MONTANA UNIVERSITY SYSTEM

Research & Technology Transfer Report

Board of Regents Meeting, January 2010

Under Policy 401 of the Board of Regents, The University of Montana – Missoula and Montana State University – Bozeman are required to meet the following reporting elements:

Federal Initiatives Report. Targeted federal initiative funds (commonly referred to as "earmarks") are funds included in federal appropriations requested by members of Congress to fund specific projects or programs. To keep the regents informed of these funding requests, UM-Missoula and MSU-Bozeman, as representatives of the affiliated campuses, shall coordinate requests for federal initiatives for their affiliated campuses and shall each submit to the Commissioner of Higher Education a report of the requests for any non-competitive federal funds which the units anticipate submitting to Montana's congressional delegation for inclusion in the federal budget. The report will be submitted before the January board meeting unless otherwise scheduled by the board.

Reports. Annually, at the September regents' meeting, UM-Missoula and MSU-Bozeman, as representatives of the affiliated campuses, shall submit to the Commissioner of Higher Education a report summarizing the research and technology transfer activities for the previous fiscal year. The report shall contain, at a minimum, the following data for the previous fiscal year:

1. All expenditures from grants and contracts managed by the respective research administrative offices;

2. Number of new invention disclosures filed;

3. Number of new start-up companies which have licensed or commercialized university-developed intellectual property;

4. Number of new intellectual property licenses issued;

5. Total intellectual property licenses in effect at the close of the fiscal year;

6. Total gross revenues from intellectual property licenses; and

7. Assessment of progress toward meeting the goals pertaining to technology transfer outlined in the campus strategic plans.

The University of Montana – Federal Initiative Requests for FY 2011

COMMITTEE	CAMPUS	REQUESTED
AGRICULTURE		
New Request		
• Mobile Energy Unit for Diseased Timber Harvesting	Missoula	$2,400,000
COMMERCE, JUSTICE, SCIENCE		
Continuing Request		
• The Montana Safe Schools Center: Trauma-Informed Communities	Missoula	$ 850,000
New Request		
• State of the Art Physics Laboratories for The University of Montana	Missoula	$2,000,000
DEFENSE		
Continuing Request		
• Defense Critical Languages and Cultures Program	Missoula	$2,500,000
New Request		
• Approaches to Preventing and Treating Epilepsy in Military Personnel	Missoula	$2,000,000
• Montana Institute for Simulation Technologies (MIST)	Butte	$2,000,000
• Development and Testing of Thermal Interface and Thermal Management Materials/Systems for Missile and Aviation Electronic Systems	Butte	$2,400,000
• Development and Testing of Lightweight Materials for Missile and Aircraft Systems	Butte	$1,450,000
ENERGY AND WATER		
New Request		
• Phase I Biomass to Synthetic Natural Gas (SNG) Commercialization Project for the Montana University System and State Government Facilities	Missoula	$5,000,000
• Research Facility – Institute for Energy and the Environment	Butte	$2,000,000
FOREIGN OPERATIONS		
New Request		
• Vietnamese Affairs Program	Missoula	$2,500,000
LABOR, HEALTH & HUMAN SERVICES, EDUCATION		
Continuing Request		
• Health Care Informatics Certification for Rural Healthcare Professionals	Butte	$1,250,000
New Request		
• Living Well with a Disability: Extending Health Promotion to Veterans with Disabilities	Missoula	$1,500,000
• The University of Montana Native American and Rural Health Initiative	Missoula	$1,000,000
• Building the Biomedical Pipeline: A Partnership for research and Education in the Montana Public Schools	Butte	$ 500,000

The University of Montana – Federal Initiatives report for FY 2010

COMMITTEE	CAMPUS	REQUESTED	FUNDED
AGRICULTURE			
New Request			
• Mobile Energy Unit for Diseased Timber Harvesting	Missoula	$2,400,000	
COMMERCE, JUSTICE, SCIENCE			
New Request			
• Montana Safe Schools Center: Threat Assessment, Trauma Response, and Suicide Prevention	Missoula	$ 850,000	$ 250,000
DEFENSE			
Continuing Request			
• Defense Critical Languages and Cultures Program	Missoula	$2,500,000	$2,500,000
• Low Acoustic and Thermal Signature Battlefield Power Source	Butte	$4,000,000	$4,000,000
New Request			
• Improving Mission Preparedness and Operational Fitness for Battlefield Airmen	Missoula	$2,500,000	
• Neuroprotective Agent to Prevent Loss and Damage	Missoula	$3,500,000	
• Living Well with a Disability: Extending Health Promotion to Veterans with Disabilities	Missoula	$1,500,000	
ENERGY AND WATER			
New Request			
• Sustainable Biogenic Coalbed Methane for Energy and Environment	Missoula	$2,000,000	
• Geoexchange Demonstration System for Montana Tech	Butte	$ 550,000	
FOREIGN OPERATIONS			
New Request			
• Vietnamese Affairs Program	Missoula	$2,500,000	
INTERIOR			
New Request			
• Nanomaterials Testing Center	Missoula	$2,000,000	
LABOR, HEALTH & HUMAN SERVICES, EDUCATION			
New Request			
• Rural Health in America: Pharmacist-Enhanced Medication Therapy Management	Missoula	$ 360,000	
• Biomass Smoke Health Effects Research Program	Missoula	$ 500,000	
• Montana Stagecoach Science Experience (MoSSE)	Missoula	$1,000,000	
• Partnership for Biomedical Research and Education	Butte	$ 500,000	
• Montana Tech Health Information Technology	Butte	$1,250,000	$ 100,000
Not included in original UM request			
• Mansfield Center Institute for Public Leadership	Missoula		$ 200,000

Research and Technology Transfer Report, 2009
THE UNIVERSITY OF MONTANA-MISSOULA

Data Elements for MUS Policy	FY 2006	FY 2007	FY08	FY09
R&D Expenditures (same data reported to NSF)	$60,070,832	$62,119,445	$62,405,729	$67,116,785
Number of new invention disclosures filed	10	5	6	6
Number of new start-up companies which have licensed or commercialized university-developed intellectual property	0	1	1	3
Number of new intellectual property licenses issued	2	1	2	5
Total intellectual property licenses in effect at the close of the fiscal year	22	23	22	21
Total gross revenues from intellectual property licenses	$0	$0	$0	$15,203

Data Elements for Strategic Plan	FY 2006	FY 2007	FY08	FY09
Patents Issued (annual)	22	28	2	5
Active Licenses (Total)	23	24	22	21
Active Licenses (MT Companies)	14	15	16	12
Percent Licenses w/ MT Companies	64%	63%	73%	57%
License/Patent Revenues	$0	$0	$0	$19,203
Reimbursed Patent Costs from Licenses	$0	$0	$0	$4,000

MONTANA TECH OF THE UNIVERSITY OF MONTANA

Data Elements for MUS Policy	FY2006	FY2007	FY2008	FY2009
R&D Expenditures (same data reported to NSF)	$7,842,753	$7,141,492	$7,882,940	$8,408,515
Number of new invention disclosures filed	2	1	6	6
Number of new start-up companies which have licensed or commercialized university-developed intellectual property	0	0	0	0
Number of new intellectual property licenses issued	0	0	0	0
Total intellectual property licenses in effect at the close of the fiscal year	1	1	1	1
Total gross revenues from intellectual property licenses	$0	$0	$0	$0

Data Elements for Strategic Plan	FY2006	FY2007	FY2008	FY2009
Patents Issued (annual)	0	0	1	1
Active Licenses (Total)	1	1	1	1
Active Licenses (MT Companies)	1	1	1	1
Percent Licenses w/ MT Companies	100%	100%	100%	100%
License/Patent Revenues	$0	$0	$0	$0
Reimbursed Patent Costs from Licenses	$0	$0	$0	$0

Total Number of Awarded Patents (Dates: 7/1/08, 1/1/08, and circa 1990) 3
Total Number of Full Patents Filed 5

AGRICULTURE

Project Title: Mobile Energy Unit for Diseased Timber Harvesting

Executive Summary: UM requests $2.4 million to support proof of concept, site analyses, converting fuel systems on equipment, procuring feedstock processing equipment (chippers, pelletizers, trommels, etc.), refurbishing the biomass unit (update systems, increasing output capacity, augment complement of engineers and operators, adding transformers and measurement ports), enhancing analytical capabilities (effluent composition and energy analyzers, calorimeters, gas chromatographs), building additional biomass units, installing hydrogen separation equipment, and adding gas collection and storage facilities.

Project Description: Forests all across the Rocky Mountain West are being decimated by the onslaughts of bark beetle infestation. In Montana alone, a 2008 survey by the U.S. Forest Service determined that 2.5 million acres of forests are under attack from beetles. Once a tree is attacked, there is little that can be done to prevent the eventual demise of the tree. It happens slowly, but inexorably over the course of 2 to 3 years. Trees grow pale, turn red, and then become a ghostly grey. Once the infected stand is dead, it presents a new risk in the form of dense fuel concentrations that substantially increase the probability of wildfires that burn with greater intensity. Besides threatening communities, wildfires pump enormous amounts of greenhouse gases and pollutants into the atmosphere and increase health risks as the smoke plumes cast across broad swaths of the region. Incredible quantities of useful biomass are also squandered in the process.

With grant funding from the USDA and DOE's Biomass Research and Development Initiative, The University of Montana developed and built a portable biomass electrical generator for a demonstration and outreach project that is in its final year of performance. The generator is capable of using wood or agricultural wastes as its feedstocks and generates 25 kilowatts of electrical power and 250,000 British thermal units (Btu) per hour of thermal heat that can be used to dry the feedstock or to provide space heating. The process uses clean and efficient downdraft gasification to render lignocellulosic material into a combustible gas which then acts a fuel for an internal combustion engine and generator. Because the process uses combined heat and power technologies, the overall efficiency is better than 70%.

This research initiative proposes to add another dimension to forest management practices as the Forest Service and other organizations develop strategies to cope with beetle damage. Forest treatments will be necessary to promote parasite and disease-resistant tree stands. Additionally, the same treatments will also help control fire and human health threats while also producing residue waste material in the form of forest slash. Mobile biomass generators could be deployed to treatment sites to salvage waste residues and convert them into an energy source that could then displace fossil fuels in treatment equipment and thereby defray costs. Alternatively, a mobile biomass unit could be positioned at a point on the utility power grid that is proximate to a treatment operation. In this way, a biomass unit adds value by generating power directly onto the grid and by minimizing the transportation costs of hauling the waste material. Such a system could help power remote command & control operation centers and emergency disaster relief facilities with locally available biomass. With the appropriate feedstock processing, other biomass residues such as straw, corn stover, invasive plant species and even trash could all be used to generate electricity and heat.

Congressional Action Needed: An appropriation of $2.4 million is requested.

Importance to Montana: This proposal will add value to a biomass energy resource that is currently not utilized and is adding increased risk to the public. It can help supply the energy requirements for treatment on public lands and defray the costs to taxpayers and stakeholders. As a carbon-neutral process, energy production will not add new carbon dioxide to the environment. In Montana and the greater Pacific Northwest, forest industry jobs and infrastructure may be preserved by embracing such renewable technologies.

Contacts at UM: Daniel Dwyer, VP for Research, 406-243-6670 daniel.dwyer@umontana.edu; R. Paul Williamson, Hydrogen and Alternative Energy R & D, 406-243-2932 paul.williamson@umontana.edu

COMMERCE, JUSTICE, SCIENCE

Project Title: The Montana Safe Schools Center: Trauma-Informed Communities

Executive Summary: UM requests $850,000 to remote economic development by providing critically needed, cost-effective and otherwise unavailable professional development for schools and youth service agencies. These services speak directly to concerns voiced by senators Max Baucus and Jon Tester, and we have the support of both, as well as the backing of Rep. Dennis Rehberg. Our work aligns with Sen. Baucus's longstanding support for health care reform and Sen. Tester's position on the Indian Affairs Subcommittee and Appropriations Committee. Our initiative aligns with President Obama's and Attorney General Eric Holder's FY2010 emphasis on reducing recidivism and eliminating violence against women and children. We support President George Dennison's first priority charge ("State of the University" 8/28/09) to directly partner with P/K-12 schools.

Project Description: Childhood trauma is the driving engine of intergenerational poverty. It is an issue that significantly influences many of the disciplinary and academic issues Montana's children face. Research is clear, if left untreated, childhood trauma leads to criminal behavior, drug/alcohol abuse, violence and troubled lives.

Our services promote economic development by providing critically needed, cost-effective and otherwise unavailable professional development for schools and youth service agencies. These services speak directly to concerns voiced by senators Max Baucus and Jon Tester, and we have the support of both, as well as the backing of Rep. Dennis Rehberg. Our work aligns with Sen. Baucus's longstanding support for health care reform and Sen. Tester's position on the Indian Affairs Subcommittee and Appropriations Committee. Our initiative aligns with President Obama's and Attorney General Eric Holder's FY2010 emphasis on reducing recidivism and eliminating violence against women and children. We support President George Dennison's first priority charge ("State of the University" 8/28/09) to directly partner with P/K-12 schools.

Over the last ten years, our center has longstanding relationships with local, state, federal agencies such as the Montana Office of Public Instruction, the U.S. DOJ COPS Office and the Office of Juvenile Justice and Delinquency Prevention; and the U.S. Substance Abuse and Mental Health Services Administration. Both MSSC and NNCTC have a leadership role in the Congressionally created National Childhood Traumatic Stress Network.

Congressional Action Needed: An appropriation of $850,000 is requested.

Importance to Montana: FY2011 will allow continuation of work on the Fort Peck, Blackfeet, Northern Cheyenne, Rocky Boy, and Flathead Reservations - as well as in non-native schools across Montana. The Montana Safe Schools Center (MSSC), and its partner the National Native Children's Trauma Center, build on fifty years of national and local level research. We deliver our school and community agency trainings across the state, with a particular emphasis on small, rural, and underserved communities (and particularly in Indian Country) to partners who are otherwise unable to secure funding for such initiatives. There is no alternative source of federal or state grant funding for a statewide program to address the related issues of trauma, suicide and school violence, and issue-specific funding is decreasing.

Contacts at UM: Richard van den Pol, Ph.D., Director, Institute for Educational Research and Service, 406-243-6756; richard.vandenpol@umontana.edu

Project Title: State of the Art Physics Laboratories for The University of Montana

Executive Summary: UM requests $2 million to create state-of-the-art physics laboratories at UM. Funds would be used towards Internet infrastructure, embedded computers, investment in new equipment and development of new laboratories exercises.

Project Description: The United States Congress has called for making math and science education a priority. Of the top 30 fastest growing occupations projected by the US Bureau of Labor Statistics over the next decade, one third will require at least a B.S. degree with physics training. Consequently, universities must develop improved methods to educate students who will enter technical careers in the modern multidisciplinary workplace, and who will benefit from exposure to the latest technology in an academic setting. Future scientists and engineers, educated using these new methods, will in turn excite future students in science, technology, engineering, and math (STEM) stimulating a system of education leading to innovation.

We propose to put in place technology infrastructure upgrades to our introductory physics and astronomy laboratories that can additionally serve as research support facilities. Exposure to rigorous laboratory exercises at the college level is essential since students develop professional laboratory techniques based on their own college laboratory experiences. These students include majors in physics, engineering, computer science, STEM education, chemistry, pharmacy, biology, geology, environmental science, and pre-medicine. The impact of this project is three-fold: to increase student understanding of the connection between theory, observation, and experiment through active engagement in all three areas through diverse media; to add to the knowledge base of best practices for integrating various technologies in post-secondary science and engineering education; and to enhance our funding capabilities and deliverables with access to state of the art research support facilities. We will be able to provide the students with engaging, hands-on, active learning experiences by integrating computer simulations with experiments that use laboratory apparatus. As evidenced by our existing advanced physics laboratory facilities, we have the ability to design and maintain state of the art facilities.

Congressional Action Needed: An appropriation of $2 million is requested.

Importance to Montana: Modernization of undergraduate physics laboratories is essential to provide Montana students with a consistent high quality, hands-on, and modern science learning experience. The application of laboratory know-how creates real-world jobs, bringing in much-needed revenue and giving birth to companies, which, as they mature, create even more opportunities with their own spinoffs. That translates locally into research partnerships. For example, Professor Reisenfeld leads the space science group at The University of Montana, which is involved in a number of NASA missions, including the Cassini mission to Saturn, the Genesis mission which returned a sample of the solar wind to Earth for analysis, the Deep Space One mission to Comet 19P/Borelly, and the Interstellar Boundary Explorer (IBEX) which is mapping out the boundary between our solar system and interstellar medium. Additionally, Professor Michael Schneider of the condensed matter physics research group at UM is in a unique position to measure the behavior of materials being used in Magnetic Random Access Memory, a promising new technology with large potential impact across many fields including, aerospace, aeronautics, defense and security.

Contacts at UM: Andrew Ware and Jennifer Fowler, Department of Physics and Astronomy, andrew.ware@umontana jennifer.fowler@umontana.edu

DEFENSE

Project Title: Defense Critical Languages and Cultures Program

Executive Summary: UM requests $2.5 million to 1) expand a new program based on best practices to meet DOD and related needs in Arab, Afghan and Pakistani strategic culture by adding two new faculty members in those areas; 2) add one faculty member to meet the DOD's demand for basic and intermediate Arabic language and another to teach beginning/intermediate Pashto or Dari, including the development of flexible on-line training programs in those languages; 3) purchase and install the necessary computers, language software, and other language teaching hardware related to this expansion; and 4) extend scholarship assistance for Reserve Officer Training Students who enroll in a national pilot program in intensive Arabic or Chinese.

Project Description: In response to recent directives from the Department of Defense and evolving strategic realities, we propose to add new capacity related to the cultures and strategic environment in Afghanistan and Pakistan, to expand our capacity in Arabic, and to begin instruction in Pashto (which is found both in Afghanistan and in western Pakistan) or Dari (a key dialect in Afghanistan that is closely related to the Farsi spoken in Iran). Both are included at the top of the DOD's list of critical languages.

Recent events have accentuated the continuing need for greater capacity in the strategic culture of the Middle East and South Asia as well as in Arabic, Dari and Pashto. Our military and reconstruction efforts in Iraq have clearly been hampered by a shortage of American speakers of Iraqi culture and Arabic. The U.S. is woefully short of soldiers with a pragmatic understanding of Afghan culture and Dari and Pashto speakers at a time Afghanistan is becoming the new battleground against terrorism, and when Pakistan's geographic proximity to Afghanistan and growing instability have dramatically elevated that nation's strategic importance. Pashto's importance is also increased by its linguistic similarity to the Farsi spoken in Iran.

The Center will also continue to respond to a key related need by providing trainees with the "operational culture" necessary to understand and function effectively in the Middle East, Afghanistan, and China. Instruction will include a thorough grounding in aspects of 1) history, society, culture, political economy, and other forces that affect its political orientation and political viability; 2) the regional strategic environment; 3) leadership dynamics and decision making, and 3) its worldview and strategic outlook, particularly as they relates to the United States. Trainees should leave with a hardheaded understanding of Middle Eastern, Afghan, or Chinese culture and behavior.

Congressional Action Needed: An appropriation of $2.5 million is requested.

Importance to Montana: The expansion of this program will raise Montana's profile as an asset to national security. When fully established, the center will employ approximately 10 full-time professionals and bring in 400 salaried military/government personnel per year, all of whom will contribute to the Montana economy as short- or long-term trainees. Wherever possible, program instructors will also continue to contribute to the UM curriculum. Significantly, the Center will also contribute to the DOD goal of "surging" language and cultural proficiency among military officers by expanding a prototype program of intensive language and cultural instruction for *future* officers, namely students enrolled in the Reserve Officer Training Program in Montana and regional colleges and universities. Instruction for the latter program is provided by skilled foreign language instructors who have native or near-native fluency and by related area studies professionals, all of whom have extensive direct experience in the target country, relevant teaching experience, and have a hard-headed, practical understanding of the culture, leaders, and peoples of the targeted regions.

Contacts at UM: Terry Weidner, Director, Maureen and Mike Mansfield Center, 406-243-2281, terry.weidner@umontana.edu

Project Title: Approaches to Preventing and Treating Epilepsy in Military Personnel

Executive Summary: UM requests $2 million to develop a gene therapy-based treatment that will modulate the expression of selected genes within specific areas of the brain and prevent seizures, often resulting from brain injury, with little to no side effects. The objectives of this project are to:

- Characterize the therapeutic effect of acute methamphetamine administration to prevent epileptogenesis following exposure to a blast wave;
- Establish the most effective therapeutic dose;
- Establish the therapeutic window of opportunity;
- Characterize the therapeutic potential of gene therapy based treatment to stop seizure chronic activity;
- Examine cell type specific modulation of three different target genes (EAAT3, ADK and EAAT2;
- Characterize the potential impact of gene therapy treatments on learning and memory, and sleep patterns.

Project Description: Epilepsy affects over 3 million Americans, with an estimated annual cost of $15.5 billion. Approximately 200,000 new cases occur each year. Traumatic brain injury represents a significant cause of epilepsy. Approximately 20-25% of patients who suffer a severe brain injury go on to develop post-traumatic epilepsy. Sadly, the potential risk of developing epilepsy is 20 times greater in military personnel due in part to exposure to blast force energy waves. This incidence may be even greater when silent or non-convulsive seizures, are considered. Our goal is the development of a bimodal approach that focuses first on the development of an acute therapy that can prevent or limit the initiation of seizures after exposure to a blast force energy wave and second, on the treatment of patients where chronic seizures have already been established. This becomes particularly relevant when one considers that more than one third of patients who suffer from epilepsy are refractory to current anti-epileptic drugs. Those patients who are sensitive to anti-epileptic drugs must often deal with the severe side effects of these drugs.

Congressional Action Needed: An appropriation of $2 million is requested.

Importance to Montana: The Montana Neuroscience Institute (MNI) is a Private, Non-profit biomedical research institute located in Missoula. Since 2001, our primary mission has been the development of basic scientific discoveries into therapeutic applications for patients in a clinical setting. One area of emphasis within the institute has been the development of therapies to prevent the initiation of seizures following brain injury and thus prevent the establishment of epilepsy in the first place. Our goal in this case is the development of therapeutics that are safe, have a large window of efficacy, and can be easily administered by first responder personnel such as paramedics and battle field medics. Toward this goal, we have determined that within FDA approved doses, methamphetamine is highly neuroprotective and may limit the development of epilepsy following exposure to a blast force energy wave. We also have preliminary data demonstrating that viral-mediated gene delivery to the brain can be used to modulate seizure activity in animals suffering from established chronic seizures (see images below). Further studies in this area are needed to fully characterize and develop this approach to the treatment of epilepsy.

Contacts at UM: David J Poulsen, Dept of Biomedical and Pharmaceutical Sciences, 406-243-4709
david.poulsen@umontana.edu

Project Title: Montana Institute for Simulation Technologies (MIST)

Executive Summary: Montana Tech requests $2 million to support the development of the Montana Institute for Simulation Technologies (MIST) to become a High Performance Computing Modernization Program Allocated Distributed Center (HPCMP ADC). This Department of Defense Program works to build computing capabilities in the U.S. to support DoD data-intensive missions such as persistent surveillance, missile defense, hypersonics and propulsion, materials design, medical, and genomic and bioinformatics data analysis. The HPCMP office has annual requirements for approximately 180 million cpu hours for Computational Fluid Dynamics (CFD) problems alone. They are able to satisfy approximately 30 million cpu hours of this requirement. This funding will be key in the creation of advanced computing, modeling, simulation, and visualization research capability for Montana and will enable our leading research institutions to participate more fully in DoD missions resulting in increased research funding and private economic development for Montana.

Project Description: Governor Schweitzer initiated an effort through the Montana legislature to establish an integrated high performance computing capability to support research and technology innovation in the State. This effort resulted in the formation of a private non-profit organization: Rocky Mountain Supercomputing Center (RMSC). Montana Tech's Montana Institute for Simulation Technologies (MIST) is a Center of Excellence for modeling, simulation, and visualization research that provides research and development assistance to RMSC and its clients.

MIST and the RMSC's partnership in computing, modeling, simulation, visualization research, and advanced networking capability opens new opportunities for federal research in Montana. The development of MIST's capabilities in modeling, simulation, and visualization research will enable our leading research institutions to participate in federally-funded modeling, simulation, and visualization research projects resulting in increased research funding for Montana.

MIST is partnered with RMSC to develop integrated, high-performance computing for advanced computation (especially those involving tera- or peta-scale data), modeling, simulation, and visualization research. This partnership will serve the needs of national and state industries, especially in the areas of energy exploration, geographic information systems, aerospace, material sciences, biotechnology and medicine. Currently, MIST is running several multi-processor, high-performance computers (e.g. a 28 processor, 64-bit Linux cluster with a sustained computational throughput of over 57 Giga-Flops) and is working with RMSC to develop comprehensive high-performance super-computing as part of an integrated cyberinfrastructure within the state.

MIST's modeling, simulation, and visualization research capabilities would be focused on several specific mission requirements for the HPCMP including:

- Life-cycle infrastructure engineering (e.g. water, transportation, waste, energy and communications).
- Engineering materials, design and prototyping of nano-scale materials for application in aerospace and biomedical imaging.
- Medical, genomic and bioinformatics data analysis in support of areas such as infectious diseases, new diagnostic and surgical solutions and protein/pharmacophore interactions.

Congressional Action Needed: An appropriation of $2 million is requested.

Importance to Montana: Montana and Montana Tech are in a unique position to catalyze development of modeling, simulation, visualization research, and high-performance supercomputing capabilities. Fostering the development of MIST will drive creation of research opportunities and funding for Montana Tech and the state of Montana.

Contacts at Montana Tech: Dr. Hal Millegan, General Engineering Department, 406-496-4856; Dr. J. David Hobbs, Chemistry Department, 406-496-4194

Project Title: Development and Testing of Thermal Interface and Thermal Management Materials/Systems for Missile and Aviation Electronic Systems

Executive Summary: Montana Tech's Center for Advanced Minerals and Metallurgical Processing (CAMP) requests $7.2 million ($2.4 million FY2011) to support applied research, testing, education and commercialization in the area of Thermal Interface Materials (TIM) and Thermal Management Materials. Utilizing CAMP's extensive knowledge of metallurgy, these efforts will create solution for removing heat from constrained electronics packages such as found in composite missiles and aviation electronics. In addition, the funding will assist with the expansion of our state-of-the-art materials testing laboratory and capabilities. The application of these new technologies will create local jobs and bring increased economic development to Montana.

Project Description: Heat is becoming a bigger issue in electronic systems every day. As microprocessors and digital components get smaller and more powerful, more heat is generated in a small area. When coupled with the increased use of composite materials in missile body(s)/components and avionics systems to reduce system weight and address other environmental concerns, traditional thermal management processes are no longer applicable. These increased thermal loads can reduce electronic subcomponent/component service life, increase required maintenance actions, negatively impact system performance, and increase system life-cycle cost. There is an immediate need for significantly improved thermal interface materials (the thermally conductive materials that join the electronics to their heat dissipation device) and thermal management materials (i.e. heat sinks, heat spreaders, thermal transfer conduits, etc.).

At the Center for Advanced Mineral and Metallurgical Processing (CAMP), located on the campus of Montana Tech, is adeptly suited to conduct applied research in the area. The best heat transfer mechanisms involve the joining of metallurgical materials at the nano, micro, and bulk scale. CAMP's work in metal free form printing can be adapted to utilize materials such as metal coated micro conductors to create advanced heat spreaders. Leveraging this work will allow us to adjust the material properties to optimize conductive and convective heat transfer properties. Combining polymers with nano and micro metal particles will open the door for improved thermal interface materials. Thermally conductive polymers are at the forefront of Thermal Interface Materials research. Combining this technology with more traditional metallurgy will allow us to exploit multi-material properties and significantly increase the performance of state-of-the-art thermal interface materials.

In addition to the applied research to develop unique thermal management solutions, this project will assist Montana Tech/CAMP in improving the thermal profiling capability within the materials test lab. Our testing lab is relatively unique across university systems. We give both graduate and undergraduate students that opportunity to utilize our state-of-the-art equipment. Students are directly hired to conduct experiments and assist in the research process. These students graduate fully trained with hands-on expertise. Our ultimate goal is to develop several components integral to thermal management in composite missile systems and aircraft avionics. These will be commercialized in Montana by a technology spin-out from the university and/or with an industry partner.

Congressional Action Needed: An appropriation of $2.4 million in FY2011 is requested.

Importance to Montana: Montana and Montana Tech/CAMP are in a unique position to rapidly commercialize developments in the area of Thermal Management. Our strong industrial relationships and ties to the Department of Defense will facilitate the rapid creation of good paying high-tech jobs in Montana. The expansion of our materials lab will allow for growth in our private sector materials research and testing. Thermal Management is a key issue with modern electronic systems and we see a bright and sustained benefit for Montana in the commercial sector.

Contacts at Montana Tech: Jay McCloskey, CAMP Acting Director & Sr. Process Engineer, 406-496-4875; Robert Hyatt, Program Manager & Process Engineer, 406-498-4454

Project Title: Development and Testing of Lightweight Materials for Missile and Aircraft Systems

Executive Summary: Montana Tech of the University of Montana's Center for Advanced Minerals and Metallurgical Processing (CAMP) requests $4.35 million ($1.45 million in FY2011) to support applied research, testing, education and commercialization in the area of Advanced Lightweight Materials. CAMP possesses an extensive knowledge of metallurgy, metals processing and lightweight composites ideal for developing next generation lightweight materials. The efforts of this project will create lightweight materials and structures for improving the performance and capability of missile and aircraft systems. In addition, the funding will assist with the expansion of our state-of-the-art materials testing laboratory and capabilities. The application of these new technologies will create local jobs and bring increased economic development to Montana.

Project Description: Montana Tech/CAMP is strategically positioned to grow Montana's presence in Next Generation Lightweight Materials manufacturing. CAMP has been approached to provide applied research, development and testing of these advanced materials by three industrial partners to date and is continuing to identify additional companies. Radiance Technologies, produces composite structures in Browning, SeaCast produces titanium and super-alloy castings in Butte and Federal Technology Group is continuing to develop lightweight lattice block structures and thermal management materials and has positioned a division in Butte. All three of these companies have approached CAMP to leverage our expertise in developing and testing new materials, products, and material systems.

Our expertise and testing capabilities will need to be enhanced to meet the forthcoming demands of these Montana based manufactures. Currently the University of Utah is the "recognized university leader" with materials testing specifically in the composites arena. Montana Tech/CAMP's broad materials knowledge (metals and composites) combined with our burgeoning analysis capability position us to be the regional leader for this broad spectrum of materials development and testing.

Our contacts within the U.S. Army Research Lab (ARL), Space and Missile Defense Command (SMDC), and the Aviation Materials Research, Development and Engineering Command (AMRDEC) have identified a critical need for advanced lightweight materials that meet the demanding needs of the armed forces. They have needs to reduced the weight carried by the warfighter, increase aircraft durability while reducing weight/payload, and to create new materials that will foster future technological improvements.

It is critical for the state of Montana to enhance CAMP's materials development and testing capabilities to ensure these and other companies get the support they need to continue position their manufacturing operations within the state (as well as attract new manufacturing operations). This funding will allow CAMP to capture the best and brightest individuals in this field and enhance our laboratory capability to not just be a Center of Excellence within the state but expand it to a regional Center of Excellence. This seed funding will allow us to effectively grow our capability to be a self-sustaining entity within the field of lightweight materials development and testing.

Congressional Action Needed: An appropriation of $1.45 million in FY2011 is requested.

Importance to Montana: Montana and Montana Tech/CAMP are in a unique position to rapidly commercialize developments in the area of advanced lightweight materials. Our strong industrial relationships and ties to the Department of Defense will facilitate the rapid creation of good paying high-tech jobs in Montana. The expansion of our materials lab will allow for growth in our private sector materials research and testing. Implementing new lightweight materials is strategic to improving the performance of missiles and aircraft. Having a presence with this technology and working with our industrial partners to establish a commercial presence will create a sustained benefit for the State of Montana.

Contacts at Montana Tech: Jay McCloskey, CAMP Acting Director & Sr. Process Engineer, 406-496-4875; Robert Hyatt, Program Manager & Process Engineer 406-498-4454

ENERGY AND WATER

Project Title: Phase I Biomass to Synthetic Natural Gas (SNG) Commercialization Project for the Montana University System and State Government Facilities

Executive Summary: UM requests $5 million for Phase I to secure funding and establish a public/private partnership between The University of Montana and GreatPoint Energy. This partnership will research the feasibility and economics of a biomass to SNG pilot/demonstration scale plant to be located in Montana. The ultimate goal is to accelerate the commercialization of emerging new technologies to utilize biomass in the production of pipeline grade SNG. Pipeline grade SNG has multiple advantages for both the producer and the customers due to it being wheeled through existing transmission and distribution infrastructure to customers, regardless of size, and utilize the SNG in their existing mechanical systems. The customers targeted in this initial case are the Montana University System and the State of Montana Government facilities.

Project Description: The commercialization effort will have two phases. The first phase consists of an engineering feasibility study which reviews applicability and feasibility of GreatPoint Energy's targeted technology through bench scale research utilizing biomass as the feed stock. GreatPoint Energy's technology has definite economic advantages using coal; however, this study will evaluate this technology using biomass to evaluate if the economics are maintained. Additionally, a significant area for evaluation to determine economics is the assessment of the biomass supply, harvest prescription and logistics and the evaluation of bi-products as inputs into other products sufficiently to develop schematic level design and preliminary operational and capital costs of a demonstration scale biomass to SNG plant in Montana. The second phase would proceed if the economic and technological assessment of Phase I is positive and would consist of the construction and operation of the demonstration scale plant and its associated logistic systems and modifying the plant and processes with lessons learned in the project to a state where the viability of a commercial application has been described sufficiently for commercial lenders and companies to confidently assess the cost effectiveness of biomass to SNG technology.

National need to be addressed:

- Sustainable and environmentally friendly energy development emphasizing biomass sources
- Goal of carbon neutral to negative, energy production
- Fossil fuels sources are becoming expensive due to world competition and global warming issues
- The University of Montana has made commitments through the President's Climate Commitment and the Talloires Declaration to accelerate and formalize efforts towards carbon neutrality
- Bench scale and feed stock logistic projects are needed to develop engineering and process experience and proforma metrics to allow commercial financing to be used in the implementation of full scale biomass to SNG industrial plant and logistic systems

Congressional Action Needed: An appropriation of $5 million is requested.

Importance to Montana: The Nation, the US West, and in particular Montana have significant biomass sources which are underutilized such as small diameter timber and slash and contribute to wild land fires. Montana has a need to maintain forest health and sustain a viable and vibrant forest products industry with the associated jobs. Additionally, energy crops and municipal waste could be utilized.

Contacts at UM: Hugh Jesse, Director of Facilities Services, 406-243-2787, jesseha@mso.umt.edu; Daniel Dwyer, VP for Research & Development, 406-243-6670, daniel.dwyer@umontana.edu

Project Title: Institute for Energy and the Environment - Research Facility

Executive Summary: Montana Tech of The University of Montana MSU requests $9 million, over a two year period, for the construction of a new research facility. Montana Tech research continues to expand into directions reflective of its traditional focus on energy, natural resources and the environment. The increased awareness of the issues of sustainability, in the context of production efficiency and resource management, has caused a major increase in research funding, both industrial and federally based. This growth has placed a severe strain on the ability of our research facilities to provide the proper environment to the faculty and students engaged in these projects. The proposed new research facility will relieve this constraint and allow an aggressive participation by Montana Tech in the research related to these important National agendas including:

- Increasing scarcity of rare earth metals
- Renewable alternatives to fossil based fuels
- Sustainable focus on both the production and consumption side of the economy
- Applications of nanotechnology to catalytic systems
- Low energy resource processing technology
- Green coal research-the complete elimination of combustion contaminants

Project Description: Montana Tech has received a major gift of land which has doubled the size of the campus. The new facility would be located on this new property, to the west of the current campus. The building would be 30,000 gross square feet, and would include research space for several Montana Tech departments, including Electrical Engineering and Environmental Engineering.

In addition, we envision a flexible research configuration, which will allow industrial and federal laboratory collaborators of Montana Tech temporary access to research space, to conduct joint research and technology development efforts. We believe this approach to an integrated research facility is an extremely effective model for technology transfer, and will be implemented in this new facility. Potential partnerships with EDA funding may exist, and will be explored to enhance the scope of the project beyond its current configuration.

The final component of this new facility will be a visualization portal to the Montana supercomputer. The State of Montana has legislatively established the Rocky Mountain Supercomputing Centers (RMSC), as a statewide center of high performance computing, in partnership with IBM. Montana Tech has been designated an RMSC Center of Excellence, focusing on modeling and simulation. We would plan to locate our RMSC visualization portal in this new facility.

Congressional Action Needed: An appropriation of $2 million is requested in FY2011 and $7 million in FY2012.

Importance to Montana: Montana is a resource rich state, with both renewable and non-renewables in abundant supply. The proposed research center will help develop these resources in a manner consistent with best engineering principles, and in a manner consistent with sustainability and efficiency. These two themes will help Montana attract and retain the next generation of business, those which will shape the energy and technology futures of the nation. We also expect the facility, and the increased opportunities for state of the art research it will bring, to further enhance Montana Tech's ability to produce one of the best engineering workforces on the planet, our students.

Contact at Montana Tech: Dr. W. Franklin Gilmore, Chancellor, 406-496-4129 fgilmore@mtech.edu

FOREIGN OPERATIONS

Project Title: Vietnamese Affairs Program

Executive Summary: UM requests $2.5 million to create a comprehensive Vietnamese Affairs Program. The Program, which will begin operations in late 2010, would help UM create a new curriculum devoted to the Vietnam war and contemporary Vietnamese affairs; become a national leader in student and faculty exchanges with Vietnam; provide degree and non-degree training to Vietnamese faculty, and organize programming on Vietnam and U.S.-Vietnamese relations ranging from trade and health care to contemporary strategic issues, the environment, human rights and legal reform.

Project Description: The potential to influence Vietnam has gained momentum with a recent warming of bilateral relations. A Joint Statement that was signed in November 2006 indicated the U.S.-Vietnam relationship "encompasses significant and growing trade and economic ties, an emerging military-to-military relationship, successful cooperation on health and development issues, growing cultural and educational links, a commitment to resolving remaining issues stemming from the war, a shared interest in ensuring peace, stability, and prosperity in the Asia-Pacific region, and frank and candid discussion of differences." (White House, Office of the Press Secretary, November 17, 2006). And the last year has in fact witnessed high-level dialogue in virtually all those areas. Reflecting the progress made in bilateral ties, The United States has become Vietnam's largest export market; two-way trade surpassed $14 billion in 2008 and has been growing by double-digits every year since the United States extended normal trade relations (NTR) treatment to Vietnam in 2001. Vietnam is also one of the largest recipients of U.S. assistance in East Asia, with aid surpassing $100 million in FY2008.

Despite progress, however, the relationship remains in its nascent stages, including in the realm of educational training and exchange. Funding for the project we propose would thus put UM and the state of Montana in a position of leadership as we re-engage an increasingly prosperous, dynamic and young society. It also presents an opportunity to stem the trend of waning U.S. influence in Southeast Asia—which has clearly worsened as we have become bogged down in Iraq and Afghanistan-- while constructively off-setting China's growing sway in Southeast Asia.

Finally, this program would involve UM and Montana in a meaningful effort to mitigate some still- troubling issues in Vietnamese society and politics. At a time when Vietnam seems to have demonstrated a weakening resolve to improve human rights, for example, initiating a vibrant student exchange that would send Vietnamese students to Montana would expose those young people to the best values of "real America." Likewise, a substantial in-state training program for Vietnamese university and high school teachers will not only improve their academic preparation but expose them to a system of open investigation and discourse vital to the creation of a modern and progressive educational system in Vietnam. Finally, support for this program would help expand pilot work being done by the Mansfield Center's Asian Legal Reform Initiative to train defense attorneys and expand the scope of rule of law in Vietnam, a vital need in that country.

Congressional Action Needed: An appropriation of $2.5 million is requested.

Importance to Montana: The benefits of this program for UM and the state are equally clear. Funding from this program would not only strengthen UM's Asia program and the Mansfield Center but offer expanded opportunities for students and faculty to study and work in Vietnam, thus contributing in a direct way to their development and the globalization of the university. In addition, the presence of far greater numbers of Vietnamese teachers and students would also add a welcome economic infusion to the community and state, while contributing in cultural terms as well. Significantly, Vietnamese students already rank 9th among international student populations in the U.S., despite the fact nearly all are currently self-supported. Finally, new linkages and business-related programs created by the program we propose would position Montana companies to benefit.

Contacts at UM: Terry Weidner, Director, Maureen and Mike Mansfield Center, 406-243-2281
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LABOR, HEALTH & HUMAN SERVICES, EDUCATION

Project Title: Health Care Informatics Certification for Rural Healthcare Professionals

Executive Summary: Montana Tech of the University of Montana is requesting $1.25 million to support research and education in the area of Health Care Informatics (HCI). This project emphasizes:
(1) Scholarships to attract students and working health care professionals to this field of study;
(2) Expansion of the already substantial online instruction capabilities of the Montana Tech Health Care Informatics program, including establishing 2+2 programs in partnership with the Health Information Technology program at MSU-GF and Montana Tech's own 2-year Medical Assistant Program, as well as moving toward the creation of similar programs in coordination with other 2-year colleges within the Montana University System; (3) Creation of a Health Care Informatics Certificate program that will provide health professionals with access to an educational resource capable of giving them immediate training in the selection, implementation, effective use, and maintenance of health care information systems.

Project Description: Implementing the Electronic Medical Record in all clinician's offices and hospitals represents a massive undertaking and will require an unprecedented number of health care informaticists to ensure that these technologies are used effectively. Meeting near-term demand for HCI professionals will require over 40,000 new workers to enter the field, which translates to an increase of almost 40%. Health care information systems represent an area where Montana Tech is positioned to lead, as it established the Nation's first undergraduate Health Care Informatics (HCI) degree program in 2001, graduating its first class in 2005. This places us in a unique position as Montana Tech has established programs at both the Bachelors and A.A.S. degree levels, at a time when other states have only just initiated similar degree programs. Moreover, Montana's program has been used as both a national and international model for undergraduate Health Care Informatics education. Most recently, Northern Alberta Institute of Technology looked to Montana Tech for courses to be delivered to their students by distance as they work to establish their own degree program in this field.

Without adequate support, rural health care providers will continue to struggle disproportionately with Electronic Medical Record adoption, largely due to lack of dedicated support staff and knowledge workers. Fortunately, Montana Tech has created a program focused on the unique needs of the rural health care provider. The rural health systems has been underserved by current educational efforts, as traditional Informatics programs were centered in teaching hospitals and focused on medical schools graduate education and these types of programs cannot possibly meet the health care informatics training needs of rural health care providers and medical facilities.

Congressional Action Needed: An appropriation of $1.25 million is requested.

Importance to Montana: The rapid adoption of Electronic Medical Record technology requires the equally rapid development of a skilled workforce. Montana Tech's Department of Health Care Informatics is already part of this workforce education solution. With additional funding, Montana Tech's Health Care Informatics Department can increase the program's overall success through scholarships, certification, on-line training, and partnership with the 2-year academic programs of the Montana University System (MUS). Not only will this program be of specific benefit to the delivery of health care in Montana, it will also be a concrete expression of many of the strategies supporting the re-invention of the MUS, as it will demonstrate; (1) a reliance on distance learning, using online instructional technologies to augment the skills of non-traditional students who may be place-bound because they are already working within the medical system, as well as (2) showcasing cooperation between the campuses of the MUS through the development of 2+2 programs, thereby realistically modeling a coordinated system of community colleges, regional universities and flagship institutions for the purpose of maximizing the instructional capacity and availability of a specific group of related academic programs.

Contacts at Montana Tech: Gary W. Mannix, Dept. of Health Care Informatics, 406-496-4345; James E. Aspevig, Dept. of Health Care Informatics 406-686-6280

Project Title: Living Well with a Disability: Extending Health Promotion to Veterans with Disabilities

Executive Summary: UM requests $1.5 million to extend the cost effective *Living Well with a Disability* program. Developed at The University of Montana, the Living Well with a Disability program has been widely recognized as an effective community-based health promotion program for reducing secondary conditions experienced by adults with disabilities. Use of *Living Well with a Disability for Veterans* could significantly assist veterans with disabilities in regaining independence and function. Moreover, its application may also reduce inappropriate and unnecessary medical service utilization and, thereby, save resources.

Project Description: While the initial medical care and rehabilitation is often the best that can be provided in the world, the pathways to services and support after hospital discharge are less well organized for military veterans. Many veterans experience significant disability from injuries and chronic conditions. This leaves many veterans at risk for an array of secondary conditions to their disability. Many of these conditions could be managed and prevented effectively through community-based health promotion. *Living Well with a Disability for Veterans* is a proven, community-based health promotion program that is delivered to veterans with disabilities through partnerships between veteran's programs and local community-based programs (i.e., centers for independent living).

To date, 642 Living Well facilitators from 176 organizations in 34 states have been trained. The combined efforts of these facilitators have served 5,072 individuals with significant impairments. Participants' annual symptom-free days are estimated at having increased by 60,356 days, and that the total cost savings range from $4.7 to $8.1 million. Discounting the cost of the program itself, the estimate net benefit to healthcare payers is between $1.7 and $5.1 million.

Depending on the economic perspective taken, extending the *Living Well with a Disability* to Veterans translates into medical service cost savings that range from $340 to $1,002 per participant over 12 months. Consequently, a modest national effort to implement Living Well with a Disability for Veterans could save the Veterans Administration and private insurers a significant amount of resources annually. In addition, the program could help VA patients with mobility impairments live healthier, more productive lives.

In addition to strong legislative support, national organizations with extensive memberships support Living Well and Working Well with a Disability, such as:

- American Association on Health and Disability (Roberta Carlin, Executive Director) – representing over 4,000 professionals across the nation; and,
- Association of Programs for Rural Independent Living (Billy Altom, Director) – representing 250 organizations in 43 states.

Congressional Action Needed: An appropriation of $1.5 million is requested.

Importance to Montana: There are approximately 2.8 million Veterans receiving Veteran Administration disability compensation, of which 257,100 are rated 100% disabled. Approximately 40% of current military recruits come from rural areas, nearly twice the proportion of the total population living in rural areas.

Contacts at UM: Tom Seekins, Director, Rehabilitation Research and Training Center, 406-243-2654
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Project Title: The University of Montana Native American and Rural Health Initiative

Executive Summary: UM requests $3 million over three years for The University of Montana Native American and Rural Health Initiative (NARHI) to work with Montana Northern Plains Indian and rural populations across the state to build capacity to address health disparities and disability due to chronic conditions and disease.

Project Description: The Initiative will use a grassroots, community-based participatory approach to assess gaps in critical resources, knowledge and services focused on prevention, early detection and early intervention of diseases particularly relevant to Native American and rural populations such as type-2 diabetes, obesity, cancer, disabilities, mental health, trauma and injury. This approach can address health disparities by creating a balance between the scientific rigors of an academic institution with respect for indigenous wisdom about the local situation. The overall goal of the Initiative is to promote sustained, improved health among Montana Northern Plains Indian and rural communities by working with Montana tribal college instructors and their students, tribal health entities and rural health programs. These individuals will participate in behavioral and community health education and technical assistance instruction to enhance skills and knowledge for working with underserved and Native American populations. The cross cutting content of this instruction includes nutrition, physical activity, traditional healing practices, psychology, preventive medicine screenings and early disease detection, community partnership building and basic science research.

For Montana's rural and Tribal healthcare providers there are no single information resources practitioners and consumers can use to make service universally accessible. For example, how can a mental health professional help someone with traditional Native American values manage depression? Or, how does a fitness professional help someone with an amputation or traumatic brain injury develop and exercise program? The information resources developed through the Initiative's community-based participatory processes can meet the needs of individuals working to improve the health of all people living in rural areas. Moreover, the health promotion resources will reduce inappropriate and unnecessary medical service utilization; saving resources and meeting the spirit of healthcare reform for all Americans. Long term plans are to develop the Initiative to be sustainable and competitive for NIH P20 program grant funding through the National Center for Minority Health and Health Disparities.

The Initiative's multi-disciplinary leadership team has expertise in Native American health, rural health and disability, health promotion, nutrition, physical activity, public and environmental health, behavioral and clinical psychology, community-based participatory research, continuing education and biomedical sciences. The project has a clear link to the University's long-range vision of assisting Montana communities to decrease health disparities and provide employment and educational opportunities in community and public health professions in minority and underserved populations. The NARHI will also support increasing health care infrastructure for Montana Indian and rural communities. The project is well-aligned with the current national health care reform debate and ties into interests of the Montana Congressional Delegation (Senators Baucus and Tester). Additional political support for the Initiative from outside Montana includes The Indian Health Service – Division of Diabetes Treatment and Prevention (Kelly Acton, Director), American Association on Health and Disability (Roberta Carlin, Executive Director) and The Association of Programs for Rural Independent Living (Billy Altom, Director).

Congressional Action Needed: An appropriation of $1 million is requested for FY 2011.

Importance to Montana: Montana is home to 58,000 Native Americans and the majority of the population (49,500) live in rural regions of the state. Native Americans residing on Montana's seven reservations are part of the 60% or more of Montanans living in rural areas where health promotion services and specialty medical care is sparse.

Contacts at UM: Blakely Brown, Dept. Health and Human Performance, 406-243-6524 blakely.brown@mso.umt.edu; Vernon Grund, The College of Health Professions and Biomedical Sciences, 406-243-4770 Vernon.grund@umontana.edu

Project Title: Building the Biomedical Pipeline: A Partnership for Research and Education in the Montana Public Schools

Executive Summary: Montana Tech requests $500,000 to support bacteriophages discovery research and education. Workforce development will result from the pipeline combining pre-college outreach viral discovery with morphological, biochemical, and genomic characterization of bacterial viruses.

Project Description: Over 2500 Montana students have isolated 48 mycobacteriophages that infect *Mycobacterium smegmatis* in Montana Tech's Outreach Phagedigging Program. This proposed project will vastly expand the outreach program across the state, and provide research sabbatical opportunities to high school teachers. Dr. Marisa Pedulla, Associate Professor of Biology, has developed partnerships with high schools and middle schools in Montana, to provide opportunities to pre-college students and teachers to discover previously unknown bacteriophages (viruses that infect bacteria). This project involves Dr. Pedulla and undergraduate researchers from Montana Tech traveling to the public schools where the students participate in "Phagedigging." In two ~40 minute class periods, Dr. Pedulla and the Tech students introduce the concept, bring the equipment and supplies, demonstrate and teach the students, who then undertake screening environmental soil and water samples (that they themselves collected), examine the results and confirm any newly discovered viruses. The middle and high school students do all the procedures to identify never-before-discovered viruses; they contribute to the scientific body of knowledge by their discoveries. Any students whose interest is sparked by the project are invited to come to work at Montana Tech to continue the studies on the viruses isolated at their school, and these students appear as coauthors on scientific manuscripts describing the new viruses.

Our aims are ambitious. We would like to extend this outreach experience to each of the 56 school districts in Montana, making the project available to current freshman and sophomore high school students, so that at the end of two years, thousands of students will have experienced a real research experience before transitioning to college or work. We propose to hold summer workshops for high school teachers and students in Butte, making them available without involving significant travel expenditures for the participants that might otherwise have prevented them from attending. We propose to offer the workshops to science courses at the 7 Montana tribal colleges and then to work with interested undergraduate students and professors at these colleges who would serve as mentors and bridge builders to bring the program to the community teachers and schools. We propose to provide sabbatical laboratory research opportunities for Montana public school science educators to work with Montana Tech's Phagedigging program and gain depth of scientific knowledge during the period. These teachers will serve to disseminate the knowledge and experience for many years and to thousands of students who follow. A key educational component of the project is that undergraduates participate in the outreach and serve as mentors and ambassadors, while gaining in-depth research experiences. These undergraduates overwhelmingly go on to pursue careers in biomedical research. We will develop formal assessment methods to track the educational and career choices of participating pre-college and undergraduate students. Program summary to date: Participating Students and Teachers: 2510; Number of Samples They Tested: 2228; Newly Discovered Phages: 48

Congressional Action Needed: An appropriation of $500,000 is requested. These funds will be used to fund salary and benefits for two one-year teacher sabbaticals (with summer training); 2 years at 50% of Dr. Pedulla's salary and benefits, and 10 undergraduate research school year and summer stipends. The requested funds also include the necessary equipment and supplies for the visits, travel to schools, and support including participant housing for summer workshops.

Importance to Montana: The broad, long-term objectives of the project are to impact job opportunities in biomedical research in Montana by contributing to the preparation of a technically capable, scientifically educated workforce that will attract contemporary high-tech industries.

Contacts at Montana Tech: Dr. Marisa L. Pedulla, Associate Professor of Biology, 406-496-4836 Fax: 406-496-4135 mpedulla@mtech.edu