

Blackfeet Skies

Leo Bird has a unique teaching style. While he is teaching biology, chemistry or astronomy to his Browning High School students, he is also teaching them about Indian culture, and, in a way, teaching them about themselves. They respect him for that.

On March 31, 2006, the community of Missoula, Montana was treated to an evening of Leo's teaching techniques at The University of Montana, where he presented a lecture titled, "Blackfeet Skies". As a part of Montana NSF EPSCoR's *Science within Society* lecture series, and co-sponsored by UM's Native American Center of Excellence, Mr. Bird discussed the Blackfeet tribe's traditional lore, cultural significance and practical usage of astronomy. Although the lecture occurred during spring break, approximately 135 people were in attendance. The event also sparked much interest from the local media. In addition to an article in the Missoulian, interviews were aired on two radio stations and the NBC television affiliate, KECI.

Historically, the Blackfeet were a nomadic people, often traveling by night using the stars for navigation, but also as a celestial tapestry illustrating the stories and ancient traditions of their culture. The night sky is very much a part of their culture. This can be seen in the designs on their traditional clothing, lodges and other art. Mr. Bird further explained this relationship and how Blackfeet constellations represent specific geological features, places, spiritual characters and ceremonial seasons. He especially wanted to impart that astronomy and knowledge of Blackfeet culture is for everyone, not just scientists.



Mr. Bird is one of the recipients of the 2005 Milken Family Foundation National Educator Award, the largest teacher recognition program in the U.S., awarding nearly 100 teachers annually. He plans to spend the \$25,000 that accompanies this prestigious award to travel to Alaska to visit his grandmother and other family, whom he has never before had the opportunity to visit, and, of course, to study the Northern skies.

Fourteen appreciative students from Browning High School visited Missoula as guests of Montana NSF EPSCoR. In addition to hearing Mr. Bird's lecture, they spent the following day at the Saturday Science Enrichment Program, sponsored by the UM Health Careers Opportunity Program (HCOP). "Keeping Your Eyes on the Skies", an event that allowed the students to learn about several research topics including: air pollution and its health effects on humans, air sampling, and GIS data collection. Although the students were thrilled just to make the trip, they were also interested in science. One student even plans to go to college to study astronomy.



International Ecoscience Conference

Due largely to global climate change, there is a growing need for research that promotes stewardship of plant communities dealing with stressful conditions. With the help of international scholars, Ragan Callaway, Ph.D. and the research scientists at the Plant Ecology Laboratory at The University of Montana are making advancements in the understanding of positive interactions among plants. In order for accurate modeling of the effects of stress on plant communities to occur, positive interaction must be taken into account as well as the more widely studied negative interaction between species. Understanding positive



interaction allows better intervention when trying to protect a species or facilitate healthy plant communities. For example: if someone wants a particular kind of tree to thrive in an area, it is better to know where to plant new trees so they will be helped, rather than hindered, by other nearby plants. Dr. Callaway says, "Integrating such ecological knowledge into practical conservation science saves money and greatly increases the effectiveness of restoration programs."

In September 2005, with the assistance of Montana NSF EPSCoR, Ray Callaway's passion for plant ecology brought experts from all over the globe to Montana. With a focus on alpine ecology, the primary goals of this conference, "*The importance of biodiversity in stressful conditions: focus on facilitation*", were to stimulate new research, publicly share current research developments with other scientists and to educate the students in attendance.



Dr. Ray Callaway in the Republic of Georgia

The five international scientists, along with Dr. Callaway, convened at The University of Montana. As part of their visit, they each participated in a symposium on September 29, 2005, speaking about their individual research that contributed to the broader focus of the conference. Rob Brooker of the Centre for Ecology and Hydrology, Banchory Research Station in Banchory, Scotland, spoke about biodiversity in his speech, "*A great big packet of M&Ms*". Richard Michalet, representing Université Bordeaux, France, presented, "*Indirect interactions in forest ecosystems*". From York University in Canada, Chris Lortie lectured on, "*A test of the stress-gradient hypothesis using meta-analysis*". "*Native cushion plants facilitate invasion by *Taraxacum officinale* in the Andes*" was presented by Lohengrin Cavieres of Concepcion University, Chile. Finally, the keynote address was given by Alfonso Valiente-Banuet of the Universidad Nacional Autonoma de Mexico, Mexico City. He spoke on, "*Positive interactions in Mediterranean-type ecosystems: the importance of ancient evolutionary lineages*".



Alfonso Valiente-Banuet and Lohengrin Cavieres,
East Front of the Rocky Mountains

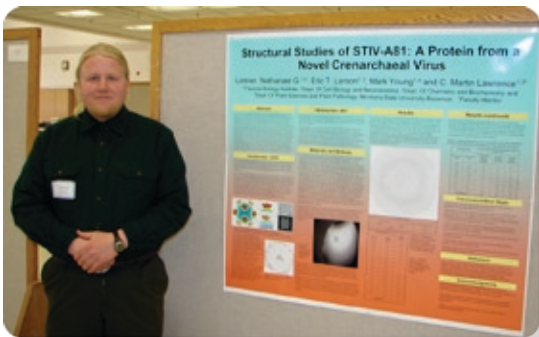
In addition to the conference, the scholars held a retreat at the Theodore Roosevelt Memorial Ranch, which resulted in the development of a co-written paper that was submitted to *Ecology Letters*. Also, a proposal has been submitted to the Andrew W. Mellon Foundation. This submission, “*Macroecological experiments in alpine community ecology: coordinating complex experiments with colloquia*”, will also be the groundwork for a proposal to NSF and, potentially, other organizations.

Wendy Ridenour, one of Dr. Callaway’s grad students at the Plant Ecology Laboratory, used the opportunity this conference presented to educate young scientists, who may one day help find answers to ecology problems around the world. Wendy developed curricula for grades 2-8 exposing students to such topics as the scientific method and photosynthesis. This classroom work culminated in the students attending the ecoscience conference.

It’s all in the presentation...

Montana NSF EPSCoR continues to sponsor the Undergraduate Scholars Program at Montana State University to aid in the encouragement, facilitation and support of undergraduate research in collaboration with faculty. To further this opportunity, the Undergraduate Scholars Conference is held annually to showcase exceptional students.

The 2006 conference was held April 4 and featured students’ oral presentations along with a poster session to exhibit their current research. Nathanael Linter, a biomedical science major and future graduate student, presented his poster, *The Structure of STIV-A81*. Linter’s experience with the poster session has proved invaluable. He explained that the process of making the physical poster can be just as important as the research presented. Creating a poster that contains scientific terminology, but can be read clearly by the public is important. In addition, poster sessions allow undergraduates the experience of explaining their research to people with a variety of backgrounds, who may not be familiar with the biomedical sciences.



Nathanael Linter

Top Honors to Scholar



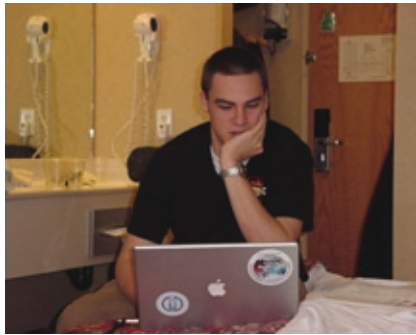
Congratulations to Dr. Cathy Cripps, recipient of the Teaching Award of Merit. Given annually to an outstanding faculty member in the Land-Grant System by North American Colleges and Teachers of Agriculture (NACTA), the award honors faculty at higher learning institutions receiving federal support for integrated programs of agricultural teaching and research, as well as extension for agriculture, food, and environmental systems.

Bob Gough, Associate Dean of Agriculture at Montana State University, commended Dr. Cripps stating, “Your consistently high teaching scores, your high degree of professionalism and instructional integrity, your affable personality and your perseverance in carrying out your instruction duties all reflect most highly upon your department, your college, and your university”.

In 2003, Dr. Cripps became an Assistant Professor of Mycology at MSU as part of Montana NSF EPSCoR’s New Faculty Hire program. She received her Ph.D. from Virginia Polytechnic Institute and State University. Dr. Cripps’ research is based on fungi, specifically those living in extreme environments such as the alpine life zone and high-elevation, smelter-impacted sites. Dr. Cripps has been voted President of the International Group of Arctic-Alpine Mycologists and is currently documenting the diversity of fungi in the alpine zone of the Rocky Mountains, the first extensive survey of arctic-alpine mushrooms in North America (outside Alaska). The study is funded by the NSF Biotic Surveys and Inventory grant.

High School Students Study Advanced Problems in Science

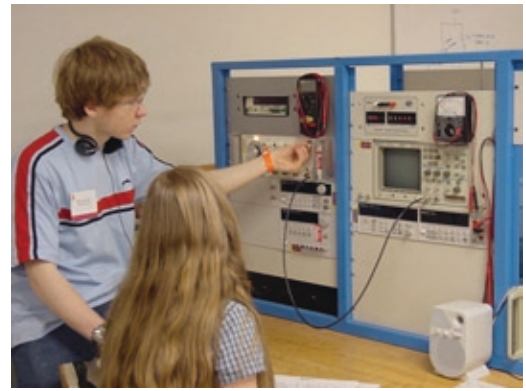
Science teachers James Harkins at Big Sky High School and Gary Gagermeier at Hellgate High School, directors of Advanced Problems in Science (APS), should be very proud of the students in the program. Several of the young scientists from schools in Missoula, Butte, Corvallis, Stevensville and St. Regis have won awards and honors at Montana's state and regional science competitions. As a result, some students will compete at higher levels. The APS program, with the assistance of faculty at The University of Montana, creates curriculum for students to perform advanced scientific research. APS provides for a need in public school systems offering experiences in "inquiry based" science. Montana NSF EPSCoR underwrites the funding that has enabled these students to compete.



Tyler Salisbury rehearsing his presentation

of April. Rafeal Villarreal-Calderon placed second overall and first in the engineering category, which awarded a \$500 cash prize for his school and a \$500 scholarship.

The research projects presented by Missoula high school students were also successful at the Montana Tech Regional Science and Engineering Fair, in Butte, March 1. In addition to the many gold, silver and bronze medals, including several other special honors bestowed upon these APS students, Hellgate student, Will Fletcher, earned an all-expense-paid trip to Indianapolis. There, he will compete in the INTEL International Science and Engineering Fair (ISEF) with his project "Quantitative Analysis of Music in MP3".



Will Fletcher shows his research to Genna Smith

Missoula high schools, again, earned many awards and some of the top honors March 19-20 at the Montana State Science and Engineering Fair at The University of Montana.

When asked about how Montana NSF EPSCoR has helped the APS program, Gary Gagermeier said, "NSF EPSCoR has allowed...students to experience the beauty and frustration of true science. These students are allowed to develop technical/scientific writing skills, presentation skills and teamwork with other students and mentors. The students are allowed to present with other area students at the JSHS, ISEF, and MAS. Without the help from NSF EPSCoR and The University of Montana, we would not have any of these experiences for Hellgate High School [students]. My students are enriched by this support and want to do more science. The students have broken down typical high school grouping barriers so that they can become scientists. One big, slow-talking cowboy in my class, quietly asked, after winning a gold medal, 'Mr. G, is it OK for a cowboy to be nerd?' NSF EPSCoR changed this student's life. Thank you!"



Students from Butte, Missoula, Stevensville and Corvallis en route to IJSHS

Tenth Annual Undergraduate Research Fair at Montana Tech

Montana Tech at Butte, Montana, held its Tenth Annual Undergraduate Research Fair on Saturday, April 8. Recognizing the research by undergraduate students, the event featured 45 students working with 27 mentors and a wide variety of research projects such as: voice recognition systems, fault gouge testing, and bacteriophage hunting. The presenters were all awardees of the Undergraduate Research Program (URP), which encourages undergraduate students to become active contributors to the research efforts at Montana Tech. The students are paid if their proposals are accepted and the research is conducted with assistance from a faculty mentor. The URP is collaboratively funded by Montana NSF EPSCoR, the National Aeronautics and Space Administration (NASA), and the Montana Tech Research Office.



James Thullbery (left) and his mentor, Dr. Lou Glassy

The Undergraduate Research Fair also included two special guest lectures. Dr. Marvin Speece, Montana Tech Professor of Geophysics, gave a speech about his research trip to Antarctica the previous fall. Seth Betterly, a graduate student in Tech's Geophysical Engineering program, traveled with Dr. Speece to Antarctica and was the second guest speaker.

All the research presented at the fair was outstanding, but too extensive to detail. Below are just a few of the many excellent research projects:

James Thullbery's major is computer science, yet his research project crossed over into geological science when he undertook the task of updating the Montana Bureau of Mines and Geology Earthquake Studies website. Through extensive work with his mentor, Dr. Lou Glassy, Assistant Professor of Computer Science at Montana Tech, James improved the

user interface of the website, making earthquake data more accessible to the public. His presentation is noteworthy due to the impressive amount of work he put into his project as well as the impact this will have on geologists throughout this region. The website can be viewed at <http://10.33.73.44/>

Brienne Burt, along with her partner, Brittne McArthur, presented their research on exercise training for the improvement of jumping ability in basketball players. After Brienne obtains her degree in applied health science at Montana



Brittne McArthur and Brienne Burt give their presentation

Tech in May, she plans to attend graduate school with an emphasis in exercise physiology. When asked about her participation in the URP, she said her favorite part is, "Being able to do research projects that are directly related to my major and also to my future career. It allows me to learn more about the real world application of concepts learned in the classroom."

Johanna Fryer's presentation, "*Fault Gouge Testing of the Virgin Fault Zone*" details her research on the Virgin Fault Zone in Northwestern Nevada. The primary purpose of her research project was to test the strength of the fault zone gouge and determine if a preferred orientation for failure exists. Newmont Mining Corporation is starting a large gold and other heavy metal mining project along this zone. The strength of this fault is extremely important information for the safety of mining in this area. When not playing for the Montana Tech basketball team, Johanna is studying geological engineering with a geotechnical option. She plans to continue her education and get a masters in geotechnical engineering.



Johanna Fryer working in a lab

An estimated 75 people turned out at various times during the day to see the students present their research. For more information about the Tenth Annual Undergraduate Research Fair, you can visit the website at: <http://www.mtech.edu/undergradresearch/>

Graduate Student Discovers Hot New Protein



Portions of this article written by Evelyn Boswell, MSU News Service

Blake Weidenheft, a Montana NSF EPSCoR funded graduate student, has discovered a new protein in an organism that lives in the harsh environment of acidic hot springs. The protein detoxifies molecules, protects DNA, and is the first of its kind found in these high-temperature microorganisms. "This protein was isolated from *Sulfolobus solfataricus*, a heat-loving archaea that thrives in acidic hot springs like those found in Yellowstone National Park," said Wiedenheft, who discovered the protein while looking for another. Trevor Douglas, co-author and Montana State University professor explains that not only does it demonstrate the "fantastic" opportunities for interdisciplinary research in the Montana University System, but it has enormous implications for understanding oxidative stress in higher organisms, which is associated with diseases ranging from heart disease to Alzheimer's. Wiedenheft was lead author of a paper explaining the SsDps protein. The paper appeared recently in the weekly journal, *Proceedings of the National Academy of Sciences* (PNAS), one of the world's most cited multidisciplinary scientific publications. Mark Young, a co-author on the paper, and Kristen O'Toole, both of Montana NSF EPSCoR, provided the photos and art for the publication.

Blake elaborates on this discovery:

What significance do you feel your publication in PNAS has had on the science community?

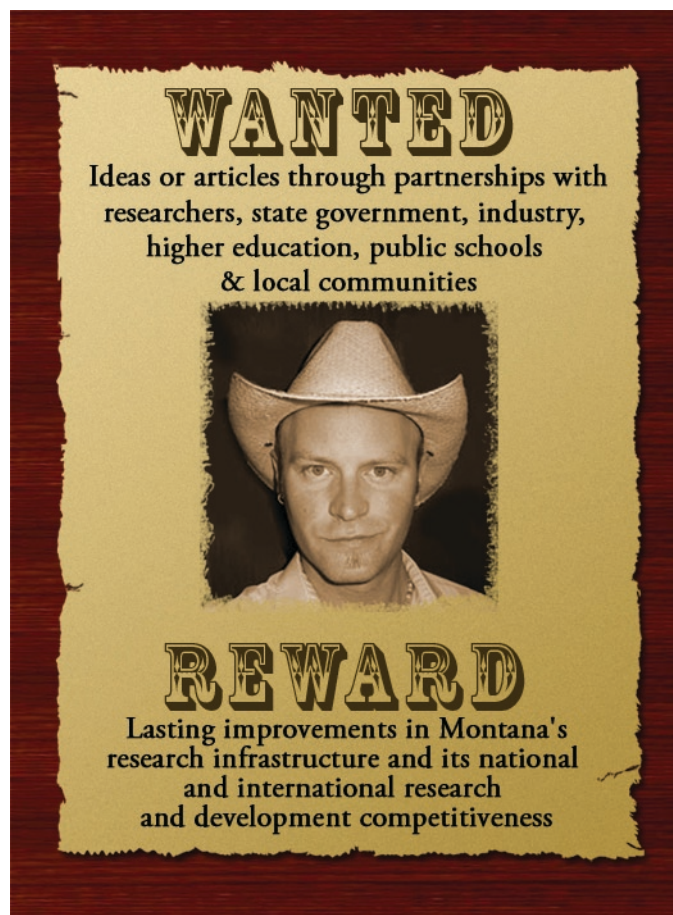
Oxidative stress is a universal phenomenon experienced by all of life. In this manuscript, titled "*An archaeal antioxidant: Characterization of a Dps-like protein from Sulfolobus solfataricus*" we detail the discovery of a novel antioxidant

protein and, in so doing, expands our appreciation for the breadth of mechanisms by which life manages oxidative stress. Prior to this discovery, the Ssdps gene was recognized as a hypothetical protein of unknown function. Thus characterization of this *Sulfolobus* protein allows us to infer similar function for related proteins in numerous other organisms.

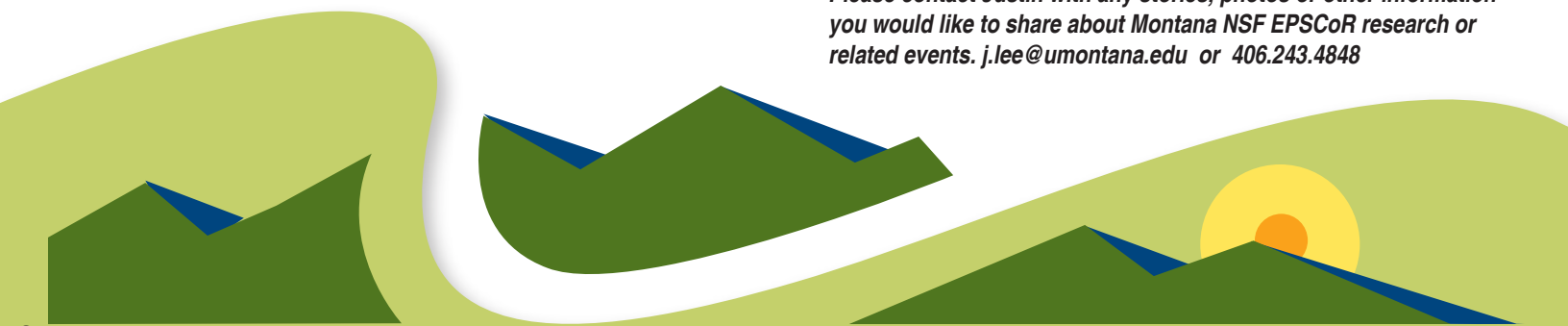
What effect has your PNAS publication had on future career plans?

PNAS is an esteemed journal credited with publishing high impact science. Having our work published and featured on the cover of PNAS has provided considerable exposure to our contributions in Archaeal biology and given me personal recognition among colleagues and potential future employers.

Information Leading to Capture



Justin Lee is the newest member of the Montana NSF EPSCoR team. His duties include: web development, graphic design, photography, publications production and generally keeping people informed about our organization both externally and internally. Please contact Justin with any stories, photos or other information you would like to share about Montana NSF EPSCoR research or related events. j.lee@umontana.edu or 406.243.4848



april

- 4** Undergraduate Scholars Conference
MSU - Bozeman
- 19** SBIR Phase 0 Solicitation Released
- 28** Year 2 Final Report to NSF

may

- 6** MSU Commencement
- 13** UM & Montana Tech Commencement
- 10** Project Director/Project Administrator Meeting
Nashville, TN
- 10 to 12** Cyberinfrastructure Workshop
Nashville, TN
- 17** Hands-on Science Day
UM - Missoula (Hosted by Science Learning Museum)
- 18** Family Science Night
UM - Missoula
- 25** SBIR Phase 0 Proposals Due

june

- 19 to 23** 2006 Clark Fork Watershed Science Academy
Montana Tech - Butte
- 29 to 30** Public Information Officer Workshop
Washington DC
- 30** SBIR Phase 0 Winners Announced

july

- 24 to 25** Project Administrator Meeting
Chicago, IL
- 30** SBIR Phase 0 Contracts Completed

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.

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