



Maine EPSCoR

Experimental Program to
Stimulate Competitive Research



Spring 2009

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.

Forest Bioproducts Research Initiative Biorefinery & Technology Center

In March 2006, Maine EPSCoR at the University of Maine received a \$6.9M NSF EPSCoR Research Infrastructure Improvement (RII) award to create the Forest Bioproducts Research Initiative (FBRI). This initiative is just completing the three-year NSF EPSCoR RII project, and has already become one of the state's premier research entities. FBRI has directly supported over 150 researchers, postdocs, graduate, undergraduate, and high school students, and generated over \$21.5M in additional funding to sustain its research agenda.

In April 2008 the U.S. Department of Energy selected Red Shield Environmental, in partnership with the FBRI, to receive a \$30 million award to design, build and operate a small-scale commercial integrated biorefinery at its pulp mill in Old Town, Maine. The foundation for this project involves the transfer of technology from FBRI labs to private industry, and would create a forest-based cellulosic biofuel value stream for the mill in addition to its normal pulping process. In August 2008 FBRI was also selected to receive \$4.8M from the Maine Technology Asset Fund to create a supporting Technology Center on the mill site, which would allow FBRI researchers to work closely with plant technicians in the development of additional technologies, and to provide on-site training.

However, plans were put on hold last November when the mill was forced to close due to poor market conditions for pulp, resulting in major layoffs. The potential of FBRI's new pre-pulping extraction technology, the DOE biorefinery funding, and the pending FBRI Technology Center provided a strong attraction in obtaining a new owner. The mill has now reopened as Old Town Fuel and Fiber and will undergo renovations to transform the traditional pulp mill into a combined pulp and biofuel plant that will put 170 people back to work. In addition, the new mill owners have offered a rent-free fifteen-year lease for the new FBRI Technology Center. Maine's Governor John Baldacci proudly noted that "In the midst of a national recession, when daily headlines are focused on downsizing companies, we are announcing the re-opening and re-tooling of a Maine facility in one of our state's most important industries."

The re-opening of the mill is significant not only for the jobs being created, but it's a key example of how cutting-edge technology arising from UMaine's research labs can contribute to economic viability and sustainability for the state. According to Governor Baldacci, Maine is well-positioned to capitalize on the growing support for renewable energy to reduce the nation's dependence on fossil fuels, and FBRI researchers will continue to examine other means of utilizing pulp-processing waste for renewable fuels and green chemicals. By finding creative and more efficient ways to utilize wood-based resources, FBRI can help to transform the state's traditional forest products industries and significantly contribute to Maine's environmental and economic sustainability.



Artist rendering of the future FBRI Technology Center

Maine EPSCoR

2008 Maine EPSCoR State Conference and NSF Proposal Writing and Mock Panel Review Workshop

On September 29 – 30, 2008, Maine EPSCoR hosted the 2008 Maine EPSCoR State Conference and NSF Proposal Writing and Mock Panel Review Workshop at the University of Maine in Orono for 198 participants from throughout the state and region. During the conference, Dr. Henry Blount, Head of NSF EPSCoR, and nine program officers from various NSF Directorates presented overviews and updates on programs and funding opportunities at NSF. Participants also had the chance to meet with program officers for one-on-one discussions. Other conference sessions included presentations on Maine's STEM Education Initiative, the state's cyberinfrastructure plan, technology transfer, Maine EPSCoR RII projects, and DOE SBIR programs. A reception and poster session followed, featuring FBRI graduate students showcasing their research.



L to R: Miles Theeman, Chair, Maine Innovation Economy Advisory Board, Dr. Henry Blount, Head of NSF EPSCoR, Dr. Michael Eckardt, UMaine Vice President for Research

The second day's proposal workshop was presented by Dr. George Hazelrigg, Program Director from NSF's Directorate for Engineering, with the other NSF program directors acting as facilitators. The workshop's 70 participants had the opportunity to review and score real NSF proposals, and then split into groups to go through a mock panel review process. Participants indicated that this in-depth experience allowed them to gain valuable insights into how to make their future proposals as competitive as possible.

Maine EPSCoR will host the 2009 State Conference on September 21-22, 2009 at the Wells Conference Center on the University of Maine campus. Watch for information and registration details at www.umaine.edu/epscor/.

SPOTLIGHT ON EPSCoR PROJECTS IN THE STATE OF MAINE

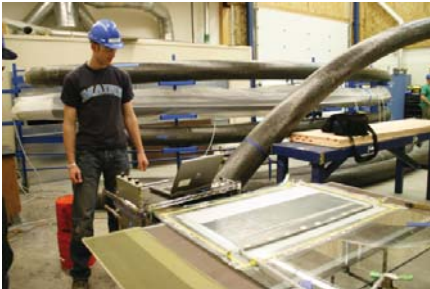
DOE EPSCoR: Thermal Conversion of Woody Biomass to Fuels and Chemicals

In 2007, the Forest Bioproducts Research Initiative (FBRI) at the University of Maine also received a \$1.9 million award from the U.S. Department of Energy (DOE) EPSCoR program. The DOE project goal is to implement new catalyst R&D infrastructure and address fundamental science and engineering pathways for the thermochemical conversion of woody biomass to fuels and chemicals, which is an area of increasing importance to the diversification of Maine's forest products industry.



The DOE EPSCoR group

DOE EPSCoR funding has enhanced UMaine's FBRI by adding a thermal conversion pathway to its research portfolio to develop methods for converting biomass from Maine's forests into fuels and valuable chemicals, and putting UMaine in a position of strength to deal with the entire spectrum of technical issues involved in biomass conversion. The project directly supports 12 faculty researchers, 1 postdoctoral associate, and 3 technicians, as well as 5 graduate and 7 undergraduate students in research internships, and allowed for the purchase of major instrumentation that would typically not be funded through normal grants. It has enabled multi-disciplinary collaborations to develop new expertise for the state (Colby, Bates, and Bowdoin Colleges, Zeomatrix and Orono Spectral Solutions, and Oak Ridge National Laboratory), as well as international collaborations (University of Concepcion, Chile and Enerkem in Sherbrooke, QC, Canada). As a result of the expertise that has been built in this area, project researchers have already received an additional major grant that will utilize the new equipment to do thermal conversions of compounds that will be produced through biological synthesis.

SPOTLIGHT ON EPSCoR PROJECTS IN THE STATE OF MAINE *continued from page 2***DEPSCoR: Fatigue Life Prediction of Sandwich Composite Joints for Navy Seaframes***Tyler Nelson, undergraduate student*

Dr. Roberto Lopez-Anido and Dr. Habib Dagher of the University of Maine's Advanced Engineered Wood Composite Center received a three-year Department of Defense EPSCoR award in 2008. The research goal of this project is to predict the sandwich T-joint component fatigue life under various axial, bending and combined loads using coupon fracture quasi-static and fatigue data combined with Virtual Crack Closure (VCC) finite element analysis method. This project will contribute to the establishment of a resource center for the U.S. Navy and shipbuilders, enabling optimized composite joint designs for the

next generation of seaframes. According to Co-PI Lopez-Anido, "The technology today really is 50-60 years old, using metal structures that corrode and have a number of problems in marine environments. ...What I foresee is a continuous process in which you will see more and more applications of composite structures."

DEPSCoR Funding Opportunity Notice:

The FY09 DEPSCoR solicitation has been released with a proposal deadline of May 4, 2009. A major change in the program this year is that each eligible university in a state may submit up to three proposals.

For more information see: <http://www.arl.army.mil/www/default.cfm?Action=6&Page=8>.

NASA EPSCoR: Real-time Wireless Shape Monitoring of Space Structures

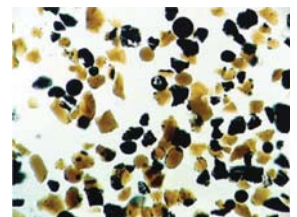
In 2008, Dr. Ali Abedi, assistant professor of electrical and computer engineering at the University of Maine, received a three-year NASA EPSCoR award. This project will improve the reliability and power consumption of wireless sensors used by NASA. The research objectives for this project are to: develop and implement robust 3-D estimation techniques for embedding sensors, develop specialized dynamic shape analysis techniques to capture the non-linear response of structures, and simplify collected data into a 3-D model to facilitate human interface. With this NASA EPSCoR funding, Dr. Abedi and his research team are developing the next generation of wireless sensor technology to mutually benefit NASA and the state of Maine. "I don't look at this as a one-time three-year project," he said. "I look at it more as the development of infrastructure....It's a win-win situation. We help NASA to go to the next level and they also help us so that the state economy grows. That's the benefit of EPSCoR."

*Dr. Ali Abedi*

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NASA EPSCoR: Toxicology of Metal and Lunar Particles in Biological Systems*A USM student in microgravity*

University of Southern Maine professor, Dr. John Wise, received a three-year NASA EPSCoR award in 2007 for his project, "Toxicology of Metal and Lunar Particles in Biological Systems." This project focuses on understanding the aspects that make lunar dust particles toxic to different organ systems and the mechanisms by which they exert this toxicity. Cytotoxicity, genotoxicity, and neoplastic transformation are all being examined.



FY08 NSF EPSCoR Co-Funding Awards to Maine

The NSF EPSCoR Co-Funding program enables more awards to be made to researchers in EPSCoR jurisdictions from the Foundation'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. This mechanism operates internally within NSF and does not require any action on the part of the proposer. Since FY2000, 105 awards have received over \$12M in co-funding, and enabled over \$30M in projects to happen that would not have otherwise been funded.

| FY2008 Maine NSF EPSCoR Co-Funded Awards | | | | |
|--|--|-----------------------------|--------------------|--------------------|
| Institution | Title | PI Name | EPSCoR Amount: | Total Project: |
| Bates College | Topics in Topological Fixed Point Theory | Wong, Peter | \$53,613 | \$107,226 |
| Bigelow Laboratory for Ocean Sciences | Collaborative Research: Quantitative Importance and Trophic Role of Noctiluca Blooms in the Arabian Sea | Goes, Joaquim | \$148,453 | \$296,905 |
| Bigelow Laboratory for Ocean Sciences | REU Site: Undergraduate Research Experience in the Gulf of Maine and the World Ocean | Wahle, Richard | \$100,000 | \$258,685 |
| Bowdoin College | The DGB site: Architecture and Sociopolitical Functioning in a Mountain Landscape, Northern Cameroon | MacEachern, Scott | \$99,814 | \$199,629 |
| Central Maine Technical College | Virtual Ideation Platform (VIP) | Dostie, Diane | \$250,000 | \$529,840 |
| Graduate student award | EAPSI: Comparison and Interpretation of Glaciochemical Climate Records | Dixon, Daniel | \$2,500 | \$5,637 |
| Jackson Laboratory | The Role of the Nuclear Periphery in Chromosome 3D Structure | Shopland, Lindsay | \$289,00 | \$327,980 |
| Jackson Laboratory | REU Site: Functional Genomics Research Projects for Undergraduate | Knowles, Barbara | \$63,650 | \$169,720 |
| University of Maine | MRI: Acquisition of an SEM-EDS-EBSD-CL Microanalytical System for Solid Earth and Climate Change Research | Gerbi, Christopher | \$181,516 | \$457,584 |
| University of Maine | Synthesis and Accelerated Testing of Oxynitride Films for High Temperature Applications | Lad, Robert | \$150,000 | \$300,000 |
| University of Maine | CDI-Type II: Collaborative Research: Cyber Enhancement of Spatial Cognition for the Visually Impaired | Giudice, Nicholas | \$138,000 | \$276,000 |
| University of Maine | Evolution of Norms and Conservation Rules in Two Fisheries | Acheson, James | \$80,060 | \$114,594 |
| University of New England | Collaborative Research: Modeling Physics in an Integrated Physics Course for Biologists | Vesenska, James | \$6,750 | \$13,500 |
| University of Southern Maine | RDE-RAD: EAST Alliance for Students with Disabilities in STEM - Phase 2 | Langley-Turnbaugh, Samantha | \$380,000 | \$1,278,433 |
| University of Southern Maine | RUI: A Collaborative Investigation into the Aggregate-Induced Emission Phenomenon in Group 14 Metallole and Metallole-like Molecules | Tracy, Henry | \$162,000 | \$360,000 |
| University of Southern Maine | Collaborative Research: RUI: Children's Planning and Production of Filler-gap Constructions | McDaniel, Dana | \$81,248 | \$162,497 |
| TOTAL: | | 16 awards | \$2,186,604 | \$4,858,230 |

Maine EPSCoR Seed Funding Initiatives in Emerging Areas

Maine EPSCoR seed funding is utilized to respond quickly to new and emerging opportunities and activities in the RII research focus area.

During 2008-2009, the FBRI project awarded seed funding to the following partners:

Tethys Research LLC: Tethys Research, a young Bangor-based biotechnology company, is developing novel enzymes to separate wood components during lignocellulosic processing. If successfully commercialized, this technology would enable more environmentally-friendly wood processing with higher yields per tree, and allow current pulping waste streams to be utilized more efficiently by forest biorefineries for the production of chemicals and biofuels.

Corinth Wood Pellets: FBRI-supported research was aimed at increasing the heating value of wood pellets and decreasing the energy used during the pellet manufacturing process. Investigators explored three different materials for their potential use as additives in the making of wood pellets.

Habitat Planning: Support provided for forest inventory and computer model development, and forest management plan development and implementation to further sustainable forest management in the Acadian Forest Region in the Upper St. John Valley of Northern Maine.

Forest Research, LLC: Support provided to review the basic types of chemicals, including pharmaceuticals, which can be extracted from trees in Maine, and to examine the market for the major types of these chemicals and pharmaceuticals in terms of price and future demand.

UMaine Emerging Project – “Projected Nutrient Losses from Biomass Harvesting Forest Stands in Maine”: FBRI has identified concerns about unsustainable nutrient withdrawals from biomass harvesting in Maine’s forest. It is important to evaluate the potential consequences for sustainable nutrient supply of an emerging bioenergy market that could lead to greater biomass removals in Maine’s forest. To this end, this project estimated nutrient uptake and removals for selected dominant forest types in Maine over successive rotations and under various biomass removal scenarios.

UMaine Emerging Project – “Stakeholder Views towards the Emerging BioProducts Industry in Maine”: The prospect of an emerging forest-based bioproducts industry raises a host of issues related to how primary stakeholders (i.e., interests within the forest products sector) and secondary stakeholders (i.e., those external to the sector) perceive and react to the industry. This project sought to conduct a systematic analysis of a broad range of stakeholders that will affect and be affected by the emergence of the industry. Overall, over 100 one-hour interviews were conducted across a wide range of stakeholder groups. In addition, a mail survey was developed and sent to 1,500 Maine households state-wide and 1,000 Maine households located in towns with an active or recently active pulp and paper mill.

“Maine’s Climate Future: An Initial Assessment – Report to Governor Baldacci”: In late 2007, Governor Baldacci asked the University of Maine’s Climate Change Institute to lead a wide-ranging analysis of the state’s future in the context of changing climate during the 21st Century. An FBRI team was responsible for analyzing Maine’s climate future in the context of forests and the forest products industry. This report identified opportunities as well as knowledge gaps for the state. UMaine faculty presented the final report to Governor Baldacci on February 25, 2009.

Atlantica BioEnergy Task Force: The Atlantica BioEnergy Task Force was established in response to a unifying challenge – how to ensure the future sustainability and prosperity of the forest products industry across the three jurisdictions which comprise the Atlantica Region: New Brunswick, Nova Scotia, and the State of Maine. The Task Force is comprised of regional government, industry, utilities, federal and regional organizations and post secondary institutions. On December 3-4, 2008, FBRI hosted 140 professionals in Orono for an R&D Forum that focused on development of an action plan.

Maine EPSCoR Partners with Maine Girls Collaborative Project

The Maine Girls Collaborative Project (MGCP) is a new statewide initiative directed by the Women's Resource Center at the University of



Maine that brings together organizations and individuals with a mutual commitment to informing and motivating girls to pursue careers in science, technology, engineering, and mathematics (STEM). The MGCP is a regional project supported by the National Girls Collaborative Project (NGCP), a National Science Foundation-funded project with the purpose of increasing the capacity, impact, and sustainability of existing and evolving girl-serving STEM projects and programs.

The MGCP was formed in 2007 when the Women's Resource Center at the University of Maine was awarded \$15,000 from the NGCP in order to form a regional project. The Maine EPSCoR office, as part of its mission to increase women's participation in STEM, pledged to match this award over three years with an additional \$15,000, which the MGCP will use to support a greater number of mini-grants. By providing a small amount of seed funding (up to \$1,000), mini-grants are designed to build collaboration and partnerships between existing programs and organizations related to motivating and supporting girls' interest in STEM careers.



The Maine STEM Collaborative was developed in 2007 in response to the conditions in Maine that demand a STEM (science, technology, engineering and mathematics) workforce in high quality and numbers. It is a statewide partnership of business, government, research, education and non-profit sectors who have come together to seek the improvement of STEM education in the state. Maine EPSCoR is a key member of this initiative.

Maine's economy and workforce increasingly depend on innovation and global competitiveness, which will require a workforce with a strong educational background in the STEM fields. However, statistics show that there are gaps that present real challenges to preparing this workforce. Forty percent of the industries projected to gain jobs in Maine from 2004 to 2014 are STEM-related. From 2004 to 2005, high technology employment grew 3.5% in Maine, which is higher than the U.S. (2.8%) and New England (2.4%), while the total job growth in Maine for all industries decreased 0.4%. Meanwhile, the number of science and engineering graduate enrollments in Maine universities has been flat since 2000 and is actually lower than in 1996. In 2007, The College Board reported that 38% of Maine high school students intended to pursue a STEM-related field in college as compared to 44% nationally. The Maine STEM Collaborative statewide partnership will help to ensure that Maine students graduate from high school with essential knowledge and skills in science, technology, engineering, and mathematics, as well as aspire to continue in the STEM fields at the post-secondary level.

The Collaborative implemented the state's first STEM Summit in 2007, which increased public awareness of STEM needs and learning opportunities in Maine, successfully generated a state-wide conversation, galvanized organizations to develop a more formal and permanent voice with broad representation across the state, and started the process of outlining a formal strategic pathway for a Maine Stem Initiative.

For more information about Maine's STEM efforts see: www.mainestem.org.

Upward Bound in the News

The following is a prime example of how even small experiences can snowball into having a much bigger effect!

In the summer of 2008, a high school student participated in the Upward Bound program at the University of Maine and, through its partnership with FBRI, learned how to produce biodiesel. She passed the procedure on to her mother, a biology teacher at a college-preparatory school in Los Angeles, who introduced it into the curriculum as a lab. A student at this school was so impressed with the lab that he passed it on to his father, a Hollywood movie producer. His father was thus inspired to produce the film "Fuel," a documentary that follows a man driving a biodiesel-powered van across the country to raise awareness of alternative fuels. This film garnered a lot of buzz this awards season, even nabbing the best documentary audience award at the Sundance Film Festival.

Maine EPSCoR

HIGHLIGHTS OF NEW 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.

UMaine College of Engineering – Orono, ME

The College of Engineering hosted 29 high school aged 4-H girls and Girl Scouts from four counties over two days during February school break. The girls toured the Orono campus, and were introduced to engineering programs at UMaine by participating in hands-on projects with different engineering departments, including those involved in the Forest Bioproducts Research Initiative. Another day of activities will be held during the April school break for another group of 23 girls.



UMaine Dept. of Mathematics & Statistics – Orono, ME

Professor Tod Shockey of UMaine's Department of Mathematics & Statistics is spearheading an outreach project to engage middle school teachers and students in mathematical biology. This project sought to recruit Native American students at the middle school and undergraduate levels into STEM fields through a special association with the work of the SPEED Lab (Spatial Population Ecological and Epidemiological Dynamics) at UMaine. Two middle school teachers were trained in the SPEED Lab in order to provide unique mathematics activities to their 22 7th and 8th grade students at the Beatrice Rafferty School in Pleasant Point, which serves the Passamaquoddy People. This project also reached approximately 40 Native American undergraduates at UMaine who have not declared a major through a presentation on the SPEED Lab at a dinner hosted by the Wabanaki Center.



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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.



Save the Date!

2009 Maine EPSCoR State Conference
September 21 & 22, 2009
Wells Conference Center,
University of Maine, Orono, ME

Get insights into:

- new opportunities in federal and private funding
- transformative research, broader impacts & participation, STEM education, etc.
- proposal preparation and project management
- interdisciplinary research efforts in the state and region
- networking and collaborations at the state, regional, and national level

Watch for registration information
and additional details at:
www.umaine.edu/epscor

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