3MT THREE MINUTE THESIS

FOUNDED BY THE UNIVERSITY OF QUEENSLAND

February 9, 2021

An event to recognize the research and creative talents of graduate students in Idaho.

Presented by the University of Idaho College of Graduate Studies
with special thanks to the University of Idaho Provost Office

University of Idaho
College of Graduate Studies

3MT® THREE MINUTE THESIS
FOUNDED BY THE UNIVERSITY OF QUEENSLAND

AN 80,000 WORD THESIS
WOULD TAKE 9 HOURS
TO PRESENT.

THEIR TIME LIMIT.... 3 MINUTES.

University of Idaho

Three Minute Thesis ® Competition

Tuesday February 9, 2021

1:00–3:00 PST

Welcome to the University of Idaho's
Three Minute Thesis® (3MT) Competition!

This competition was originally developed by the University of Queensland in 2008, and is now held in over 600 universities across the world.

Today, 24 graduate students from the University of Idaho will compete to describe their research in 3 minutes or less.

The winner will take home $1000, second place will receive $750, third place will receive $500, and the People's Choice winner will get $250.

The top competitors of the U of I 3MT event will be given the opportunity to present their work at the Statewide 3MT event on February 23, 2021, and compete with students from Boise State University and Idaho State University.

Thank you for participating in this wonderful event to celebrate graduate student's research at the University of Idaho.

Officiator of Events

Jerry McMurtry, Ph.D.

College of Graduate Studies Dean

Judging Panel

Louise-Marie Dandurand

Research Associate Professor – Entomology, Plant Pathology & Nematology

Lee Vierling, Ph.D.

Director of the Environmental Science Program and Department Head – Natural Resources and Society

Matt Powell, Ph.D.

Associate Professor – Animal, Veterinary & Food Sciences

Mark Nielson, Ph.D.

Associate Dean of College of Science, Mathematics and Statistical Science Professor

Hanwen Dong, M.A., M.S.

Instructional Technology Librarian, Assistant Professor

Competitors

Liquid Phase Plasma Discharge Catalysis for Green Fuels

Muhammad Aamir Bashir

Conventional biodiesel production from fats and oils is a time-consuming and energy-intensive process. A novel liquid-phase plasma discharge (LPPD) reactor was designed and evaluated for rapid esterification and transesterification to convert fats and oils into biodiesel. Different ratios of alcohols to oil and catalyst concentrations were evaluated to determine the highest conversion efficiency. The effects of LPPD on the reaction process was revealed, and the ability of plasma discharge to form reactive species and enhance the conversion process efficiency was also discussed in detail. This novel LPPD process can significantly reduce the time and heating energy required for the conventional biodiesel production reactions, thus significantly improving the production efficiency of the current biodiesel industry. With the ongoing research, the LPPD system studied herein could be further improved in conversion rate by modifying the reactor design to provide more free reactive radicals for better protonation to increase the conversion rate of the system.

Muhammad Aamir Bashir is a doctoral student in Chemical and Biological Engineering under Dr. Sarah Wu

The role of small masses in sculpting the structure and orbital evolution of rings and moons

Joseph A'Hearn

While resonances determine the large-scale dynamical structure of planetary systems, interactions among the small bodies in these resonances alter their orbital evolution. We use numerical simulations to study the orbital evolution of interacting small bodies orbiting within two different locations in Saturn's rings. These simulations reveal the importance of interaction timescales for multi-body orbital dynamics, and the fragility of low-mass co-orbital satellite systems.

Joseph A'Hearn is a doctoral student in Physics under Dr. Matthew Hedman

Renewable products from mixed feedstocks and plastic wastes – a review and technology recommendation

Galo Albor

Bioenergy is essential to build a resilient economy and decrease fossil fuel dependency to achieve environmental sustainability. Traditional bioenergy comes from high moisture biomass feedstocks, which accounts for most renewable energy in the United States. Scaling-up biomass can result in the most successful path to harness energy production. High moisture content feedstocks and non-recyclable waste are value pathways to promote an environmental and economical solution to satisfy energy demands. To achieve the energy demand can be met with supporting cradle to the cradle economy to encourage a balance between the human food chain, mixed feedstocks and plastic waste, and bioenergy production to make policy and economic development equilibrium.

Galo Albor is a master's student in Environmental Science studying under Dr. Amin Mirkouei

Competitors

Decomposition of Organic Iodide Using Electric Discharge

Chaithanya Balumuru

Energy production is needed with no effect on global warming. To overcome the future needs, we must adopt zero carbon emission methods. Nuclear energy is a contributor of electricity production as it is known to be clean energy. Uranium is used as fuel for producing nuclear energy, however, due to limited uranium reserves and the efficacy of it, there is a need to opt the reprocessing operations of nuclear fuel. Although there are many benefits to nuclear energy, there are equal disadvantages. A disadvantage is the release of toxic radioactive iodine species while reprocessing nuclear fuel cycle in off gas streams which cause severe damage to the environment and health. These radioactive iodine species are differentiated into two types, organic and inorganic iodine/molecular iodine. Adsorption techniques are effective in capturing inorganic species, but less effective for organic species such as methyl iodide gas. Hence, we propose a simple and effective electric discharge pretreatment method to break the radioactive iodine species and decompose organic iodide before further treatment. The objective of this research is to get almost zero level of methyl iodide in exist gas stream which will help further adsorption treatment processes to capture radioactive iodine and to make the nuclear fuel treatment process environmentally friendly.

Chaithanya Balumuru is a master's student in Chemical Engineering studying under Dr. Vivek Utigkar

Competitors

Psinging Goudimel's Goodies

Sean Bohnet

One key aspect for renewal in liturgical communities, is the form and function their worship services adopt. In part to social and political unrest, there exists a growing body of scholarship and practice that intend to reclaim aspects of the Protestant Reformation. Crucial to the advancement of this branch of Christianity was the use of music especially hymnody and psalmody. Sixteenth century composer Claude Goudimel helped advance the potency of the Huguenot Psalter, a song book where each psalm was married with a melody, when he harmonized it in 1564. While notable scholarship has been done in the field of sixteenth century protestant reformation music, a comprehensive and accessible version of the Huguenot Psalter as harmonized by Goudimel in modern notation does not exist. The following thesis establishes the background and credence necessary for meeting this need along with select transcription examples.

Sean Bohnet a master's student in Music History studying under Dr. Barry Bilderback

Forest Floor Leaf Litter Decomposition: a Microbial Tale

Katelyn Conery

Microbes are ubiquitous and the role they play in ecosystem processes should not go unrecognized. Forest floor leaf litter decomposition is a process expedited by the work of soil microbes. Microbial communities can vary throughout different ecosystems, therefore varying in their functional capabilities. My research seeks to understand how different microbial communities decompose Ponderosa pine litter. My preliminary data suggests that different microbial communities decompose Ponderosa pine litter differently, showing differences in mass loss and respiration. Overall, microbial interactions with different environments are far from being understood and I hope to shed light and raise new questions on microbial forest floor leaf litter decomposition processes.

Katelyn Conery is a master's student in Environmental Science under Dr. Michael Strickland

Lower Extremity Joint Stiffness Associated with Drop Jump Performance

Youngmin Chun

The human body reacts mechanically to the external loads during the weight-bearing movements by changing positions of the body. Lower extremity muscles create tensional forces to absorb or utilize the load by actively lengthening and shortening muscles and alters each joint position. The relationship between the load and changes in joint positions refers to the joint stiffness and this affects joint strategies for the complex movement. The joint stiffness and the performance have a curvilinear relationship, which means the optimal joint stiffness may exist for the best performance to store and return maximal mechanical energy. Theoretically, types of training and the focus of the sport task affect the ability to properly utilize energy storage and return to improve performance while reducing the risk of injury. My research hypothesis is to identify if there is a relationship between women collegiate athlete's sports and their stiffness characteristics during a drop jump task.

Youngmin Chun is a doctoral student in Exercise Science under Dr. Joshua Bailey

Controlling Tomato Flowering Time and Fruit Characteristics by Chromatin Remodeling

Rachel Gross

The process of flowering and development of fruit in tomatoes is tightly regulated by many different genes. To understand which genes are important for these complex processes we can examine the targets of chromatin remodeling complexes. Chromatin remodeling complexes are a group of proteins which modify the structure of chromatin. Chromatin is a section of DNA wrapped around small proteins called histones. The structure of chromatin around genes can regulate their expression, essentially turning genes off or on. My research has identified a chromatin remodeling complex in tomatoes which when its function is impaired leads to a delay in flowering time and abnormal fruit characteristics such as smaller fruits, very low sugar content and reduced seed set. If we examine the targets of this chromatin remodeling complex, we hope to identify which genes control these aspects of tomato flowering and fruit development.

Rachel Gross is a doctoral student in Plant Science studying under Dr. Fangming Xiao

A Vaccine Pill for Fish

Evan Jones

The aquaculture industry continues to grow at a rapid pace; however, it experiences losses due to preventable diseases that cost an estimated 10 billion dollars annually. Vaccinations are typically used to prevent these diseases, however much of the mortality occurs in the first 6 months of the fish's life. These fish are too small to receive most commercial vaccines, which are injection based. Researchers at Oregon State University have developed a novel oral vaccine particle, or pill, that can be fed directly to fish. This research will focus on comparing the antibody response and protective effects of the oral vaccine to other vaccination routes, such as injection, in two fish species: rainbow trout (Onchorynchous mykiss) and sablefish (Anaplopoma fimbria). If there is evidence that the oral particle can provide a similar response as these other methods, it can reduce production costs in aquaculture and provide cheaper fish for the market.

Evan Jones is a master's student in Natural Resources under Dr. Ken Cain

Efficient degradation and mineralization of methylene blue via continuous-flow electrohydraulic plasma discharge

Anilkumar Krosuri

A novel, continuous-flow electrohydraulic plasma discharge (EHPD) process characteristic of establishing a sgtable discharge through the conducting channel in the center orifice of a dielectric plate was developed and investigated to degrade methylene blue (MB) in water. The effect of three operating parameters, i.e., liquid flow rate (37-94 ml/min), air flow rate (1-4 L/min), and initial dye concentration (10-100 mg/L), on the MB degradation efficiency was evaluated. The results indicated 100% degradation of MB was achieved within 10 min of treatment for all MB concentrations tested and the mineralization showed 92.5% COD removal for 100 mg/L MB. The energy efficiency for different operating parameters was in the range between 0.16g/kWh-0.81g/kWh at 50% conversion. The overall results indicated that the novel, continuous-flow EHPD is a robust and highly effective process for degradation and mineralization of MB, a potential technology that can overcome the limitations of advanced oxidation processes for wastewater treatment.

Anikumar Krosuri is a doctoral student in Environmental Science studying under Dr. Sarah Wu

Competitors

The science of dry-aged steak

Jessica Lancaster

Dry-aging is a practice that involves storing meat at refrigerated temperatures without protective packaging. The process has been observed to create unique flavors and consumer demand for dry-aged beef continues to increase. Despite the popularity, relatively little is published about commercial dry-aging parameters. Sixty-six beef strip loins (IMPS #175) were assigned to ten commercial dry-aging facilities, the remaining six where wet aged. Strip loins were shipped to aging locations, aged for 45-days, and returned to the University of Idaho. Strip loins were fabricated into steaks, vacuum packaged, and frozen until analysis. Dry-aging facility cooler conditions were observed to be different ($P < 0.01$) for temperature, percent relative humidity, and wind speed. Consumer taste panels indicated differences in acceptability ($P < 0.01$), tenderness ($P = 0.01$), and flavor ($P < 0.01$) based on aging location. This research indicates that conditions within individual dry-aging facilities aid in producing unique dry-aged beef products.

Jessica Lancaster is a doctoral student in Animal Physiology studying under Dr. Philip Bass

Friction Stir Based Repair Welding of Dry Storage Canisters and Mitigation Strategies

Anirban Naskar

The Nuclear Regulatory Commission has identified chloride-induced stress corrosion cracking (CISCC) of austenitic stainless steel dry cask storage systems as an area of major concern. Dry storage systems are used for long-term storage (up to 100 years) of spent nuclear fuels (SNF) and fabricated by 304L or 316 type austenitic stainless steels. Salts carried by the dust will deliquesce as heat generated by radioactive decay declines over time. The deliquescence of salt deposit could induce various forms of corrosion attack such as pitting and CISCC. Friction stir welding (FSW) is a solid-state process, a commonly used joining process is implemented to repair stress corrosion cracks. FSW has many benefits over traditional arc welding such as- low heat input, defect -free weld, low residual stress and grain refined microstructure in the stir zone. This research deals with finding optimized parameters for FSW to effectively repair stress corrosion cracks. Also, friction stir alloying, a modified FSW technique is used to incorporate alloying elements (Mo and N) in the 304L matrix while repairing cracks, which can significantly improve the corrosion-resistant properties.

Anirban Naskar is a doctoral student in Chemical and Materials Engineering under Dr. Krishnan Raja

Competitors

Modular low-cost housing: reimagining engineered wood in West-Africa

Olamide Olorunkosebi

Fast, effective and affordable housing is the basis of a never-ending conversation that has seen no change in West-Africa. With population on the rise and average income at an all-time low, it is essential to reimagine an alternative to “acetylated wood used in cold regions” in achieving low-cost housing for the average West-African, regardless of social status, class or income through the re-introduction of wood for mass construction. This research outlines the possibilities of design and construction beyond disaster relief, and the opportunities to commercialize it. The study seeks to introduce engineered wood to the mass concrete style of construction. The goal is to create scalable modular housing by redefining wood construction for hotter climates in Africa, while maintaining affordability and structural weight without sacrificing quality.

Olamide Olorunkosebi is a master’s student in Art and Architecture studying under Dr. Bruce Haglund

Looking for new sources of resistance to PVY in potatoes

Mariana Rodriguez Rodriguez

Potato virus Y (PVY) causes huge economic losses in potatoes worldwide. An effective control measure is breeding PVY resistant potato cultivars. Plant resistance can be the result of single genes or due to multiple genes. Single genes are commonly used in breeding programs because of their dominant and simple inheritance. However, using this type of genes, the chances of new PVY strains appearing and overcoming the resistance increase. Recessive resistance is based on minor multiple genes, can control multiple viral strains and is more durable. Combining both type of resistance in the same genotype could clear a new route for the breeding of PVY resistance. In this work we assess the presence of recessive genes in a popular commercial potato cultivar with not known PVY resistance (Russet Norkotah), by hybridization with a potato cultivar with known PVY resistance (Yukon Gem), which we suspect possess dominant and recessive PVY resistance genes.

Mariana Rodriguez Rodriguez is a doctoral student in Plant Sciences studying under Dr. Alexander Karasev

Existential Coaching Education: A Pedagogical Pathway to Alleviate Anxiety and Increase Coping Skills of Collegiate Female Swimmers

Mark Sowa

This twelve-week intervention was conducted with a female collegiate swimming team. Preliminary results indicate a significant difference in trait anxiety between pre to posttest in the treatment group t(25)=4.0, p=.002. Posttest means (30.4+/-1.39) were significantly lower than pretest means (34.4+/-1.67). Paired analysis of pre and posttest results from the control groups showed no significant change t(30)= 0.80, p=.428. Posttest means (36.13+/-1.56) were not significantly different than pretest means (35.33+/-1.52).

Significant change was found in pre to posttest in the treatment group in levels coping skills t(23)= -4.30, p=.007. Posttest means (73.39+/-1.57) were significantly higher than pretest means (69.08+/-1.67). A paired analysis of pre and post test results from the control group showed no significant change in coping skills t(30)=(-.71), p=.383. Posttest means (70.7+/-1.55) were not significantly different from pretest means (69.88+/-1.88).

Preliminary conclusions indicate that a twelve-week systematic, existential coaching intervention positively affects anxiety and coping skills in female swimmers.

Mark Sowa is a doctoral student in Education studying under Dr. S.K. Stoll

Identifying Genetic Markers and Potential Biological Pathways for Cattle Fertility

Morgan Stegemiller

The ability of livestock to reproduce efficiently is critical to the sustainability of animal agriculture. Reproductive track scores (RTS) and Antral follicle count (AFC) can be used to estimate fertility in beef heifers, but the genetic mechanisms influencing variation in these measures are not well understood. Two genome-wide association studies (GWAS) were conducted to identify significant markers associated with these traits. The GWAS analyzing RTS had 289 heifers and compared prepubertal to pubertal animals. The second GWAS had a subset of these heifers (n=217) and analyzed the number of antral follicles the heifers presented. Four significant regions were found for RTS and three for AFC. These regions contained genes associated with cell proliferation, transcription, apoptosis and development. This study proposes candidate genes for beef cattle fertility, although future research is needed to elucidate precise mechanisms.

Morgan Stegemiller is a master's student in Animal Science studying under Dr. Brenda Murdoch

Competitors

Disparities in emergency medical service (EMS) response time for automobile crashes in Idaho

Skye Swoboda-Colberg

Automobile crashes are a leading cause of death in the United States, and the timely response of Emergency Medical Services (EMS) to these events is critical for the survival of crash victims. The purpose of this research is to measure the accessibility of EMS to Fatal and Severe crashes using actual and predicted temporal response intervals. Geographical approaches are utilized to identify statistically significant differences among these intervals between Urban, Rural, and Roadway classifications, as well as identify areas that could benefit from a more rapid EMS response.

Skye Swoboda-Colberg is a master's student in Geography studying under Dr. Felix Liao

HARD Questions About Bone in Cattle

Katie Walker-Shira

United States beef consumers demand safe, high-quality beef from young healthy animals and that is what the industry provides. One step in grading beef at the highest quality takes into account an estimate of animal age using the maturity of the skeletal system or dentition. Much like humans, modern cattle that are fed well grow and mature more quickly. As a consequence, chronologically young cattle appear physically older with respect to their skeletal development; this is termed advanced skeletal maturity. Producers are paid less for these advanced maturity animals. I validated genetic variations within genes in cattle (N=1,000) that predispose them to advanced skeletal maturity and this will allow the development of a genetic test to help producers manage their cattle and maximize their value. This is an applicable solution to a real-world problem, ensuring US beef consumers will continue to have the highest quality beef.

Katie Walker-Shira is a doctoral student in Animal Physiology studying under Dr. Gordon Murdoch

Competitors

Regenerative Urbanism

Lyndsay Watkins

Cities have glossed over the reciprocity between natural and urban environments. This project explores opportunities to reterritorialize key intersections within the urban fabric to take regenerative action towards resilient infrastructure and architecture by proposing an interconnected system of solutions in the form of urban nodes.

The project pinpoints critical moments in the urban fabric with historical and infrastructural correlation, then generates and tests solutions that can be scaled and grow outward over time with a method of hyper-localized “plug and play” template solutions as opposed to the installation of a singular architectural solution.

The set of systems being developed are not an answer, but a path forward that must grow and develop with the city as the seasons pass. The hope is that this set of interventions provides a viable, rational, and creative framework that transforms as it grows and regenerates the downtown Boise area socially and environmentally over time.

Lyndsay Watkins is a master’s student in Art and Architecture studying under Dr. Dwaine Carver.

Blackleg Disease of Canola in Northern Idaho

Kayla Yearout

Blackleg disease of canola, caused by the fungal pathogen Leptosphaeria maculans, is a major constraint to production of canola (Brassica napus) worldwide and an emerging threat in Idaho. Blackleg can cause severe stem lesions and cankers, resulting in detrimental yield loss. In northern Idaho blackleg was first identified in 2009. As a recent introduction it is crucial to understand the biology of L. maculans and its epidemiology specific to this region to develop management strategies. Research objectives aim to identify the most common disease-causing genes in the pathogen population, determining when initial disease infection occurs and if it is caused by wind-blown or rain-splashed spores, and identifying the optimal time of fungicide application to reduce disease incidence and severity. It is from this research that grower guidelines for best management practices can be developed specific to the production of canola in northern Idaho.

Kayla Yearout is a master's student in Plant Science studying under Dr. Kurt Schroeder

Thank you for attending the University of Idaho's 3MT event!

We hope to see you at the Idaho Statewide 3MT competition on February 23, 2021.

More info:
www.uidaho.edu/cogs/3mt