in the 2005 Entomological Society of America student competition and was the recipient of the UMaine Biological Sciences Department's 2006 Edith M. Patch-Frank H. Lanthrop Prize in Entomology. In addition to entomology, Graham is interested in illustration and museum exhibit design. She has contributed to a number of environmental and entomological outreach programs and exhibits. Graham continues to work on UMaine's European fire ant research in Acadia National Park as a part-time collaborator. Photo by Michael Mardosa

# UMaine Today

## Director of University Relations

Joe Carr

## Editor

Margaret Nagle

## Designers

Michael Mardosa, Carol Nichols,  
Valerie Williams

## Staff Photographer

William Drake

Printed by University of Maine  
Printing and Mailing Services

Readers are invited to send comments to:  
[umainetoday@umaine.edu](mailto:umainetoday@umaine.edu)

## 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.

*UMaine Today* is produced six times a year by the Department of University Relations, University of Maine, 5761 Howard A. Keyo Public Affairs Building, Orono, Maine 04469-5761, 207-581-3744.

In complying with the letter and spirit of applicable laws and in pursuing its own goals of diversity, the University of Maine System shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, national origin or citizenship status, age, disability or veteran status in employment, education, and all other areas of the university. The university provides reasonable accommodations to qualified individuals with disabilities upon request. Questions and complaints about discrimination in any area of the university should be directed to: Executive Director of Equal Opportunity, 101 North Stevens Hall, University of Maine, Orono, Maine, 04469-5754, 207-581-1226.

©2007 by the University of Maine System.

Printing and distribution of *UMaine Today* are underwritten by the University of Maine Foundation and the Office of the Vice President for Research.

Printed on recycled paper.



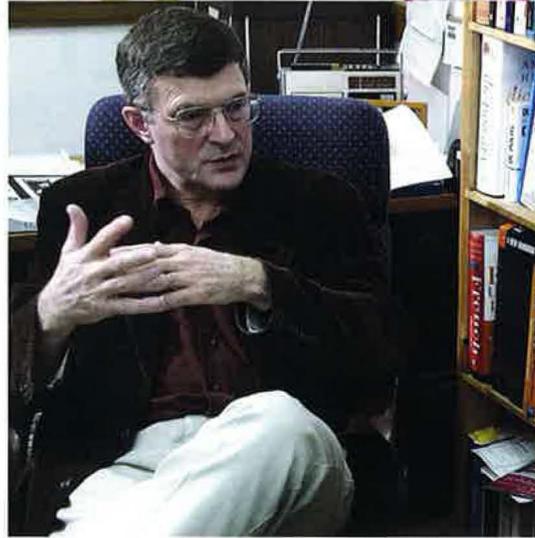
A Member of the University of Maine System

Visit us online at [www.umaine.edu/umainetoday](http://www.umaine.edu/umainetoday)  
for UMaine's daily news, and the online version of *UMaine Today*.

# FUSE

14

8



2



20

## features

2

### Villains in Vacationland

UMaine entomologists are studying the effect of invading European fire ants on local ecosystems, where the aggressive species is out-foraging native ants with their overpowering hunting and scavenging skills.

8

### Rethinking Islamic Fundamentalism

Anthropologist Henry Munson talks about Islam, nationalism and the resentment of foreign domination at the heart of the conflict in the Middle East.

14

### Fuse

For seniors majoring in studio art, a challenging capstone course with an emphasis on critical thinking and the communication of ideas is a bridge to the professional art world.

20

### Tuning In

Psychologist Thane Fremouw's research exploring the neural mechanisms required for complex auditory perception in birds could help us better understand how humans discriminate between sounds.

22

### Warning Light

Researchers in the Department of Chemistry and the Mitchell Center are developing a sensor-based monitoring system to ensure the safety of drinking water.

March/April 2007

Volume 7 Issue 2

### Departments

<b>Students</b>	<b>7, 13</b>
<b>Perspective</b>	<b>19</b>
<b>Insights</b>	<b>26</b>



22

Photo by James Wedge, Cornell Laboratory of Ornithology

# Villains *in* Vacationland

**UMaine entomologists study the effect of invading European fire ants on local ecosystems**

By David Munson

*Remember those B-movie horror flicks in which heroic scientists threw themselves in the paths of seemingly unstoppable monsters while terrified innocents ran screaming into the night?*

*It's kind of like that.*

*This true, hair-raising story that reads like the script of a '50s sci-fi thriller is about a monster on the loose in coastal Maine. The villain isn't an atomic robot or a giant alien from an experiment gone wrong, but *Myrmica rubra*, the European fire ant.*

*"I first discovered them by the vegetable garden, and now they have taken over the entire back lawn," says Polly Camp, whose yard and garden in Orono, Maine, have been overrun by the stinging pests. "I had to give up gardening last year, and I worry about my grandson going out to play. They're nasty, aggressive things, and their sting is just terrible."*

**P**OLLY CAMP'S story is all too common. From Eastport to Kittery, the ebb and flow of Maine's natural communities are being interrupted, along with backyard barbecues, woodland walks and even elementary school recesses, by the scrappy tenacity of the fire ant. All but immune to traditional methods of control, the invasive fire ant has reached a kind of renaissance in Maine in recent years, rapidly expanding its range and increasing the size

of its populations. Fire ants are slowly stinging their way up the food chain, and their success has citizens and scientists alike scrambling for answers.

"These ants are a different species from the fire ants that are causing problems in the southern part of the United States," says University of Maine entomologist Ellie Groden. "These originate from somewhere in northern Europe, whereas the southern fire ants originate from South America. The natural distribution of the European fire ants extends up into the Arctic Circle in

Illustrations by Carrie Graham





The first documented sighting of the European fire ant in the United States was in 1908 at Harvard University's Arnold Arboretum outside Boston, but the infestations that dot the Maine coast are probably the product of multiple introductions.

northern Europe, so unlike the southern species, we know that these ants are well adapted to our cold climate.”

These ants have been in Maine for more than half a century, Groden says, but “over the last few years, a lot of people who never noticed the ants before are saying that fire ants have taken over their lawns. There are a lot of things that could be happening, but I think that the ant's success in recent years is probably due to a combination of environmental factors and genotype.”

Groden suspects that the species slowly adapted to its new home, remaining relatively inconspicuous as it tweaked its behaviors and biology to meet the challenges of its new environment. It may have recently reached a sort of threshold for success, both behaviorally and genetically, that has allowed it to rapidly expand its population.

Whatever the reason, the fire ant is definitely on the march in Maine.

A colony can make its home almost anywhere, creating cryptic nests under fallen branches, dead leaves, piles of construction materials — almost any natural or manmade debris. Multiple queens make it possible for individual nests to grow into full-blown infestations rather rapidly, and the highly mobile colonies make the insect an excellent candidate for human-aided dispersal.

“Colonies move around all the time according to the abundance of food and the colony's needs, and multiple queens can ‘bud’ off the main group to form new nests,” says Groden. “Last summer we filmed an entire colony as it moved from a stone wall into a pot that had a rhododendron in it,

# Villains in Vacationland

ready for planting. It made it easy to see how colonies can get moved around by people.”

**T**HE FIRST documented sighting of the European fire ant in the United States was in 1908 at Harvard University’s Arnold Arboretum outside Boston, but the infestations that dot the Maine coast are probably the product of multiple introductions. In the past 100 years, importers and U.S. customs officials have regularly encountered the tiny, eighth-inch opportunists in plant materials from Europe. From bags of sphagnum moss from Ireland to potted dahlias from Germany, plants and garden supplies have harbored the hitchhikers, delivering the pest to urban neighborhoods in cities like Bangor and Portland,

**Fire ants make excellent herders, tending tiny aphids that suck juices from plants. The ants collect sugar-rich, high-energy secretions from aphids and, in exchange, protect the delicate sapsuckers.**

and to quiet country landscapes in areas as remote as Monhegan Island.

Groden estimates that Maine’s fire ant populations started to become a real problem in the mid-1990s, but it wasn’t until an infestation was discovered in Acadia National Park that the pest began to draw widespread attention. With financial support from the National Park Service, fire ants now are being monitored by UMaine researchers at more than a dozen sites on Mount Desert Island.

Groden and her team have spent more than four years studying fire ants on the island to determine the extent of the infestation, its environmental impact and potential methods for control. Recent U.S. Department of Agriculture funding has allowed the research to expand to other areas in Maine.

With established populations of the fire ant scattered across coastal Maine, the insect’s potential to disrupt local ecosystems is a real concern. Ongoing UMaine research projects are assessing how fire ant colonies affect other organisms in their range.

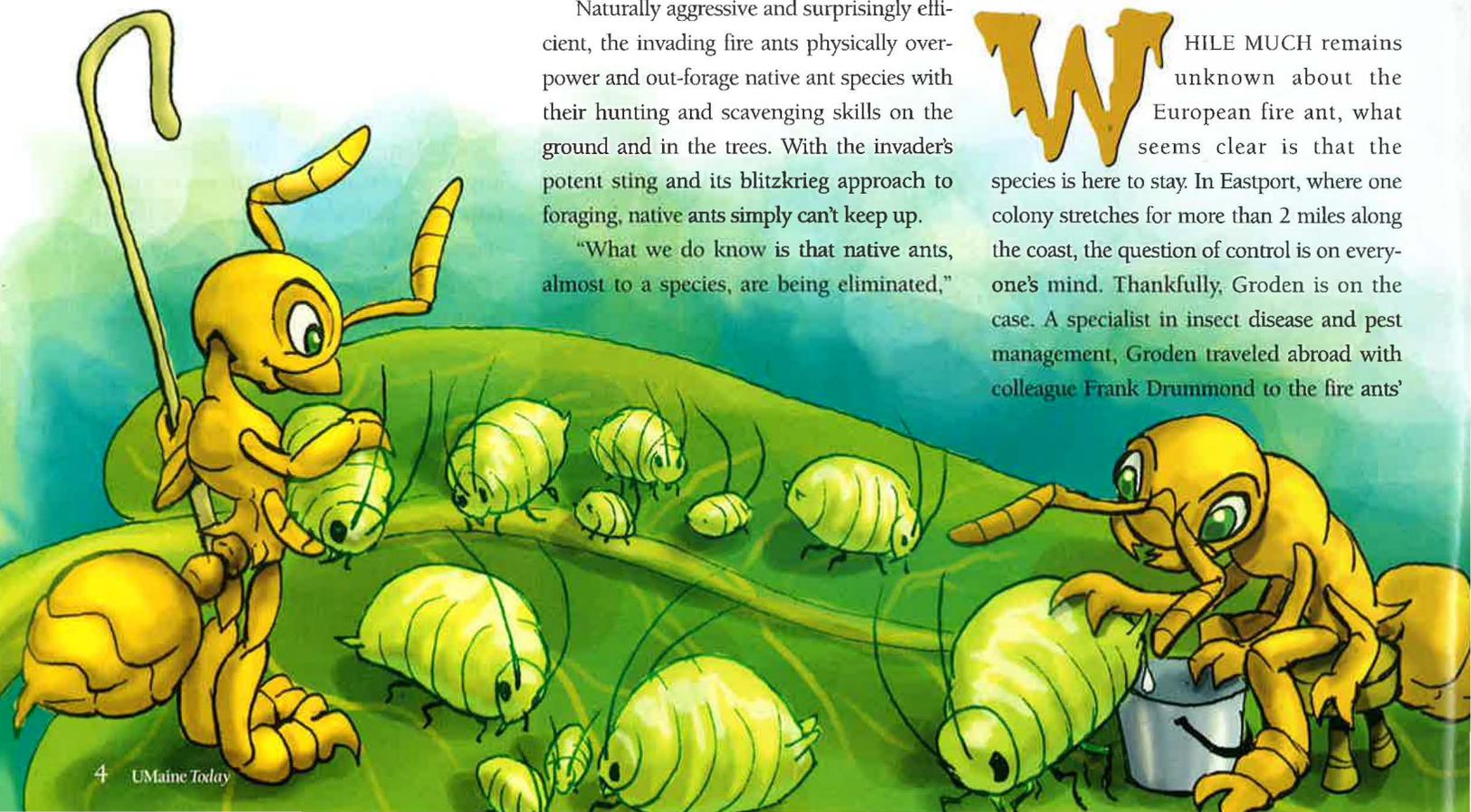
Naturally aggressive and surprisingly efficient, the invading fire ants physically overpower and out-forage native ant species with their hunting and scavenging skills on the ground and in the trees. With the invader’s potent sting and its blitzkrieg approach to foraging, native ants simply can’t keep up.

“What we do know is that native ants, almost to a species, are being eliminated,”



says Groden. “In most sites in Maine, (fire ants) are very aggressive, but their impact on small vertebrates is still in question. There is some evidence that they are causing declines in the number of visits by native bees and other pollinators.”

**W**HILE MUCH remains unknown about the European fire ant, what seems clear is that the species is here to stay. In Eastport, where one colony stretches for more than 2 miles along the coast, the question of control is on everyone’s mind. Thankfully, Groden is on the case. A specialist in insect disease and pest management, Groden traveled abroad with colleague Frank Drummond to the fire ants’





**Multiple queens make it possible for individual nests to grow into full-blown infestations rather rapidly. The highly mobile colonies also make the insect an excellent candidate for human-aided dispersal.**

home range in search of pathogens that could provide new methods of control.

Their quest paid off. After scrutinizing thousands of fire ant nests across the English countryside, Groden and Drummond discovered not one but three fungal pathogens not found in the U.S. After a nearly catastrophic misunderstanding with customs officials, they were able to bring ants killed by fungal pathogens back to the States to begin the long process of culture and analysis.

"We were quite successful finding pathogens in England, and they have become a significant part of our research," says Groden. "We collected cadavers and found new fungi not found in the U.S., one of

which may be a new genus. We have worked very hard to establish a culture and reinfest the ants to determine whether there is any potential for use as a biological control."

Reinfesting the ants in the lab proved almost as difficult as finding a single dead ant in the rolling hills of the English countryside. Ants are extremely fastidious when it comes to personal hygiene, constantly grooming themselves and each other, even applying anti-microbial compounds to nest mates. The U.S. populations also perform a unique housecleaning ritual studied by UMaine graduate student Carrie Graham.

As part of her master's research, Graham examined ant middens — select locations away from the nest where workers bring the colony's refuse and, more importantly, its dead. Graham discovered that the ants carry off their cadavers to very specific sites. She examined these "ant graveyards" to determine how environmental factors influence site selection for the middens.

"Preliminary lab experiments showed that the ants tend to prefer warm areas where there is direct sunlight for disposing of cadavers. A lot of ant pathogens are UV sensitive," says Graham. "They may be baking their dead to disinfect them."

**U**NDERSTANDING the interaction between members of neighboring colonies may be just as important as the ants' behaviors in and around an individual nest. Drummond has focused his research on the relationships between groups of ants, hoping to determine whether *Myrmica rubra* has formed so-called supercolonies like those of the invasive Argentinean fire ant in Europe and the southern United States.

"Usually ants are fiercely territorial. The fighting that they do among themselves helps to keep populations down," says Drummond. "In a supercolony, that compe-



Photo by Jeff Garnas

## A Wolf in Ladybug's Clothing

**LADY BEETLES**, commonly referred to as ladybugs, and their grub-like larvae are one of the primary predators of aphids, gorging themselves on the largely immobile herbivores and thereby helping to control aphid populations. Imported fire ants interrupt this natural balance by attacking any lady beetle that might threaten their aphid flock.

By setting up artificial aphid "farms," University of Maine Ph.D. student Christie Finlayson has discovered a way to compare the defensive behaviors of native lady beetle species with their non-native counterparts.

"My research shows that non-native species of lady beetles have become dominant over native lady beetle species in almost all habitats in Maine," says Finlayson, who specializes in the ecological role of non-native species in the environment. "I wanted to see how different species of lady beetles react in the presence of predators like fire ants."

Finlayson set up trials where native and non-native beetles visited ant-protected aphid colonies, developing a specialized rating system to chart both the ants' levels of aggression and the beetles' reactions. While the data from dozens of trials is still being analyzed, Finlayson suspects that the project may reveal that some non-native lady beetles are better equipped to handle predation, giving them a competitive advantage over their native counterparts.

# Villains *in* Vacationland

tition disappears. Ants will work together, foraging and sharing the care of the young.

"In Europe, the Argentinean fire ant has established a supercolony along the Mediterranean that is more than 600 km long, which means that you could take an ant from either end of that 600 km area and put them in the same jar and they wouldn't fight. In their home range, ants from nests separated by just a couple of meters fight."

Using a variety of laboratory and field experiments, Drummond showed that ants from different nests in Maine did, indeed, fight, suggesting that Maine's invading fire ants are multicolonial, despite the high number of nests per acre in infected areas. Ants are able to recognize a nest mate based on the chemical signature of complex hydrocarbons that cover its body. By examining these compounds, along with genetic data that shows the degree of relatedness

**As part of her master's thesis in entomology, Carrie Graham examined ant middens — select locations away from the nest where workers bring the colony's refuse and its dead.**

between colonies, Drummond's research is unraveling the complexities of fire ant communication and aggression.

**A**S IF THEIR aggressive tendencies and painful stings weren't enough, the fire ants' agricultural proclivities also are proving to be a problem. Fire ants make excellent herders, patiently and ferociously tending aphids — small sucking insects that feed on the juices of a variety of plants. From aphids, the ants get sugar-rich secretions.

UMaine ecology and environmental sciences graduate student Katie McPhee is studying the ants' unique farming practices to better understanding the invaders' effect on its environment.

Her research is focused on measuring the extent to which fire ant and homopteran (aphids, mealybugs and other sucking insects) populations affect one another. The big questions: Is there one homopteran species in particular that is associated with *Myrmica rubra*, and, if so, is that giving

*rubra* a competitive edge over native species?

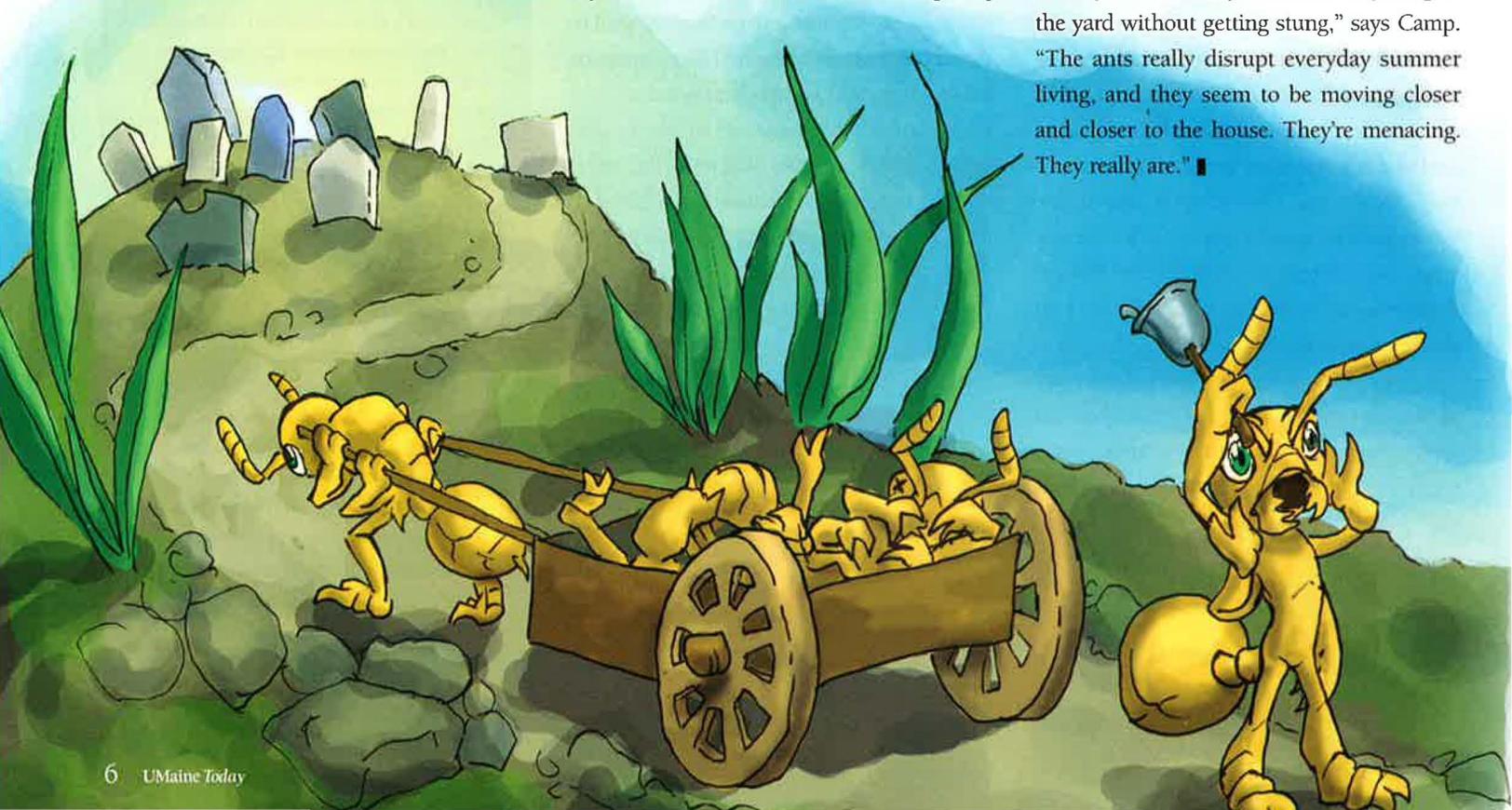
"The research also is helping to show how *rubra* is affecting both the insect and the plant community," she says.

The unique behaviors of fire ants may be the key to their control. From tracking ant foraging movements with fluorescent dyes to examining modes of aggression between ant species, Groden and her team are amassing data that may expose a chink in the ant's armor, paving the way for effective control.

"One of the approaches we are taking now is to examine how fire ants are able to prevent infection. If we can disrupt their behavior in ways that increase their susceptibility to pathogens, we may be able to come up with an effective strategy for control that, along with an inoculant or pesticide, may keep fire ants in check."

For homeowners like Camp, who recently began working with Groden's team to control the infestation spreading through her yard, any degree of fire ant control would be a relief.

"I can't pick my raspberries, I can't hang out my sheets to dry, I can't do anything in the yard without getting stung," says Camp. "The ants really disrupt everyday summer living, and they seem to be moving closer and closer to the house. They're menacing. They really are." ■



# Powered by chemical engineering

FOR UNIVERSITY OF MAINE chemical engineering and business marketing major Robert Fisher, energy is a way of life.

Known as “Fish” to his friends and family (and even a few of his professors), the charismatic 27-year-old from Oak Harbor, Wash., injects a certain energy into everything that he does, including the recent regional and national ChemEcar competitions, sponsored by the American Institute of Chemical Engineers (AIChE).

Fisher and his teammates pushed UMaine to the top in regional competition in April, securing first and second place with their two entries and edging out tough competition from teams representing some of the nation’s most prestigious engineering programs, including MIT, Tufts, Clarkson and Cornell.

“It felt really good to beat out a lot of the big-name schools,” says Fisher, who is wrapping up his four-year program this spring with the hope of pursuing his MBA at UMaine. “People don’t realize how good the engineering programs are here.”

The idea behind AIChE’s ChemEcar competition is to inspire student teams to apply their knowledge of chemical engineering to create an alternative fuel vehicle capable of transporting a payload a specific distance. The design, construction and testing of the UMaine cars required hundreds of hours of work by the student team members, who collaborated under the guidance of chemical and biological engineering professor John Hwalek.

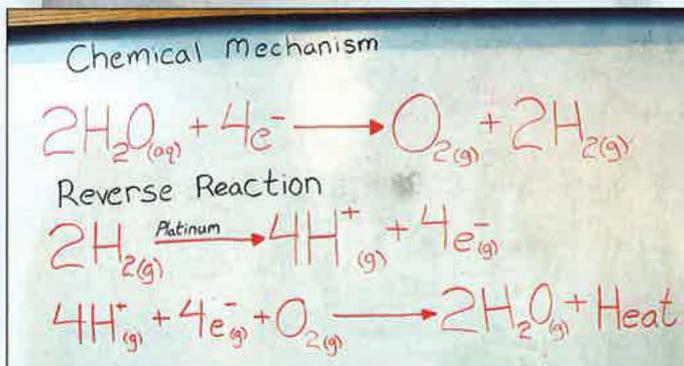
The two, six-person teams from regionals combined to make one in preparation for the national competition, selecting the more predictable hydrogen fuel cell car over an aluminum-air battery design. Fisher did much of the construction of the shoebox-size vehicle, from scaling down the gear ratio to cutting out the thin, polycarbonate wheels. After conducting dozens of tests to fine-tune the original design, the team headed to California for the prestigious national contest.

At the AIChE national conference in San Francisco, the buzz among student competitors was that UMaine would be the team to beat, since Fisher and his teammates placed first in several categories in regionals. The UMaine car pushed its way to third place, powered by hard work, innovation and, of course, a little hydrogen.

However, building alternative-fuel vehicles isn’t all that Fisher does. In addition to the academic demands of his double major, he also works as an engineering assistant in the Pulp and Paper Pilot Plant on campus.

“I do a little bit of everything over there,” says Fisher, on his way to another engineering class. “Repair, design, test, construct new lab equipment. If it breaks, I fix it. I have really had a lot of great opportunities for hands-on projects. I’m going to have a lot in my tool box when I leave here.”

**At the AIChE national conference in San Francisco, the buzz among student competitors was that UMaine would be the team to beat.**

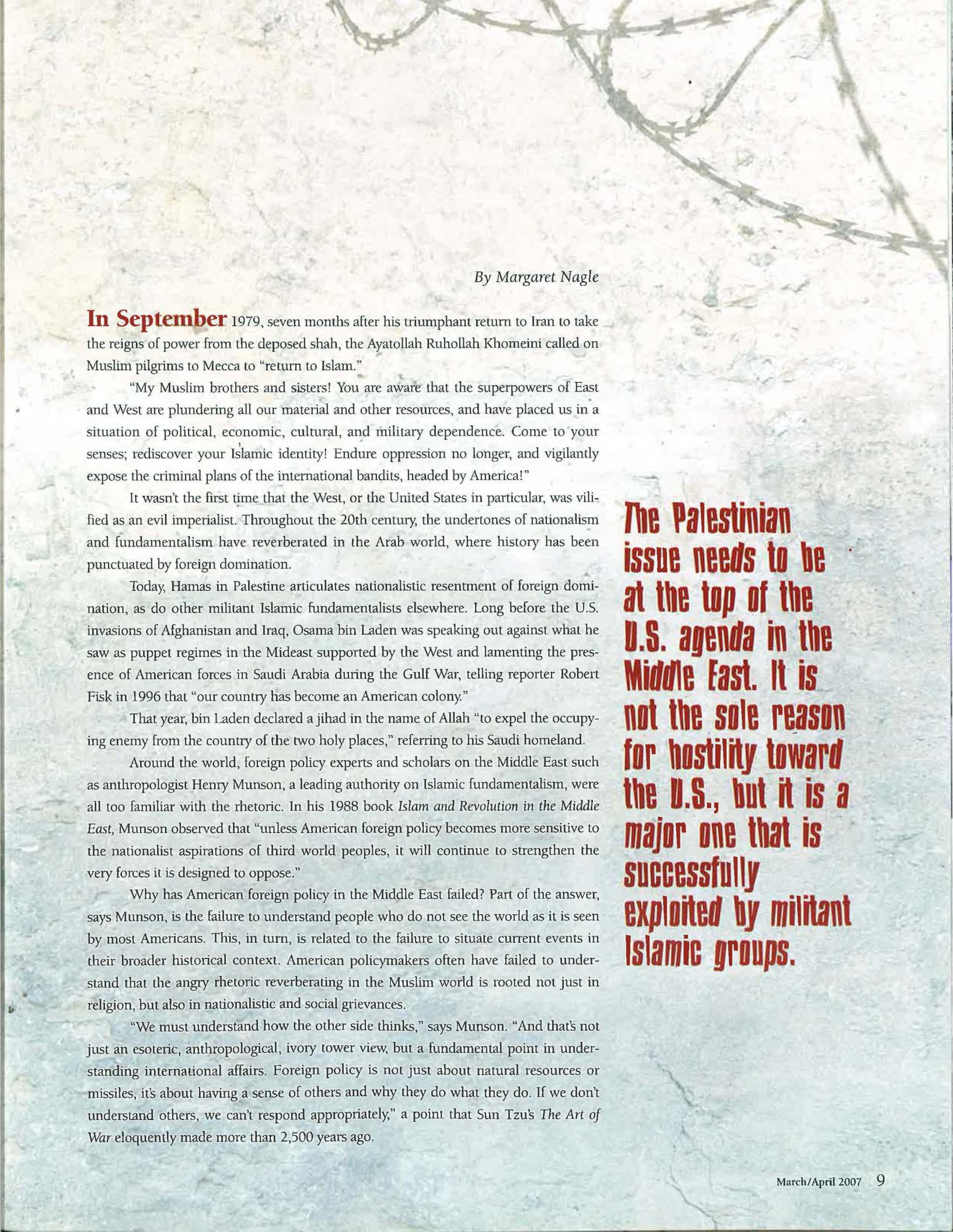


**BE**

*Islamic fundamentalism:  
What we must understand*

**TEEN**

**KEEPING**



By Margaret Nagle

**In September** 1979, seven months after his triumphant return to Iran to take the reigns of power from the deposed shah, the Ayatollah Ruhollah Khomeini called on Muslim pilgrims to Mecca to “return to Islam.”

“My Muslim brothers and sisters! You are aware that the superpowers of East and West are plundering all our material and other resources, and have placed us in a situation of political, economic, cultural, and military dependence. Come to your senses; rediscover your Islamic identity! Endure oppression no longer, and vigilantly expose the criminal plans of the international bandits, headed by America!”

It wasn't the first time that the West, or the United States in particular, was vilified as an evil imperialist. Throughout the 20th century, the undertones of nationalism and fundamentalism have reverberated in the Arab world, where history has been punctuated by foreign domination.

Today, Hamas in Palestine articulates nationalistic resentment of foreign domination, as do other militant Islamic fundamentalists elsewhere. Long before the U.S. invasions of Afghanistan and Iraq, Osama bin Laden was speaking out against what he saw as puppet regimes in the Mideast supported by the West and lamenting the presence of American forces in Saudi Arabia during the Gulf War, telling reporter Robert Fisk in 1996 that “our country has become an American colony.”

That year, bin Laden declared a jihad in the name of Allah “to expel the occupying enemy from the country of the two holy places,” referring to his Saudi homeland.

Around the world, foreign policy experts and scholars on the Middle East such as anthropologist Henry Munson, a leading authority on Islamic fundamentalism, were all too familiar with the rhetoric. In his 1988 book *Islam and Revolution in the Middle East*, Munson observed that “unless American foreign policy becomes more sensitive to the nationalist aspirations of third world peoples, it will continue to strengthen the very forces it is designed to oppose.”

Why has American foreign policy in the Middle East failed? Part of the answer, says Munson, is the failure to understand people who do not see the world as it is seen by most Americans. This, in turn, is related to the failure to situate current events in their broader historical context. American policymakers often have failed to understand that the angry rhetoric reverberating in the Muslim world is rooted not just in religion, but also in nationalistic and social grievances.

“We must understand how the other side thinks,” says Munson. “And that's not just an esoteric, anthropological, ivory tower view, but a fundamental point in understanding international affairs. Foreign policy is not just about natural resources or missiles, it's about having a sense of others and why they do what they do. If we don't understand others, we can't respond appropriately,” a point that Sun Tzu's *The Art of War* eloquently made more than 2,500 years ago.

**The Palestinian issue needs to be at the top of the U.S. agenda in the Middle East. It is not the sole reason for hostility toward the U.S., but it is a major one that is successfully exploited by militant Islamic groups.**

## Rethinking Islamic fundamentalism

**Munson argues** that fighting people whose motives one does not understand is like fighting blindfolded. That's what we are doing in Iraq, he says.

Munson emphasizes that it is a mistake to assume that political movements have only one cause or distinctive feature. He has argued in a series of recent articles that militant Islamic movements definitely do have a fundamentalist dimension. They insist on strict conformity to a sacred text and require that all aspects of life, including the social and political, should conform to sacred scriptures believed to be inerrant and immutable. But Islamic fundamentalism usually also has a nationalist and anti-imperialist dimension. For many Muslim fundamentalists, militant Islam is to some extent a means to an end — overcoming foreign domination.

In the Quran, as well as in the minds of

many traditional Muslims today, there is but one explanation for the subjugation of the believer by the unbeliever: God is using the latter to punish the former for his sins, including deviating from his laws, Munson says. Only a return to a strictly Islamic way of life will induce God to free the faithful from the faithless. A return to Islam is thus linked to overcoming foreign domination and a return to cultural identity. In 1972, the Ayatollah Khomeini told followers:

If the Muslim states and peoples had relied on Islam and its inherent capabilities and powers instead of depending on the East (the Soviet Union) and the West, and if they had placed the enlightened and liberating precepts of the Quran before their eyes and put them into practice, then they would not today be captive slaves of the Zionist aggressors, terrified victims of the American Phantoms, and toys in the hands of the accommodating policies of the satanic Soviet Union. It is the disregard of the noble Quran by the Islamic countries that has brought the Islamic community to this difficult situation full of misfortunes and reversals and placed its fate in the hands of the imperialism of the left and the right.

Munson stresses that understanding such rhetoric does not entail endorsing it. He notes that there are many aspects of Islamic

militancy that are outrageous and deserve condemnation, notably the horrendous violence against civilians and the anti-Semitism. He describes the Holocaust conference held in Tehran in December 2006 as “sickening.” But he stresses that “it is in the interest of the United States to try to limit the appeal of militant Islamic movements. Invading Muslim countries has precisely the opposite effect, as we can see in Iraq.”

A major misconception in the U.S. is that the Muslim religion is inherently violent, says Munson. The reality is that all religions are shaped by the changing societies in which they are embedded. Any religion can be used to justify violence against the “Other.” Christian persecution of the Jews for two millennia is a prime example.

**What's important** to understand in the Mideast conflict, says Munson, is that the words of Islamic fundamentalists ring true even for moderates in the Arab world because of the widespread resentment of foreign domination.

Take the 1977–78 revolution that overthrew the American-backed Shah of Iran, a turning point in the Mideast, Munson says. “While many university students and other educated Iranians revered Khomeini as a symbol of cultural authenticity, they also revered him as a symbol of Iranian resistance to foreign domination,” wrote Munson of the charismatic Islamic leader, named by *Time* magazine as one of the 100 most influential people of the 20th century. “He articulated the widespread resentment of American domination in all its forms.”

Today, bin Laden's focus on the suffering of the Palestinians and Iraqis, and his criticism of Muslim governments that fail to speak out about these issues, have made him a hero in the eyes of many Muslims. Even young Arab girls who have abandoned traditional Islamic dress for blue jeans praise bin Laden as an anti-imperialist hero. A young Iraqi woman and her Palestinian

friends told French scholar Gilles Kepel that the man behind the Sept. 11 attacks “stood up to defend us. He is the only one.”

“In the Middle East, there is a pervasive sense of impotence and subjugation,” Munson says. “When bin Laden engages in counter attacks, culminating in Sept. 11, he signals that someone is fighting back. Even Muslims who despise bin Laden, who don’t ever want to be governed by him and who are shocked at the slaughter of 3,000 human beings, admire him for defying the United States, which most Muslims hold responsible for the suffering of the Palestinians, the Iraqis, and other predominantly Muslim peoples.”

A 2003 survey by the Pew Research Center for the People and the Press found a significant increase in Muslim hostility toward the U.S. as a result of the Iraq invasion. Out of the 16,000 people in 21 countries surveyed, only 15 percent of Indonesians and Turks held a favorable view of America. In Jordan, that favorable view was held by only 1 percent. The survey also found that more than half those polled in Indonesia, Jordan and the Palestinian

Authority, and almost half in Morocco and Pakistan, listed bin Laden as one of the three world figures in whom they had the most confidence “to do the right thing.”

**Munson stresses** that American foreign policy often has been crippled by the failure to recognize nationalistic resentment of foreign domination. “Many Americans seem to think that patriotism is a uniquely American sentiment. It is not.” He argues that the Bush administration’s failure to

understand the nationalistic and social grievances that fuel militant Islamic movements is reminiscent of a similar myopia regarding communist movements during the Cold War.

“Robert McNamara (secretary of defense in the Kennedy and Johnson administrations) has acknowledged that the U.S. didn’t perceive the Vietnam conflict as it was seen by most Vietnamese. In the United States, the Vietnam situation was seen in terms of a global war against communism,” Munson says. “We failed to recognize the local

context in Vietnam, where communists articulated nationalistic resentment of foreign occupation and poor social conditions. Most Vietnamese saw the United States as just another imperialist power occupying their land.”

In both Vietnam and Iraq, a U.S. focus on military responses to what was perceived as a global struggle against a monolithic enemy obscured the local grievances that drove people to support specific movements, Munson says. When the Bush administration invaded Iraq, it rein-

forced bin Laden’s message that the U.S. sought to subjugate the Islamic world in order to control its oil and protect Israel. That general perception in the Islamic world generates recruits for militant Islamic movements.

Michael Scheuer, the conservative intelligence analyst who headed the CIA’s center responsible for tracking bin Laden, has said that if bin Laden believed in Christmas, the Iraq War would have been what he wanted as a present. Munson says Scheuer is right.

Moreover, by invading Iraq, the U.S. became embroiled in local sectarian and ethnic tensions that had nothing to do with the effort to fight al Qaeda terrorists. The Iraqi government is now controlled by Shiite fundamentalists, whose worldview is much closer to that of the Islamic Republic of Iran and Hezbollah in Lebanon than it is to that of the U.S. And the bloody civil war between Sunnis and Shiites has now spun out of control.

Meanwhile the Kurds in northern Iraq have a de facto state, which causes major concerns in Turkey and Iran with restive Kurdish populations.

**Tip O’Neill** once said that all politics is local. Similarly, most terror is local, Munson says. At the time of the first Gulf War, 1990–91, George H.W. Bush, Jim Baker, Dick Cheney and Colin Powell all concurred that marching to Baghdad was a bad idea because it would inflame public opinion in Iraq and the Islamic world. They knew Muslims would see it as an imperialist act of aggression.

Sept. 11, says Munson, induced George W. Bush to do what his father had not done in 1991. “9-11 induced a panic that undermined normal, rational decisionmaking and led to the use of unwise military options,” he says. “Neoconservatives were pushing for an invasion of Iraq, and Bush listened to them.”

Criticism of the war is now commonplace, but whereas many people focus on the inadequacy of the way the war has been conducted, Munson stresses that the very idea of invading Iraq was misguided from the outset. And contrary to the conventional wisdom that conservatives supported the war and liberals opposed it, many of the most prescient warnings that the war would strengthen Islamic militants were voiced by conservatives like Gen. Anthony Zinni and the foreign policy experts of the libertarian Cato Institute, not to mention Gen. Brent Scowcroft, the first President Bush’s national

**Unless American foreign policy becomes more sensitive to the nationalist aspirations of third world peoples, it will continue to strengthen the very forces it is designed to oppose.**

## Rethinking Islamic fundamentalism

security advisor, and Gen. William Odom, the director of the National Security Council during the Reagan administration. President George W. Bush ignored such warnings.

“The country that gained the most from the overthrow of Saddam Hussein was Iran,” Munson says. “Thanks to the American invasion, the government of Iraq is controlled by Shiite fundamentalists with close ties to Iran. This gives the Iranian government a great deal of leverage. Iran, if provoked, could make the U.S. position in Iraq even worse than it already is.”

Iraq will go down in history as one of the worst failures in American foreign policy. The question at this point is how to minimize the magnitude of the failure, Munson says. The catch-22, says Munson, is that the presence of American troops fuels hostility toward the U.S. in Iraq and most of the Islamic world, yet a precipitous withdrawal would lead to even more horrendous bloodshed, which would be blamed on America.

**Going after** al Qaeda was a natural response to 9-11, Munson says. But in lieu of military solutions to political problems, there should have been more police work — tracking down the people responsible and dealing with some of the grievances that induce people to support such movements.

“Trying to eliminate training camps in Afghanistan was sensible,” he says. “We could have done it without invading. Going after the leadership of al Qaeda to prevent it from engaging in further acts of terror is a more effective strategy.”

In Afghanistan, which has been overshadowed by the Iraq conflict, President Hamid Karzai’s influence does not extend much beyond Kabul. The countryside continues to be home to warlords and a booming opium crop. Here, too, internal ethnic tensions have nothing to do with Bush’s global war on terrorism.

“The best way to discredit anything in the Mideast is to have it endorsed or

**A major misconception in the U.S. is that the Muslim religion is inherently violent. The reality is that all religions are shaped by the changing societies in which they are embedded.**

imposed by the USA. This includes democratization,” says Munson. “Too much emphasis on democratization in a time of instability is not wise. Democracy is good, but it should not be forced on societies by an external power.”

It is in America’s national interest to strengthen moderates in the Muslim world, Munson says, and that entails stepping back from the reliance on military power and addressing social and nationalistic grievances. One obvious way would be to focus more attention on the creation of a viable Palestinian state in the West Bank and Gaza. This would not resolve the Iraqi conflict, Munson says, but it would dilute hostility toward the U.S. in the Islamic world as a whole.

“After Arafat died, the U.S. and Israel could have strengthened the hand of Palestinian Authority President Mahmoud Abbas and the moderates, making life easier through concessions like the elimination of some of the checkpoints that make daily life miserable for the Palestinians. But there

were no concessions, thus encouraging Palestinians to vote for Hamas.”

Munson notes that Israel also could have organized its withdrawal from Gaza in such a way as to strengthen the Palestinian Authority. Instead, it withdrew unilaterally, making the evacuation of Israeli settlements appear to be the result of Hamas terrorism, without helping the Palestinian Authority improve the living conditions in Gaza.

The first President Bush understood the importance of the Palestinian issue, as did President Clinton, Munson says. At the end of the Clinton administration, Israeli and Palestinian negotiators were on the verge of producing an agreement. No matter how difficult further negotiations may be, they are essential, says Munson.

“The establishment of a viable Palestinian state is essential. Trying to dilute the appeal of militant Islamic groups without resolving the Israeli-Palestinian conflict is like trying to run on quicksand. It exhausts you and gets you nowhere.” ■

**FREE**

# In the Jungle



**S** CRAMBLING ACROSS the slippery clay banks of the Madre de Dios, soaked to the skin by the unforgiving Peruvian rain, Luke Powell passed the time between semesters a little differently than most college students. Powell spent winter break on a research trek across the Peruvian Amazon — a journey that began as a homework assignment.

“I was taking a one-credit course in professionalism in biology that was co-taught by Mike Kinnison and Rebecca Holberton. One of the assignments was to write a grant proposal,” says Powell, who is pursuing his master’s degree in the University of Maine’s Ecology and Environmental Sciences Program. “I wanted to focus on a real-world question. I really got into it.”

Powell’s class project blossomed into a full-blown grant proposal, even though he had no specific audience in mind during its creation. He worked closely with Kinnison, Holberton, and mathematics and statistics professor Bill Halteman to fine-tune the proposal, and eventually decided to submit the work to the Amazon Conservation Association. The group liked what it saw, and Powell’s class assignment suddenly developed into a fully funded research project in the jungles of Peru.

Working out of the Los Amigos Research Center near Puerto Maldonado, Powell traveled by boat to 15 sites where exposed clay deposits along remote riverbanks are frequented by parrots. Conflicting theories have been proposed to explain why the brilliantly colored parrots frequent these collpas, or clay licks, and consume the soil there.

Soil samples collected at the collpas and at similar control sites will be analyzed in the lab to determine how the composition of the soil might benefit the birds. Powell hopes his project will shed new light on the value of small-scale landscape features to wide-ranging species.

“My interests have always had a slant toward conservation, and I really love working in the field. This project is a great opportunity to answer an important question in the conservation of these birds,” Powell says.

While macaws are an important part of Powell’s research interests, his master’s project focuses on the rusty blackbird, a small songbird whose range in Maine and elsewhere has been shrinking rapidly in the last 20 years.

**“What really motivates me are the challenges of working in the field to find patterns that help to explain why native birds are disappearing. The ultimate goal is to make discoveries that can be effectively applied to a different species and to use that science to answer conservation questions.”**

**Luke Powell**

# FUSE

## SENIOR STUDIO ART 2007

### FUSE: A NOUN AND A VERB, AN OBJECT AND ACTION.

A fuse can safely interrupt excessive electrical current or set off an explosive charge. To fuse is to blend or melt, mix or combine.

That's just what happens every year in the capstone course for senior studio art majors at the University of Maine.

The senior studio seminar is like a circuit breaker, challenging students on multiple levels to step out of their comfort zones and prepare to participate in the professional art world. The semester-long course each fall also ignites practical plans for how to realistically pursue their artistic passions.

"They get a sense of what it's like to be professional artists, segueing from the student level," says Assistant Professor of Art and painter Ed Nadeau, who teaches the course.

The class is designed to take students from the conceptualization of their individual pieces of art to the installation of a public exhibition of their works. Their art is critiqued twice. They must write theses and artist statements, compile resumes and curriculum vitae. And they must plan and carry out an exhibition — from installation to publicity — that opens every December.

This year, that senior art exhibition was titled *Fuse*.

A focus of the capstone course is on critical thinking and the communication of ideas. Nadeau helps the student artists home in on where their ideas come from and what makes them unique. That introspective exploration becomes theses, which are then distilled to artist statements for the exhibition.

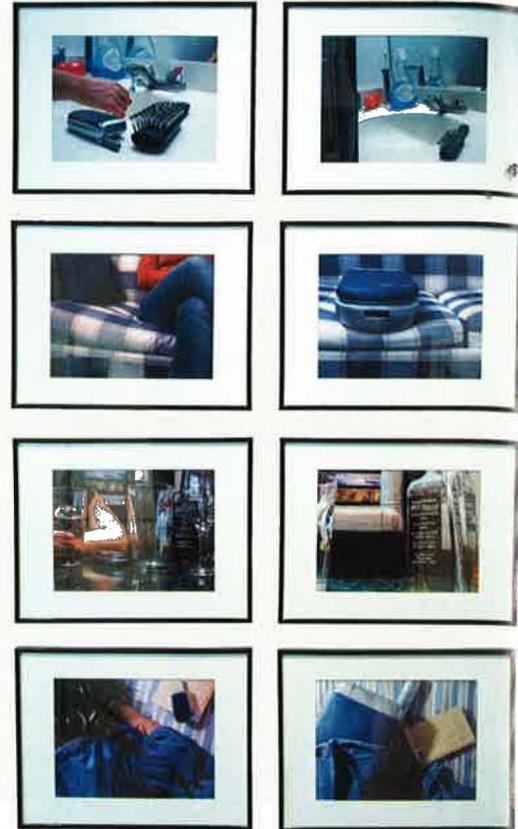
"That's the thread that's difficult," says Nadeau. "They're expected to come up with artwork that they generate. They also have to be able to talk about it formally and conceptually, communicating to their audiences. They have to be able to articulate their ideas and go beyond creating."

In the course, Nadeau also works to dispel what he says is the romanticized myth of the artist as poor, starving, even half-crazed in solitary pursuit of creativity.

"We talk about what is reality, separating fact from fiction," says Nadeau. "Because the students have so many things to juggle in this class, it becomes a metaphor for how they'll have to juggle art in their lives. If they want to be artists, they have to balance their lives — paying the mortgage, feeding the kids, creating."

"Being an artist is about how one lives one's life rather than about just a job. It has to do with how you see life and relate to things. The students walk away with a sense of continuity in how their work fits into the art world."

Olivia Cyr  
A Musing Confidant  
digital photography  
October 2006



"My past may be one of the weightiest origins of my ideas. The home and community I grew up in, the attitudes of my family and our overall lifestyle, as well as the defining moments of my life, are what I consider to be the most influential aspects of my past.

These influences are inseparable from the subjects I incorporate into my art."

*Olivia Cyr*



"I have an enthusiasm for cars, especially European cars from the '60s. My work reflects a frustration with modern design standards. While modern cars are striking, they do not reflect the same passion instilled 40 years ago. I try to reinstate that passion. Proportion is key in giving my cars the correct look. They are more minimal and focus more on implied line."

*Ian Beeuwkes*



Ian Beeuwkes  
Avian  
print  
2006



Ian Beeuwkes  
F6001  
print  
2006



Andrea Gerulat  
Summer  
chalk pastel  
November 2006



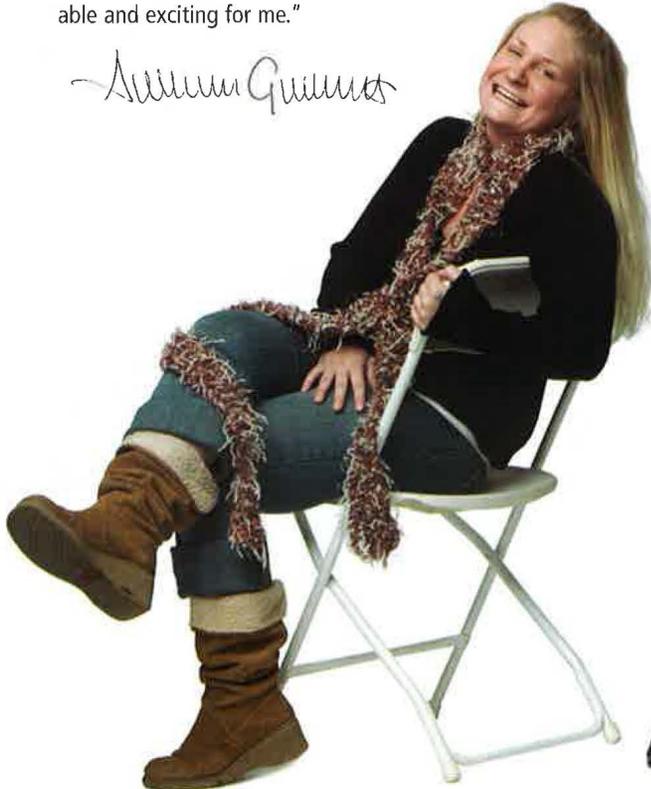
Christy Knights  
Object of Affection  
o/c, wire, cheesecloth  
2006

Christy Knights  
Rain  
o/c, wire  
2006

*Christy Knights*

"I have always been drawn to the human face for inspiration. It has to do with the notion I have of people seeing human forms or faces everywhere they look. I think it is the spontaneity that keeps art and creating enjoyable and exciting for me."

*Aurum Guillot*



"In my work, it is important that the piece allows for living and breathing characteristics, so that you may want to reach out and explore it with more than just your eyes. I have created these works of texture to make you wonder, explore and feel a part deep within that is truly thriving."

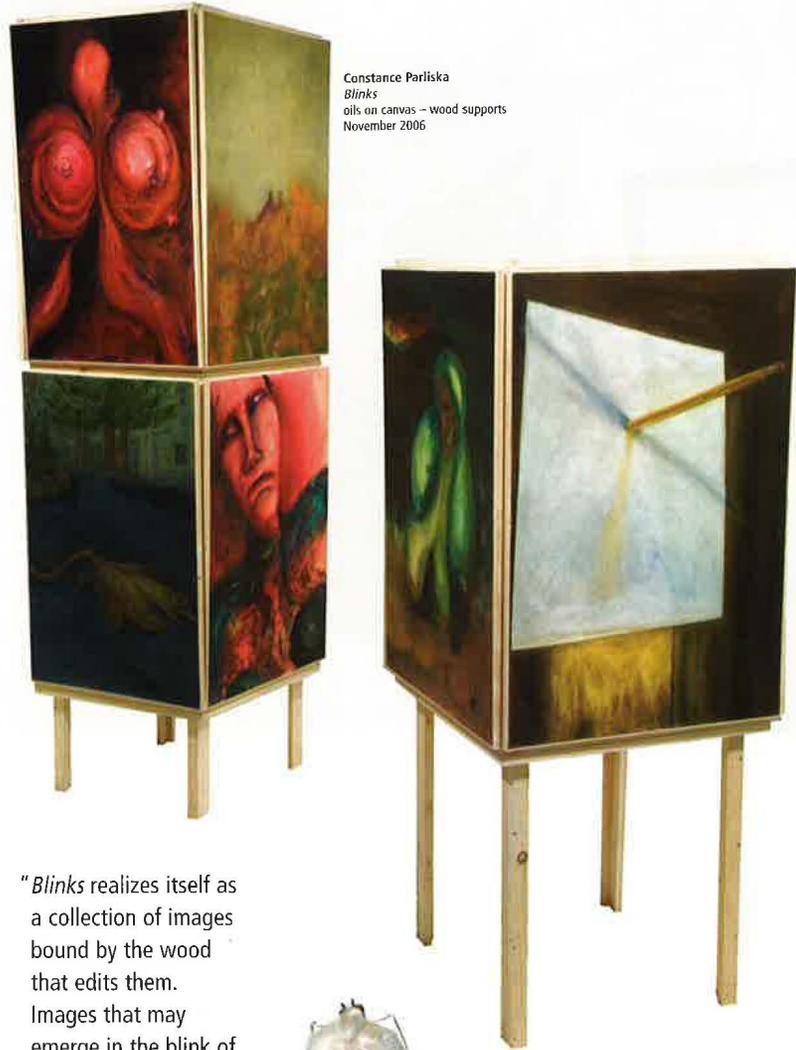


# FUSE

Yeshi Parks  
An Outpost  
oil and collage  
2006

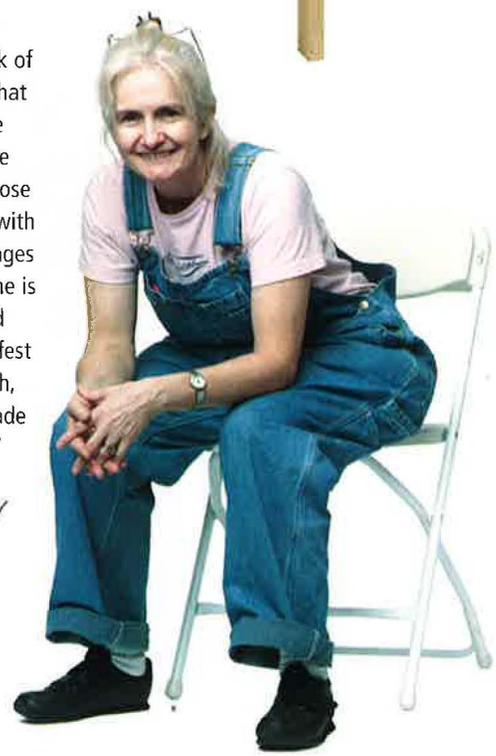


Constance Parlika  
Blinks  
oils on canvas - wood supports  
November 2006



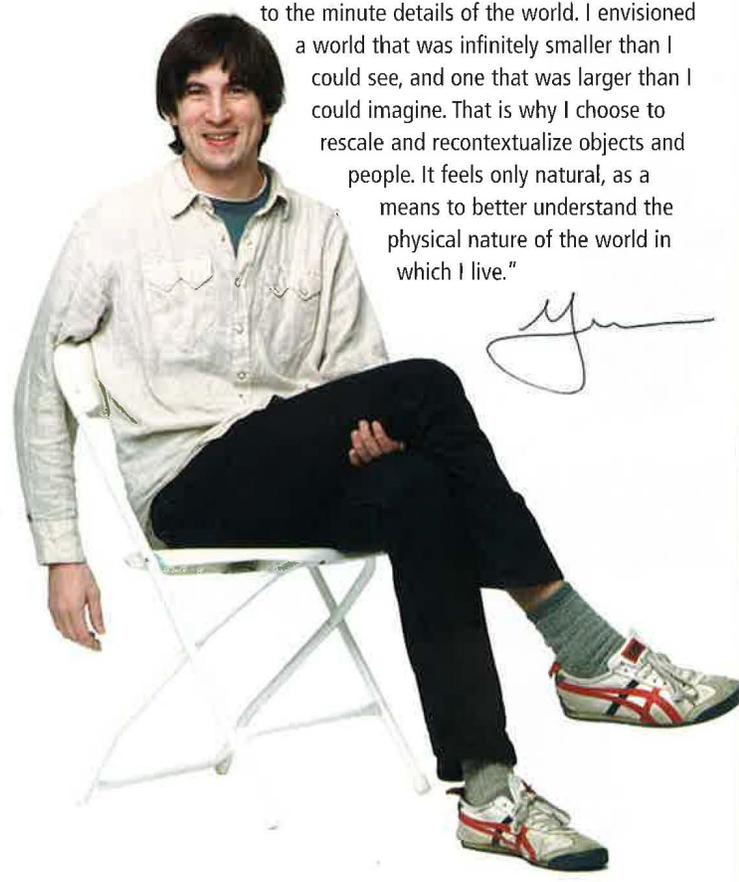
"Blinks realizes itself as a collection of images bound by the wood that edits them. Images that may emerge in the blink of the eye — those that may be seen in the mind's eye with the eyes closed and those that may be seen with the eyes open. Images visualized while one is otherwise engaged that perhaps manifest themselves as myth, memory or manmade in ongoing Blinks."

*Constance Parlika*



"Every since I was a child, I found myself drawn to the minute details of the world. I envisioned a world that was infinitely smaller than I could see, and one that was larger than I could imagine. That is why I choose to rescale and recontextualize objects and people. It feels only natural, as a means to better understand the physical nature of the world in which I live."

*Yeshi Parks*



Katherine A. McRorie  
*Untitled*  
 oil on canvas  
 November 2006



"I am fascinated and obsessed with human form in relationship to body image. The work I am currently doing focuses on these feelings of self-doubt and deprivation. I show my conflicted feelings toward the body through form, composition, color and light."

*Katherine A. McRorie*



"Ideas come from my environment and spirituality, filtered and impacted by present and past emotions, circumstances and situations. Nature is a part of me and I am a part of it. I study, listen, smell and let it infuse me with its story; this is often what I paint."

*Pamela K. Jensen*

Pamela K. Jensen  
*Woodland Pool*  
 oil on canvas  
 2006



Corey Drisko  
*Negative Space 2*  
 mixed media  
 2006

"For me, art has always been about fun, first and foremost. I enjoy telling stories with my art, so strong narrative elements are important. I'm also fascinated with illustration. Many of my strongest influences come from film, so I take it as a very high compliment when someone tells me my art has a cinematic quality."

*Corey Drisko*



"I believe in the tremendous potential of human beings to do equally great and horrible things, and my work seeks to address the whole range of human behavior. My primary interest lies in the various ways we all come to terms with overwhelming detail, and what happens when we can't."



Justin Woollard  
#1: ... like bright metal  
on a sullen ground ...  
Nero lead and graphite  
August 2006

*Justin Woollard*



Laura Giorgio  
No More Tangles  
steel  
2006

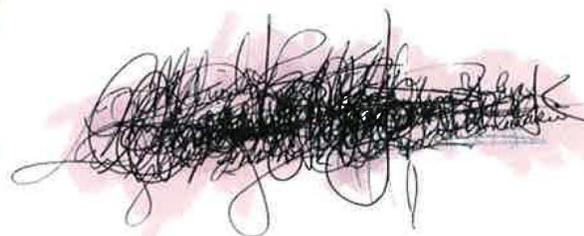
*Laura Giorgio*

"I incorporate storytelling into my work and consider my art an expression of latent memories. For me, art is more than just cathartic expression. It is a preservation of memories and a means of forming them into something new."



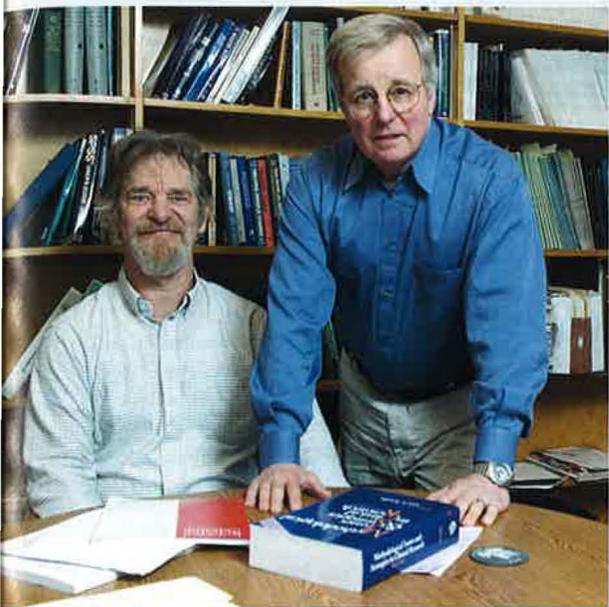
## The **24** artists participating in FUSE

- Ian Beeuwkes
- Andrea Bonatakis
- Amanda Boston
- Aaron Branson
- Ingrid Carey
- Danielle Clark
- Mariel Connor
- Olivia Cyr
- Corey Drisko
- Isaac Dupere
- Cassandra Estabrook
- Andrea Gerulat
- Laura Giorgio
- Melinda Hile
- Pamela Jensen
- Christy Knights
- Kimberleigh Martul-March
- Katherine Mcorie
- Kimberly Moreno
- Colleen Morgan
- Yeshe Parks
- Constance Pavliska
- Melissa Whitt
- Justin Woollard



# perspective

## cognitive function and health



Michael Robbins, left, and Merrill Elias

### Merrill Elias

**Title:** University of Maine Professor of Psychology and Research Professor of Epidemiology in Mathematics and Statistics, Boston University

**Research focus:** Behavioral correlates of hypertension, age and vascular diseases

**Years at UMaine:** 30

**Milestones:** In 1975, initiated the Maine-Syracuse Longitudinal Study, one of the longest-running scientific investigations relating aging, arterial blood pressure and cardiovascular disease risk factors to comprehensive measures of neuropsychological test performance; in 2002, elected a Fellow in the Council of High Blood Pressure of the American Heart Association

### Michael Robbins

**Title:** University of Maine Senior Research Associate and Cooperating Associate Professor of Psychology

**Research focus:** Health behavior and personality in relation to cognitive aging

**Years at UMaine:** 29, including nine as a Ph.D. student

**Milestones:** Joined the Maine-Syracuse Studies in 1981, became an investigator on the Maine-Syracuse Studies in 2000

**Question:** You have been studying the relationship between high blood pressure and cognitive ability for more than 30 years. What have you learned?

**Elias:** When we started in 1975, comparatively little was known about the adverse effect of hypertension on brain structure and function. Today, hypertension is widely recognized as a risk factor for lowered cognitive performance. There were a number of benchmark findings in our ongoing, 30-year longitudinal study: chronic hypertension is related to accelerated changes in cognitive performance at all ages and, although subtle, these changes are progressive; the higher the blood pressure, the greater the rate of change in cognition over time; adverse effects of high blood pressure on cognition cannot be attributed to antihypertensive drug treatment; well-practiced verbal skills are spared by hypertension, but fluid, spatial and working memory abilities are affected, as is speed of performance; hypertensive individuals function very well in activities of daily life; hypertension-related changes in cognition are subtle and quite clearly can be offset by education.

**Question:** What is the relationship between cognitive ability and the risk factors for cardiovascular disease (CVD)?

**Elias:** These studies are ongoing. Thus far, our studies indicate that in persons free from dementia and stroke, modestly lower levels of cognitive performance are seen in the presence of risk

factors such as diabetes; obesity; high blood levels of homocysteine, a product of 1-carbon metabolism; and APOE  $\epsilon 4$  genotype, a gene allele involved in neuronal repair. Again, while deficits are mild initially, the concern is the progression of cognitive deficit over time if modifiable risk factors are not treated and adequately controlled. Not all risk factors are negative. In our studies we find that physical activity, vitamins B12 and B6, and folic acid are positively related to cognition.

**Question:** What can people do to protect their cardiovascular health and cognitive functioning as they age?

**Robbins:** There are health-promoting behaviors that can prevent or at least delay the physical processes that lead to CVD. These include not smoking, being physically active and eating a well-balanced diet. Recent Maine-Syracuse data indicate that lower blood levels of vitamins B6, B12 and folate are associated with poorer cognitive functioning. For some people, vitamin supplements may be appropriate to augment the amounts of these B vitamins in their diet. Once CVD conditions are diagnosed, often medication, along with lifestyle modification, is prescribed for treatment. It is important to follow such treatment regimens closely. Salt intake reduction is important for hypertensive and pre-hypertensive individuals. In order to protect both cardiovascular health and cognitive functioning, being physically and mentally active continues to be important as we age.

**M**ANY COLORFUL DESCRIPTORS could be used to characterize the life of the average suburban songbird, but quiet certainly isn't one of them. Scratching and pecking their way through the hustle and bustle of the urban landscape, house finches, English sparrows and a myriad of other urban species pursue life amid a cacophony of sound. Speeding cars, rattling trains and whining sirens all contribute to the auditory landscape within which the birds must function.

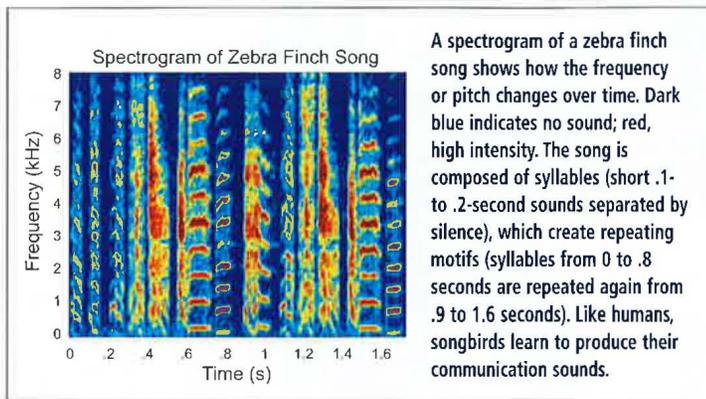
According to University of Maine researcher Thane Fremouw, a bird's nervous system responds to all that noise much like ours does, tuning out the superfluous to avoid auditory overload. Still, selecting the truly important sounds remains critical, even for those birds that have abandoned field and forest for the bounty of suburban feeders and downtown dumpsters. From finding food and avoiding predators to locating mates and identifying members of the flock, being in tune to the sounds of the environment is key to birds' survival.

What Fremouw discovered is that songbirds are able to sort out certain sounds based on the temporal and spectral modulations likely to be most important to them, effectively homing in on sounds that are different than the often repetitive background chatter of everyday life. By allocating more of their nervous system resources to sound patterns that differ from the norm, they are making the most of their listening abilities — and their brains.

"We typically think of the brain as having some limited attentional capacity. From a neuroscience perspective, we wanted to look at how the auditory system can optimize its abilities through specialized processes," says Fremouw, a recent addition to the UMaine Psychology Department. "Traditional auditory neurophysiology focused on playing pure tones and simple sounds to measure neuronal response. There is evidence that such reductionistic approaches might be a little misleading. There might be a benefit to looking at how birds process very complex sounds, including the whole song. By playing complex sounds and using normalized reverse

correlations that get at the specific frequency and timing of the auditory processes, we were able to create maps of the neuronal response that show how the birds respond differently to one part of the song than they do to another."

Fremouw was then able to apply the birds' neural response maps to bird song data from the field to show that they were allocating more processing capacity to specific parts of the song.



"They were concentrating their resources on the outliers to discriminate between songs, homing in on certain sounds," says Fremouw. "They were finding more efficient ways to process sound."

The neurophysiology of this type of auditory sorting process in birds not only offers clues to how they respond to their environment, it also helps to provide the basis for understanding how humans discriminate between sounds and how the human brain processes what it hears.

"How we code information in the brain depends on the nature of the

stimulus. It's important to understand how the system optimizes itself so that we can discover how best to treat individuals with hearing problems," says Fremouw.

In a related line of research, Fremouw is working to bridge the gap between the physiology-based research being done on birds and other animals, and the study of human language and consciousness. By looking at the neurological basis for processing spatial relationships, categorization techniques and memory, and comparing that data to what is known about those same factors in humans, he hopes to provide scientists with better tools for understanding the similarities and differences between humans and other animals.

"In many areas, there seems to be a rift between the research work on humans and the studies being done on animals related to consciousness and language," says Fremouw. "Studies on humans rely heavily on language and consciousness to measure memory and categorization, while the work on the neuronal level is happening in animal research. Quite frequently, we tend to view having consciousness as being the same as having language, and there are already some examples where this simply isn't the case."

Fremouw is working to build connections between the separate worlds of human and animal research by studying how pigeons behave in categorization experiments. By comparing the pigeons' performance with that of humans, Fremouw is able to map the relationships and fine-tune the experi-

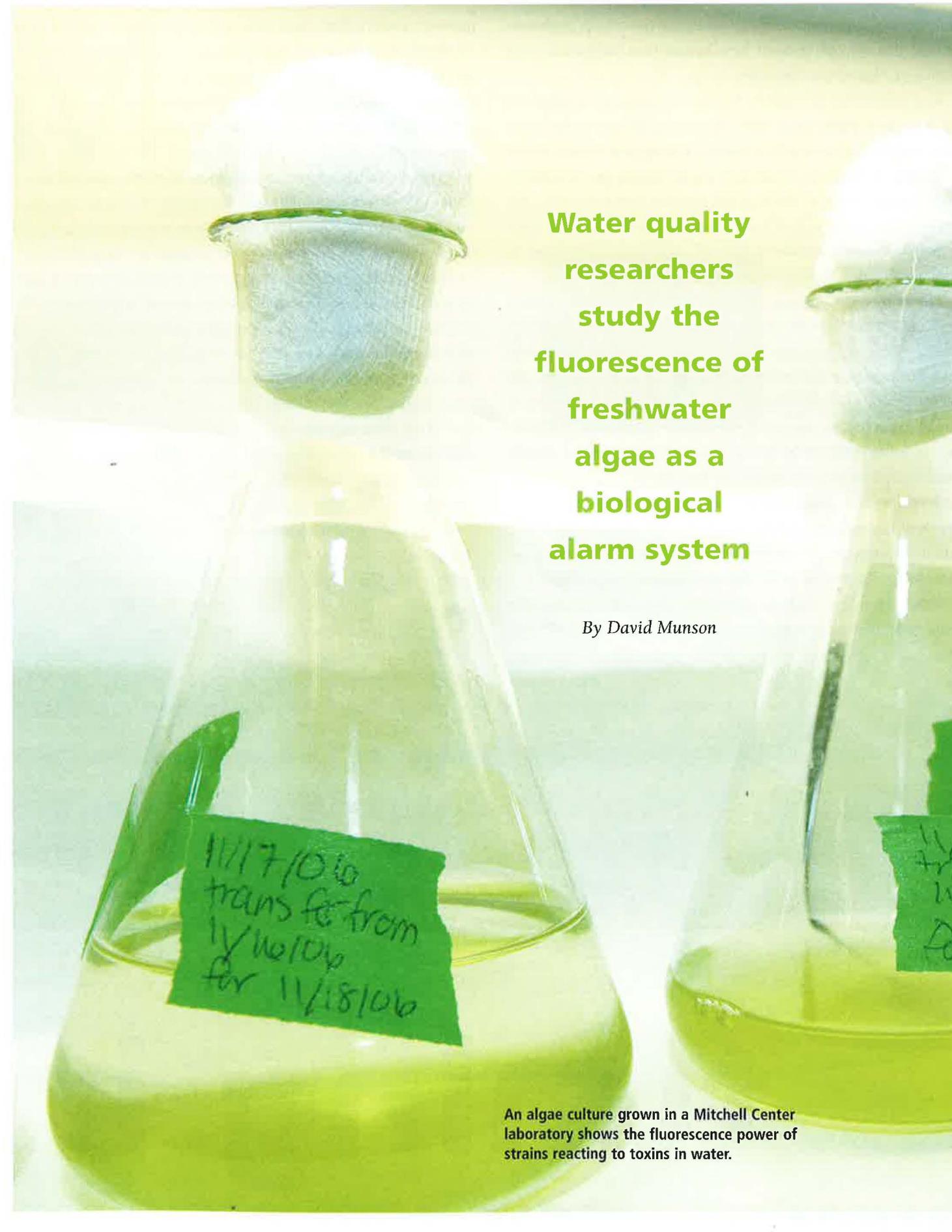
ments to create a bird model that applies to human research in a meaningful way. By identifying a clear connection between humans and birds in behavioral and cognition studies, Fremouw hopes researchers will be better able to apply what is known about the physiology and chemistry of the avian nervous system to research for humans.

"This research could not only help us to answer specific questions, like determining which neurotransmitters and neuronal circuits affected by Parkinson's disease play a major role in cognition, it also gets at what it means to have language," he says. "Songbirds can create novel arrangements and develop new strings that are grammatical. They have some of the same processes that are involved in language. This is an opportunity to find out what brain functions allow that type of processing. It says a lot about what the animal mind is like. Are they like us? And, if so, what are the implications?" ■

By David Munson

# tuning in

Sorting process offers clues to how humans discriminate between sounds



**Water quality  
researchers  
study the  
fluorescence of  
freshwater  
algae as a  
biological  
alarm system**

*By David Munson*

An algae culture grown in a Mitchell Center laboratory shows the fluorescence power of strains reacting to toxins in water.

# Warning Light

**T**IRELESS, INCONSPICUOUS and keenly aware, they are perhaps the perfect sentries: free-floating algae that are extremely sensitive to their environment, reacting in predictable ways to any toxins that invade their aquatic homes. A team of University of Maine scientists is working to harness the natural sensitivity of these primitive plants, with the goal of ensuring a safe supply of drinking water for all.

Ubiquitous and lightly tinged with green, freshwater algae species with unwieldy names like *Ankistrodesmus falcatus* may soon serve in the same capacity as the proverbial canary in the coal mine, providing a biological alarm system that warns of potential threats to human health.

"In nature, algae fluoresce and give off light," says John Peckenham, assistant director of the Sen. George J. Mitchell Center for Environmental and Watershed Research at UMaine. "Toxins have a clear effect on how algae fluoresce. After the attacks of 9-11, we began to look for ways to use this behavior as a monitoring device to help ensure the security of our drinking water."

Combining the Mitchell Center's extensive expertise in environmental monitoring and water quality with UMaine chemistry professor Howard Patterson's experience with the molecular properties of fluorescence,

Peckenham built a multifaceted team that includes bio-optical oceanographer Collin Roesler of the Bigelow Laboratory for Ocean Sciences and a highly skilled core of graduate and undergraduate researchers.

With more than \$400,000 in funding from the federal Environmental Protection Agency's homeland security research programs, the team is in the midst of devel-

**The team is in the midst of developing an algae-based sensor system that can be easily integrated into existing public water supply monitoring networks to warn of potential threats to human health.**

oping an algae-based sensor system that can be easily integrated into the existing monitoring networks of public water supplies.

"The Department of Homeland Security is obviously concerned about drinking water safety and the security of our water resources, both with regard to accidental contamination and terror threats," says Patterson. "The idea is to devise a network of sensors that can monitor the algae population in our lakes, ponds and reservoirs, and tell us if the water is okay to drink."

ONE OF THE PROJECT'S key researchers is Jamie Pinto, a graduate student in UMaine's Ecology and Environmental Sciences Program. After overcoming the challenges of establishing pure algae cultures in the lab, Pinto began the daunting task of quantifying the algae's relative responses to toxins. The tiny plants react in distinctly different ways to various contaminants, making them uniquely valuable for water quality monitoring.

"Algae are particularly useful because of their rapid response to environmental changes," says Pinto. "Toxic contaminants introduced to water supplies cause changes in algae chlorophyll chemistry, which can be monitored using fluorescence technology or sensors. We are working to determine how different toxins affect algae fluorescence intensity and if these effects are similar for different types of algae and different types of toxins — how they change with stress as a function of the stressor."

Once a baseline response is established for each potential toxin, the associated fluorescence levels for the algae become a computer-based standard against which sensor data can be immediately evaluated. Working around-the-clock, a sensor array installed in a public water supply could rapidly locate and identify a contaminant by measuring its fluorescent signature in the



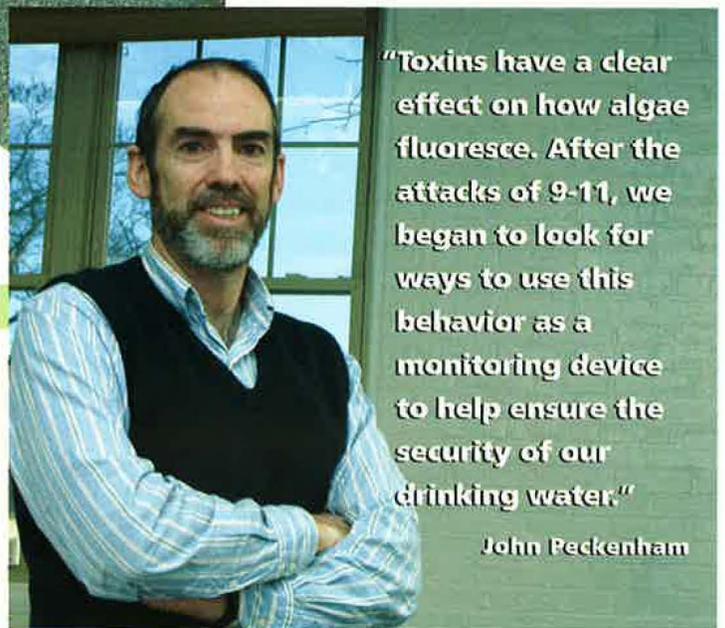
Second-year graduate student Jamie Pinto, left, leads a team of undergraduate researchers at the Sen. George J. Mitchell Center for Environmental and Watershed Research, where the focus is on cultivating strains of algae species. Working with Pinto are, left to right, Sarah Sturgell, Whitney Varney, Jordan Duncan and Amanda Maloney. Internationally recognized for its leadership in water quality research, the Mitchell Center is a critical resource for researchers who study Maine's water resources.

pond's native algae population against a database of known signatures at the local water company.

Working with Collin Roesler of Bigelow and Andy Thomas from UMaine's School of Marine Sciences, graduate student Chris Proctor is conducting experiments with an in-situ sensor in water supply lakes. New technology will be built around the device.

To ensure that the new monitoring technology being developed will transition smoothly into commercial use, Peckenham also enlisted the help of Sewell Engineering Co., in Old Town, Maine. Experienced with monitoring systems, as well as GIS systems and mapping, the company was a perfect fit for the project. It will assist with the logistics of maintaining both the sensors and the fluorescence library in a way that is efficient and reliable enough for commercial use.

BY INSTALLING AN ARRAY of sensors in the water supply, the system allows utilities to more accurately isolate the source of contamination and helps to avoid false alarms. According to Peckenham, water companies are interested in the technology not only because it can be easily integrated into existing systems, but also because the sensors can monitor the algae population.



**"Toxins have a clear effect on how algae fluoresce. After the attacks of 9-11, we began to look for ways to use this behavior as a monitoring device to help ensure the security of our drinking water."**

**John Peckenham**

**"The idea is to devise a network of sensors that can monitor the algae population in our lakes, ponds and reservoirs."**

**Howard Patterson**

Roesler has developed a way to distinguish between different species of algae based on their fluorescence, providing water companies an early warning system for algal blooms and other imbalances in the water supply.

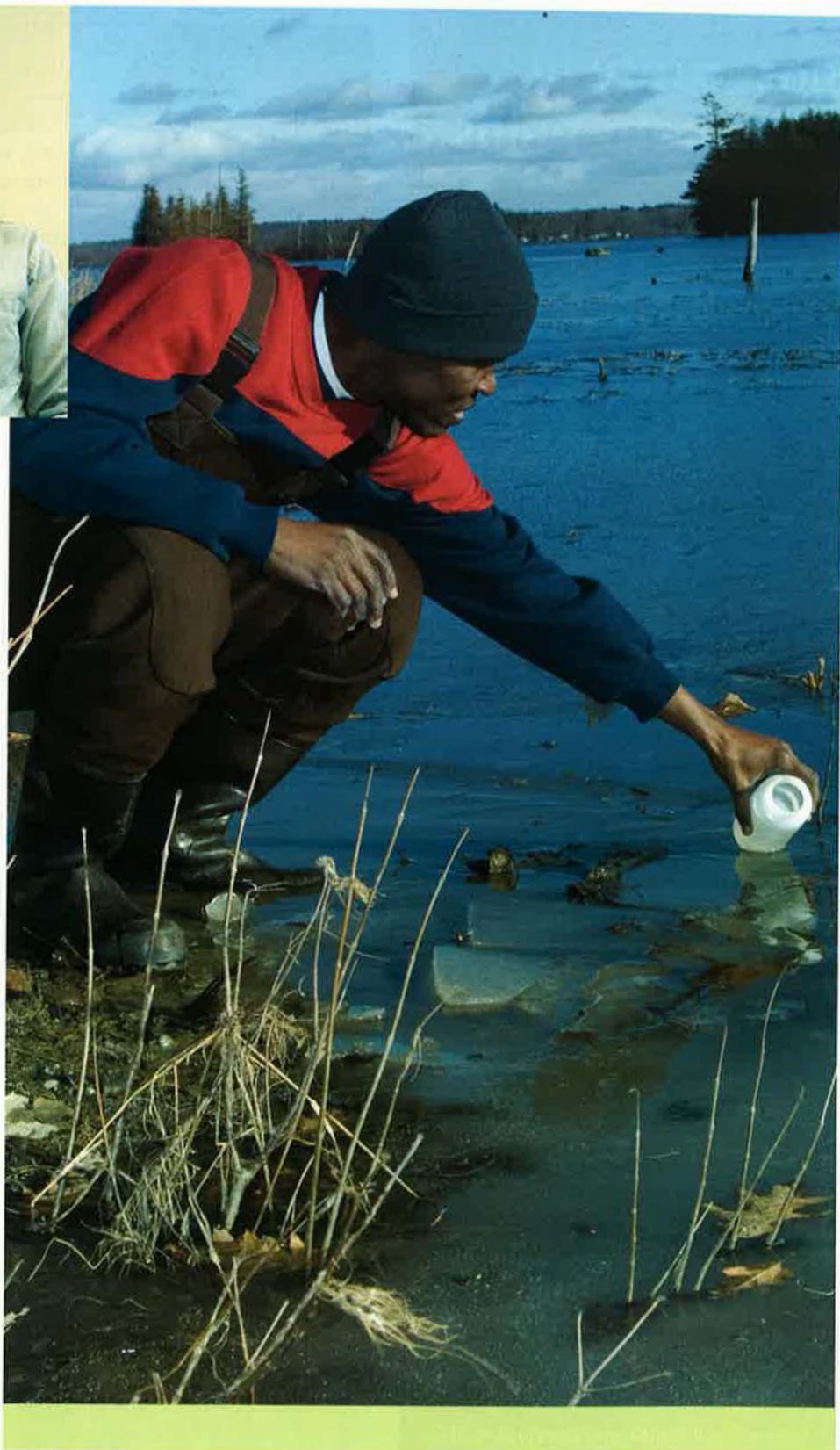
"Making sure that this technology gets put to use is critical," says Peckenham. "The real goal here is to develop a new technology that we can take to market as a security system."

The project's emphasis on the reliability of the system is revealed in the methods used for examining the algae. While Pinto cultures pure strains of certain species in the lab, doctoral student Lucner Charlestra is in the field, applying cutting-edge sampling techniques to make sure that the project is based on an accurate assessment of the native algae populations.

The relative fluorescence of samples Charlestra has collected from area water supplies are quantified along with the laboratory cultures, providing a more realistic picture of what can be expected in the field.

The project promises to improve both the security and management of public water supplies. It already is proving to be an outstanding model for collaboration in addressing environmental concerns.

"The real beauty of it is that this system can protect our water by responding not just to one or two kinds of toxins, like most tests, but also to any toxin that enters the water supply," Peckenham says. ■



**In the field, Ph.D. student Lucner Charlestra retrieves samples from area water supplies to ensure that the project is based on an accurate assessment of native algae populations. Charlestra and Jamie Pinto, both doctoral students in ecology and environmental sciences, have as their Ph.D. adviser Howard Patterson, professor of chemistry.**

# Biosecurity in the potato fields

**P**OTATO WART, a highly contagious fungal disease of potatoes, can not only ruin a potato crop, it can destroy the agricultural value of the soil it infects for decades. So virulent that it has been listed as a threat to the nation's biosecurity by the federal government, potato wart has had a devastating impact on European agriculture and can be found just beyond Maine's borders in isolated areas of Newfoundland, Canada.

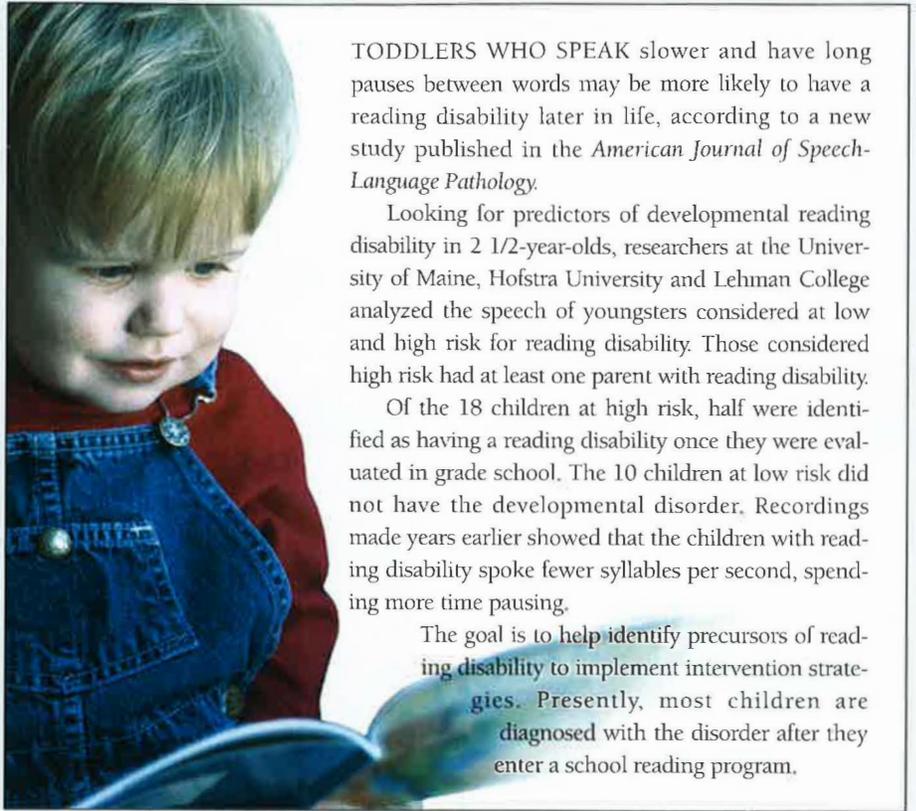
University of Maine researchers Laurie Connell and Rosemary Smith are combining their expertise in molecular biology and sensor development to help combat the dangerous disease. With a four-year, \$800,000 grant from the United States Department of Agriculture Biosecurity Program, Connell and Smith are working with Steven Woods of the Canadian Food Inspection Agency to create a fast and effective device for detecting potato wart in soil.

The mobile, handheld sensor currently being developed will use groundbreaking techniques in nanotechnology to identify the RNA sequence specific to the potato wart pathogen, providing faster, more accurate results than the field identification techniques currently in use. The new sensor, which utilizes a bridge of gold nanoparticles that reacts to specific molecular configurations, could provide researchers with an important new tool for detecting a broad range of potential toxins and pathogens in the field.

Connell and Smith are developing the specialized surfaces and attachment methods required for the nanoparticles and streamlining the process for extracting the potato wart pathogen from the soil. The project promises to greatly improve the chances of early detection of the disease, which is critical to its control.



# Toddler talk



TODDLERS WHO SPEAK slower and have long pauses between words may be more likely to have a reading disability later in life, according to a new study published in the *American Journal of Speech-Language Pathology*.

Looking for predictors of developmental reading disability in 2 1/2-year-olds, researchers at the University of Maine, Hofstra University and Lehman College analyzed the speech of youngsters considered at low and high risk for reading disability. Those considered high risk had at least one parent with reading disability.

Of the 18 children at high risk, half were identified as having a reading disability once they were evaluated in grade school. The 10 children at low risk did not have the developmental disorder. Recordings made years earlier showed that the children with reading disability spoke fewer syllables per second, spending more time pausing.

The goal is to help identify precursors of reading disability to implement intervention strategies. Presently, most children are diagnosed with the disorder after they enter a school reading program.

# Arresting Protesters

**SOCIAL DISSENT** sometimes leads to confrontations with the police and possible arrest. Studies of social movements have examined the types of police response to such protest. But according to a University of Maine sociologist, the criminal justice treatment of protesters — what happens to them after their arrest — also is significant in understanding the social control of dissent.

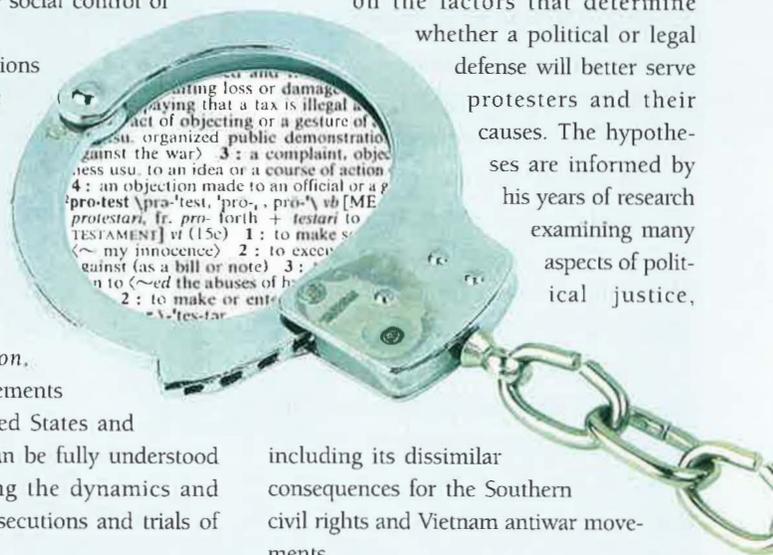
"Protest prosecutions create a very public and potentially dramatic stage for repression and dissent to play out," says Steven Barkan, writing in the international journal *Mobilization*.

"Neither social movements nor law in the United States and other democracies can be fully understood without appreciating the dynamics and outcomes of the prosecutions and trials of political activists."

After a protest arrest occurs, prosecutors and judges respond to legal misconduct and political threat, while protest defendants struggle to balance the needs of their cause and their own political convictions with concerns for their personal welfare.

Barkan proposes eight hypotheses on the factors that determine whether a political or legal defense will better serve protesters and their causes. The hypotheses are informed by his years of research examining many aspects of political justice,

including its dissimilar consequences for the Southern civil rights and Vietnam antiwar movements.



# Media and the military



A STUDY OF a decade of news coverage of U.S. military interventions around the world beginning in the early 1980s shows that American public opinion was most favorable when the Pentagon insisted on media pools, according to a professor of journalism at the University of Maine.

In a military media pool, a small number of participating reporters agree to share their coverage with other news outlets. Military censors clear their reports.

Shannon Martin's research involved the content analysis of nearly 20,000 media articles and transcripts covering U.S. military intervention from the 1980s–90s. Her goal was to determine if there is a correlation

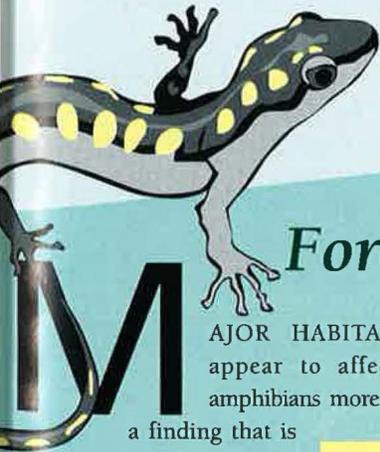
**Message managers know that the public considers the reasons for military deployment as important as the results of the action. The way that action is framed affects public opinion about the "rightness" of the military intervention.**

between the characterization of the intervention by pool reporters and the shifts in public opinion during the U.S. troop deployments to Bosnia and Herzegovina, Grenada, Haiti, Iraq, Lebanon, Libya, Panama and Somalia.

Martin found that when U.S. media were constrained by military pooling, the news corps characterized the military intervention as facilitating local change in government and public opinion was initially favorable. When the media were

not constrained by military pooling, intervention was characterized as part of a humanitarian effort and public opinion was less favorable.

The tactic suggests savvy agenda framing and agenda setting among military operations planners who organize the media pools, says Martin, who published her findings in the *Journal of Peace Research*.



## Forests and amphibians

MAJOR HABITAT changes appear to affect juvenile amphibians more than adults,

partial-cut tracts compared to clear cuts. In particular, the number of wood frog juveniles was significantly higher and the animals larger in uncut and partial-cut areas.

**If fewer juvenile amphibians choose to enter clear cuts, the probability of successful dispersal and the amount of available habitat are reduced.**

The University of Maine study corroborated previous research that

found fewer amphibians in clear cuts, with adult green frogs and American bullfrogs showing more tolerance for canopy removal.

But the findings also showed that uses of habitat by adult and juvenile amphibians differed. The UMaine researchers found that juvenile amphibians choose to move through forest rather than open-canopy areas, and partial canopy removal may reduce the abundance of many species.

The study by UMaine wildlife ecologists David Patrick and Malcolm Hunter, and wetlands ecologist Aram Calhoun was published in *Forest Ecology and Management*.



## Fueled by seeds

WORKING IN collaboration with businesses in northern Maine, University of Maine Cooperative Extension Crops Specialist Peter Sexton has completed a pilot project that successfully converted Maine-grown seed crops into 1,000 gallons of biodiesel. The project offers an exciting glimpse into Maine's potential as a producer of oilseed for fuel.

Sexton planted 30 acres of oil-rich mustard and canola in Aroostook County. The experimental plots yielded more than 25 tons of oilseed, which was pressed by CHB Proteins, an independent mill that is one of several small businesses participating in the project.

More than 2,000 gallons of raw canola oil was extracted from the seeds harvested from Sexton's test plots. A portion of the thick, amber oil was later blended with petroleum-based fuel to produce the state's first 1,000 gallons of homegrown biodiesel, an alternative blend that can be used in the same way as traditional diesel fuel without any engine or burner modifications.

More than half of the biodiesel is being used for home heating and fueling farm equipment in northern Maine. Already available at select sites across the state, biodiesel produced elsewhere is rapidly increasing in popularity as an alternative to all-fossil fuels produced largely overseas.

While oil from field crops will likely remain only a small piece of the nation's energy puzzle, Maine has the potential to greatly increase its oilseed production.

"Within the potato rotation in Maine, if we produce 10,000 to 15,000 acres of canola, then we could in theory produce approximately 800,000 to 1,200,000 gallons of biodiesel," says Sexton.

## Assessing aquatic animal health

**A** MORE THAN \$396,000 grant from the state's Marine Research Fund will be used to purchase equipment to facilitate applied research in marine animal health assessments and investigations at the university's new Maine Aquatic Animal Health Laboratory (MAAHL).

Several instruments will enable MAAHL to serve as a magnet research facility for marine researchers. For example, a Biolog Microbial Identification System will allow for database building and consistent identification of microbial assemblages of marine aquatic animals. The system will be key to lobster and mollusk diagnostics and health assessments. Plans call for the Biolog to eventually be made available for outside users and sample submissions. The database can be shared with private and government aquatic animal diagnostic laboratories, providing a vital tool for bacterial identification.

The Marine Research Fund grant also facilitates the establishment of the state's first, state-of-the-art marine samples repository, featuring high-capacity -80C freezers and a computerized laboratory information management system. The repository will facilitate comparative studies over time and provide historically supported scientific data critical for informed ecosystem management.

With a fully equipped lab in place, MAAHL personnel will be better able to support marine animal health research, and foster entrepreneurial activity and technology transfer.

MAAHL is a collaborative service of UMaine's Department of Animal and Veterinary Sciences, Cooperative Extension, and the Lobster Institute.

## Historic heavy metals

MORE THAN A century after silver and copper mines went bust along Egypt Stream in Maine, scientists are finding elevated levels of heavy metals in adjacent coastal bay sediments.

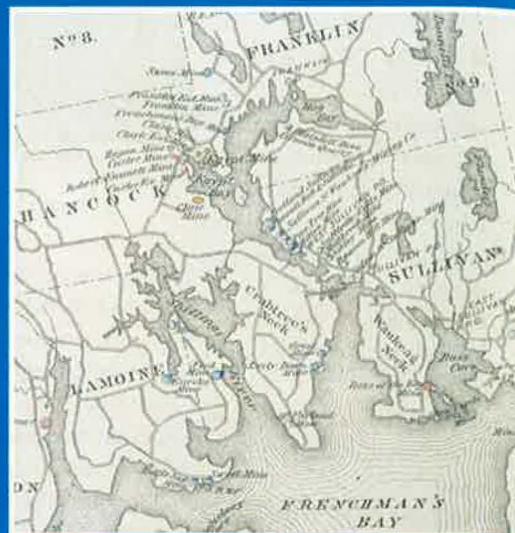
The findings by University of Maine researchers illustrate that estuarine sediments provide well-preserved records of coastal land use history. Despite mixing by worms, these materials also recorded the deposition of more recent contaminants, including metal and radiogenic particles from the atmosphere.

In 1877, a vein of silver and copper was discovered along the banks of the Taunton River. Within eight years, there were 50 mines in the upland surrounding Taunton Bay, with shafts up to 24 meters deep. Mining activities in the Egypt Stream watershed in Hancock County lasted through the early 1900s. The stream feeds Egypt Bay, part of the Taunton Bay estuary.

Soil samples collected in tailings piles at a former copper mine in the watershed revealed elevated levels of cobalt, zinc, silver and cadmium. The surface soils surrounding the historic mine were not contaminated.

Analysis of sediment from 26–34 cm depths in Egypt Bay identified heavy metal enrichment comparable to the soils in the tailings piles. Lead 210 dating of the metal-contaminated silts and clays determined that they were deposited at the time the historic mines operated.

Laurie Osher of the Department of Plant, Soil and Environmental Sciences led the research that involved five UMaine scientists. Their findings appeared in the journal *Estuarine Coastal and Shelf Science*. The research was initiated by former student Lauren LeClerc.



Atlas of Hancock County, Maine, S.F. Colby & Co., 1881; Fogler Library Special Collections

## Genome of deadly fungus sequenced

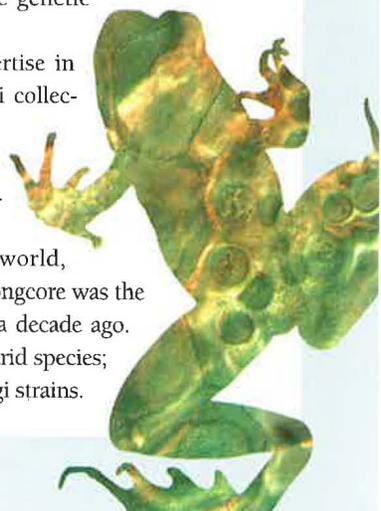
RESEARCHERS AROUND the world now have a valuable new tool for studying the deadly *Batrachochytrium dendrobatidis* fungus, thanks to the efforts of scientists at the Broad Institute, Timothy James of Duke University and University of Maine researcher Joyce Longcore.

The fungus' genome sequence consists of more than 20 million base pairs, offering scientists new insights into the genetic nature of the pathogen.

One of only a handful of researchers with expertise in identifying and culturing the unusual group of fungi collectively known as chytrids, Longcore provided the diploid strain of *B. dendrobatidis* that was sequenced by the Broad Institute's Fungal Genome Initiative team. James extracted the DNA from Longcore's cultures.

Implicated in amphibian declines around the world, *B. dendrobatidis* is the first chytrid to be sequenced. Longcore was the first to isolate a pure culture of the pathogen nearly a decade ago. Her research focuses on the relationships between chytrid species; her lab is the world's leading repository for chytrid fungi strains.

UPDATE



## last impression



**I**N A WORLD WHERE research projects typically last three to five years, the University of Maine's Bear Brook Watershed in Maine (BBWM) study is in a class of its own, having contributed nearly 20 years of comprehensive and continuous data to our understanding of how forest ecosystems react to ever-changing environmental conditions. At Bear Brook, the whole-ecosystem approach to studying the effects of a changing physical and chemical climate began in the late 1980s, when bimonthly treatments of ammonium sulfate began being dropped by helicopter on one of the two watersheds being examined. Ever since, the effects of these treatments have been measured against an untreated reference watershed, providing UMaine researchers and their collaborators over time with invaluable data on soil cation depletion, nitrogen saturation, soil and stream acidification, and forest chemistry.

From acid rain impact studies to ongoing research on the effects of climate change in the new century, the Bear Brook project has resulted in more than 100 scientific publications, and provided insights into ecosystem response and adaptation that simply cannot be accurately measured in short-term research projects. By providing researchers, managers and legislators with reliable, long-term information on areas ranging from surface water chemistry to root dynamics and vegetative chemistry, BBWM continues to set the standard by which forest ecosystem and watershed research is judged, and effective policy and management practices are developed.

## Natural stewardship

UNIVERSITY OF MAINE STUDENTS Catherine Kropp and Nicole Mercier are most at home in the natural world. And that's where they plan to make a difference.

Kropp and Mercier are both majoring in forest ecosystem science. Kropp, a senior, also will receive a degree in wildlife ecology. Mercier, a junior, has an academic focus on conservation.

"I want to bring my love for Earth and my attitude toward the living world to the forest and its stewards," says Mercier. "All the money in the galaxy couldn't get me out of my tree."

For two consecutive years, Kropp and Mercier have received financial aid from the **Abnaki Girl Scouts Sarah J. Medina Scholarship Fund in the University of Maine Foundation**. The fund was established in 2004 with gifts from the Seven Island Land Co., and the colleagues and friends of Sarah J. Medina. Medina was one of a handful of women who graduated from the Forestry Program in the early 1970s. She has been involved with Girl Scouts for many years, including six years as council president.

The fund is earmarked for students majoring in forestry-related programs who, like Medina, have been committed to Girl Scouting, and are dedicated to the ideals of sustainable forest management and responsible stewardship of land.



Catherine Kropp, left,  
and Nicole Mercier

UNIVERSITY of MAINE  
**FOUNDATION**