

MSU INVESTMENT PROPOSAL FOR INSTITUTIONAL PRIORITIES

PROPOSAL OVERVIEW

Title	Advanced interdisciplinary sample preparation facility for natural and engineered materials	Request Date	16 December 2011
Department	Cross-cutting	Email	cashaw@montana.edu
Requestor	Paul Gannon, Colin Shaw	Phone	x6760

STRATEGIC ALIGNMENT

<p>Core Themes and Objectives (check all that apply)</p>	<p>Educate Students</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Our graduates will have achieved mastery in their major disciplines <input type="checkbox"/> Our graduates will become active citizens and leaders <input type="checkbox"/> Our graduates will have a multicultural and global perspective <input checked="" type="checkbox"/> Our graduates will understand the ways that knowledge & art are created and applied in a variety of disciplines <input checked="" type="checkbox"/> Our graduates are prepared for careers in their field <input checked="" type="checkbox"/> We will provide increased access to our educational programs <input checked="" type="checkbox"/> Communities and external stake holders benefit from broadly defined education partnerships with MSU
	<p>Create Knowledge and Art</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Students, faculty, and staff will create knowledge and art that is communicated widely
	<p>Serve Communities</p> <ul style="list-style-type: none"> <input type="checkbox"/> We help meet a fundamental need of the citizens of Montana by providing degree programs for our students <input checked="" type="checkbox"/> We help meet the educational needs of the citizens of Montana by providing a wide range of educational opportunities to a variety of students <input checked="" type="checkbox"/> Our students, faculty, staff, and administrators reach out to engage and serve communities <input checked="" type="checkbox"/> Our students, faculty, staff, and administrator reach in to build the university community
	<p>Integrate Learning, Discovery, and Engagement</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Each graduate will have had experiences that integrate learning, discovery and engagement <input checked="" type="checkbox"/> Outreach activities will educate students and address the needs of the communities we serve <input checked="" type="checkbox"/> Students, faculty, and staff will create knowledge and art that addresses societal needs <input checked="" type="checkbox"/> MSU is a community that will be characterized by synergy within and across disciplines, roles and functions.
	<p>Stewardship</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> The public trusts the institution to operate openly and use resources wisely <input checked="" type="checkbox"/> The faculty and staff are well-qualified and supported <input checked="" type="checkbox"/> MSU will support Native American students, programs, and communities <input checked="" type="checkbox"/> MSU will be an inclusive community, supporting and encouraging diversity <input checked="" type="checkbox"/> Our publicly provided resources are used efficiently and effectively <input checked="" type="checkbox"/> Natural resources are used efficiently and sustainably <input checked="" type="checkbox"/> MSU nurtures a culture of resource conservation and ecological literacy among students, faculty and staff <input checked="" type="checkbox"/> Our physical infrastructure (e.g., building, equipment, open spaces) will be well-maintained and useful

INSITUTIONAL BENEFIT						
Campuses	<input checked="" type="checkbox"/> Bozeman <input type="checkbox"/> Billings <input type="checkbox"/> Havre <input type="checkbox"/> Great Falls <input type="checkbox"/> FSTS <input type="checkbox"/> Extension <input type="checkbox"/> MAES					
Cross Depts	Please List: ChBE, ESCI, Physics, CBE, Chemistry, LRES, MOR					
TIMEFRAME						
Proposed Dates	Start: 1 July 2012			End: 30 June 2013		
COST AND REQUIREMENTS						
Funding Type	One-Time (\$)	Multi-Year (\$)			Base (\$)	FTE
		Year 1	Year 2	Year 3		
Personnel (w/benefits)					34,500	0.5*
Materials & Supplies	76,000					
Travel						
Contracted Services						
Capital						
Other Operations						
TOTAL	76,000				34,500	0.5
Please comment, if necessary, regarding cost and requirements.	* only includes permanent lab technician position, not work-study.					
	<u>Budget Explanation</u>					
	<p>One Time Only Funds include lab renovation, equipment procurement and web application development. Lab renovations are estimated at ~\$50,000 and include installing dedicated plumbing lines to existing equipment (currently supplied from a faucet), purchasing/installing micro-level water filtration to make water supply usable for precision grinding, purchasing/installing air filtration to make building pressurized air system usable OR installing dedicated compressor/tank system, cleaning/refurbishing existing fume hood, installing additional cabinetry/workbenches, installing task lighting, and fabricating plexiglass equipment enclosures to limit contamination.</p>					
	<p>Equipment purchased under this proposal would be minimal and would include a polarizing condenser for checking thickness of translucent/birefringent samples with the existing Olympus microscope (~\$3000), purchase of a hot-mounting press for sample embedding (~\$7000), and purchase of a clean-storage cabinet for precision polishing cloths.</p> <p>Development of a web site and scheduling application for the preparation facility is a key component of the project. We request \$6000 for web development (~100 hours @ \$60/hour – MSU Web Communications).</p> <p>Base Funding would support a permanent 0.5 FTE laboratory technician position. This position already exists, but is funded exclusively through soft money. We request \$32,500 for this position. The estimate includes salary and benefits. This category also includes funding for two undergraduate work-study students (70% federal work study funding + 6.7% benefits & worker's comp, 30% funded through this proposal ~\$1000 each).</p>					

PROPOSAL SCOPE

Describe the Proposal

Advanced materials imaging and analysis are cornerstones of MSU's leadership in materials science and nanotechnology. Maximizing the returns of cutting-edge analytic techniques demands flawless sample preparation that is highly tuned to the demands of specific instruments and applications. Currently, MSU researchers use a piecemeal approach to sample preparation in labs across campus that allows considerable duplication and inefficiency. Potential users are often unaware of equipment that is available in individual labs on campus and sample preparation expertise accumulated through years of experience is diluted and inaccessible to potential users. Some potential users contract services that could be provided in-house simply because they are unaware of the capabilities that we have on campus.

This document lays out a plan to create a multi-user materials preparation facility that will provide a central resource of equipment and expertise for materials scientists and students across campus. The proposed facility represents a true investment in that it will reduce inefficiency, improve productivity, develop a revenues stream from outside contracts, and enhance opportunities to attract additional equipment acquisition and research funding.

We propose to build on the foundation of existing facilities and collaborations across campus to create a highly coordinated, but distributed multi-user sample preparation facility for use by MSU students and researchers, visiting scientists and external contract customers. This facility will comprise a central laboratory with the most commonly used equipment as well as a distributed network of more specialized equipment housed in individual investigator's laboratories across campus. Equipment scheduling via a central web site will ensure wide availability and efficient use of resources. The facility will be staffed by a part-time expert technician assisted by graduate research assistants (funded separately) and undergraduate work-study students to handle routine tasks. Once established, we expect the facility to be largely self-sustaining through internal user charges for funded projects and external contract fees. The facility would be available free-of-charge for student projects and unfunded pilot projects.

Facility Description

Central materials preparation laboratory (329 Cobleigh – Gannon Lab). The core facility will house the most common materials preparation equipment for tasks including mounting/embedding, ultrasonic cleaning, cutting, grinding, polishing, and quality control. Optimal infrastructure for demanding applications (filtered water/air, clean workspace etc.). The core facility would be staffed by an expert technician (0.5 FTE), graduate research assistants (funded through research grants and contracts) and undergraduate work-study technicians. The staff would provide assistance, training and consultation in addition to contract and research sample preparation work.

Distributed facilities. More specialized equipment acquired and maintained by individual PIs and housed in their labs or departmental facilities would be available for use by MSU researchers, visitors and contract work. These facilities would be available for booking or contract work via the central web site. Information on available facilities would be updated frequently to provide a central resource for potential users to learn about material preparation capabilities at MSU. Specialized tasks would be handled by trained personnel for a fee. Participation would be entirely voluntary and PIs would manage facilities and set policies for use. Some facilities might be open to all appropriately trained users while others might have lab personnel handle processing tasks for users. Some highly specialized or sensitive facilities might only be available to members of a restricted research group. Initially, distributed facilities would include:

- **Earth Sciences Natural Materials Prep. Facility:** Rough preparation, large samples, crushing/separations, thin sectioning, lapping
- **Museum of the Rockies Histology Preparation:** Fossil/soft tissue embedding, sectioning and polishing
- **SubZero Lab:** Ice microtome
- **Montana Microfabrication Facility:** Profilometer, ultraclean workspace, dicing saw
- **ICAL:** Conductive coating, etc.
- **Hugo Schmidt Stuff**

We propose to invest in four critical areas: Infrastructure, Equipment, Expertise, Efficiency

This project is truly an investment. The infrastructure developed through this program at modest cost would provide a firm foundation to help researchers secure external funding for additional capabilities and establish a revenue stream to help support the laboratory.

Investment in Infrastructure. (OTO funds, ~\$50k)

- Micron-filtered water in 306 Cobleigh
- Hard-plumbed water supply & drains for grinding equipment
- Clean enclosures for equipment
- Clean enclosures for workspace (positive pressure enclosure for at least one workbench)
- Clean, covered washing/drying and storage space (positive pressure?)
- Filtered air/nitrogen system for pneumatic equipment and sample cleaning/drying
- Upgraded electrical
- Upgraded or renovated fume hood (existing vents) for chemical preparation
- + Other??

Investment in Equipment. (OTO funds)

- Vacuum hot/cold embedding system (~\$7k)
- Transmitted-light polarizing accessories for monitoring birefringent samples (~\$3k?)
- Install ion mill (currently in storage)

Investment in Expertise. (Base funding)

- Technician: salary + benefits (0.5FTE, ~\$20k/year). Additional funding would be through soft-money (grants and external contracts)
- 2-3 Undergraduate work-study positions (~\$2-3k/year)

Investment in Efficiency - Collaboration and Coordination (OTO funds)

- Website (~\$5k)
- Advisory board/User group
- Ongoing web site updates and facility coordination (Technician)

PROPOSAL SCOPE

Describe the broader impacts and benefits of this proposal

MSU has outstanding material science research laboratories and analytic instruments. The sample preparation facility proposed here will enhance these facilities at a modest cost by building on the excellent foundation of existing equipment and collaborative relationships that already exist on campus. The facility will provide substantial value-added by improving our analytic results, promoting efficiency, reducing duplication of effort and expense, fostering collaboration and attracting outside clients. By providing a central resource for materials preparation this facility would enhance awareness of capabilities that we have on campus, encourage faculty and students to take advantage of facilities that they may not have been aware of and facilitate intra-disciplinary collaboration. Once we have established a robust infrastructure we anticipate many opportunities to work together to acquire new state-of-the-art equipment to further enhance preparation capabilities. The facility has excellent potential for generating a significant revenue stream to support supplies, maintenance and (perhaps) staffing from user fees and outside contracts.

Some text here... Potential outside users... paying customers.

Project Benefits.

- Develop an expert resource to help researchers optimize results and improve efficiency
- Improve analytic results with optimal sample preparation
- Provide sample preparation facilities for student research
- Reduce and prevent redundant capabilities in multiple labs
- Enhance use of analytic labs (e.g. ICAL) by adding needed sample prep facility

- Develop revenue stream from external contracts
- Build infrastructure to accommodate future grant-funded equipment acquisitions
- Provide infrastructure for new ChBE materials science hire
- Provide high-end sample preparation services to other MSU campuses

Potential Users - Building on ongoing collaborations and relationships:

- ***Chemical & Biological Engineering:*** Gannon, Seymour, **New hire**, grad students
- ***Mechanical & Industrial Engineering:*** Sofie, Cairns, Mian
- ***ICAL & Physics:*** Avci, Suo, Schmidt, ICAL users
- ***MT Microfabrication Facility:*** Dickensheets, Himmer, grad students
- ***Earth Sciences:*** Shaw, Mogk, Lageson, Jackson, Varricchio
- ***MOR:*** Lamm, Horner, grad students
- ***LRES:*** Stoy, Brookshire, grad students
- ***Industry – outside contracts:*** American Eagle Instruments, ADVR, GT Advanced Technologies, Micropowder Solutions, EIP, Int., Accelergy, Zinc Air, Inc., Applied Materials

ADDITIONAL INFORMATION

Implementation Plan *(Please describe with timelines)*

The project leverages existing resources and equipment. Laboratory renovations would be scheduled during summer 2012 and equipment should be ready for use by fall. The Laboratory Assistant would commence new duties 1 July 2012.

Existing Resources & Equipment

- **Corrosion/Fuel Cell Lab – 329 Cobleigh (Gannon)**
 - Allied Techcut low-speed saw
 - Allied Techprep grinder/polisher
 - Allied Metprep grinder/polisher w/AP-3 power head for hard materials (Shaw)
 - Beuhler Vibromet vibratory polisher for ultra-polishing (Shaw)
 - Olympus BX-41 microscope (reflected/transmitted light, needs polarization accessories)
 - Fume hood
 - Ultrasonic cleaner
- **ICAL**
 - Emitech carbon sputter coater, Emitech metal sputter coater (multitarget)
 - Gatan ion polisher (currently in storage)
- **Earth Sciences Sample Prep Facility**
 - 24" MT-Diamond Rock/masonry block saw
 - 10" MT-Diamond Rock saw
 - 20" BD-Diamond semi-automated Slab Saw
 - 8" BD-Diamond semi-automated trim saw
 - 5" Hillquist trim saw
 - Beuhler precision low-speed saw
 - Hillquist thin section machine (precision saw and diamond cup wheel)
 - Two lap wheels
- **Museum of the Rockies**
 - Beuhler Petrothin thin section machine
 - Beuhler 8" grinder/polisher
- **Hugo Schmidt Stuff**
- **MMF Stuff**
- **Other...**

Assessment Plan *(Please describe with indicators)*

Assessment would include three instruments: (1) inventory of equipment acquisitions that are enabled/facilitated by new infrastructure improvements, (2) tracking value of facility to researchers utilizing the facility (work that would have been handled externally), (3) annual user satisfaction survey.

If assessed objectives are not met in the timeframe outlined, what is the plan to sunset this proposal?

The only ongoing funding is for the part time Lab technician. If project goals are not met base funding for the position would be terminated after 2 years (June 2013).

SIGNATURES					
Department Head <i>(please print)</i>		Signature <i>(required)</i>			Date
N/A		—			
Dept Head Priority <i>(please circle one)</i> : Very High High Medium Low Very Low					
Dean/Director <i>(please print)</i>		Signature <i>(required)</i>			Date
Robert Marley		[Signature]			3 Jun 2012
Dean/Director Priority <i>(please circle one)</i> : Very High High <u>Medium</u> <u>Low</u> Very Low					
Executive/VP <i>(please print)</i>		Signatures <i>(required)</i>			Date
Executive/VP Priority <i>(please circle one)</i> : Very High High Medium Low Very Low					