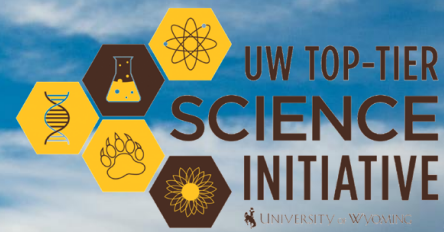


Science Initiative Programs Update Presentation to the UW Board of Trustees

Mark Lyford
16 July, 2020



2019-20 ANNUAL REPORT



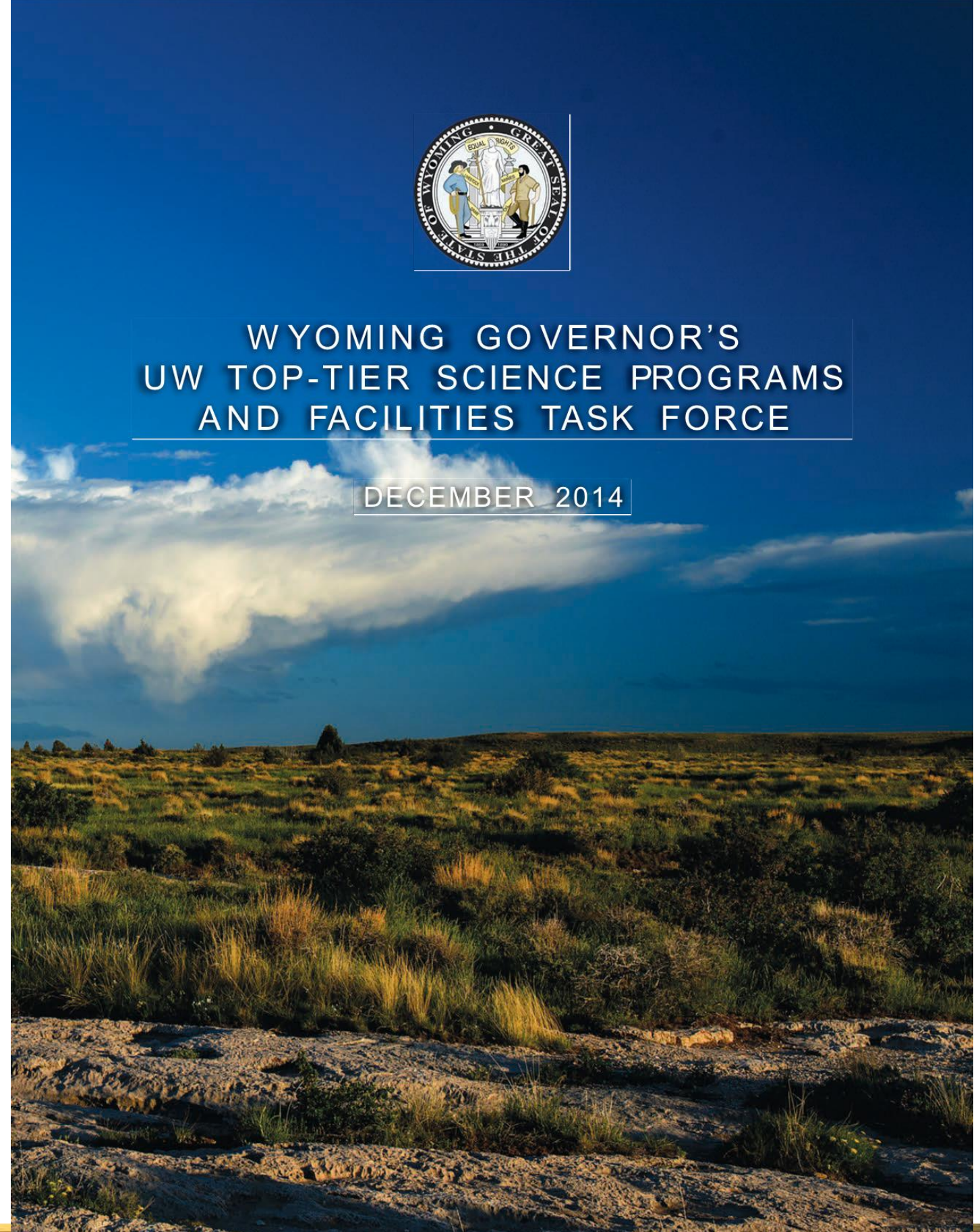
UNIVERSITY OF WYOMING

Science Initiative Overview:



WYOMING GOVERNOR'S
UW TOP-TIER SCIENCE PROGRAMS
AND FACILITIES TASK FORCE

DECEMBER 2014



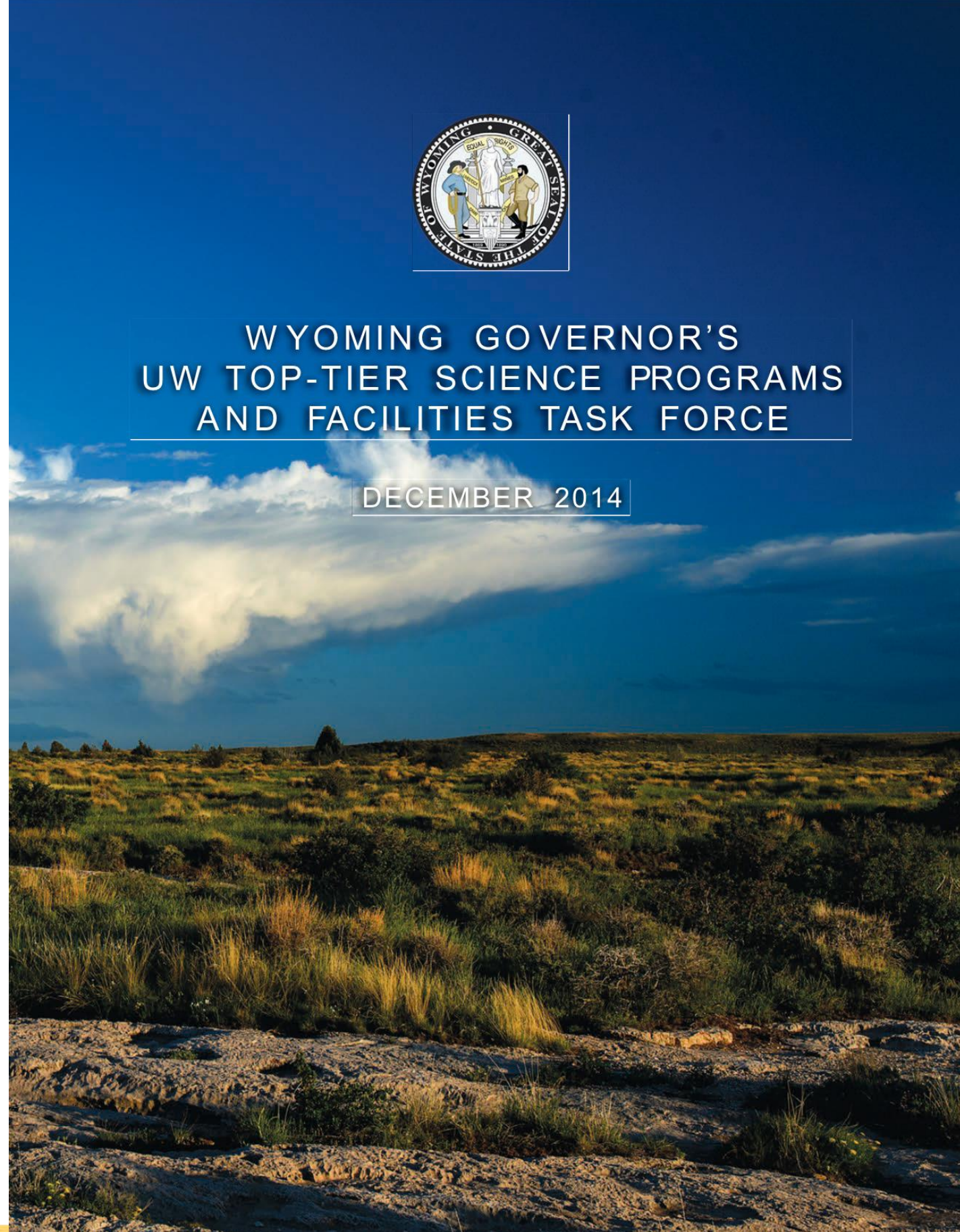
UNIVERSITY OF WYOMING

Science Initiative Overview: Transformative Facilities & Programs



WYOMING GOVERNOR'S
UW TOP-TIER SCIENCE PROGRAMS
AND FACILITIES TASK FORCE

DECEMBER 2014



SI Overview: Facilities

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



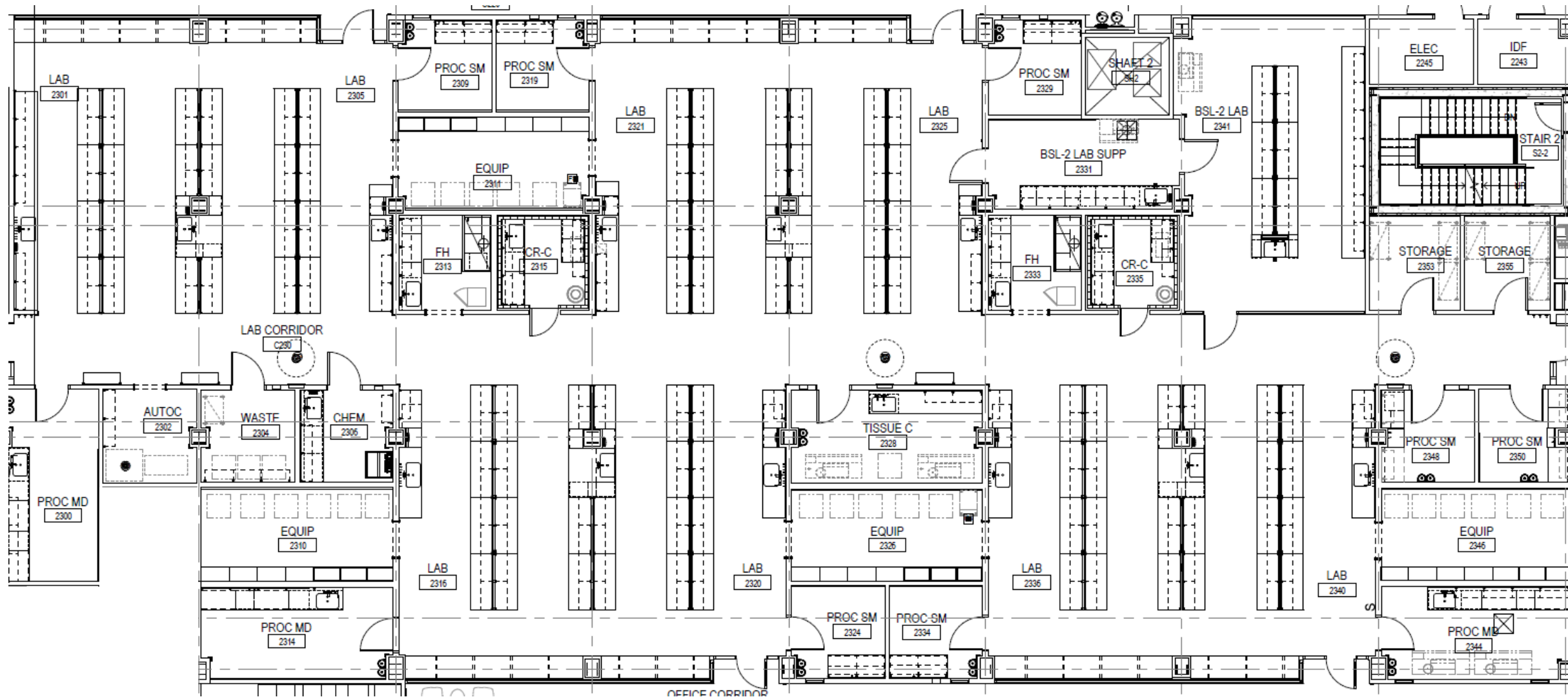


 UNIVERSITY OF WYOMING

SI Facilities

Interdisciplinary Research Programs and Support Facilities

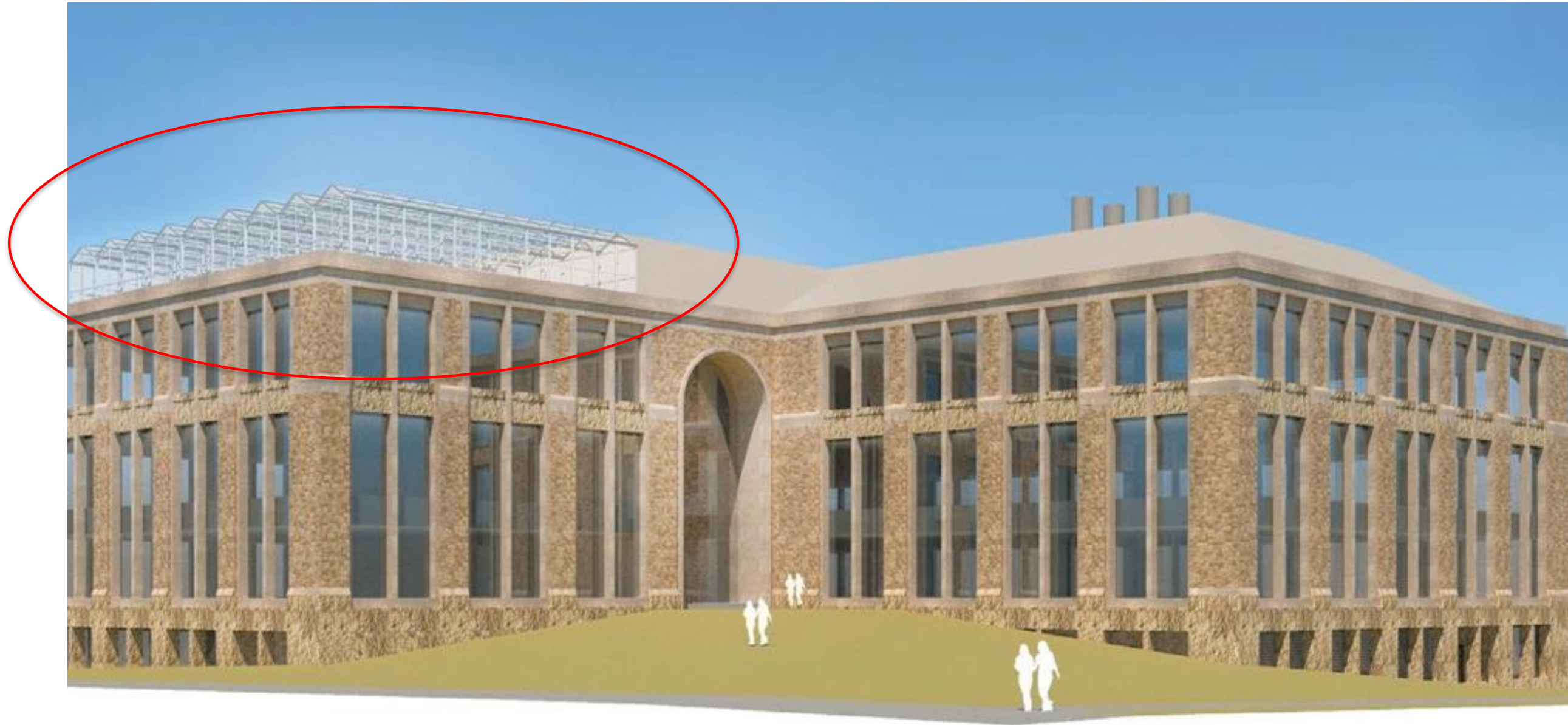
- Shared Labs for Interdisciplinary Research in Cell Biology, Organismal Biology, and Earth Systems Biology – spanning spatial and temporal scales



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



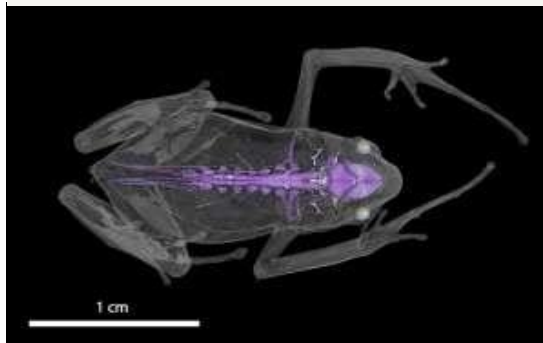
SI Facilities

Interdisciplinary Research Programs and Support Facilities

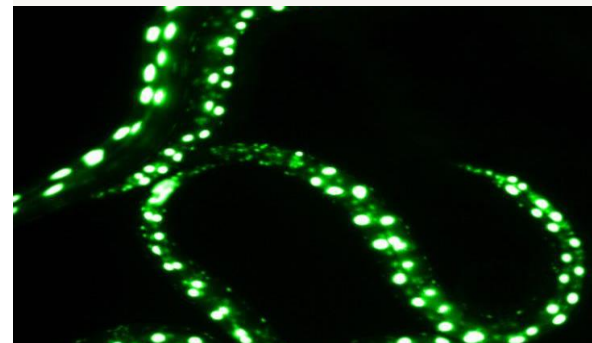
- New Core Facility – Center for Advanced Scientific Instrumentation



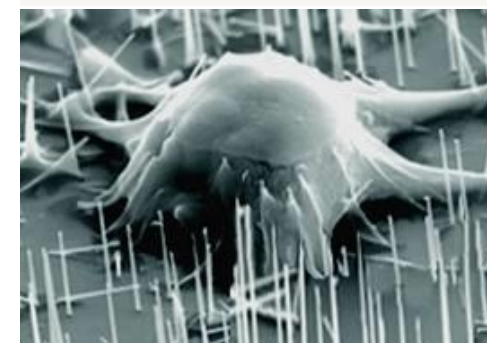
Organism-scale imaging facilities



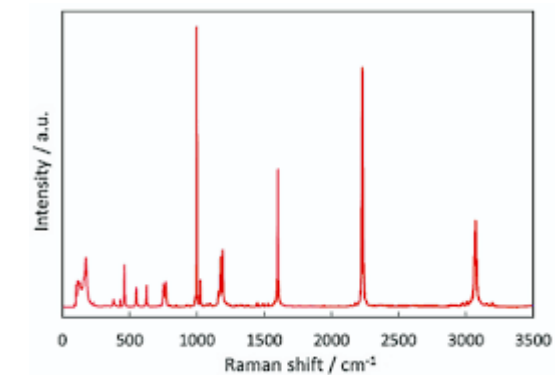
Light microscopy core



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

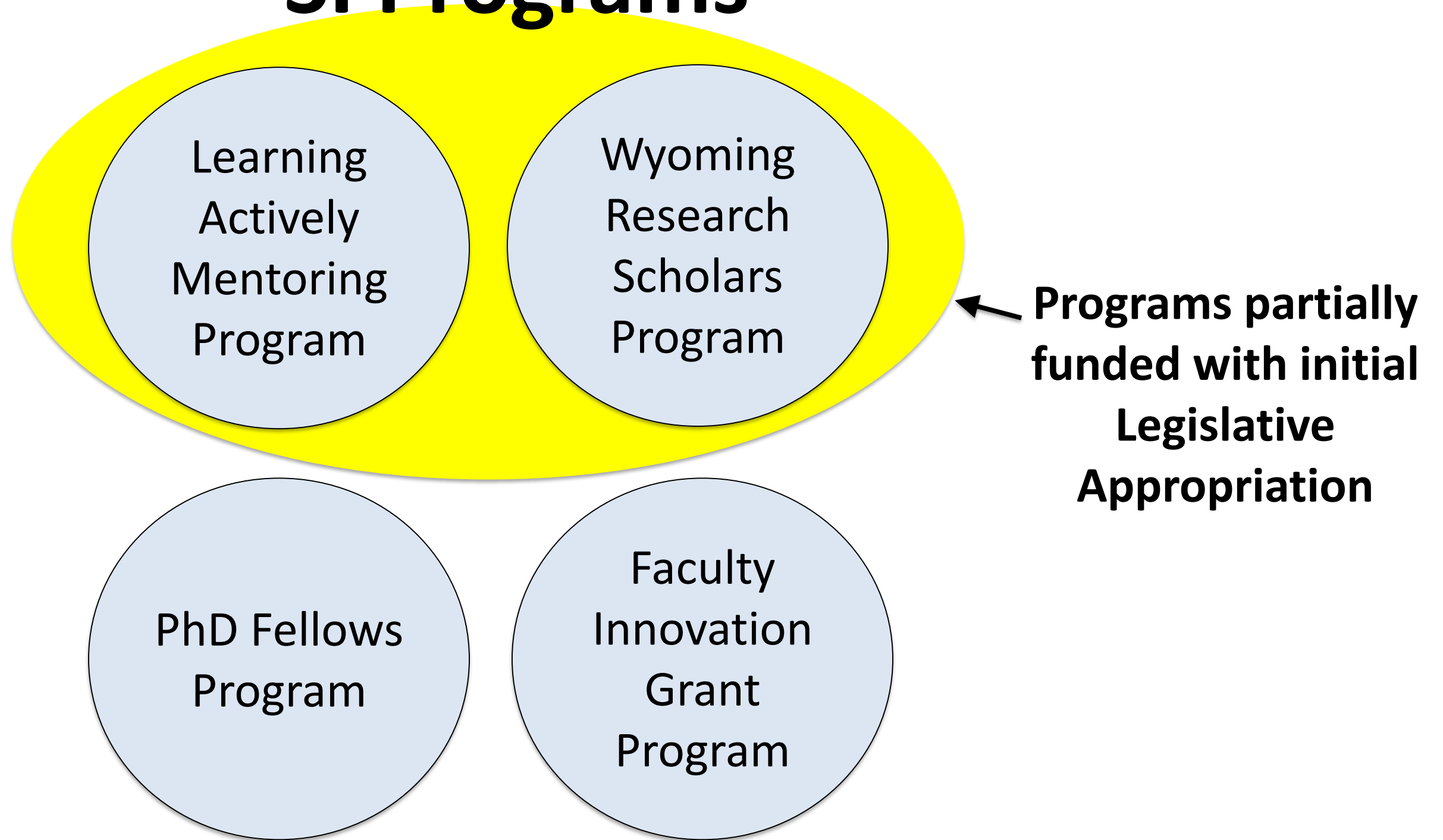
Wyoming
Research
Scholars
Program

PhD Fellows
Program

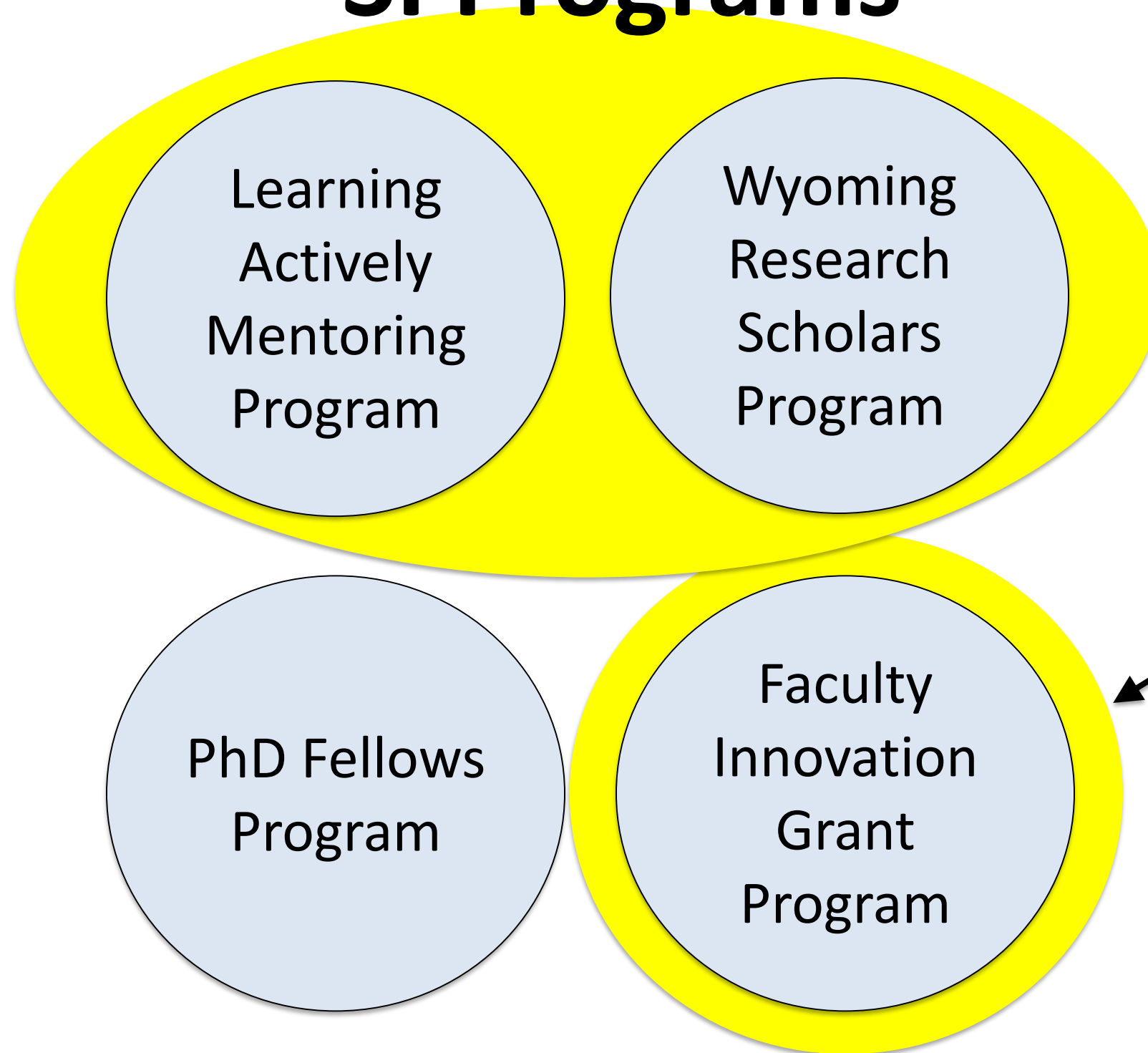
Faculty
Innovation
Grant
Program



SI Programs



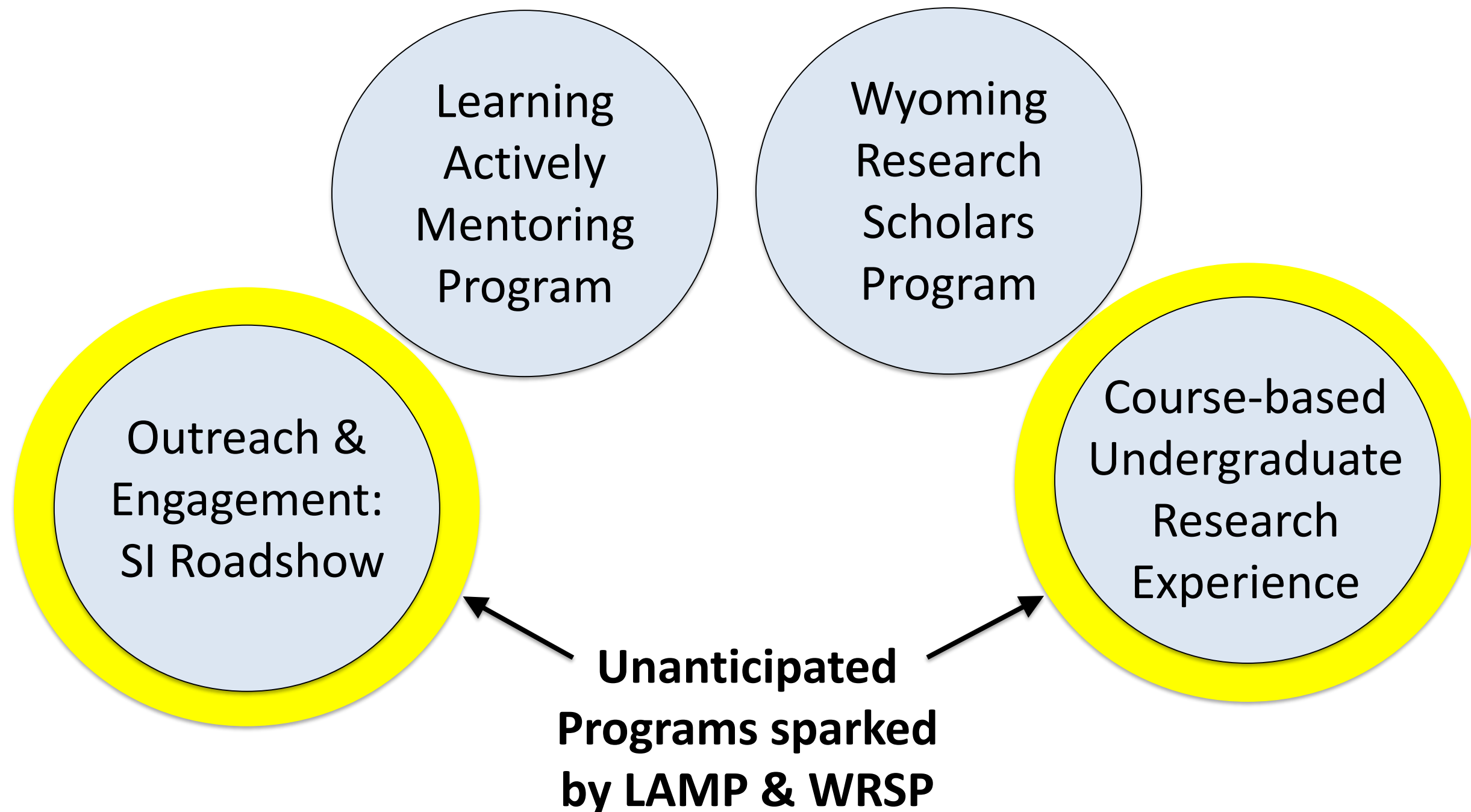
SI Programs

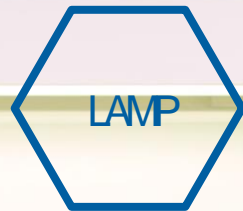


**One-time Legislative
Appropriation**



SI Programs





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





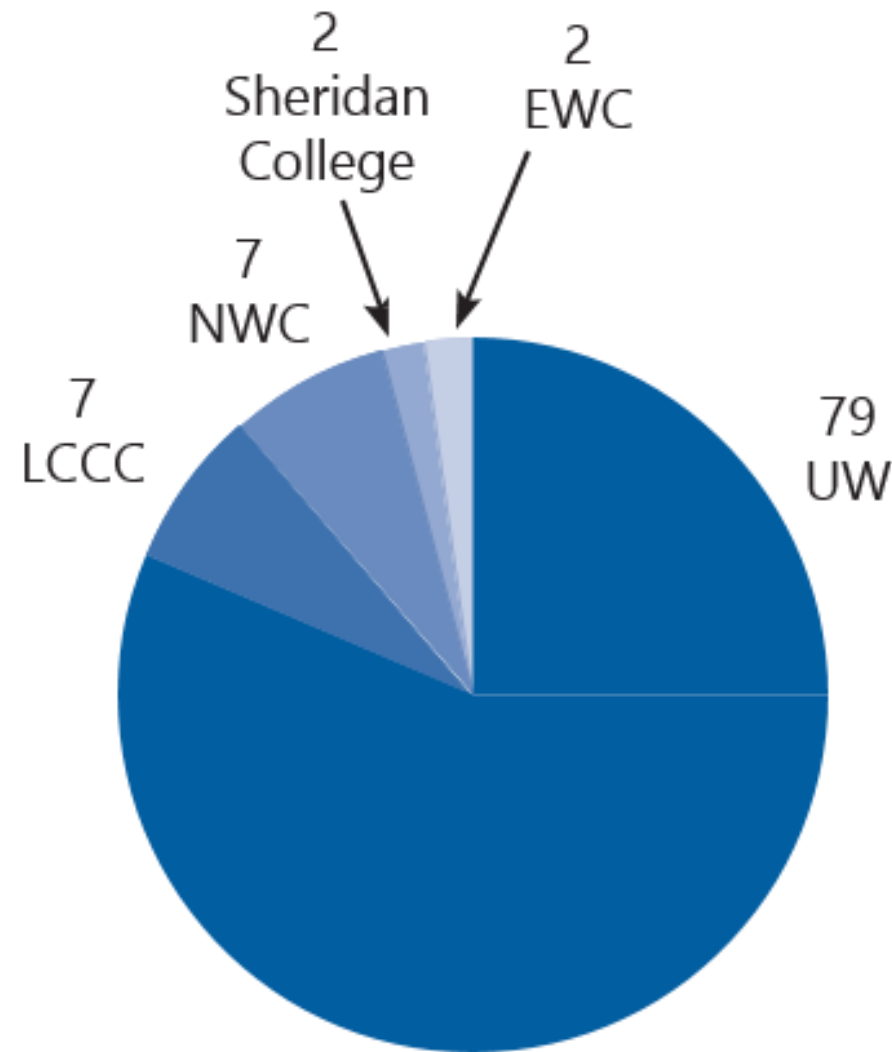
LAMP is a comprehensive, sustained mentoring and professional development program with an emphasis on how to best adopt active learning strategies in large-scale active learning classrooms at UW and in classrooms across the state's community colleges.





LAMP Fellows Through Time (2016-2020)

97
total fellows
from
5
WY institutions of
higher education



Number of educators trained by institution.

Since 2016, **79** LAMP-trained educators at UW have impacted

16,617
students in
342
active learning classes



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



Learning Assistant leads small group student learning.

This academic year,

26

UW students have been
LAs for

37

active learning courses



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)

SI'S SIGNATURE
PROGRAMS



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

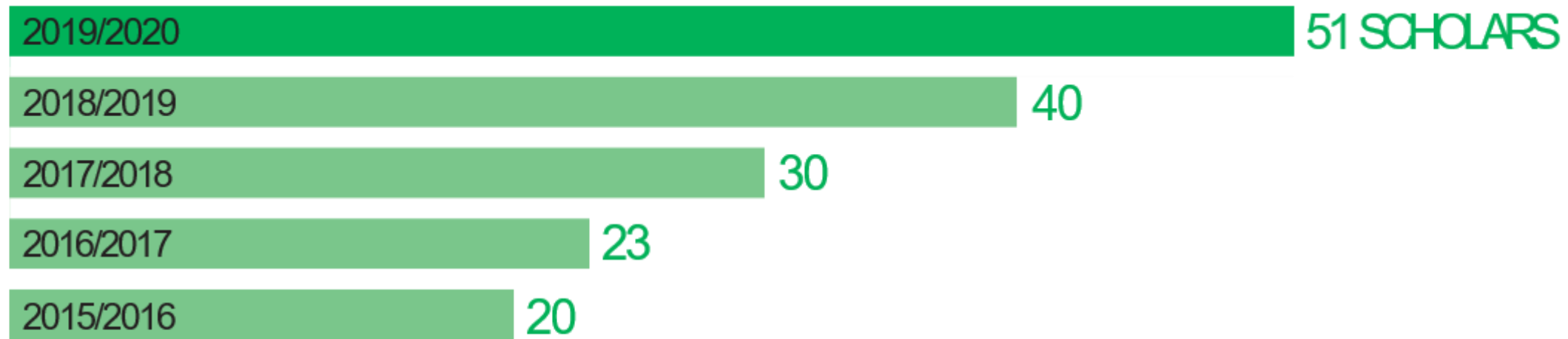


The **Wyoming Research Scholars Program (WRSP)** pairs undergraduate students with faculty mentors to participate in their own cutting-edge research project starting as early as their freshman year. Research experiences through WRSP build confidence and competence in young scholars at a formative stage in their training.





Wyoming Research Scholars Through Time (2016-2020)



101
total scholars

FROM

3

countries

AND

24

US states and
territories

61

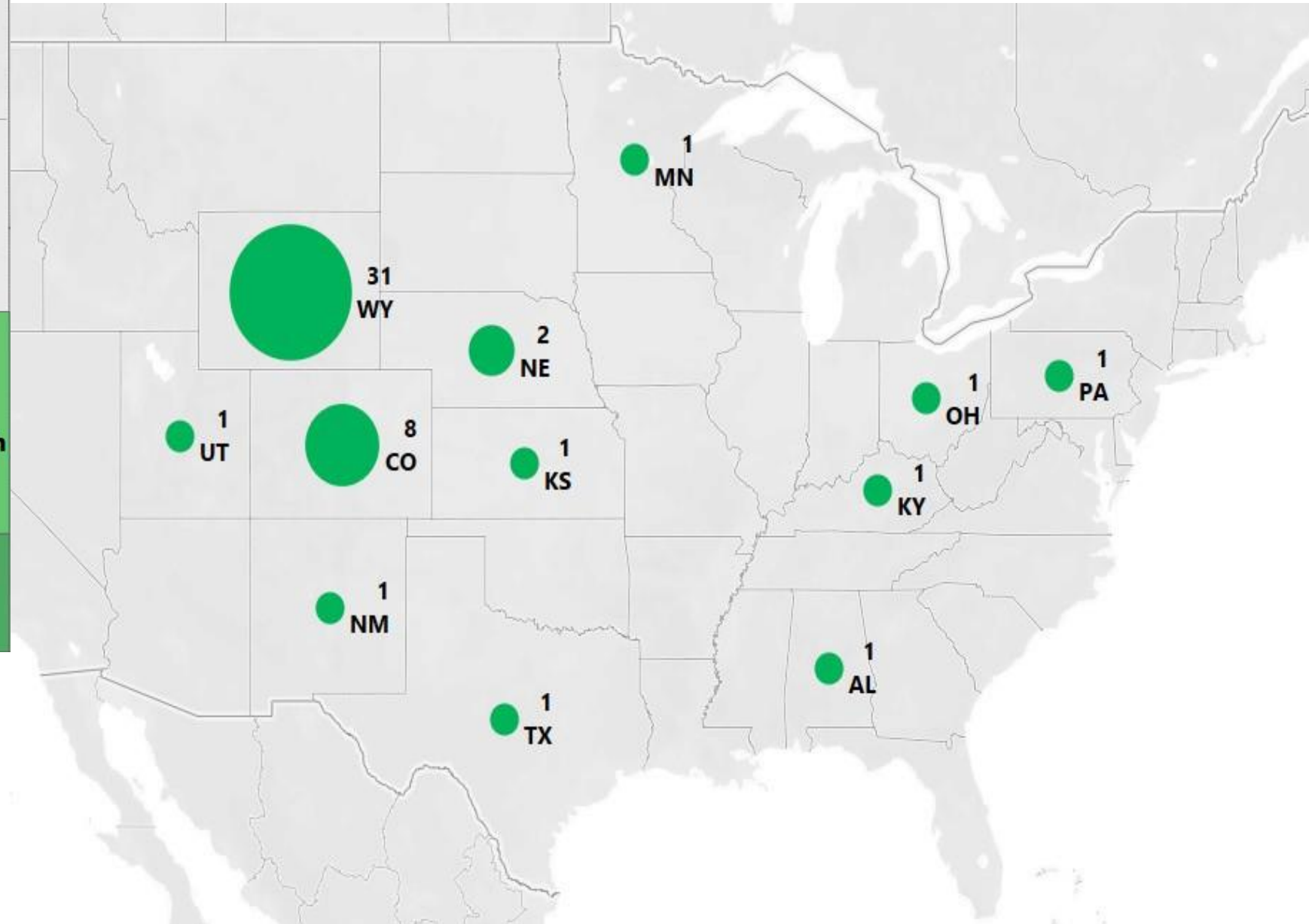
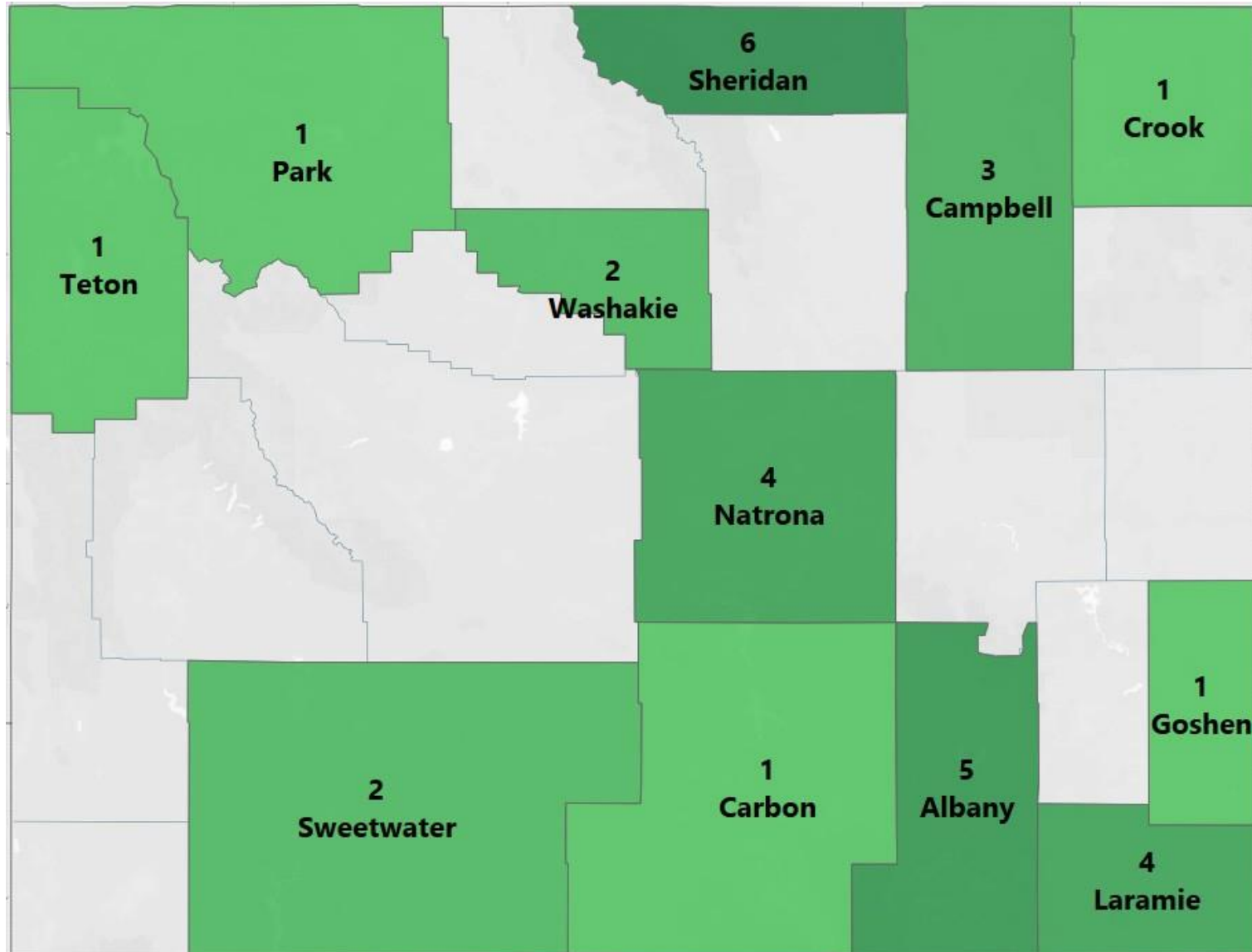
scholars from

17

Wyoming counties



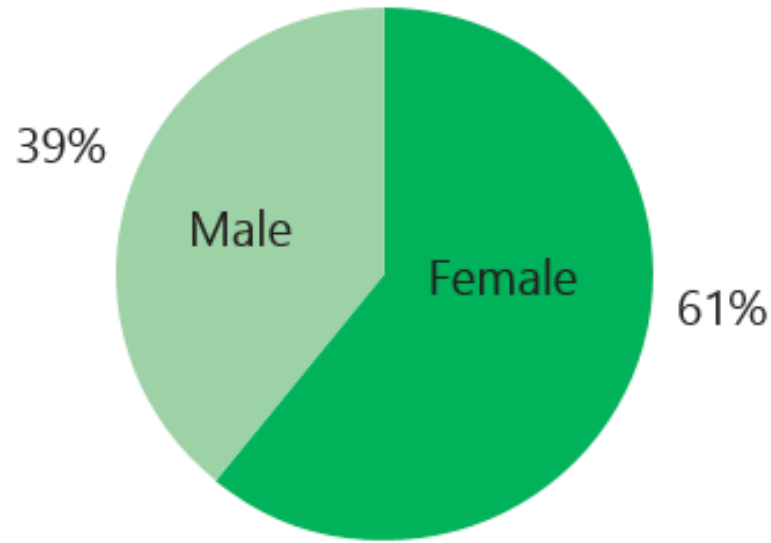
Wyoming Research Scholars (2019/2020)



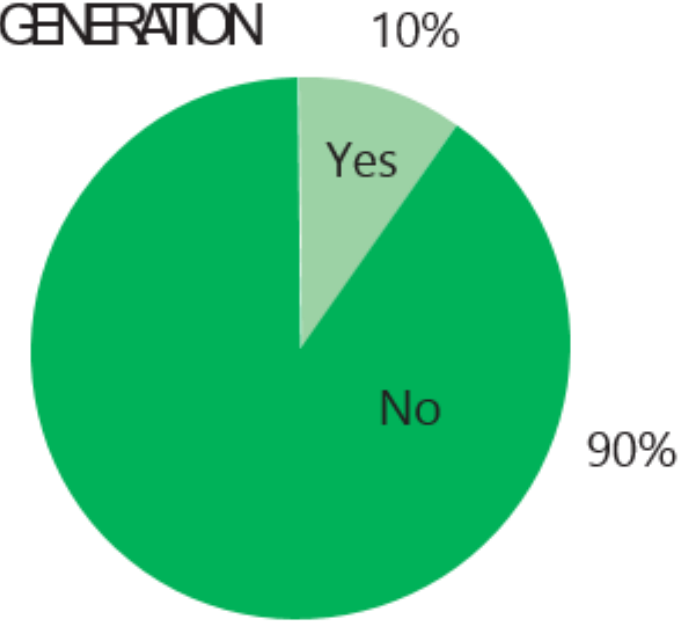


WRSP scholars did
10,928
hours of research

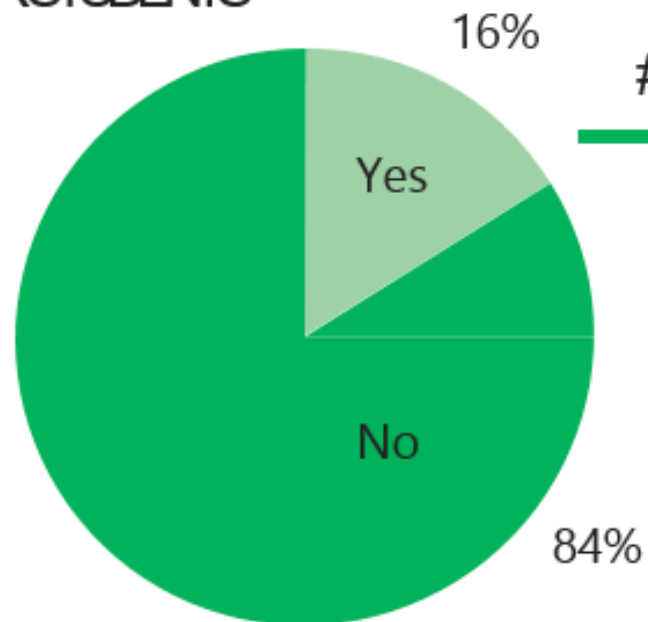
GENDER



FIRST GENERATION

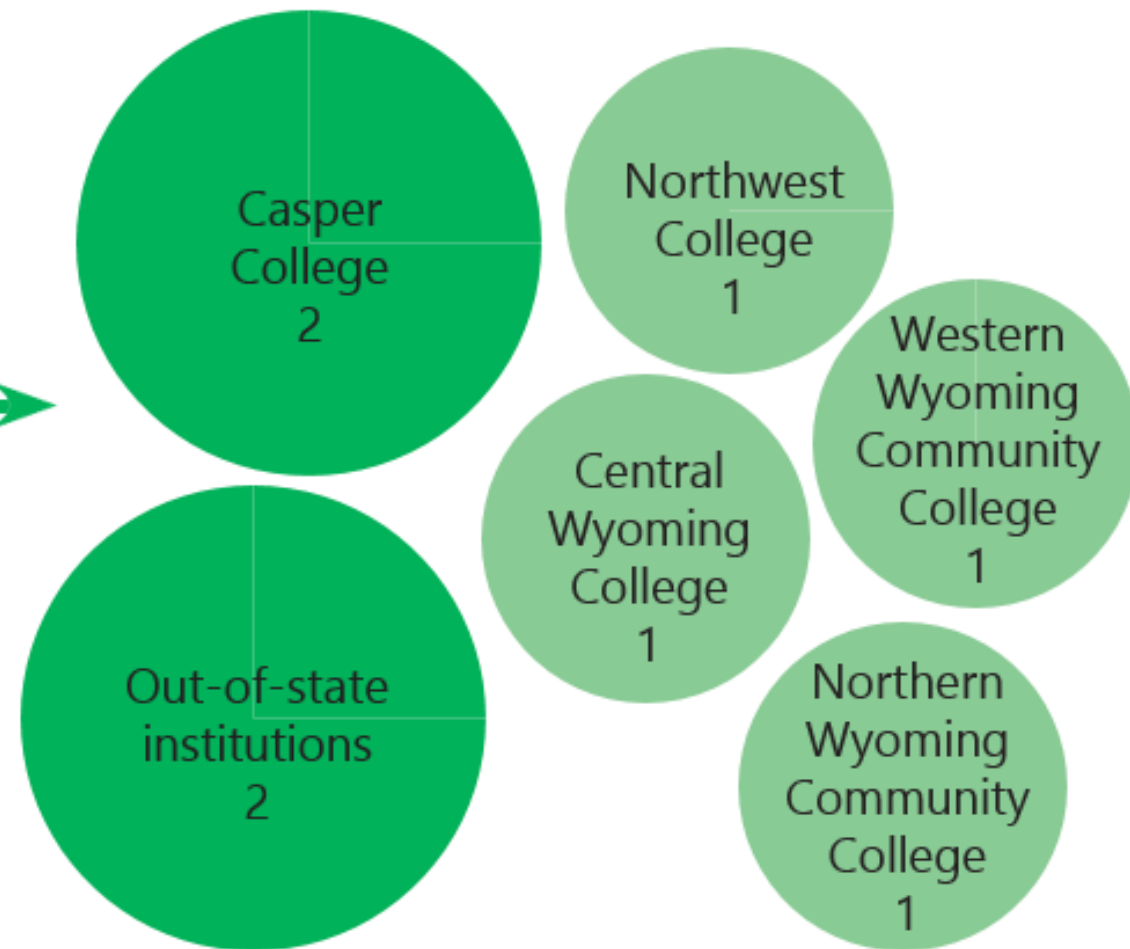


TRANSFER STUDENTS



OF SCHOLARS

FROM





WRSP Presentations & Publications (2019/2020)

PRESENTATION TITLE	EVENT/CONFERENCE NAME
Selection of an Optimal Invertebrate Taxon as a Baseline in Stable Isotope Analyses of Stream Food Webs	American Fisheries Society & The Wildlife Society Conference
Patterns of Gene Expression Underlying Salt Stress Tolerance in Vitis	Western INBRE Conference
What Brain Sites are Involved in Decision Making?	NIH IDeA Western Regional Conference
Decision Making: Identifying the Pathways used in Cognitive Decision Making	NIH IDeA Western Regional Conference
Individual Distinctiveness in Vocalizations of a Suboscine Songbird	American Ornithological Society Conference
New Approaches to Hydrocarbon Feedstock Conversion: Bifunctional Pd Complexes for Tunable Heterolytic C-H Activation	American Chemical Society National Meeting & Exposition
Bifunctional Pd Complexes for Tunable Heterolytic C-H Activation and Alkene Dimerization	American Chemical Society SWRM Regional Meeting

ARTICLE TITLE	JOURNAL TITLE
Identification and Characterization of the Lactating Mouse Mammary Gland Citrullinome	International Journal of Molecular Sciences
Selective Modification of Tryptophan Residues in Peptides and Proteins Using a Biomimetic Electron Transfer Process	Journal of the American Chemical Society
Variable Hybridization Outcomes in Trout are Predicted by Historical Fish Stocking and Environmental Context	Molecular Ecology

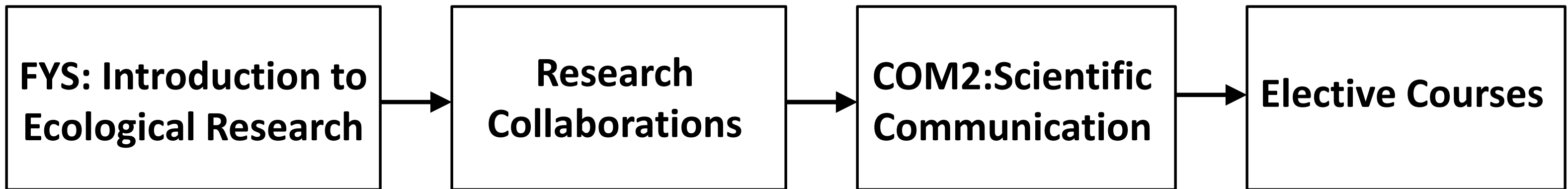
SI'S SIGNATURE
PROGRAMS



Course Based Undergraduate Research Experiences



Course-Based Undergraduate Research Experiences



SI'S SIGNATURE PROGRAMS



8

9

Is water a source of food for plants and animals? Why or why not?

A. Yes, because food is anything that is needed by plants and animals, and water is needed by plants and animals.

B. Yes, because food is anything that provides energy to plants and animals, and water provides energy to plants and animals.

No, because liquids cannot be food for plants and animals, and water is a liquid.

No, because food must contain molecules that have carbon atoms linked to other carbon atoms, and water molecules do not have carbon atoms linked to other carbon atoms.



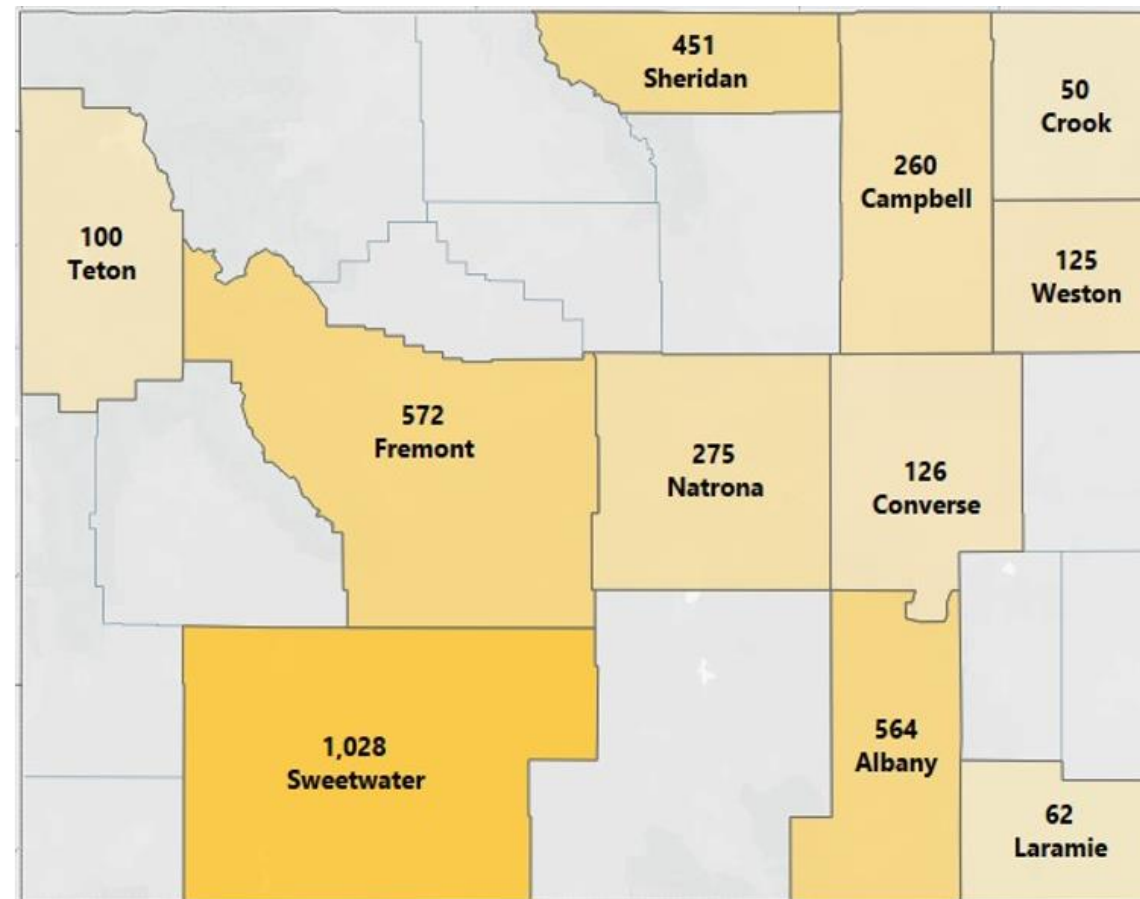
SCIENCE INITIATIVE ROADSHOW



SI Roadshow Through Time (2017-2020)

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

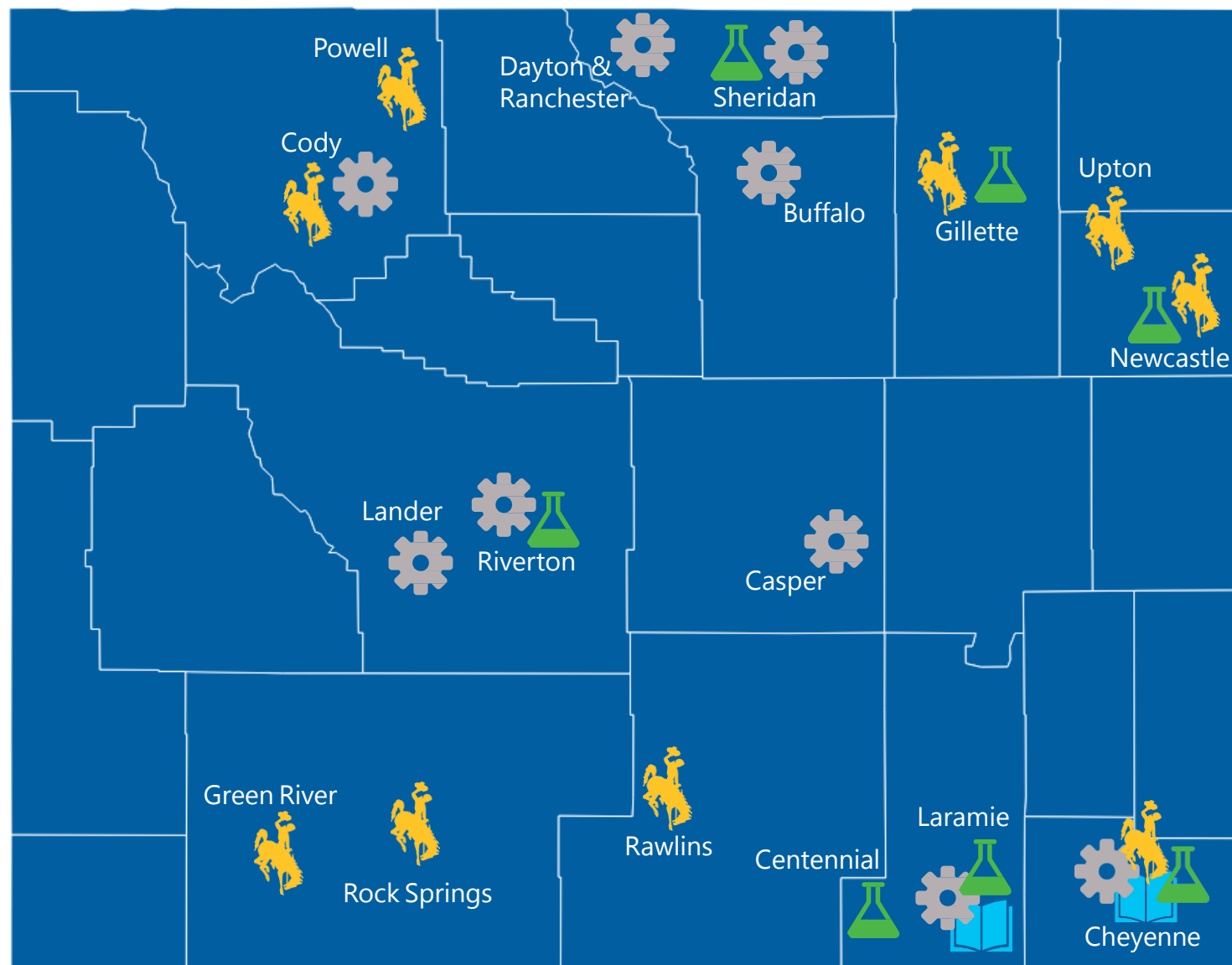
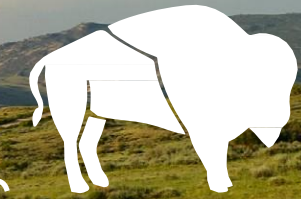
Riverton Community-Based Learning Project

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	1/14/2020 - Riverton
9/19/2019 - Gillette	1/15/2020 - Riverton
10/7/2019 - Riverton	2/3/2020 - Laramie
11/4/2019 - Riverton	2/19/2020 - Sheridan
11/15/2019 - Centennial	2/24/2020 - Cheyenne
12/5/2019 - Newcastle	



"WYOMING NEEDS MORE COWBOYS" - Alumni events and student assemblies

9/19/2019 - Gillette	12/5/2019 - Upton
10/10/2019 - Cody	1/25/2020 - Rock Springs
10/10/2019 - Powell	1/25/2020 - Green River
11/7/2019 - Rawlins	2/20/2020 - Cheyenne
12/5/2019 - Newcastle	



SERVICE CLUB VISITS - Bringing SI stories to Rotary and Kiwanis clubs

10/10/2019 - Cody Rotary	1/14/2020 - Riverton Rotary
12/12/2019 - Laramie Rotary	1/15/2020 - Lander Rotary
1/7/2020 - Laramie Kiwanis	1/21/2020 - Cheyenne After Hours Rotary
1/8/2020 - Laramie Sunrise Rotary	1/28/2020 - Cheyenne Sunrise Rotary
1/13/2020 - Casper Rotary	2/6/2020 - Cheyenne Kiwanis
1/13/2020 - Buffalo Kiwanis	2/20/2020 - Sheridan Rotary
1/13/2020 - Ranchoester & Dayton 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



FACULTY INNOVATION GRANT PROGRAM

SI'S SIGNATURE
PROGRAMS

SEED
GRANTS





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.

PI & UWDEPT	CO-PIs & UWDEPTS	PROJECT TITLE	TOTAL AWARD
*Mike Brotherton , Physics & Astronomy	Daniel Dale , Physics & Astronomy Ruben Gamboa , Computer Science	Accelerating the computational investigation of supermassive sub-parsec binary black holes candidates	\$45,000
Carrie Eberle , Plant Sciences	Steve Paisley , Animal Science	Establishing <i>Crotalaria juncea</i> as a new forage crop for the sustainable intensification of the Wyoming agricultural industry	\$89,992
Brian Leonard , Chemistry	Elliott Hulley , Chemistry William Rice , Physics & Astronomy John Ackerman , Chemical Engineering	Understanding intercalation chemistry to design novel 2D materials	\$90,000
Merav Ben-David , Zoology & Physiology	Brian Cherrington , Zoology & Physiology Vikram Chhatre , Molecular Biology	Genomic analyses of embryonic diapause in the Musteloidea with an eye towards improving assisted reproductive technologies	\$77,366
Amy Navratil , Zoology & Physiology	Jay Gatlin , Molecular Biology	Understanding how the tubulin code regulates reproductive function of gonadotrope cells	\$90,000
John Oakey , Chemical Engineering	Daniel Levy , Molecular Biology	Nuclear size in 3D cancer cell migration	\$52,000
Ginger Paige , ESM	Melanie Murphy , ESM Fabian Nippgen , ESM Brent Ewers , Botany	Tracking eco-hydrologic changes in the hyporheic zone to improve water resource management	\$88,740
**Daniel Laughlin , Botany	Dan Tekiela , Plant Sciences	The first experimental test of a new paradigm in ecological restoration	\$69,232
Catherine Wagner , Botany	Bryan Shuman , Geology & Geophysics Amy Krist , Zoology & Physiology Annika Walters , WY Game & Fish Cooperative Unit	The tempo of ecological and evolutionary change: response to predator introduction in alpine lakes of the Wind River Range	\$89,537

PI & UWDEPT	CO-PIs & UWDEPTS	PROJECT TITLE	TOTAL AWARD
Don Jarvis , Molecular Biology	Jason Gigle , Molecular Biology Jonathan Fox , Veterinary Sciences	Assessing the impact of a viral contaminant on the biosafety profile of the baculovirus-insect cell system	\$89,580
Simone Runyon , Geology & Geophysics	Susan Swapp , Geology & Geophysics Erin Philips , SER Carol Frost , Geology & Geophysics Robert Gregory , WY State Geological Survey	REE enrichment in Wyoming Roll-Front uranium deposits	\$89,996
Te-Yu Chien , Physics & Astronomy	Maohang Fan , Petroleum Engineering and SER	Synthesizing graphene-related materials and carbon nanotubes from coal through microwave treatments	\$90,000
Ellen Currano , Botany	Laura Viette , Geology & Geophysics Mark Clementz , Geology & Geophysics	Back to the future: interdisciplinary research on 50 million year old ecosystems will allow WY to better prepare for the year 2140	\$82,931

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

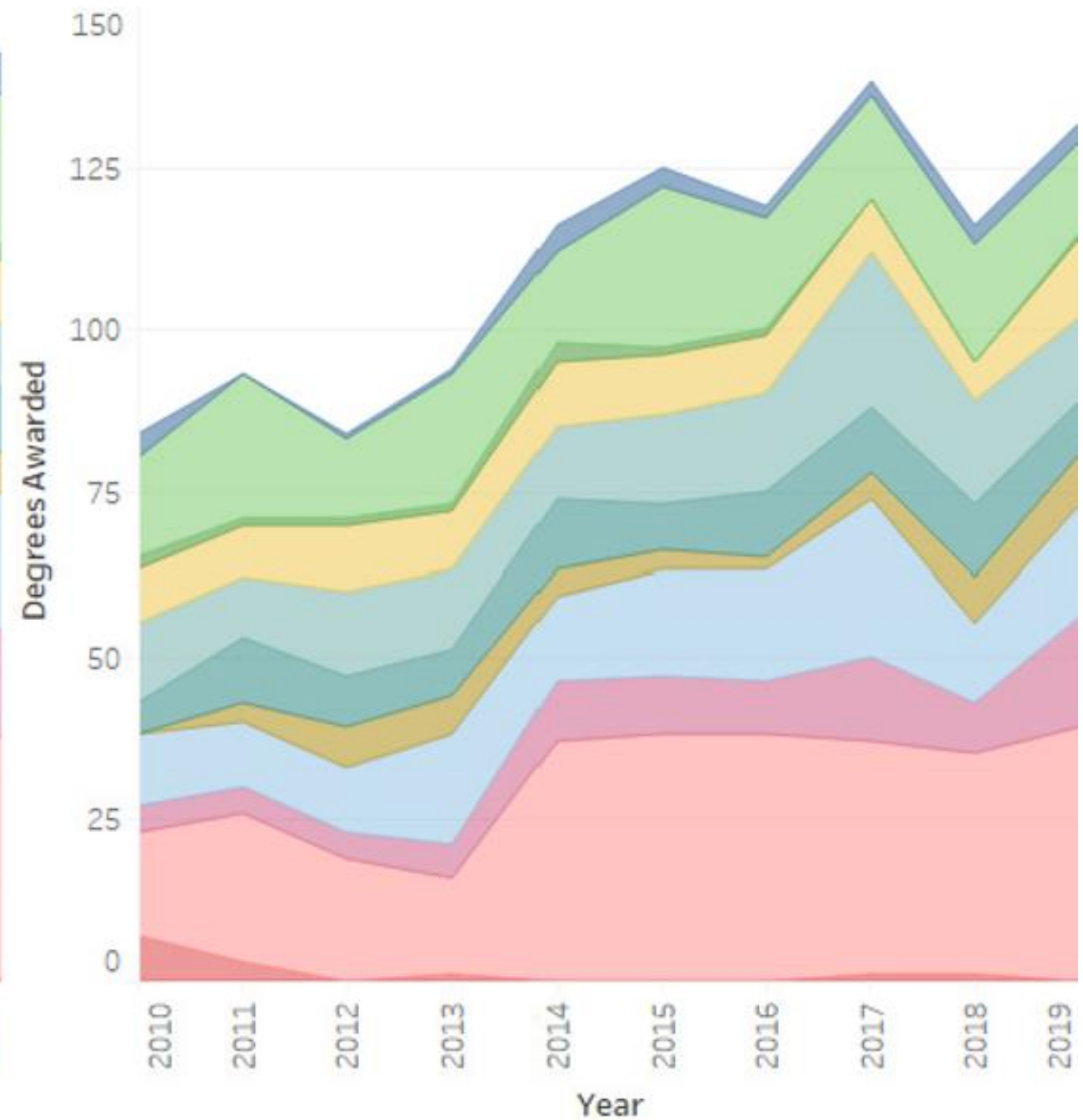
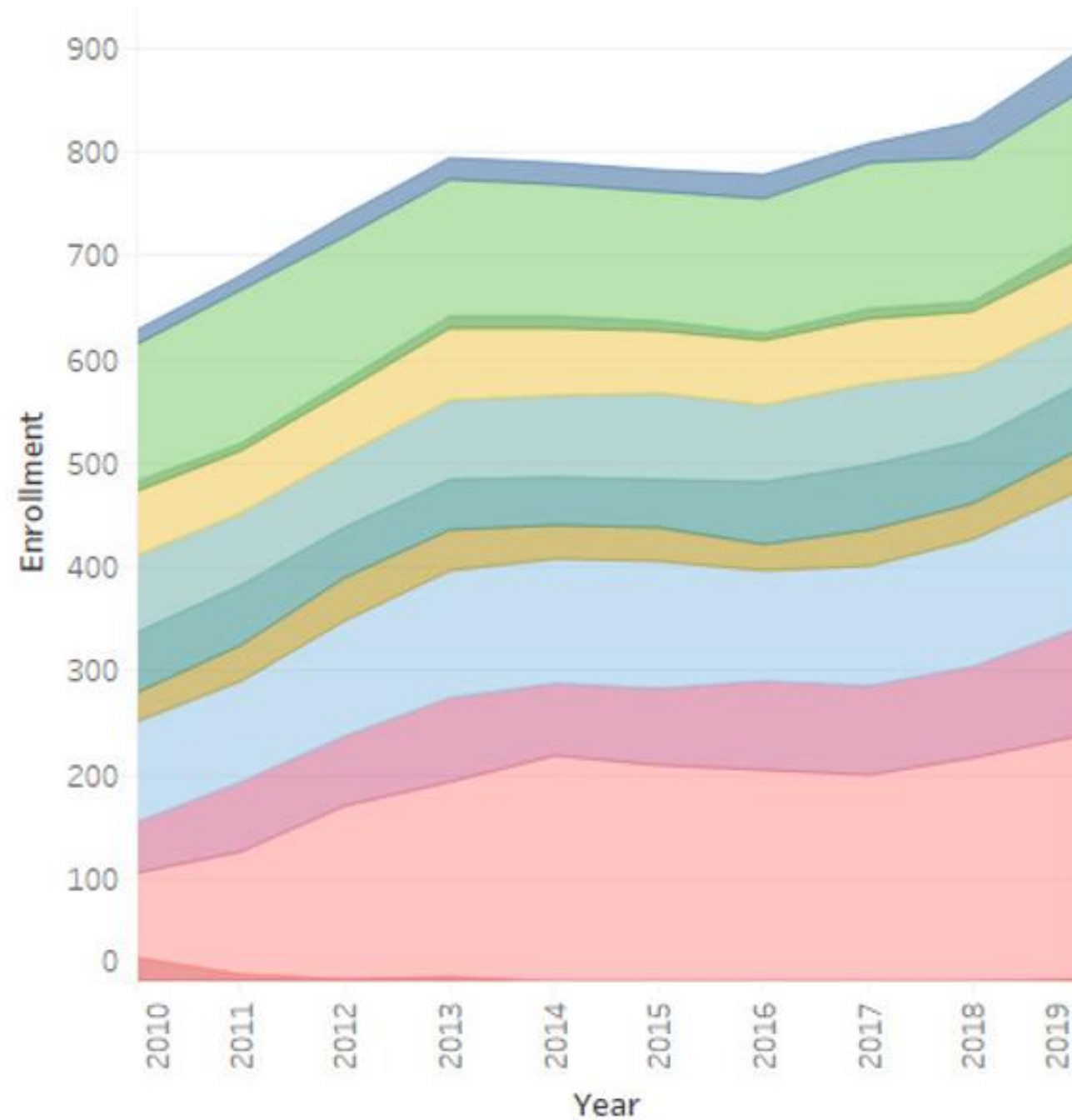
Wyoming
Research
Scholars
Program

PhD Fellows
Program

Faculty
Innovation
Grant
Program



Key Metrics: Student Enrollments and Degrees Awarded in SI Departments

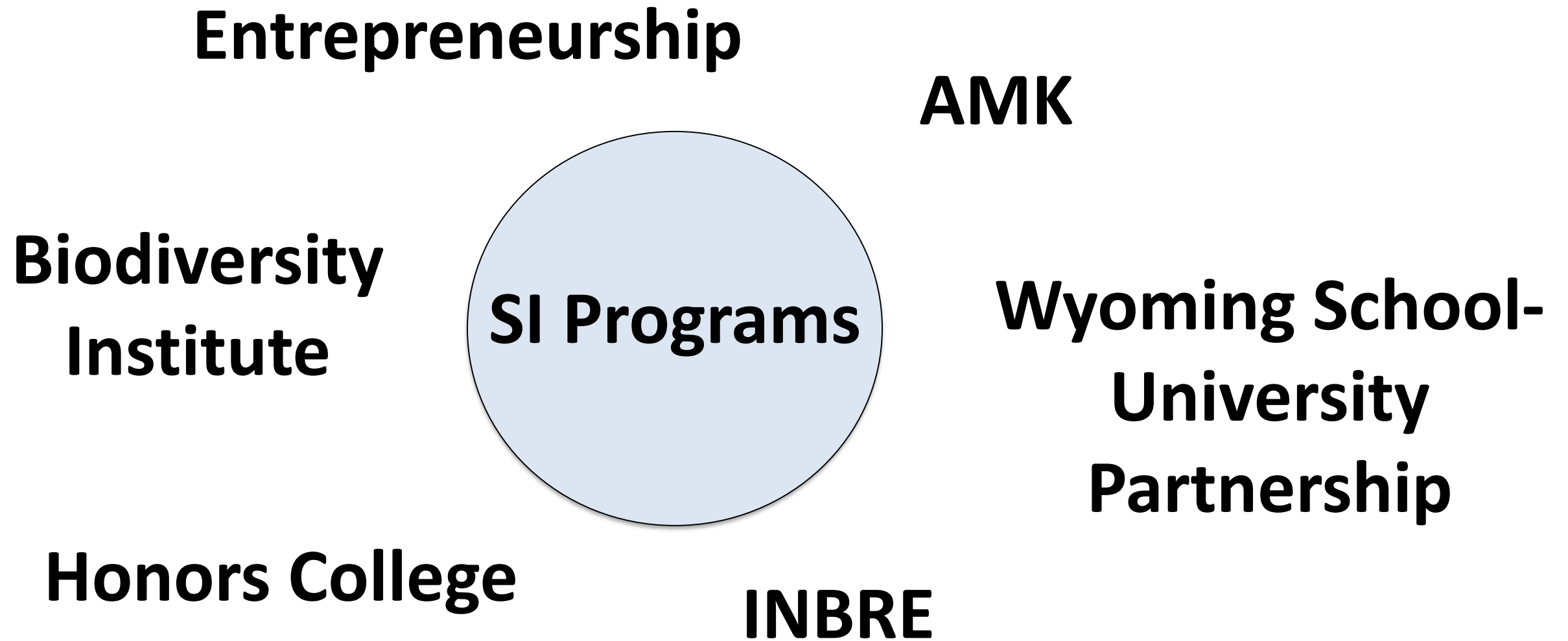


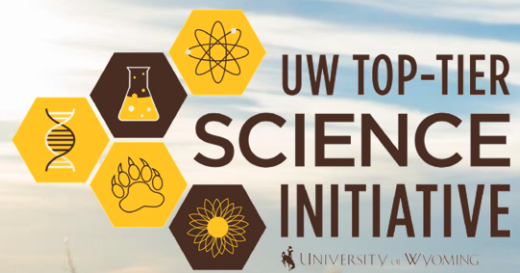
Program

- Astronomy & Astrophysics
- Microbiology
- Zoology
- Biology
- Molecular Biology
- Physiology
- Botany
- Physics
- Zoology & Physiology
- Chemistry
- Wildlife & Fisheries Biology & Management

Future Connections & Collaborations

(Building Strength on Strength)





Questions?