



INSPIRED DISCOVERIES



**RESEARCH REPORT
2018**



University of Idaho

A Growing Research Enterprise that Meets Society's Needs

A MESSAGE FROM THE VICE PRESIDENT



In my second year at the University of Idaho, I've had both the honor and pleasure of seeing our research institution significantly expand its research enterprise. It has been another stellar year for the University of Idaho, and I hope you will enjoy reading our 2018 Research Report: Inspired Discoveries. In addition to our numbers, this report highlights some of the amazing projects and the range of research, scholarship and creative activities that are ongoing at the University of Idaho.

Last year, we broke our \$100 million milestone, achieving \$102.5 million in total research expenditures. This year, we celebrate an additional growth, reaching the \$109.5 million mark, and all indications show we'll surpass \$110 million in research expenditures this coming year.

With this growth, we've invested in new technologies and infrastructure to help our researchers engage in more cutting-edge and cross-disciplinary research that addresses the needs of our society. We expanded both the capacity and capabilities of our research institutes, leveraging investments in new, high-tech equipment and in our distinguished researchers in order to accelerate the quality, efficiency and breadth of our research. These efforts solidified us as thought leaders in evolutionary sciences, aquaculture and water conservation.

Our new 60,000 square-foot Integrated Research and Innovation Center (IRIC) has been in operation for a full year, fostering interdisciplinary discovery at the intersections of education, law, arts and humanities, social science and the STEM (science, technology, engineering and mathematics) disciplines. The building is always brimming with activity in the labs, workspaces, hallways and open auditoriums—and is the perfect venue for research presentations, such as our newly launched Short and Sweet (SAS) Talk series.

Our partnerships are also growing as we engage and lead in new research collaborations with academic institutions, government agencies and industry. Both internal investments, as well as support from programs such as the Idaho Global Entrepreneurial Mission (IGEM), have sparked innovation and fostered research partnerships between university researchers and businesses in order to bring new technologies to market.

I'm proud of our faculty, students and staff, who tirelessly support our land-grant mission. The research, scholarship and creative activities at the University of Idaho help improve the quality of our lives and broaden our understanding of the world. Please celebrate with me. Go Vandals!

A handwritten signature in blue ink that reads "Janet E. Nelson".

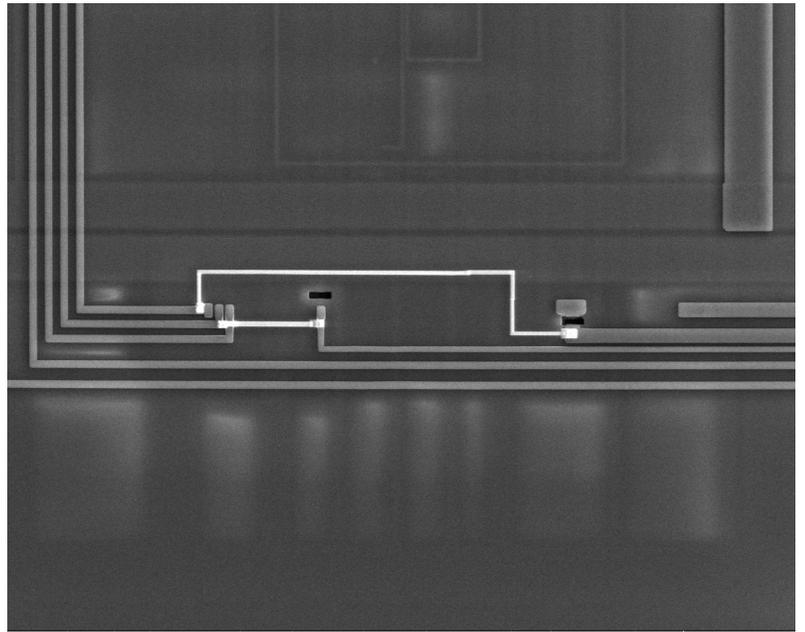
Janet E. Nelson, Ph.D.

Vice President for Research and Economic Development



Powerful New Instrument Sharpens Our View of the ‘Nanoverse’

Combining a powerful focused ion beam (FIB) with a scanning electron microscope (SEM) helps researchers engineer major breakthroughs, especially in the world of nanomaterials. Thanks in part to a \$340,000 grant from the M.J. Murdock Charitable Trust, the University of Idaho acquired a new FIB-SEM system. It is the first instrument of its kind in the Pacific Northwest region and is housed in the Integrated Research and Innovation Center (IRIC), U of I’s modern research facility and home to more than 20 dynamic interdisciplinary research projects. The instrument’s wide array of capabilities will play a central role in faculty and student research. The device gives engineers the capabilities to fabricate and repair tiny integrated circuits; gives biologists a vivid look inside plant and animal cells; and enables geologists to slice mineral samples as small as several microns wide.



Micro-surgery performed on a non-functioning integrated circuit; bright lines indicate circuit repairs

STEM Education Flows to Boise’s Youth through River Restoration Project

An innovative program designed to pair elementary students with river restoration researchers illustrates just one way that our university helps Idaho develop a STEM-educated workforce. Through funding from the National Science Foundation, associate professor Daniele Tonina and professor Ralph Budwig at U of I Boise’s Center for Ecohydraulics Research have combined their interest in using plants to clean and restore rivers with their desire to train future scientists.

“It has been a joy to work with the students who are with us each month,” said Budwig. “We hope their monthly hands-on participation will kindle a lifetime pursuit of learning and contribution in a STEM field, especially as related to stewarding our environment.”

The lab facilities located at the U of I Boise Center include a large-scale stream laboratory with the ability to manipulate flow and sediment load to better understand stream dynamics. The modern laboratory facilities and direct interaction with U of I faculty provide an immersive and engaging environment for the budding researchers, many of whom are from underrepresented groups. The experience has helped inspire them to pursue higher education degrees in science, technology, engineering and math.



Monthly outreach activity at Whitney Community Center in Boise



Educational flume on display at the Whitney Community Center's annual block party

New Research Center Established to Protect Plant, Animal and Human Health

Distinguished researchers Shirley Luckhart and Edwin Lewis joined our faculty in 2017. They established the Center for Health in the Human Ecosystem (CHHE), a multidisciplinary and collaborative entity in the College of Agricultural and Life Sciences. “This center is dedicated to improving the health of Idaho’s interconnected ecosystems and their inhabitants through excellence in teaching, research and outreach on the impacts of environmental change and land-water use on diseases, including those spread by insects and related organisms,” Lewis said. Through educational efforts, the CHHE aims to train a scientific workforce equipped for the highly diverse and integrated landscape of health, the environment and those living

in it. CHHE brings together research teams from diverse disciplinary backgrounds and address current and future threats to the health of our world.



Shirley Luckhart



Edwin Lewis

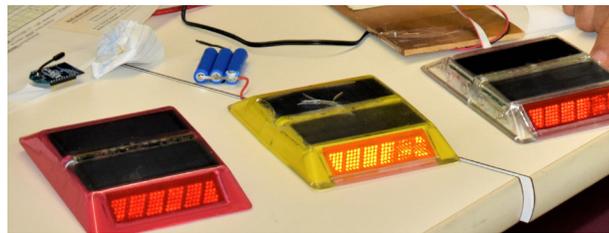
Harking ‘Bach’ to the 18th Century

Johann Sebastian Bach’s six cello suites have been beloved cornerstones of the cello’s repertoire for 300 years, but some may be surprised to learn that the modern four-stringed cello we know today was not standardized when he wrote them. “Suite No. 6 in D Major,” arguably one of Bach’s most complex, was written for a five-stringed cousin of the cello that could have taken one of several forms. The high E-string on this instrument could facilitate multi-note chords and high pitches that the modern cello cannot, making it impossible to accurately recreate the sound of “Suite No. 6 in D Major” today as it was originally written. Miranda Wilson, associate professor at U of I’s Lionel Hampton School of Music, reimagined a 21st century solution to this 18th century problem. Using support from the College of Letters, Arts and Social Sciences and the Office of Research and Economic Development, she commissioned the custom production of a five-stringed carbon fiber cello to make this complex piece more playable for the modern cellist. Wilson then used this instrument to perform “Suite No. 6 in D Major” and other compositions in concert.



Miranda Wilson

U of I Helps Light up the Road with Industry-first Technology



U of I’s engineering faculty brings new capabilities to this raised pavement marking system

In a few key locations across Washington and Idaho, sleepy nighttime drivers are awakened by an unusual sight: flashing LED lights on the road lighting up in concert. They’re test sites for an industry-first technology developed to reduce accidents. How? By accentuating painted road markings and signage in dark and dimly lit areas, as well as sensing dangerous road conditions.

The University of Idaho’s National Institute for Advanced Transportation Technology (NIATT), a leading center of excellence for transportation engineering, engaged with industrial partner Evolutionary Markings, Inc. to improve these lights, also known as the EMI Model 200 series LED Smart Raised Pavement Marking (RPM) system. NIATT helped develop new capabilities for these solar-powered LED lights embedded in the roadway.

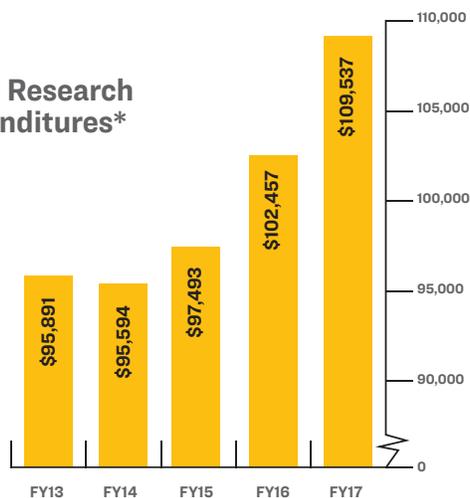
The Idaho Global Entrepreneurial Mission (IGEM) provided nearly \$300,000 in funding to develop three key technological capabilities for these markings: to communicate with existing traffic lights, to signal road crews when dangerous road conditions arise and to wirelessly interact with autonomous vehicles. Evolutionary Markings, Inc., responsible for bringing this innovative product to market, matched \$50,000 in project funding.

Thanks to NIATT’s improvements, drivers and cyclists can one day see these markers on the road change color in tandem with stoplights—and instantly see which reversible lanes they should enter based on the red or green colors of the lane borders. Municipal and city crews can also know exactly where and when to address black ice forming on their city or town roads. Further into the future, the markers can provide autonomous vehicles with a more reliable signal to keep them within lanes.

RESEARCH ACTIVITY AND EXPENDITURES

FY 2017 expenditures as reported to the National Science Foundation's Higher Education Research and Development (HERD) Survey

Total Research Expenditures*



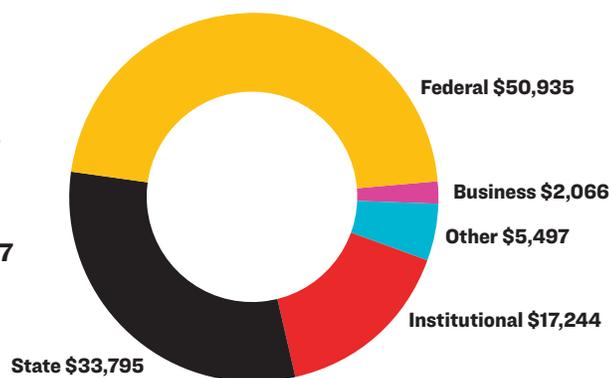
Summary of Sponsored Project Activity

SPONSORED PROJECTS	NUMBER	AMOUNT*
Proposals Submitted	951	\$255,925

AWARDS RECEIVED	NUMBER	AMOUNT*
New Awards	434	\$53,981
Other Actions	247	\$24,002
TOTAL AWARDS	681	\$77,983

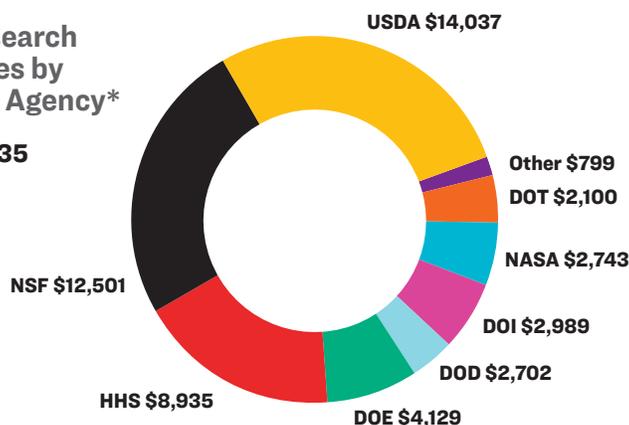
Total Research Expenditures by Funding Source*

TOTAL \$109,537



Federal Research Expenditures by Sponsoring Agency*

TOTAL \$50,935



Technology Commercialization

ACTIVITY	NUMBER
Invention Disclosures	20
Licenses	5
Patent Applications	8
Issued Patents	2
Issued PVP Certificates	4

Sponsored Project Activity by College and Unit

SPONSORED PROJECTS	# OF AWARDS	AWARDED AMOUNT*	# OF PROPOSALS	PROPOSED AMOUNT*	TOTAL EXPENSES*
College of Agricultural & Life Sciences	250	\$18,446	346	\$67,715	\$15,509
College of Letters, Arts & Social Sciences	17	\$691	20	\$313	\$591
College of Art and Architecture	13	\$3,501	13	\$756	\$1,287
College of Business & Economics	16	\$729	14	\$728	\$639
College of Education, Health & Human Sciences	40	\$12,814	50	\$26,287	\$11,980
College of Engineering	77	\$9,998	144	\$47,884	\$9,380
College of Graduate Studies	2	\$129	2	\$155	\$205
College of Law	4	\$142	3	\$142	\$245
College of Natural Resources	121	\$9,466	149	\$30,827	\$9,982
College of Science	61	\$11,195	112	\$54,122	\$12,040
General Library	1	\$95	1	\$25	\$101
Academic and Student Affairs	18	\$1,168	5	\$84	\$997
Facilities Management	1	\$70	1	\$70	\$0
University Outreach	19	\$3,985	40	\$9,993	\$3,615
Office of Research & Economic Development	40	\$5,553	49	\$16,436	\$11,293
WWAMI Med Educ/WI Reg Vet Medicine	1	\$1	2	\$388	\$2
TOTAL AWARDS	681	\$77,983	951	\$255,925	\$77,866

*Dollars in Thousands



University of Idaho

Office of Research and
Economic Development

875 Perimeter Drive MS 3010
Moscow, ID 83844-3010



* 8 9 5 9 9 0 *

NONPROFIT ORG
U.S. POSTAGE
PAID
UNIVERSITY OF IDAHO

Phone: 208-885-6689

Email: vpresearch@uidaho.edu

Web: www.uidaho.edu/research

NSF CAREER Awards Support Four Unique Projects

This year, four early career faculty at our university were conducting a wide variety of research funded by the National Science Foundation's Faculty Early Career Development (CAREER) Awards. This prestigious five-year award is coveted, as the awardees become recognized leaders among their peers in research and education. The research of these four awardees is expected to have a large and lasting impact on technology, nature and human life:



Vishal Saxena, associate professor in the College of Engineering, is using his \$453,000 award to develop mixed-signal photonic circuits with high-speed, energy-efficient optoelectronic interfaces that will satisfy the growing needs for data bandwidth, as well as reduce energy levels associated with Internet cloud usage.



David Tank, associate professor in the College of Science and director of the university's Stillinger Herbarium, was awarded \$807,000 to research the phylogeny – or evolutionary history – of the “paintbrushes,” a group of plants that includes more than 200 species. By empirically quantifying how the many plants in this group are related, Tank's research will provide insights into the evolution of new species.



Tara W. Hudiburg, assistant professor in the College of Natural Resources, hopes to improve our understanding of how management activities like restoration thinning influence a forest's water, carbon and energy balance. This is especially important in an era of intensified drought and wildfire caused by changes in precipitation, which affect temperatures and other factors. This award totaled \$653,000.



Craig P. McGowan, associate professor in the College of Science, is using his funds to research how the kangaroo rat's body structure functions in an effort to improve prosthetic devices for humans. The \$1.11 million project will shed light on the relationship between musculoskeletal structure and the way animals move in their environments.