



University of Idaho

College of Graduate Studies



An event recognizing the  
research and creative talents  
of our graduate students

# UNIVERSITY OF IDAHO'S THREE MINUTE THESIS



**JERRY MCMURTRY**

Dean of Graduate Studies  
and Event Moderator

**THURSDAY  
DECEMBER 1  
3PM**



# MEET THE JUDGES

Dr. Barrett is a marine polychaete taxonomist at EcoAnalysts with degrees from the University of Hawaii (MS.c.) and the National University of Ireland in Galway (Ph.D.). Prior to moving to Moscow, Dr. Barrett worked extensively in the marine bioassessment field for 20 years. He is a member of the Southern California Association of Marine Invertebrate Taxonomist and International Polychaetologists Association and also active in various international fraternal organizations focused on community service.

Dr. Carter is a senior instructor in communications with degrees from WSU (PhD), USC (MA), and Cal State Fullerton (BA). Prior to teaching, Dr. Carter planned and implemented marketing and promotions for the Motorcycle Division at American Suzuki Motor Corporation. Her research interests center on the shedding light on the perpetuation of power structures between different social, cultural and political groups in mass media.

Professor Bruce Haglund has been an architecture professor at the University of Idaho since 1982 and involved in teaching, research, and continuing education. Haglund's current interests, which build on over thirty years of experience, focus on sustainable and regenerative architectural design and its effects on buildings and occupants.

Professor Haglund is an alum of Illinois Institute of Technology and the University of Oregon.

**Brendan "Chip"  
Barrett**



**Diane Carter**



**Bruce Haglund**



# MEET THE JUDGES

Margrit von Braun is an environmental engineer with degrees from the Georgia Institute of Technology (BS), the U of I (MCE), and WSU (PhD). Dr. von Braun's teaching and research at the University of Idaho (UI) were in hazardous waste management and risk assessment. She founded and directed the Environmental Science program and later served as dean of the College of Graduate Studies until 2011. In 2012, Dr. von Braun co-founded TerraGraphics International Foundation (TIFO) as the nonprofit successor to TerraGraphics Engineering which is dedicated to working with communities to improve environmental health around the world.

Sanjay Sisodiya is the Interim Associate Dean and Associate Professor of Marketing in the College of Business and Economics with degrees from U of I (BS), Penn State (MMM & MBA), and WSU (PhD). Dr. Sisodiya's research interests are in product innovation, open innovation, marketing strategy, interfirm relationships, technology products, and predicting movie success.

**Margrit von  
Braun**



**Sanjay Sisodiya**



**1st place \$1000**  
**2nd place \$750**  
**3rd place \$500**  
**People's Choice \$250**

**The winners today  
will advance to the  
statewide competition  
at CWI on February 7th**

Presented by the University of Idaho College of Graduate Studies  
with special thanks to President Green and the U of I President  
and Provosts' Offices

# MEET THE 19 PARTICIPANTS

Beta-glucan is a water-soluble polysaccharide, also known as mixed-linkage (1,3; 1,4)- $\beta$ -D-glucan (MLG). It is present in the cell walls of some cereals like barley and oats. MLG of barley grain is used as a dietary supplement which has benefits for human health. The main objective of this research is to verify the hypothesis of how the starch and MLG biosynthesis pathways are mutually connected during seed and leaf development. From prior results, more MLG content is found in the barley plants when less AGPase activity is used for starch accumulation. Several experiments on enzymatic activity were conducted to determine the reduction of the content of ADP-Glucose in mutant plants where the AGPS1 gene is mutated by the gene-editing technique. The results show a considerable difference in AGPase activity, implying that the starch accumulation is decreased and MLG content is increased in mutant plants compared to control.

I will present the dynamic sorption behavior of the nanocarbon sorbent synthesized in our lab to collect the organoids found in the vessel off-gas (VOG) stream produced by the recycling of spent nuclear fuel (UNF). The dynamic sorption results will be shown in both a monolith-coated form and a pelletized form.

The following are the study's key findings:

1. Nanocarbon created in our lab had a higher sorption capacity than those previously reported in the literature and was able to remove methyl iodide from the gas stream.
2. The nanocarbon's capacity for sorption was decreased with aging.
3. The performance of nanocarbon was impacted by the presence of moisture.

**Leela Appili**  
*MS Plant Science*  
*with Dr. Hong*

**Biochemical and genetic  
characterization of a beta-  
glucan mutant of barley**

**Chaithayna Balumuru**  
*PhD Chemical Engineering*  
*with Dr. Utgikar*

**Novel processes for capture  
of radioactive iodine species  
from nuclear fuel cycle**

# MEET THE PARTICIPANTS

Increasing renewable energy resources in microgrids increases the stability problems. To overcome these issues, converters connected to energy storage systems are integrated with renewable energy resources to provide virtual inertia and emulate the conventional synchronous generator to improve the system's stability. The superconducting magnetic energy storage system is considered a high-power density system and deals with high-frequency power fluctuation and emulates the inertial response of the traditional synchronous generator. On the other hand, the battery provides high energy and deals with low-frequency power fluctuations. This hybrid system reduces the stress on the battery due to the transient and high charging and discharging currents, and so increases its lifetime. The general features offered by the hybrid energy storage system and its controller are described. Also, the effects of inertia and damping constants emulation on the system response and sizing of the converter and energy storage system are described.

Traditional traffic simulators use a step-by-step movement of vehicles to predict outcome of proposed signaling solutions. This is impractical for use in a stochastic optimization which requires evaluation of large numbers of potential signaling solutions. My solution is to develop and use a new traffic simulator where cars are moved in a single step from one node in the traffic network to another with arrival time at the next node predicted by using machine learning techniques. Arrival times are sensitively dependent on parameters such as traffic and road conditions, weather, and traffic behavior patterns which may be dependent on the specific road. By learning traffic behaviors rather than using an a priori traffic formula, we will get a more accurate model of traffic behavior that reflects the real-world influences and adapts to changing conditions on the roadway. Furthermore, my simulator is much faster making it suitable for modern stochastic optimizers.

**Mahmoud Badreldien**  
*PhD Electrical & Computer  
Engineering  
with Dr. Johnson*

**Modern control of smart  
power grid**

**Neeta Anna Eapen**  
*PhD Computer Science  
with Dr. Heckendorn*

**A traffic simulator which  
learns traffic behavior  
patterns**

# MEET THE PARTICIPANTS

Implementation of autonomous and connected trucks (ACTs) will have major impacts on mobility, safety, and infrastructure service life. Although truck platooning will increase fuel efficiency and improve transportation services, the platooning configuration is expected to accelerate damage to the existing infrastructure. This damage, if accumulated, will cost the country billions of dollars to fix and will affect the mobility of people and goods. This research aimed at developing a well-defined framework for assessing and a data-driven solution for addressing the influence of truck platoons on existing bridges to be prepared for future implementation of ACTs and to preserve the current bridge inventory. An extensive parametric study of 59,200 computer simulations was conducted to address the impact of a wide range of platooning configurations on load ratings of existing bridges using three different methodologies. The results were used to create engineering guidelines to find the optimum parameters for any bridge case.

Precision agriculture incorporates emerging technology into farming practices to increase crop efficiency and production and reduce harmful climatic impacts. The United States has prioritized precision agriculture adoption, but problems arise with high costs of equipment as well as education and usability barriers for end users with current technology offerings. To help address these gaps, the University of Idaho has been developing the SCARECRO system to provide low cost and open source remote sensing systems to users without a technological background. One of the key components of SCARECRO is the incorporation of artificial intelligence (AI) into the broader data ecosystem. However, there is no existing general purpose design to incorporate large amounts of data from different sensors at different timescales. SCARECRO aims to investigate biologically inspired neural networks and unsupervised feature development to determine what AI approach works best for a rapidly developing precision agriculture system.

**Mohamed Elshazli**

*PhD Chemical Engineering  
with Dr. Ibrahim*

**Impact of autonomous and connected truck platoons on existing bridges**

**Mary Everett**

*PhD Computer Science  
with Dr. Shovic*

**The SCARECRO System:  
Open source, scalable  
precision agriculture**

# MEET THE PARTICIPANTS

As the world shifts towards and more global society, a growing understanding in the value of global citizenship is paramount. Universities have long valued study abroad and internationalization programs, but international service-learning (ISL) can exceed both programs' expectations.

This quasi-experimental, pre-test/post-test design study is to compare global citizenship in an undergraduate population. Results will be used to determine whether the ISL students have significantly higher GCS scores. This way universities and ISL providers will have a clearer picture of what undergraduate students' needs are for global citizenship and how universities can better prepare undergraduates for the global future.

Morphological and mechanical properties of the plantar fascia (PF), such as thickness and stiffness, have been suggested to play a role in developing plantar fasciitis. The true etiology and progression of plantar fasciitis are unknown. A better understanding of the tissue properties prior to injury is important as there are currently no known preventative strategies. This dissertation explored the effects of imposed running demands on PF properties. PF thickness and stiffness decrease acutely in response to a single session of high intensity track repeats. Both properties returned to pre-run values after 30 minutes of rest. Furthermore, PF thickness in a rested state increased due to distance running on three consecutive days. These findings suggest that mechanical overloading and insufficient rest induce conformational PF change and add new information regarding the behavior of the tissue in response to running, improving the outcomes of injury prevention.

**Tanner Heath**  
*PhD Education*  
*with Dr. Son*

**International service learning's effects on global citizenship**

**Lukas Krumpl**  
*PhD Movement Science*  
*with Dr. Bailey*

**Morphological and mechanical properties of the plantar fascia in response to imposed running demands**

# MEET THE PARTICIPANTS

Heat stress reduces hepatic mitochondrial protein expression, however the functional impact of heat stress on mitochondria is unclear. We hypothesized that heat stress has a direct effect on hepatic metabolism through impaired mitochondrial function and oxidant imbalance, with consequences for lactation performance. Mid-lactation ( $94 \pm 6$  d in milk) multiparous Holstein cows were randomly assigned to treatment. Treatments ( $n = 8/\text{group}$ ) were heat-stressed (HT) or pair-fed thermoneutral (PFTN). Measures of mitochondrial behavior such as mitochondrial number, biogenesis, and function were taken to understand how heat stress directly impacts mitochondrial function. Our results suggest heat stress does not have a substantial direct impact on hepatic mitochondrial function and antioxidant capacity.

**Adamarie Marquez Acevedo**  
*MS Animal Science*  
*with Dr. Skibiel*

**It's getting hot in here,  
time to cool all your cows!**

## WHO WILL WIN?

**1st place \$1000**

**2nd place \$750**

**3rd place \$500**

**People's Choice \$250**

## WHO'S YOUR FAVORITE FOR PEOPLE'S CHOICE?

# MEET THE PARTICIPANTS

Asymmetrical lower extremity movement mechanics may increase the risk of injury due to increased loads of one limb and a lack of stability on the other limb. Repetitive unilateral training of one limb has the capability to improve strength or skill on the contralateral limb through the neurological phenomenon of cross-education. However, there is currently no evidence that a cross-education training protocol can improve lower limb movement symmetry during a single leg squat. The potential for a unilateral training protocol to improve lower extremity movement symmetry would be of great benefit for rehabilitation and injury prevention programs. Therefore, the purpose of this study was to examine whether repetitive unilateral training with a single leg squat can improve the movement mechanics of individuals with self-identified movement asymmetry. It is hypothesized that performing multiple sets of single leg squats on the self-identified preferred leg will improve the movement on the non-preferred side.

Livestock wastewater after anaerobic digestion usually features high amounts of phosphates and ammonium which poses serious environmental pollution threats to air, soil, and water resources without adequate treatment or disposal measures. One potential approach to recover these nutrients from such waste streams is by struvite (Magnesium ammonium phosphate) crystallization. Due to its chemical composition and low solubility, struvite is often considered a premium grade, slow-release fertilizer with higher purity and lower heavy metal content than some commercial phosphate fertilizers. The purpose of this research is to:

1. develop an electrolytic reactor and evaluate its performance based on struvite purity, particle size distribution, amount of phosphate and ammonium recovery from synthetic anaerobic-digested poultry wastewater
2. develop and validate an appropriate mechanistic modeling framework that can predict the quality of recovered struvite and process performance as a function of precipitation kinetics mechanisms, solution thermodynamic equilibria, and reactor hydrodynamics

**Nickolai Martonick**  
*MSAT Exercise Science*  
*with Dr. Bailey*

**Correcting movement imbalances**

**Robinson Junior Ndeddy Aka**  
*PhD Environmental Science*  
*with Dr. Wu*

**Modeling electrolytic struvite precipitation for nutrient recovery from anaerobic-digested livestock wastewater**

# MEET THE PARTICIPANTS

The quarantined pest of potato, *Globodera pallida*, a cyst nematode (PCN), was first found in Idaho in 2006. Since many nematicides have been banned, development of new methods for controlling this nematode are essential for eradication. One control measure is the use of *Solanum sisymbriifolium*, or litchi tomato (LT) which induces hatch but limits reproduction of PCN. LT has little economic value as a crop and seeds are unavailable. There is evidence that this plant kills the nematode through production of toxins. Previous research indicates that pure solanaceous glycoalkaloids may be toxic to PCN. Currently, our research indicates that glycoalkaloids are found in higher concentrations in the leaf tissue. We are now identifying and purifying these compounds by liquid-liquid extraction and fractionation of infected and uninfected LT plants. Once fractionated, their impacts on PCN will be evaluated. Potential discovery of novel chemistries for nematicide development would be a valuable achievement.

Research is clear a spiritual element resides in athletics: a major component of the Wellness Wheel. Most coaches lack connection to spirituality and are rarely trained pedagogists. Instead, they are indoctrinated into a culture focused on conditioning, motor skill development, and winning. Because winning is almost everything, an alarming trend of increased anxiety and depression exists in collegiate athletes. The imminent crisis is psychological, existential, and spiritual. Our mixed methods study examines inner-reflection, self-awareness, and spirituality that contribute to their well-being and human flourishing. Our study uses phenomenological reflection to increase coping, reduce anxiety, and inspire individual spirituality. Our intervention includes a twelve-week systematic intentional coaching education, applying our methodology, and assessing the effects on the well-being of athletes measured by anxiety levels, athletic coping skills, and spirituality. Our projected sample size is 8 US collegiate teams. Ultimate outcomes for both coach and athlete are increased well-being and spirituality.

**Lindsay Schulz**

*PhD EPPN*

*with Dr. Dandurand*

**Toxic effects of the trap crop, *solanum sisymbriifolium*, on the potato cyst nematode, *globodera pallida***

**Nathan Stark**

*PhD Education*

*with Dr. Stoll*

**Existential coaching education: A pedagogical pathway to alleviate anxiety, increase coping skills, and appreciate spirituality in collegiate athletes**

# MEET THE PARTICIPANTS

Information is a critical resource for animals, and access to information can shape their ecology and behavior. Visibility, which characterizes accessibility of visual information as a function of habitat structure, can be especially important for prey species attempting to avoid predation. Three-dimensional habitat structure blocks sightlines and consequently alters the potential area from which visual information can be collected. Methods for estimating visibility have not accounted for fine-scale 3D structure, limiting our ability to quantify this crucial resource. Using lidar technology has allowed us to overcome these limitations and test hypotheses about the effects of ecosystem-specific structure on visibility and assess how prey species make use of visibility when selecting for secure habitat. Results of this work are advancing the emerging field of 'viewshed ecology' by improving methods for estimating visibility and applying these new methods to better understand why and how animals select habitat.

To meet their municipal and agricultural water needs during the dry summer months, the Southeastern United States relies on streamflow. Many of these rivers cross-state boundaries, and thus have become the subject of interstate legal battles in recent years. An important component of these legal decisions is the use of historical streamflow measurements, many of which have been reconstructed using tree ring width measurements. Although tree rings can successfully reconstruct discharge in individual basins, a regional investigation into the discharge patterns of these heavily-litigated rivers is lacking. To address this gap, we use a point-by-point reconstruction method to reconstruct river discharge in 11 watershed subregions in the South Atlantic-Gulf Region. We then identify spatial patterns in streamflow across the SE. We explore the relationship of these patterns to regional climate features like the Bermuda High to better understand subregional character of drought in this part of the country.

**Rachel Stein**

*PhD Natural Resources*

*Fish & Wildlife*

*with Dr. Rachlow*

**Seeing is surviving: How habitat structure influences access to visual information and predator avoidance**

**Richard Thaxton**

*PhD Geography*

*with Dr. Harley*

**Heavily-litigated rivers and streamflow change in the SE United States**

# MEET THE PARTICIPANTS

Remote sensing has many applications and benefits in earth science. Visible (350-750 nm) and near-infrared (750-2500 nm) wavelengths can measure environmental data more efficiently than traditional laboratory methods, and in this thesis, a hyperspectral sensing system is used to predict phosphorus (P) in soil and heavy metals in wildfire ash. Ex-situ reflectance was measured with an ASD FieldSpec 4 instrument on 282 soil samples collected from the Lake Tahoe Basin (California, USA). Soil phosphorus was measured using conventional laboratory tests and predicted based on Random Forest and Partial Least Squares Regression. Similarly, models were built to predict heavy metal concentrations in 40 wildfire ash samples collected across the Western US. The data and findings support the development of field-based remote sensing systems that can assess forest watershed P loading potential and the risk of heavy metal contamination in wildfire ash.

Anthropogenic disturbance in the form of human harvest can exert tremendous pressure on wildlife populations. By exploiting populations at high levels and targeting specific traits in ways that do not mimic natural predation, human harvest of wild populations can generate rapid evolutionary changes in harvested species. Yet, the behavioral consequences of rapid, human-induced changes in animal morphology or physiology remain poorly understood. For example, although intensive poaching for ivory has led to an increase in tusklessness among some female African elephant (*Loxodonta africana*) populations, no studies have investigated the impacts of tusklessness on elephant behavior.

We studied elephant behavior in Gorongosa National Park, Mozambique, and our findings suggest that tuskless females use foraging habitat differently than their tusked counterparts, which could dramatically alter the structure and function of entire savanna ecosystems. This research directly supports the UN Decade of Ecosystem Restoration, which focuses on overcoming the global biodiversity crisis.

**Paul Tietz**

*PhD Soil & Water Systems*

*with Dr. Strawn*

**Use of hyperspectral remote sensing to detect forest soil phosphorus and wildfire ash metal content**

**Jeremy Van Driessche**

*PhD Natural Resources*

*Fish & Wildlife*

*with Dr. Long*

**The influence of tusklessness on foraging behavior of female African elephants (*Loxodonta africana*)**

# MEET THE PARTICIPANTS

From the introduction of the Chestnut blight (*Cryphonectria parasitica*), the American Chestnut tree (*Castanea dentata*) was wiped out across almost the entirety of the species' range with only small saplings left to live in the forests today. I would like to share the tale of the American Chestnut by using an emotional and political ecologies framework and mixed methods approach (including archives, qualitative interviewing, multispecies ethnography, and botanical surveys). While being grounded in a geographical approach, the study rendered a unique historical account of the American Chestnut. Since the blight's introduction, I was able to trace the emotional and political role of the American Chestnut in Appalachian families and communities. We also put together a preliminary inventory of the multispecies world surrounding modern Chestnut saplings. The research works to build and add to the growing conversations of defining what plant extinction is in the Anthropocene.

Merleau-Ponty (MP) (1964) stated that first-person reflective experience gets to the truth of experience. Through epoché (reduction), a powerful tool exists to understand the self. This study uses Merleau-Ponty's phenomenology (presuppositionless perspective, first-person description, epoché, intentionality, constitution, and body-subject) to describe the effects of a social media platform and physical activity tracker, Strava. Phenomenology is a gift to appreciate running as a body-subject activity and gain meaningfulness of the run. The purpose of this phenomenological study using Merleau-Ponty's methodology is to describe the objective effects of Strava on limiting the individual subjective experience.

**Nick Koenig**  
*PhD Geography*  
*with Dr. Harley*

**Emotional extinctions:  
Entanglements with the  
American Chestnut**

**Samantha Lewis**  
*PhD Education*  
*with Dr. Stoll*

**If it's not on Strava,  
did it even happen?**



An event recognizing the research and creative talents of graduate students in Idaho!

# IDAHO'S STATEWIDE THREE MINUTE THESIS



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College of Graduate Studies



Idaho State University



BOISE STATE UNIVERSITY

**WATCH TODAY'S WINNERS ON...**

**TUESDAY  
FEBRUARY 7, 2023 3PM**

**VIA ZOOM FROM THE CWI  
CAMPUS**