Maine EPSCoR

at THE UNIVERSITY OF MAINE

Summer 2008

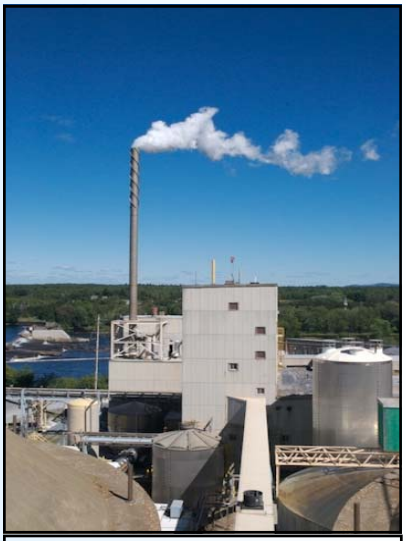
The Experimental Program to Stimulate Competitive Research (EPSCoR) is a federal program directed at states that have historically received lesser amounts of federal R&D funding. Through this program, states receive support to develop partnerships between their higher education institutions, industry, government, and others in order to effect lasting improvements in their R&D infrastructure, capacity, and national competitiveness. Maine has been an EPSCoR state since 1980, and competes for funding from the following programs: NSF EPSCoR, DOE EPSCoR, DEPSCoR, NASA EPSCoR, and NIH IDeA.

$30M DOE Grant to Transfer Maine NSF EPSCoR Research to Commercial Biorefinery

An innovative partnership involving the University of Maine (UMaine), Red Shield Environmental (RSE) and American Process Incorporated (API) has resulted in a grant award of $30 million from the U.S. Department of Energy (DOE) to design, build and operate a small-scale commercial biorefinery in Old Town, Maine. The biorefinery will produce ethanol, acetic acid and other by-products from the wood chips that are also utilized to produce market pulp in Red Shield's mill. Construction is expected to begin in 2009 and a fully integrated biorefinery will be in operation by 2011.

In announcing the grant in April 2008, DOE Secretary Samuel Bodman emphasized that the funding will "further President Bush's goal of making cellulosic ethanol cost-competitive by 2012." Red Shield is one of only seven companies nationwide that received these DOE grant funds.

Maine's Governor John Baldacci added that "Not only will it solidify and grow Red Shield in Old Town in collaboration with the University, but it will be able to be a model for the rest of the nation's pulp and paper companies. To be able to do this there is huge."



Red Shield Mill, Old Town, ME

The Old Town biorefinery project moves the University one step closer in its goal to successfully transfer forest-based cellulosic ethanol and bioproducts research from its labs to commercial mill operations. In 2006 the state received a $6.9M National Science Foundation EPSCoR Research Infrastructure Improvement award to create the Forest Bioproducts Research Initiative (FBRI) at the University. Since then, over 30 researchers have collaborated in the NSF EPSCoR project in order to address some of the pressing issues of our time: replacements for fossil fuels, renewable energy, green chemicals, and creative uses of sustainable forest resources.

The University's resulting biorefinery process has significant technical and commercial advantages over competing technologies because the new products can be produced as part of the normal pulp-making process by making more efficient use of the wood fiber. In addition, the process requires far less fossil energy than corn ethanol and only a fraction of what is needed to produce gasoline.

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Red Shield has been collaborating with UMaine's researchers for the past two years on this technology, and in December 2007 it was able to convert its one-vessel pulping system into a two-vessel system. This allowed for the test production of pulp in conjunction with the extraction of hemicellulose from wood chips (to provide a new feedstock for ethanol production). The DOE award will now allow Red Shield to expand this UMaine technology into the small-scale biorefinery, prompting Jack Cashman, Gov. Baldacci's senior policy adviser, to confidently state that "I see a rebirth in this state in the forest products industry led by the University of Maine."

FBRI Co-Director Hemant Pendse & Red Shield General Manager Dick Arnold

Maine NSF EPSCoR FBRI Project Supports 141 Individuals

Maine's current NSF EPSCoR RII project began in April 2006 under a $6.9M award from NSF, which was matched by $3.45M from the University's MEIF funds. This project created the Forest Bioproducts Research Initiative (FBRI) at the University of Maine. One of the project's major objectives is to enhance human resource development in this focus area for current and future researchers.

To date a total of 141 individuals have been directly supported by this project. This includes: 31 core faculty and 3 outreach faculty, 4 postdoctoral associates, 30 graduate students, 37 undergraduate students, 12 high school students, and 12 technicians/professional/administrative staff on the core project and another 12 in outreach partners. During this past year, the project was able to achieve its goal of hiring three new tenure-track faculty, four new postdoctoral associates, and two new research staff positions. This investment in human infrastructure has had a strong impact on Maine's capacity and competitiveness in this field.

Welcome to FBRI New Faculty Hires:

Anthony Halog

Dr. Halog joined the Forest Bioproducts Research Initiative team in July 2008 as an Assistant Professor in Industrial Ecology and Life Cycle Analysis. Dr. Halog's research focuses on how to preserve overall ecological landscapes while harnessing the potentials of forest resources for the good of the economy and the people.

Peter van Walsum

Dr. van Walsum joined the Forest Bioproducts Research Initiative team in August 2007 as an Associate Professor in Chemical and Biological Engineering, where he leads FBRI's biological processing research cluster. He has dedicated his career to research and industrial work in energy supply, production, and sustainability.

Aaron Weiskittel

Dr. Weiskittel is an Assistant Professor of Forest Modeling and Biometrics at the University of Maine, School of Forest Resources. He received his B.S. in Natural Resources from Ohio State University, and his research interests range from empirical modeling of individual tree growth to mapping regional potential productivity.

MAINE EPSCoR HIGHLIGHTS OF OUTREACH PARTNERS:

These collaborating partners have received outreach support to assist Maine EPSCoR's FBRI project in meeting its goals and objectives for educational, research, and human resource development.

Maine Tree Foundation – Augusta, ME

The Maine TREE Foundation is a private, non-profit environmental education organization with a focus on the forest.

With Maine EPSCoR support, the Maine Tree Foundation has annually conducted four-day "Forests of Maine Teachers' Tours," held additional teacher professional development workshops focusing on forest bioproducts, and conducted an extended Facilitators Conference for K-12 teachers from throughout the state.

UMaine Wabanaki Center – Orono, ME

The Wabanaki Center, in an integral partnership with Maine EPSCoR, is working to increase participation of tribal groups in STEM activities through their Native Scholar Educational Outreach Project. An initial planning phase allowed for needs assessment and establishing contacts within the tribal communities, and the Center is now implementing Phase II of their project. This will include: establishing a mentor program where Native alumni STEM scholars provide on-going support to students who wish to pursue a career in a STEM-related field; website enhancement to provide students with STEM resources; and student events in which tribal high school students can explore STEM programs at the University.

Troy Howard Middle School – Belfast, ME

Troy Howard Middle School received an outreach award in order to establish an after school environmental club for 6th and 7th graders. Support was also provided for the purchase of scientific equipment which was used for club activities, as well as for new environmental educational activities for STEM classroom curriculum. School teachers worked with FBRI faculty and other outreach partners to maximize the impact of their award.

Maine Energy Education Program – Parsonfield, ME

MEEP is a non-profit organization focused on helping Maine students become energy-literate citizens.

Maine EPSCoR provided outreach support for MEEP to research and develop materials on ethanol production from forest products that would complement their existing K-12 educational materials. The newly developed visual information and experiential activity was piloted with 100 students, and will be integrated into MEEP's on-going educational programs.

The Pulp and Paper Foundation – Orono, ME

The Foundation financially supports and helps prepare engineering students for careers in the pulp and paper and allied industries.

The Pulp and Paper Foundation's outreach award supported the addition of a third one-week program to their Consider Engineering summer program. This allowed 30 more high school juniors to experience various engineering activities with UMaine faculty and students, and to participate in hands-on engineering teams. This year a total of 101 high school juniors were able to attend, and FBRI faculty and graduate students participated as mentors. *Continued on page 4*

MAINE EPSCoR HIGHLIGHTS OF OUTREACH PARTNERS *continued from page 3*

UMaine Women's Resource Center – Orono, ME

The Women's Resource Center provides services and programs to women of the University of Maine as well as those throughout the state of Maine.

Maine EPSCoR has provided support for the Women's Resource Center's annual one-day conference entitled "Expanding Your Horizons" which is focused on providing middle school girls with opportunities to connect with women in under-represented career fields, including science, engineering, mathematics, and technology. This year 507 girls attended with 69 teachers and/or chaperones from 29 schools around the state. A total of 59 women acted as presenters, including many FBRI faculty and graduate students.

UMaine Foster Student Innovation Center – Orono, ME

The Innovation Center is designed to provide knowledge and tools to help students in the state become innovators and entrepreneurs.

The Foster Student Innovation Center received support to hold an annual innovation and commercialization plan contest that was open to undergraduate and graduate students throughout the state. Awardees received support to help them develop their new commercial "green" concepts.

Maine Association of Conservation Districts – Belgrade, ME

MACD is a non-profit organization connecting Maine's Soil and Water Conservation Districts.

MACD provided educational outreach through the Maine Envirothon Program to increase public awareness and participation in environmental issues. Envirothon is a natural resource problem-solving competition for students in grades 9-12.

Washington Academy – East Machias, ME

Washington Academy is a private high school on the coast of Maine.

Washington Academy's outreach award allowed them to construct a larger, and portable, biodiesel unit that is utilized for teaching students about this field. By making the unit portable with its own trailer, it also allowed for the ability to bring increased awareness of biofuel technologies to a broader audience by "taking it on the road." In its first test run, the portable biodiesel unit was utilized during UMaine's Upward Bound program, which focused entirely on FBRI research.

UMaine Center for Science and Mathematics Education Research – Orono, ME

The Center is a joint effort of the university's College of Liberal Arts and Sciences, College of Education and Human Development, and College of Natural Sciences, Forestry and Agriculture, and provides an integrated approach to University-based research and training in science and mathematics education.

The Center's outreach awards have provided support for the exchange of research-supported content focused on the best practices in K-16 science and math teaching and learning, as well support for the Center's fourth biennial national conference and Summer Academy. A total of 284 people, comprised of 121 K-12 teachers, 81 university students, and 82 other educators, participated in four collaborative efforts and two conferences.

UMaine Upward Bound – Orono, ME

Upward Bound is a non-profit educational program that involves high school math and science students in a summer research opportunity.

Upward Bound's outreach award supported 35 high school students as they worked with FBRI faculty and graduate students during a six-week summer program. Students conducted individual and group research, presented project posters at a science fair, and prepared articles that were published in a special book.

UMaine College of Education & Human Development – Orono, ME

Support was provided to enhance CEHD's Future Teachers' Academy, a week-long program that brings together 20 high school students with 5 University of Maine staff members to provide them with a variety of science, technology, engineering, and mathematic learning experiences and to foster an interest in teaching.

UMaine Center for Research on Sustainable Forests – Orono, ME

The CRSF is a research center at the University of Maine, working closely with its forest resources researchers.

Forests for Maine's Future, a collaborative of Maine organizations that includes the CRSF, held a day-long community event in Portland titled "All Things Woods." The event featured exhibits, activities, and interactive workshops, and outreach funding was provided to sponsor special educational activities for youth. Approximately 800 adults attended the event, the majority of which brought one or more children with them.

University of Southern Maine: Center for Toxicology & Environmental Health – Portland, ME

Under the direction of Dr. John Wise, students are trained on state-of-the-art equipment in the foundations of toxicology and environmental health.

USM's outreach awards have supported 1 graduate, 3 undergraduate, and 2 high school students in summer and academic year research internships. Students were trained to conduct toxicology studies on cellulosic nanoproducts that are being produced by the core FBRI research team at UMaine.

UMaine Climate Change Institute/Dept. of Earth Sciences – Orono, ME

Dr. Molly Schauffler, adjunct faculty at the University of Maine, was awarded an outreach grant in order to build the capacity of middle and high school science and mathematics teachers to apply technology skills to answer environmental questions. This was achieved through participation in a Maine Science Teachers Association Workshop, the Middle School Science Collaboration, the Maine Water Conference, and the Belfast Bay Watershed Coalition Evening Speaker Series. A total of 300-400 middle and high school students and Maine Water Conference attendees participated, as well as 15-30 teaching colleagues.

Summary of NSF EPSCoR Initiatives

NSF EPSCoR provides support to states through the following initiatives:

- **Research Infrastructure Improvement Grants:** these large-scale awards provide support for sustainable improvements in the state's research infrastructure in order to increase competitiveness and capacity. There is a limited application process with only one submission per state. Therefore, Maine EPSCoR oversees the project selection process and the state's EPSCoR committee approves submissions. Maine is currently in the process of applying for both the NSF EPSCoR Track I (research infrastructure) and Track II (cyberinfrastructure) solicitations. Please contact the Maine EPSCoR office for more information.
- **Co-Funding Assistance**: this mechanism is internal to NSF and enables more awards to be made to researchers in EPSCoR jurisdictions from NSF's regular research, education, and special emphasis competitions by providing partial support for those proposals that merit review places at or near the cutoff for funding by the reviewing program. PIs can mention in their proposals that Maine is an EPSCoR state, and they can also remind their NSF program officers that they are eligible for this consideration.
- **Outreach**: NSF EPSCoR provides support for NSF staff to travel to specialized events in EPSCoR jurisdictions that will allow researchers to become more familiar with NSF priorities, programs, and policies.

FBRI Hosts NSF Research Experience for Undergraduates (REU)

The Forest Bioproducts Research Initiative (FBRI) at UMaine was host for a second year to ten undergraduate students from throughout the nation who participated in the FBRI NSF REU program. This rewarding ten week summer research experience allowed students to be mentored by faculty who are senior personnel in the FBRI. Participants conducted research advancing their general knowledge of sustainable forest bioproducts and also gained a detailed understanding of one particular thematic element of the research effort. At the conclusion of their experience, students reported in both oral and written formats in professionally organized seminars attended by FBRI faculty, University administration, and the public.

During their stay, students benefitted from weekly seminars taught by FBRI faculty and visiting experts, weekly team meetings of all research students and faculty mentors, and the opportunity to discover Maine's superb outdoor recreational assets. The FBRI REU program has been able to offer promising undergraduate students a rich experience of research, scholarship, teamwork, and exploration.

2008 REU Participants:

Jesse Capecelatro—SUNY, Binghamton

Tatyana Khamathurova-Tomlin—University of Texas

Mike Jacobson—West Virginia University

Abigail Hamilton—University of Maine

Ian Stone—Louisiana State University

Melody Rhine—Emory University

Andrew Knox—Whitman College

Lucas Andruysk—Iowa State University

Marci Scorfield—University of Maine

Jim Grundy—Harvard University

Orono High School Summer Research Experience

Thirteen students from Orono High School had the opportunity this summer to participate in cutting-edge research at the University of Maine through Maine EPSCoR's outreach program with the Forest Bioproducts Research Initiative.

The students worked daily with faculty, research associates, graduate students, and undergraduate research students in laboratories across campus. Research encompassed the fields of chemical and biological engineering, wood science, chemistry, pulp and paper technology, advanced composite materials, and nanotechnology. Each student engaged in individual student research projects which included: investigation of conifer foliage for potential high value pharmaceutical components; examination of bio-treatments of corn stover for biofuels; analysis of catalysts for conversion of biomass to fuels and chemicals; production and analysis of wood/plastic composite materials; generation and characterization of cellulose nano-fibers for use in high-value materials; and investigation of protein transport across lipid bilayers.

OHS Student,

Nathan Curtis

These students will also have the opportunity to continue their research during the academic year by signing up for a new academic course at Orono High School that allows them to receive high school credit for their research experience.

This is the second year for this outreach program, which was extremely successful last year in giving students who were not sure of their future career choices a much better sense of what it would be like to be a research scientist. For participants who had indicated that they had not initially considered being a scientist, the summer research experience changed their minds about their options.

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Maine State EPSCoR Committee:

Maine EPSCoR is overseen by the Maine Innovation Economy Advisory Board, a statewide steering committee of individuals from Maine's education, research, and business communities and state government. The Board is under the auspices of Maine's Office of Innovation.

For more information see:
www.maineinnovation.com

The Maine Science & Technology Action Plan can also be downloaded at this site.

You are invited to attend the

MAINE EPSCoR

All activities will be held at the
Wells Conference Center,
University of Maine, Orono ME

For more information & to register:

www.umaine.edu/epscor/conference.htm

Maine EPSCoR Office at the University of Maine
maineepscor@umit.maine.edu
(207) 581-2285

No conference fee but registration required.
A limited number of travel scholarships are available for researchers at Maine educational institutions.

2008 Maine EPSCoR State Conference

Monday, September 29, 2008

- **Network with program officers from the National Science Foundation's Directorates and learn more about their missions, new initiatives, and funding opportunities**
- **Learn more about NSF EPSCoR, NSF & DOE SBIR/STTR, & other funding opportunities**
- **Poster session & reception showcasing the region's research will foster collaborations**
- **Learn about Maine's STEM Initiative, Maine's Cyberinfrastructure Plan, & technology transfer**

NSF Proposal Writing and Mock Panel Review Workshop

Tuesday, September 30, 2008

with Dr. George Hazelrigg of NSF

Participate in "reviews" of real NSF proposals and learn how to sharpen your proposal writing skills.
(We apologize that due to scheduling conflicts, this workshop falls on a day of religious observance for some.)

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