10-8-2019

Montana State University Research Program Overview

Dr. Jason R. Carter

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Montana State University
Research Program Overview

Jason R. Carter, PhD
Vice President of Research, Economic Development and Graduate Education
Research Portfolio

OSP managed, state appropriated, MAES and gifts that support research

Total Research Expenditures

FY19

- DOD 20.6%
- HHS/NIH 24.6%
- PRIVATE 10.6%
- STATE 4.4%
- NSF 11.0%
- NASA 4.6%
- USDA 6.7%
- OTHER FED 4.2%
- USDOE 4.2%
- USDOED 2.2%
- USDI 1.7%
- USDOT 4.2%
- USEPA 0.2%

Millions, Dollars

Montana State University Strategic Plan, adopted in 2019

- Transformational Learning
- Scholarship That Improves Lives
- Expanding Engagement

Montana State University research and creative activity demonstrates impact through application of our discoveries in communities, industry, and organizations, as well as through academic indicators of the expansion of knowledge.
Improve Lives and Society through Research, Creativity and Scholarship

*Four Grand Challenges*

- **Caring for our environment**: environmental science, design, engineering, architecture and social structure
- **Promoting wellness in our communities**: access and equity in education and health outcomes, community-based participatory research, biomedical sciences and entrepreneurship
- **Food and fuel security**: sustainable food systems, precision agriculture, energy production, transmission and storage
- **Securing the future of Montana**: cybersecurity, photonics and optics, defense, governance and public policy
Energy Research at Montana State
## Scope of MSU Energy Research 2017 –2018

<table>
<thead>
<tr>
<th>Department</th>
<th>Faculty</th>
<th>Grad</th>
<th>Prof.</th>
<th>Student</th>
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Wide range of topics, 16 Departments and Centers  
Over 270 individuals involved, 91 Peer reviewed publications  
Large student participation (92 grad, 77 undergrad)
## Scope of MSU Energy Research 2017 – 2018

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Wide range of topics, Typically $7m - $12 M annual expenditures
Over 270 individuals involved, 91 Peer reviewed publications
Large student participation (92 grad, 77 undergrad)
Recently Funded- MSU attracts funding in highly competitive areas

Biomass Energy (1 of 7 funded nationally): $1.3 M to Optimize processing of corn stover biomass  
David B. Hodge, Joseph Seymour and John E. Aston (co-PI) INL  
Title: “Enhanced Feedstock Characterization and Modeling to Facilitate Optimal Preprocessing and Deconstruction of Corn Stover”

Gaseous Fuel Storage (1 of 7 funded nationally): $875 K to Develop new materials for natural gas of hydrogen fuels vehicles  
Nick Stadie and Channing C. Ahn (Cal Tech)  
Title: “Heteroatom-Modified and Compacted Zeolite-Templated Carbons for Gas Storage”

CO₂ Reutilization (1 of 3 funded nationally): $1.5 M to Develop an efficient reactor to convert CO₂ to useful chemicals  
Stephen Sofie and Lee Spangler with U S. Florida, OCO, DNVGL  
Title: “Development of a scalable, robust electrocatalytic technology for conversion of CO₂ to formic acid via microstructured materials,”
Partnering With DOE National Labs (Active & Recent Collaborations)

- Composite Materials for Wind Turbine Blades and Marine Hydrokinetic Systems
- Subsurface Microbial Studies, Carbon Capture and Storage (CCS)
- CCS, Solid State Batteries, X-ray characterization of buried interfaces
- Carbon Capture and Storage (CCS), Solid Oxide Fuel Cells, Algal Biofuels
- Applied Research Programs, CCS
- Carbon Capture and Storage (CCS)
- CCS, fluid behavior in fractured reservoirs
- X-ray characterization of buried interfaces, CCS
- Biomimetic Electron Transfer, Wind Application Center, Composite Materials
MSU Provides Leadership to DOE Lab Partnerships

- Zero Emissions Research and Technology Collaborative involving LANL, PNNL, LBNL, LLNL, NETL, Brookhaven, WVU
- MSU was lead organization, directed project
- Built first in the world field test site for CO₂ detection technologies
- Provided funding to modify four different DOE Lab multiphase flow simulators to handle supercritical CO₂ and brine in the subsurface

- MSU Directs one of six DOE funded Regional Carbon Sequestration Partnerships
- Partners through different phases of the project include LANL, PNNL, INL and LBNL

- MSU faculty member Yves Idzerda managed National Synchrotron Light Source Beamline - I
MSU Partners with the Private Sector

AON
Accelergy
Altamont Energy (Cut Bank, MT)
Amethyst Research
Autopilot (Bozeman, MT)
Boeing
Bridger Photonics (Bozeman, MT)
Church & Dwight Co
Collaborative Design Studio (Billings, MT)
Conoco Phillips
CTA Architects (Bozeman, MT)
DNV GL USA, Inc.
Enviromin (Bozeman, MT)
Exelix
Exxon Mobile
Fisker
Fuel Cell Energy
FX Drilling (Oilmont, MT)
GE Wind
Glacigen Materials (Bozeman, MT)
GroundMetrics
GT Advanced Technologies (Missoula, MT)
Hexion Resins
Li-COR
Los Gatos
Loudon Technical Services
Marathon
MM&W Architects (Missoula, MT)
Montana Emergent Technologies (Butte, MT)
Northwestern Energy (Butte, MT)
Ocean Renewable Power
OCO, Inc.
PetroBras
Picarro
Portland General Electric
Rehau
Resodyn (Butte, MT)
Resonon (Bozeman, MT)
Schlumberger
Shell
Siemens
Southern Company
SRK Consulting
Talen Energy (Colstrip, MT)
Teck Resources
Toyota
TPI Composites
Vecta Oil and Gas
Vista Clara
MSU TechLink Center, est. 1996

- Provides outreach to high-tech sector in state, region, and nation
  - DoD and VA’s national Tech Transfer partner
  - MSU Technology Transfer Office
  - MT Innovation Partnership lead
- Army Corps of Engineers Software Analysis Lab
- For more information, visit: montana.edu/techlink
National Security Portfolio

- **Photonics**
  - MSU has one of the largest, thriving photonics clusters in the country, focused on all aspects of development from photonics materials to sensor development (e.g., FMCW LIDAR)

- **Cybersecurity, AI, Machine Learning**
  - MSU has a growing program in the Gianforte School of Computing working with DHS, AF, and the Navy – software/hardware applications

- **Composites/AM Modeling and Testing**
  - DoE and private industry contracts for controlled/classified projects

- **Space Systems – SmallSat**
  - Air Force and Defense Prime work incorporating sensors and supporting cybersecurity requirements and controlled/classified levels
Applied Research Lab (ARL)

• 8 Labs at the Secret, Q and Top Secret, plus a 2000 sq ft SCIF
  – Autonomous labs for MSU, U.S. government and private industry
  – Department of Defense, Department of Energy, Intel Community

• Contract Options
  – Direct: SBIRs, Broad Agency Announcement (BAA)
  – Partnership Intermediary Agreement (PIA):
    • Contract to engage academia and industry on behalf of government to accelerate tech transfer and licensing – MIPR-based funding

• Current contracts with: DoD, DoE, IC, Defense Primes and National Labs – collaborations with universities and industry
ARL Design
Montana State University and the Bozeman community will host the 34th annual National conference on Undergraduate Research, NCUR 2020. MSU will welcome more than 4,000 students from around the world.

March 26-28, 2020