

UMaine Today

CREATIVITY AND ACHIEVEMENT AT THE UNIVERSITY OF MAINE

JANUARY/FEBRUARY 2003

BUSINESS

RESEARCH

EDUCATION

TECHNOLOGY

**Collaborating
to strengthen R&D**

Capitalizing on research

Target: economic development

From the President

THIS ISSUE of *UMaine Today* includes several stories that highlight the importance of the economic development connection between business and science. It strikes me that, while business and science may seem to be as different as can be, they really do have some similarities.

Both are risky. Businesses can fail because a market dries up, a patent is not granted or competitors get the upper hand. Scientists can fail to get research funding or find that experiments don't work according to expectations. Scientists can learn as much or more from their failures as from successes. Business and science both depend on educated people who know how to manage information and use it creatively. Universities excel at creating the workforce necessary for successful science and business enterprises.

It takes time to see results in both business and in science. Business incubators, such as UMaine's Target Technology Center, which is profiled in this magazine, guide scientists and engineers through the detail work that is necessary to gain a successful result. Although business and science have different needs, they can in fact work well together and create new foundations for Maine's economy. We can see several examples: the nonprofit Jackson Lab in Bar Harbor, IDEXX Laboratories in Westbrook, and Applied Thermal Sciences in Sanford all follow this model.

We at UMaine are truly proud of our contributions to Maine's economic development through research in all academic areas. Continuing and growing in our ability to contribute to a knowledge-based economy is one of the imperatives for UMaine's future that I identified in my recent State of the University Address. This capacity is one of the elements that defines UMaine's unique and vital role in shaping the state's future.

It is also important to note that the unique nature of university research is necessarily tied in to the broad range of opportunities and experiences of a comprehensive 21st-century university. All of us who are part of UMaine draw inspiration from the arts, draw enthusiasm from our interaction with students, draw perspective from our diversity, and draw our desire to learn from each other. We keep that in mind as we look forward to the next UMaine advances that will serve to make our lives better.



Photo by Toby Hollis

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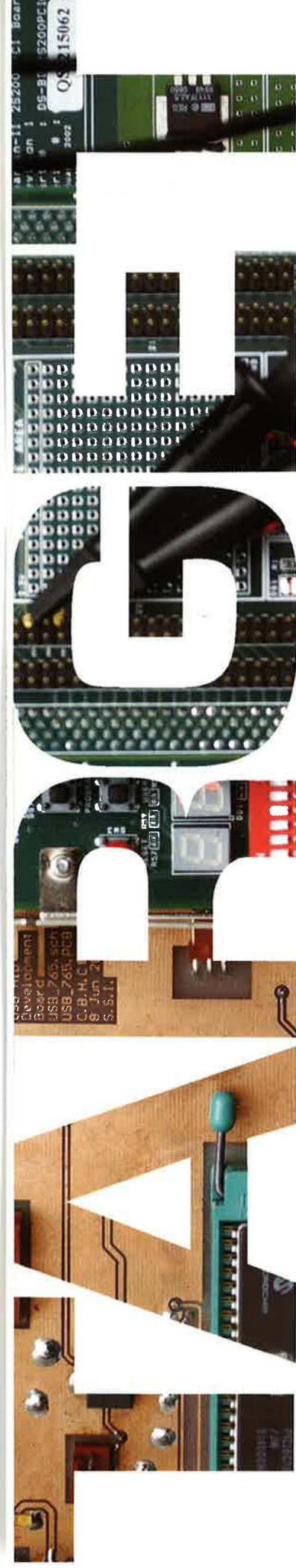
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Photos by Toby Hollis

Graduate student Christopher Frank and Debbie Neuman, director of Target Technology Incubator, examine a prototype of a device based on "smart maps" research at UMaine.

Technology incubation and research center sets sights on growing companies

Larry Thompson is a research engineer with Applied Thermal Sciences Inc., (ATS) of Sanford, Maine, but his office is more than 150 miles away at the Target Technology Center near the University of Maine. Here, he and his university colleagues work with Maine's newest supercomputer — a Ferrari of high-end technology composed of 208 dual-processor PCs linked by more than three

miles of fiber-optic cable. They are applying the latest computer modeling techniques to engineering problems as diverse as missile defense and engine performance.

Meanwhile, in a neighboring office in the technology center, partners in Stillwater Scientific Instruments Inc., are designing circuitry, applying for patents and getting accounting advice. UMaine scientists created the company last winter to take advantage of technology devel-

oped by one of their colleagues, UMaine chemist Brian Frederick. Using Frederick's ideas, they are building a device that significantly increases the speed of mass spectrometers, machines commonly used in chemical laboratories around the world.

Down the hall, a group of researchers is talking about forming a company. If their technology works as planned, they may be selling a new product best described as a digital travel aid. Christopher Frank, a graduate student from Colchester, Vt., is working on the device with Max Egenhofer, director of the UMaine National Center for Geographic Information and Analysis (NCGIA). Although still on the drawing board, their invention could be the first of a family of products based on "smart maps" research at the university.

Being located at Target places ATS, Stillwater Scientific and UMaine engineers at the heart of a badly needed statewide effort to develop businesses and create jobs. The Target Center is one of seven state-supported economic development facilities known as business incubators. These facilities are designed to put scientists and engineers face to face with business development specialists, patent attorneys and owners of existing businesses. Located in communities from Limestone to Sanford, the incubators are focusing on technology sectors such as aquaculture, precision manufacturing and composite materials.

Target specializes in information technology. Owned by the nonprofit Bangor Target Development Corp., the 20,000-square-foot facility has rental space for existing businesses, new start-up companies and university researchers. It is located in the Maine Business Park, off Interstate 95 in Orono.

With an incubator approach to economic development, Maine is in good company. Governments around the world use incubators to stimulate business. Within their protective walls, they nurture new ventures with a supportive mix of legal, financial and entrepreneurial services. In Maine, the university has active affiliations with most of the incubators and operates the Target facility through its Department of Industrial Cooperation, part of the Office of Research and Economic Development, or ORED.

The success of business incubators is evident in their history. In 1980, there were 12 incubators in the U.S. Today, there are more than 900. A 1997 study published by the National Business Incubator Association concluded that 87 percent of the companies developed in incubators were still operating. And most of them strayed little from their entrepreneurial nurseries, locating within 10 miles of the incubator facility.

In her 2002 research on U.S. incubators, Candan Unver, a graduate student in the UMaine Business School, has found that being in an incubator environment increases a new company's



Bruce Segge, UMaine associate professor of electrical and computer engineering, is the technical director for Target's supercomputer, designed to meet high-speed computing needs of Maine businesses.

chance of success. These specialized facilities are only one part of Maine's efforts to lay the groundwork for a knowledge-based economy. The state is increasing investments in university-based research, stimulating new technology through the Maine Technology Institute, and evaluating progress through the Maine Science and Technology Foundation.

Debbie Neuman, director of Target Technology Incubator, is banking that a new economy can grow out of the initiatives under way in Orono. On a daily basis, she works with scientists and

inventors who want to create products and jobs out of technological insight. Offices and conference rooms at Target are abuzz with talk of financial and legal matters or possible solutions to technology problems. Experts in patent law, accounting and marketing provide assistance to Target tenants on a regular basis. And Neuman works hard at matching business and financial assistance with the needs of scientists and engineers whose ideas may hold commercial promise.

Assistance also can come from people who are already running a successful business

through what Jake Ward, executive director of ORED, calls "around the coffee pot interaction." In addition to ATS, three existing firms have offices at the center: Four Directions Development Corp., of Bangor; MapTech Inc., of Amesbury, Mass.; and SGC Engineering of Westbrook, Maine. By putting emerging business neophytes like Chris Frank together with veterans, Target creates "networking opportunities and a critical mass in the way people think," says Ward. "Young entrepreneurs have an environment that they haven't had before. Face-to-face time is the critical element."

Rounding out the mix of technical and business expertise at Target are UMaine students and faculty in business, electrical and computer engineering, new media, spatial information sciences and computer science. Moreover, businesses that are not ready to commit to renting space in the facility can participate in a Target Affiliate Program. The benefits include participation in weekly workshops and the use of offices to meet with potential clients, development specialists and colleagues.

Making the jump from technical development in a lab to running a business is not easy, says Neuman, a former small business owner and Eastern Maine Development Corporation (EMDC) consultant.

"People may think they have the latest, greatest technology, but commercial success requires that they get it to market and





keep it there,” she says. Creating a business requires the right attitude, and a commitment and willingness to learn about markets, finances, government regulation, production, transportation and taxes.

It’s enough to make scientists throw up their hands and go back to the lab. Or wonder if, in the midst of it all, making the jump is even possible.

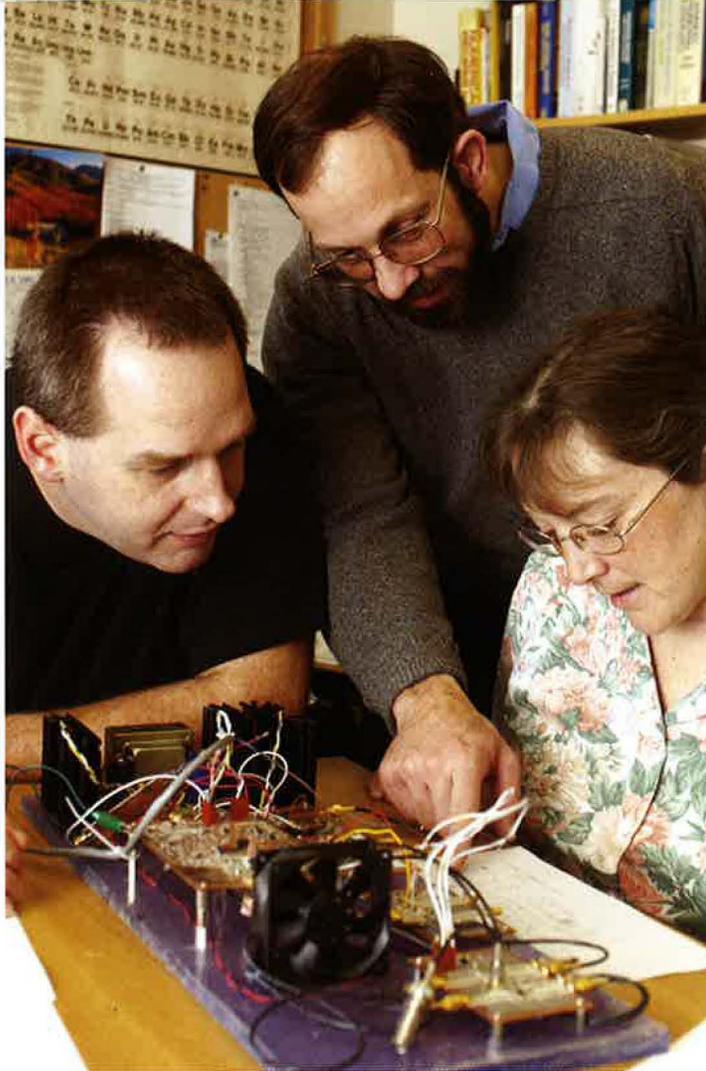
That thought has already occurred to Brian and Barbara Frederick, president and treasurer, respectively, of Stillwater Scientific Instruments Inc., Target’s first incubator business tenant. An incubator environment is exactly what they and four other scientists needed after creating their company in 2002 on the basis of research done in Europe and at UMaine.

While each of the partners has strong scientific credentials, they have little or no business background.

“We have had to decide whether our technology can actually displace existing technology in the marketplace,” says Brian Frederick, who is an assistant professor of chemistry and on the staff at the Laboratory for Surface Science and Technology at UMaine.

“We want to create well-paying, high-tech jobs for Maine. We plan to make our instruments in the Target Center for a few years. Eventually, we will move to another location in the Orono area,” he says.

Like scientific research, business is a collaborative enterprise,



Three of the six partners in Stillwater Scientific Instruments Inc. — left to right, Bronson Crothers, Brian Frederick and Barbara Frederick — review plans for state-of-the-art circuitry in a new generation of laboratory instruments.

says Neuman. “One person doesn’t have all the answers. We’re fortunate in Maine that we have a vast array of resources and experts.

“As a small company, you don’t have the time or knowledge to figure out what you need,” Neuman says. “You’re trying to run your company day to day, and you may not know that you could benefit from working with the Maine Manufacturing Extension Partnership on your manufacturing process, or that the Maine International Trade Center exists and could help you develop opportunities internationally.”

Jack Smith, vice president of ATS, sees Target as a huge benefit for his company, UMaine and the state. “We believe it is important to have this access near the university so that we can know what’s going on there,” he says.

“It’s critical to have this cross talk (with scientists and engineers), particularly when we’re walking at the edge of technology. To create new products and technologies, this is where it happens.”

To date, Smith and ATS have been instrumental in helping UMaine secure nearly \$4 million in funding from the Department of Defense to build the super-

computer housed at Target. The supercomputer has been ranked as one of the 500 fastest in the world by a high-tech Web site, www.top500.org. This spring, an upgrade will double its size. With its blazing speed, the machine can run programs in a few days that might take months on the fastest PCs.

ATS’s Larry Thompson, who was the first UMaine student to earn a Ph.D. in mechanical engineering, and his colleagues are simulating missile flights for the U.S. Army, operations that would cost millions of dollars if done the old fashioned way — by designing, building and flying the missiles.

High-speed computer modeling saves a lot of money and provides critically important information, says Associate Professor of Electrical and Computer Engineering Bruce Segee, who serves as the technical director for the facility. “You don’t want to spend millions of dollars designing something on paper, building and flying it, and then find out that it doesn’t operate the way you expected it to and you can’t control where it’s going.

“A tremendous number of things fall into that category. It really just makes good economic sense to spend a small amount of time verifying the model without committing to the expensive risk of making the model. It doesn’t have to be supersonic aircraft. It could be ship design.”

In fact, a Maine marine design software company has



Brian and Barbara Frederick were not business majors in college. That's why their start-up business was the first to take up residence at Target Technology Incubator in Orono, Maine.

Brian is a University of Maine chemist and member of the Laboratory for Surface Science and Technology (LASST) on campus. He studies the behavior of atoms on metal oxide surfaces. He also applies statistical theory to mass spectrometers, workhorses of chemical analysis in laboratories around the world. Barbara writes computer software. She has specialized in technology that manages and visualizes instrumental data for scientists and technicians.

In 2002, none of that technical expertise prepared them for the labyrinth that entrepreneurs face in starting a new business. With four UMaine colleagues, they launched Stillwater Scientific Instruments to develop and market a device that dramatically speeds up the analysis of chemical compounds. Their partners include three university graduates — Bronson Crothers, Bob Jackson and Jay LeGore (pictured above) — as well as Peter Kleban, professor of physics, all affiliated with LASST.

In its quarters at the Target Technology Center, Stillwater Scientific personnel meet with a small business advisor, accountants, corporate and



Breaking into the mass (spectrometer) market

patent lawyers, and the owners of other businesses to get guidance and advice. They participate in an invitation-only workshop on how to commercialize new technologies run by the Maine Technology Institute and work with a marketing specialist through the Maine Manufacturing Extension Partnership.

And since they plan to market their product globally with Millbrook Instruments Ltd., of England, they are working with the Maine International Trade Center to comply with regulations affecting trade between the U.S. and other countries. They also are applying for U.S. and international patents.

Stillwater Scientific's products are based on new data analysis software and hardware that can switch an ion beam on and off in billionths of a second. "The best existing laboratory technology makes measurements about 0.1 percent of the time," says Brian Frederick.

"With the approach that we've developed, we take data about 50 percent of the time, so that the measurement can be made as much as 500 times faster."

The motivation for the technology evolved from Brian's research at the University of Liverpool in England and the University of Hannover in

Germany in 1996. The technology has been developed by his group at the University of Maine under a three-year grant from the National Science Foundation. The development work continued at Stillwater Scientific through a Maine Technology Institute award, but the scientific research turned out to be the least of their problems.

"We convinced people that we have the technology," Brian says. "But we also had to convince them that with it, we could start a new business, and that it could replace existing technology that is now in the marketplace."

Barbara had some experience in the business world. In 1993, she started a company, Cutting Edge Technologies, to produce and sell software that provided a graphical interface for statistical analysis software created by Spectrum Square Associates of Ithaca, N.Y.

Her company now is integrated with Stillwater Scientific, and as treasurer, she is setting up its financial structure. She also continues to develop software that will allow Stillwater Scientific's new products to be used in the instruments that are being manufactured by Millbrook Instruments in England.

Mass spectrometers represent an estimated worldwide market of \$2 billion a year, principally in the pharmaceutical, biomedical and environmental science fields.



already taken a crack at applying the supercomputer to the needs of that industry. Last summer, Aerohydro Inc., of Southwest Harbor, participated in a trial run of software that would dramatically reduce the amount of time it takes to create a high-performance hull. That company may be the pioneer in a super-computing collaborative, an effort by the university to make the supercomputer accessible to all businesses in the state.

Not every business needs high-speed computing. But for those that do, Target could provide a competitive edge. Biotechnology companies, including Jackson Laboratory in Bar Harbor, Maine, could use the facility to rapidly generate information from massive gene sequence databases.

At ATS, high-speed computing helps engineers study one of the toughest problems in missile defense. At speeds approaching 15 times the speed of sound, the missiles generate such friction in the atmosphere that their carbon fiber skins catch fire. Although the missile develops a charred layer that prevents further damage, the resulting pressures caused by combustion can affect the missile's flight path. ATS researchers are using the super-computer to calculate those pressures across the missile's skin.

As a place where technology

development walks arm in arm with business, Target is helping to lay the foundation for Maine's future economy. No one demonstrates that potential better than Chris Frank, the NCGIA graduate student who would like to turn smart maps research into a practical aid for travelers.

His idea could appeal to tourists who want easy access to information without lugging bulky travel guides. And it could help travelers discover new places by linking their exact where-

Target Technology Center near the University of Maine is one of seven state-supported economic development facilities, also known as business incubators. These facilities are designed to put scientists and engineers face to face with business development specialists, patent attorneys and owners of existing businesses. In communities from Limestone to Sanford, incubators are focusing on technology sectors, such as aquaculture, precision manufacturing, composite materials and, in the case of Target, information technology.

abouts to information, such as maps, historic and cultural facts, and locations of hotels, restaurants and services. The device combines wireless communication technology, sensors, global positioning system receivers and online databases.

"This could ease the 'way-finding' process for travelers," says Frank. "It can identify objects and display maps based on a geographic location. The project falls under what we call intelligent spatial technologies."

In two to three years, the hope is to manufacture a product that will be the first in a family of products, says Egenhofer.

"Working at the Target Center has enabled Chris to take advantage of the legal and financial expertise there while he also takes business classes at the university."

Egenhofer has succeeded in attracting about \$3 million in federal research funds to develop the underlying theory and practical applications of intelligent spatial technologies.

Investigations also continue into the use of chemical and biological sensors, the creation of information filters to allow users to specify the details they need, and the thorny issues of privacy and legal standards. The research team includes all of the NCGIA faculty and 10 graduate students.

Basing economic growth on UMaine research can provide a solid basis for creating jobs, says Renee Kelly, business and economic development liaison with UMaine's ORED.

"There's an emphasis on thinking about how existing businesses in Maine can apply new technology. We're not going to attract many other MBNAs to the state, so we need to grow our own," she says.

Nick Houtman

More information about the Target Technology Center can be found on the Web www.targetincubator.com, or see www.atdcmaine.org for information about the State of Maine Advanced Technology Development Centers

Inside the Incubator



Before she went to work at the Target Technology Center last spring, Candan Unver (pictured left) knew that business incubators are successful in generating new economic activity. Unver, a native of Izmir, Turkey, had been studying the performance of incubators throughout the United States under an assistantship from the University of Maine Department of Industrial Cooperation.

Unver, a graduate student in the Maine Business School, has been looking at how incubators operate — from sharing office equipment to the length of time new companies can stay in a facility. Her data shows that once companies leave an incubator facility, their odds of success are greater because of the start-up assistance they receive.

"Competition is good and will kick in once these companies graduate. Right now, these companies need to get on their feet," she says.

Being on the inside of this process at Target is giving Unver and two other UMaine business students experience with business incubators — one of the hottest new economic development tools.

In addition to Unver, Maine students Ashley Perry (center) and Andrea Duquette (right), both seniors in business, are working at Target. They attend workshops, gather information for center tenants and affiliates, and learn to apply lessons from the classroom to the real needs of entrepreneurs.

All three students say that being at Target has given them a practical perspective on business.

A photograph of a scientist in a laboratory. The scientist is wearing a white lab coat and white gloves. They are using a pipette to transfer liquid into a multi-well plate. The background shows various laboratory equipment, including bottles and a fume hood. The text 'Developing Research' is overlaid on the right side of the image.

Developing Research

Maine Research Consortium to help the state build a knowledge-based economy

OFFERING A PH.D. PROGRAM in the cutting-edge field of functional genomics requires an interdisciplinary core curriculum in biological, computational and physical sciences. To do that in Maine requires an inter-institutional approach.

Maine does not have a university medical center, as do most states. What it does have is a private institution that is a world leader in genetics, a research university and a hospital-based research institute.

That collaboration between Jackson Laboratory in Bar Harbor, the University of Maine and Maine Medical Center Research Institute in Scarborough has resulted in a \$2.68 million Integrative Graduate Education and Research Traineeship (IGERT) grant from the National Science Foundation (NSF) to launch a five-year doctoral program in functional genomics — the study of genes and their proteins as part of the biochemical processes in the body.

Throughout the country, programs like NSF IGERT are considered new models for graduate education, featuring collaborative research that transcends traditional disciplinary boundaries. In Maine, the new doctoral program exemplifies the innovation needed to



Photo By Toby Hollis

Deirdre Mageean

"As Maine's primary research and graduate institution, the University of Maine leverages both education and research to stimulate economic development," says Deirdre Mageean, UMaine associate vice president for research and dean of the Graduate School. "Our researchers are addressing tough problems in information technology, biotechnology, composites, the environment and sensors. The combination of scientific expertise, student insight and business support will drive the knowledge-based economy in these and other fields.

"In 1998, the Maine legislature began increasing investment in research and development. UMaine used those dollars to attract new federal funding, pay salaries, buy goods and services, and encourage business creation. Engineered Materials of Maine, a new wood composites company, is a direct spin-off from state, federal and private investment in UMaine research. Stillwater Scientific Instruments Inc., is not far behind. With the Maine Research Consortium, they will not be the last."

participate in an increasingly knowledge-based economy. It epitomizes the philosophy and potential of the new Maine Research Consortium.

The Maine Research Consortium — Bigelow Laboratory for Oceanographic Sciences, Jackson Laboratory, Maine Medical Center Research Institute, UMaine, the University of Southern Maine and the University of Maine System — was created in 2002 to develop collaborative strategies to secure large-scale, multidisciplinary projects to strengthen R&D in the state.

As a facilitator, the consortium will develop protocols and procedures by which researchers can collaborate, prepare funding proposals, and share facilities, equipment, faculty, students and costs. Also included will be criteria by which other Maine organiza-

tions may join the voluntary group. In essence, says Don McDowell, retired CEO of Maine Medical Center, the consortium will do what traditionally happens in the executive offices of a state university's medical center.

"With the consortium, the state will be able to attract its proportionate share of federal research dollars," says McDowell, who chaired the Interim Research Council that drafted the five-year memorandum of understanding signed in October by the six founding consortium institutions.

"Those dollars will bring jobs and financial resources. This will expand the ability of Maine organizations to compete with those in New York, Massachusetts and California. We will have as much research horsepower in the combination of our multiple institutions as those states have in one (medical school)."

From the beginning, McDowell says, it

was important to understand that each institution is sovereign and fully operational. "As members of the consortium, we're not asking them to give up any of their autonomy. Any involvement in the consortium is on a voluntary basis. There will even be times that member institutions could be competitors for the same grant. Nevertheless, from the first meeting, all agreed that the consortium was in

the best interest of their organizations."

Life sciences research, including conservation biology and genetics, is a common thread among the consortium's member institutions. According to McDowell, the consortium also will focus on areas of expertise, such as marine research with medical applications and forest products research.

An example of the kind of project the consortium could facilitate will receive federal funding early next

year. The multi-million-dollar NSF infrastructure grant will create the Center of Molecular Biophysics with UMaine, Jackson Laboratory and Maine Medical Center Research Institute. For the three institutions, it will mean new jobs and a new chapter in cutting-edge research in Maine, says UMaine Executive Vice President and Provost Robert Kennedy.

"It's bringing tremendously promising research in nanotechnology and combining it with breakthroughs in human genomics," Kennedy says. "The biophysics center will take world-class expertise in biophysics from our campus and combine it with joint programs in genetics at Jackson Lab and Maine Medical to address biomedical problems."

Through this and other projects, faculty and students will have access to collaborations and interactions that add value and opportu-

Knowledge workers are scientists, software programmers, engineers, mathematicians, researchers, technicians, managers, marketers, investors and others who innovate: who create knowledge or use knowledge to create new products, processes and services. Through innovation — developing new technologies and products, and bringing them to market — they help drive a region's economy. They tend to work in "high technology" or "knowledge-intensive" industries, including new industries (software, biotechnology, composites, etc.) and traditional industries that have converted to leading-edge technologies (paper, aquaculture, shipbuilding, etc.).

nity, says Kennedy. "The result will be better training for students because of more opportunities and better funding for research than the state can afford by itself."

Such an alliance among universities and independent research labs in Maine is the cornerstone of a November 2001 action plan issued by the State Planning Office called "30 and 1,000: How to Build a Knowledge-Based Economy in Maine and Raise Incomes to the National Average by 2010." Based on a review of per capita income data for the past decade from all 50 states, the State Planning Office cited two primary factors for differences nationwide: the percentage of adults with four-year college degrees, and the dollars per employed worker spent on R&D.

The report notes that, in 1998, 19 percent of adults in Maine had college degrees (placing the state 46th in the nation) and \$255 per worker spent on R&D (44th in the nation), producing \$23,529 in per capita income (37th in the nation). But according to the State Planning Office, if 30 percent of Maine's adults had four-year college degrees and \$1,000 was spent on R&D per worker by 2010, Maine's per capita income would rise to the national average (\$28,000) or above, and economic activity would increase.

Under the 30-1,000 formula, an additional 100,000 adults in Maine would get college degrees in the next decade, and R&D investments statewide would increase four-fold.

"The 30 and 1,000 report is about economic development, pursuit of new knowledge and identification of the drivers here. We will only meet our goal by getting high-paying

jobs in our state. We need to grow entrepreneurs in Maine, as opposed to just attracting them to Maine," says State Planning Office Director David Keeley.

In a time of budget shortfalls and a weak economy, it's more important than ever to look at investments in education and leveraging of federal research dollars, Keeley says.

"The Maine legislature and voters have increased public spending for R&D from less than \$1 million to more than \$30 million a year," Keeley says. "In many instances these funds have leveraged federal and private funding five-fold. This is the kind of return on our investment that we need. The expenditure of research dollars means building buildings, hiring staff, buying equipment, people moving to the area. The ripples through the economy continue with the creation of new products and services."

People often struggle to understand the importance of R&D, Keeley says. "The blue collar worker may say, 'it's not going to benefit me.' Part of what we're doing is helping people understand how it all merges together (for the greater good). It's all about growing Maine's economy so your child, whether he or she is in the crib or in high school, will find jobs in Maine paying above the minimum wage. (It's about) providing children opportunity."

An obvious measure of success will be the degree to which Maine has collaborative research funded "in significant numbers to the left of the decimal point," McDowell says. "If we can attract millions of dollars through collaborations, we will have succeeded. We will have contributed to the world of science and the good of mankind. And the state will be viewed as a small but highly respected, very active force in research in this country."

Margaret Nagle

Knowledge-generating institutions are the economic engines of the knowledge-based economy. Whether in the private or public sector, they do not simply share or transfer knowledge. They create it, usually through intensive R&D. They include research universities, private nonprofit and for-profit laboratories, R&D divisions of industry, governmental labs, teaching hospitals and similar organizations.

From "30 and 1,000: How to Build a Knowledge-Based Economy in Maine and Raise Incomes to the National Average by 2010," November 2001, Maine State Planning Office.



Richard Woychik

"The Jackson Laboratory brings an international reputation in biomedical research, particularly mammalian genetics and the mechanisms of human disease," says Richard Woychik, director of Jackson Laboratory.

"Scientists at Jackson Laboratory, the University of Maine and Maine Medical Center Research Institute have worked tirelessly to establish the basic relationships that have blossomed into the current (Maine Research) Consortium effort. They have obtained funding from the National Science Foundation for 14 pre-doctoral fellows in functional genomics, and they have applied for funding to develop a Center of Molecular Biophysics. I believe in fostering interdependent research collaborations: assembling partners that bring expertise, then working together to achieve a synergism so we can accomplish things that no one partner could on its own. We want to launch first-rate programs that have the highest visibility and that can attract the world's best investigators."

Trading on the Environment

UMaine economist's
research indicates that
free trade policies
don't always equate to
more pollution

OPENNESS
INDICATOR TO
INTERNATIONAL TRADE
$$OI = \frac{(X+M)_i}{GDP_i} \quad (2)$$

The economic impact

of free trade agreements is tough enough to study. Try measuring the environmental effects of such policies.

Does more trade necessarily mean more pollution? Are there aspects of free trade that can be good for the environment? How do countries balance "green" interests against pro-growth pressures?

Given the complexity of the relationship between trade and the environment, there are no easy answers. The multiple variables — social, economic, political and industrial — are constantly in flux. Determining the environmental impact of liberalized trade is about as difficult as forecasting the weather several months in advance.

However, there are economists and other academics who think it's important that countries understand, to the extent possible, the environmental impact of their trade decisions — and vice versa. Among those studying the trade-pollution connection is Georges Tanguay, assistant professor of economics and Canadian studies at the University of Maine.

"Governments have a responsibility to offset possible negative effects of free trade and growth, and to base their environmental policies on the public interest," Tanguay says. "They should aim to maximize social welfare and not bend to pressure from interest groups, but it's not obvious that they are currently playing that role."

TANGUAY AND HIS COLLEAGUES have found that lobbying and other forms of political pressure greatly influence environmental policies. Their study of 22 of the world's richest countries indicated that, in a five-year period, all other things being equal, strong lobbying by industry groups resulted in less stringent pollution controls, while countries with large numbers of Greenpeace members had tougher environmental protections.

Free trade refers to trade among countries that isn't constrained by artificial barriers, mainly tariffs and quotas. Free trade policies bring economic growth and, it is widely believed by the general public, environmental harm. For economists, part of that story is correct, based on what's called the scale effect, says Tanguay.

"The idea is that a country's industries will generate more pollution simply because they are producing more goods while technology and the composition of the consumption basket (food and non-food goods) stay the same," says Tanguay, who came to UMaine in 2001 from the Business School at the University of Montreal.

But there's more to it. The so-called technique effect can be a positive influence on the environment when trade increases.

"Wealthy countries with strong environmental standards may put pressure on their less-developed trading partners to change their ways of doing things and pollute less," says Tanguay. "The developed countries will do this because they are under pressure from the public at home and from their own industries, which don't want to be operating at an economic disadvantage."

Also, more developed countries often export cleaner production technologies to poorer ones. "Both technology transfer and public pressure can have the effect of decreasing pollution in poorer countries after they start trading with richer ones," Tanguay says.

As wealth increases, industries can afford to pollute less, and the public demands more environmental controls.

"When people have more money, they become more interested in protecting or restoring environmental quality," Tanguay says. "To put it simply, when they get richer, they want to get cleaner."

A THIRD FACTOR TO CONSIDER in the impact of trade on the environment is the composition effect. Countries tend to trade with each other based on their production strengths. For example, capital-rich countries such as the United States produce high-tech goods that require more capital than labor, and poor countries with large populations have more labor-intensive industries since their relative wages are low.

Based on that, it has been widely believed that when poor countries open themselves to trade, they tend to become "pollution havens." The assumption is that polluting companies will move to poorer countries since they have lower pollution standards and will keep environmental regulation weak in order to boost their economies.

"Theoretically, the hypothesis that trade liberalization sets off a race for the bottom in terms of environmental protection has been proven over and over," Tanguay says. However, it is a theory that empirical studies have failed to support.

"In reality, many factors influence industrial location decisions, including taxes, labor costs, amenities and political stability. Often environmental regulation is less important than many of these factors."

Currently, one of the biggest problems in determining the environmental impact of free trade policies is uncertainty about the extent of pollution and the effects that pollution will have in future years worldwide. Another complication, Tanguay says, is that pollution doesn't recognize national boundaries.

"Even if a country has strong pollution regulations for its own industries, its environment can suffer because of pollution generated in neighboring countries," he says. "That is why there need to be global solutions to global environmental problems."

Dick Broom



Alternative Fueling

UMaine
obstacles
fo

Transitional Barriers

- solar
- biodiesel
- electricity
- ethanol
- propane
- hydrogen
- natural gas

In 1973, a few days after the outbreak of the fourth Arab-Israeli war, most of the oil-producing Arab countries imposed an embargo on petroleum exports to the United States.

To cope with the shortages, some gas stations limited the number of gallons each customer could buy. Others opened late and closed early. In some towns, people were only allowed to buy gas on certain days of the week, depending on whether their license plate ended in an odd or even number.

For consumers, anxiety levels rose as their gas gauges fell. The less gas there was, the more desperately people sought it, sometimes waiting in line for hours to top off their tanks. During the five-month embargo, millions of Americans came to understand how much their lifestyles and, in many cases, their livelihoods depended on oil. They were shocked to learn how vulnerable the U.S. was to interruptions in the flow of foreign oil. Everyone agreed that something had to be done.

The Nixon administration responded with Project Independence, a seven-point plan to make the country energy self-sufficient. America would produce and conserve more energy. We would get serious about developing alternative-energy

Alternative DEBATE

g Debate

**ational policy analyst Jonathan Rubin is studying the
adopting advanced-technology vehicles in America
the sake of economic security and the environment**

vehicles to make us less dependent on oil. But a quarter-century later, despite the introduction of two hybrid electric-gas cars, we still don't have all those advanced-technology vehicles we were supposed to be driving by now. And more important, there are still obstacles to manufacturing them, bringing them to market and getting people to buy them.

THE STALEMATE is the subject of intensive study nationwide, and one of the leading researchers in the field is Jonathan Rubin, interim director of the Margaret Chase Smith Center for Public Policy and associate professor of resource economics and policy at the University of Maine. Rubin and colleagues at the Oak Ridge National Laboratory in Tennessee have created a model for analyzing the barriers to transitioning to alternative-fuel

vehicles or hybrid vehicles. Alternative fuels include ethanol, methanol, propane, compressed natural gas and electricity. Hybrid cars might run on a combination of gasoline and electricity.

Interest in advanced-technology vehicles is driven by the desire for both energy security and lower air emissions, says Rubin. The two types of emissions associated with gasoline engines are greenhouse gases, mainly carbon dioxide, and pollutants like oxides of nitrogen (NO_x) and volatile hydrocarbons that are responsible for ground-level ozone and smog.

The different types of advance-technology cars — those on the drawing board and in various stages of development — offer significant energy-security and air-quality benefits. Some technical problems remain to be solved, but most of them are minor compared to the

social and economic barriers to bringing any of these new cars to market, Rubin says.

“In transitioning to these technologies, we face huge economies of scale. It is very expensive to produce just a few of a new type of car. The question is: If you can get past that scale barrier, can these vehicles be cost effective in the marketplace?”

Rubin says other important obstacles are, ironically, the low cost of petroleum energy in America and the high cost of building a nationwide network of retail stations for alternative fuels. However, this would not be an issue with hybrid vehicles that run on a combination of gasoline and electricity.

THE MODEL that Rubin co-developed for analyzing these barriers — the Transitional Alternative Fuels and Vehicles Model — simulates the use and cost of non-petroleum fuels under various conditions. “We build the cost barriers into the model and then test the effectiveness of various government policies in overcoming them,” Rubin explains. “We can do all kinds of experiments with it. For example, we can throw in an oil price shock (a sudden, steep rise in price) and see if that changes the relative benefits of different technologies.” To date, his analysis shows that an oil price shock lasting five years or less would not be effective, by itself, in making alternative-fuel vehicles feasible.

“That is largely because vehicles last a long time,” he says. “An average car is a \$20,000 capital investment with a 12-year life span. So a five-year price shock is not sufficient to induce a fundamental change in vehicle purchases.”

The long-talked-about switch to advanced-technology vehicles would be unlike most other big technology transitions in history. Cars replaced horses because they offered

Alternative ENERGY

benefits to the individual. The personal advantages of speed and convenience also ensured the popularity of cell phones, microwave ovens, personal computers and hundreds of other new technologies. But alternative-fuel and hybrid vehicles are different. Their benefits accrue largely to society as a whole rather than to individual consumers, making them a much harder sell. While some people would pay a little more to promote the common good, most car buyers put their personal interests first. People will keep driving SUVs unless they are forced — or offered incentive — to change.

“Since energy security and better air quality are public benefits, I think there is an important role for government to play in transitioning to advanced-technology vehicles,” says Rubin, who serves on both the Alternative Fuels Committee and Transportation Energy Committee of the National Transportation Research Board.

“Government has to determine how important these benefits are and then appropriately adjust market prices through subsidies and tax incentives. A number of bills were introduced in the last session of Congress to provide significant subsidies to alternative fuel, fuel cell and advanced-hybrid vehicles,” he says. All of the alternative technologies have their advocates. For example, ethanol, which is made from corn, has strong support in farming states, especially in the Midwest.

THE FEDERAL GOVERNMENT has been subsidizing research and development related to advanced-technology vehicles for years. The Clinton administration began the Partnership for New Generation Vehicles Program. In 2002, the Bush administration announced the FreedomCAR Partnership with DaimlerChrysler, Ford and General Motors. The partnership says its long-term vision is “to free the nation’s personal transportation system from petroleum dependence and from harmful vehicle emissions.” FreedomCAR’s major R&D focus is on “technologies to enable mass production of affordable hydrogen-powered fuel cell vehicles.”

Of all the advanced-technology alternatives being explored, the hydrogen-based fuel cell system seems, to many, to be the best candidate



Based on his research, Jonathan Rubin (pictured above) does not foresee this country transitioning to hybrid cars or any other advanced technology vehicles anytime soon.

believes the costs are simply too high. The best short-term solution, he says, might be to further increase fuel-efficiency standards for gasoline-powered vehicles. “A lot of economists don’t like higher fuel efficiency standards because of the costs they impose,” he says. “But I think we could achieve substantial energy gains as well as some greenhouse gas reduction benefits.”

Then, perhaps in two or three decades, the country might be ready to move in a big way to one of the new technologies. In the meantime, trying to get a handle on what it will take to accomplish that move is incredibly complex work.

“It’s interesting and challenging being at the interface between social science, engineering and policy,”

Rubin says. “My work is applied research, trying to find answers to real, practical problems.”

Dick Broom

for large-scale production and marketing. “A lot of people are holding it up as the Holy Grail,” Rubin says, “but I’m skeptical of it happening, even in the next 20 years, because the cost would be so high. (Even now) people complain when the gas tax goes up a few cents.”

HOW MUCH are we willing to pay for energy security? How much to reduce greenhouse gas emissions and global warming? Even if those questions could be answered, there is still no consensus on which alternative technology will work the best and cost the least.

“The magnitude of the uncertainty is large,” Rubin says. “One of the main things that government policy-makers worry about is how to avoid locking into the wrong technology.”

Rubin’s alternative vehicles analysis model is one of the tools being used to help evaluate the costs and feasibility of adopting the various technologies.

Based on his research, Rubin does not foresee the U.S. transitioning to hybrid cars or any other advanced-technology vehicles anytime soon. He

More information about alternative fuel transition research can be found on the Web www.umaine.edu/mcsc/Research/EnvPol/TAAFTMP/TAAFTMP.htm

Entrepreneurial Edge

Maine Business School engaging enterprising students in the state's economic future

IN AN INTRODUCTORY course in finance, college students typically spend a lot of time reviewing case studies of Fortune 500 companies, poring over balance sheets and stock options.

But what about the finances of small and midsize businesses? The principles of finance are the same, whether you're talking about a major corporation or a company with 20 employees. However, the financing options are not the same.

"Small and midsize businesses are the future of the Maine economy, and students need to be prepared to be part of it," says Daniel Innis, dean of the University of Maine College of Business, Public Policy and Health.

In an ongoing effort to address the state's economic development needs, an emphasis on entrepreneurship is something that will soon be woven into the curricula of the Maine Business School. Coursework for UMaine business students will include studies of smaller companies that don't have all the short- and long-term financing options of the Fortune 500 companies, and need other mechanisms to continue operation.

Students will be encouraged to think big, even when they've got just a kernel of a new idea. Above all, they need to understand the viability and importance of small and midsize businesses.

That's particularly pertinent when integrating business with R&D activities.

"We will build an entrepreneurial element into many if not all of our programs, and we're working in collaboration with other colleges on campus to bring entrepreneurial thinking and activity into their class-

rooms," says Innis, who joined the UMaine community this academic year from Ohio University.

"We want students thinking of the transition from the lab to the business world. There's an awful lot of research on this campus and the business school has an important role in helping to get those ideas to market."

Innis and other UMaine academic leaders look to Northern Ireland as a model in entrepreneurial education. "Ireland tried to transform its economy by instilling an entrepreneur mind-set in the culture," Innis says. "It underwent a change in education so that young, creative people

were always thinking about commercializing an idea or

invention. We want to explore how they did it, with an eye to doing some of the same things in Maine."

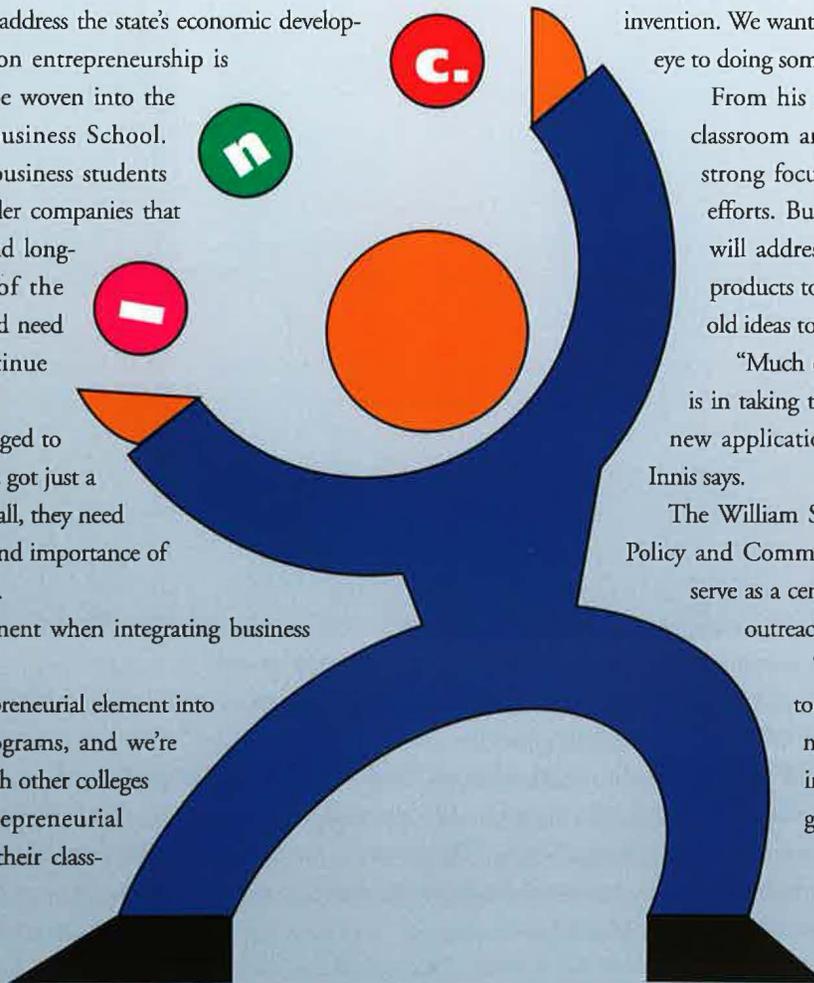
From his college, Innis says lessons in the classroom and in the community will have a strong focus on commercialization of R&D efforts. But the entrepreneurial training also will address the need for existing ideas and products to have better business plans, and for old ideas to get "new twists."

"Much of the economic future of the state is in taking the areas we do well in and finding new applications to build a business around," Innis says.

The William S. Cohen Center for International Policy and Commerce in the college is expected to serve as a centerpiece for many of the economic outreach efforts, Innis says.

"We need to be a college that is in touch with the economic realities and needs of the state in terms of creating an environment that promotes growth," Innis says.

Margaret Nagle



CAPITALIZING ON RESEARCH

Development of engineered construction

FOR SCIENTISTS, seeing an idea move from the lab to the marketplace can be as exciting as sending your child out into the world to start a new life. For entrepreneurs, it can mean taking a risk and making an investment in the future. The resulting marriage of public university research and private investment can benefit the state and beyond.

That's what happened in states like North Carolina, Georgia and Texas. And now that's what's happening in Maine, according to those involved in turning University of Maine wood engineering into a new commercial production facility — Engineered Materials of Maine (EMM).

"This is recognition that state investment in R&D leads to federal investment in university research, which creates a pipeline of ideas leading from basic research to new concepts to new technologies to patents to spin-offs and business incubation to venture capital investment to successful firms with solid bottom lines and plenty of well-paying jobs to a region with a sound economy," says University of Maine President Peter Hoff.

"Without this formula, states like North Carolina, Georgia and Texas would still be reliant on agriculture and natural resources, and their economies would be nowhere near what they are."

Bangor, Maine-based EMM is a start-up company that obtained a license from UMaine to manufacture Advanced Engineered Lumber (AEL) — a new beam and column composite product developed by the university's Advanced Engineered Wood Composites Center (AEWC). Production of AEL for residential and light commercial building is due to begin this winter. It is the result of two years of federally funded research by AEWC faculty and students, an emphasis on business development and the vision of a private investor. "We spent the past five years designing and building the AEWC lab and assembling a world-class team," says Habib Dagher, AEWC director.

Now the economic benefits are starting to show.

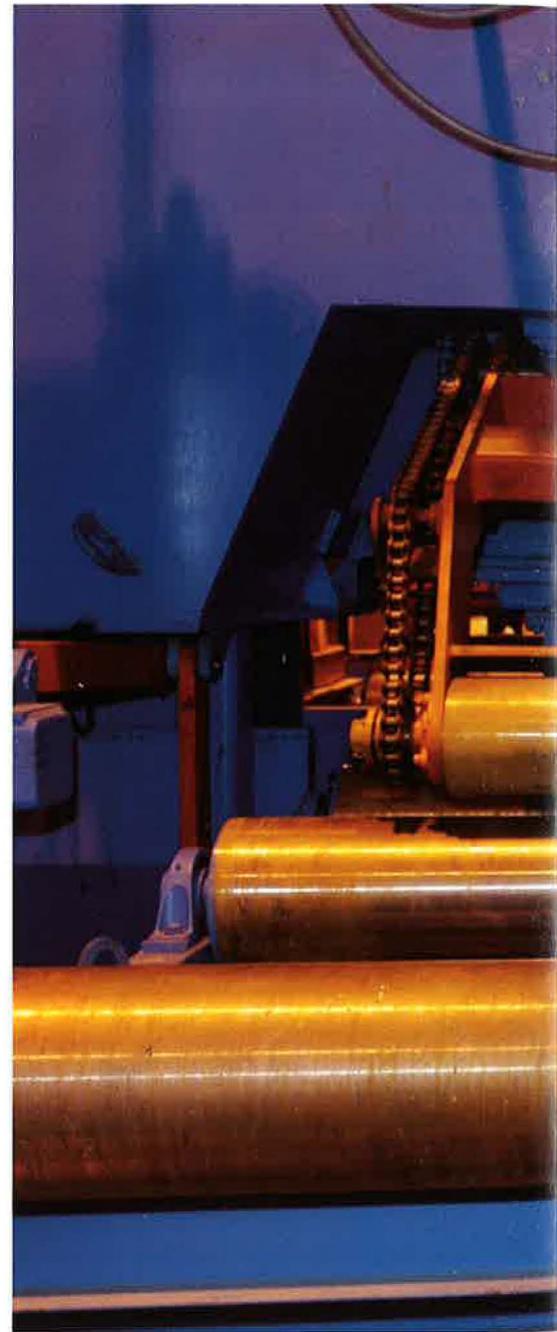
"This is an economic development investment," says Chip Hutchins, the Bangor investor behind EMM. "I'm frustrated when I look on the television screen at (a graphic of) the state showing jobs lost. I say 'do something about it.' This is my way."

Initially, EMM will result in 15 new jobs and \$1.6 million in tax revenue. By the end of 2004, the company could employ up to 75 full-time workers with a \$4.7 million payroll.

The city of Bangor also was instrumental in making the economic development success for Maine's forest products industry a reality. Bangor spent \$1.3 million to purchase and renovate the building where EMM is located. EMM is leasing the facility from the city.

"Other parts of the country are enjoying a rise in engineered wood. There's no reason for Maine to be left out," says EMM President Jon Fiutak, who worked in the forest products industry in Oregon before working on economic development at UMaine. "We are not the world's first engineered materials company. But with Habib's lab, my experience from the West Coast and Chip's investment, we have an equation that works for Maine."

AEL is one of several products developed at the AEWC Center, a 33,000-square-foot facil-



ity on campus, providing Maine with a state-of-the-art research and learning center dedicated to growing the state's economy through the development and commercialization of composite materials. The center, which opened its doors in June 2000, is a recognized world leader in composites research, attracting more than \$20 million in research funding. It



Advanced Engineered Lumber (AEL) is a new beam and column composite product developed by UMaine's Advanced Engineered Wood Composites Center. Now, Engineered Materials of Maine will manufacture AEL from layers of solid, low-grade sawn hardwood up to 1.5 inches thick.

Materials at UMaine leads to commercial enterprise



employs more than 20 professional staff and over 100 UMaine student researchers annually.

The center itself is a business that attracts \$4 million a year in R&D funding. In addition to EMM, the center has worked with more than 100 Maine companies to help them develop new products, conduct joint R&D, or simply answer technical questions.

Fiutak spent 18 months working closely with AEWC to explore commercialization opportunities for engineered construction materials primarily made of underutilized species such as red maple. The advanced engineered lumber made by EMM will be a unique product — beams made from layers of solid, low-grade sawn hardwood up to

"This is an economic development investment," says entrepreneur Chip Hutchins, pictured right, with EMM President Jon Fiutak.

Photos by Toby Hollis



Tyler Riggs, left, EMM's production supervisor, and Shane MacDougall, technical director at EMM, are both UMaine graduates who worked at the AEW Center as students.

1.5 inches thick. Because of their defects, such low-grade by-products from sawmills traditionally have been used in pallets.

ACCORDING TO DAGHER, the new technology developed at UMaine “uses a new way of spatially dispersing and randomizing defects in the wood structure,” making the laminated beam significantly stronger than one sawn directly from a log, and stronger than other wood composites on the market. Student researchers tested a dozen beam designs. When one design produced test results that far exceeded expectations, they thought the test equipment was faulty, says Dagher. Further research confirmed the findings, and the result, he says, is no less than a revolution in the glue-laminated wood industry.

One UMaine patent is now pending, in

addition to others that have resulted from AEW research, including one for a formula for fiber-reinforced polymers (FRP), high-strength plastics used to reinforce wood composites. UMaine also patented a process of bonding the polymers to wood. The technology reduces the cost and increases the strength of building materials made with wood.

The engineered lumber manufactured by EMM is ideal for home building — useful from roof to floor, says Fiutak. Like all engineered wood, it is strong, dry and uniform. It also has the potential to be more cost-effective than concrete and steel. Just as important, it serves a state's economy by adding value to low-grade wood and wood by-products that are underutilized, if not totally discarded.

“We're not replacing solid sawn lumber but we can save on-site assembly costs with

spans that are longer and can carry heavy loads,” Fiutak says. Manufacturing engineered lumber in Maine means there will be a local supply of the building materials.

EMM also is keeping in state one of Maine's most valuable resources — college graduates like Shane MacDougall, EMM's technical director. The Maine native graduated from the university in 2001 with a bachelor's degree in civil engineering and is now completing his master's degree in civil/structural engineering at the AEW Center. MacDougall's research, funded by the Federal Highway Administration, focused on development of a composite railroad tie using low-grade Maine hardwoods. The project evolved with Fiutak's input and resulted in AEL.

Another UMaine graduate, Tyler Riggs, is EMM's production supervisor. A Vermont native, Riggs has degrees in forestry from Paul Smith's College in New York and in wood science from UMaine. As a student, he worked in the AEW Center. After graduation, he worked with students at the center to produce advanced engineered lumber for national building code approval. A major challenge was to obtain code approval for AEL to be sold throughout the U.S. This required manufacturing and testing more than 300 AEL beams at the AEW lab. Ten graduate and undergraduate students were involved in the project for 18 months.

It's such local talent, combined with University of Maine R&D and the interest of an investor, that form the circle of technology transfer, says Hutchins. “Complete success will be financial, keeping our kids here with jobs, and adding to the tax base,” he says.

Margaret Nagle

More information about UMaine's Advanced Engineered Wood Composites Center can be found on the Web www.aewc.umaine.edu



Learning to be part of the knowledge-based economy

Maine Adult Education's focus on family literacy, education and job skills is essential in economic development



WHEN KATHY HEBERT was laid off from her lumber mill job in Bethel, Maine, last year, she didn't even know how to turn on a computer. At the age of 45, the high school graduate assumed her options were limited to the manual labor she had done all her life, such as another mill job — with the prospect of being laid off again — or working as a housekeeper at the nearby ski resort.

After being referred to the local adult education center, Hebert's outlook improved markedly. She learned how to turn on — and use — a computer. She brushed up on her math and writing skills. But, most importantly, she learned that she could thrive in college and, ultimately, embark on a career that didn't involve "sucking in sawdust."

"The adult education program is, in my opinion, probably the most important money this state will ever spend," says Hebert, the mother of two who is now enrolled in Mid-State College in Auburn. She is on her way to earning an associate degree to work in a medical office.

"I don't want an unemployment check every week. I want a job. And the only way to get

a job today is through education," she says.

Hebert's story is repeated hundreds of times each year as mills and other manufacturing facilities close or downsize in the state. The Maine Adult Education System is the safety net that catches many workers like Hebert and prepares them for new jobs that often require new skills, including technical expertise and the ability to solve problems, and to develop and share ideas.

Working in schools, workplaces, correctional facilities and other sites, adult educators prepare students for the job market and post-secondary education. The University of Maine, through its Center for Adult Literacy and Learning (CALL) in the College of Education and Human Development, provides the training and support needed by these educators to reach out to the more than 120,000 adult students who use the system each year.

FOR 25 YEARS, the Maine Department of Education has contracted with the university, through CALL, to provide staff development, technical support and leadership to the approximately 3,360 practitioners in the state's adult education system who are spread from Fort Kent to Kittery. The center, located in Orono, provides professional development, technical assistance, and instructional and professional resources to directors, teachers, counselors and support personnel in all of Maine's adult education programs. The programs serve about 65,000 adults enrolled in academic and vocational courses, and another 59,000 taking a variety of enrichment classes, from nutrition to computer science.

CALL, which has a staff of six, also serves as the State Literacy Resource Center for the adult education system.

With the university's leadership, the state's adult education system has been tailored to ensure that adult learners gain the skills they need to succeed in the workplace, their communities and their families. If, for example, a student says she needs to be able to better communicate her ideas to co-workers

and supervisors, the adult educator would focus on teaching those skills. The university trains adult educators to provide this type of instruction and has helped develop a system to ensure that the desired outcomes are achieved.

"Adult Education is a bridge to a better life and community," says Evelyn Beaulieu, director of CALL. "And now, we have a definition of quality instruction, a consumer-based definition of the skills adult learners need for success, and common standards and language statewide."

TODAY'S WORKERS need four key skills to succeed, says Beaulieu. They are strong interpersonal skills, the ability to communicate well and to make well-reasoned decisions, and a commitment to lifelong learning.

Not all adults who use the system want to come away with all these skills, simply because they are busy with work and family commitments. But according to Beaulieu, once they have seen how they benefit from education, they are likely to return to gain additional training and skills. Plus, the shift to a student-centered approach has meant that fewer adults have dropped out of classes because they see the value of the coursework.

Employers also have responded positively to adult education's focus on equipping students to thrive in many realms.

"They say, 'Yes, that's what I want,'" Beaulieu says.

In addition to job skills training, adult education offers opportunities for students to improve literacy skills, complete high school or earn a GED. People from other countries

may learn English and survival skills through adult education, which also offers courses at correctional facilities throughout the state.

THE ADULT EDUCATION system is funded by local taxes, state subsidies, federal grants and registration fees. CALL services are funded, in part, by federal Workforce Investment Act monies that the state receives.

With the university's guidance, Maine has been a leading state in developing standards and performance measures for what adults need to know and be able to do as successful workers. Maine is one of five states that are developing benchmarks for successful adult education courses. Such courses must use a "real-life" curriculum that weaves academic instruction with skills that students themselves say they want to acquire.

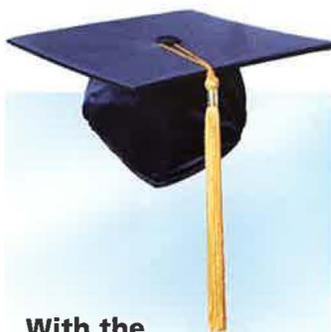
"We play a strong connecting role throughout the education system and a vital role in economic

development, helping people improve their skills and attain more education," says Rebecca Dyer, acting state adult education director at the Maine Department of Education.

Attaining more education has made a world of difference to the Hebert family of Bethel. Not only did Kathy lose her job last year, so too did her husband, who had worked as a heavy equipment mechanic. Through adult education, he earned a GED and landed another job.

"Not having a diploma was a big hold back," Hebert says. "He wouldn't have gotten the job he has now (without it)."

Kay Hyatt and Susan Young



With the university's guidance, Maine has been a leading state in developing standards and performance measures for what adults need to know and be able to do as successful workers. Maine is one of five states that are developing benchmarks for successful adult education courses.



AILEEN NUTTER believes that “being involved is a way of exploring other forms of learning.” The University of Maine senior political science major from North Berwick, Maine, has spent her undergraduate years pursuing as many experiential learning opportunities as possible — all while maintaining a nearly straight-A grade point average as an honors student working to reach her long-held goal of attending law school.

On campus, Nutter is involved in student government, Chi Omega sorority and academic honor societies. As a sophomore, she studied at Cambridge University in the United Kingdom.

Last spring, Nutter was selected to participate in UMaine’s competitive Congressional Internship Program. She was an intern in the press office of Sen. Susan Collins in Washington, D.C. Nutter ultimately assumed the role of deputy press secretary for Collins until the November elections.

“This has been such an exciting experience and great educational opportunity — it’s opened up a whole new world for me. Working for Sen. Collins and helping the people of Maine have made me realize just how much I want a career that makes a difference,” Nutter says.

Nutter came to UMaine in 1999 on an Osher Scholarship, an award of \$6,000 per year for four years. The scholarship is awarded based on academic achievement, community involvement and financial need.

Following law school, Nutter says she will either make her career in the judiciary or in politics.

“UMaine has helped me to glean the most from my education by encouraging me to pursue diverse and exciting opportunities,” she says.

a world of opportunity



Photo by Toby Hollis

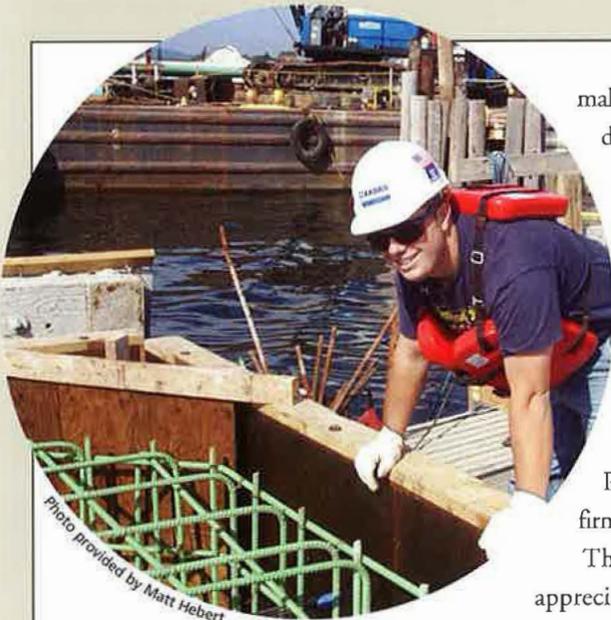


Photo provided by Matt Hebert

Under Construction

If THERE IS A BOOT CAMP for people who manage large construction projects in Maine, Matt Hebert has found it.

Hebert has helped to run pipes in the heat and humidity above a paper-

making machine in Rumford, scheduled deliveries of lumber and steel for a hydroelectric project in Winslow, and tracked finances and coordinated suppliers for a new Swan’s Island ferry pier in Bass Harbor. He combined courses in the UMaine Construction Management Technology (CMT) Program with a summer job at Cianbro Corp., of Pittsfield, Maine’s largest construction firm.

The experience has given Hebert an appreciation for the teamwork required in projects ranging from a factory upgrade to a new skyscraper.

“There is more than one right solution to a problem in the construction industry. The CMT Program has given me the tools to adapt to any company’s approach. But the people who really make it all happen are the pipe fitters, bricklayers and others on the front lines. You have to know how management decisions affect them,” says Hebert.

Hebert received a CMT bachelor’s degree with a business minor in December. The combination of work experience with rigorous courses and national academic competition has prepared him to take advantage of an industry trend toward highly trained project managers.

“I love a challenge, and this program has given me the tools to apply the right solutions to every step of the construction process,” says Hebert, a native of Oakland, Maine.

The CMT Program was established in 1988 under the guidance of Chuck Gould, who retired in 2001 but continues to advise students. Today, Knud Hermansen, professor of civil engineering technology, runs the program, which has 111 students taking courses in engineering, business, information management and law. The program’s 12-member industrial advisory committee includes representatives of some of the state’s largest construction firms.



Categorizing Winter Storms

PREDICTING the impact of a winter storm in the eastern and central United States can be treacherous. How quickly it strengthens, where it goes and how fast it travels can mean the difference between shoveling a few inches of snow and being stuck in the driveway.

Greg Zielinski, Maine state climatologist and an associate research professor in the University of Maine Institute for Quaternary and Climate Studies, has developed a way to help weather forecasters and the

public understand the likely effects of winter storms. He has categorized their severity on a scale of 1–5, with 5 being most intense. Zielinski applies the classification to two types of storms: nor'easters that often intensify in the mid-Atlantic region and move up the coast into New England; and intense storms sometimes called the Witches of November that originate east of the Rocky Mountains and move through the Great Lakes region or up the Ohio River Valley.

"We have classification schemes for tornadoes and hurricanes," says Zielinski. "Why not for winter storms? With my classifications, the potential impact of a storm can then be passed on to public service officials so they can make plans for precipitation

amounts, particularly snow, snowfall rates, wind speeds, drifting potential and overall impact on schools, businesses, travelers and coastal communities."

Zielinski's approach uses two features of a storm. He calculates characteristics of air pressure, which reflects storm strength, and forward speed, because even moderately intense storms can have a large impact if they move

slowly. For example, a 1969 storm that stalled above Cape Cod for two days dumped more than 8

feet of snow on top of Mt. Washington in New Hampshire. Conversely, the cumulative impact of strong storms may lessen if they move through an area quickly. That was the case in New England with the March 1993 "Storm of the Century."

Zielinski is using his scale in a historical investigation of New England's climate. He has classified more than 70 storms of the past, including the Great Arctic Outbreak of 1899, the Blizzard of 1888 and other storms that are part of U.S. weather lore.

A December 2000 storm was the most intense found in his study.

Zielinski hopes to compare storms and look for patterns in the more than 100 years of scientific weather records.

We have classifications for tornadoes and hurricanes. Why not for winter storms? With classifications, the potential impact of a storm can be passed on to public service officials.

SENSORS in schools

STUDENTS AT BANGOR HIGH SCHOOL are studying some of the hottest topics in engineering as a result of a new program initiated by the University of Maine College of Engineering with support from a \$1.65 million National Science Foundation grant.

In the program called GK-12: Sensors, 10 graduate and five undergraduate students are working with the high school students in their classrooms for a minimum of 10 hours a week. Their focus is on sensor technologies, which have applications in fields from public health and pollution control to national defense.

In addition, high school teachers spend time in UMaine laboratories learning about sensor technologies and developing new curricula with the help of faculty members from UMaine's multiple engineering disciplines: electrical and computer, spatial information science, mechanical, biological and chemical, and civil and environmental. The faculty are affiliated with cutting-edge research facilities at UMaine, including the National Center for Geographic Information and Analysis, the Laboratory for Surface Science and Technology (LASST), and the Advanced Engineered Wood Composites Center.

John Vetelino, a professor in the UMaine Department of Electrical and Computer Engineering and LASST, created the project with Steve Godsoe, chair of the Bangor High School Department of Mathematics.

Other community partners include the Maine Discovery Museum and the Maine Challenger Project. Technology-based companies from throughout the state also participate by offering tours for students and sending personnel to the high school to make career presentations.

The three-year GK-12: Sensors project will develop educational resources, including a new high school honors class on sensors that can be shared with schools throughout Maine and the nation.

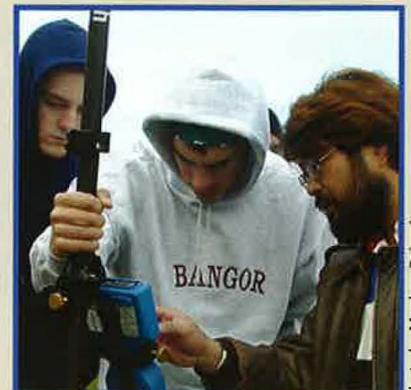


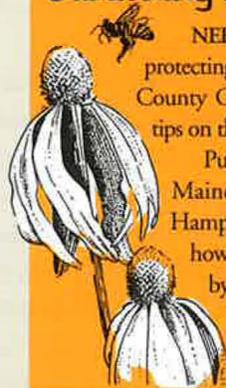
Photo by Meghan Pojasek

Gardening by Calendar

NEED ADVICE on planting vegetables, selecting roses or protecting the garden from deer? The illustrated 2003 North County Garden Calendar from Cooperative Extension offers tips on these and other topics for every day of the year.

Published by Extension offices at the University of Maine, University of Vermont and University of New Hampshire, the calendar also provides information about how to find Extension publications on gardening topics by phone or via the Internet.

The calendars are available from Extension offices in each of the three states.



Fish River Finds

AN ARCHAEOLOGICAL RESEARCH TEAM from the University of Maine has identified four new sites in the Fish River drainage of northern Maine that could shed light on how people in that region lived during the Archaic and Ceramic periods (7000 B.C.–A.D. 1500).

Adrian Burke, an assistant professor of anthropology and Quaternary studies, four UMaine students and a student from Acadia University in Nova Scotia conducted an archaeological survey of the area last summer.

The scientists found stone tools and by-products of their manufacture, demonstrating that there were far-reaching trade networks among people in what is now northern Maine, Quebec and New Brunswick.

“This part of the state has been virtually unexplored archaeologically, so this research is beginning to fill in the gaps about that time period. Our initial findings indicate that this region was not on the periphery of communication and trade; rather, it was connected to a much larger regional network,” Burke says.

Next summer, Burke will return to the area with more students to set up a field school to excavate one or more of the sites.

The Fish River drainage is located in the upper St. John Valley, where large lakes empty via the Fish River into the St. John River at Fort Kent, Maine. The region remains part of the territory of the Maliseet and Micmac Indian Nations of Maine, Quebec and New Brunswick.

Research in the Fish River drainage will provide additional and complementary information about trade networks, cultural contacts, transportation routes and the long-term history of the native people of northern Maine.



Photo by Adrian Burke

In the field for up to 10 hours a day for a month, the researchers covered about 200 square miles by canoe, motor boat and foot. They identified the search areas using topographic maps and aerial photographs, and by looking at the patterns of site distribution in neighboring regions.

Canada and Mexico to Europe, Africa and Asia. The system has already connected Maine companies with correspondents in 14 countries.

awareness and action to fight osteoporosis



ONE OF THREE federal grants to develop a National Osteoporosis Awareness and Prevention Action Plan has been awarded to the University of Maine Center on Aging, in conjunction with the Maine Center for Osteoporosis Research and Education in Bangor, Maine.

The other recipients of the U.S. Department of Health and Human Services grants are the National Osteoporosis Foundation in Washington, D.C., and the Foundation for Osteoporosis Research and Education, located in Oakland, Calif.

In Maine, Lenard Kaye of the UMaine School of Social Work and Dr. Clifford Rosen, director of the Maine Center for Osteoporosis Research and Education, are co-principal investigators on the one-year, \$138,000 grant.

Osteoporosis affects approximately 10 million people in the United States, mostly women. In 2001, the National Institutes of Health estimated the costs related to the disease, manifested by the loss of bone mass, at \$47 million per day. Kaye and Rosen will lead an effort to develop a strategy and plan that will raise knowledge about osteoporosis and its prevention.

“By bringing together the best minds on aging and osteoporosis, and talking with diverse groups of older women throughout the United States, this project is intent on not just educating the public about the risk of osteoporosis, but actually bringing about reductions in risk-taking behavior,” Kaye says. “If successful, such a campaign will ultimately reduce the frequency of diagnoses of osteoporosis in the older female population.

“Central to our efforts will be our ‘whole person’ philosophy of osteoporosis education that emphasizes the importance of open communication between women and their healthcare providers, personal empowerment and responsibility, and education that targets underserved older women in those regions of the nation where health information is most scarce,” he says.

Alumni Abroad Advising Maine

THE POTENTIAL TO BUILD relationships among people with connections to Maine, no matter where they are in the world, is the focus of Maine International Networking Service, or MINS.

In a global marketplace, state businesses and government agencies are increasingly looking to foreign markets for economic opportunities. Whether searching for new customers, business partners or trade relationships, they need to know where to go and whom to contact.

Developed with two years of support from UMaine’s Department of Industrial Cooperation, MINS is linking businesses and government leaders with Maine college and university alumni who now live in countries from

Canada and Mexico to Europe, Africa and Asia. The system has already connected Maine companies with correspondents in 14 countries.

In its first year, the MINS database contains 330 alumni of UMaine, Maine Maritime Academy, Husson College and Bowdoin College.

Former U.S. diplomat Bob Sargent of Downeast International Consultants in Sargentville, Maine, manages MINS.

The network will be most useful in the early stages of project development, says Richard Coyle, director of the Maine International Trade Center in Augusta, Maine. “Normally it’s a roll of the dice when you contact business or government officials in other countries,” he says. “MINS gives us an advantage” — contacts who have ties to Maine.



**RAPID TURNOVER
IN COMPUTERS AND
OTHER HIGH-TECH EQUIPMENT**

gives retailers a headache. What is hot one day can be out of date the next. Keeping track of product updates and availability, not to mention price changes, can have technology sellers reaching for the aspirin.

Now comes a cure in the form of software developed by University of Maine students working with Doug Marchio,

manager of the Computer Connection, UMaine's campus computer store. Known as the Buyers and Sales Assistant, or BSA, the new system has proven so successful that universities nationwide are using it to manage their technology purchasing.

"The computer industry is the hardest industry for sourcing products," says Marchio. "For example, prices for memory sometimes change multiple times a day. It's a monster, and we've developed a monster tamer."

Through a contract with the Campus Computer Resellers Alliance, a higher education non-profit organization of more than 600 colleges and universities, Marchio has seen a "lite" version

Solving Procurement Problems

of BSA solve technology procurement problems for some of the country's largest universities, including Stanford, the University of Illinois and the University of Southern California.

Other large universities are establishing separate contracts for full BSA versions.

The approach was developed by Benjamin Scott, a 2000 UMaine computer science graduate, in conjunction with Marchio. It starts by importing computer supplier databases on a nightly basis (up-to-the-minute or real-time are optional). The system retrieves, sorts and filters data to produce its own searchable data-

The computer industry is the hardest industry for sourcing products. It's a monster, but the Computer Connection has developed a monster tamer.

base. That information is then placed on a Web site and tailored to specific groups of users.

Suppliers benefit, says Marchio, by having product information and vendor advantages in the BSA database. Campus retailers save customers time and money by finding the best available deals on everything from high-end PCs to printer ink cartridges. End-user consumers will soon be able to shop for themselves at an eStore Web page that uses the BSA database.

Scott, who developed the original computer code for BSA as a student, continues to work on the system from his home in Portland, Maine, with support from UMaine's Department of Industrial Cooperation. Scott says he would like to see the system applied to purchasing in other industries.

THE STATE'S LARGEST LIBRARY

will use the latest technology to bring an interactive multimedia digital music library to teachers and students with the help of a \$344,000 grant from the federal Institute of Museum and Library Services (IMLS).

The University of Maine's Fogler Library, in partnership with the Bagaduce Music Lending Library and the Bangor Public Library, will create "The Maine Music Box." In this two-year project, the libraries will design a digital library of musical scores with associated sound renditions, cover art and lyrics. With this instructional tool, users will be able to view, play and print scores, and manipulate music by changing the key or instrument.

Throughout the country, educators are grappling with ways to meet state-mandated education standards. The Maine Music Box will help teachers and students achieve Maine Learning Results with online strategies tailored to specific requirements for all levels in the visual and performing arts, and social studies.

"This project provides a model for libraries that are endeavoring to find new ways to share their



resources and redefine the use of their collections and services in this digital era," says Elaine Albright, dean of Cultural Affairs and Libraries at UMaine. "The project will demonstrate how collections can be enriched with the tools of information technologies, and connected to local communities to support and advance the broad education mission of libraries."

Fogler Library staff will collaborate with outreach coordinators from the Maine Center for the Arts. Together, they will direct and implement the project to support access to the partner library music collections and to deliver the instructional tool for educators.

Fogler Library's IMLS grant proposal was one of 12 funded out of 35 applications nationwide.

IMLS is a federal grant-making agency located in Washington, D.C., that fosters leadership, innovation and a lifetime of learning by supporting museums and libraries.

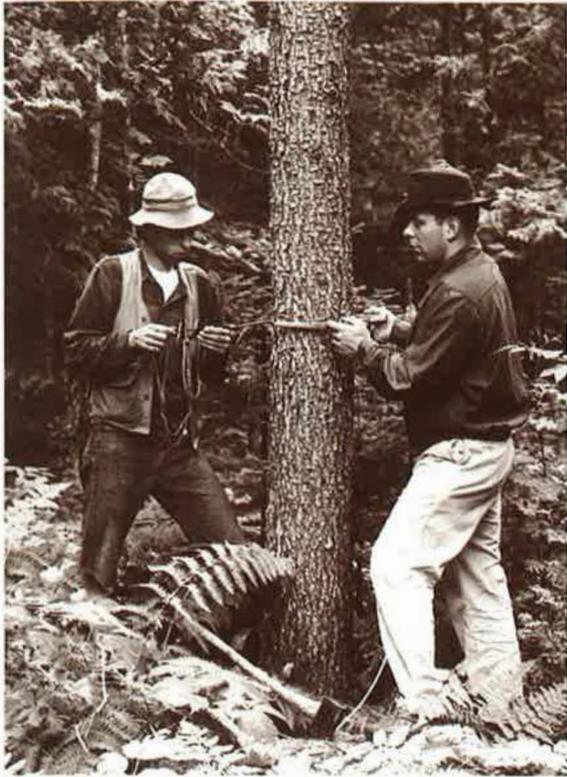
writing in *Français*

For Susan Pinette, the way something is said says something about a culture. Pinette, the director of Franco American Studies at the University of Maine, is conducting research about the way early modern French writers who traveled in North America and those who remained in France depicted French Canada.

In her research, Pinette is focusing on how early modern French writers used literary techniques such as dialogue and autobiography. Her goal is to analyze how they contributed to a distinctly French perspective on ethnography and science.

By investigating the role of North American French language and culture within a broader historical, cultural and literary context, Pinette's research is helping to establish the significance of North American Francophone communities within academic French studies.

LASTING IMPRESSION



IN 1903, THE FIRST forestry course was offered at Maine's land-grant university. Three years later, four University of Maine students became the first to graduate with degrees in forestry. The 1906 UMaine yearbook, *The Prism*, noted that forestry "is rapidly becoming one of the most popular courses offered, and is almost certain to show wonderful development within

the next few years." Little did the students know that a century later, UMaine would have the longest continuously accredited professional forestry program in the United States.

This year, the forestry program in the departments of Forest Management and Forest Ecosystem Science in the College of Natural Sciences, Forestry, and Agriculture is observing its 100th anniversary. The department offers degree programs in forestry; forest operations science; parks, recreation and tourism; and wood science and technology. Its mission is to provide education, conduct research, and supply other public services that deal with the management and use of forest resources for the well-being of the people of Maine, the nation and the world.

"Lasting Impression" features a memorable person or event in UMaine history.



Measuring tree growth
1995 photo by Tom Stewart ©
Circa 1945 photo courtesy of
Fogler Library Special Collections



Hardy Research

Donglin Zhang, University of Maine assistant professor of horticulture, is working with Trefoil, a Maine-based software company, to develop horticulture databases for use by the public and commercial growers. Funding for the project came from the Maine Technology Institute.

Photo by Toby Hollis

WITH ITS DARK FOLIAGE and white-to-pink flowers, mountain laurel is a sought-after shrub for landscaping. However, its overall winter survival rate has limited its use in northern climes.

Four years ago, research at the University of Maine on the cold hardiness of mountain laurel shed light on the varieties most likely to overwinter. The findings informed nursery owners like Jeff O'Donal and the homeowners buying plant stock from the family business in Gorham, Maine.

"Based on what the research has shown to be hardy, I'm purchasing different mountain laurel," O'Donal says. "With that kind of information, the industry is more knowledgeable and homeowners can have more confidence that they're purchasing plants that they will have success with in the winter."

In recent years, similar studies by faculty members and graduate students in UMaine's Landscape Horticulture Program have addressed overwinter survival and propagation of a number of ornamental plants, including stewartia, magnolia, viburnum, ornamental grasses, heath

and heather. The direct benefit to Maine's \$288 million horticulture industry has prompted the Ornamental Horticulture Council to create an endowed fund in the University of Maine Foundation in support of research. The fund-raising goal is \$2 million.

The Ornamental Horticulture Council is an umbrella trade organization established four years ago to address common issues facing horticulture-related industries in the state. Joining members from four trade associations — the Maine Arborist Association, Maine Landscape and Nursery Association, Mid-Maine Greenhouse Growers Association, and Maine State Florists' and Growers' Association — are two state Department of Agriculture representatives and Lois Stack, University of Maine Cooperative Extension ornamental horticulture specialist. The council, formed at Stack's suggestion, represents more than 1,000 businesses in Maine.

According to O'Donal, incoming president of the council, the group's research priorities include streamlining plant production, crop fertilization, product marketing, and evaluating the feasibility of propagating and marketing underused native plants.

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