FEBRUARY 15, 2022
A EVENT RECOGNIZING RESEARCH AND CREATIVE TALENTS OF GRADUATE STUDENTS IN IDAHO.

Presented by the University of Idaho College of Graduate Studies with special thanks to the U of I President and Provost Offices
Welcome Competitors from

BOISE STATE UNIVERSITY

Idaho State University

University of Idaho
Welcome to the Idaho’s Statewide Three Minute Thesis® Competition

Tuesday, February 15, 2022
3:00 PM MT at Trailhead in Boise Idaho
Audience viewing available via Live Stream

This competition was originally developed by the University of Queensland, Australia in 2008, and is now held in over 600 universities across the world. Today, four graduate students from each of the Idaho graduate schools will compete to describe their research in 180 seconds or less.

The 1st place winner receives $1000, 2nd place $750, 3rd place $500, and the People’s Choice $250!

The top three and the People’s Choice winner in today’s 3MT event will be given the opportunity to present their work at the Western Regional 3MT event in March.

Thank you for participating in and celebrating graduate student research in the state of Idaho.
Emcee of Events
Chandra Zenner Ford
Executive Officer, U of I Boise

Special Welcome
C. Scott Green
President, University of Idaho

Judging Panel
Lori McCann
Idaho House of Representatives

Nic Miller
Executive Director of Venture College

Tiam Rastegar
Director of Trailhead

Cally Roach
Idaho State Board of Education

Matthew Weaver
Deputy Director – Idaho Department of Water Resources
University Speakers

Presidents (Videos)

Marlene Tromp, Ph.D.
Boise State University

Kevin Satterlee, J.D.
Idaho State University

C. Scott Green, M.B.A.
University of Idaho

Graduate College Deans (Live)

Scott Lowe, Ph.D.
Boise State University

Adam Bradford, Ph.D.
Idaho State University

Jerry McMurtry, Ph.D.
University of Idaho

Twelve Participants (Live)
Lori McCann is the current representative of District 6, House Seat A in the Idaho Legislature. Lori spent 16 years as the Director of the Paralegal and Legal Assistant programs at Lewis-Clark State College, and currently serves as president of LCSC’s Foundation Board, is a board member on the Idaho Community Foundation and the Idaho Business for Education. When not working, she can be found behind the wheel of her Peterbilt Semi-Truck she calls "Ruby," or spending time with her husband, children, grandchildren and friends. Lori holds a B.S. in Education from the University of Idaho and is a strong advocate for higher education in the state.
Nic Miller is the Executive Director of the Venture College, a program in the College of Innovation and Design at Boise State University. The Venture College helps students launch their ventures beyond the classroom. Prior to joining Boise State, Nic was the Director of Economic Development for the City of Boise under Boise’s longest-serving mayor, Dave Bieter, and led efforts to expand services for Boise businesses and entrepreneurs. He has held leadership positions in the U.S. and abroad in food security, economic development, ag-tech and education. Nic received a B.A. in History from the University of Idaho.
Cally J. Roach grew up on a family farm in southern Idaho. She currently serves on the Idaho State Board of Education and is a retired Vice President of Corporate Relations and Organizational Development for the employee-owned Clear Springs Foods. She previously served on the Idaho Department of Parks and Recreation Board and the St. Luke’s System governance committee. She is a member of the WWAMI/University of Idaho advisory board and the Idaho Business for Education board of directors. Among her many past involvements, she is a former CSI Foundation president, former board member of Agri-Service, Inc., and a former executive committee member for the Idaho Association of Commerce and Industry. She received her bachelor’s degree from Lewis-Clark State College and master’s degree in Human Resource Training and Development from Idaho State University. She graduated from Payette High School.
Executive Director of Trailhead

TIAM RASTEGAR

Born in Iran and raised in Germany as an asylum seeking war refugee, Tiam moved to Boise in 2000 and lives there with his wife and two children. Tiam received both a bachelor of International Business and an Executive MBA from Boise State University.

He has wide-ranging experience in Sales, Marketing, Product Development and Program Management, Mergers & Acquisitions with Boise startups since the early 2000s. As the Executive Director of Trailhead, Boise’s non-profit hub for entrepreneurship and startup incubation, he also co-chairs Boise Entrepreneur Week. Tiam earned the Idaho Business Review's 2021 CEO of Influence Award, and was ranked 2nd in the Idaho Business Review's Power 25: Startup Edition.
Mat Weaver is the Deputy Director of the Idaho Department of Water Resources. As Deputy, Mat oversees the Department’s Hydrology Section, Water Compliance Bureau, and Information Technology Services Bureau. Despite those obligations, he spends most of his time wrestling with the job responsibility category of “other duties as assigned,” which recently has included the comprehensive review and republication of all of the Department’s administrative rules.

Born near the confluence of great trout rivers in western Montana, Mat grew up across the Pacific Northwest. He earned a B.S. in Civil Engineering from Montana State University, a Masters in Hydrology from Boise State University, and is currently a licensed Professional Engineer in Idaho. When Mat’s not working, he enjoys living an active “Idaho Lifestyle” with his wife and twin boys, including backpacking, skiing, mountain biking, and fly fishing.
Strategies for Recycling Multi-Layer Plastic Materials

Rebecca Miller—Boise State University (BSU)
Ph.D. in Materials Science & Engineering, advised by Scott Phillips, Ph.D.

Each year, approximately 8 million tons of produced plastic packaging are multi-layer. The layers in these materials cannot be separated from one another, and thus cannot be recycled, contributing to plastic waste accumulation in the environment. This presentation describes our efforts to address this problem. The results suggest that self-immolative polymers incorporated into multi-layer materials enables clean separation of the layers using conditions already practiced by industry. This work demonstrates the impact of using self-immolative polymers in plastic packaging to enable recycling of multilayer materials.

Altered Microglia the Gardeners of the CNS may Potentially Lead to Atypical Feeding Behaviors in a Valproic Acid Rodent Model of Autism

Allison Loyola—Idaho State University (ISU)
M.S. in Pharmaceutical Science, advised by Prabha Awale, Ph.D.

Autism, a neurodevelopmental condition, is thought to be due to hyperconnectivity in the brain. The cause of this is unknown; however, it is well established that microglia are key players in synaptic connectivity. The antiseizure medication valproic acid is a risk factor for autism and therefore our aim was to investigate the effect of this drug on microglial numbers. Our studies in the mouse model showed a dramatic reduction in microglia by valproic acid, which may likely lead to brain hyperconnectivity.
Evaluation of Variant Calling Programs for Analyzing Diversity Between U.S. Sheep

Morgan Stegemiller–University of Idaho (U of I)
Ph.D. in Animal Physiology under Brenda Murdoch, Ph.D.

Accurately identifying genomic DNA sequence variation is a critical step in discovering causal variants for biological traits and genetic diseases. Several programs can be used to detect variants, but these programs use different quality metrics that may affect call accuracy. Our aim was to compare the performance of two commonly used variant detection programs (GATK HaplotypeCaller and Freebayes) and call variants from fourteen U.S. sheep breeds. These results showed that Freebayes called an average of 6.11% more SNPs than GATK HaplotypeCaller. From the variants called we clustered the breeds based on genetic similarity which corresponds to different physical characteristics. Furthermore, the variants identified can be used to help determine the genetic cause for the different physical characteristics. This research provides a basis for understanding the genetic diversity within and between breeds and future insight into selection pressures of US breeds.

Plasma Jet Printing of Electronics on Flexible, Low-Temperature Substrates

Jacob Manzi–BSU
M.S. in Electrical and Computer Engineering, advised by Harish Subbaraman, Ph.D.

When the benefits of 3D printing were realized, it revolutionized much of how plastic prototyping and manufacturing were done. In a similar way, additive manufacturing for electronics has made manufacturing of electronics and prototyping much cheaper and easier. I am researching parameters and materials for plasma jet printing of flexible electronic devices. Plasma jet printing has many advantages over other additive methods. The plasma promotes adhesion of the printed films, can print without the need for gravity, and sinters the film, in situ, as it is being printed. The latter is especially important for direct fabrication of devices without the need for thermal or another post processing step. This allows for printing electronics onto flexible and low temperature substrates like paper and plastic that could not be easily achieved before.
Novel Treatment Option for Rheumatoid Arthritis through Bone Targeted Delivery of Novokinin

**Arina Ranjit–ISU**
*Ph.D. in Pharmaceutical Science, advised by Ali A. Habashi, Ph.D.*

Novokinin, a peptide drug, could provide a novel therapeutic bone target for treating Rheumatoid Arthritis (RA). However, its metabolic instability limits efficacy. We aim to improve the half-life of novokinin by conjugating it with a bone targeting moiety, where bone functions as a reservoir for its sustained release. Using a rat model, our novokinin conjugate presented superior therapeutic effects due to its improved stability with no significant side effects.

Irrigation of Historical Drylands: Consequences on Soil Microbes and Antibiotic Resistance

**Amanda Bauer–U of I**
*M.S. in Soil & Water Systems, advised by Michael Strickland, Ph.D.*

Forty percent of global landmass are drylands, supporting 1.8 billion people in developing countries - partially through irrigated agriculture. While desert farming can be helpful for food security, there are ecological consequences. By irrigating soil once too dry to support crops, the environmental conditions for organisms living within the soil are rapidly changing. Soil bacteria produce antibiotics as an ecological, competitive strategy. In turn, antibiotic resistance can evolve within the soil community. Inherently, dryland soils have less abundant antibiotic resistance genes (ARGs) than more moist environments. But by manipulating environmental conditions through irrigation, soil community antibiotic interactions may shift. This presents a potential pathway for greater antibiotic resistance exposure to humans because ARGs have been shown to transfer from soil to crop. This research focuses on the transformation of semi-arid lands into lush, irrigated fields and the effects on soil bacteria, with implications to human health.
Competitors

What Can Microbial Function Tell Us About Host Health?

Jessica Bernardin—BSU
Ph.D. in Ecology, Evolution & Behavior, advised by Leonora Bittleston, Ph.D.

All living creatures from trees to beetles, host a diverse and complex assortment of microbes, their microbiome. Research has made major developments in understanding which bacteria are present in certain microbiomes, but there are gaps in what we know about how they interact with each other and their host. My research works to understand differences in microbial community function and how those differences impact their host. Pitcher plants are an excellent model system to study the effects of microbial function on host health. The bacterial communities hosted in each pitcher help to digest insects and release nutrients, which are then absorbed by the plant. I can manipulate the bacterial communities in this system and measure the downstream impacts on host health. Looking for patterns in community function within the model pitcher plant system may help us predict how host microbiomes respond to changes in nutrients, temperature, and stress.

"Here Every Creed and Race Find an Equal Place" But Not Queer People?

Krystoff Kissoon—ISU
D.A. in Political Science, advised by Kellee Kirkpatrick, Ph.D.

Trinidad & Tobago (TT) is one of the most diverse countries, yet LGBTQ+ individuals experience severe discrimination. Why do we accept some groups into the "melting pot" but not others? In TT, I argue it is because citizens think about LGBTQ+ rights in terms of race and religion rather than human rights. Government elites are discouraged from passing LGBTQ+ rights because violating racial and religious norms can hurt their political success. This creates unique challenges for LGBTQ+ advocates who may require new strategies to be successful.
Competitors

Heat Stress Effects on Mitochondria

Akorode Seriki—U of I  
Ph.D. in Biological Sciences, advised by Christopher J. Marx, Ph.D.

A population of genetically identical bacteria growing in the same condition exhibits phenotypic diversity. This allows bacteria to evolve strategies to tolerate stress, such as formaldehyde - a metabolic toxin. Formaldehyde tolerance has been studied in Methylorubrum extorquens, an organism that can grow on methanol, which is oxidized to formaldehyde during its metabolism. This tolerance ability is heritable. However, a knowledge gap is the genetic basis for tolerance in some but not all members of the same population. Twenty-three genes were implicated in the tolerant population, 22% of which are involved in protein misfolding. We hypothesize that handling protein misfolding contributes to tolerance and there could be a link between these genes and tolerance. This will be tested via genetic modifications to some of these genes and single-cell analysis. The outcome will expand our knowledge of the behavioral responses of bacteria to environmental stress based on their genetics.

Inactivation of Bacterial Biofilms in Porcine Wound Models Using Cold Plasma

Dalton Miller—BSU  
M.S. in Chemistry, advised by Ken Cornell, Ph.D.

Chronic wounds - wounds that become arrested in the inflammatory stage of healing - afflict 6.5 million people in the United States alone. These wounds remain open for weeks to months on end, and by their very nature, facilitate bacterial biofilm formation in the wound site. This further exacerbates the inflammation and prolongs the duration of the wound. Current methods of treatment are not always effective and are uncomfortable for patients, as they involve scrubbing out the wound site with antiseptic and cutting away necrotic tissue. Here we demonstrate a method of biofilm inactivation via cold atmospheric pressure plasma discharge in porcine wound models infected with Staphylococcus aureus, a common wound pathogen, while not having a deleterious effect on the mammalian cells. This could provide a less painful, less expensive, and more effective treatment for chronic wounds.
Critical trauma theory in literature posits that trauma is both unremembered and unspeakable. I argue that the problem with trauma communication isn’t a problem with the expressive language of trauma survivors, but with the receptive language of non-survivors who are uncomfortable hearing spoken trauma. This leads to social shame for survivors who attempt to speak, and robs the opportunity to learn from their experiences. Trauma can be remembered and spoken. When will we allow it to be heard?

Intercropping: An Approach to Sustainable Agriculture

Growing a single crop in a field can deplete soil health and compromise agricultural productivity. Intercropping—the practice of growing two or more crops simultaneously on the same plot of land—may be a more sustainable alternative.

Intercropping mixes often include pulse crops which can fix their own nitrogen, a critical nutrient. These crops may reduce fertilizer demand without damaging yields, resulting in economic and environmental benefits. Additionally, intercropping may support a more diverse soil microbial community, a key component of healthy and resilient soils.

As the global population continues increasing, sustainable agricultural practices will be critical to support the rising demand for food, fuel, and fiber. This research assesses measures of soil health such as nutrient status, resource allocation, and microbial diversity in intercropped fields in southern Idaho. The results of this work will help to assess the merit of intercropping as a sustainable production practice.
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