Montana University System Science and Technology Advisory Committee (MUSSTAC): Montana's State Committee

Dr. Tom McCoy, Vice President for Research, Montana State University

Montana Snapshot

- **2010 Population 990,000**
- **Median Age 39.8**
- **Percent 65 or older 14.8**
- **% with BS or higher 28.2**
- **Median Household Inc $43,400**
- **Six 4-year public & 3 private universities, 7 tribal colleges**

Montana GDP by Industry ($40B)

Industry	GDP ($B)	Share (%)
• Government	6.1	16.2
• Trade	4.7	12.0
• Real Estate	4.5	11.7
• Services	4.0	11.0
• Health	3.6	9.6
• Manufacturing	2.3	6.0
• Construction	1.9	5.0
• Finance & Ins.	1.9	5.0
• Mining	1.9	4.9
• Transportation	1.8	4.6
• Ag & Forestry	1.6	4.2

MUSSTAC Membership

- Deputy Commissioner of Higher Ed
- MSU and UM Provosts and VPR's
- Legislative Members
  - Senate: One D and one R
  - House: One D and one R
- Governor's Office Representative
- 5 Private Sector Representatives – One for each of the five focus areas in the S&T plan.
- Representatives from agencies –
  - NIH Rocky Mountain Lab
  - BLM
  - US Forest Service
  - USGS Northern Rocky Mountain Science Center
  - USDA ARS Fort Keogh Livestock Center (LARRL)
- Economic Development Director – Bozeman
- Administrator Kalispell Regional Medical Center

S&T Focus Areas

- **Health and Biomedical Sciences**
- **Agricultural Sciences**
- **Energy Sciences and Engineering**
- **Environmental and Ecosystem Science**
- **Materials Science and Engineering**

MUS-STAC Responsibilities

- **Develop and guide the implementation of a Science and Technology Plan for Higher Education and Related Enterprises.**
- **Prioritize focus areas for Montana's state-based EPSCoR grant applications.**
- **Serve an advocacy role for Science and Technology Research and Graduate Education in Montana.**

MUS Research Contributes to Economic Development

- Largest R&D enterprise in Montana (almost $200 million in FY12 expenditures)
- Prepare graduates who are ready to enter the knowledge economy
- Technology transfer
- Business assistance programs, e.g. TechLink, MMEC and MilTech
- Magnet in attracting technology based businesses, e.g. RightNow Technologies (start-up in Bozeman in 1997- acquired by Oracle for $1.5 billion in 2011)

Montana EPSCoR

Guiding Principles

- Leverage opportunities and strengths
- Work on regionally relevant and nationally significant research
- Invest in people
- Engage all partners – 2 University Systems and 7 tribal colleges



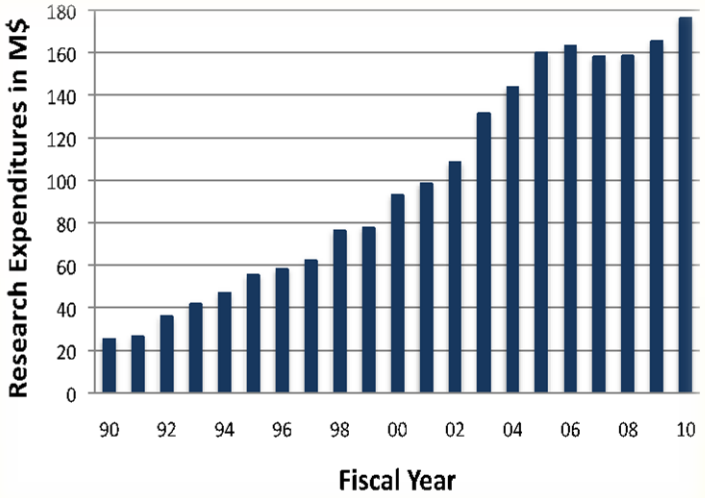

MONTANA NSF EPSCoR

Montana EPSCoR - Faculty

Since 2007, **31** new faculty members have been hired who have garnered over **$24M** in external funding.

Since 2001, 95 new faculty hired with over 90% still in Montana

Montana EPSCoR attracts and retains high quality faculty



Rapid growth of Montana's research activity at its two research campuses

Montana EPSCoR - Students

Graduate Student Stipends

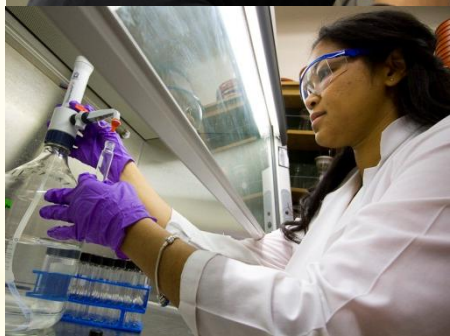
- Over 300 PhD students have received support

New Graduate Programs

- PhD program in History of Science, Technology and Society
- A joint Neuroscience PhD program between MSU and UM
- Molecular Biosciences Graduate recruiting and fellowship program
- Master of Fine Arts in Science and Natural History Filmmaking, the first of its kind in the world
- And others

Undergraduate Research

- Funded over 1500 students in academic year and summer research experiences
- Undergraduate research now required for graduation at MSU



MONTANA STATE UNIVERSITY

Montana EPSCoR - Diversity

- Funded hundreds of Native American high school students to explore higher education and science careers through American Indian Research Opportunities programs
- Developed Accelerated Math Program for calculus preparation of incoming Native students
- Supported graduate students in the Native American Research Laboratory
- Participated in hire of seven new science or math faculty at tribal colleges

Montana EPSCoR - Infrastructure

Research Centers

- Montana Microfabrication Facility
- Center for Bio-Inspired Nanomaterials
- OpTec
- Center for Biomolecular Structure and Dynamics

Equipment

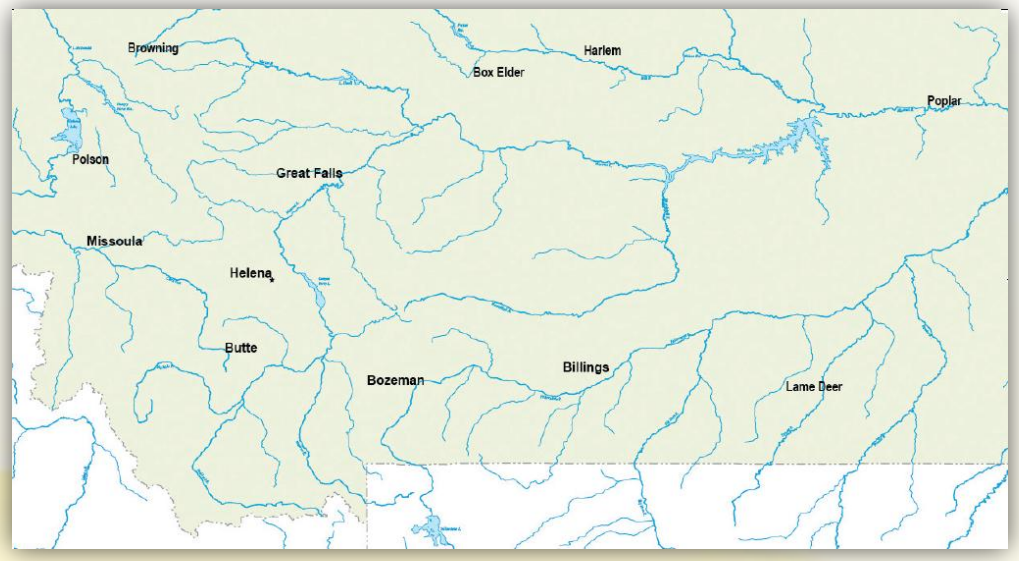
- Transmission Electron Microscope
- Nuclear Magnetic Resonance machine
- Nuance Multispectral Imaging System

Resources

- Web of Science for journal access
- Tribal College Cyberinfrastructure
- Research Computing infrastructure and support
- Image and Chemical Analysis Lab

Montana EPSCoR – State Economy

- MSU and UM Business students participate in EPSCoR funded internships with small businesses in Montana
- Developed training webinars offered through the Small Business Development Centers around the state
- Commercialization Assistance Program in which businesses receive advice on start-up issues
- Entrepreneurial “Jam Sessions” for new businesses led by veteran company executives
- Core industries such as optics seeded by EPSCoR hires going back to the 1990’s

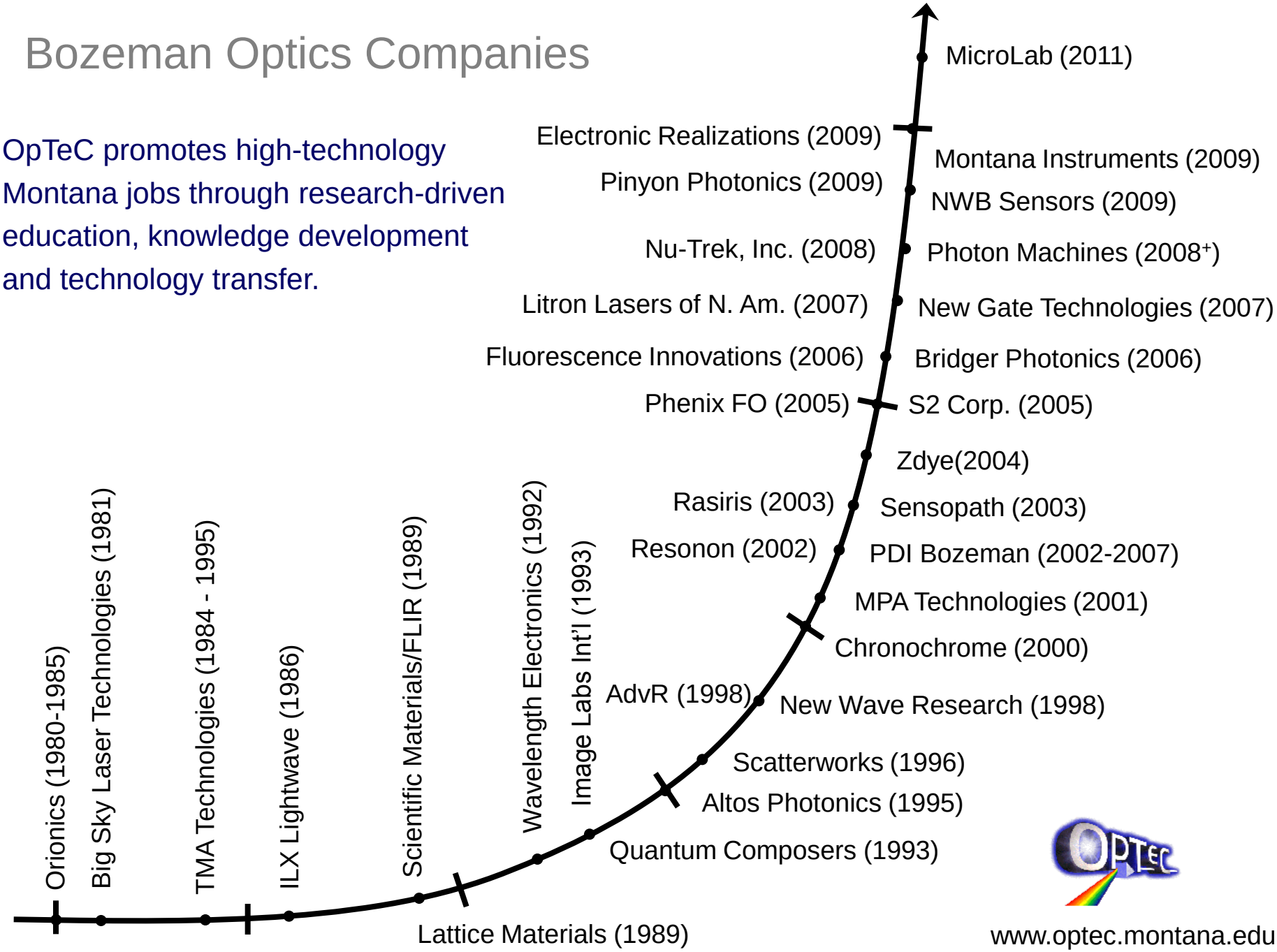


EPSCoR Success Story: OpTeC

- Demonstrates that it takes time to reap significant benefits from EPSCoR Investment
- The Optical Technology Center was launched with NSF EPSCoR support in 1993
- EPSCoR funds used to assist in hiring seven additional TT faculty in the 90's focused on optics.
- Currently have 30 faculty in four departments.
- More than 50 graduate students and more than 100 undergraduate students engaged.
- More than 30 companies and 17 with funded research collaborations with MSU. Five companies started by MSU grad students.
- 50 MSU patents in the optics area.

Bozeman Optics Companies

OpTeC promotes high-technology Montana jobs through research-driven education, knowledge development and technology transfer.



www.optec.montana.edu

OpTeC Research Areas

- Infrared imagers used in surveillance and environmental science
- Detection of invasive species
- Remote detection of illicit drug labs, e.g. meth
- Remote detection of toxic chemicals
- Technologies applicable to remotely piloted aircraft applications
- Laser sensors used in explosives and land mind detection
- Laser based diagnosis and therapy for cancer treatment

MT NASA EPSCoR Examples of Success

Components of MT NASA EPSCOR:

1. Faculty travel grants; ~12/year
2. Small (~$40K) Research Initiation grants; 2-3/year
3. Large ($750K) nationally-competed research group grants; average MT success rate is 1-2/year

Travel grant and Research Initiation success examples, 2007-present:

65 talks at professional meetings

15 new collaborations at NASA Centers

12 non-EPSCoR follow on grants

MT NASA EPSCoR Examples of Success

Research Group: 10 years ago

MSU Astrophysics (Cornish group)

- Established the Montana Gravitational Wave Astronomy Group, including 3 faculty, 4 post-docs, 6 PhDs granted, and 8 current PhD students
- Cornish appointed member of NASA and ESA LISA International Science Team in 2004, the NASA Advisory Council in 2006, NASA Senior Review in 2008, Astro2010 Decadal Survey in 2009, and delegate for the Division of Astrophysics for the American Physical Society in 2010
- Publication of 42 peer-reviewed articles on space astrophysics
- Continuous NASA follow-on funding

MT INBRE Network Research Capacity and Impact
(2001 – 2012)

Network-wide:

- Funded and mentored137 research projects across the state among Tribal Colleges (TCs), Primarily Undergraduate Institutions (PUIs), MSU, and UM in infectious disease, environmental health, health disparities, social and behavioral health sciences and outreach
- Sponsored and administrated 1,441 undergraduate and graduate fellowships
- Engaged 2,230 elementary, middle school, and high school student research participants, as well as trained 24 high school teachers
- Sponsored Project leaders published 186 scientific papers, 84 co-authored by students
- Enhanced statewide research infrastructure (bioinformatics, UM's Electron Microscopy Facility, and research laboratories at PUIs and TCs where none existed previously)
- Generated $50,443,330 in new extramural funding to the network's partner institutions.
- Fund 150-170 positions annually through research projects
- Developed and enhanced research culture at TCs, PUIs, and departments at MSU resulting in statewide collaborations among network institutions
- Developed social and behavioral health sciences research across the network, resulting in the first R01s for any social and behavioral sciences investigators at MSU

MT INBRE Network Research Capacity and Impact

Tribal Colleges (TCs):

- Sponsored 6 faculty hires in science and math (made in collaboration with MT EPSCoR)
- Funded and mentored 40 pilot research projects among all 7 of Montana's TCs to develop biomedical and social and behavioral health sciences research conducted by TC faculty and providing research opportunities for the first time for TC students
- Sponsored 8 network-wide meetings held at TCs focusing on cross-cultural education and developing research infrastructure (60 – 110 participants per meeting)
- Funded and mentored 10 TC multi-year research projects
- Developed 10 research collaborations among TC investigators and MSU faculty (in addition to TC projects)
- Enhanced research infrastructure at all 7 TCs, including development of new and remodeled research labs and acquisition of state of the art scientific equipment
- Trained and mentored TC faculty in grant writing and grant management; collaborative efforts with INBRE resulted in NIMHHD RIMI grant awarded to Little Big Horn TC, NIMHHD NARCH proposal submitted by Blackfeet TC (pending review), TCUP proposal in process at Blackfeet TC
- Sponsored Crow Tribe water quality research project, which was recognized by *Nature* and NCRR's *Reporter* as exemplary TC research
- Developed social and behavioral health sciences research capacity in order to develop capacity of TCs to respond to health problems of their communities

MT INBRE Network Research Capacity and Impact

Tribal College Student Pipeline:

- Funded 584 TC student research participants
- Sponsored up to 5 Native American undergraduates annually through MSU's American Indian Research Opportunities (AIRO) Program (~60 students)
- Sponsored 8 Native American Graduate Fellowships: 3 PhD in process at MSU, 1 at UM; 2 MS completed and 2 MS in process at MSU
- Sponsored 2 Native American post doctoral fellowships at MSU in 2010 (individuals recruited into tenure-track faculty appointments at the University of MN-Duluth)

New sources of funding resulting from previous DEPSCoR activity

Federal Agencies

Defense Agencies: AFOSR, ONR, Army Research office, DoD-DURIP, DoD-MURI, Ballistic Missile Defense Office, Office of the Secretary of Defense MURI.

Non-Defense agencies : NSF, DoE , NIH, NASA, MBRCT

Private companies

Lockheed-Martin Aeronautics, Metatech, Spectral Sciences, Alameda Applied Sciences, Boeing Corp., ALD - Nano solutions, Eltron Research and Development.

Extramural Funds Awarded : $38M

One investigator grew his initial DEPSCoR support 47 fold

Summary of successful DEPSCoR outcomes (Nine awards)

1(a). New extramural research support obtained ……..……..…9/9
(b). Critical instruments purchased..……..……..…9/9

2(a). Students trained……..……...68
(b) Those now working in field related to DEPSCoR effort…….28

3 (a). Non-trivial industrial interaction by faculty…..……..…9/9
(b). SBIR, STTR, patents……..…….…….....…16
(c). New companies formed in Montana, c. 30 employees 2

4 (a). Demonstrable positive influence on faculty career…..……..9/9
(b). Peer reviewed publications *……..……..117

*** Does not include presentations.**