Science Initiative
Programs Update
Presentation to the UW Board of Trustees
Mark Lyford
16 July, 2020
Science Initiative Overview:
Science Initiative Overview:
Transformative Facilities & Programs
SI Overview: Facilities

Create transformative facilities that support cutting-edge research, teaching and engagement.
SI Facilities

Interdisciplinary Research Programs and Support Facilities

• Shared Labs for Interdisciplinary Research in Cell Biology, Organismal Biology, and Earth Systems Biology – spanning spatial and temporal scales
SI Facilities

Interdisciplinary Research Programs and Support Facilities

- Shared Support Facilities: Model Organism Research Facilities (Greenhouses)
SI Facilities

Interdisciplinary Research Programs and Support Facilities

• Shared Support Facilities: Model Organism Research Facilities (Vivarium)

- Small-mammal cage systems & support
- Amphibian/fish aquaria systems & support
SI Facilities

Interdisciplinary Research Programs and Support Facilities

- New Core Facility – **Center for Advanced Scientific Instrumentation**

- Organism-scale imaging facilities
- Light microscopy core
- Atomic-scale microscope facility
- Misc instrumentation
SI Facilities

Pioneering Student-Centered Learning & Collaborative Spaces

- Largest, most sophisticated Active Learning Classroom in nation
SI Overview: Programs

Create transformative programs that support cutting-edge research, teaching and engagement
SI Programs

- Learning Actively Mentoring Program
- Wyoming Research Scholars Program
- PhD Fellows Program
- Faculty Innovation Grant Program
SI Programs

- Learning Actively Mentoring Program
- Wyoming Research Scholars Program
- PhD Fellows Program
- Faculty Innovation Grant Program

Programs partially funded with initial Legislative Appropriation
SI Programs

- Learning Actively Mentoring Program
- Wyoming Research Scholars Program
- PhD Fellows Program
- Faculty Innovation Grant Program

One-time Legislative Appropriation
SI Programs

- Learning Actively Mentoring Program
- Wyoming Research Scholars Program
- Outreach & Engagement: SI Roadshow
- Course-based Undergraduate Research Experience

Unanticipated Programs sparked by LAMP & WRSP
LEARNING ACTIVELY MENTORING PROGRAM
Why Active Learning?

Active learning dramatically improves student success in classes
Increased engagement
Better attendance
Improved exam scores
Significantly lower DFW rates
Realized success across all demographics, but greatest gain for minorities and non-traditional students
LAMP is a comprehensive, sustained mentoring and professional development program with an emphasis on how to best adopt active learning strategies in large-scale active learning classrooms at UW and in classrooms across the state’s community colleges.
LAMP Fellows Through Time (2016-2020)

97 total fellows from 5 Wisconsin institutions of higher education.

Since 2016, 79 LAMP-trained educators at UW have impacted 16,617 students in 342 active learning classes.

Number of educators trained by institution:
- UW: 79
- Sheridan College: 2
- EWC: 2
- NWC: 7
- LCCC: 7
2019 LAMP Science of Teaching and Learning Survey (47 Fellows)

**LAMP educators are creating scholarship that supports student learning** - including 24 posters and presentations, nine journal articles, and eight grant proposals that incorporate active learning into STEM teaching and research.

**85% of respondents built new collaborations through LAMP** - these relationships impacted respondents’ teaching, scholarship, and overall happiness by helping isolated educators feel like part of a community, providing educators with resources to transform specific courses, and boosting educators’ professional and personal fulfillment and happiness.

**Respondents were inspired to further development** - seven reported increased understanding and confidence in course development and educational research, seven reported more awareness and understanding of other opportunities for growth, six reported increased passion for teaching, and four reported a desire to be a resource for others.
LAMP Learning Assistants

The LAMP Learning Assistants Program began in Spring 2018 and provides UW undergraduate and teaching certificate students with opportunities to assist teaching in large introductory science courses taught in active learning classrooms at UW. Learning Assistants (LAs) act as peer mentors to help facilitate team-based and other types of learning. As many LAs are pursuing employment as K-12 STEM teachers, the program also integrates active learning into their training and gives them valuable teaching experience.

Since Spring 2018, 48 UW students have been LAs for 81 active learning courses.

This academic year, 26 UW students have been LAs for 37 active learning courses.

Learning Assistant leads small group student learning.
Assessing the experience of LAMP Trained Educators with the Transition to Remote Teaching During the COVID-19 Pandemic

More immersive & sustained training provided by LAMP enables educators to facilitate student learning, even in emergency online environments.

The percentage of UW educators (with varying degrees of professional educational development) who said their students achieved the same amount or more learning outcomes as compared to previous semesters:

- **25%** of educators with little to no educational development
- **37%** of educators who had engaged in short workshops
- **47%** of educators who had engaged in semester- or year-long educator learning communities
- **52%** of educators who had engaged in LAMP (year-long or longer development)
WYOMING RESEARCH SCHOLARS PROGRAM
Why Undergraduate Research?

Research is the Ultimate Form of Active Learning – Science is doing!

- Transformative experience for students
- Increased students in SI Majors
- Improved retention and graduation rates
- Engages a broader set of students (Minorities & First-Generation)
- Research experiences are what elevate our students above others and prepares them for careers and further education
The **Wyoming Research Scholars Program (WRSP)** pairs undergraduate students with faculty mentors to participate in their own cutting-edge research project starting as early as their freshman year. Research experiences through WRSP build confidence and competence in young scholars at a formative stage in their training.
Wyoming Research Scholars Through Time (2016-2020)

- 2019/2020: 51 scholars
- 2018/2019: 40 scholars
- 2017/2018: 30 scholars
- 2016/2017: 23 scholars
- 2015/2016: 20 scholars

101 total scholars from 3 countries and 24 US states and territories.

61 scholars from 17 Wyoming counties.
Wyoming Research Scholars (2019/2020)
WRSP scholars did 10,928 hours of research.

**Gender Distribution:**
- Male: 39%
- Female: 61%

**First Generation:**
- Yes: 10%
- No: 90%

**Transfer Students:**
- Yes: 16%
- No: 84%

**# CF Scholars from:**
- Casper College: 2
- Northwest College: 1
- Western Wyoming Community College: 1
- Central Wyoming College: 1
- Northern Wyoming Community College: 1
- Out-of-state institutions: 2
## WRSP Presentations & Publications (2019/2020)

<table>
<thead>
<tr>
<th>PRESENTATION TITLE</th>
<th>EVENT/CONFERENCE NAME</th>
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</thead>
<tbody>
<tr>
<td>Selection of an Optimal Invertebrate Taxon as a Baseline in Stable Isotope Analyses of Stream Food Webs</td>
<td>American Fisheries Society &amp; The Wildlife Society Conference</td>
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<tr>
<td>Patterns of Gene Expression Underlying Salt Stress Tolerance in Vitis</td>
<td>Western INBRE Conference</td>
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<tr>
<td>What Brain Sites are Involved in Decision Making?</td>
<td>NIH IDeA Western Regional Conference</td>
</tr>
<tr>
<td>Decision Making: Identifying the Pathways used in Cognitive Decision Making</td>
<td>NIH IDeA Western Regional Conference</td>
</tr>
<tr>
<td>Individual Distinctiveness in Vocalizations of a Suboscine Songbird</td>
<td>American Ornithological Society Conference</td>
</tr>
<tr>
<td>New Approaches to Hydrocarbon Feedstock Conversion: Bifunctional Pd Complexes for Tunable Heterolytic C-H Activation</td>
<td>American Chemical Society National Meeting &amp; Exposition</td>
</tr>
<tr>
<td>Bifunctional Pd Complexes for Tunable Heterolytic C-H Activation and Alkene Dimerization</td>
<td>American Chemical Society SWRM Regional Meeting</td>
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<tr>
<th>ARTICLE TITLE</th>
<th>JOURNAL TITLE</th>
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<tbody>
<tr>
<td>Identification and Characterization of the Lactating Mouse Mammary Gland Citrullinome</td>
<td>International Journal of Molecular Sciences</td>
</tr>
<tr>
<td>Selective Modification of Tryptophan Residues in Peptides and Proteins Using a Biomimetic Electron Transfer Process</td>
<td>Journal of the American Chemical Society</td>
</tr>
<tr>
<td>Variable Hybridization Outcomes in Trout are Predicted by Historical Fish Stocking and Environmental Context</td>
<td>Molecular Ecology</td>
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</tbody>
</table>
Course Based Undergraduate Research Experiences
Course-Based Undergraduate Research Experiences

FYS: Introduction to Ecological Research → Research Collaborations → COM2: Scientific Communication → Elective Courses
SI'S SIGNATURE PROGRAMS

ROADSHOW

SCIENCE INITIATIVE ROADSHOW
Teams of undergraduate and graduate students from UW, including WRSP Scholars and LAMP Learning Assistants, travel throughout the state facilitating hands-on learning in K-12 STEM classrooms using active learning techniques through the **Science Initiative Roadshow**.

Since 2017, the Science Initiative Roadshow has brought active learning to 3,613 K-12 students from 11 Wyoming counties.

- 28 school visits
- 19+ schools
- 14 WY communities
Riverton Community-Based Learning Project

During the 2019/2020 academic year, UW faculty and students, including Rachel Watson’s UW microbiology capstone class, partnered with 60 7th grade students and their teachers from Riverton Middle School, the City of Riverton, and Inberg-Miller Engineers on a large, community-based project involving research into the possible phytoremediation of a decommissioned landfill in Riverton.
STATEWIDE ENGAGEMENT (2019/2020)

THE SCIENCE INITIATIVE REACHED 18 DIFFERENT WYOMING COMMUNITIES

SCIENCE INITIATIVE ROADSHOW - Bringing active learning to K-12 classrooms
- 8/23/2019 - Riverton
- 9/19/2019 - Gillette
- 10/7/2019 - Riverton
- 11/4/2019 - Riverton
- 11/15/2019 - Centennial
- 12/5/2019 - Newcastle

“WYOMING NEEDS MORE COWBOYS” - Alumni events and student assemblies
- 9/19/2019 - Gillette
- 10/10/2019 - Cody
- 10/10/2019 - Powell
- 11/7/2019 - Rawlins
- 12/5/2019 - Newcastle

SERVICE CLUB VISITS - Bringing SI stories to Rotary and Kiwanis clubs
- 10/10/2019 - Cody Rotary
- 12/12/2019 - Laramie Rotary
- 1/7/2020 - Laramie Kiwanis
- 1/8/2020 - Laramie Sunrise Rotary
- 1/13/2020 - Casper Rotary
- 1/13/2020 - Buffalo Kiwanis
- 1/13/2020 - Laramie Kiwanis
- 1/13/2020 - Riverton Rotary

OTHER EVENTS
- 10/11/2019 - Laramie - Wyoming Latina Youth Conference - active learning experiences
- 10/24/2019 - Laramie - UW-STEM Speed Mentoring Event - brought UW alumni to campus to provide advice on employment to current UW STEM students
- 11/14/2019 - Cheyenne - Governor’s Business Forum
- 11/15/2019 - Laramie - Science outreach event at Spring Creek Elementary School in conjunction with UW Science Kitchen
SI Facilities

Student Collaborative Research Outreach & Learning Laboratory (SCROLL)

Suite of spaces that provide:

**Collaborative** research space for Undergraduates enrolled in CURE courses

**Training** space for LAMP Fellows and Undergraduate Learning Assistants

**Dedicated** space for K-12, community college, and public inreach activities
In March of 2019, the Science Initiative launched a pilot version of the **Faculty Innovation Grant Program**, designed to stimulate and bolster submission of competitive interdisciplinary grant proposals to federal agencies.

<table>
<thead>
<tr>
<th>PI &amp; UWDEPT</th>
<th>CO-PIs &amp; UWDEPTs</th>
<th>PROJECT TITLE</th>
<th>TOTAL AWARD</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Mike Brotherton, Physics &amp; Astronomy</em></td>
<td>Daniel Dale, Physics &amp; Astronomy Ruben Gamboa, Computer Science</td>
<td>Accelerating the computational investigation of supermassive sub-parsec binary black holes candidates</td>
<td>$45,000</td>
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<tr>
<td>Carrie Eberle, Plant Sciences</td>
<td>Steve Paisley, Animal Science</td>
<td>Establishing <em>Crotalaria juncea</em> as a new forage crop for the sustainable intensification of the Wyoming agricultural industry</td>
<td>$89,992</td>
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<tr>
<td>Brian Leonard, Chemistry</td>
<td>Elliott Hulley, Chemistry William Rice, Physics &amp; Astronomy John Ackerman, Chemical Engineering</td>
<td>Understanding intercalation chemistry to design novel 2D materials</td>
<td>$90,000</td>
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<tr>
<td>Merav Ben-David, Zoology &amp; Physiology</td>
<td>Brian Cherrington, Zoology &amp; Physiology Vikram Chhatre, Molecular Biology</td>
<td>Genomic analyses of embryonic diapause in the Musteloida with an eye towards improving assisted reproductive technologies</td>
<td>$77,366</td>
</tr>
<tr>
<td>Amy Navrati, Zoology &amp; Physiology</td>
<td>Jay Gatlin, Molecular Biology</td>
<td>Understanding how the tubulin code regulates reproductive function of gonadotrope cells</td>
<td>$90,000</td>
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<tr>
<td>John Oakey, Chemical Engineering</td>
<td>Daniel Levy, Molecular Biology</td>
<td>Nuclear size in 3D cancer cell migration</td>
<td>$52,000</td>
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<tr>
<td>Ginger Paige, ESM</td>
<td>Melanie Murphy, ESM Fabian Nippgen, ESM Brent Ewens, Botany</td>
<td>Tracking eco-hydrologic change in the hyporheic zone to improve water resource management</td>
<td>$88,740</td>
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<tr>
<td><strong>Daniel Laughlin, Botany</strong></td>
<td>Dan Tekiela, Plant Sciences</td>
<td>The first experimental test of a new paradigm in ecological restoration</td>
<td>$69,232</td>
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<tr>
<td>Catherine Wagner, Botany</td>
<td>Bryan Shuman, Geology &amp; Geophysics Amy Krist, Zoology &amp; Physiology Annika Walters, WY Game &amp; Fish Cooperative Unit</td>
<td>The tempo of ecological and evolutionary change: response to predator introduction in alpine lakes of the Wind River Range</td>
<td>$89,537</td>
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<td>Don Jarvis, Molecular Biology</td>
<td>Jason Gigle, Molecular Biology Jonathan Fox, Veterinary Sciences</td>
<td>Assessing the impact of a viral contaminant on the biosafety profile of the baculovirus-insect cell system</td>
<td>$89,580</td>
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<tr>
<td>Simone Runyon, Geology &amp; Geophysics</td>
<td>Susan Swapp, Geology &amp; Geophysics Erin Philips, SER Carol Frost, Geology &amp; Geophysics Robert Gregory, WY State Geological Survey</td>
<td>REE enrichment in Wyoming Roll-Front uranium deposits</td>
<td>$89,996</td>
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<tr>
<td>Te-Yu Chien, Physics &amp; Astronomy</td>
<td>Maohang Fan, Petroleum Engineering and SER</td>
<td>Synthesizing graphene-related materials and carbon nanotubes from coal through microwave treatments</td>
<td>$90,000</td>
</tr>
<tr>
<td>Ellen Currano, Botany</td>
<td>Laura Viette, Geology &amp; Geophysics Mark Clementz, Geology &amp; Geophysics</td>
<td>Back to the future: interdisciplinary research on 50 million year old ecosystems will allow WY to better prepare for the year 2140</td>
<td>$82,931</td>
</tr>
</tbody>
</table>

These seed grants are expected to encourage 30+ competitive grant proposals over the next two years to federal agencies including NSF, DOE, DOD, USDA, NIH, & USGS. **Seed Grants often yield a 20 to 1 return.**
SI Programs Yet to be Realized

- Learning Actively Mentoring Program
- Wyoming Research Scholars Program
- PhD Fellows Program
- Faculty Innovation Grant Program
Key Metrics: Student Enrollments and Degrees Awarded in SI Departments
Future Connections & Collaborations
(Building Strength on Strength)

Entrepreneurship

Biodiversity Institute

Honors College

SI Programs

AMK

Wyoming School-University Partnership

INBRE
Questions?