

Year 1

Montana NSF EPSCoR

The Montana NSF EPSCoR Program

is a partnership between Montana's research universities (MSU and UM) as well as Montana Tech and Montana's seven tribal colleges. Under this award, Montana EPSCoR is focusing on increasing research competitiveness in two targeted research areas: *Hydrogen and the Environment* and *Large River Ecosystems* and one support area, *Cyberinfrastructure*. *Hydrogen and the Environment* builds on the expertise of researchers in the Montana University System who study hydrogen metabolizing mechanisms in nature with the mission of applying their understanding to the development of hydrogen as an alternative fuel. *Large River Ecosystems* is building partnerships in the state and region to examine the range of processes affecting large rivers and their ecosystems and restoration techniques and efforts.



annual report
August 1, 2007 – July 31, 2008

o1/HIGHLIGHTS OF THE YEAR INCLUDE:

- Researchers in the *Hydrogen and the Environment* research group began collaborative interdisciplinary work as part of a large NASA-funded Astrobiology Institute and an NSF-funded Nanoscale Interdisciplinary Research Team.
- A successful state conference was held in Billings, MT with representatives from both research universities, Montana Tech and all seven of Montana tribal colleges present.
- The LRE research focus area has engaged 6 tribal colleges in research projects that significantly relate to their reservations and water research and/or other associated issues.
- The spectrUM “Science. Try It.” ad campaign was recognized with three prestigious Montana Addy awards and two Northwest Addy awards.

o2/SCIENTIFIC ACHIEVEMENTS:

Using X-ray crystallography, scientists produced a crystal structure of the hydrogenase enzyme to unprecedented resolution, revealing a new level of detail in the enzyme’s active site, and enabling them to better understand how this enzyme functions. The hydrogenase enzyme is a large, complex enzyme which plays a major role in anaerobic metabolism by creating molecular hydrogen.

Pandey, A.S., Harris, T.V., Giles, L.J., Peters, J.W., Szilagy, R.K. “Dithiomethylether as a ligand in the hydrogenase h-cluster.” Journal of the American Chemical Society, April 2, 2008; 130(13) 4533-4540.

Scientists were able to make uniformly-sized titania nanoparticles within a virus by reducing the pH inside the virus. Nanoparticles of uniform size that demonstrate reliably stable properties

are useful for a variety of applications including photocatalysts.

Klem, M.T., Young, M., Douglas, T. “Biomimetic synthesis of B-TiO2 inside a viral capsid.” Journal of Material Chemistry 2008. DOI: 10.1039/b805778h

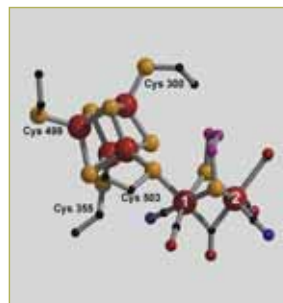
Two metagenomic sequencing grants were awarded to scientists to sequence viruses and microbial communities from high temperature environments in Yellowstone National Park, possibly elucidating novel enzymes and mechanisms applicable for hydrogen production.

Under the LRE research focus initiative Professor Johnnie N. Moore was appointed the Director of the River Center in November 2007. The goals of the River Center over the next 5 years are to inform the broad community of river scientists, managers and restoration practitioners in innovative and sound methodologies to improve river management and restoration skill.



o1. Participants in the Yellowstone Research Coordination Network Conference, Yellowstone National Park, January 2008

o2. Undergraduate students conduct research in labs on both Hydrogen and the Environment and Large River Ecosystems projects. **o3.** Ball and stick representation of the H-cluster part of the Fe-Fe hydrogenase, the enzyme that catalyzes reversible hydrogen oxidation. **o4.** Since 2006, over 27,000 visitors have been to the Science Learning Tent, a traveling component of the spectrUM Discovery Area outreach initiative.



o2

o3

o4

o3/PROGRAMMATIC ACHIEVEMENTS:

- Three new faculty hires:
 - Dr. Abigail Richards, Chemical and Biological Engineering (MSU)
 - Dr. Kevin Wanner, Plant Sciences and Plant Pathology (MSU)
 - Dr. Wyatt Cross, Ecology (MSU)
- Board of Regents approved Center for Riverine Science and Stream Renaturalization at UM
- Six Tribal College subawards granted on LRE research theme in local, relevant large river ecosystem research such as: evolution of channel morphology and aquatic habitat in the Middle Clark Fork River, Milk River Watershed, and training in field and laboratory techniques for studying environmental microbiology on the Tongue River.
- Six graduate student stipends awarded
- 51 Undergraduate students supported through research stipends
- Contributed to the development of an Office of Research Computing at UM

- Provided research infrastructure facility support at MSU
 - Bioinformatics Teaching and Research Facility
 - Transmission Electron Microscopy Facility
 - Imaging and Chemical Analysis Laboratory
- Six outreach partnerships developed: MSU Extended University, spectrUM, Montana Technology Innovation Partnership Program, FIRST Lego League Conference, MSU Undergraduate Scholars Conference, NASA Astrobiology Program
- Five Scientific Conferences/Meetings co-supported
 - 5th National Meeting of the Center for Riverine Science and Stream Renaturalization Ecology
 - Yellowstone National Park Research Coordination Network Conference
 - 11th Annual State of Montana NSF EPSCoR Conference Montana Large River Ecosystems-Tribal College Collaborations
 - International Conference on Mathematical Tools for Multi-Scale Biological Processes
 - 4th International Symposium on Bioorganometallic Chemistry



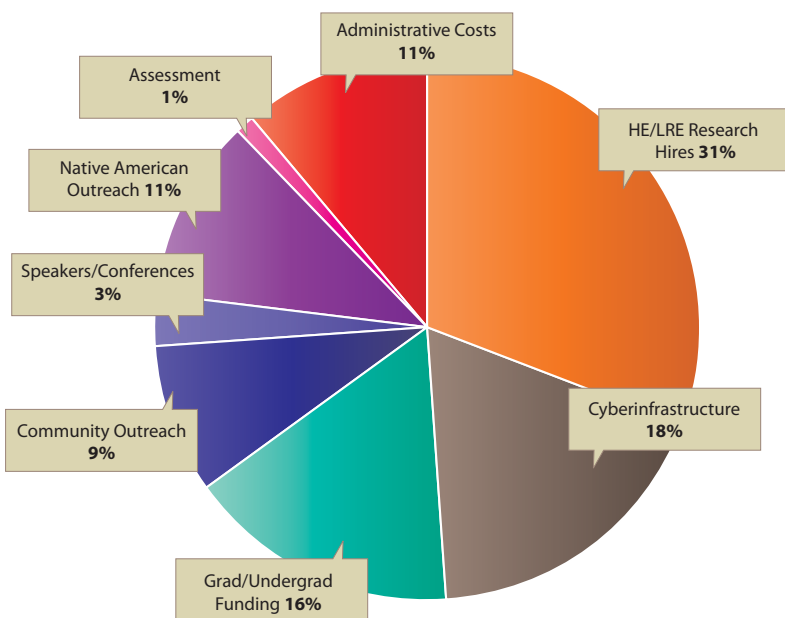
o5



o6



o7



Year1 Expenditure Distribution

GENDER			ETHNICITY						
MALE	FEMALE	TOTAL	AMERICAN INDIAN	ASIAN AMERICAN	AFRICAN AMERICAN	PACIFIC ISLANDER	HISPANIC	WHITE	TOTAL
183	122	305	67	7	0	0	2	229	305

Participants in EPSCoR activities this year

o5. Dr. Abigail Richards, Department of Chemical and Biological Engineering, MSU **o6.** Dr. Wyatt Cross, Department of Ecology, MSU **o7.** Dr. Kevin Wanner, Department of Plant Sciences and Plant Pathology, MSU



08. Under the Large River Ecosystems research focus area, Alluvial Floodplains are the biodiversity and production “hotspots” across Montana.

11. Students at Fort Peck Community College in Poplar, Montana participate in water monitoring studies on the Poplar River.



09. Professor Michael Ceballos, Director of the Native American Research Laboratory at the UM, discusses ongoing research with Salish Kootenai College student, Joshua Marcea.

12. As part of the Outreach Program, Rebecca Sporman, spectrUM Discovery Area science educator, explains a cow eyeball lens to students from Browning, Montana.



10. Trinity Hamilton, graduate student, conducts research on hydrogen in the laboratory of Dr. John Peters.

13. NSF Program Officers Tony Walters and Denise Barnes visit Little Big Horn College, Crow Agency, Montana, May 2008.



Montana NSF EPSCoR

For more information:

<http://www.mtnsfepscor.org>



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