

Montana Tech Library

## Digital Commons @ Montana Tech

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National Lab Day

Lectures

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10-8-2019

### Montana State University Research Program Overview

Dr. Jason R. Carter

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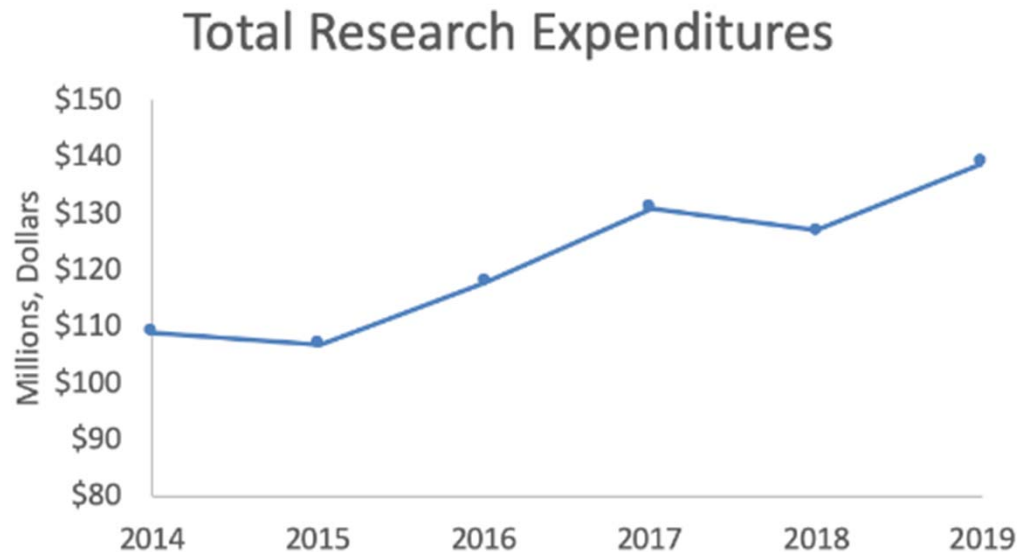
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# Montana State University Research Program Overview

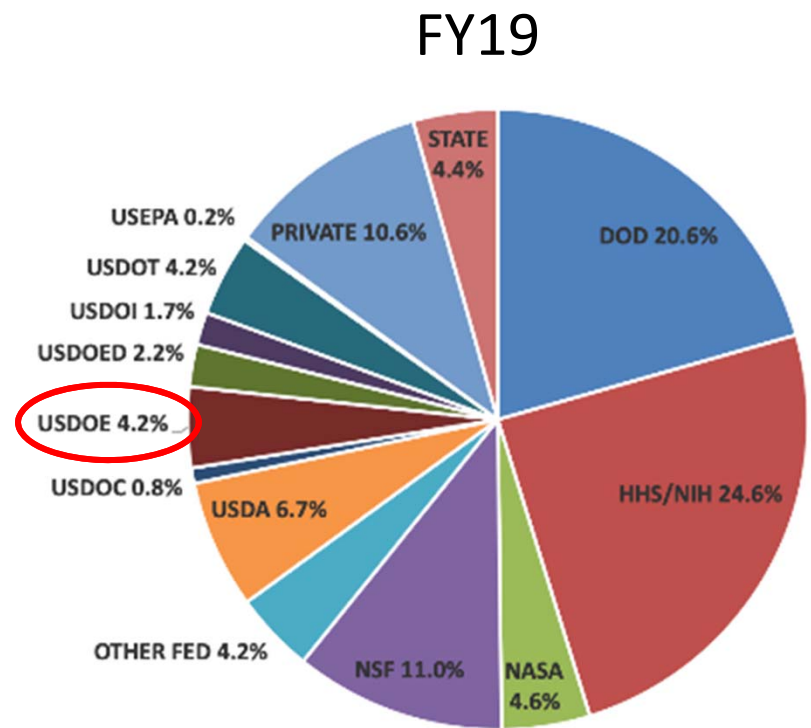
Jason R. Carter, PhD

Vice President of Research, Economic  
Development and Graduate Education

# Research Portfolio



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



# choosing promise

## 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

Mountains & Minds

# Scope of MSU Energy Research 2017 –2018

	Faculty	Grad	Prof.	Student	Classified	Total	Expenditures
Bio	7	12	5	14	1	39	\$1,421,553
Buildings	4	2	1	13	1	21	\$374,824
Catalysis	3	10	1	9		23	\$310,100
CCS	7	4	14	6	1	32	\$2,978,474
Computation	2	5		4		11	\$166,351
Education	3	1	1			5	\$76,661
Fuel Cell	3	10		1	3	17	\$648,951
Materials	8	17	1	19		45	\$1,113,215
Nat Resour	7	17	16	17	2	59	\$2,497,780
Soc & Econ	8	11	5	5		29	\$1,940,412
Solar	1	5	1	2		9	\$473,830
Wind	1			3		4	\$24,618
<b>Sum</b>	<b>54</b>	<b>94</b>	<b>46</b>	<b>95</b>	<b>8</b>	<b>297</b>	<b>\$12,026,769</b>
<b>Unique Total</b>	<b>49</b>	<b>92</b>	<b>46</b>	<b>77</b>	<b>6</b>	<b>270</b>	

Wide range of topics, 16 Departments and Centers

Over 270 individuals involved, 91 Peer reviewed publications

Large student participation (92 grad, 77 undergrad)

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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)



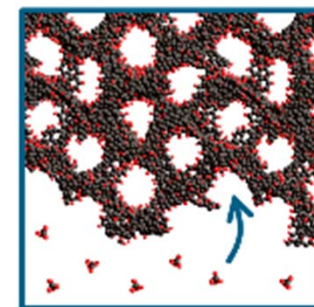
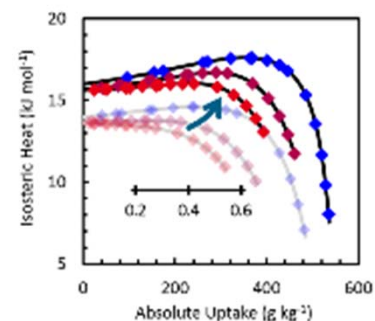
## Recently Funded- MSU attracts funding in highly competitive areas

### **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 or hydrogen fuels vehicles***

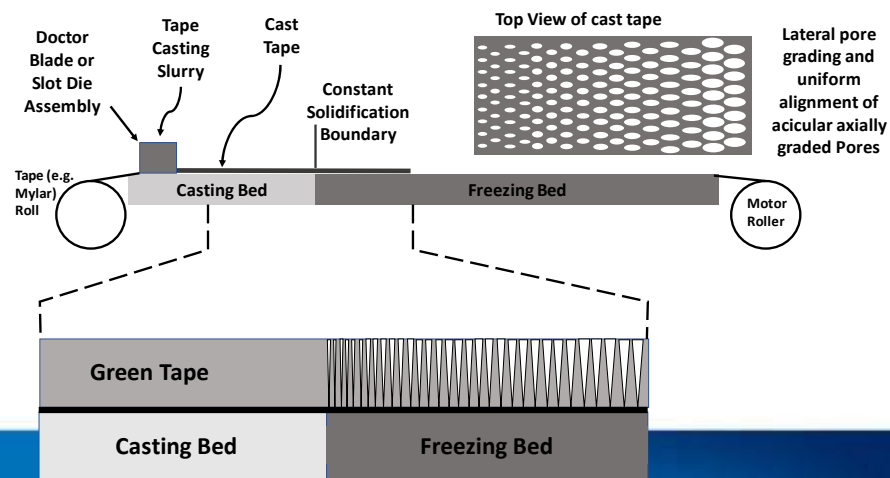
Nick Stadie and Channing C. Ahn (Cal Tech) Title: "Heteroatom-Modified and Compacted Zeolite-Templated Carbons for Gas Storage"



### **CO<sub>2</sub> Reutilization (1 of 3 funded nationally): \$1.5 M to *Develop an efficient reactor to convert CO<sub>2</sub> 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 CO<sub>2</sub> 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**



**Composite Materials**



**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 CO<sub>2</sub> detection technologies
- Provided funding to modify four different DOE Lab multiphase flow simulators to handle supercritical CO<sub>2</sub> 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



## *National Synchrotron Light Source*

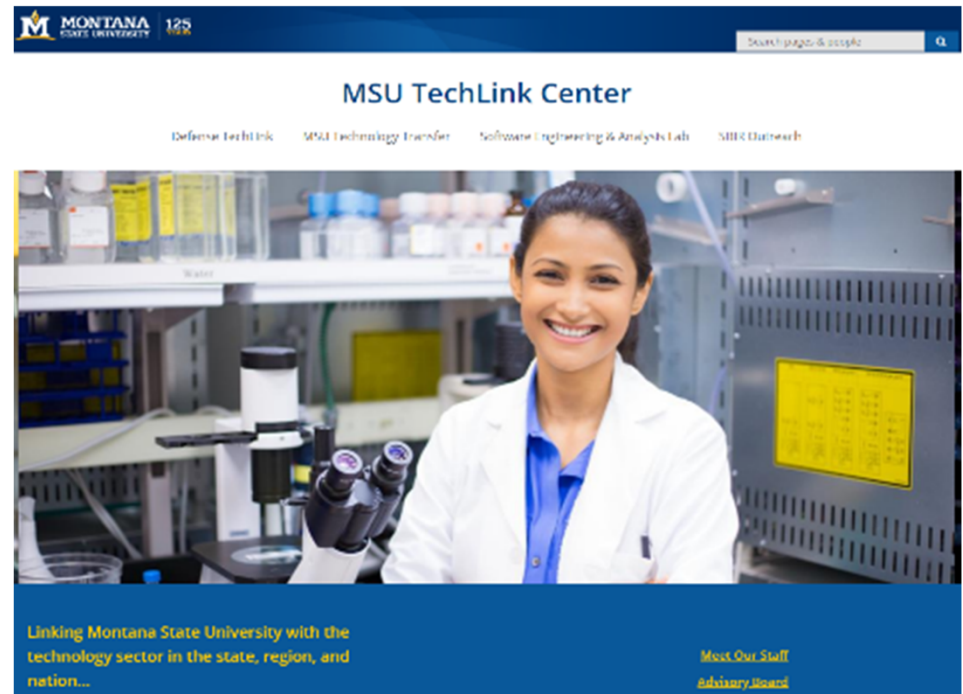
- MSU faculty member Yves Idzerda managed National Synchrotron Light Source Beamline - I

# MSU Partners with the Private Sector

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

# 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](http://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







# YEAR OF UNDERGRADUATE RESEARCH

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## MONTANA STATE UNIVERSITY

Montana State University and the Bozeman community will host the 34<sup>th</sup> annual National conference on Undergraduate Research, NCUR 2020. MSU will welcome more than 4,000 students from around the world

March 26-28, 2020

