University of Idaho

2022 RESEARCH REPORT

Photo credit: Katy Riendeau

A MESSAGE FROM THE VICE PRESIDENT FOR RESEARCH AND ECONOMIC DEVELOPMENT

While the University of Idaho continues to demonstrate resilience amidst the uncertainty of the global COVID-19 pandemic, this year revealed the event's negative impacts on our research enterprise and expenditures. Despite this, the U of I research enterprise continues to thrive and move forward. Although travel bans, illness and other barriers presented by the pandemic hampered our ability to do all the research we wanted to, it is a testament to the ingenuity and perseverance of our faculty, staff and students that they were able to accomplish so much. As you will see in this research report, our research community has been busy. From regional projects demonstrating the social impacts of wildfire to developing state-of-the-art facilities to investigate and better understand the soil that supports life on Earth and the creation of sustainable building materials from wood waste, U of I is leading the way. The impact and diversity of projects at U of I continues to show the value our research provides to Idaho, the nation and the world. I invite you to explore a few of the many fantastic research projects taking place at U of I.

Go Vandals!

Sincerely,

Chris Nomura, Ph.D.
Vice President for Research and Economic Development

Confluence Lab, Partners Address Pacific NW Justice Issues with $4.5 MILLION GRANT

Story credit: Leigh Cooper
Photo credit: University of Idaho Photo Services

The University of Idaho Confluence Lab, University of Oregon and Whitman College were awarded a three-year $4.52 million grant from the Andrew W. Mellon Foundation to launch the Pacific Northwest Just Futures Institute (PNJFI) that will address racial and climate justice issues.

As part of PNJFI, the Confluence Lab will create a virtual "Stories of Fire: A Pacific Northwest Climate Justice Atlas" that illustrates people's complex relationships with fire. In this context, an atlas comprises maps, stories, images and other representations of data that bring insight to a specific issue.

U of I faculty Erin James, Jennifer Ladino, Teresa Cohn and Stacy Isenbarger are partnering on the "Atlas of Fire" project. The atlas will focus on the connections between fire, social justice, environmental justice and traditionally underrepresented communities, drawing on the environmental humanities to tell stories about the changing region. The atlas is one part of a larger suite of projects associated with the PNJFI.

"Wildfires highlight some of the social crises we are facing," Ladino said. "By focusing on people's personal experiences with fire, we can better listen to a diversity of rural voices and address social justice issues like settler colonialism, environmental racism and socioeconomic inequities."

EXPLORING EARTH'S SUBSOIL

Story credit: Amy Calabretta
Photo credit: deepsoilecotron.org

Soil is one of our most important natural resources, yet most of the research on this vital part of our ecosystem resides in the top foot of soil. Little is known about deep soil environments and their role in agriculture, carbon sequestration and other processes. An $18.9 million grant from the National Science Foundation to build a Deep Soil Ecotron facility will enable University of Idaho researchers to explore this uncharted frontier.

The Deep Soil Ecotron will allow researchers to study soil up to 10 feet in depth – depths greater than anywhere else in the world. The facility will house 24 eco-units – huge columns used to study soil cores complete with above-ground plants and below-ground organisms such as insects and microbes. Researchers will be able to control a range of variables including temperature, water and exposure to carbon dioxide and other greenhouse gases.

"Deep soils are probably one of the last research frontiers," said Michael Strickland, associate professor of microbial ecology in the U of I College of Agricultural and Life Sciences and principal investigator on the project. "Soils are inherently important to life on the planet from supporting plants to driving processes like carbon and nutrient cycling. This facility would enable us to better understand those processes at depth."

The Ecotron will be housed in the JW Martin Laboratory on the Moscow campus with renovation expected to start in summer 2022.

"We don't know where the climate trends are going and can't prepare using past knowledge," said Zachary Kayler, assistant professor of biogeochemistry and co-lead investigator. "This facility will allow us to perform experiments which will help us plan for those future environmental conditions."

Proposal Development Academy Paves the Way for GRANT PROPOSAL SUCCESS

In 2020, the Research and Faculty Development (RFD) team launched U of I's first Proposal Development Academy for early-career faculty members. The RFD team developed the nine-week program in response to their experiences working with many early-career faculty members applying for external funding to support their research and other creative work and realizing that these individuals were not "grant ready." The concept of grant readiness refers to a faculty member having the necessary preparation, qualifications, resources, time and attitude to develop a competitive grant proposal. Learning what it takes to be grant ready can take years for those at the beginning of their careers using the trial-and-error process.

The RFD team aims to considerably shorten the timeline for an early-career Principle Investigator (PI) to be successful at securing extramural funding with this intensive academy. Topics include developing a five-year plan, learning how to work with a Program Officer, considerations for collaborating, dissecting proposal solicitations and getting to know your funder, among others. Each year, approximately 12 early-career individuals from across U of I have participated in this cohort activity and graduates of the academy have already demonstrated success in securing their first grant awards. Nominations for academy participation have been solicited from college deans.

MAUGHAN EARNS $4M
to Build 3D-Printing Technology

Story by: Alexiss Turner and Michael Maughan
Photo credit: University of Idaho Photo Services

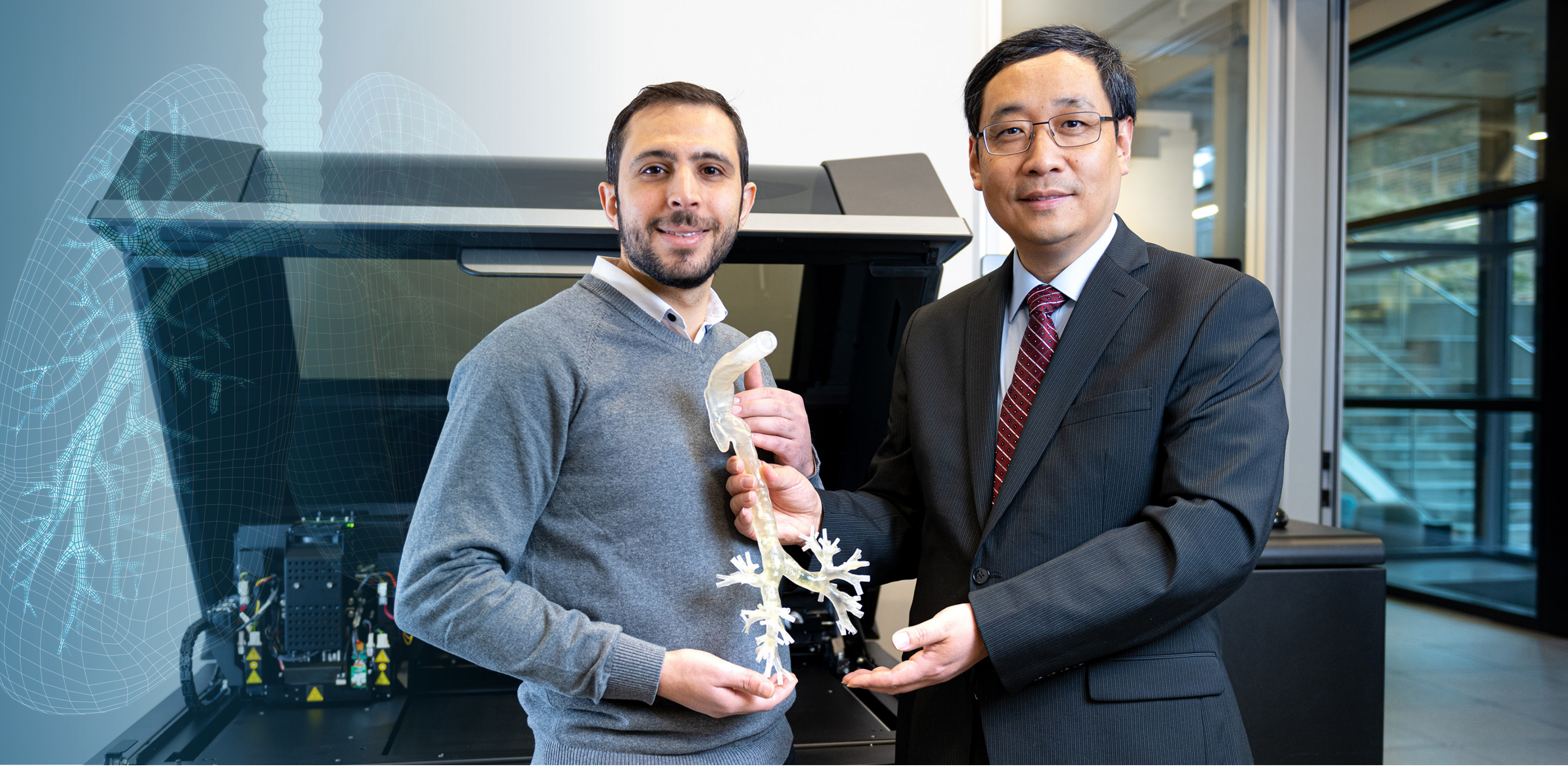
The University of Idaho is developing technology to turn Idaho wood waste into one the most sustainable building construction materials on the market — by using it as a medium for 3D-printing building construction materials.

An interdisciplinary research team led by College of Engineering Assistant Professor Michael Maughan has been awarded nearly $4 million from the National Science Foundation's (NSF) EPSCoR Research Infrastructure Improvement Program.

Funding through 2025 supports further development and testing of an additive manufacturing process and the design and construction of a 3D printer capable of producing modular wall, floor and roof panels printed from wood for industrial construction.

"We're developing a new composite material, using completely bio-based resources on a truly large scale," Maughan said, "With this technology, houses and commercial buildings can be made entirely differently. We can push past climate change, mitigate impact on our environment and make better use of the natural resources we have."

Working ins collaboration with the College of Art and Architecture's Integrated Design Lab and the College of Natural Resources since 2019, the U of I team has developed an advanced 3D-printing technology using a binding agent and wood fibers not used by the lumber market — like waste wood and sawdust from mills and wood processing plants. As part of the NSF funding, researchers from Auburn University will join the team to continue to refine the binding agent used in the renewable material.



INTEGRATED 3D IMAGING AND PRINTING SYSTEM

to Revolutionize Biofluids and Biomechanics Research

Story credit: Tao Xing
Photo credit: University of Idaho Photo Services

Globally, 4 million people per year die prematurely from chronic respiratory disease. The development of effective treatments for respiratory disease is greatly hampered by a lack of understanding of the gas exchange and fluid (gas)-structure (tissue) interaction (FSI) in the lungs. An interdisciplinary team led by Tao Xing, Ph.D., associate professor of the Mechanical Engineering Department and director of the university 3D Imaging and Printing Laboratory located in the Integrated Research and Innovation Center, aims to achieve a better understanding of the mechanisms of lung ventilation. This goal depends on proper function at each anatomical level of the lung, from the macroscale conducting zone (buccal cavity, upper airway; trachea, bronchi and early generation bronchioles) to the microscale respiratory zone (middle- and late- generation bronchioles, alveolar sacs and alveoli) where gas exchange occurs in the alveolar sacs.

This team will achieve its goal through a multiscale interdisciplinary research effort that includes numerical simulations at all scales and experimental studies of FSI at each anatomical level of the lung. With a recent $252,542 grant from the National Science Foundation and $250,000 grant from the M.J. Murdock Charitable Trust, Xing's team has established a state-of-the-art laboratory that includes an integrated 3D imaging and printing system consisting of a high-resolution imaging SkyScan 1275 3D Micro-Computed Tomography Scanner, a Stratasys J850 Pro 3D printer that can print both rigid and flexible materials and a Dell Precision Workstation with a graphics processing unit that connects them. Hospital chest CT scans usually resolve large airways whereas the scanner resolves small airways. A combination of both creates a high-resolution lung geometry that can be used in FSI simulations and 3D printing. The printed model will allow in-vitro experimental measurement and/or physiological simulation of lung function including the use of flexible materials to accurately mimic lung compliance, which is important to validate the simulation models.

"High-fidelity numerical simulations and experimental measurements will allow us to address many limitations in prior studies such as low-resolution geometry, omission of geometry deformation, and lack of experimental data. It will also allow us to rigorously control errors and uncertainties in our simulations and experiments, which is a key to ensuring the quality of the research data," said Xing, who is also an associate editor of the American Society of Mechanical Engineers Journal of Verification, Validation and Uncertainty Quantification. The integrated system will also allow for advanced research in many other topics, such as cerebrospinal fluid drug delivery, aneurysm treatment methods and the mechanical properties of biological tissues.

ICCU ARENA

unveils sustainable futures

Story credit: Kelsey Evans
Photo credits: University of Idaho Photo Services

As the country's first engineered wood venue, the new Idaho Central Credit Union (ICCU) Arena showcases Idaho as a place where students, researchers, industry and community come together to build sustainable futures.

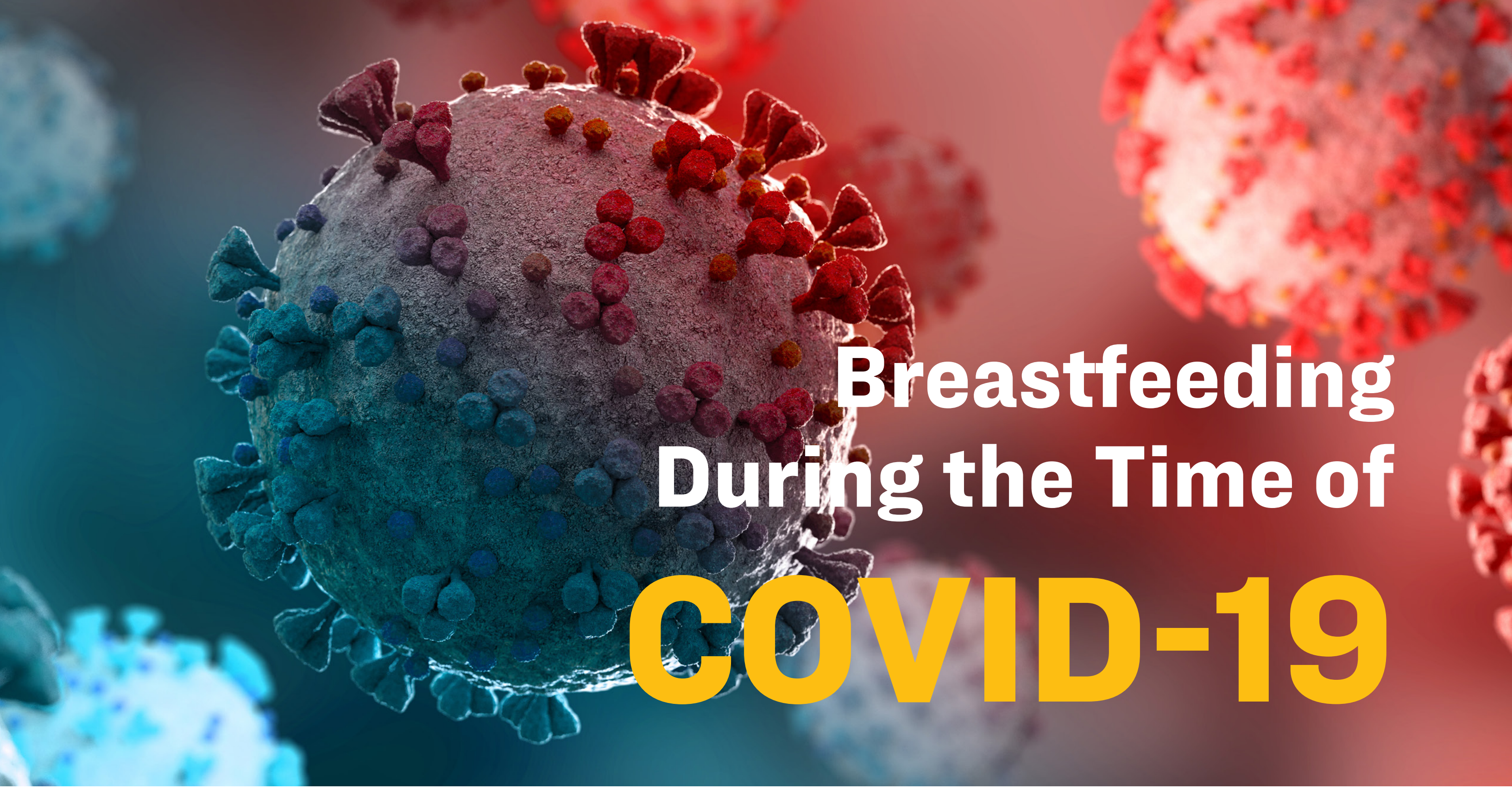
From the brainstorming of its cutting-edge design to the first Vandal basketball game of the 2021-2022 season, the arena continues to be more than a building; it's a living laboratory modeling modern technology and aesthetic beauty.

The 62,000-foot structure is made of mass timber from the University of Idaho's Experimental Forest (UIEF) and other sustainably managed forests across the state and the surrounding area. Mass timber is produced by mechanically fastening smaller wood components to form larger elements, such as the arena's glulam beams and sloping roofs. Shaped to resemble the Palouse's rolling hills, the arena is an architectural feat that pushes the bounds of contemporary engineering.

Sourced from well-managed forests that mitigate climate change and preserve biological habitat, soil and water, the arena's wood is certified by Sustainable Forestry Initiative standards. It is a real-life learning laboratory site where natural resources, engineering and architecture students continue to learn about forest products supply chains, carbon sequestration, life cycle analysis, sustainable nursery and forest management, and building performance during extreme weather events.

When U of I basketball teams first stepped onto the arena's court, it was clear that they were a part of something bigger — a hub for learning, innovation and civic activity that will last for decades to come.

"The arena is a source of Vandal pride for the entire student body and our community," said Jon Newlee, women's head basketball coach. "Now, we are lost in the glory of being in this beautiful place."



Breastfeeding During the Time of COVID-19

When the COVID-19 pandemic reared its head in early 2020, people around the globe strained to find ways to contribute to the common good. Healthcare providers braved the risks of caring for COVID-19 patients. Engineers found new solutions for creating ventilators out of repurposed parts. Sewers fashioned effective masks out of fabrics. Educators reimagined how to deliver lessons and labs to homebound students. Employees and students at the University of Idaho did the same, asking, "What can I do to help in this crisis?"

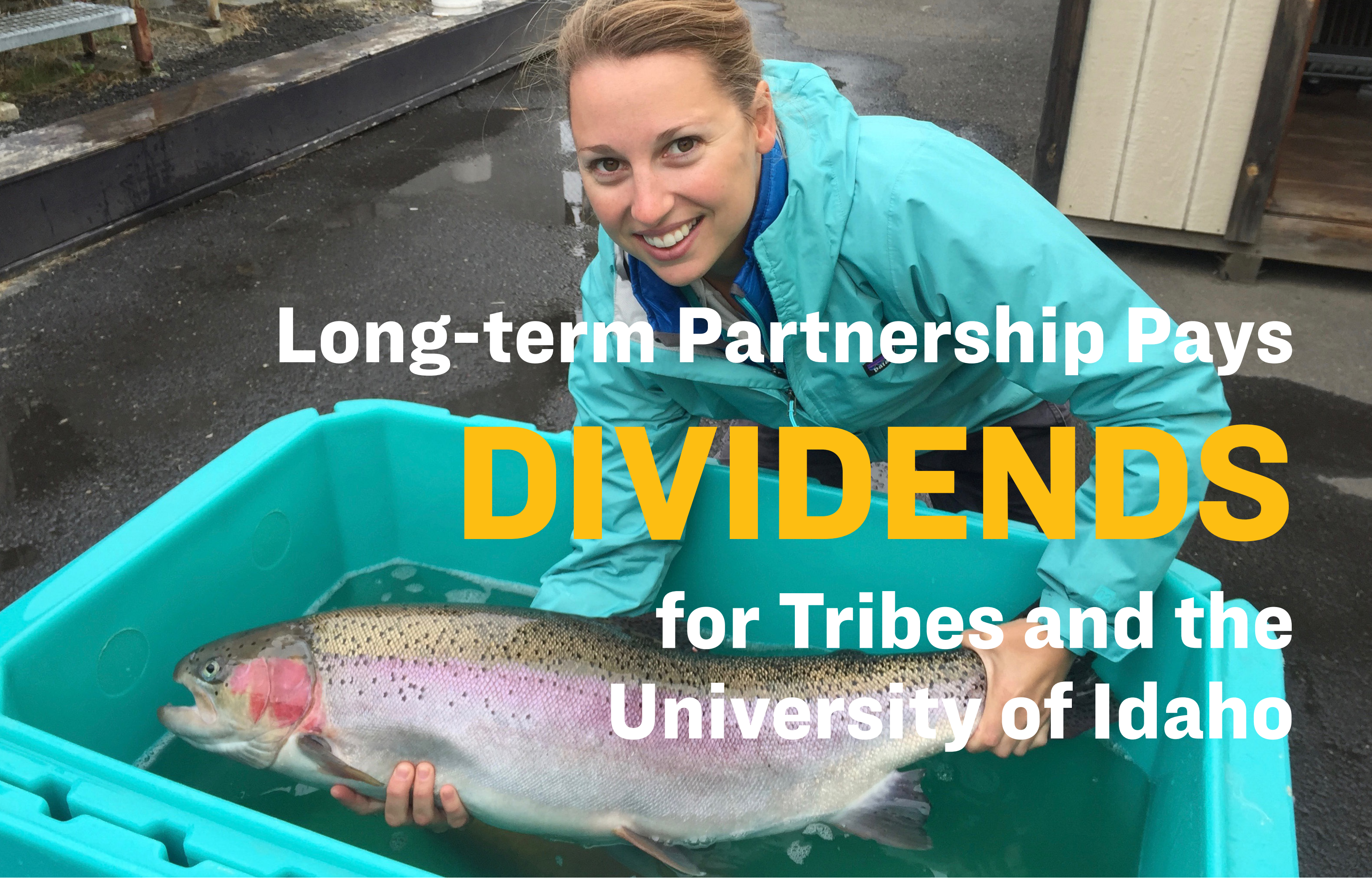
In the laboratory of professors Mark and Shelley McGuire and Janet Williams of the College of Agricultural and Life Sciences, the question asked was, "Can mothers with COVID-19 infect their babies via breastfeeding?" Questions about breastmilk and breastfeeding have been explored at the laboratory for over 30 years but finding answers had never been so urgent. The COVID-19 pandemic brought the reasonable concern that breastfeeding might pose a risk to infants of infected mothers. Other illnesses, such as AIDS and tuberculosis, can be transmitted in this manner. Consequently, many mothers and newborns around the globe were being separated from each other, threatening maternal-infant bonding and the establishment of successful breastfeeding.

Answering the question was simultaneously simple and daunting.

It was simple because finding the answer only required that the team analyze breastmilk produced by infected mothers for SARS-CoV-2, the virus that causes COVID-19. It was daunting for logistic and scientific reasons. For example, these types of studies are expensive and the ability to garner new research funding during the pandemic was extraordinarily limited. However, the Bill and Melinda Gates Foundation and the National Science Foundation rapidly provided the needed grants.

The next set of challenges the team faced was recruiting infected breastfeeding women, collecting milk from them using precise techniques, shipping the milk to the laboratory and analyzing it under strict protocols. To do this, researchers worked with postdoctoral fellow Ryan Pace and a cadre of undergraduate and graduate students at U of I, as well as colleagues at Washington State University and a handful of other U.S. universities. Potential participants were recruited via a national Facebook campaign; sterile sampling kits were shipped to participants' doorsteps; women were instructed in how to collect the milk samples via phone calls and online conferences; and samples were rapidly shipped back to the Moscow campus via a specialized courier service.

The multi-university team was in constant contact with individuals at the World Health Organization and the Centers for Disease Control and Prevention during the project. When their results showed that breastfeeding is not only safe but likely protective for infants of infected mothers, the findings were immediately translated to practice. In other words, maternal-infant separation was no longer recommended. The team has published several refereed papers on the topic and are working to understand the impact of maternal COVID-19 vaccination on breastmilk composition.



Long-term Partnership Pays DIVIDENDS for Tribes and the University of Idaho

Story credit: Brian Small, James Nagler

Photo credit: University of Idaho Photo Services (page 8)
Photo credit Dr. Andrew Pierce, CRITFC Scientist (page 9)

Following litigation efforts in the 1990s when genetic data was used extensively to designate groups of salmon populations as conservation units for Endangered Species Act listing decisions, the tribes realized the need for genetic data sovereignty and scientific studies that were independent from state and federal agencies. Columbia River Inter-Tribal Fish Commission (CRITFC) staff met with each of its four-member tribes and coordinated with tribal fisheries programs to collect tissue samples for independent genetic analyses that could be completed throughout the Columbia River Basin. These collections were also associated with existing monitoring projects that enabled questions to be addressed for specific tribal programs. CRITFC approached several groups as potential collaborators and found willing partners with Ernie Brannon and Matt Powell at the University of Idaho for initial studies. Further, Brannon spearheaded efforts to acquire land and infrastructure from the U.S. Fish and Wildlife Service to establish the Hagerman Fish Culture Experiment Station (HFCES) as an extension facility of the Aquaculture Research Institute with U of I. Collaborative research activities at HFCES were aimed towards fish nutrition, health and genetics, with initial CRITFC contracts issued to Powell for genetic analysis.

Powell completed those initial studies, and CRITFC could see that the tribes collective need was great enough to hire a geneticist as a full-time CRITFC staff member. At the same time, U of I was supportive of placing a CRITFC geneticist at the HFCES. They hired Shawn Narum in 2002 and around the same time, signed a Memorandum of Agreement with U of I that formalized the partnership. By then, there was a huge backlog of samples, and as Narum and newly hired technicians worked to process all the samples, CRITFC approached the Northwest Power and Conservation Council and Bonneville Power Administration (BPA) with the idea of funding new facilities at Hagerman. CRITFC secured $2.3M from BPA for capital construction in 2001 and U of I contributed $1.75M from the state's capital improvement fund to build new laboratory and office facilities at the HFCES, creating a 13,000-square-foot facility that houses six analytical laboratories to explore fish genetics and physiology, a 5,500-square-foot wet lab to study fish diet and production, and a tissue archive to store fish samples from around the Pacific Northwest for future DNA testing. Directors of HFCES, including Ron Hardy and Brian Small, have supported the development and continuation of a CRITFC genetics program at HFCES, and funding from tribal programs has led to a group of 16 full-time CRITFC staff at the facility. This in-house collaboration has led to millions of dollars in collaborative funding and the training of several graduate students, postdoctoral fellows and international visiting scholars. The strong tribal ties at HFCES have also resulted in several workforce development opportunities for tribal members interested in hatchery management.

In 2008, CRITFC signed the Columbia Basin Fish Accords and expanded steelhead trout kelt reconditioning efforts into the Snake River. CRITFC staff developed a contract first with Christine Moffitt and later expanded to include James Nagler at U of I to develop a better understanding of the physiology of iteroparity in steelhead. This work on the Moscow campus provides laboratory support for Andrew Pierce, CRITFC's lead physiologist. This collaboration has yielded many advancements in our understanding of steelhead life history, including regulation of spawning interval and reproductive investment, with physiological assessment of maturation now an essential part of the project. In 2015, studies on precocious maturation in hatchery-reared male spring Chinook salmon were begun, resulting in two promising methods to reduce the number of "minijacks" produced by conservation hatcheries, as well as insights into the physiological regulation of this trait.

The CRITFC/U of I collaboration at the HFCES and on the Moscow campus has resulted in five Ph.D and four master's of science degrees directly funded by the tribes (primary supervisors included Matt Powell, Christine Moffit and James Nagler). Among these, Zach Penny (Nez Perce), went on to serve as CRITFC's Fishery Science Department manager and recently accepted a political appointment with the Biden-Harris Administration as a senior advisor to the Department of Commerce on matters related to tribal fisheries. The strength of the CRITFC/U of I collaboration and quality of the science is further demonstrated by the over 140 peer reviewed manuscripts since 2004.

The real keys to success of this partnership include:

1. Very willing faculty partners (Ernie Brannon, Matt Powell, Christine Moffitt, Ron Hardy, James Nagler and Brian Small) and the U of I commitment to this partnership;
2. CRITFC and U of I securing funding from BPA and the State of Idaho for the new HFCES facility;
3. Huge support from CRITFC member tribes and vision for independent research that has made an impact in the conservation and management of native fish in the Columbia River Basin;
4. Hiring the right people – Shawn Narum and Andrew Pierce have led the labs to levels that were never imagined and have built strong collaborations with U of I faculty; along with support staff who have been instrumental in providing long-term stability for research labs in genetics and physiology;
5. A common vision for the protection and restoration of salmonid populations and natural fisheries.

STUDENT RESEARCH HIGHLIGHTS

INTERNATIONAL SPACE STATION

Student team sends research to International Space Station as finalist in nationwide project.

Vandal innovation has reached the International Space Station (ISS).

Story credit: Alexiss Turner
Photo credit: University of Idaho Engineering

A University of Idaho College of Engineering team is one of five groups selected nationwide for NASA's Student Payload Opportunity With Citizen Science (SPOCS) program to build an experiment that is currently aboard the ISS and will remain undisturbed for 30 days before returning to Earth.

The U of I team includes chemical engineering graduates Adriana Bryant, Hannah Johnson, Travis Lindsay, Roslyn McCormack, Niko Hansen and Kael Stelck, as well as current students Kaitlyn Harvey and Ashley Keeley. Led by Matt Bernards, NASA Idaho Space Grant Consortium Director and U of I chemical engineering associate professor, they spent the past year researching how microgravity impacts the efficacy of polymers known to resist bacteria on Earth.

"The goal of our project is to ultimately further space travel by reducing bacteria growth and disease on the International Space Station," Bryant said. "In light of the COVID-19 pandemic, our experimentation could be potentially be utilized to prevent sickness here on Earth as well."

Synthesizing two types of polymers, the team is testing the ability of these molecules to resist bacteria on an aluminum alloy that is utilized for many high-contact areas throughout the ISS, such as hand rails and door handles.

The two polymers on the ISS have been selected using trials completed by third- through fifth-graders at J. Russell Elementary School in Moscow. As part of the NASA-funded project, teams are expected to involve K-12 students in their research.

Lindsay, McCormack and Stelck refined a non-toxic gel solution containing the bacteria-resistant polymers. Using petri dishes containing three different bacteria-resistant polymers and a control, elementary students were asked to get creative, collecting bacteria from various sources including sinks, floors, windows, lunch tables, keyboards and even a bottle of hand sanitizer.

"These students gave us 91 different data points to get a conclusion from," said SPOCS Chief Citizen Science Officer Kael Stelck. "Our team would have had to do an incredible amount of work, especially with a project of that nature. It was really beneficial to have these young scientists run it."

Over the course of 30 days, elementary students were asked to "feed" potential bacteria growth in their petri dishes using a nutrient broth designed to help bacteria thrive. Monitoring daily changes, students then reported which two polymers they believed to be the best candidates to send to the ISS.

The SPOCS team then analyzed the data to verify results and choose the top two performing polymers. The next major step will be to attach these polymers to aluminum plates and prototyping the container in which these research tools will be sent.

The SPOCS program is designed to celebrate NASA's 20 years of humans in orbit on the ISS.

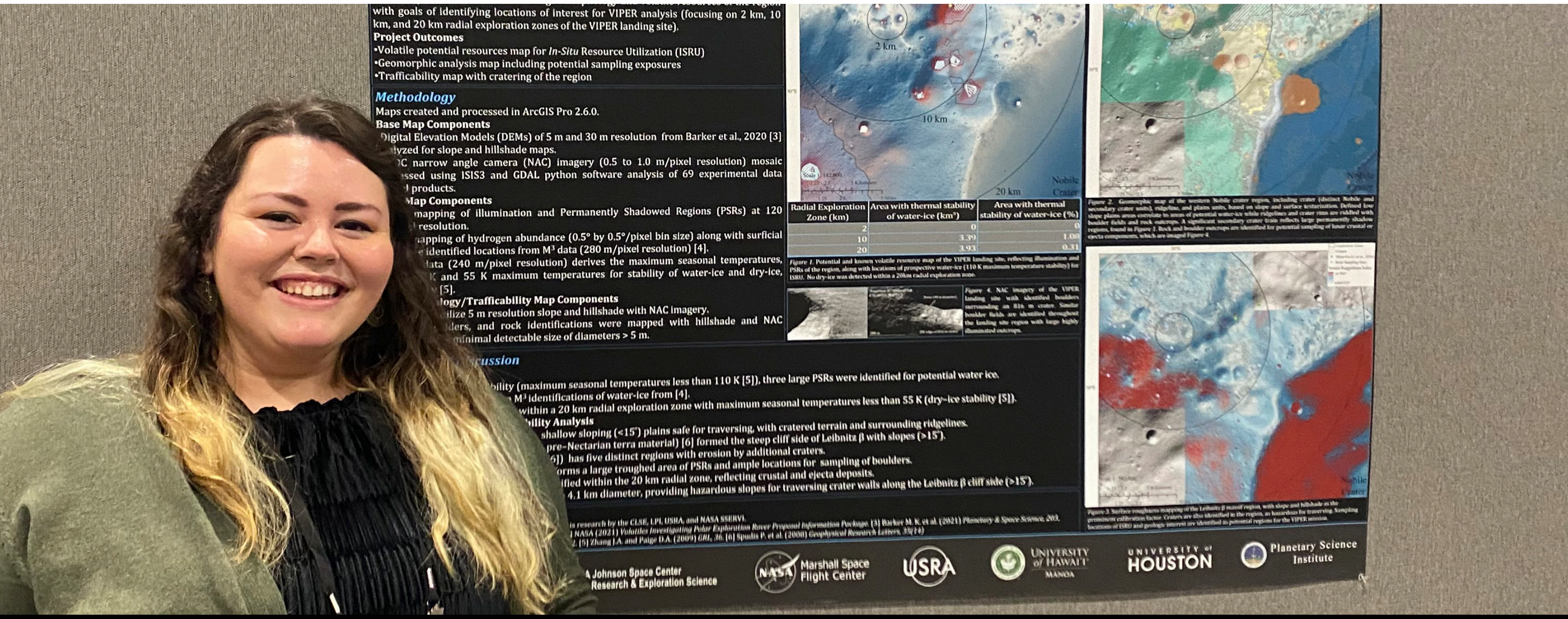
BRIDGE TO DOCTORATE

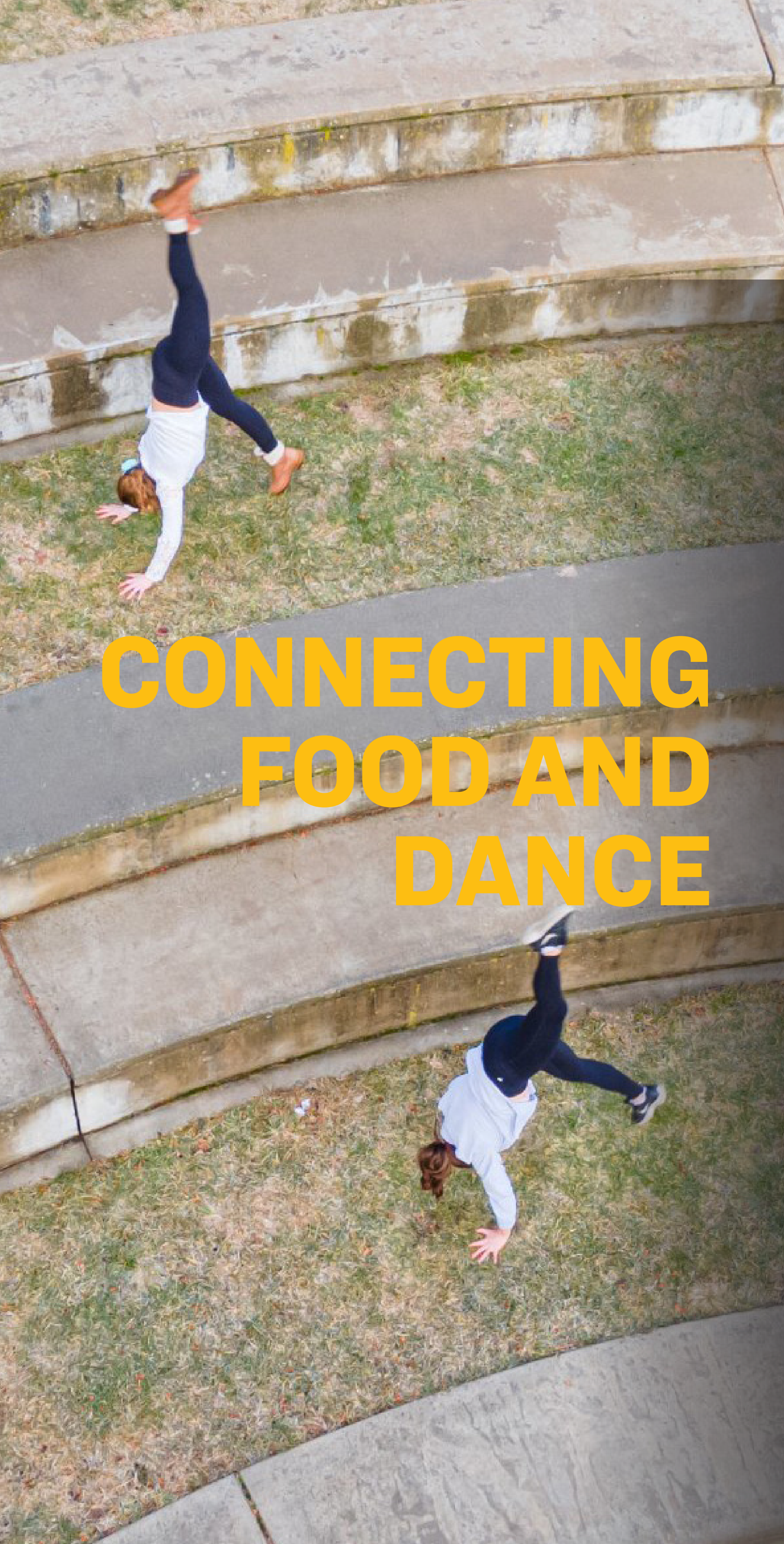
Program Research Update

Story and photo credit: McKayla Meier

As a second year Ph.D. student in geological sciences, I study interactions between lava and water using microscopic and surface reflectance analysis. For this work, I use portable spectrometers in the field along with University of Idaho's Scanning Electron Microscopy lab, performing four sets of analysis along numerous lava flows through Oregon, Idaho, Alaska and Iceland. To investigate the interactions between lava and water, our team examines lava fields that formed in either wet or icy environments, in comparison to control dry environment eruptions. As for my current progress on the project, I have presented my findings of the petrological and spectral analysis of dry lava flows at the 2021 American Geophysical Fall Meeting and the 2021 LPI Workshop on Terrestrial Planetary Analogs, along with co-authoring a paper (in revision) on the initial investigation of the correlation between surface reflectance and crystallinity. This year, I am working on two manuscripts slated for publication in summer and winter, along with an additional presentation of lava-ice interactions at the 2022 American Geophysical Fall Meeting. I am also a mentor for the summer 2022 GeoSPACE field camp, which aims to determine field processes (in person and remotely) for planetary volcanic analogs.

Along with my doctoral project, I was a Lunar and Planetary Institute Graduate Exploration intern during summer 2021. During that time, I worked on a dynamic team of other graduate students from across the U.S. to investigate parameters of potential lunar landing sites, along with modeling of lunar cratering processes. From this research, I analyzed the morphology, volatile deposition and trafficability of three potential lunar landing sites for manned and unmanned rover missions, including the newly selected site for the first mission of Artemis III. The initial mission of Artemis III, VIPER (Volatiles Investigating Polar Exploration Rover), will be landing west of Nobile crater at the lunar south pole, for which I have done a preliminary study to determine areas of interest for water-ice deposits and rock sampling. This work was presented at the 2022 Lunar and Planetary Science Conference as a first-author poster and abstract, with two additional co-authored posters and one co-authored talk. I will be the first author on a paper slated to be published in summer 2022 addressing the resource and exploration analysis of the VIPER and two potential land sites which the Artemis program can utilize for mission preparation and planning.





STUDENT RESEARCH HIGHLIGHTS

CONNECTING FOOD AND DANCE

Story credit: Katy Wicks
Photo Credit: University of Idaho Photo Services

Mandy Scheffler's passion for dance goes beyond the studio. She collaborated with a team of University of Idaho students and faculty to connect movement to the rolling hills of the Palouse.

Their project highlighted the ways food sources are taken for granted by connecting dance movements to the beauty of the local fields where the food is grown. The team partnered with Washington, D.C.-based Dance Exchange, an organization that guides dance groups through linking dance to social movements.

"There are so many ways to approach dance, and you can be inspired by so many different people and experiences," Scheffler said.

The Granite Falls, Washington, native connected with the project because of her lack of knowledge and exposure to farming growing up. Pursuing this project allowed her to learn about farming through community and her peers.

"We studied movement in a new way, and we had to apply concepts that are almost never connected to dance," the junior said.

The team also met with local farmers to hear their stories. As a team, they transformed these narratives into a dance that they filmed in the fields. Working directly with the community members was the most powerful aspect of the project, said Scheffler.

"It was amazing to work with community members to learn to drive movement in ways we never had before," she said.

Disentangling the Web of DIABETES

Morgan Flynn packed a lot into her five semesters at the University of Idaho.

She not only made room for playing for the Vandal soccer team in her schedule, but she also found the time for research and improving community health.

“She reached out to me in an email and said she read one of my articles online,” Chantel Vella, a movement sciences professor, said of her first encounter with Flynn. “Very rarely do you have an undergraduate student reading your work, so I wanted to contact her ASAP about working in the lab. In 11 years here, I’ve worked with a handful of undergraduates, and Morgan is definitely top-notch.”

Flynn’s research explored the link between screen time and pre-diabetes indicators. She ultimately confirmed there was a strong correlation between the time spent using a phone, computer, or watching TV to one’s risk for Type 2 diabetes. Previous studies have shown that sitting for long periods of time can change a person’s metabolism and increase their vulnerability to Type 2 diabetes.

After earning a Summer Undergraduate Research Fellowship, Flynn spent much of Summer 2021 immersed in every aspect of the study, from recruiting participants to drawing blood and evaluating data.

“I enjoyed getting to know the participants and hearing their stories,” Flynn said. “My study was just a part of a bigger study that Dr. Onesmo Balemba and Dr. Vella are working on. There is definitely a need for further research to investigate how to reduce screen time.”

Flynn presented her research at the Idaho Conference on Undergraduate Research in July and continued to gather data throughout the fall semester.

“I came in just wanting research experience, and after my experience over the summer, I decided this is definitely what I want to do long term,” Flynn said. “I’m more interested in community health and looking at preventative health measures.”

COVID-19 dynamically shaped Flynn’s U of I experience. As a Canadian citizen, she was forced to return home in 2020. Between border closings, lockdowns and hundreds of Zoom sessions, Flynn also had to wear a mask at times while practicing with her soccer teammates, which piqued her interest in community health research.

She’s headed to graduate school at the University of British Columbia, where she plans to research how masks affect endurance athletes’ performance.

“My thesis is very niche to COVID, but there are many components around it,” said Flynn, who earned her degree in exercise science with an emphasis on fitness and community health. “There is really no respiratory barrier with a mask on, but that might change with endurance athletes and their lung capacity. That’s my project next year.”

College of Letters, Arts and Social Sciences Student Studies

HUMAN BEHAVIOR THROUGH ARCHAEOLOGY

Photo credit: University of Idaho Photo Services

Stumbling onto historical remains of remote mining camps in the Boise Basin was part of University of Idaho senior Kristina Cockerille's outdoor experience as a teenager.

"We'd go for a hike and find mining camps, or old sheep herder cabins," the anthropology major said. "I was always around history."

On her first day as a freshman at U of I, Cockerille asked her archaeology professor for a research assignment. She found herself cataloguing century-old artifacts, coincidentally from mining camps in the Boise Basin where she grew up.

Her research has included studying the remains of shoes found at Chinese mining camps in the basin. She has also investigated food remnants found under a former Chinese merchant shop in Idaho City and participated in bioarchaeology. Recent work included cataloguing a collection of pottery and artifacts from Ecuador that was donated to the university in 2019.

Cockerille photographed the collection of Sarayacu Quichua pottery, masks and sculptures from central Ecuador, noting the recurring symbolism and themes among the pieces.

By providing a detailed survey of artifacts including a description, composition, function and what they may depict, cataloguing helps researchers understand patterns in human behavior and evolution.

"I love learning about people and cultures," she said. "Once I'm confident in one aspect, I want to explore something else and learn more."

Revealing the

HIDDEN SIDE OF ANIMATION

Story and photo credit: Jean-Marc Gauthier

Jesse Ross, virtual technology and design (VTD) student, uses cutting-edge technology to research animation secrets of the creators of "Wallace and Gromit," a British stop-motion comedy created by Nick Park of Aardman Animations.

Growing up exposed to the family business of metallurgy, Ross combined his personal knowledge of casting and metal works with the LIDAR, 3D photogrammetry and motion capture technologies he was learning at VTD. The result was his digital reproduction of the moving armatures embedded inside the famous characters developed by the London animation studio. Through online resources, Ross researched the metal structures inside the characters, recreated them digitally and animated the rigs using motion capture.

Ross is excited to make his research accessible to students learning animation and plans to demonstrate the technology to animation studios interested in combining state-of-the-art digital animation with the traditional art of stop-motion animation.

Student Research Drives Peer-Reviewed Papers at

U OF I'S ROWLEY LAB

Story credit: Ralph Bartholdt

Josephine Boyer a student in Biology Professor Paul Rowley's lab did not foresee her future as a published scientist.

Despite attending a science and math-based middle school in Boise and enrolling at the University of Idaho with the intention of earning a biology degree, Boyer, who graduated in 2021, considered science daunting.

"I never thought I could be a scientist," she said.

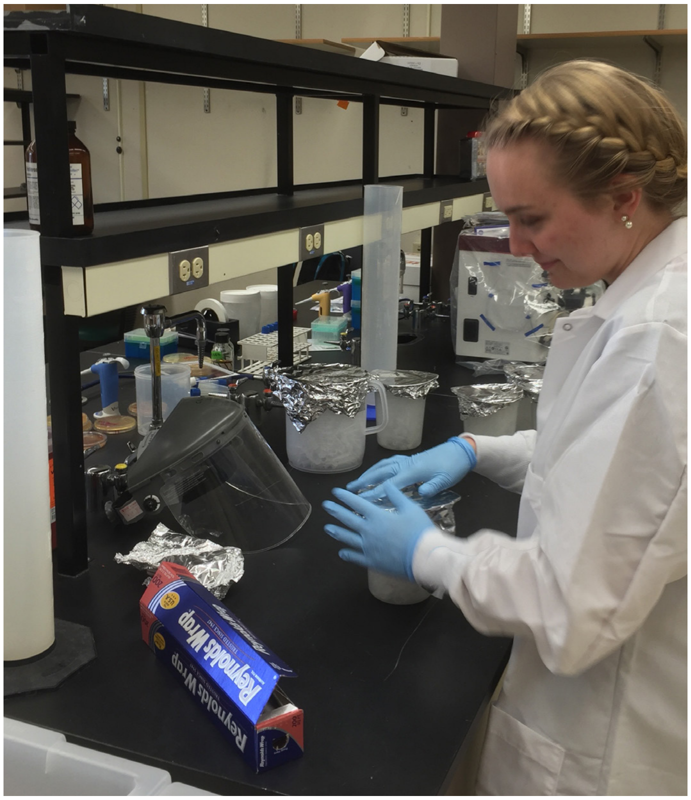
Becoming a published scientist seemed even more unlikely and being published as a student was a pipe dream.

This year, Boyer and eight of her peers in Rowley's lab published research papers in PLOS Genetics and Antimicrobial Agents and Chemotherapy (AAC), two peer-reviewed journals that focus on science, technology and medicine.

The student-driven research explored antifungal toxins produced by yeasts to combat drug-resistant fungi, and how the toxins are transferred externally between different species of yeast.

Since the start of the lab in 2016, more than 40 students have worked on various projects and their research has generated more than $170,000 in project-funding grants.

"My students have been wildly successful," Rowley said. "Being part of a lab is incredibly valuable for them because they get to apply what they've learned in the classes and teaching laboratories. Without the undergraduates doing the research on these papers, the papers would not have come out."



STUDENT RESEARCH HIGHLIGHTS

Pioneering Digital Forest Technology on the

EXPERIMENTAL FOREST

Story credit: Ralph Barnhardt
Photo credit: Robert Keefe

During a summer internship at a large western timber company, forest supervisors encouraged University of Idaho senior Jordan Williams to master deciphering airborne imagery before she graduates.

The imagery, called lidar, for "light detection and ranging," uses reflected laser energy to measure structures scanned from a drone, helicopter or fixed-wing aircraft to generate precise, 3D information about trees, brush, terrain, streams, roads and rock formations.

In her forestry classes at U of I, Williams had already learned that lidar data are used to digitize forest structure. Forest managers use this information to accurately inventory forests on a computer screen, significantly reducing time spent in the woods counting and measuring trees using traditional practices.

"A lot of traditional foresters don't know how to use this technology," Williams said. "It's a generational thing. As the next generation, we're expected to know how it works, so we can teach others."

In the past, the industry relied on foresters to measure trees to learn about dimensions, volume, species and disease. Modern foresters use lidar-produced measurements to inventory forests with much less time spent in the field.

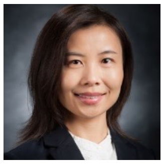
"It helps us collect more data faster and more accurately than having boots on the ground," Williams said. "It lets us see the species of trees in different stands, measure timber volume, the levels of vegetation from the ground to the canopy, and how much heat and humidity is stored on different landscapes."

Goldwater Scholarship


Nicholas Pancheri, a junior from Moscow and a biological engineering student in the College of Engineering, and Peik Lund-Andersen, a junior from Sandpoint who studies molecular biology and biotechnology in the College of Science, are the 2021 Idaho recipients of the Barrie Goldwater Scholarship and Excellence in Education Foundation awards. They will each receive up to $7,500 per year for up to two years for tuition, fees, books and room and board.

M.J. Murdock Charitable Trust Partners in Science Program





Christine Parent, Sarah Wu, and Lili Cai received Murdock Partners in Science awards in which they are each paired with a local high school science teacher as mentors to perform cutting-edge research for two summers. Twenty-five grants are awarded each year to fund these teacher-mentor research opportunities in the Pacific Northwest.

Mountain West Clinical Translational Research Pilot Grants

Dan Fitzsimons, an assistant professor in the department of animal, veterinary and food sciences, has been awarded a Mountain West Clinical Translational Research Infrastructure Network (MW CTR-IN) pilot grant. These grants are intended to help obtain preliminary data that will support an R-level grant application to National Institutes of Health (NIH) or other funding agencies.

Fulbright Scholars


Alan Kolok, professor of environmental sciences, has received a Fulbright U.S. Scholar Program award to the University of Concepcion, Chile. He will be conducting a project on the water quality in the Chilian River.

Vivek Utgikar, professor in chemical and biological engineering, has received a Fulbright-Nehru Academic and Professional Excellence Fellowship to conduct research in collaboration with the faculty of the Institute of Chemical Technology in Mumbai, India. The focus of this research is on the recovery of rare earth elements from electronic and electrical waste.

American Association for the Advancement of Science Fellow

Eva Top, Professor Emerita in biological sciences, was recognized for her distinguished career of research on the ecology and evolution of multiple drug resistance plasmids in bacteria.

National Science Foundation Faculty Early Career Development Program (CAREER) Awardees

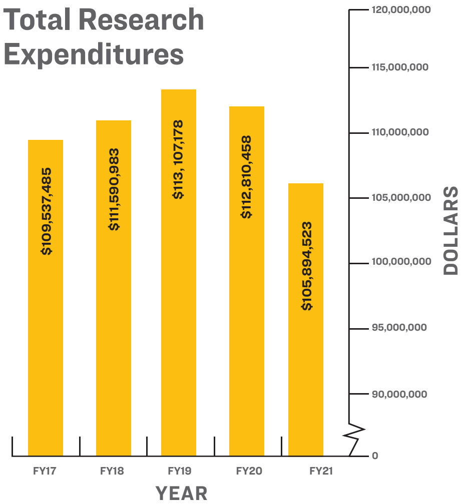

Paul Rowley, assistant professor in biological sciences, was granted an NSF CAREER award for research that aims to discover the cellular mechanisms that are important for fungal resistance to antifungal “killer” toxins.

Chris Hamilton, assistant professor in entomology, plant pathology and nematology, will apply his NSF CAREER towards research into whether the Madrean Archipelago has been a generator for North American tarantula diversity.

Research Activity and Expenditures

Pending Higher Education Research And Development (HERD) approval.

Total Research Expenditures



Summary of Sponsored Research Activity

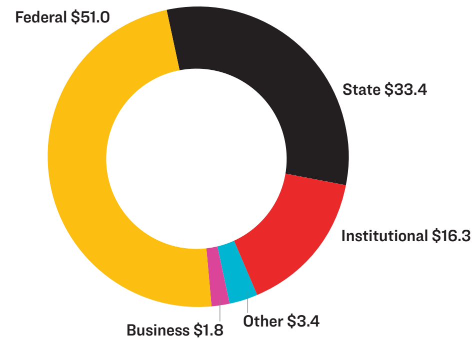
SPONSORED PROJECTS	NUMBER	AMOUNT
Proposals Submitted	960	$331,578,438

AWARDS RECEIVED	NUMBER	AMOUNT
New Awards	443	$72,389,398
Other Actions	243	$50,592,794
TOTAL AWARDS	**686**	**$122,982,192**

FY21 Total Research Expenditures by Funding Source

(Dollars in Millions)

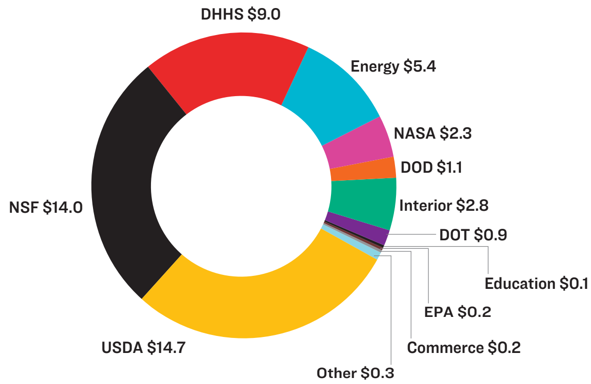
TOTAL $105,895



FY21 Federal Research Expenditures by Sponsoring Agency

(Dollars in Millions)

TOTAL $51,021



Technology Commercialization

ACTIVITY	NUMBER
Number of ALL invention disclosures	29
Number of ALL new patent applications	10
Number of ALL US patents granted	1
Number of ALL licenses	14

Sponsored Project Activity by College and Unit (Dollars in Thousands)

SPONSORED PROJECTS	AWARD #	AWARDS AMOUNTS	PROPOSAL #	PROPOSAL AMOUNTS	TOTAL EXPENSES
CoEd, Health and Human Sciences	35	$12,208	36	$18,063	$11,914
Col of Agricultural and Life Sciences	254	$36,461	386	$99,797	$17,287
Col of Letters, Arts and Social Sci.	13	$791	22	$4,852	$470
College of Art and Architecture	14	$1,148	23	$4,079	$6,021
College of Engineering	80	$12,348	140	$51,511	$8,782
College of Graduate Studies	1	$322	0	$0	$766
College of Law	2	$115	2	$131	$94
College of Natural Resources	134	$13,326	152	$48,062	$10,906
College of Science	56	$16,072	90	$42,434	$15,388
Finance	3	$19,573	0	$0	$21,648
General Library	3	$341	9	$992	$142
Research Centers and Institutes*	0	$0	0	$0	$0
Office of Research & Economic Development	1	$30	1	$120	$63
Idaho Geological Survey	3	$440	6	$1,047	$237
University Outreach	40	$4,790	57	$32,488	$3,853
Students/Equity/Tech/President/Business	32	$3,143	20	$16,327	$2,549
WWAMI Med Educ/WI Reg Vet Medicine	15	$1,874	16	$11,675	$1,430
TOTALS	**686**	**$122,982**	**960**	**$331,578**	**$101,550**

** activity in Research Centers is shown in home colleges of primary PI*