

# MONTANA NSF EPSCoR

Experimental Program to Stimulate Competitive Research



## The SCIENCE LEARNING TENT

traveled to festivals, powwows and the Western Montana Fair this summer. The program's educators (a.k.a. the Super Science Squad) use interactive science activities to promote scientific curiosity and learning for Montanans of all ages.



Autumn 2006



## Humanity Can Learn From Mollusks

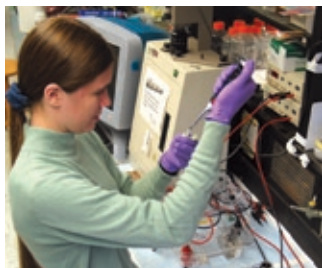
On June 22, The University of Montana-Missoula hosted Dr. Geerat Vermeij, a world-class professor of marine ecology and paleoecology from the University of California-Davis. As part of the *Science within Society* lecture series sponsored by Montana NSF EPSCoR, “*Why we study nature: what shells tell us about our past and about our future*”, explained how we can learn much about humanity and global economics from studying the evolution and history of mollusks. In both his lecture and an interview aired on Montana Public Radio, Dr. Vermeij touted the importance of science in our society. Blind since early childhood, he also took part in a natural history and ecology camp for blind and low-vision children during his visit to Montana. His primary lesson for them, and for us all: be observant and ask questions.



## Symposium on Air Pollution

About 90 high school students gathered to present their research on air pollution at the Air Toxics Under the Big Sky Symposium. Using equipment purchased with Montana NSF EPSCoR dollars, the students measured levels of volatile organic compounds, carbon monoxide and PM2.5 in the air, both in and outside family homes and public buildings. The array of hypotheses focused on potential causes of the buildup of these toxins. Various comparisons were made, such as differing heating systems and new construction vs. older structures. The University of Montana faculty members, Dr. Tony Ward, research professor at the Center for Environmental Health Sciences and Dr. Earle Adams, Department of Chemistry, assisted and monitored the students’ research and were involved in the organization of the symposium. Two participants, Maura Mall and Kayla Nelson said that

they really appreciated the ability to perform research and learn about equipment such as the gas chromatograph - mass spectrometer, opportunities most people don’t get until their junior year of college. Both plan to attend college in Montana as chemistry majors and Maura said, “...we’ll already be pros by the time we get there.” The symposium’s overall prize, a \$150 gift certificate to the UM Bookstore, was determined by a panel of judges including: local television meteorologists, Russ Thomas and Mark Heyka, Montana Grizzlies’ football coach, Bobby Hauck, Missoula mayor, John Engen, (pictured in foreground above l-r), and Dr. Garon Smith, UM Department of Chemistry (not pictured).



## Goldwater Scholarship Winner

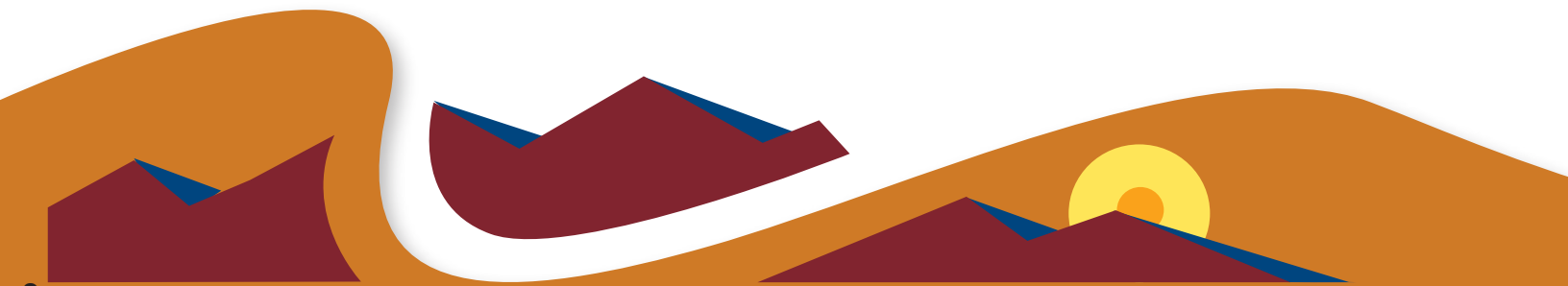
Elizabeth Morton has been awarded the prestigious Goldwater Scholarship in the 2006 competition. The photo at left was taken when Elizabeth participated in the Montana NSF EPSCoR Undergraduate Research Program in 2004. Majoring in biology and working in the lab of Dr. D. Scott Samuels, Associate Professor at The University of Montana, her research was part of a larger genetic study of *Borrelia burgdorferi*, a microscopic bacterial organism that causes Lyme disease. She intends to earn a doctorate and conduct primary research exploring the nature and mechanisms of gene regulation.



## Coming in the Next Issue....”Where are they now?”

Cleat Zeiler (pictured, left), created an impressive real-time computer display of regional earthquake activity for his undergraduate research project at Montana Tech. This led to the discovery of his strong interest in research and seismology. He recently won a scholarship from the American Society for Engineering Education that is helping fund his graduate studies. In exchange for this assistance, Cleat has agreed to work at the Air Force research labs identifying the differences between man-made and naturally occurring seismic events.

*In the Winter 2007 issue, read more about Cleat’s continued education and career as well as other former recipients of undergraduate research awards sponsored by Montana NSF EPSCoR.*



## Advancing Rural Montana Science

ARMS is a new program at Montana Tech with the goal of providing science, engineering and technology enrichment and education to rural K-12 students and teachers. The results have included a substantial increase in independent research by rural high school students through encouragement of active participation in regional science fairs and by hosting a new summer program for high school science teachers.

In March, twenty-one students from six schools entered the Montana Tech Regional Science and Engineering Fair. For all but one student, this was the first time they had competed in a regional science fair. Although they were very nervous and surprised by the quantity of resources and quality of research done by students from larger schools, the new-comers were eager to participate again next year. With help from family members, teachers and some professional mentors arranged by ARMS staff, the students' research topics ranged from water analysis to engineering cost effective ballistics gel to antibiotic discovery in common plants.



*Chelsea Ouder Kirk, St. Regis High School, talks with a judge at the Montana Tech Regional Science and Engineering Fair*



*Mardy Demarais, Malta Public Schools, works with another science teacher during the Summer Science Academy*

This summer, ARMS teamed up with the Clark Fork Watershed Education Program to host the 2nd Annual Summer Science Academy for high school science teachers. During this week teachers learned about research techniques, analyzing data, the values of teaching science

research, encouraging science fair participation, curriculum development, and ways to inspire students in the classroom. The evaluations received from teachers at the end of the academy showed they felt it was highly productive and beneficial.

For more information about this program, please contact Amy Verlanic, Director of Technical Outreach at Montana Tech (406) 496-4690.

## Dr. Rajendra Kasinath: Biomedical Innovator

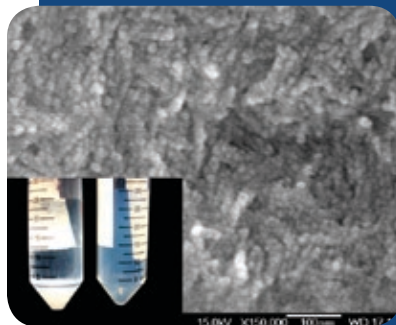
The vast amounts of research in nanotechnology and biomimetics are producing significant breakthroughs, increasing the public awareness of these fields. Nanotechnology refers to engineering and fabrication at an incredibly small, molecular scale. Biomimetics is a moniker for designing man-made materials and structures that imitate those found in nature.

These are descriptors for the work of Dr. Rajendra Kasinath, one of the Montana NSF EPSCoR new faculty hires in Autumn 2005, who is developing new hybrid nanomaterials at Montana Tech-Butte. Combining organic and inorganic substances, he is currently researching a synthesized "nano-system" with many potential biomedical purposes.



*Research Associate Pankejam Ganesan in Dr. Kasinath's lab*

The organic material used in creating this composite is chitosan, the structural element in the exoskeleton of crustaceans (shrimp, crabs, etc.), which binds readily with heavy metals, amino acids and fats. Combining the chitosan with the inorganic substance (hydroxyapatite), the compound is then dried. During this process it self-assembles into a multi-layered film with a complex structure. The bio-adhesive and other functional properties of this hybrid nanomaterial are being researched for biomedical applications: drug delivery, tissue and dental engineering, and coating prosthetic devices or tiny filters that remove heavy metals.



*Hydroxyapatite nanoparticles mediated in citric acid*

Some of Dr. Kasinath's plans for the future include two other EPSCoR supported programs. He seeks to establish collaboration with the Center for Bioinspired Nanomaterials at Montana State University as well as participation from students in the Undergraduate Research Program at Montana Tech.

To learn more visit:  
[www.mtnsfepscor.org/news/kasinath.pdf](http://www.mtnsfepscor.org/news/kasinath.pdf)

# Keeping Science and Technology in Big Sky Country

**Q:** What do the following things have in common: bees who can detect land mines, geospatial software, antibiotics and gluten-free flour milled from a native Montanan grass?

**A:** They are all products from newly formed Montana technology companies that have recently received SBIR/STTR awards.

To further assist start-up research and development companies, a conference sponsored by Montana NSF EPSCoR in collaboration with the State of Montana Department of Commerce and Navy SBIR/STTR, will bring more

than a dozen national SBIR/STTR representatives to the Best Western GranTree Inn of Bozeman, September 11-13. The

SWIFT Tour VI (SBIR/STTR Where Innovation Focuses Technology) benefits members of the science and technology industry who wish to learn about federal agencies that grant awards intended to bolster business potential and advance their research. This event features valuable seminars about available funding potential, a chance to speak with federal program managers and will also provide excellent networking opportunities.

Small Business Innovation Research (SBIR) awards aid enterprising inventors and entrepreneurs across Montana, enabling them to become more competitive for federal SBIR/STTR awards, boost the science and technology components in Montana's economy and entice more researchers to remain in the state.

For more details about the conference, registration information or to otherwise learn about the programs that have aided these and many other research and development businesses, please visit the Montana NSF EPSCoR web site or <http://sbir.mt.gov/SwiftTour.asp>



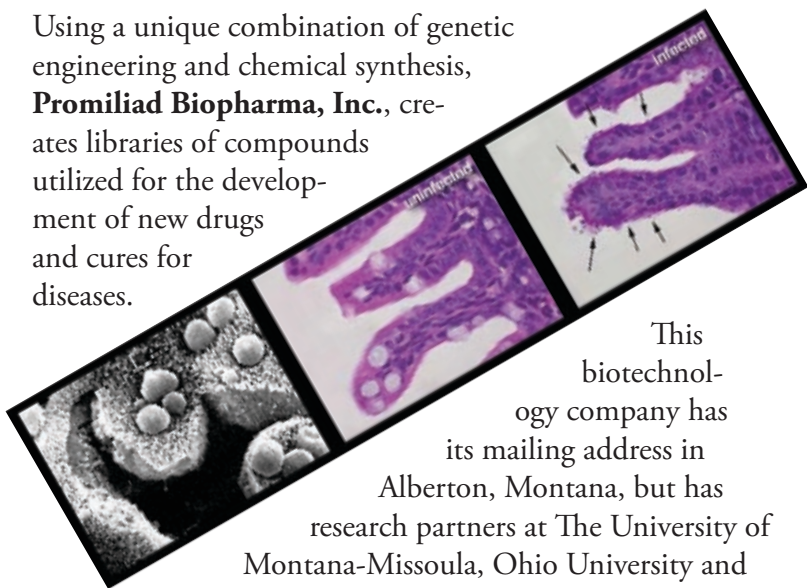
SBIR Phase 0 award recipient **BeeAlert Technologies** performs research on honeybees. Part of their research involves conditioning bees to be attracted to the chemicals used in explosives. In field trials using laser technology called LIDAR, they have tracked these bees to buried landmines. Above: a beekeeper holds bees near two unfused antitank mines. The photo appears courtesy of Sandia National Laboratories, a partner in this research. <http://beekeeper.dbs.umt.edu>

# - Small Business Innovation Research

Founded in 1999 by Dr. David Opitz and Stuart Blundell, **Visual Learning Systems** is a Missoula-based business that has won SBIR awards from NASA, the Department of Defense, Montana NSF EPSCoR, and is currently nominated for a Tibbetts Award. This company develops software that assists in processing large amounts of data retrieved by satellite and other imaging technology to identify features such as buildings and roads. Their main software products, Feature Analyst® and LIDAR Analyst™, primarily have military applications, but are becoming increasingly useful to private companies needing satellite imagery and data. To learn more, visit the company's web site: <http://www.featureanalyst.com>



Using a unique combination of genetic engineering and chemical synthesis, **Promiliad Biopharma, Inc.**, creates libraries of compounds utilized for the development of new drugs and cures for diseases.



This biotechnology company has its mailing address in Alberton, Montana, but has research partners at The University of Montana-Missoula, Ohio University and Dartmouth College. In a new collaboration with the University of Connecticut, an STTR Phase I award was granted for their development of treatments for cryptosporidiosis. Also known as "crypto", public awareness of this water-borne illness has been elevated in Montana due to numerous confirmed cases. Promiliad Biopharma has also recently been awarded an STTR Phase II award to assist in expanding their chemical libraries and research. For more information about this company and the services it provides, visit <http://www.promiliad.com>

On the eastern side of Montana in Sydney, **Safflower Technologies International** is coordinating public and private research programs to promote the use of safflower oils, meals and seeds. One of their finished safflower products, branded NutraSaff, has improved nutrient digestibility over normal safflower due to its genetically removed hull. NutraSaff is trans-fat free and high protein, among other beneficial qualities. It is researched and marketed as a desirable nutritional supplement for ruminant animals and excellent feed for birds. Safflower Technologies has also developed Healthola (pictured above.), a high-oleic oil for healthy cooking as well as for cosmetics and biolubricants. <http://www.safflowertech.com>



**Amazing Grains**, based in Ronan, is yet another Montana company that has benefited from the SBIR/STTR program. Resulting from research and development efforts initiated at Montana State University, a farmer-owned cooperative was formed in 2003 to market their trademarked, Montana™ brand of gluten-free flour products milled from Indian ricegrass. Native to Montana and the U.S. prairies, Indian ricegrass is well adapted to the climate and soil conditions making it an attractive choice for the 56 current cooperative growers. Indian ricegrass seeds are high in protein and nutritional fiber. In addition to boasting great flavor, Montana™ flour products are a boon to individuals who are gluten intolerant or have wheat allergies. SBIR funding is being used to further research Montana's™ nutritional attributes, baking characteristics and to identify new market opportunities. With agricultural sustainability, a niche market and a solid research base, this company, along with the others previously mentioned, has a promising future. Learn more at <http://www.amazinggrains.com>



## Exposing the Secrets Kept by Mud



Cathy Whitlock studies climate change one centimeter at a time. This paleoecologist and her students examine 20,000 years of environmental history in the Western United States dating back to the last ice age, reconstructing the past to understand the present and the future. The group scrutinizes sediments in core samples taken from lake bottoms. One centimeter of lake mud equals about 10 years, Whitlock said of her study sites in Yellowstone National Park.

“In these cores, we are looking at pollen grains, charcoal particles and maybe a few insect legs and wings that landed in the lake and sank to the bottom each year,” said Whitlock, who joined Montana State University’s Department of Earth Sciences in 2004 through the support of Montana NSF EPSCoR’s New Faculty Hire program. “Over time, the accumulation of these materials becomes a record of how forests have developed and changed, when fires and insect outbreaks have occurred, and how the ecosystem has responded to climate changes”.

Yellowstone has experienced dramatic changes in its environment in the past, and continues to evolve. “One difference is that current and future climate changes are occurring at a much faster rate than in the past; and, we keep pace with changes of such magnitude,” she said. Whitlock’s research seems to indicate that the regional climate was much warmer and drier 10,000 years ago. “We are also finding that large fires, similar to those of 1988, affected many sites about 200 and 300 years ago, but fire frequency has been steadily decreasing over the last several millennia. During warmer, drier periods, like that from 11,000 to 7,000 years ago, many watersheds experienced fires every few decades. The fire activity in Yellowstone is and has been closely tied to summer drought; when droughts were more severe, fires were more frequent. The long time perspective teaches us that present-day conditions are short-lived and shouldn’t be viewed as normal.” So the question isn’t *if* change will happen, but *when*.

Whitlock’s research findings have also aided in discoveries involving tree-boring invertebrates. Yellowstone biologist, Roy Renkin states, “Through Whitlock’s research, we hope to identify periods of high levels of insect activity and find out if the outbreaks occur three times a century or six to seven times.”

“We need to understand the ecosystem’s response to climate change to discover what will likely happen in the future,” Whitlock said.

## Film Examines Student Smoking

Why do college students smoke, when do they smoke and do they want to quit? Parker Brown addresses these questions in *DRAG*, a ten-minute documentary that examines the behavior and attitudes of college students toward smoking. The film Brown created includes interviews with college students who smoke and features the research of Dr. Kari Harris, a public health and psychology professor at The University of Montana who studies predictors and potential intervention for smoking among college students.

Brown created *DRAG* as part of his graduate work in the Master of Fine Arts Science and Natural History Filmmaking program at Montana State University. With support from Montana NSF EPSCoR, the program is the first graduate program of its kind in the country, training students to use the medium of film to advance the public understanding of scientific topics and exposing people to new ways of seeing issues like smoking.

“*DRAG* is my attempt to bring a new way of thinking to the creation of science films. I have attempted to use alternate and original ways to solve the problems of science filmmaking, such as how to establish credibility for the person espousing information; and, how to create a simultaneously entertaining and enlightening film about a real world science topic,” stated Brown.

A graduate of Lake Forest College in Chicago with a chemistry degree, Brown had no filmmaking experience before entering the program. A baccalaureate degree in the sciences is required for admission to the program, while education in filmmaking is not. In the production of this film, he credits Montana NSF EPSCoR not only for financial support, but also for the motivation to promote the work of a Montana scientist. *DRAG* will be televised this fall as part of the Terra program on Montana PBS.



# september

**11 to 13** SBIR & MT NSF EPSCoR State Conference  
Best Western GranTree Inn - Bozeman

**13 to 14** Jim Gosz, Senior Program Director, NSF EPSCoR  
The University of Montana - Missoula

# october

**6** 2007 NSF EPSCoR Proposal Submission Due  
FastLane

# november

**1** 2004-06 Final Report Due  
MBRCT

**7** Election Day, Holiday

**7 to 10** NSF EPSCoR National Conference  
Lexington, KY

**10** Veterans Day, Holiday

**23 to 24** Thanksgiving Holiday

# december

**11 to 15** Finals Week  
Montana State University & The University of Montana

**7 to 13** Finals Week  
Montana Tech

**25** Christmas, Holiday

This publication promotes the development of Montana science and technology resources through partnerships involving Montana universities, industry and state research and development enterprises. EPSCoR operates on the principle that aiding researchers and institutions in securing federal funding will develop Montana's research infrastructure and advance economic growth. EPSCoR's goal is to maximize the potential inherent in Montana's science and technology resources and use those resources as a foundation for economic growth.

## Montana NSF EPSCoR Partners

The University of Montana - Missoula  
Montana State University - Bozeman  
Montana Tech of The University of Montana  
Montana Tribal Colleges  
The University of Montana - Western  
Montana State University - Billings  
Montana State University - Havre

## Montana NSF EPSCoR Director

Dr. Charles Thompson  
The University of Montana  
Biomedical & Pharmaceutical Sciences  
Missoula, MT 59812-1296  
406-243-4643 (phone)  
406-243-5461 (fax)  
charles.thompson@umontana.edu

## Montana NSF EPSCoR Co-Director

Dr. Mark A. Young  
Montana State University  
Plant Sciences and Pathology  
Bozeman, MT 59717-3150  
406-994-5158 (phone)  
406-994-5177 (fax)  
myoung@montana.edu

## Montana NSF EPSCoR web address

[www.mtnsfepscor.org](http://www.mtnsfepscor.org)

## Montana NSF EPSCoR is supported by:

NSF Grant EPS-0346458 and  
MBRCT Agreements #04-06 and #06-07

## Please send comments and inquiries to:

Gay Allison, Associate Director  
Montana NSF EPSCoR  
The University of Montana  
Davidson Honors College  
Missoula, MT 59812-1049  
gay.allison@umontana.edu



Montana NSF EPSCoR  
The University of Montana  
Davidson Honors College  
Missoula, MT 59812-1049



***The Montana NSF EPSCoR newsletter  
is now available online!***

If you would like to receive an electronic version  
of our newsletter, please visit:  
<http://www.mtnsfepscor.org/news>

There, you will be able to sign up to receive our  
newsletter electronically, update your mailing  
address, view announcements and other news.

