

Empire mapping

Why not?

Sports writers

UMaine Today

CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE

FALL 2012



Being there

Braving spring in the North Atlantic
to understand the planet-sustaining
forces beneath the waves



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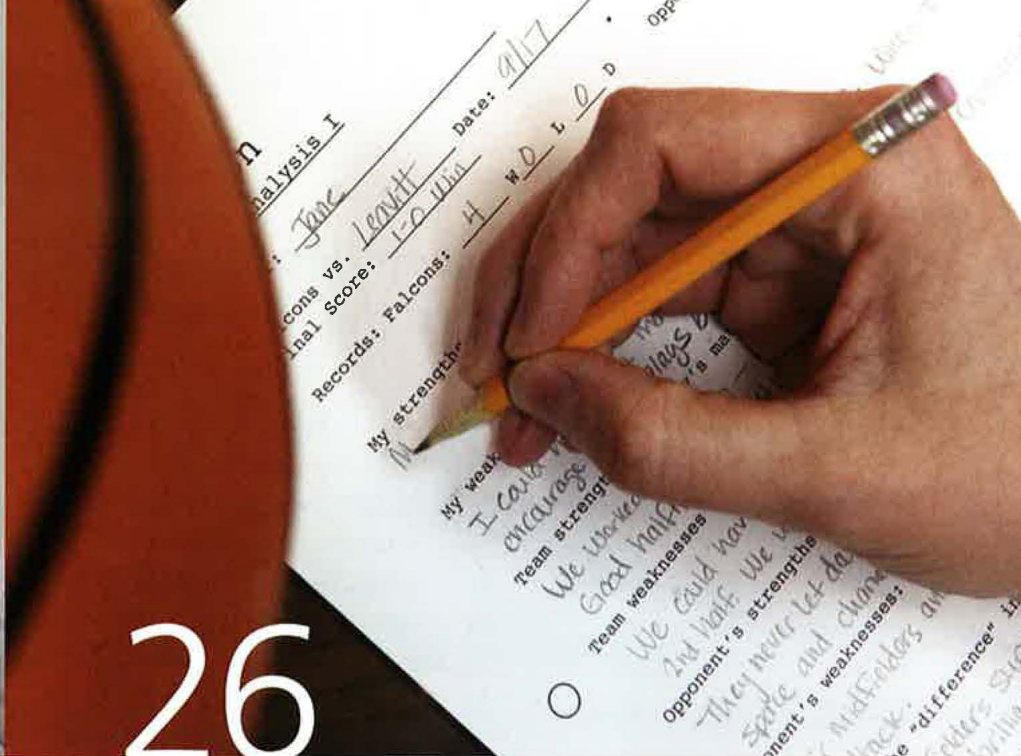
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For athletes from Olympians to high school players, keeping a journal can be a way to “decompress, unpack mentally and think critically” about their sporting events, according to education researcher Richard Kent.



ON THE COVER: A fierce early April North Atlantic storm greeted the scientists on the 2008 North Atlantic Bloom Experiment expedition as they prepared to deploy the gliders and float from the Icelandic research vessel *Bjarni Saemundsson*. See related story on page 2.

Photo by Eric Rehm



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An unprecedented expedition to the North Atlantic yields new insights into the life-sustaining spring bloom

SPRING IN THE North Atlantic is formidable. Storm-lashed, frigid, gray. The subpolar region is so tumultuous that ever-vigilant space satellites often can't penetrate the almost perpetual cloud cover, unable to provide a clear view of one of the most important life-sustaining events on the planet — the spring phytoplankton bloom.

That means if researchers ever hope to understand the phenomenon, they have to take to the high seas.

In 2008, an international expedition called the North Atlantic Bloom Experi-

ment, funded by the National Science Foundation, did just that. It was the first to put marine scientists in the North Atlantic to observe the entire progression of the spring bloom over a three-month period, from development to demise.

They did that by using underwater robotic gliders and a float developed by University of Washington researchers that reported conditions between the surface and 1,000 meters several times per day, from early April through late June. High volumes of data were literally “phoned home” by the robots via Iridium satellite.

Now, the discoveries made possible by unprecedented, in situ data collection are

being made public. The most recent announcement came in July when the National Science Foundation and the journal *Science* reported the results of one of the experiment's studies — the discovery that the spring bloom can begin up to 30 days earlier than previously thought as the result of eddies stratifying the near-surface waters, rather than springtime warming of the ocean surface.

These new contributions to our understanding of the North Atlantic spring bloom, one of the largest in the world, will inform modeling by marine and climate scientists, according to University of Maine biological oceanographer Mary

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By Margaret Nagle

Jane Perry, who was among the 26 researchers from five countries on the expedition. The research findings also have implications for the Gulf of Maine, which is fed by the waters of the North Atlantic and supports similar species.

Major changes in the Gulf of Maine — including the influx of freshwater from accelerated melt in the Arctic and Greenland, and shifts in the marine food web — often occur first in the North Atlantic. But unlike the terrestrial ecosystem, scientists understand much less about North Atlantic phenology, Perry says, including annual variability, patterns and mechanisms.

“The North Atlantic is a really special place — a really important part of the ocean — because what happens there is so important to the atmosphere’s carbon dioxide cycle,” says Perry. “This subpolar region is responsible for more than 20 percent of the entire ocean’s uptake of carbon dioxide, and phytoplankton have an important role in that drawdown.”

A small red flag (photo below) indicates the location of a robotic float moving with the waves of the turbulent North Atlantic. At right, engineers Michael Ohmart and Adam Huxtable prepare to launch an underwater sea glider as part of the North Atlantic Bloom Experiment. Photos by Eric Rehm



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PHYTOPLANKTON, WHICH include diatoms and dinoflagellates, are microscopic plants at the base of the marine food web that fuel the ecosystem. The photosynthetic organisms also help maintain the health of the atmosphere by absorbing and sequestering carbon dioxide caused by the burning of fossil fuel.

For more than a quarter-century, starting at the University of California, San Diego, Perry has studied marine phytoplankton in an effort to understand its biomass variability and production dynamics. In recent years, her focus has been on the interaction of phytoplankton and light in the ocean.

The quest to better understand phytoplankton has taken Perry on two major expeditions to the subpolar North Atlantic. Her first research cruise was as a faculty member at the University of Washington in the early 1990s as part of a Cold War-era initiative. The focus was on light propagation in the open ocean, where phytoplankton play a role in how deep in the ocean light can penetrate. That variability was particularly important when employing laser technology to detect Russian submarines and for friendly undersea laser communications.

While it was the shortcomings of technology — the inability of moorings to provide a comprehensive spatial view and of satellites to see through clouds — that sent Perry to the North Atlantic, it was the latest in autonomous underwater profiling floats and sea gliders equipped with sensors that made the second expedition so successful. A mixed-layer float hovered in near-surface waters, moving with the ocean. The 6-foot gliders surveyed the

area to depths of up to 1,000 meters, returning to the surface to transmit data.

The autonomous underwater robots compiled information about the physical environment, including temperature, salinity and velocity of the water, as well as data about the chemistry and biology of the phytoplankton bloom, oxygen and nitrate levels, and unique optical signatures of the tiny plants.

“When we started the expedition in 2008, a big storm greeted us and we were thrown about for three days,” Perry says. “We were tossed about by the waves that were crashing over the wheelhouse. It’s one of the many good reasons for doing data collection autonomously with this kind of technology.”

JUST AFTER JOINING the UMaine School of Marine Sciences in 1999, Perry was instrumental in the development of autonomous glider technology for remote deep-sea data gathering. Her contribution focused on leading a project that designed optical sensors to measure phytoplankton and particulate carbon in the water column. Her efforts to improve the efficiency and effectiveness of the sensor technology, including miniaturizing it from the size of a football to a hockey puck, is reflected in every autonomous marine glider manufactured in the United States today.

Perry’s interest in robotic technology was driven by her life-long interest in trying to measure and observe the



Twenty-six scientists, including 13 students, were part of the North Atlantic Bloom Experiment in 2008. Among them were UMaine undergraduate student Jennifer Fortier and graduate student Nathan Briggs, seen here bringing the conductivity, temperature, depth (CTD) and water-sampling bottles safely back to the deck of the research vessel *Knorr*. Photo by Dane Wojcicki

patterns and amounts of phytoplankton as the base of the food web, and understand why the patterns change. On the 2008 expedition, which involved four research cruises of up to 21 days south of Iceland, data collected by optical, chemical and physical sensors on four gliders, a float and the ship were coupled with a 3D biophysical model. The result was unprecedented documentation of the spring bloom from beginning to end, including previously unknown aspects of its mechanics.

The discovery announced in July was the result of a study led by Amala Mahadevan of Woods Hole Oceanographic Institution, Eric D'Asaro and Craig Lee of the University of Washington, and Perry. Their research revealed that eddies or small whirlpools of swirling seawater can switch on the bloom up to 30 days earlier than the natural confluence of seasonal heat and light.

Until this latest research, scientists using climate models understood that springtime warming of the ocean surface triggered the near-surface vertical density gradation, known as stratification. That stratification, which prevents vertical mixing of the phytoplankton, and the increased seasonal light exposure that occurs every spring were thought to be the primary prompts of the bloom.

AMONG THE OTHER breakthroughs was unprecedented documentation of critical phenomena essential to carbon sequestering. One study focused on the aggregate flux event that feeds the deep ocean and contributes to carbon dioxide sequestering. During these events, phytoplankton



A NASA/MODIS ocean color satellite image of a phytoplankton bloom southwest of Iceland.

Photo courtesy NASA Earth Observatory

THE NATIONAL SCIENCE FOUNDATION asked University of Maine researcher Mary Jane Perry and the other lead scientists on the North Atlantic Spring Bloom Experiment to elaborate on the importance of the phytoplankton phenomenon and the significance of their discoveries — what they mean to you and to me. The following is an excerpt:

Just as we experience the seasons, the oceans and life within also experience immense changes in the transition from winter to summer. During winter, deep mixing creates an abundance of nutrients in the surface layer, but limits exposure to light that phytoplankton need for growth. The transition from winter to spring is marked by an increase in light availability to phytoplankton due to stratification. These conditions lead to rapid growth and an immense bloom that greens the surface of the North Atlantic.

The first species to bloom are the diatoms — phytoplankton that live in “glass houses” made of silica. Like the succession from spring to summer of flowers and weeds in fields and gardens, phytoplankton also undergo a succession of species. The element silica is depleted first, leading to a transition from diatoms to other smaller phytoplankton species.

In early summer, the dominant species are coccolithophorids — phytoplankton covered with little plates of calcium carbonate, similar to the species that created the chalk of the White Cliffs of Dover. Our measurements spanned the transition from winter to summer, providing

very detailed information on the diatom spring bloom. This phenomenon has repercussions through the entire food web and also on the uptake of carbon dioxide (CO₂).

During the North Atlantic spring bloom, tiny phytoplankton have a big effect on the global atmospheric carbon dioxide concentration. The subpolar North Atlantic Ocean is responsible for more than 20 percent of the net oceanic uptake of CO₂ from the atmosphere. Phytoplankton contribute to this uptake through photosynthesis by using energy from the sun to create organic matter from CO₂. During the bloom, CO₂ is removed from the atmosphere.

We now know that the timing of the spring bloom is controlled by an interplay of ocean eddies and atmospheric cooling. When cooling abates, eddies lead to rapid restratification of the upper ocean, thereby retaining phytoplankton near the surface and in the light. Ocean eddies are similar to the high and low pressure systems of the atmosphere.

As on land, the ocean also has north-to-south gradients of temperature, salinity and density. In winter, when cold air cools the ocean and there is little sunlight to warm the ocean, these gradients are enhanced. In spring, when the days become longer and the air warms, 1–10 kilometer scale eddies can slide warm (light) water from the south over cold (dense) water from the north.

The resulting density layering (light water on top, heavy water below) resists vertical mixing, retaining phytoplankton in the sunlit surface layer to help trigger the bloom.

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growing on the ocean surface form layers of aggregates and sink, providing food for deep-sea ecosystems and a carbon cycling function vital to the atmosphere.

Scientists have struggled to detect or estimate aggregate flux events that could ultimately inform estimates of carbon flux in the ocean. The study, led by Perry and the subject of a UMaine master's thesis by Nathan Briggs, used optical sensors to collect data on the flux event, including sink rates, distribution, relative abundance and chlorophyll content of aggregates.

Perry has also co-authored other papers with expedition colleagues, including one to be submitted shortly, that reveals the importance of a specialized life cycle stage of a diatom species in carbon export from surface waters. Researchers discovered that as an essential nutrient, silicic acid, is depleted, the diatom enters an encapsulated life stage that makes it highly resistant to degradation and extremely efficient for transporting carbon to the depths of the sea.

"It's all coming together in terms of our abilities to observe complete cycles in remote places for extended periods of time," Perry says. "That's important, because if the ocean changes, how will we know if we don't look?"

"We have to be able to be there more than once or twice with a ship," she says. "Such a snapshot is biased by whatever is occurring at that moment. We need a better view than what we get from satellites. We need long-term, sustained measurement. A persistent presence. We need a combination of autonomous sensing and detailed validation sensing — important parts of moving our understanding of the ocean forward." ■



UMaine professor Mary Jane Perry, right, and education specialist Carla Companion discuss a concept map for the COSEE-OS webinar series on the North Atlantic Bloom Experiment.

Photo by Annette deCharon

Translating science

SHARING HER KNOWLEDGE and enthusiasm for oceanography is as important to University of Maine biological oceanographer Mary Jane Perry as her marine science discoveries.

"One of the most rewarding things is when an undergraduate or graduate student matures (in his or her research) and you see them 'get it,'" says Perry, who was named a 2010 Fellow of The Oceanography Society for her contributions to the founding and advancement of bio-optical oceanography and the education of the next generation of bio-optics researchers.

"With my graduate students, I'm happiest when they don't need me any more. It's exciting to see people learn and understand, and start to be critical thinkers."

The benchmarks in her educational outreach efforts include the launch in 1985 of a graduate-level bio-optical oceanography summer course that has had a multiplier effect for up-and-coming young researchers working across the globe.

At UMaine's Darling Marine Center, she also is actively involved in educational outreach efforts for high school students and their teachers. Her research involves both UMaine graduate and undergraduate students.

A UMaine field course last year drew on her experiences in the North Atlantic that she then passed on to students on a two-day Gulf of Maine cruise.

On the 2008 North Atlantic Bloom Experiment with Perry and 25 researchers from five countries were undergraduate and graduate students, including six from UMaine.

To further collaboration efforts beyond the expedition, "big data" from the North Atlantic Bloom Experiment is now online and fully available in the Biological Chemical Oceanographic Data Management Office.

Last summer, the research of the scientists involved in the North Atlantic Bloom Experiment was the focus of a webinar series offered by the Center for Ocean Sciences Education Excellence — Ocean Systems (COSEE-OS) — one of several such centers funded by the National Science Foundation. COSEE-OS, directed by Annette deCharon at UMaine's Darling Marine Center, focuses on improving science literacy in the context of the ocean.

The five weekly North Atlantic Bloom webinars, featuring Perry and six other scientists involved in the research, attracted 68 participants from 21 states, as well as from Canada, Iceland and Germany. More than half of the participants were educators.

The archived material from the webinars — transcribed webinar video, data sets, and interactive concept maps with images, animations and teaching resources on the spring phytoplankton bloom and its role in the ocean ecosystem — has become the second most-visited section of the COSEE-OS website (cosee.umaine.edu/programs/webinars/nab).

Hamlin values

HANNIBAL HAMLIN, vice president during Abraham Lincoln's first term in office, is perhaps best known for his role in urging the president to issue an emancipation proclamation. Hamlin was one of the first people with whom Lincoln shared a draft of the famous Jan. 1, 1863 executive order that freed 3 million slaves.

Hamlin's values were deeply instilled in his children, including his son, Cyrus, who was among the first to advocate for the enlisting of African-American troops in the Union Army. Cyrus was the first person appointed from Maine to command an all-black regiment, the 80th United States Colored Troops.

Hannibal Hamlin was born in Paris Hill, Maine, in 1809 and practiced law in Hampden. He served in the Maine legislature from 1836–41, including three terms as speaker. He was on Capitol Hill as a representative from 1843–47, then as a senator and chair of the Committee on Commerce.

In 1857, he was back in Maine, serving as governor for a few weeks — Jan. 8 to Feb. 26 — before resigning to return to the U.S. Senate.

For political reasons, Hamlin was not selected as Lincoln's vice presidential candidate in 1864, but both families remained close. Hamlin's son, Charles, and daughter, Sarah, were at Ford's Theatre the night Lincoln was assassinated.

Hannibal Hamlin went on to serve as collector of the port of Boston and, in 1881, was appointed by President Garfield to a ministerial post in Spain. Hamlin held this post for a year before returning to live his final years in Bangor.

Hamlin died July 4, 1891 at the age of 81. He collapsed while playing cards at Bangor's Tarratine Club, which he founded. The couch on which he died a few hours later is now at the Bangor Public Library. Hamlin is buried in Bangor. ■

The Hamlin Family Papers in Fogler Library include personal, political and business correspondence from three generations, 1802–1911. Much of the collection includes letters from Hannibal Hamlin to his wife Ellen Emery Hamlin, and correspondence with his children, as well as speeches, family photos and books from his library.

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**Reframing the dialog about STEM
to put girls back in the equation**

By Margaret Nagle

Photo illustration by Adam Küykendall





“

To diversify the STEM fields we must take a hard look at the stereotypes and biases that still pervade our culture. Encouraging more girls and women to enter these vital fields will require careful attention to the environment in our classrooms and workplaces and throughout our culture.”

Why So Few? Women in Science, Technology, Engineering and Mathematics

TEN-YEAR-OLD Abby wants to be an artist or a dancer when she grows up. Thirteen-year-olds Holly, Lindy and Page also know what they want to be: photographer, physician and “someone who works with people with special needs.”

Eight-year-old Melody doesn't know yet; perhaps a softball player.

Compared to the eras when their grandmothers and great-grandmothers were growing up, girls today know early on that they can be anything they want to be, including women working in traditionally male-dominated careers.

Problem is, too few of them are choosing those high-end careers in the science, technology, engineering and mathematics fields known as STEM. Somewhere on the journey between verbalizing their aspirations and pursuing their career path, many girls get mixed signals. Or, worse, they are subtly

or not so subtly made to understand that the STEM fields are not for them.

It's not just that life gets in the way. And the fix is not as simple as thinking pink.

“In high school it was obvious that math was definitely for boys,” says 24-year-old Becca, who discovered her aptitude for numbers in college and went into a career in international business. “Nothing was ever said, but it was implied. It became a self-fulfilling prophecy that girls don't ‘do’ math.”

Among the most recent national groups to study the underrepresentation of women in STEM careers is the Girl Scout Research Institute. Its 2012 report, *Generation STEM: What Girls Say about Science, Technology, Engineering, and Math*, notes that in the life sciences, chemistry and mathematics, women are better represented than they are in engineering, computer science and physics, where they account for only about 20 percent of the bachelor's degrees. Regardless of the STEM area, only about 25

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percent of STEM jobs are held by women, according to the report.

“As opposed to the past stereotype that even girls who perform well academically are not interested in STEM (because it is a ‘boy thing’) our research demonstrates that interest among girls is there, it just needs to be primed,” the report says. “The challenge that remains is how to turn girls’ interest into action and make STEM the winner in the competition for girls’ attention when it comes to career choices.”

In 2010, a research report by the American Association of University Women (AAUW) cited environmental and social barriers as the chief reasons for so few females in STEM fields. The report, *Why So Few? Women in Science, Technology, Engineering and Mathematics*, funded by the National Science Foundation, notes the importance of culture and learning environments in the cultivation of abilities and interests.

“To diversify the STEM fields we must take a hard look at the stereotypes and biases that still pervade our culture,” the report says. “Encouraging more girls and women to enter these vital fields will require careful attention to the environment in our classrooms and workplaces and throughout our culture.”

UMaine Today asked four University of Maine researchers to share their perspectives on why girls and women continue to be absent from this nation’s science, technology, engineering and mathematics equation. All four are involved in STEM-related initiatives on campus, and their work informs state and national dialog.

Girls aren’t broken and don’t need fixing

FOR DECADES, WE’VE acknowledged that the United States must produce more STEM professionals to remain competitive in a global economy. Increasing the number of women in these fields shows the most promise in identifying untapped potential. To this end, a plethora of strategies and approaches have been put in place to attract women to these fields, with limited success. Although we’ve seen gains in some disciplines, most notably the life sciences, other fields such as physics and engineering have remained stagnant with only minimal gains. Computer science, arguably the most critical field of the 21st century, has actually seen a decrease in the participation of women.

We have persisted in strategies that intuitively seem effective, including exposing girls to careers in STEM and using mentors, based on the theory that by increasing the number of girls interested in STEM, the problem will be solved by waiting for girls to progress through the pipeline.

But experience shows us that women leave the STEM fields all along the pipeline. Even when they persist in their education/training and achieve professional credentials, many women still leave the field or go into sales or teaching. Indeed, many female engineers refer to engineering as their first career. Clearly, the pipeline is not solving the problem.

Additional challenges that have a detrimental effect on girls’ performance: the backlash against programs for

girls that occurs as people identify problems with boys’ academic success, and research showing that there “might” be a gender difference in aptitude for different subjects. Boys are also struggling in an educational system that is outdated and unable to change with the speed required in today’s world.

We need to stop looking for quick remedies and we need to stop concentrating on how to “fix” the girls. Although we cannot neglect strategies and research about improving education in the STEM fields for girls and boys, other components are just as important. There is no single reason that girls persist in STEM less successfully than boys. It is a combination of interest, talent, socialization, support and opportunity that adds to the complexity of the problem. While we continue to identify new educational approaches, we must also look to ourselves and actively challenge our assumptions about why these dynamics exist. There isn’t a deliberate strategy to exclude girls. Rather, with all good intentions, we see what we are used to seeing.

As individuals, we need to do our own work. We need to continually educate ourselves about gender dynamics — both blatant and invisible, as it is accepted as “normal” in our culture — and we need to ask more questions rather than look for simple answers. If we understand our own internal biases and good intentions, we are better able to respond to both girls and boys as individuals, and offer support and challenge that benefit both.

We need to reframe the issue. We need to consider teacher preparation, become more culture-literate consumers, question

our assumptions, recognize that girls are not the problem and understand that it is not as simple as getting them to love science. Girls have a natural curiosity and interest in the world that can be nurtured, but until we rethink our strict gender expectations, stop color-coding our children and their toys, and resist the urge to be complacent with the status quo so our children fit in and don't suffer the pain of being different, progress will be slow, individuals will not fully meet their potential, and society will be constrained by a narrow selection process for some of our most critical fields.

Sharon Barker is the director of the UMaine Women's Resource Center and collaborative lead for the Maine Girls Collaborative Project

Reengineering the future

MY BEST FRIEND Sue and I turned 14 in 1972, the year Title IX was enacted to ensure gender equity in educational programs receiving federal funding. Encouraged by our IBM fathers, we both became engineers and expected lots of girls to follow our lead. At first, we were right. The number of women who graduated as engineers jumped from 500 in 1972 to 8,300 in 1982. But growth slowed. Then, in 2002, it flattened to about 12,500 graduates. Today, college-bound women are well-prepared to study engineering, but only one in five engineering students is a woman. Without the directed parental encouragement we received, many young women reject the field, convinced that engineers are math and science whizzes like our IBM dads.

As states incorporate engineering outcomes into K-12 curricula, federal agencies and engineering societies are working to break through the stereotype so girls can see themselves as engineers. Biomedical engineer Jessica designs stents to repair clogged arteries. On the Engineer Your Life website, she describes how she loves her work that helps a patient live longer and enjoy a better quality of life. Also on that site, Katherine recalls how her 4-year-old brother's life was saved by a helicopter ride to a hospital. She's now a materials engineer designing helicopter parts.

Girls are more likely to consider engineering careers when they hear women engineers telling how their work makes a difference, and how their jobs are enjoyable and in good working environments, offering good salaries and flexibility. The website Changing the Conversation by the National Academy of Engineering posts outreach examples engineering educators can use to appeal to young women, and highlights audience-tested messages, such as "Engineers make a world of difference."

STEM educators can use free online surveys developed by the Assessing Women and Men in Engineering Project to determine if their programs are reaching youths.

Engaged schools and universities are applying these well-researched tools.

In 2004, the Government Accountability Office reported that federal granting agencies needed to do more to ensure compliance with Title IX. The NASA *Title IX & STEM* self-evaluation guide makes clear that outreach is critical to the university admissions process, and asks universities receiving NASA funds to evaluate whether their outreach messages attract young women.

Title IX reviews can encourage engineering programs to improve their recruitment to reach girls and women.

The U.S. needs to kick-start new growth in the number of women pursuing engineering degrees. We can begin by reframing engineering education and outreach so more young women believe engineering is a career for them. NASA's *Title IX & STEM* guidelines suggest we have a legal obligation to do so.

Karen Horton is a UMaine associate professor of mechanical engineering technology and past chair of the Government Relations and Public Policy Committee of the Society of Women Engineers



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Decoding the mixed messages

AS A YOUNG girl, I had three clear choices about what I could be when I grew up — a mom, secretary or teacher. Early on, I ruled out a career as a nurse because, despite being a top student in elementary school, I believed I was “not good” in math or science. Luckily, things have changed for girls. Now girls are told they can be anything they want to be. Certainly, this is the message I gave to my daughters when they were young. Why, then, are more girls not choosing to pursue careers in science, engineering, technology and mathematics?

Girls receive many conflicting messages about what it means to be a girl in our society. Many of these messages contradict the messages I gave to my daughters. The most pervasive contradictions can be found in media.

Open a magazine or watch television with an eye toward how girls and women are portrayed. You’ll see a multitude of images, words and storylines that scream that girls and women are valued for their appearance and sexuality, and life revolves around boys and men. Some advertisements and television shows may even be premised on “girl power,” but upon closer examination, you will likely find that girl power has been redefined.

My colleague Lyn Mikel Brown demonstrates in her book, *Packaging Girlhood*, that girl power has been co-opted by marketers. Yes, girls still have power, but now they have the power to shop, fight with each other and decide if they will be a girly girl or a guy’s girl.

If you need more evidence of the

limited options offered to girls, go to a toy store. How long does it take you to figure out which aisle is for boys and for girls, and which one has the more interesting and creative toys? Check out the LEGO section. LEGO now has reinvented sets for girls. In the new pastel LEGOs, girls can build beauty shops, hot tubs and cafés. The LEGO figurines have waists and breasts.

How is a girl supposed to reconcile these messages with the message that she can be anything? Certainly not on her own. Girls need adults who can help them understand that they are more complex, smarter and powerful than portrayed by the media and marketers. Here are some ways you can support a girl you care about to broaden her range of possibilities, including what it might be like to be a scientist, computer programmer, engineer or mathematician:

- Beginning at a young age, help girls critically analyze the media and the world around them.
- Expose girls to opportunities to meet women in STEM fields and other nontraditional jobs.
- Promote books and television shows that portray girls and women as strong and smart, such as the original *Dora the Explorer* or the *SciGirls*.
- Praise a girl for her efforts, not the results of her efforts.
- Reinforce that learning information and skills takes practice.
- Tell a girl how smart she is, instead of how pretty she is.
- Expose girls to diverse learning opportunities (e.g., robotics camps,

LEGOs that build something other than hot tubs; science camps and clubs).

- Help girls and boys understand how what scientists and engineers do helps people, animals and our environment.
- Create a climate at home or in the classroom that encourages exploration and curiosity without limits based on gender. Give girls trains and boys dolls.
- Ensure that girls get hands-on time in science.

Rather than lament about girls not pursuing careers in science, technology, engineering and mathematics, take action to help girls in your life broaden their world of possibilities. Who knows? She might be the next Sally Ride.

Mary Madden is the director of UMaine’s ADVANCE Rising Tide Center and an associate research professor of education

Changing the culture

WHEN I DECIDED to major in physics in the early 1970s, I had no idea that so few women would be joining me to study and work in this field. At that time, I was an undergraduate at Princeton, and it was not unusual to be the only woman in a class, since the university had only recently begun admitting female students. I envisioned that women would move relatively quickly into the field, just as they had done in law and medicine. I assumed that others would be attracted by the creativity, the excitement of solving challenging, important problems, and the



fun of building equipment to design and conduct experiments. Throughout my career and now as a professor of physics at the University of Maine, I have continued to enjoy these kinds of work opportunities.

Looking at current statistics, though, only approximately 20 percent of physics undergraduate degrees in 2010 were awarded to women, and 8 percent of full professors in physics are women. Why has this situation persisted in physics and many of the engineering disciplines, when women have readily moved into other professions that are also viewed as challenging and require many years of study? In an era in which we have a national need for additional workers in engineering

and the physical sciences, why have we not seen more women entering these fields?

These questions and others have led me more recently to focus on challenges in STEM education: What does research tell us about how to prepare students for careers in STEM disciplines and how should we teach in ways that attract more students, especially those currently underrepresented, into these fields? These types of questions motivated me to lead the formation of the Maine Center for Research in STEM Education 10 years ago and to pursue, with colleagues around the state, funding for the Maine Physical Sciences Partnership.

In considering the shortage of women and girls in many STEM disciplines, two common myths need debunking:

Myth #1: We just need to figure out the one thing that should be done to change this situation. So often people say, “If we could just keep girls interested in mathematics and science in middle school”; or “If we just had more women role models”; or “If girls only studied more mathematics.” In fact, the underrepresentation of women in particular disciplines arises from many factors. The causes of underrepresentation are multifaceted and the solutions that work will be as well.

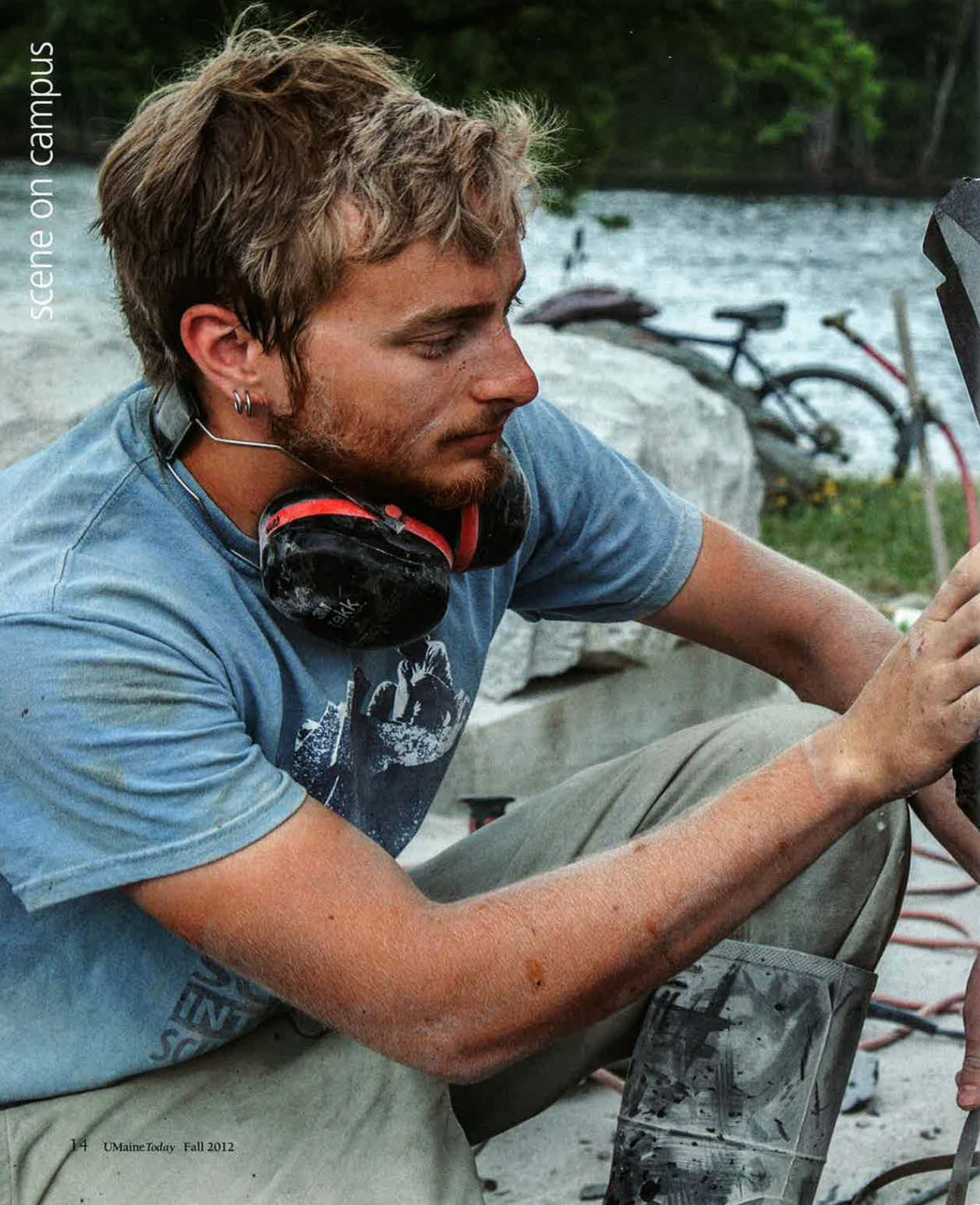
Myth #2: Time is fixing this problem. If we continue to wait, the next generation of girls will pursue these disciplines as commonly as boys, in spite of the lack of women already in them. Statistics don’t support this view. In the last three decades (1981–2010), the percentage of physics

bachelor’s degrees earned by women has only risen from about 12 percent to 21 percent — a decline of a few percentage points from the maximum reached in 2000. In 39 percent of Ph.D.-granting physics departments, there are either no women faculty or only one woman on the faculty (2006 data).

These myths suggest some important avenues to pursue to move toward the cultural changes needed to bring more women into physics, engineering and other disciplines in which their talents are needed. First, the community needs to recognize that this problem requires a collaborative, thoughtful and comprehensive approach. The Maine Girls Collaborative takes an important step in bringing leaders, both women and men, together to build this approach in K–12. This type of work needs to be expanded into postsecondary institutions and workplaces.

Changing the culture and providing support and opportunities for girls and women in these disciplines must be a long-standing and immediate priority. We cannot wait for this type of change to happen on its own. Work toward this end must be valued, incentivized and rewarded in our institutions. In tough economic times, it is natural to focus professional energy to meet mainstream measures of productivity, neglecting underrepresentation and diversity. Ongoing awareness and research-guided actions are both essential to change this situation.

Susan McKay is a UMaine professor of physics and the founding director of the Maine Center for Research in STEM Education (RISE Center) on campus ■





Celebrating stone

International residential sculpture symposium summers on campus

DUST BILLOWED and sparks flew this summer at the University of Maine where eight international sculptors created public artwork from granite for sites in Bangor, Orono and Old Town. The artists from the Netherlands, Taiwan, Korea, New Zealand, Japan and Maine were selected to participate in the fourth Schoodic International Sculpture Symposium (SISS), held this year on campus in partnership with UMaine. The symposium, which began on the Maine coast in 2007, pays tribute to the state's historic stoneworking culture. For six weeks, the artists were in residence, creating their sculptures in a communal, outdoor workspace open to the public.

UMaine received two of the large-scale sculptures. A work by Lee Zih-Cing of Taiwan will be installed this fall near Oxford Hall and one by Tim Shay of Old Town, Maine, will be sited near Nutting Hall as a Percent for Art project. A third sculpture by Johnny Turner of New Zealand will be installed on the grounds of UMaine's Buchanan Alumni House, sponsored by the University of Maine Foundation.

With the Stillwater River as a backdrop, the symposium drew hundreds of visitors to campus. They included UMaine students and area schoolchildren who had an opportunity to closely observe the sculptors at work.

Assistant art professor Greg Ondo led a sculpture course in which each student was assigned to an SISS artist to learn firsthand about the creative culture and process. In the class, the students also created their own sculptures from stone.

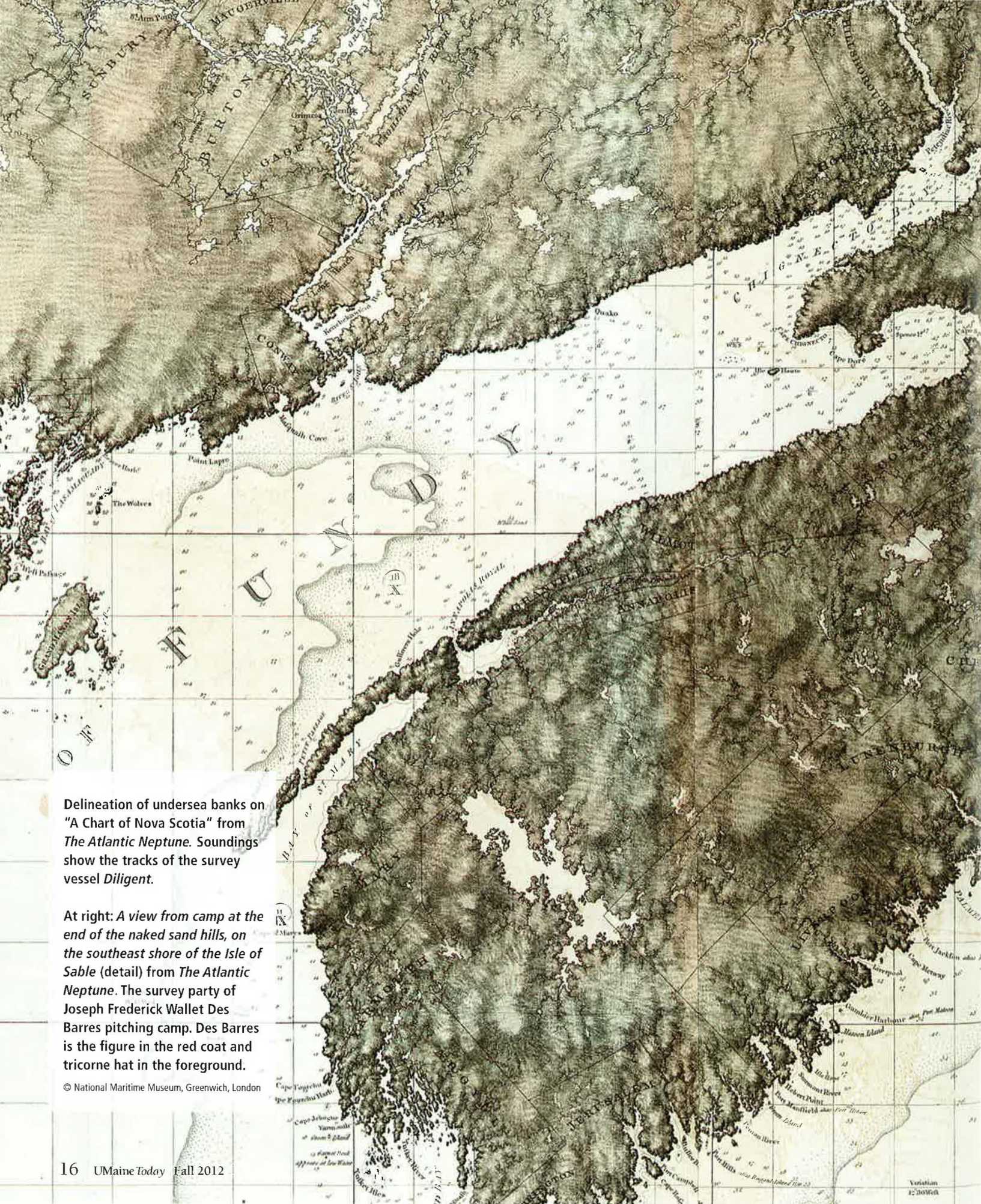
In addition, a UMaine documentary class involved students in video, audio and photography to create a dynamic archive of the event.

Rich Reichenbach and Matthew Foster, who graduated in May 2012 with art degrees from UMaine, served as lead assistants to the sculptors.

In conjunction with the Schoodic International Sculpture Symposium, UMaine's Hudson Museum featured "Carved in Stone," an exhibition highlighting its impressive collection of ancient to modern stonework from around the world. And the Division of Lifelong Learning organized daylong tours along the Maine coast to 19 sites where sculptures from previous symposia have been installed. ■

Matthew Foster worked as a lead assistant in this year's Schoodic International Sculpture Symposium, helping with hammering and drilling, general shaping and polishing of the granite sculptures. He is seen here with the work being created by Koichi Ogino of Japan. Foster is himself a sculptor who graduated from UMaine this past May with a degree in art. Last year, he interned with the symposium. Among Foster's many honors are a Good Idea Grant from the Maine Arts Commission and a nomination for the International Sculpture Center Outstanding Student Achievement Award.

Photo by D. Alan Stubbs



Delineation of undersea banks on "A Chart of Nova Scotia" from *The Atlantic Neptune*. Soundings show the tracks of the survey vessel *Diligent*.

At right: A view from camp at the end of the naked sand hills, on the southeast shore of the Isle of Sable (detail) from *The Atlantic Neptune*. The survey party of Joseph Frederick Walle Des Barres pitching camp. Des Barres is the figure in the red coat and tricorne hat in the foreground.

© National Maritime Museum, Greenwich, London

Historical research traces Britain's ambitious efforts to survey its North American holdings

Mapping the empire

By Rich Hewitt

ROLLED UP AND tucked away in a corner of the British Library in London sits a hand-drawn map of the Maine coast, created in the years just before the American Revolution. At a scale of two miles to the inch, it is an extremely detailed rendering of the intricate coastline from Cape Elizabeth to the St. John River. It's big — 10 feet long or more when fully unfurled on a map table.

"It's breathtaking to see," says Stephen Hornsby, a professor of geography and Canadian studies at the University of Maine and the director of UMaine's Canadian-American Center. "Absolutely magnificent. It's part of the heritage of the state, but it's in London. It's unknown in Maine."

The Maine map is one in a series drawn from the first major survey of Britain's holdings in North America. The General Survey of the Northern District and the Survey of Nova Scotia, conducted between 1764–75 by two Army officers, Samuel Holland and Joseph Frederick Wallet Des Barres, have been largely overlooked, despite their influence on the British government's approach to surveying and on subsequent surveys done throughout the expanding empire.

Hornsby first became aware of the survey as a graduate student conducting research on Cape Breton Island and continued to find references to a major survey of British America as



Mapping the empire



time went on. He noticed the distinct grid lines on Prince Edward Island, and how the roads and lot boundaries followed them. He also noticed what seemed to be a peculiar pattern of place names.

“I had questions that accumulated over the years and lay in the back of my mind,” he says.

To answer those questions, Hornsby began to research the survey — a five-year project that culminated last year in the publication of *Surveyors of Empire: Samuel Holland, J.W.F. Des Barres and the Making of the Atlantic Neptune*. The book has received favorable critical reviews and has earned Hornsby two awards: Publication of the Year by The Prince Edward Island Museum and Heritage Foundation, and the John Lyman Book Award for Science and Technology by the North American Society for Oceanic History.

Through his research, Hornsby discovered the most ambitious survey of that

century. It was the first scientifically based survey of British America from Labrador to the Gulf of Mexico, which led to the publication of *The Atlantic Neptune*, a four-volume atlas containing maps and charts of that enormous area. The survey set the standard for mapping Britain’s expanding empire and established a practice of using the science of those surveys, backed by its formidable military force, to govern.

“The British surveys of North America were not simply interesting examples of the entwining of Enlightenment science and military power in the late 18th century, but directly influenced British understanding of specific parts of the globe and helped shape government policy at a critically important juncture,” Hornsby notes in his book.

VICTORY OVER FRANCE in the Seven Years War established Britain as the global military and scientific superpower. Scien-

tific developments made it possible to fix latitude and longitude at sea, and established the Greenwich Meridian as the Prime Meridian, further aiding more precise and coordinated mapping.

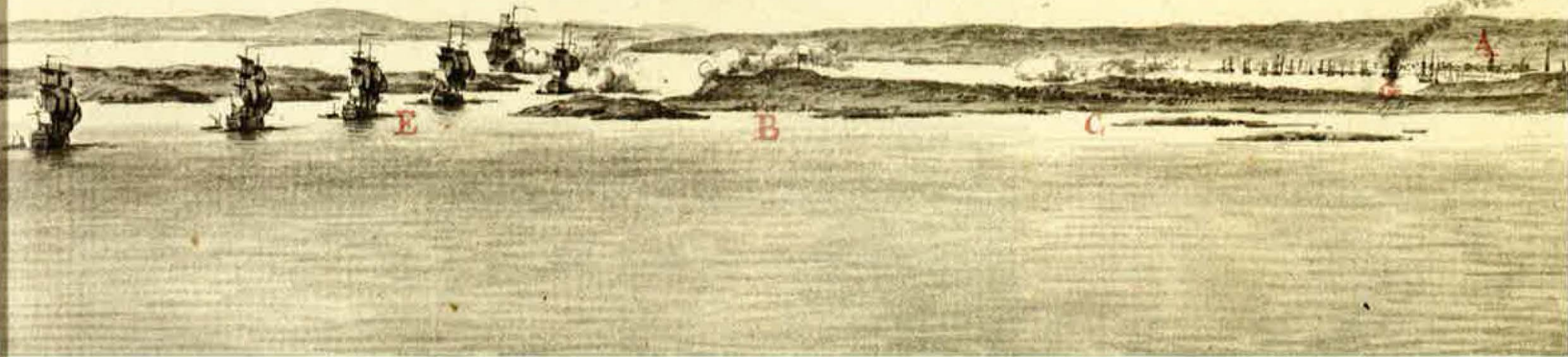
And Britain needed maps.

According to Hornsby, Britain was ill-prepared to govern the vast territory it now controlled. In addition to Canada, which it had captured from France in the war, Britain also gained Florida and territories along the Gulf of Mexico from Spain. England now controlled all land in North America from the Arctic to the Gulf of Mexico and from the Eastern Seaboard to the Mississippi River.

Fishermen, explorers and settlers had been sailing in the North Atlantic for centuries, but according to Hornsby, their maps and charts were vague and lacked the detail that Britain needed to help govern the American colonies, as well as those newly acquired lands.

French squadron entering Newport, 8 August 1778 (detail), by Pierre Ozanne. The survey of these waters in 1778 proved invaluable to the British fleet in pursuit of the French.

Courtesy of Library of Congress, Prints and Photographs Division



The government had a plan to settle the lands both in the north and south of the existing colonies in America. Parliament in 1763 issued a proclamation prohibiting further settlements beyond the Appalachian Mountains, and planned to funnel prospective settlers north into Maine and the Canadian provinces, and south toward Florida and Georgia.

To settle those areas, the British government proposed a General Survey of two districts: southern, from the Potomac River to Florida and into the gulf; and northern, from the Potomac to Labrador.

Enter Holland and Des Barres. The two Army officers, both engineers with surveying experience, were assigned to handle the survey in the northern district. Holland had worked on surveys along the St. Lawrence River at the end of the Seven Years War. He had been named surveyor general for Quebec and when the General Survey was planned, was also named by

the British Board of Trade as surveyor general for the General Survey of the Northern District. Des Barres got his marching orders from the Admiralty and was named surveyor general for the Survey of Nova Scotia.

The two men faced problems with logistics, weather, geography and communication as they worked on the surveys. Although the French had settled areas along the St. Lawrence River and there were some settlements in Nova Scotia, much of the newly acquired Canadian territory was unsettled wilderness. Des Barres established his headquarters in Halifax. Holland, however, was forced to move his base of operation annually as the survey moved from Canada to the American colonies.

Both men were assigned ships and a captain to aid them in their surveys. Des Barres was assigned to work with Lt. John Knight, while Holland was paired with Lt.

Henry Mowat. Knight, a good naval officer, and Des Barres produced a very good hydrographic survey, particularly of Nova Scotia, says Hornsby.

Holland fared differently. Mowat was often "off chasing smugglers," a more financially profitable endeavor. Holland repeatedly bemoaned the lack of accurate soundings on the maps he produced.

THE SURVEY ITSELF took much longer than anticipated. With Des Barres working in Nova Scotia, Holland focused his teams initially on the Gulf of St. Lawrence, St. John's Island (now Prince Edward Island), Cape Breton Island and Newfoundland. It was in Newfoundland where Capt. James Cook cut his surveying teeth and gained the experience that earned him renown in the South Pacific. Though Cook's exploits in the South Pacific overshadowed Holland's accomplishments with the General Survey, Hornsby says, Cook

Mapping the empire

considered him a mentor and once remarked that everything he knew about surveying he'd learned from Holland.

That first phase of surveying in Canada took five years — the time Holland had estimated for the entire survey. Holland was still at work on the surveys in the colonies when the outbreak of the American Revolution in 1775 forced him to leave New York, the southernmost point he had reached. Although the survey failed to stretch to the Potomac, the surveying parties led by Holland and Des Barres mapped about 15,000 miles of British North America from Labrador to New York.

The teams used what might seem like very basic survey tools and methods today. Flagmen set points and compasses were used to take bearings using triangulation to determine distances. Graduated chains were used to measure distances, one chain length at a time. Chronometers and quadrants established latitude and longitude.

Although the maps and charts contained some omissions and errors, they are surprisingly accurate — precise enough that UMaine geologists have used them to locate a 1760s Gulf of Maine shoreline and figure out the rise in sea levels since then, Hornsby says.

AT THE END of the American Revolution, Holland returned to Quebec to serve as surveyor general. In that role, he conducted and oversaw the survey of British lands to the west of Quebec toward Lake Ontario and Niagara, in preparation for the British loyalists, displaced from their homes in the colonies and seeking to relocate in that region.



Lt. John Knight was still working on the British surveys with Joseph Des Barres when, in 1775, he sailed into Machias, Maine, just two weeks after local patriots had attacked and seized the British sloop *Margaretta*. His ship, the *Diligent*, and a smaller sailing ship were taken without a fight and Knight was captured. He was later released in a prisoner exchange, and all of the charts and maps from the surveys went with him.

Artifact courtesy of University of Maine Fogler Library

Des Barres had remained in London during the early years of the war, promoting the publication of *The Atlantic Neptune*. Hornsby says Des Barres knew the value of the manuscript maps he possessed and was determined to publish them himself to gain both credit and what he hoped would be considerable profit. In early summer 1775, he was busy engraving and printing maps and charts based on the *Neptune* to get them in the hands of the Admiralty and on British war ships sailing to America that fall.

“They were very helpful for the navy during the early years of the war,” Hornsby says. “But the great irony of the project is that while the British had maps and charts based on the coastal surveys, the war, to a great extent, was fought on land. And the British did not have good maps of their 13 colonies.”

Interior maps of the colonies might have made a difference in the conduct and the outcome of the war, according to Hornsby. However, Britain learned from the experience of the General Survey and put that knowledge to good use after the war.

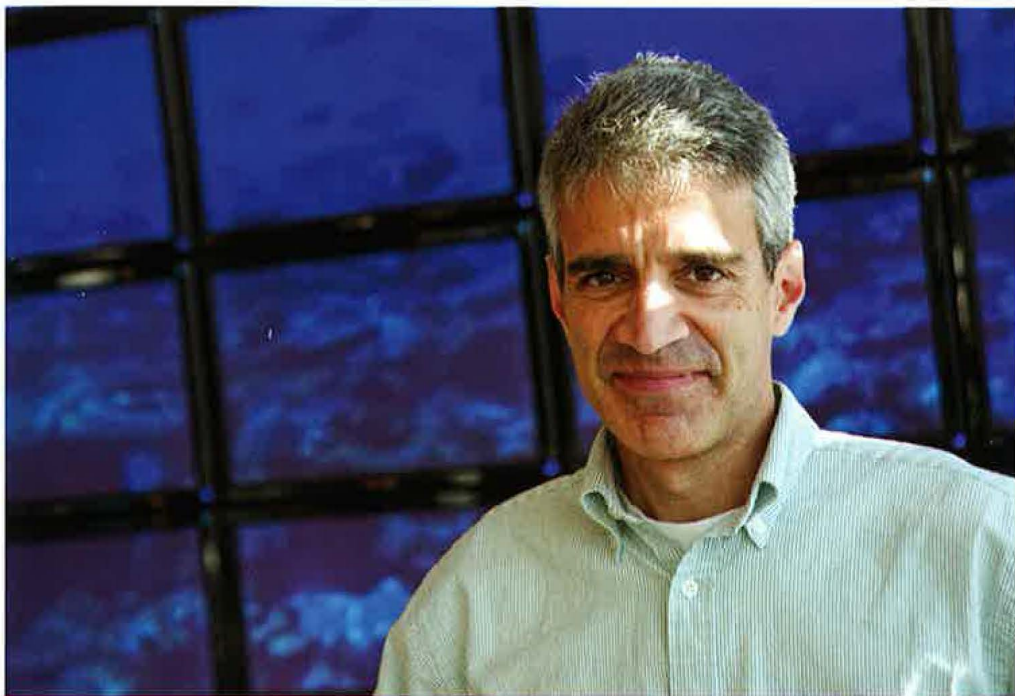
“By the early 1800s, Britain realized that they needed a naval mapping office,” Hornsby says. “The General Survey was accomplished in a rather ad hoc manner; it was all done by different parts of the government. That’s not a very efficient way of operating. The experience and the problems and difficulties led to the Admiralty creating the Admiralty Hydrographic Office.”

It was the hydrographic office that would create the British Admiralty charts that covered most of the globe’s waters and remained the gold standard for mariners throughout the 19th and into the 20th century, Hornsby says.

But it was Holland and Des Barres who set the standards for those imperial surveys on land and on water — scientific, coordinated surveys of an empire on which the sun never set — from London to India, Australia, Africa and Atlantic Canada. The two surveyors provided Britain with the tools and methods to delineate its empire and define much of the world we know today. ■

Timing is everything

FinishLynx a world leader in sports results technology



Doug DeAngelis

At the finish lines of athletic events around the globe — from world championships to school competitions — is a hardware and software system developed by Lynx System Developers Inc., founded in 1991 by alumnus Doug DeAngelis. FinishLynx was used in Olympic competitions in Salt Lake City and Nagano.

IN THE WORLDS of running, rowing, speed skating and cycling, FinishLynx is practically a household name. Invented by 1988 University of Maine graduate Doug DeAngelis, the finish-line system features a high-speed digital line-scan camera and Windows-based software that times races accurately and quickly, and sends results to scoreboards and databases.

FinishLynx has been used in the Tour de France, Kentucky Derby and NCAA championships, and by many high schools for their track competitions. It was even used to time Usain Bolt's world record of 9.58 seconds in the 100-meter dash.

For DeAngelis, FinishLynx and its parent company, Lynx System Developers Inc., have an even deeper meaning. Lynx is the intersection of DeAngelis' background in engineering — he has a bachelor's degree in electrical engineering from UMaine and a master's from the Massachusetts Institute of Technology in computer science and electrical engineering — and running sports.

“My love of running not only put me in a position to see the problem that needed to be solved, but also gave me the strength to persevere in the early stages of the company when working 20-hour days and traveling nonstop were commonplace,” says DeAngelis, an Orrington, Maine, native who was co-captain of the UMaine cross-country team in his senior year.

“My engineering background gave me the ability to envision the elegant solution, know where I could add the most value in achieving it, and also identify where I needed help.”

DeAngelis is hoping his company's latest project, IsoLynx, also will become an industry standard.

“IsoLynx is like a very accurate version of GPS for tracking athletes in the field of play,” he says. “Because it applies to many more sports, and applies equally as well to training as it does to competition, we hope that it will have a much bigger impact on sports than FinishLynx.” ■

The race is on

UMaine research picks up the pace to ensure horse track safety

THE ANTIQUE Cape Cod-style house on a quiet corner in Orono, Maine, belies its latest occupant. Computers, laboratory benches, and hefty equipment and machinery dominate the furnishings. Lining the walls are stacks of plastic buckets containing labeled soil samples from horse racing tracks all across the United States and Canada. While the Racing Surfaces Testing Laboratory may keep an outwardly low profile, the horse racing world is beating a path to its door, hoping to tap into research to improve what have been increasingly long odds in recent decades against keeping equines and their jockeys safe.

Racing Surfaces Testing Laboratory founder Michael “Mick” Peterson, the University of Maine Libra Professor of Engineering, has been contracting with track owners and racing industry leaders since 2004 to test the strength, stability and water-retaining qualities of track surfaces, both natural and synthetic. Groups include Churchill Downs Inc., which launched a Safety from Start to Finish program three years ago and has had Peterson evaluating its racing surfaces.

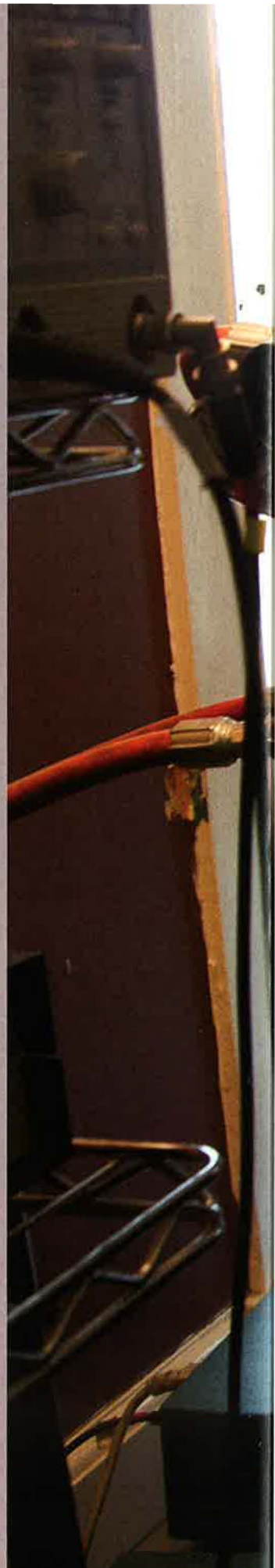
Interest in Peterson’s work has surged in response to recent high-profile racing injuries that have captured public attention. In 2008, the 3-year-old filly Eight Belles was euthanized on the track after breaking both front ankles immediately following a second-place finish in the Kentucky Derby. In 2006, the colt Barbaro, a favorite for that year’s Triple Crown, shattered 20 bones in his right hind leg while running the Preakness. Barbaro was put down eight months later after efforts to rehabilitate him failed.

Such devastating injuries raise important questions about track conditions and other factors, says Christie Mahaffey, who received her Ph.D. in mechanical engineering in May and serves as director of the laboratory.

“If a track can say, ‘We’ve done all this testing and we have the numbers to back up the integrity of our track,’ then it forces officials to look at other issues like drug use, training and genetics,” she says.

Mahaffey is examining the interface between a horse’s galloping hoof and the track surface it strikes. She earned her undergraduate degree in biology from Pennsylvania State University and her master’s from College of the Atlantic in Bar Harbor, where she studied the use of spatial modeling to predict the risk of whale strikes — collisions between whales and ships — in the Gulf of Maine.

Using the biomechanical hoof Peterson invented to study racetrack injuries, Mahaffey





Racing Surfaces Testing Laboratory director Christie Mahaffey, left, and undergraduate Molly Segee prepare a machine that simulates the loading of a horse's hoof to test surface stiffness, which varies with temperature. That information is being compiled in a database correlating racetrack surface conditions with horse injuries in North America.



In the Racing Surfaces Testing Laboratory, UMaine undergraduate Julia Bradson, left, prepares samples from racetrack surfaces for the drying ovens. In preparation for triaxial shear testing, Molly Segee then mixes the dried material with a measured amount of water and compacts it.

focuses on “the first impact” — the split-second of the hoof’s initial contact with the track and its small but crucial slide before the horse shifts its weight onto the extended leg. The degree, angle and depth of that slide, and the track conditions that affect it, are critical factors in injuries sustained by racehorses, she says.

The robotic hoof is aligned to hit the ground flat while simultaneously sliding at an 82-degree angle. It slams the track surface with the equivalent energy of a horse’s impact at full gallop and generates readings on dozens of points representing the hoof and leg.

Mahaffey has used the robotic device to collect data at tracks and arenas in New York, Florida, Kentucky, California and other states.

Racetrack composition in the U.S. varies regionally. West Coast tracks often are built with more clay than those in the

East in order to preserve moisture due to lower precipitation and humidity. The clay helps maintain the desired shear strength, but may reduce cushioning and make the track surface too hard. Eastern tracks often employ more sand to promote drainage, but may lose shear strength.

Variations in composition within one track are also dangerous.

By improving the understanding of how specific track materials and moisture conditions affect the way a horse’s hoof lands, Mahaffey says her research can help track owners create optimal race surfaces for horses.

Peterson’s lab also involves undergraduates from a variety of disciplines in the research. Julia Bradson, a second-year student, is majoring in international affairs with a minor in soil sciences. She and Molly Segee, a fourth-year mechanical engineering major with a minor in robot-

ics, analyze track samples for moisture capacity and shear strength.

Nick Hartley, a senior in civil engineering, spent a couple summers as a soils tester and inspector for the Maine Department of Transportation (MDOT). At the MDOT central testing lab in Bangor, he encountered the Micro-Deval test, a mechanical process for measuring the rate of degradation in a soil sample. MDOT uses the test to evaluate road construction materials. In Peterson’s lab, Hartley quickly saw how the test could be used for analyzing racing surfaces.

“With my information and a single phone call, the Santa Anita racetrack in California committed to purchasing the machine for the lab and sponsoring a project on wear in racing surface materials,” Hartley says. “It shows me that different disciplines have to work together in real-world applications.” ■



Bugs gone bad

A diagnostic lab on the front lines

THEY ARRIVE in jars, bags, boxes and envelopes. Alive and dead. All considered a nuisance at best and a threat at worst. And with that standard introduction, the seasoned staff of the University of Maine Cooperative Extension Insect and Plant Disease Diagnostic Lab gets to work identifying the pests and the problems, raising public awareness, and ensuring the health and safety of Maine citizens and their food supply.

The diagnostic lab gets an average of 2,500 queries a year — calls, emails, mail and walk-ins — on subjects ranging from whether a certain caterpillar could have caused a child's rash and if this tick is the kind that carries Lyme disease to why tomato plant leaves are turning yellow and have black spots.

“Our role is to educate people on what their pest or plant disease situation is and how to manage it,” says UMaine Extension pest management specialist Jim Dill. “We stress identification of the problem — and if it even is a problem. Not all bugs are bad. And we stress integrated pest management (IPM) and minimal pesticide use.”

The top pest bugging citizens today: the bedbug. Calls to the lab from homeowners to hotel managers have increased 100-fold in the last four years, prompting Dill and the other experts in the Insect and Plant Disease Diagnostic Lab to regularly provide self-help strategies and produce a video on what to do on your next overnight hotel stay.

Two of the most recent threats in Maine with economic development implications are the spotted-wing drosophila, an invasive fruit fly that could affect the wild blueberry industry, and late blight, a plant disease that impacts tomatoes and potatoes. Both have UMaine Extension's IPM experts on the front lines of prevention and defense. ■

At the University of Maine Cooperative Extension Insect and Plant Disease Diagnostic Lab, new pest and plant problems are the norm. Last fall, it was the appearance in Maine of the spotted-wing drosophila, a fruit fly with the potential to impact the state's 60,000 acres of wild blueberries. In 2009, the state experienced a serious late blight outbreak affecting home gardeners — a problem that, if unchecked, could have had serious implications for Maine's 55,000 acres of potatoes. That same year, UMaine Extension experts were focused on the Eastern Equine Encephalitis (EEE) virus carried by mosquitoes. The Insect and Plant Disease Diagnostic Lab offers integrated pest management fact sheets online (extension.umaine.edu/ipm). Photos by Edwin Remsburg

Falcon Soccer

○ Match Analysis I

Player: Jane

Falcons vs St Date: 9/17 Place: Away
Final Score: 1-1

Records: W 0 L 0 D Opponent: 3 W 1 L 0 D

My strengths in today's match:
My impactness. Right amount of talk - I didn't
Lisbon. I had a brilliant run through the
+ taking third...

My weaknesses in today's match:
I was supportive of Jamie. When I
letter.



...ments...

... during the

... is:
... let down. #9 had warp-speed. Her runs opened
... and chances on goal.

... weaknesses:
Their midfielders and forwards did not mark us well
in attack.

What was the "difference" in today's match:
Our midfielders support of the forwards... and, did I
Mention, a brilliant run by the sweeper?

What team adjustment would you suggest for the next match against this
opponent?

#9 = FAST. More Dusty? More variety in attack.

Other comments about team strategy, attitude, preparation...

○ We were prepared! The seniors had us ready to play,
Un-DE-feated!

Sports writers

A UMaine researcher studies the impact of journaling on student-athletes

By Jessica Bloch

TENNIS STAR Serena Williams does it. Olympic legend Michael Phelps did it during the 2012 London Games. Baseball player Carlos Delgado was profiled in a 2006 *New York Times* story for doing it.

So did the soccer teams Richard Kent coached around 30 years ago when he was teaching high school students in the western Maine town of Rumford.

Now an associate professor in the University of Maine's College of Education and Human Development and the director of the UMaine-based Maine Writing Project, Kent has developed the concept of team notebooks in which athletes spend time in the course of a sports season writing evaluations of their preseason goals, feelings about games they have played and watched, and postseason outcomes.

He relates the notebooks concept to differentiated learning, which acknowledges that the variety of ways in which students learn in a classroom (or on a

field, court or wherever athletes do their work) requires a teacher (or coach, trainer or adviser) to present a variety of learning techniques.

For athletes — from Olympians to high school players — Kent's research shows that keeping a journal is a way to decompress, unpack mentally and think critically about the outcome of a game, match or other sporting event. Some use journaling in preseason to clarify their goals for the upcoming competition, or in the postseason to set themselves up for off-season training. Others write while an event is in progress. Delgado, for example, was known to keep notes in the dugout when he wasn't playing.

"The team notebook is a way for athletes to communicate more directly with a coach, but even more than that, for them to think about learning in different ways," Kent says. "What we know about learning these days is that we all learn differently, and in fact it's differentiated instruction for coaches. This really mirrors what we know in the College of

Education and Human Development of the effective classroom, which is that we address learners where they come from.

"In other words, we all have different ways to learn. Some of us do well by writing about it, some of us need to talk about it, some need to think about it, and some need a little bit of everything. That's the bottom line with this research, that an effective coaching practice has lots of different ways for athletes to consider their performances and their training, and writing is one of them."

Although athletes have been journaling on their own for years, Kent's notebooks are among the first of their kind to standardize the process with specific writing prompts and consistent questions. Several institutions have starting using Kent's model notebooks and tailoring them to their own needs, which Kent encourages. Coaches at Southern Virginia University, Gonzaga University, University of Missouri and Temple University have adapted the notebooks and implemented them in their programs.

Sports writers

KENT'S IDEAS about athletes and journaling started about 30 years ago during a flight from Europe. At the time, he was Maine's state soccer coach, returning with a group of players who had competed in a tournament. It wasn't a successful trip for the team. It hadn't fared well against its European opposition.

That's when Kent had the idea to have the players write about their experiences and how they felt about the trip. Problem was, the only paper available on the plane was the airline's airsickness bags.

"Some kids wrote six sentences, but some wrote on both sides, ripped open the bags and wrote inside," says Kent, the author of 10 books, including *Writing on the Bus: Using Athletic Team Notebooks and Journals to Advance Learning and Performance in Sports*, *The Athlete's Workbook* and *The Soccer Team Notebook*. "I sat there and read them and thought, 'Holy mackerel, this is really interesting.' I started incorporating more writing activities with my teams."

While Kent had used writing exercises with his soccer teams for years, his research for the notebooks began in 2005-06 when a University of Southern Maine soccer coach gave them to his team as a pilot project for a season. Also around that time, Kent met with David Chamberlain, an elite World Cup cross-country skier who grew up near Kent in Wilton, Maine. Chamberlain had long kept journals and training logbooks, and allowed Kent to study five years' worth of his writing.

"An effective coaching practice has lots of different ways for athletes to consider their performances and their training, and writing is one of them." Richard Kent

Kent looked at Chamberlain's logs through a writing-to-learn lens advocated by William Zinsser, a well-known writer and teacher, and others who believe writing enables us to find out what we do — or don't — know about a subject.

"The concept of writing to learn allowed me to see what types of themes would emerge," Kent says. "Then I would interview Dave about those themes, one of which was he was thinking about whether he wanted to stay with ski racing or move on to become a coach. He wrote seven pages grappling with this issue.

"I do a great deal of narrative analysis, where you look at a piece of writing and think about: What direction is this athlete going with this? How do the themes merge with his thinking and what he ends up doing? It ended up that he stayed with skiing for another three years."

Kent also asked UMaine head soccer coach Scott Atherley and members of his staff for feedback on the notebooks. A friend who was then an assistant coach

with a professional basketball team also reviewed them.

"Everybody was very accommodating and offered me ways to reconstruct the notebooks," Kent says. "Like with anything in writing, there is always a process of revision. When I work with teams or coaches I say, 'Listen, make it your own.' There isn't one right way to do this. You have to revise and be comfortable with it. I used team notebooks five days a week, but you might want to do it once a week."

KENT BELIEVES journaling makes athletes more accountable in a number of ways, and his work with Chamberlain provided a good example of this. At the higher levels of endurance skiing, athletes in training measure the levels of lactic acid in their blood as an indication of fitness level. Skiers who journal, along with tracking their lactic levels, can establish patterns that reveal how factors such as sleep, nutrition and mood affect a training session. The journals are frequently shared with coaches, sometimes via email.

"They write about it, talk to trusted advisers about it, and then make decisions about how they're going to adapt their training," he says. "Writing is a critical component for all of this and I think it's been a missing link in athletics."

Journaling can be a way for athletes to learn to take emotion out of analysis and think about categorizing, moving on from a win or loss.

Athletes have been journaling for years. Richard Kent's writing-to-learn notebooks are among the first to standardize the process with prompts and questions.

“The mere act of writing slows us down and makes us think,” Kent says. “You start with the self, think about what you need and then move forward. It’s the same with the team notebooks. After a match, you sit and think: ‘What did I do well in this match, what did I struggle with? How did the other team do against us? What advice would you give as a coach to the other team about the way they played? It helps them as writers to learn theory and how to think more deeply about the way they look at sports, but also sort of turns them into coaches, which I think is a great thing. It helps them consider the sport through a different lens.’”

THE BASIC athlete notebook contains five sections, complete with writing prompts based on the templates Kent used while he was coaching soccer. The notebook begins with a page called Preseason Thoughts, which the athlete is meant to fill out before regular-season competition begins. The athlete is asked to write about his or her individual and overall team strengths and weaknesses in the previous year, preparation done in the off-season for the upcoming season, goals for upcoming season, and information about his or her class load for the upcoming season.

The next section, Competition Analysis I, asks athletes to reflect on the outcome of a game or match in which they have participated. The writing

prompts include individual, team and opponent strengths and weaknesses, suggestions for adjustments in subsequent games or matches, and what made the difference in a win or loss.

That section is followed by a Competition Analysis II, which is meant to be completed by players following a match they have watched but not participated in. It directs them to write their observations of the two teams, including strengths and weaknesses, halftime adjustments, comments about players at different positions, key moments of the game, and a final analysis that asks the players to think like a coach.

A page called Postseason Thoughts allows the player to think about strengths and weaknesses as an individual and a team, describe plans to improve in the off-season, reflect on preseason goals and discuss how he or she is handling schoolwork. The fifth section, Athlete’s Notes, is a kind of free space for players to store handouts, sketch plays and keep notes.

One of the trepidations teams often have when confronted with the notebooks is the amount of time that should be dedicated to journaling. This is particularly true for student-athletes who might have homework to do following a game, or coaches who are already overburdened. But Kent has designed the journals so they take a few minutes to complete. Athletes can write as little or much as they choose, and coaches can take as much time as they want to read the notebooks.

Coaches nationwide have contacted Kent to praise the notebooks for having helped their teams become more pragmatic and thoughtful about the way they analyze a game and a season. Kent sensed the power of the notebooks himself one night years ago following a soccer game that his team won after a late comeback.

The members of his winning team had formed a circle on the field, pulled out their notebooks and were busy writing. On the other side of the field, the members of the losing team milled about aimlessly, walking off into the darkness.

“I thought about the (losing team members’) drive back to their school and wondered how the players would unpack the match with one another,” Kent says. “I looked at my kids and how purposeful they were about their writing and their thinking, and knew that this was something that was special and helped create a common language for the team. That’s what I have explored and expanded through this research.” ■



FUELS OF the future will be cleaner, cheaper and more “made in America” if the United States adopts a national Low Carbon Fuel Standard (LCFS), according to a study by six researchers, including University of Maine economist Jonathan Rubin.

The National LCFS Project released the reports during a bipartisan briefing on Capitol Hill this summer, co-hosted by U.S. Sen. Olympia Snowe of Maine and Sen. Dianne Feinstein of California. The National LCFS Project is a collaboration among researchers from six top U.S. institutions, each looking at a different aspect of how a Low Carbon Fuel Standard would affect America’s energy posture, national security, environment and economy.

The reports, including technical analysis and policy design recommendations, are online (nationallcfsproject.ucdavis.edu).

A Low Carbon Fuel Standard is designed to reduce the amount of carbon in transportation fuels. It would require all energy companies to meet a common target for carbon intensity, but leave it up to the companies themselves to decide how to reach that goal. For example, an oil company might choose to diversify into electric or hydrogen fuels, or it might add more low-carbon biofuels to its mix of offerings, or it might buy credits from companies that specialize in low-carbon fuels, or that can lower the carbon intensity of their fuels more efficiently.

Fueling standards

“LCFS encourages innovation and diversity by harnessing market forces. These reports provide practical policy recommendations, and are designed to inject scientific information into the national conversation.”

Jonathan Rubin



Preparing for abrupt climate change

THE NEED to adapt environmental policies and management strategies to meet the social and ecological challenges caused by abrupt climate change events around the world is the focus of a new graduate program at the University of Maine beginning this fall, funded by a five-year, \$3 million award from the National Science Foundation (NSF).

The program, called Adaptation to Abrupt Climate Change, is a collaboration between UMaine’s Climate Change Institute and School of Policy and International Affairs, funded through NSF’s Integrative Graduate Education and Research Traineeship (IGERT) program. It will support the international research of 24 Ph.D. students in Earth sciences, ecology, economics, anthropology and archaeology. Their focus will be on threats of abrupt climate change to global security; ecosystem sustainability under abrupt climate change; and adaptation of economic, social, political and ideological systems to abrupt climate change.

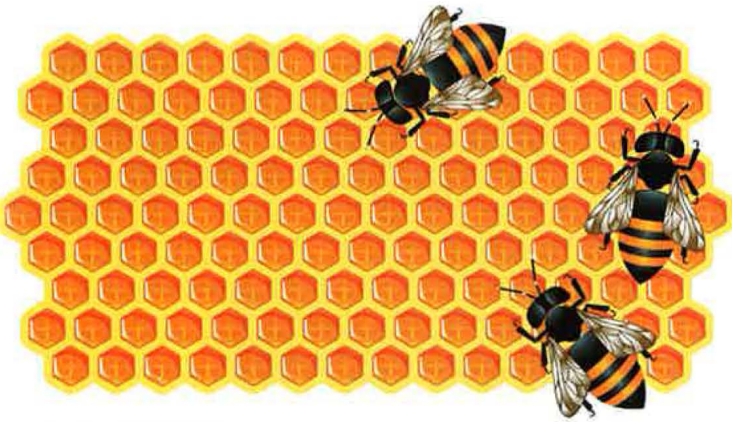
In addition to collaborative interdisciplinary research, the students will participate in policy and management internships with international, federal and state agencies and organizations.

In the new graduate training program, students will become experts and leaders in their fields, understanding the dynamic relationship between the environment and the security of humans in response to abrupt climate change, says Jasmine Saros, associate professor of biology in UMaine’s Climate Change Institute and the principal investigator on the project. They will be the next generation of scientists charged with anticipating, managing and meeting the environmental and social challenges of abrupt climate change.

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TOP INSTITUTIONS

are involved in the National LCFS Project: University of California, Davis; UMaine; Oak Ridge National Laboratory; University of Illinois, Urbana-Champaign; Carnegie Mellon University; and the International Food Policy Research Institute.



Researchers hope to better understand pollinator communities in each crop system, characterize levels of pollination deficits across sites, crops and regions, and look at how landscape and farm-scale factors can influence pollinator diversity.

Native buzz

A \$6.6 MILLION U.S. Department of Agriculture regional study has begun to provide a detailed assessment of the role of native bees in the pollination of lowbush blueberries in Maine, cranberries in Massachusetts, squash in Connecticut and apples in New York.

The four-state research project comes at a time when wild honeybee populations have all but disappeared and commercial honeybee populations are shrinking because of parasites, pesticides and landscapes that are insufficient to provide wild flower pollen and nectar for the bees and their young.

University of Maine entomologist Frank Drummond, the principal investigator of the research being done with bees in Maine blueberry fields, says the project will determine ways to reduce dependence on commercial bees by relying more on native bees and create environments favorable to bees. The researchers will provide insight into how to enhance environments for sustainable wild bee populations, along with recommendations on pesticide use or avoidance by growers to protect both wild and commercial honeybees, and bumblebees, which also assist in crop pollination.



Transforming technologies

IN JUNE, the University of Maine's Technology Research Center (TRC) opened in Old Town, Maine, connecting private industry with UMaine researchers in the Forest Bioproducts Research Institute to validate, demonstrate and help commercialize developing fuel, chemical and advanced material technologies from forest bioproducts at an industrially relevant scale.

TRC serves as a one-stop shop for processing and analysis of technologies. The 40,000-square-foot, high-bay facility, located on the grounds of Old Town Fuel & Fiber, features state-of-the-art process control and process information systems.

Many of the projects already in development in the lab and ready for pilot trials are the result of public-private partnerships, with investment from federal agencies, such as the U.S. Department of Energy, U.S. Defense Logistics Agency and National Science Foundation, and collaboration with private companies, including Maine paper companies and entrepreneurial start-ups.

TRC facility and equipment were capitalized in 2009 with a \$4.8 million grant from the Maine Technology Asset Fund.



High-level harassment

WOMEN WHO break the glass ceiling of professional advancement also face increased incidence of sexual harassment from coworkers and subordinates, according to new research by sociologists at the University of Maine and University of Minnesota.

Traditional characterizations of workplace harassment portray male supervisors harassing female subordinates, but "power-threat" theories suggest that women in authority may be frequent targets.

In spite of progressive legal and organizational responses to sexual harassment over the past few decades, the cultural image of harassers and targets hasn't kept pace with changing workplace realities, according to UMaine sociologist Amy Blackstone and her research colleagues. The study offers "the strongest evidence to date on the interaction of sex, gender and power in predicting sexual harassment," say Blackstone, UMaine alumna Heather McLaughlin, now a Ph.D. candidate at the University of Minnesota, and Christopher Uggen, a University of Minnesota sociology professor.

"Sexual harassment can serve as an equalizer against women in power, motivated more by control and domination than by sexual desire," say the researchers, writing in the journal *American Sociological Review*.

YOUNG MEN with social anxiety, especially a fear of being judged negatively by others, are more likely to engage in physical and psychological dating aggression, according to a study by psychologists at the University of Maine.

The researchers also found that fear of negative evaluation put the young men particularly at risk for increased aggression when they viewed their romantic relationships as poor and antagonistic.

Until recently, it's been largely held that socially anxious people tended to avoid confrontation, taking on an avoidance or "flight" rather than "fight" response. But increasingly, studies like the one at UMaine have explored the possibility that social anxiety and aggression are related.

"The notion of control seems central to understanding why socially anxious men may be more likely to engage in psychological aggression with their dating partners than their female counterparts," the UMaine researchers wrote in the *Journal of Interpersonal Violence*. "Men who expect their partners to evaluate them negatively may also fear that their partners will ultimately reject them."

Fearful romance

Immediate identification

SOLDIERS IN war zones, and law enforcement and first responders on the scene will soon have the ability to collect and immediately analyze trace amounts of potentially dangerous chemical, explosive or biological agents with the help of a surface swabbing device developed and prototyped by a Maine-based technology company with the help of the University of Maine Advanced Manufacturing Center (AMC).



The OSS swabs work like a "nanosponge" that interfaces directly with a portable, computerized, infrared spectrometer made by Smiths Detection.

The device, roughly the size of a penny, snaps on the end of a wand to swab a potentially contaminated surface. Residue on the swab then can be immediately scanned and identified using a portable instrument developed by Smiths Detection, a prominent U.S. defense contractor, according to UMaine alumnus Eric Roy, project manager and senior research scientist at Orono Spectral Solutions (OSS) in Bangor, Maine, where the "surface sampler" was designed.

OSS and the AMC are working with prospective manufacturers to mass-produce the surface swabbing devices, which will then be distributed by Smiths Detection. The swabs have been tested at Edgewood Chemical and Biological Center, a secure U.S. Department of Defense facility in Maryland, with chemical warfare agents, biological warfare agents, explosives and other threat materials.

The Defense Department funded the research and development of the new device.



Blogging abroad

IAN HENDERSON, a graduate student studying global policy in the University of Maine School of Policy and International Affairs (SPIA), wanted an international internship that would expose him to reform in the Arab world. He found one with the Ibn Khaldun Center in Cairo, Egypt, a nongovernmental organization researching reform as it affects democracy, women's rights, and free and fair elections.

Henderson is one of eight SPIA students who participated in summer internships and blogged about them (umainespia.blogspot.com) from as far away as East Timor, Egypt, Kenya and Chile, and as close as Washington, D.C. and Rockland, Maine. Unlike the traditional study abroad experience, the SPIA internship program focuses on experiences that affect global policy, often with the agencies the students may ultimately work for, according to Jim Settele, SPIA's assistant director.

In the interdisciplinary master's program, which leads to an international service degree, students choose one of three concentrations — international environmental policy; international trade and commerce; and international security and U.S. foreign policy — taught by some 40 UMaine professors from multiple disciplines.





THIS PAST AUGUST, I had the honor of participating in the Justin Morrill Symposium celebrating the 150th anniversary of President Lincoln's signing of the Morrill Land Grant College Act. This one-of-a-kind symposium was convened at Senator Morrill's National Historic Landmark Homestead in Strafford, Vt., and gathered historians, politicians, educators and interested citizens. As a keynote speaker, I had the privilege of focusing on the original mission of the Morrill Act, while reflecting on both our current challenges in Maine to adapt to rapidly changing social, political and economic environments, but also to affirm the inherent strength of our national land grant institutions as catalysts of economic and workforce development, cultural enrichment and lifelong learning. I believe that there is no more appropriate time than now to reenergize our role as Maine's land grant university, commensurate with the responsibility to meet Maine's present-day needs.

In fulfilling our commitment to meeting Maine's present-day needs, the UMaine community has moved seamlessly into the implementation phase of the Blue Sky Plan, the university's comprehensive strategic plan, finalized this past spring and approved by the University of Maine System Board of Trustees in July. As we focus on implementation over the next year, our goal is to structure diverse implementation teams around each of the five pathways that guide the plan. Each pathway will consist of approximately 10 individuals recommended for their particular expertise/experience related to the focus of the pathway initiative and their recognized leadership within the UMaine community. The Pathway Implementation Teams will provide the primary focus on setting goals, timelines and metrics, and ensuring accountability for achieving our Blue Sky Initiatives.

In representing the University of Maine at the Justin Morrill Symposium, I was proud to share the Blue Sky Plan as our strategy to carry forward Justin Morrill's vision for the future of higher education in the 21st century. That vision was clearly stated to the U.S. Congress in 1858:

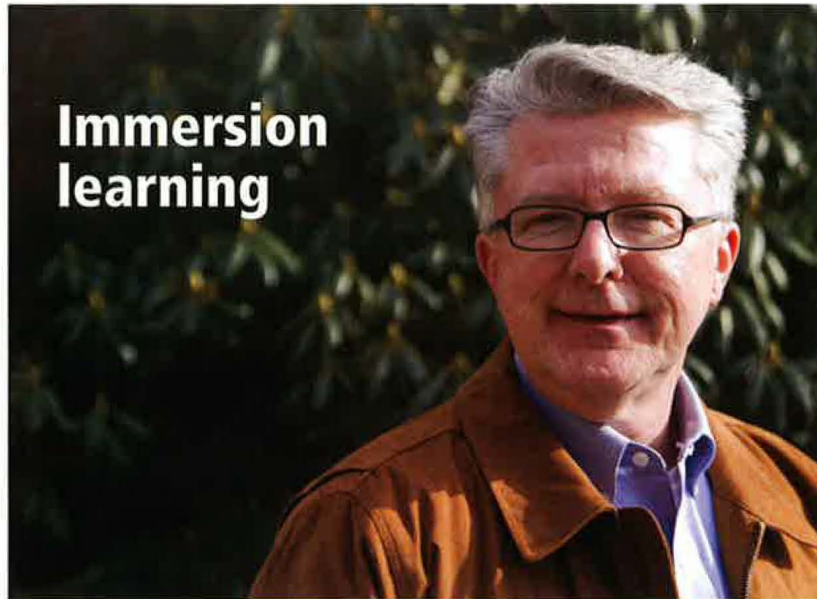
Let us have such colleges as may rightfully claim the authority for teachers to announce facts and fixed laws, and to scatter broadcast that knowledge which will prove useful in building up a great nation — great in its resources of wealth and power, but greatest of all in the aggregate of its intelligence and virtue.

We are looking forward to welcoming a new class of Black Bears this fall and sharing with them our vision and UMaine Blue Sky thinking. The success of that vision will be dependent, in part, upon them as well as the entire UMaine community. To that end, I remain so grateful for your support and continued partnership in advancing the excellence of the University of Maine.

Paul W. Ferguson
President

"I had opportunities in my work life to travel around the country and the world. Those travel opportunities taught me about the places I visited and I also discovered what made Maine a special place for me. I am very happy that my fund helps UMaine students travel as part of their undergraduate education, something I wasn't able to do."

Charles V. Stanhope



The Charles V. Stanhope '71 Honors College Study Abroad Fellowship Endowment Fund was established in the University of Maine Foundation in 2008 with a gift from Charles V. Stanhope, a member of the Class of 1971. This endowment is the inaugural Study Abroad Fellowship fund for the Honors College.

The fellowship is awarded to a student in the Honors College who studies for at least a semester outside the borders of the United States.

"I established this fund to celebrate the excellent UMaine undergraduate education I received," says Stanhope, who resides in Southwest Harbor, Maine, after retiring as the assistant chief operating officer for executive operations at the Library of Congress. Stanhope now chairs the Maine Arts Commission.

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