

## VT EPSCoR Staff

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## NASA EPSCoR

Vermont's NASA EPSCoR's Core Research Infrastructure Project and two of Vermont's three proposed NASA EPSCoR research groups were awarded three years of NASA funding. The Core Project began in August of 2001, and funding for the two approved research groups was received in March of 2002. NASA recently announced that VT-NASA EPSCoR has been awarded an additional two years of Continuation Funding to support all three of its current components. This award was made after an extensive review by NASA personnel and outside evaluators of a Continuation Application that detailed the successes of the last three years and presented a roadmap for continuing accomplishment. With this Continuation Award, NASA will now fund Vermont's current program for the full five years allowed under the existing Cooperative Agreement.

Dr. William D. Lakin, Professor of Mathematics and Statistics at the University of Vermont (UVM), directs Vermont's NASA EPSCoR Program. Dr. Lakin also serves as Director of the Vermont Space Grant Consortium (VSGC). The VSGC cooperates closely with VT-NASA EPSCoR in promoting the development of Vermont's research infrastructure in areas of interest to NASA. Ms. Laurel Zeno, who acts as Program Manager for both VT-NASA EPSCoR and the VSGC, assists Dr. Lakin. The Vermont NASA Advisory Board includes partner institutions in the State, private sector, and State EPSCoR Director, Dr. Christopher Allen.

Vermont's two funded NASA EPSCoR research groups were formed to study topics that are research priorities for both NASA and Vermont. One group studies Biomedical Problems Associated With a Human Presence in Space while the second group considers Advanced Remote Sensing Technologies for Monitoring Indicators of Global Climate Change. Together with the Core Project, the three current

components of VT-NASA EPSCoR involve Vermont academic researchers statewide. Faculty supported by the program over the past three years come from multiple departments at the University of Vermont as well as St. Michael's College, Norwich University, and Johnson State College.

### The Biomedical Research Group

The Biomedical Research Group, led by Dr. William Lakin, considers aspects of human physiology related to the health, performance, and survival of humans in microgravity environments. Of special interest to this research group are the systems or "weak points" in the human body that may limit man's potential exposure to space and low gravity environments. It has been realized for some time that a lack of normal Earth gravity can have significant effects on human



Dr. Jun Yu, Professor and Associate Chair Department of Mathematics and Statistics, UVM and NASA EPSCoR Researcher. His project title - **Variations in Global Sea Surface Temperatures on Interdecadal and Decadal Scales.**

health and performance. For example, prolonged exposure to microgravity environments can produce a loss of bone mass and muscle atrophy. A high percentage of astronauts experience debilitating effects due to Space Adaptation Sickness during the first few hours or days of flight. There is also evidence that altered gravity effects metabolism. Medical conditions may arise during long-duration missions that require surgery, but our knowledge of bleeding in microgravity is incomplete. Human presence in space thus requires a fuller understanding of the effects of microgravity and other components of the space environment on the physiological systems of the body. Without such an understanding, countermeasures cannot be developed to insure both the health and unhindered performance of crewmembers in flight, nor can postflight problems be addressed.

In addition to faculty support, funding for the five projects in this research group has supported graduate students, postdoctoral fellows, and techni-

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## Vermont EPSCoR Attends VASE Meeting

VT EPSCoR attended a recent symposium hosted by the Vermont Academy of Science and Engineering entitled "Legislative needs in a Science and Technology-Based Economy". Drs. Harvey V. Fineberg, MD, PhD, President of the Institute of Medicine and William A. Wulf, PhD, President of the National Academy of Engineering were the keynote speakers. Vermont legislators, area businesses and academics gathered in the Vermont State House to tour exhibits and discuss their interests and thoughts con-

cerning the role of technology in Vermont. The Vermont EPSCoR exhibit highlighted the entire range of research, education and public service activities provided by the program. ■



Dr. Paul Hale, Executive Director, Vermont Technology Council on right

# VT EPSCoR Outreach

## VT EPSCoR Outreach

*"The Vermont Experimental Program to Stimulate Competitive Research (EPSCoR) contributes to building an infrastructure which will improve the research competitiveness of Vermont scientists and engineers as well as bring NSF resources to the service of the broader community"*

### New Partnership with the McNair Scholars Program

VT EPSCoR recently partnered with the McNair Program, led by Professor Jim Vigeroux of the Biology Department, by providing funding to expand its program to 10 weeks and support of the Summer Research Symposium in 2005.

"The mission of the McNair Scholars Program is to work with qualified UVM undergraduates to increase the number of first generation, lower income or underrepresented minority students who earn a PhD."

### VT EPSCoR Provides Funding for Women in IT Institute at Champlain College, Encouraging Girls to Pursue IT Education and Careers

In May 2003, the Vermont Information Technology Center (VITC) together with the Vermont Commission on Women (VCW) undertook an initiative to study the fact that significantly fewer women than men pursue careers in information technology... a phenomenon often referred to as the Digital Gender Divide (DGD).

The initiative attracted partners from nearly 30 Vermont institutions and organizations interested in the issue. The purpose of the project is to develop a *Women in IT Institute* at Champlain College and to offer a series of for-credit summer courses addressing the DGD problem.

VT EPSCoR has provided funding so that VITC and Champlain College can develop and offer a program to teachers and guidance counselors addressing the DGD issue. The program will initially be offered in the summer 2005 and will provide college credit to attendees upon successful completion. For more information please con-

tact Mr. David Binch, Director Vermont Information Technology Center, at [binch@champlain.edu](mailto:binch@champlain.edu).

### VT EPSCoR High School Outreach

The High School Outreach Program establishes a research mentorship structure to link Vermont high school students, under-represented groups, their science teachers, and UVM faculty in research of local importance. The aim is to excite students about science by involving them in research. This year VT EPSCoR will sponsor four teams as part of our challenge to bring hands-on science to under-represented groups. We have worked out partnerships with Christopher Columbus and DeWitt Clinton High

Schools from the Bronx, NY and also John D. O'Bryant School of Math and Science in Roxbury and Massena High School (Abanaki Nation) in Upstate NY. In 1994, four teams, nine students, and four faculty sponsors participated. Now we are celebrating 10 years of outreach science and our current teams consist of 22 students, 14 of which are young women in science, 10 teachers (four female) and 10 UVM faculty, post-docs and graduate students. The projects include "DNA repair",

"Immunology – Gene Expression",

"Food Safety – Alternatives to Pasteurization" And "Control of Insect Pests".

This experience will give teachers and students an invaluable opportunity to actually do science beyond the classroom setting. They will not only learn cutting edge techniques used in specific areas of science, they will also learn how a research team functions and experience first hand the scientific process.

Our program has been an inspiration as others spin-off from our program. This year alone we have collaborated on expanded grant projects with Botany, Physics, and Mechanical Engineering. A new program has been funded helping undergrads from our HS partnerships to continue their education at UVM and be part of the new mentorship for environmental biology.



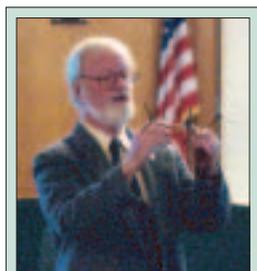
2004 McNair Scholars with UVM President Daniel Fogel.

## Vermont EPSCoR Notables

### Professor Christopher Allen Receives UVM Dean's Lecture Award

Each semester the College of Arts and Sciences at the University of Vermont selects a faculty member to receive the Dean's Lecture Award. This award honors a colleague who is an outstanding teacher – scholar, an individual who is an acclaimed scholar or artist in his/her profession, and who has demonstrated an unusual ability to share that excellence with students. The Fall 2004 recipient of this honor was Christopher Allen, Vermont EPSCoR Project Director.

On November 15, 2004, Dr. Allen presented a lecture entitled *"Polyester: You Wear It, You Love It, But Do You Know It?"*. Speaking to about 150 audience members from varying cross campus departments, the talk focused on "how chemists use knowledge of molecular structure to design new materials and understand their



Dr. Christopher Allen

behavior (e.g. why those cheap pants don't wrinkle), leading to an exploration of the synergism and tension of basic vs. applied research and how this plays out in public policy".

Interim Associate Dean, Joel Goldberg, welcomed the crowd and said that Dr. Allen has been at the University for 38 years, arriving in 1967 after receiving his Ph.D. from the University of Illinois. Dr. Allen holds the distinction of being the

first UVM faculty member to receive both the Kidder and University Scholar awards. Dr. Goldberg went on further to say that "Chris was selected by a faculty committee based on nomination letters from

colleagues in the Chemistry and Philosophy departments as well as on supporting letters from his students. Former undergraduate student and now Chemistry Ph.D. candidate Steven Flemer, Jr. also provided remarks stating, "Had it not been for the consistent efforts of Professor Chris Allen, I don't think that I would be employed in a

role as a teacher today. Something about his teaching manner and the way he approached the role of instructor resonated with me, and I have never forgotten it. I am grateful to have had the opportunity for our paths to cross in an instructor-student capacity".

Longtime friend and colleague Professor Bill Geiger, also spoke of the high teaching and scholarly standards.

Dr. Allen closed by saying, "So these tensions (basic vs. applied science) pulling in opposite directions are not unlike the others we experience in life. The ideal vs. the actual, the profound and the everyday – all setting up those conflicts from which knowledge and good things come."

*"Although Chris was the 28th recipient of this honor, he is the first physical scientist to be recognized by the Dean's Lecture Award, which is indicative of his recognized ability to communicate complicated ideas in the sciences to a broad-based audience drawn from across the College of Arts and Sciences."*

Dr. Joel Goldberg  
Interim Associate Dean UVM

### Faculty Collaboration Leads to NSF Multi-Investigator Award

Drs. Donna Rizzo (UVM CE&E) and Lori Stevens (UVM Bio), were recently awarded a NSF grant from the Division of Biological Infrastructure. The Undergraduate Mentoring in Environmental Biology program funds innovative new programs that, through year-round research activities and sustained mentoring support, encourage students to pursue careers in environmental biology. Prior to this award, Drs. Rizzo & Stevens collaborated to receive a Vermont EPSCoR multi-investigator award for a graduate research assistant as part of the Vermont EPSCoR Research on Water in the Environment Initiative. ■

## Focus Groups Discuss Future Directions for VT EPSCoR

Preparation is underway for the next EPSCoR infrastructure grant proposal due in July 2005. Two focus areas for investment and enhancement have been identified as follows:

- Materials Science Broadly Related to Polymers and Composites
- Computational Approaches to Basic Science & Engineering

Focus group meetings were held in November to explore the potential for establishing specific and focused plans for each of the two areas under consideration. The rationales for these areas are that the former builds both on some initial investments in this area in the current EPSCoR cycle and the latter will build on the UVM Advanced Computational Center which is under development.

The core requirements for Vermont EPSCoR investments include the following:

- They must be consistent with the areas outlined in the Vermont

Science and Technology Plan. The NSF relevant areas in the plan include: Biotechnology, Environmental Science and Engineering, Information Technology and Advanced Materials.

Investments must be in areas that have the potential for future funding through established NSF programs. EPSCoR provides initial funding to enable Vermont scientists and engineers to be more competitive at the NSF. Thus, excellence and national competitiveness are core goals of the EPSCoR program.

Groups and programs, which will lead to multi-investigator and center-like activities, are primary targets for EPSCoR investments. Innovative approaches, which transcend departmental and college boundaries, are of high priority.

Investments must lead to permanent enhancements of institutional infrastructure.

Focus groups included participants from the State and private sector in addition to faculty from the University of Vermont. ■

## VT EPSCoR Funds Science-Technology Fellowship for Economic Development

A newly created graduate assistantship has been created in the UVM School of Business. Funded by the VT EPSCoR program, the assistantship will work with the Center for Emerging Technologies (VCET) and receive course credit through the UVM Business School. Graduate student, William King, recipient of the first fellowship, will work with VCET to help new start-up firms develop their business plans and observe technology transfer efforts of VCET and UVM.

Director of the Center for Emerging Technologies, Thomas Rainey, described the new assistantship: "The Vermont Center for Emerging Technologies is a focal point for transferring commercially viable scientific discoveries and technologies, cultivating relationships with institutional and individual investors, matching client businesses with appropriate resources, and providing a prestigious corporate address for area entrepreneurs. The program emphasizes providing physical infrastructure for new high technology companies, management development and strategic business planning, and the ultimate goal of working with client businesses to obtain debt or equity financing and successful "graduation" from the incubator program. Will is "in the trenches" with start-up businesses identifying gaps in their business plans, and applying what he's learned through the MBA program. High tech

entrepreneurs are typically more comfortable with their technologies than with the business management and development required to be successful in a globally competitive marketplace.

Will has been tasked with serving as a liaison with UVM's

School of Business Administration to match faculty, staff and fellow students to leverage this pool of talent and energy for our affiliated high-technology entrepreneurs. There is a growing "buzz" around the initiative. It brings a sense of excitement and urgency as these companies are real, and they are looking for solutions NOW.

Rocki-Lee DeWitt, Dean and Professor of Management at the UVM Business School said: "The Science-Technology Fellowship for Economic Development provides benefit to VCET and the student alike. Formative businesses have support to identify and address critical business issues that often limit the realization of the market potential of

technology. The student develops a stronger understanding of the critical issues involved in the commercialization of technology. The fellowship helps put theory into action for both the inventor and the fellow."

VT EPSCoR Project Director, Christopher Allen, explained that "the program is a logical step forward in the strong linkage between VT EPSCoR and economic development in Vermont". ■



Left to right: Thomas Rainey, Director VCET, and Will King, fellowship recipient.

## Award Results from Recent EPSCoR Competitions

### Equipment Acquisition for faculty at UVM

15 applications, 9 awards totaling \$152,803

### Graduate Research Assistantships (UVM)

12 applications, 7 awards totaling up to \$175,000

### Baccalaureate Institution Faculty Summer Support

9 applications, 8 awards totaling \$79,338. Institutions included Middlebury, St. Michael's College, Norwich University.

### Baccalaureate Institution Equipment Acquisition

6 applications, 3 awards totaling \$61,173. Institutions included Middlebury College, Johnson State College and Bennington College.

### Minigrant (use of facilities) for faculty at UVM

8 applications, 3 awards totaling \$12,745

### DoD (DEPSCoR)

5 preproposals selected to develop to full proposals – awaiting results from Department of Defense.

### SBIR Phase (0)

#### DOE

New England Research, Inc.

"Characterizing Mesoscale Variability in Heterogeneous Media: Data Integration, Model Development, and Upscaling"

Green Mountain Antibodies, Inc.

"Improved Detection of Inhibitory Anti-Factor VIII Antibodies"

MicroBrightField, Inc.

"A System for Focusable Virtual Slides"

Green Technologies

"A Zero Waste/Closed Loop Biodiesel Production Plant"

MED Associates, Inc.

"Protection of Military Working Dogs by Prophylactic Transdermal Drug Delivery"

Apollo SRI, LLC

"New Mesoporous Substrates for High Performance Liquid Chromatography (HPLC)"

Lansky Consulting, LLC

"Cell Culture Bioassay: Robotic Randomization and Confidence Intervals for Similarity Assessment"

Vermont Photonics LLC

"Terahertz Spectroscopy Project"

North Dancer Labs, Inc.

"Gated Dynamic Light Scattering (GDLS)"

### NASA

Contechs Engineering Design Inc.

"Space Thermal Management System"

Green Mountain Optix, Incorporated

"Super-Hard Optical Coatings"

Integrated Biomedical Systems

"High Performance Wireless Ear Canal Probe for Hearing Screening" ■

## NASA EPSCoR *continued from page 1*

cal staff as well as the acquisition of significant instrumentation. Travel funds have allowed the faculty researchers to establish and strengthen links with researchers at NASA Centers. Two of the five projects have provided undergraduate students at UVM with significant research experiences. Research progress to date has resulted in 19 papers in the refereed professional literature, and an additional 13 papers are currently under review. One patent application has also resulted from this research, and 13 proposals to Federal agencies for follow-on funding have been submitted.

### The Remote Sensing Group

Co-Leaders of this research group are Dr. Jun Yu of UVM's Department of Mathematics and Statistics and Dr. Leslie Morrissey of UVM's School of Natural Resources. The focus of this group's research is the application of advanced remote sensing technologies to address terrestrial and oceanic surface-atmosphere exchange processes related to global climate change. The two projects in this research group address global, regional, and local analyses on seasonal to decadal time scales. The first effort seeks to identify spatial and temporal oscillations in global sea surface temperatures on decadal or longer time scales as an unambiguous indicator of global climate change. The second effort is local in scope, addressing net ecosystem productivity of selected northern hardwood forests. Each effort represents either a unique integration of existing technologies or the application of new, or soon-to-be available, advanced sensor technologies.

Both of the project investigators in this research group have developed close research ties with colleagues at a NASA Center, and one project involves collaboration with the private section. This research group has submitted four proposals to Federal agencies for follow-on funding.

### The Core Project

Goals of Vermont's NASA EPSCoR Program include improving the research competitiveness of Vermont's scientists and engineers in areas of interest to NASA, promoting the development of additional research infrastructure in these areas, and facilitating the establishment of ties between Vermont's academic researchers, Vermont companies, and NASA. To further these goals, the Core Program holds an annual competition for faculty research proposals and has developed an Industrial Partners Initiative (IPI) linked to Vermont EPSCoR's annual SBIR Phase 0 Competition.

The Core's Faculty Research Competition is open to faculty researchers at all of Vermont's higher educational institutions, and proposed research projects can be in any area that is of interest to NASA. Faculty researchers may propose a seed-money grant to initiate a research project, a small-scale grant to fund a more established research project, or a travel grant to visit a NASA Center and explore

potential collaborations with NASA researchers. Ten faculty research projects have been funded by the Core Project to date, and an additional five projects are expected to be funded in 2004.

The Core's Industrial Partners Initiative seeks to promote technology transfer, support State economic development goals, and establish additional links between Vermont's private sector and NASA by making the expertise of Vermont's faculty researchers available to Vermont companies for concept development projects. IPI projects must involve an academic researcher as an integral part of the research effort and have the potential to lead to an NASA SBIR Phase 1 application. Four SBIR Phase 0 awards have been made to Vermont companies to date under the IPI. Two of these projects are currently in progress, and both of the completed IPI projects have led to SBIR Phase 1 applications.

### The Next Two Years

The next phase of Vermont's NASA EPSCoR Program will build on the accomplishments of the past three years. Director William Lakin remarked "It's been a pleasure to be associated with such an exciting group of researchers. Despite the physical distance between Vermont and any NASA Center, NASA now has a visible presence in Vermont. I look forward expanding our efforts over the next two years." Vermont EPSCoR Project Director, Dr. Christopher Allen said, "Vermont NASA EPSCoR is an integral part of the statewide science and technology infrastructure building activities. The strong connection which Bill Lakin and his team have developed with partner Vermont EPSCoR programs have produced major benefits for science and engineering in the state." ■

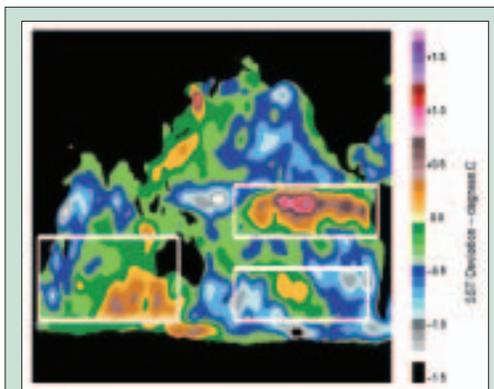


Figure shows Dr. Jun Yu's research of the deseasoned, zonally demeaned, and low-pass filtered Scanning Multichannel Microwave Radiometer sea surface temperatures at the peak of the 1983 El Niño. Image segmentation and motion analysis of the Synthetic Aperture Radar (SAR) sea ice imagery in Bering Sea are a part of Dr. Yu's NASA EPSCoR research. These studies have very broad applications including for examples, to marine science, fishery, oceanography, and polar engineering.

## 2005 VT EPSCoR Annual Meeting

focused on

### Polymers & Composites

February 25, 2005

9:00 a.m. – 4:00 p.m.

Sheraton Hotel & Conference Center  
Burlington, VT

For more information please visit [www.uvm.edu/EPSCoR](http://www.uvm.edu/EPSCoR)  
or phone (802) 656-7969



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### The Vermont-NSF Partnership

The Vermont Experimental Program to Stimulate Competitive Research (EPSCoR) contributes to building an infrastructure which will improve the research competitiveness of Vermont scientists and engineers as well as bring NSF resources to the service of the broader community.

The fundamental goals of the Vermont EPSCoR program naturally parallel the two National Science Foundation (NSF) review criteria (intellectual merit and broader impact). The explicit recognition of the importance of the broader impact of science on society has been a fundamental hallmark of the Vermont EPSCoR program since its inception in 1985. The close relation to state needs is reflected in Vermont EPSCoR's governing board, the Vermont Technology Council, a privately organized non-profit group devoted to joining academic research and Vermont economic development. The state's S&T plan, developed by the Council with active EPSCoR leadership, has defined the areas of S&T emphasis which are critical to the state's economy and, therefore, are the areas where the Vermont EPSCoR program makes its infrastructure investments. (Advanced Materials, Biotechnology, Environmental Science/Engineering and Information Technology).

**Upcoming EPSCoR Events & Deadlines**

2005 SBIR Phase (0)	March 17, 2005	Competition
EPSCoR Annual	February 25, 2005	Conference
– See web for more details –		
VT State House Visit	March 16, 2005	Conference Center Sheraton Hotel &
Grant Writing Workshop	June 2005	

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Experimental Program to Stimulate Competitive Research



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