RESEARCH, SCHOLARSHIP, & CREATIVE WORK
FROM THE WSU COMMUNITY

Academic Showcase & GPSA Research Expo

SHOWCASE

WASHINGTON STATE UNIVERSITY

SHOWCASE

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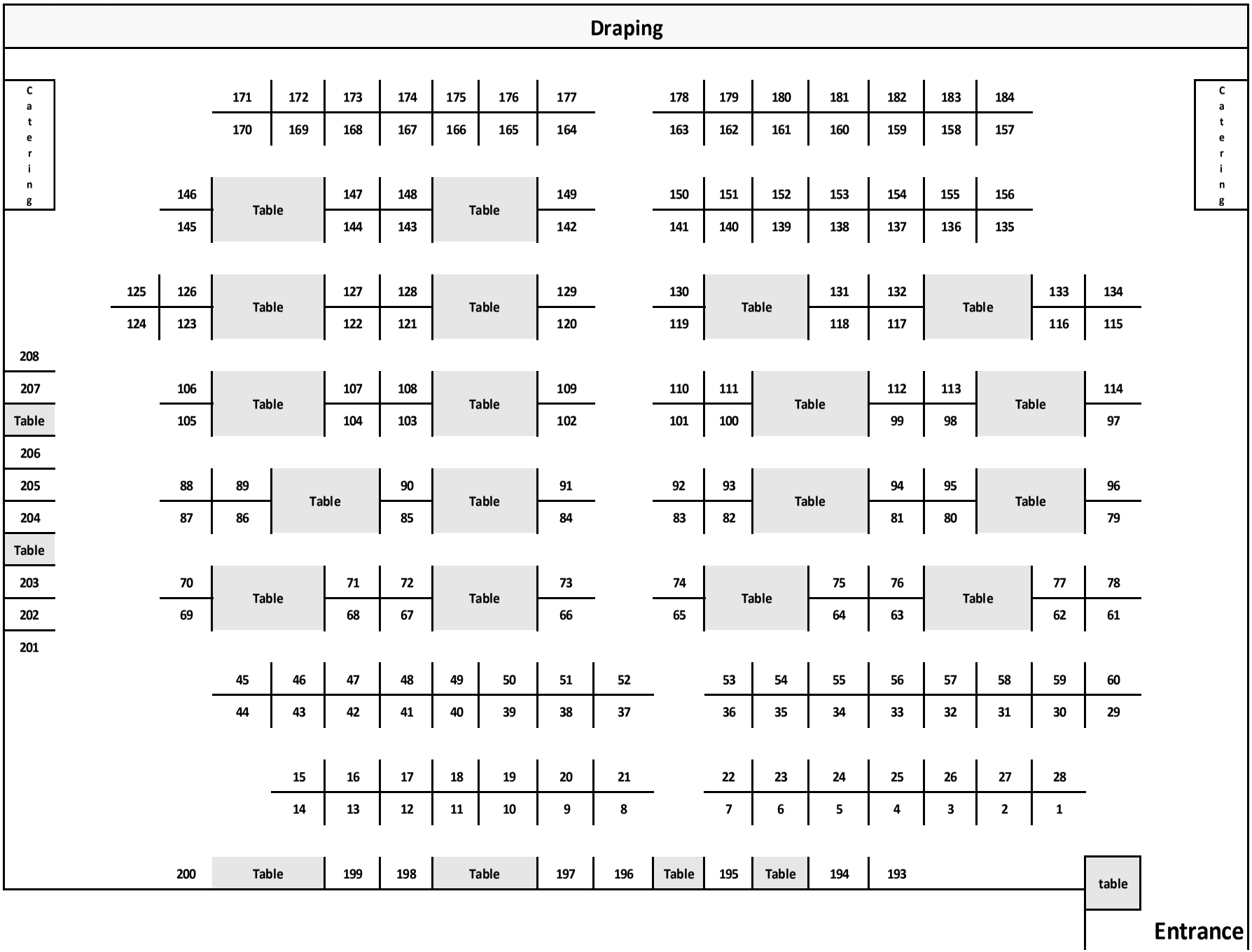
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Entrance

GPSA Research Exposition Participant
Board Placement: 1

What is the Effect of Animated Paragraph and Animated Map with Self-explanation on Achievement?

Primary Author: Blessing Adaramola
Co-Author(s):

Faculty Sponsor: Olusola Adesope

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

Empirical studies have shown that animations are beneficial for learning. Although numerous studies have shown that animation is valuable for learning, few studies have examined the synergistic effects of self-explanation with animated maps or paragraphs in learning chemistry concepts. The present study investigates the effects of animated map + self-explanation, animated paragraph + self-explanation, animated map only, and animated paragraph on learning gas concepts in a large introductory chemistry class. In a 2X2 factorial design, this study examines student performance with animations (animated map vs. animated paragraph) and self-explanation (yes or no). Participants (n = 685) were randomly assigned to one of four groups to learn chemistry concepts. A 2 X 2 between-subjects multivariate analysis of variance (MANOVA) was conducted with animation factor and a self-explanation factor as the independent variables and students' posttest as the dependent variables. A post hoc test indicates no significant difference between the test conditions across the groups. It did not show any statistically significant difference for students' overall score between the groups, F (3, 666), = .144, p = .934. Results indicate no main interaction or significance within groups at = .05. Theoretical and practical implications of the findings will be discussed.

Academic Showcase Participant
Board Placement: 140

Noncognitive learning outcomes of immigrant and non-immigrant students in the United States: A multilevel study.

Primary Author: SAMUEL AINA
Co-Author(s):

Faculty Sponsor: Olusola Adesope

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

There is an increasing number of immigrant students in the United States. Between 1965 and 2015, the immigrant population more than doubled from about five to fourteen percent of the total U.S. population. This upsurge has necessitated more focus of research on the academic outcomes of immigrant students, particularly because of the disparities in academic performance between non-immigrant students and their first- and second-generation immigrant peers. However, the focus on the academic outcomes of immigrant students has been largely on their cognitive outcomes such as standardized test scores and intelligence quotient (IQ) tests. There is need for more focus and effort on how to help immigrant students do well in school on noncognitive outcomes, without neglecting their cognitive outcomes. Using data from the PISA 2018, this study examined immigrant students' noncognitive outcomes in the United States, with a specific focus on student mastery goal orientation. The study employed multilevel modeling techniques to examine how student- and school-level factors such as immigration status, socioeconomic status, and parents' education predicted students' noncognitive outcomes. Findings showed that against popular beliefs that immigrant youths are less competent relative to their non-immigrant peers, variation in mastery goal orientation among schools and students are more likely to be attributable to inequities and disparities in socioeconomic status than student immigration status. Implications of the study for policies, educational practice, and future research were discussed.

GPSA Research Exposition Participant
Board Placement: 80

Flic-Grip - Utilizing 3d Printing to Develop Accessible Page-Turning for Brass Instruments

Primary Author: Tristan Akdamar
Co-Author(s):

Faculty Sponsor: Keri McCarthy

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

This project began as a personal quest to create an attachment for the trombone to develop a page-turning accessory for digital sheet music without using a foot pedal. I have designed and printed over twenty accessories that fit different trombone models through collaboration conducted with trombonists globally. This project was a logical expansion to create attachments for trumpet, horn, euphonium, and tuba.

Research and design have been conducted with Washington State University's brass faculty to fit the 3D printed attachments in various configurations to their instruments. Priority was placed on ergonomics, functionality, and removability for each instrument and model. The attachment mounts a pre-existing page-turning button to the instruments for use with digital sheet music devices.

While much of this project has resulted in a physical product, there is an accompanying document in progress containing: a brief introduction, history of 3D printing, overview of other 3D printed musical accessories, the process of fitting and designing, and a bibliography. This project is only the first step as much is still to be studied and created within the realm of 3D-printed musical accessories.

I have brought accessible, ergonomic page-turning accessories to other brass instruments beyond the trombone with this project. The result is a sellable product for the primary brass family of instruments. Beyond just fitting the designated instrument, these designs will also serve as a template for the world's numerous models of brass instruments.

GPSA Research Exposition Participant
Board Placement: 195

INHIBITION OF DRUG-RESISTANT BACTERIA BY SULFATED POLYSACCHARIDES FROM PORPHYRIDIUM PURPUREUM (RHODOPHYTA)

Primary Author: Marwa Aly
Co-Author(s):Wen-ji Dong
Schonna Manning

Faculty Sponsor: We-ji Dong

Primary College/Unit: Engineering and Architecture
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Approximately 35,000 people die every year in the U.S. due to infections from drug-resistant bacteria that have high mutation rates and become resistant to commonly used antibiotics. Porphyridium is a unicellular red microalga that is known to secrete sulfated polysaccharides (SPS) to create a protective extracellular matrix. The antimicrobial activity of extracellular SPS from Porphyridium purpureum UTEX LB 2757 was tested against Staphylococcus aureus (G+), Bacillus subtilis (G+), Pseudomonas aeruginosa (G-), and Acinetobacter baumannii (G-) to assess growth inhibition in bacterial cultures. Different concentrations of SPS (10, 50, 100, and 500 µg/mL) were added to pre-incubated cultures in the middle of the exponential phase to determine the minimum inhibitory concentration (MIC) for each bacterium. Results for SPS experiments were compared to treatments with tetracycline (positive control), and tryptic soy broth (TSB), and water (negative controls). Culture density was measured using a plate reader spectrophotometer at 600 nm set at 37 °C with constant mixing; measurements were taken once every 15 min over 8 hours. The growth of bacteria decreased significantly, or was halted completely, after the addition of SPS; growth inhibition in SPS treatments was dose-dependent for all bacteria tested. Ten µg/mL was the MIC of SPS that inhibited the growth of S. aureus, B. subtilis, and A. baumannii, whereas 50 µg/mL was the MIC that inhibited the growth of P. aeruginosa. These experiments demonstrate the antimicrobial properties of SPS from Porphyridium purpureum and the feasibility of using microalgal natural products to help combat drug-resistant bacteria.

Academic Showcase Participant
Board Placement: 43

Alkali-Metal Spin-Destruction Rates in Rb-Xe and Cs-Xe Systems

Primary Author: Zahra Armanfard
Co-Author(s):

Faculty Sponsor: Brian Saam

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Hyperpolarized gases like Xenon are used in medical imaging. Understanding spin-exchange optical pumping (SEOP), benefits all its applications. We have studied Rb and Cs spin-destruction rates in He(94%)-N2(3%)-Xe(3%) gas mixtures similar to those used in polarizers. Measuring the spin-exchange efficiency helps understanding which alkali-metal is an efficient partner for polarizing Xe, which depends on measuring the spin-exchange rate and the spin-destruction rate of the alkali-metal.
We determine the spin-destruction rate for Rb-Xe and Cs-Xe systems under identical conditions. Using an optically detected pulsed-RF EPR technique that we developed. We use an optical chopper to periodically block the pump laser for a short period of time and perturb the alkali-metal atoms spin system with small-flip-angle pulses and record its free induction decay. We then map out the polarization decay of the alkali-metal atoms and fit the slowest decay to a single exponential.
We measure the spin destruction rate as a function of total gas density at fixed composition. Our preliminary results show that Xe-Cs spin-destruction rate is about 20% slower than Xe-Rb spin-destruction rate over the range of one to a few amagats of gas density. Therefore, considering the reported 10% faster spin-exchange rate coefficient for Cs, we may realize a ≈40% improvement in SEOP efficiency if Cs is used instead of Rb.

GPSA Research Exposition Participant
Board Placement: 5

Analysis of Optimized Plans for School Redistricting

Primary Author: James Asare
Co-Author(s):

Faculty Sponsor: Molly Kelton

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

One of the long-standing issues in the United States is gerrymandering. The practice where politicians purposefully change election district boundaries to favor their party, or socioeconomic class while damaging the chances of their opponents seeking political representation. Because public school districts lie within the boundaries of a county or city, district boundaries are modified or redrawn whenever the population changes in a process called redistricting. It is very complicated to allocate students to these schools while considering different criteria like balance and contiguity. Historically, there is record of legislative efforts that have promoted unfair redistricting processes, but the current discussion that persists till date is centered on segregation. Advocates have suggested the use of algorithms for redistricting because they are nonpartisan, but there is no supporting mathematical or experimental evidence. Policy makers, nonetheless, rely on these optimization algorithms to justify and modify the planning and attendance areas of students. One recent observation is that the direct application of sampling/optimization methods can lead to poor representational outcomes for minority residents. In this work, we analyze the optimization methods implemented in a well-used algorithm called REGAL on a US public school district having different school levels and ethnicities. Using three different metrics in our analysis, our results suggest evidence that the direct application of sampling/optimization methods can lead to segregation. In the particular district investigated, this happened the most in elementary schools. This foundational work can lead into future studies for exploring redistricting with ensemble methods.

SHOWCASE

Academic Showcase Participant
Board Placement: 63

Type 4 Secretion System Effector prediction across the genus Rickettsia

Primary Author: Joseph Aspinwall
Co-Author(s):Kelly Brayton

Faculty Sponsor: Kelly Brayton

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

The type 4 secretion system (T4SS) secretes effector molecules across the bacterial membrane into host cells, and is consequently important for infection. The genus Rickettsia consists of obligate intracellular bacteria which often colonize arthropod hosts, including blood feeding parasites such as ticks and lice. The hematophagous lifestyle of the arthropod transmits the bacteria to the vertebrate hosts on which the arthropods feed. In both vector and host, the bacteria must survive and replicate in a unique set of cells. T4SS effectors are key players in exploiting these diverse niches.
Prediction of T4SS effectors is particularly challenging because they are not well conserved between species. Several prediction programs have been developed, but their outputs do not overlap well. Our lab has developed a learning algorithm based prediction program called OPT4e to identify T4SS effector candidates across the genus Rickettsia. The goal was to identify differences in the effector repertoire of Rickettsia bellii (Rb) as compared to other rickettsial species.
Eight rickettsial genomes were analyzed with OPT4e. The number of predicted effectors per genome ranged from 84 to 345, with Rb having the largest. This is dramatically higher than in the related Anaplasmataceae, where effectors number between 32 and 88. When searched against the Pfam_A database, 59% of these proteins had predicted domains and of those 58% were similar to those of eukaryotes. In addition, the program predicts 8 known/putative T4SS effectors. This large set of effectors, particularly in Rb, challenge the dogma that genomes of obligate intracellular bacteria have reduced complexity.

GPSA Research Exposition Participant
Board Placement: 9

Why are there so many DUCs?

Primary Author: Dipanwita Barai
Co-Author(s):Thomas L. Marsh

Faculty Sponsor: Thomas L. Marsh

Primary College/Unit: Other
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Abstract

Principal topic

Oil production has been increasing in the past few years in the USA, especially in the Permian region. Along with the increment of oil production, the USA economy has experienced a gigantic increment of both drilled but uncompleted oil (DUCs) wells. This study investigates how the change of the economic variables (such as the expectation of oil prices, rigs count, oil stock, and oil production) impacts the change of the DUCs using Autoregressive Dynamic Lag Model (ARDL).

Method

ARDL estimated models capture equilibrium dynamics through ARDL specifications for the change of the USA DUCs. It shows the change in DUCs as a function of the change in the WTI spot and future four months ahead price differences, change in Cushing Ending Stocks of Crude Oil (Oil Stock), change in total Rig Count, change in total oil production, change in total real GDP, change in total oil export, change in DUCs in the previous year.

Results/implications

This study finds that several considered economic variables (such as, change of the rigs counts or DUCs in the previous period) significantly influence the increment of the DUCs for the considered region. An ongoing oil producing wells and DUCs exerts almost same level of negative environmental externality with lot more economic development. This analysis aids the policymakers in understanding the impact of the economic variables on the DUCs of the USA along with Permian and Appalachia region and ultimately helps them take steps to decrease this massive amount of DUCs over time.

Academic Showcase Participant
Board Placement: 76

Photoluminescence of gallium oxide under static pressure

Primary Author: Lauren Barmore
Co-Author(s):

Faculty Sponsor: Matthew McCluskey

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal topic
Gallium oxide (β-Ga2O3) is a semiconductor that has been a recent focus of research due to its material properties that are useful for electronics. Specifically, gallium oxide is useful because it has a wide bandgap, meaning there is a large energy barrier that an electron must overcome to conduct electricity, and it can be doped n-type, which is when impurities that donate electrons are added to the crystal. Understanding the role of stress and impurities in semiconductors is important to optimizing device performance.

Method
This work investigates the effects of high pressure on the photoluminescence properties of gallium oxide doped with chromium (Ga2O3:Cr3+). Chromium impurities substitute for the gallium atoms in the crystal lattice and cause red photoluminescence emission peaks. A diamond anvil cell is used to apply static pressure to gallium oxide crystals up to a maximum of 10 gigapascals. As pressure is increased, the spectra of gallium oxide inside the cell is measured. Additionally, photoluminescence mapping was used to create a spatial map of the gallium oxide spectrum across an entire crystal under pressure.

Results
Under hydrostatic pressure, the red chromium emission peaks shift linearly with increasing pressure. The gallium oxide crystal displayed stress gradients oriented along the crystal growth direction. The emission spectrum can be compared with the well-known case of ruby (Al2O3:Cr3+) under pressure, and allows a better understanding of the effects of stress and impurities in semiconductor crystals.

Academic Showcase Participant
Board Placement: 68

An Interdisciplinary Collaboration to Improve Healthy Eating: Nutrition Education and Produce Donation at a Residential Life-Rehabilitation Unit

Primary Author: Amy Behler
Co-Author(s):Fionnuala Brown
Kylie Pybus

Faculty Sponsor: Deborah Eti

Primary College/Unit: Nursing
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Poor eating patterns and malnutrition are common among people recovering from substance use disorder. Consumption of foods and drinks high in sugar, fat, and sodium, coupled with underconsumption of nutrient-dense foods, can lead to diseases, such as obesity, hypertension, and diabetes. Health care providers practicing at a residential life-rehabilitation unit (RLRU) observed poor eating patterns and low nutritional knowledge among its residents.

A Doctor of Nursing Practice (DNP) candidate from the College of Nursing identified the need for nutrition education at the RLRU. They partnered with WSU Extension's Expanded Food and Nutrition Education Program (EFNEP) to offer direct nutrition education to residents at the RLRU. The EFNEP is an evidenced-based program that works to improve the diets of low-income families through classes taught by peer educators who are members of the communities they serve. In addition, the DNP candidate secured weekly produce donations to the RLRU kitchen from two community food pantries. Produce donations were incorporated into residents' daily meals.

In the Fall of 2021, residents at the RLRU (n=15) participated in the EFNEP's, Eating Smart• Being Active (ESBA), class series for six weeks. Participants completed a pre-post 30-item behavior questionnaire and 24-hour dietary recall. After completion of the program, 87% of participants reported improvement in one or more nutrition behaviors such as eating more fruits and vegetables and drinking fewer regular sodas.

The interdisciplinary collaboration between the College of Nursing and WSU Extension helped improve residents' health and nutrition as shown in their dietary changes.

Academic Showcase Participant
Board Placement: 3

Developing alternative approaches for artificial oocyte activation

Primary Author: Miranda Bernhardt
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Somatic cell nuclear transfer (SCNT or “cloning”) has important applications in genome engineering and agriculture, but the process is inefficient, and some animal clones suffer from developmental abnormalities. SCNT involves fusing a body cell nucleus with an enucleated oocyte and artificially activating the oocyte to trigger embryo development. Typically, chemical treatments or electric pulses are used to raise intracellular calcium levels and cause activation. We have developed a novel activation method that triggers a more natural pattern of calcium oscillations in mouse oocytes by stimulating the same signaling pathway as sperm. The goal of this project is to test whether this method can be applied to porcine or bovine oocytes, with the ultimate objective of improving embryo quality following SCNT. We hypothesize that inducing embryo development with a signal similar to fertilization could generate healthier SCNT embryos and offspring. Microarray and RNAseq data from mouse, porcine, and bovine oocytes show robust expression of our target gene. Using mass spectrometry, we were unable to detect matching peptides in porcine oocytes; however, the number of peptides identified was very low. In initial calcium imaging experiments, two activators of G-protein-signaling that evoke calcium signals in mouse oocytes did not cause detectable responses in porcine or bovine oocytes. Additional experiments are underway to inhibit target genes and determine whether calcium responses can be induced. In future studies, we plan to compare calcium signaling pathways among multiple animal species to improve assisted reproductive technologies, animal agriculture, and human health.

Academic Showcase Participant
Board Placement: 67

The effects of pay disparity in a team's strategic core

Primary Author: Jeremy Beus
Co-Author(s):Shaun Parkinson
Jay Bates

Faculty Sponsor: Jeremy Beus

Primary College/Unit: Business
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Effective teamwork among all members of a team is important, yet team performance is often driven by star performers, or by a team's strategic core. Although research indicates that apportioning a greater percentage of financial resources to a team's strategic core—team members who encounter more team problems, have greater exposure to team tasks, and are more central to team workflow—is connected with greater team success, how those financial resources are disbursed among the strategic core should affect the manner and extent of contributions a team receives from its core role holders. Using a combination of equity theory and money priming theory as a conceptual basis, we posit that inequitable pay disparity among core role holders on a team is negatively associated with team performance and that this effect is stronger when strictly considering a team's strategic core as opposed to considering the team as a whole. We examine team effort and coordination as explanatory mechanisms for this expected effect and test our hypotheses in a sample of professional basketball teams from the National Basketball Association. Results support a negative connection between inequitable pay disparity and team performance, but only when the disparity exists among core role holders (as opposed to the entire team) and only via the mediating mechanism of team coordination (not team effort). These findings underscore the pervasive impact of core role holders on team performance, emphasizing that how core role holders are paid is meaningfully connected with team success.

Academic Showcase Participant
Board Placement: 24

Towards Automated Blossom Thinning in Apple Trees

Primary Author: Uddhav Bhattarai
Co-Author(s):

Faculty Sponsor: Manoj Karkee

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal Topic
Blossom thinning is one of the crucial crop-load management approaches, which controls the current season fruit yield and quality, and coming season's return bloom. Every year growers rely on laborious and labor-intensive manual hand blossom thinning to achieve systematic and controlled thinning. This study proposes a robotic blossom thinning system to perform precision thinning using a miniature mechanical thinner navigated via machine vision-assisted robotic manipulator.

Methods and Results
Flowers are densely located in clusters making individual flower segmentation highly challenging. Hence instead of segmenting and removing individual flowers, the proposed approach involves segmenting the flower clusters, counting the number of flowers per cluster, and removing a proportion of flowers. A deep learning-based pixel-level instance segmentation was used to delineate the flower clusters (Average Precision=0.86) and to control the end-effector to precisely reach the target blossom. Another deep learning-based system was developed to estimate the flower distribution and count in the canopy images (Count Accuracy = 15.4%). To control the thinning intensity, results from both cluster segmentation and counting were combined to achieve segmented flower clusters and flowers per cluster. Furthermore, a miniature electrically actuated end-effector was custom-designed using spindle-string structure. Ongoing efforts involve developing a motion planning framework and integrating the vision system with a 6-DOF robotic arm to navigate the end-effector to the desired location and orientation and remove the expected proportion of flowers from target clusters in a commercial orchard.

Implications
The proposed approach, when successful, will provide the foundation for developing robotic solutions for blossom thinning in fresh market apples.

GPSA Research Exposition Participant
Board Placement: 16

Using Machine Learning to Predict the Presence of Pest Aphids

Primary Author: Megan Blance
Co-Author(s):

Faculty Sponsor: David Crowder

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principal topic
Within crops, insect pests create damage and transmit disease which can lead to billions of dollars in crop loss each year. While application of pesticides can reduce pest populations, it is costly and excessive application can have harmful environmental effects. In situations where insect pests do not always reach an economically damaging population level, pesticide application may be an unnecessary cost to growers. Therefore, it is beneficial to know when pests will become a problem. I propose using alternative host plants for these insects as predictors for pest outbreaks. In cereal crops, aphids present as one of the biggest pest concerns and they feed on a variety of grass hosts.
Method
In 2021, I used sweep netting to sample insects on grass species from 32 sites across the Palouse. Using this sampling data, I worked to create a Machine Learning algorithm that would predict insect presence, specifically aphids, depending on the plant community. This algorithm uses a dataset to train a computer to recognize patterns without specifically programming in those patterns. Then with another dataset, you can test the accuracy of the algorithm's predictions. The more accurate it is, the better it does at predicting the presence of the target insect.
Results/implications
This novel approach to pest management is successfully able to predict insect presence using plant community data based on initial findings, proving its feasibility as a technique. With this, pests can be predicted before they affect crops allowing growers to proactively manage them.

Academic Showcase Participant
Board Placement: 154

Fuly Quantitative Mapping of Zoning in Igneous Phenocrysts by Electron Microprobe Using Mean Atomic Number Background Estimates

Primary Author: Scott Boroughs
Co-Author(s):John Wolff
Ramsey Nersinger
Arron Steiner

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Like tree rings, zoning in minerals can record the changing environments of their host magmas during growth and, when carefully interrogated, provide insight into magma formation and evolution. The electron microprobe at WSU is an ideal tool for measuring chemical variation at the micron scales necessary to resolve zoning in minerals, but conventional spot analyses may provide an incomplete picture or be extremely labor intensive. Here, we present a technique for quantitatively mapping the chemistry of minerals, which increases data density and continuity, without necessarily increasing analytical time. Maps were acquired using the Probe Software Suite, which applies all of the complex calculations and corrections utilized in conventional analyses, to each pixel of the map. Mean atomic number background estimates use a series of carefully selected standards to estimate the background intensity of the unknown. For large data sets and mapping, this saves considerable instrument time, as one only needs to measure the peak intensity of the analyte, while conventional mapping requires two additional measurements to estimate the background (high and low off peak). Lastly, by rastering the stage across the map area, overhead time (e.g. spectrometer motion, beam measurements, etc.) is substantially reduced compared to spot analyses. This technique was used to create fully quantitative maps of barium zonation in feldspars from the Columbia River Basalts and Snake River Plain Rhyolites, at 2-10 micron spatial resolution and ~100 parts per million detection limits, which has improved modeling of the timing of magma contamination, recharge, and evolution.

GPSA Research Exposition Participant
Board Placement: 19

Labor discrimination of the transgender population in the Peruvian labor market

Primary Author: HECTOR BOTELLO-PENALOZA
Co-Author(s):

Faculty Sponsor: BEN COWEN

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Peru is one of the Latin American countries where governments in the last two decades have made reforms in an attempt to ensure that the LGBT population has a greater integration within civil society. The objective of this research is to estimate whether there is labor discrimination against this population in the Peruvian labor market. In this sense, this research uses a survey applied to 406 transgender people in Peru. This is the first research focused on the study of employment discrimination of the transgender population in Peru. The methodological design evaluates whether the probability of being employed is different for the transgender population compared to the general population. Different controls associated with the probability of being employed such as education and experience are used. Investigating this dynamic is relevant because it shows that despite advances in gender equality policies, the enforcement of laws is limited by institutional weakness and the preponderance of conservative values in the aforementioned societies. Preliminary results show that there is no statistical difference in employability rates that can be explained by the transgender status of the worker. However, once employed, nearly 40% of transgender people report having suffered discrimination at work. This is double the rate reported by the general population. Consequently, the low rate of reporting of these crimes (20%) and the low institutional response to them is noteworthy. The results show that there is a need to improve institutional management aimed at improving equal opportunities for this group.

GPSA Research Exposition Participant
Board Placement: 23

Crustal evolution of the Lofoten – Vesterålen area in Norway through solution Hf isotope and coupled U-Pb and Hf isotope analysis

Primary Author: Manuela Botero
Co-Author(s):Jeffrey Vervoort
Fernando Corfu

Faculty Sponsor: Jeffrey Vervoort

Primary College/Unit: Arts and Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

The Lofoten–Vesterålen area in Norway records multiple magmatic and metamorphic events that span from the Neoarchean to the Paleoproterozoic. In this study we present new Lu-Hf and Sm-Nd data from Precambrian rocks to constrain the crustal evolution. The samples are subdivided into three groups: 1) The granulite facies zone (GFZ); 2) the amphibolite facies zone (AFZ) and; 3) the Anorthosite-Mangerite-Charnockite-Granite association (AMCG). Solution Hf isotope compositions were obtained for zircons previously dated by ID-TIMS [1,2]. We also conducted in-situ LASS–MS-ICPMS analyses on zircons to simultaneously determine U-Pb ages and Hf isotope compositions. Garnet geochronology was performed by isotope dilution. LASS data from the GFZ yield two populations, a Neoarchean (~2.6 Ga) with εHf(i) from +0.1 to -1.4 and, a Paleoproterozoic (~1.8 Ga) with εHf(i) around -14.0. Rocks within the AFZ yield Neoarchean ages around 2.6 Ga with εHf(i) -1.6. All AMCG samples yield in-situ U-Pb ages between 1.87 and 1.79 Ga and Hf isotope compositions varying from -4.0 and -15.0 εHf(i). In general, there is a good agreement between solution and in-situ data. Rocks within the GFZ yield garnet Lu-Hf and Sm-Nd ages of 1879 and 1791 Ma, respectively. This Paleoproterozoic metamorphism is not recorded within the AFZ, supporting the hypothesis of a tectonic boundary between the GFZ and AFZ. Paleoproterozoic magmatism has Hf isotope composition that suggest incorporation of both, recycled ancient crust, and juvenile material. Sub-chondritic Hf isotope compositions from Neoarchean rocks suggest no significant presence of older crust within the source regions of these rocks.

SHOWCASE

Academic Showcase Participant
Board Placement: 166

Technology Assisted Adherence to Buprenorphine for Opioid Use Disorder: A Patient Feedback Survey

Primary Author: Theresa Bowden
Co-Author(s):Crystal Lederhos Smith
Abigail Keever
Sterling McPherson
Katie Olson
Michael McDonell
John Roll
Gillian Smoody
Jeff LeBrun

Faculty Sponsor:

Primary College/Unit: Other
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Aim: The intent of the current investigation was to examine direct qualitative and quantitative patient feedback on a Bluetooth-enabled pill bottle cap and associated mobile application for patients currently prescribed buprenorphine for an opioid use disorder (OUD).
Background: OUDs impact the health and the well-being of millions of Americans. Opioid Agonist Therapy (OAT), such as buprenorphine/naloxone (BUP/NAL), can reduce opioid overdose deaths, decrease opioid misuse, and improve quality of life. Unfortunately, poor medication adherence is one of the main barriers to long term efficacy of OAT.
Methods: A convenience sample at an opioid use disorder clinic were asked about medication adherence, opioid cravings, experience with technology, and their existent support system through a brief, electronic survey. Patients provided detailed feedback on features such as inclusion of a personal motivational factor, craving and stress tracking, incentives, online support forums and virtual coaching.
Results: Twenty people (n=20) with an OUD who were currently prescribed BUP/NAL participated in the study. Participants had a mean age of 34 years, were 65% female, and 80% Caucasian. Out of the potential features reviewed in the study, when the participants had the opportunity to select the most useful, second most useful, and least useful, the large majority of participants indicated that motivational reminders would be most useful (42.1%), followed by craving and stress tracking (26.3%) and online support forums (21.1%).

Conclusions: Requesting suggestions for the described pill-bottle technology may encourage the use of the platform, as well as allow technology developers and BUP/NAL providers to modify this tool for different patient populations.

Academic Showcase Participant
Board Placement: 153

Social Media Use among American Indian and Alaska Native People

Primary Author: Amanda Boyd
Co-Author(s):Ashley Railey
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Alex Kirkpatrick
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Dedra Buchwald

Faculty Sponsor:

Primary College/Unit: Communication
Category Social Sciences
Campus: Pullman

Abstract:

Patients, health professionals, and publics use social media to communicate information about health conditions and associated risk factors. Studies have highlighted the potential for social media to reach underserved populations, suggesting these platforms can be used to disseminate health information. The objective of this cross-sectional study is to better understand the use of social media platforms to disseminate health information among AI/ANs. 429 AI/ANs aged 18 years and older were recruited to complete surveys during cultural events in the United States in 2016-2017. We used descriptive statistics and logistic regressions to assess participant use of Twitter, Snapchat, Facebook, and Instagram by participant demographics, including age, gender, education, and residence (rural vs. metro). Facebook was used by more participants (80%) than any other platform, followed by Instagram (31%), and 50% used only one social media platform. A 5-year older age difference was associated with a lower odds of using Facebook (0.8 OR, 95% CI: 0.7, 1.0), Instagram (0.8 OR, 95% CI: 0.7, 0.9), and Snapchat (0.6 OR, 95% CI: 0.5, 0.7). College education was associated with a 2.0 higher odds (95% CI: 1.1, 3.6) of using additional social media platforms compared to those without any college education. Most participants used social media platforms suggesting that they may be a useful tool in disseminating health and health risk information to AI/ANs. Further research should document how social media can be used to effectively disseminate health information across the life course, and assess changes in knowledge and behaviors, among these populations.

Academic Showcase Participant
Board Placement: 133

Approach to help migrant and seasonal farmworkers during COVID-19

Primary Author: Hannah Brause
Co-Author(s):Hannah Brause

Faculty Sponsor:

Primary College/Unit: Other
Category Social Sciences
Campus: Other

Abstract:

Agriculture plays a significant role in the Columbia Gorge Region, which is known for its apple, pear, and cherry production. Each year, approximately 30,000 to 40,000 migrant and seasonal workers arrive to pick orchard fruit during harvest. This group of workers is critical to the success of the region and its economy. However, the influx of foreign workers had some residence concerned for their own safety at the onset of the COVID-19 Pandemic. In response, a group of concerned community members reached out to one another to find ways to support these workers and to prevent similar potential outbreaks that had occurred in other agriculture segments. Expanding to include 70 community partners and 140 total participants, the work group met 147 times during 2020. WSU Extension played a critical role, building on its strong relationships with the orchard industry and other community partners and agencies. The work group focused its efforts on multiple fronts working proactively when possible and tackling complex issues as they emerged. “Esencial” poster helped combat the fear and racist language and behavior being directed towards the Gorge’s migrant workers, the work group rallied to show support and solidarity. Artist Edith Belman, who is the daughter of farmworkers, created images that were used to promote positive messages such as “We are one Community” and “Thank a farmworker today.” In total, 33 large banners, 60 posters, and 100 yard signs were featured around the Gorge, working to improve the systems and environment of the Gorge farmworkers.

SHOWCASE

Academic Showcase Participant
Board Placement: 109

Implementing a Palliative Care Education Program: A Quality Improvement Project

Primary Author: Austin Brekke
Co-Author(s):Brian Seppi
Janet Purath

Faculty Sponsor: Janet Purath

Primary College/Unit: Nursing
Category Nursing
Campus: Spokane

Abstract:

Purpose: This Quality Improvement project implemented and evaluated an educational intervention for consumers of a community-based Palliative care program in Eastern Washington.
Background: Palliative care is a collaborative approach to address the physical, psychological, social, and spiritual stressors of chronic, life-limiting illnesses. Early, aggressive Palliative care interventions improve the quality of life for patients and families. This approach to care is often mis-understood by providers and patients. It is believed that reducing knowledge gaps improves confidence in health care providers and patient satisfaction.
Methods/Intervention: We developed an educational video for referring providers. A second video for patients/families was provided to participants admitted to the Palliative care program. A mixed-methods approach was utilized consisting of quantitative ranking of participant understanding and qualitative, thematic analysis of knowledge gaps and satisfaction. Understanding of Palliative care's services and recommendations for program improvement were evaluated with a post-survey. Patient/family satisfaction with Palliative care was also surveyed one-month post intervention.
Results: Most patient/family respondents (71.4%) strongly agreed that their understanding of Palliative care improved. Most respondents (83.3%) had further questions which were answered by the nursing staff. Patient/family satisfaction was rated as "Satisfied" (50%) and "Highly Satisfied (50%). Health care providers similarly agreed with improved understanding (50% strongly agree; 40% agree) post-intervention.
Conclusion: Increased awareness and education improves consumer satisfaction. Questions were still present post-intervention. More aggressive informational campaigns and outreach is needed to improve understanding of the purpose of, and services provided by Palliative care programs.

Academic Showcase Participant
Board Placement: 205

Factors Regulating Periderm Development in Field Grown Potatoes

Primary Author: Connor Buckley
Co-Author(s):

Faculty Sponsor: Jacob Blauer

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Potato (Solanum tuberosum L.) tuber periderm development has a vital role in reducing skinning and in protecting the tuber from biotic/abiotic stress. The objective of our research is to determine the role in which tuber maturity, phellem cell size, and the number of phellem cells protect the tuber and how grower practices modify periderm morphology for improved integrity. The tensile strength of the periderm increases proportionally with tuber development. Increased periderm strength improves resistance to skinning through increased unesterified pectins, forming calcium-pectate cross-links within the phellogen cell wall matrix, and thickening of the phellogen cell wall. We hypothesize that the size and number of phellem cells is crucial for retention of the postharvest life of the potato. A thicker, denser, phellem layer has the potential to reduce water loss by allowing increased surface area of suberin deposition. Commercial potato cultivars were planted in the Columbia Basin and evaluated for the development of periderm formation in relation to genotype and standard grower practices. Previous research demonstrated that end of season soil moisture content altered the phellem structure in greenhouse studies. In-field studies to alter soil moisture were conducted. Microscopic examination of tuber periderm across different stages of development, and different irrigation treatments was performed to assess the size, number, and maturity of the cells within the periderm. These results will have practical application to guide growers for best practices for managing periderm development for commercially relevant cultivars and further research to identify underlying allelic variation to promote healthy skin formation.

Academic Showcase Participant
Board Placement: 142

SERVICE LEARNING ENHANCES RETENTION RATES OF WSU UNDERGRADUATES, ESPECIALLY VULNERABLE SUB-POPULATIONS

Primary Author: Ben Calabretta
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Faculty Sponsor:

Primary College/Unit: Other
Category Social Sciences
Campus: Pullman

Abstract:

Service-learning can help WSU students connect with peers and the community at large and influence academic success and retention. BIO 102 enrolls about 1200 students annually, mostly first-year students, thus providing opportunity for a controlled study of the effects of service learning on academic success and retention. The Center for Civic Engagement (CCE) partnered with Biology 102 in AY18 and AY19, with half of the lab sections incorporating service-learning experiences – structured community-based projects organized by the CCE, including orientation and reflection – while the other half proceeded with the traditional curriculum. Statistical analysis comparing overall grade earned in BIO 102, overall GPA, and retention to the subsequent academic year between the randomly assigned control and CCE groups showed a single service -earning experience improves both grades and retention. Comparisons were performed separately for each of four cohorts: Fall 2017 (N=599), Spring 2018 (N=418), Fall 2018 (N=701), Spring 2019 (N=446). Service-learning students had significantly higher grades for BIO 102 among three of the four cohorts ($p<0.05$). The service-learning group also had significantly higher overall GPA during the semester they took the class among three of the four cohorts ($p<0.05$). Additionally, higher retention rates of students who completed service-learning projects was seen for the Fall 2017 (81% versus 75%, respectively) and Spring 2019 (91% versus 86%, respectively) cohorts. These differences were especially pronounced among vulnerable sub-populations of First-Gen and underserved minority students. Following these students longitudinally to graduation would provide insight into longer-term benefits of service-learning.

Academic Showcase Participant
Board Placement: 34

A Decision Model for an Electricity Retailer With Energy Storage and Virtual Bidding Under Daily and Hourly CVaR Assessment

Primary Author: Josue Campos do Prado
Co-Author(s):Ugonna Chikezie

Faculty Sponsor:

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Vancouver

Abstract:

Electricity retailers are essential agents in deregulated electricity markets since they operate as intermediaries between large power producers and end consumers without the need of operating and maintaining physical assets in transmission and distribution grids. In this work, a short-term decision-making model for an electricity retailer is developed. The proposed model integrates battery energy storage system (BESS) and virtual bidding through a two-stage stochastic optimization framework.
In the first stage, the retailer determines the amount of power to be purchased in the day-ahead wholesale market and the optimal incremental and decremental virtual bidding curves to be submitted in the electricity market. In the second stage, the optimal BESS decisions and the retailer's involvement in the real-time market are determined. The proposed model minimizes the retailer's expected procurement cost and generates the optimal power and virtual bidding curves in the day-ahead market. Two types of Conditional Value at Risk (CVaR), namely T-CVaR and h-CVaR, are integrated in the proposed model to manage the retailer's expected hourly and daily risks, respectively. Case studies with real-world data are performed to verify the retailer's cost reduction obtained with the integration of BESS and virtual bidding and to study how the hourly and daily risk-management strategies affect the retailer's procurement cost distribution for different risk-aversion levels. It turns out that, both risk-management tools are useful to control the retailer's risks. However, depending on the risk-aversion level, the h-CVaR can provide lower expected costs and improve the retailer's cost distribution in comparison with T-CVaR.

GPSA Research Exposition Participant
Board Placement: 27

Decolonizing the Colonizer: The Renovation of the AfricaMuseum and Belgian Colonial Contexts (1910-2018)

Primary Author: Kyley Canion Brewer
Co-Author(s):

Faculty Sponsor: Raymond Sun

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

Principal Topic
The Museé Royale de l'Afrique Centrale in Tervuren, Belgium purports to have the richest collection of African cultural artifacts in the world. Constructed at the height of the Belgian King Leopold II's reign of terror in Congo, the museum stands as both a testament to and memorial of Belgian state and monarchical colonial legacies. The museum, relatively unchanged since its reimaging at the turn of the 20th century, closed its doors in 2013 to undergo a five-year decolonizing renovation designed to repair the museums relationship with Belgian memory and international morality. The deconstruction of colonial sentiment across European institutions is an increasingly important movement across multiple fields of study.
Method
Incorporating elements of Museum Studies, Indigenous Studies and Methodologies, Memory Studies and History, this project seeks to engage the troubling myth of decolonizing a fundamentally colonial space by placing in context the newly renamed AfricaMuseum's renovation policies, strategies, and consequences. By engaging multiple disciplines, I believe my work can provide an important contribution to the emerging conversation about representation in memory spaces, and by comparing the museum's contemporary remodel to its predecessor I have found the AfricaMuseum to still be lacking in contextual awareness.
Results
Ultimately, my findings suggest that the immensely colonized spaces represented by institutions such as this continue to dominate the commemorative recognition of colonial atrocity and undermine national efforts to effectively diversify understandings of colonial history.

GPSA Research Exposition Participant
Board Placement: 171

Optimization of Temperature and Sulfur Dioxide Levels for Non-Saccharomyces Yeast Survivability and Metabolism

Primary Author: Heather Carbon
Co-Author(s):Charles Edwards
Jonathan Brumley

Faculty Sponsor: Charles Edwards

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal topic
In recent years, winemakers have observed rising sugar levels in grape musts due to climate change and viticultural practices that extend ripening periods. High must sugar levels can yield high ethanol wines, lowering overall quality. Nonconventional yeast species, specifically, non-Saccharomyces yeasts, can produce lower alcohol wines. These yeasts are found in musts during the early stages of fermentation but cannot metabolize all fermentable sugars, so continued fermentation by Saccharomyces cerevisiae is critical to achieve dryness. Previously isolated Metchnikowia pulcherrima and Meyerozyma guilliermondii strains from Washington vineyards can lower alcohol levels without reducing wine quality; however, fermentation conditions for these yeasts, including temperature and sulfite (SO2) tolerance, have yet to be optimized. The aim of this research was to determine optimal SO2 tolerances and temperatures for these non-Saccharomyces strains.
Method
In this study, bottles containing sterile synthetic grape juice medium were subjected to 0.0, 0.2, 0.4, 0.6, or 0.8 mg/L molecular (m) SO2 prior to inoculation with Mt. pulcherrima, My. guilliermondii, or S. cerevisiae, in triplicate. Bottles were then held at 10°, 15°, 20°, 25°, or 28°C for 10 days and sampled for population and sugar reduction.
Results/Implications
Non-Saccharomyces growth was best between 15° to 25°C with 0.2 mg/L mSO2 present, and both yeasts were inhibited by ≥ 0.6 mg/L SO2 regardless of temperature. In media containing 0.4 mg/L mSO2, both yeasts grew best and utilized more sugar at 20° and 25°C, respectively. These optimized conditions allow winemakers to implement these yeasts into winemaking processes with successful alcohol reduction.

SHOWCASE

Academic Showcase Participant
Board Placement: 60

Human Aquaporin-4 Orthogonal Array of Particles in Biomimetic Membranes: Aggregation, Protein Tracking and STED

Primary Author: Jessica Carder
Co-Author(s):

Faculty Sponsor: James Brozik

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

- Principal topic

Aquaporin-4 (AQP4) is an integral water channel protein located in the plasma membrane of astrocyte cells in the central nervous system (CNS) and helps regulate water-ion homeostasis. Some isoforms of AQP4 further order themselves into aggregates known as orthogonal arrays of particles (OAPs). AQP4 exists in two main isoforms, M1 and M23, with M23 being the isoform that favors stabilization by aggregation into OAPs. What role these OAPs play in the membrane of cells is still largely unknown.

- Method

This study takes natively folded AQP4 aggregates and incorporates them in a supported lipid bilayer CNS biomimetic, which has been characterized using fluorescence recovery after photobleaching (FRAP). Using single molecule fluorescence microscopy, we can observe the interactions of AQP4 proteins with the surrounding lipid environment and discover how different environmental cues effect OAP assembly kinetics and equilibrium states.

- Results/implications

Through this study, we were able to track the protein temporally and physically watch the proteins interact within the bilayer. Using single molecule analysis, we determined that AQP4 tends to assemble and disassemble on their own with no outside interactions. Also, using STED, we were able to conclude that AQP4 aggregates in the artificial membrane the same way it does in a real cell membrane. This is the foundational work that will lead to future studies exploring AQP4 mechanics under different environmental conditions.

Academic Showcase Participant
Board Placement: 86

Evaluation of Tibial Component Orientation After Total Knee Arthroplasty Performed with Kinematic Alignment

Primary Author: Brian Carlson
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Hana Keller
David Scott

Faculty Sponsor:

Primary College/Unit: Other
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Total knee arthroplasty (TKA) performed with kinematic alignment is gaining interest, but some concerns remain in safety and efficacy, specifically component wear, and survivorship of the tibial component. This study aims to evaluate the tibial component orientation relative to the floor and mechanical axis to understand how the prosthesis is functionally loaded postoperatively and its impact on implant wear and fixation.

Preoperative and postoperative full-length weight-bearing radiograph measurements were taken for 179 kinematically aligned TKAs that were enrolled in a prospective trial. The measurements included hip-knee-ankle (HKA), mechanical lateral distal femoral angle (mLDFA), anatomic lateral distal femoral angle (aLFDA), medial proximal tibial angle (MPTA), and joint-line orientation angle (JLOA).

The mean MPTA was 2.78° varus preoperatively, and 1.61° varus postoperatively. The mean preoperative JLOA was 1.07° varus and 0.57° varus postoperatively. The difference between MPTA and JLOA was 1.71° preoperatively ($p<0.001$) and 1.04° postoperatively ($p<0.001$). Thirty-four patients had their tibial component >3° of alignment varus/valgus relative to the mechanical axis. However, only 18 patients had a tibial alignment >3° degrees varus/valgus when oriented to the ground.

Of the 34 patients considered outliers determined by MTPA, only 18 are outliers relative to the vertical axis defined by JLOA. These results support the conclusion that 1) JLOA may be more relevant than MPTA in assessing prosthesis function under load and 2) kinematically aligned TKAs may not be more susceptible to tibial component loosening because the prosthetic joint line is aligned within less than one degree perpendicular to the floor with few outliers.

Academic Showcase Participant
Board Placement: 11

The Santiago Metro since 1990: State-Building, Social Conflict, and the Search for Profit

Primary Author: Andra Chastain
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Vancouver

Abstract:

This project examines the recent history of the Santiago metro system, which is the largest in South America and serves a metropolis of six million people. It is part of a monograph, under contract with Yale University Press, about the political, social, and cultural history of the Santiago metro system in the twentieth century. This chapter investigates a puzzle: since Chile's return to democracy in 1990, experts have lauded the Santiago metro as a success, yet a small fare hike in 2019 sparked massive popular protests, millions of dollars in damage to the metro system, and the rewriting of Chile's constitution. What explains this seeming contradiction? I argue that workers, passengers, and residents have paid the price for the metro's financial success and economic efficiency. In 1990 the metro became a state corporation, with increased labor flexibility and pressure to turn a profit. I use qualitative methods, reading the company's annual reports, the local press, and government archives, and drawing on oral histories that I conducted with workers. This project is significant because it shows the human cost of a corporation's financial success. Chile is often heralded as a neoliberal success story due to its tremendous economic growth, reduction in poverty, and stability for foreign investors. Yet the protests in recent years have shown that this is not the whole story. The metro is a case study of broader patterns in Chile and elsewhere in the Americas where efficiency is achieved through high human costs.

Academic Showcase Participant
Board Placement: 18

Climate analogs for actionable insights on US specialty crop production in a changing climate

Primary Author: Siddharth Chaudhary
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Faculty Sponsor: Kirti Rajagopalan

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Effective communication of climate-change implications and associated adaptation strategies are critical, and one promising approach is through climate analogs. Analogs emphasize viewing future climate risk for a target location through the lens of historical experiences in an analog location (analog location's historical conditions resemble the target location's projected future) and using these experiences to chart realistic courses of action. Analogs create networks of locations that can benefit from information exchange and allow stakeholders to immediately relate to the impacts as real experiences of peers, improving the perceived utility and use of information. Our objective is to use specialty crop production in the US as a case study and (a) identify analogs and (b) utilize focus groups with participants across the analog network to brainstorm adaptation implications and assess the effectiveness of analogs as a communication tool. We used agro-climatic variables derived from historical data (1990–2020) and future climate projections (2040-2070) from 17 models for two representative concentration pathways (RCP4.5 and RCP8.5) and calculated analogs using a sigma-dissimilarity metric. Results indicated that parts of the Pacific Northwest U.S. are transitioning into conditions with higher resemblance to parts of California, but without exposure to the extreme conditions, while parts of the Great Lakes region have analogs in the inland northwest US. Stakeholders identified analogs as an effective means of communication. Results help advance ongoing discussions around effective climate change communication, facilitate the transition from science to practice, and contribute towards building resilience in the U.S. agricultural enterprise.

GPSA Research Exposition Participant
Board Placement: 176

How Does Channel Integration Affect Consumers' Selection of Omni-Channel Shopping Methods? An Empirical Study of U.S. Consumers

Primary Author: Yini Chen
Co-Author(s):

Faculty Sponsor: Ting Chi

Primary College/Unit: Other
Category Visual Arts & Design
Campus: Pullman

Abstract:

Principal Topic
In recent years, fashion retailers have been advancing rapidly to provide U.S. consumers with more seamless omni-channel (OC) shopping experiences. The pandemic has further accelerated the growth of OC shopping. This study aimed to explore the effects of channel integration in six aspects (i.e., promotion, product and price, transaction information, information access, order fulfillment, and customer service) on the U.S. consumers' intentions to use three OC shopping methods: buy online pick-up in-store, buy online curbside pickup, and buy in-store home delivery. This study also tested the mediating effects through hedonic and utilitarian value, perceived risk, and perceived behavioral control. Furthermore, this study explored the moderating effect of perceived COVID-19 vulnerability (PV) on the relationships between the mediators and consumers' shopping method selecting intentions.

Method
The primary data were collected by a Qualtrics survey of U.S. consumers who had previously used OC shopping methods for purchasing fashion products. A total of 516 eligible responses were received. The statistical assumptions including normality, multicollinearity, and correlations were first examined, followed by multiple regression analysis for testing the hypotheses.

Results/Implications
Six types of channel integration showed significant effects on the U.S. consumers' perceptions, which in turn influenced their intentions to use certain types of OC shopping methods. The proposed model exhibited a satisfactory explanatory power. PV did not moderate any investigated relationships, demonstrated a long-term shift of U.S. consumer lifestyle toward OC retailing.

Academic Showcase Participant
Board Placement: 62

Beautiful Water: One Small Town and the Changing Face of America

Primary Author: Peter Chilson
Co-Author(s): Yes

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

In 1818, French Canadian trappers cached beaver pelts along a river in Paiute Indian territory. They were among the first whites to cross what is now eastern Oregon and did so without permission of the Paiute. When they returned, the pelts were gone, stolen by Indians, they claimed, though there's no way to know who or what took the pelts—animals, other trappers? Maybe the Paiute regarded them as the price of passage, like payment for a visa and hunting license. The trappers named the river, Malheur, French for "misfortune." Beavers are gone now, hunted out by people, and crowded out by invasive species like nutria, a rodent from South America. But people of the Malheur River (locals say Mal-here), still live off the land.

My book is about the small river town of Ontario and its immigrant past and present as the U.S. transitions from a white European nation to one more ethnically diverse. During the 19th century, half a million people, overwhelmingly white, came West over the Oregon Trail. A few settled Ontario—today one of Oregon's most diverse communities. The narrative follows the stories of Native peoples, Paiute and Umatilla, whose lands cover much of the Pacific Northwest; of farmers and ranchers descended from trail pioneers; of Latino families around since before the Mexican-American War and Latino migrant workers who followed; of Japanese-Americans with roots in World War II internment and labor camps built near Ontario; and, finally, of new refugees from the Middle East and Africa.

Academic Showcase Participant
Board Placement: 28

Discordance between family health history and genetic screening.

Primary Author: Sierra Colletto
Co-Author(s):Crystal Lederhos-Smith
Thomas May

Faculty Sponsor:

Primary College/Unit: Spokane
Category Social Sciences
Campus: Spokane

Abstract:

As genetic screening becomes more widely available, there is observed discordance between information provided on inherited disease risk through family history versus genetic screening. Objective: The purpose of this study was to investigate the discordance between family health history and genetic screening results. Participants: Individuals from the Alabama Genomic Health Institute (AGHI) were invited to partake in an interview regarding their family health history and genetic screening. Sixteen individuals volunteered. Methods: Half to 1 hour long interviews were conducted and results were analyzed using Qualitative Content Analysis based on methods described in Schreier (2012). Results: Two themes emerged across the interviews: 1) Family health history knowledge is multifactorial, and 2) Participants reported that post-screening communication with families regarding their results was intended to provide information that allowed for proactive health measures to be taken. Implications: Based on the information gathered, there is no indication that discordance between information gathered via family health history and genomic testing is rectifiable through modifications to family intake forms. Thus, it appears genomic screening can add to our assessment of risk over and above family health history intake.

Academic Showcase Participant
Board Placement: 26

Focused on Climate and Social Justice? An Assessment of Large United States Environmental Nonprofits

Primary Author: Azdren Coma
Co-Author(s):

Faculty Sponsor: Erik Johnson

Primary College/Unit: Arts and Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Over the past 30 years two issue areas have come to dominate scholarly discussion of environmental nonprofits: social justice and climate change. We use IRS filings to examine uptake of these issues across different environmental nonprofit issue-niches. Among the 5,413 relevant organizations we identify, nearly 8% attend to issues of climate and 10% to issues of social justice. Younger and larger environmental nonprofits are more likely to attend to issues of climate change and social justice, locally based groups less so. Development groups and organizations whose identity spans multiple issue categories are most likely to attend to both climate and justice issues, while wildlife groups are decidedly unlikely to attend to either. Energy and natural resource groups, while strongly vested in climate issues, are amongst the least likely category to attend to issues of social justice in their mission foci.

GPSA Research Exposition Participant
Board Placement: 179

The value of time, with and without a smartphone

Primary Author: Joseph Cook
Co-Author(s):Mary Tiana Randriamaro

Faculty Sponsor: Joseph Cook

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Waiting is a ubiquitous feature of life. We wait on planes, trains, automobiles, in stores, etc. Research shows that devices like smartphones, or laptops can decrease the disutility of time spent waiting by enabling productivity and making time pass more pleasantly. We focus in this paper on how the value of time spent waiting changes based on different access to smartphone services.

We recruited 80 subjects from the local community who span a wide age range. The majority were nonstudents. We use a Becker-DeGroot-Marschak mechanism to elicit the compensation required to wait for 30 minutes, alone in an empty room, under four conditions: unrestricted smartphone use, use of only the bluetooth features for calling or streaming music, use of only an FM radio, and no phone or radio access. This mechanism is incentive compatible, so it was in the subject's best interest to be truthful with their compensation request.

Compared to the treatment of having full use of their smartphones, subjects required 24% more to wait with only the bluetooth features of the phone remaining, 48% more to wait with only a radio, and 79% more to wait without a phone or radio. We find little correlation between a subject's wage rate and compensation required to wait. This implies that the predominant analytical practice of valuing waiting time as a fixed fraction of income is not always accurate. Additionally, the result emphasizes the importance of heterogeneity in the value of time that is based on context rather than income.

Academic Showcase Participant
Board Placement: 118

A Hierarchy of Needs for Synchronous On-Line Classrooms

Primary Author: Lynne Cooper
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Business
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Modeled on Maslow's famous Hierarchy of Needs, the Hierarchy of Needs for Synchronous Online Classes distills lessons learned from trying to maintain the flavor of in-person learning in a COVID-constrained world. This research addresses the question: what are the unique requirements for learning in synchronous online classes?

To answer this question I relied on personal experience and those of colleagues. In the resulting model, like in Maslow's Hierarchy, each upper level depends on lower levels being satisfied. The six layers of this model are:

- Layer 1: Access to Reliable Internet, e.g., broadband, an appropriate device, and a distraction-free physical space
- Layer 2: Functional Classroom Technology, which means the virtual classroom technology has to work, especially the learning management (e.g., Blackboard, Canvas) and a video conferencing (e.g., Zoom) systems.
- Layer 3: Instructor Competence with the Technology. Instructors need to know how to use the technology with confidence, and be able to recover from errors and problems.
- Level 4: Student Comfort with the Technologies. Students need to be able to use the required features without being overwhelmed.
- Level 5: Social Norms for Interaction. These replace the visual, behavioral, and auditory cues that would otherwise be available in the physical classroom.
- Level 6: Designed Forced Interaction. It is not enough to simply provide an opportunity for engagement. Instead, the online synchronous student needs to be put into situations where they have to interact (e.g., breakout rooms with groups documenting their work in a shared google doc).

Academic Showcase Participant
Board Placement: 35

Collaborative Conversations: Teacher and Leader Candidate Co-mentorship While Learning About Culturally Sustaining, Socially Just Pedagogy

Primary Author: Kathleen Cowin
Co-Author(s):Sarah Newcomer

Faculty Sponsor:

Primary College/Unit: Education
Category Social Sciences
Campus: Tri-Cities

Abstract:

Our research, in its third academic year of study, reports on bringing teacher and school leader candidates together to deepen the candidates' self-study about culturally sustaining, socially just, pedagogy, with the purpose of allowing candidates to reflect together on their teaching and leadership practices. We call our study “Collaborative Conversations.” Our goal was to learn more about how to connect teacher and school leader preparation coursework, and to study the efficacy of this collaboration between teacher and school leader candidates. Teacher and leader candidates were engaged in four collaborative dialogue sessions focused on six anchor readings. Small groups were formed, comprised of both teacher and school leader candidates, so the candidates could share their perspectives as future teachers and school leaders with one another. After each session the candidates also met as a whole group for a review of the highlights of their small group discussions, especially focusing on their own study of their culturally sustaining and socially just pedagogy. Candidates wrote reflections based on their insights from the small and whole group discussions following each session. We will report what we learned about the candidates' communication from observing our cohorts’ dialogues. Over the course of the four dialogues we observed co-mentoring networks develop. We will record the topics of the dialogues as well as the candidates' reports of how their self-study impacted their culturally sustaining and/or socially just teaching or leadership practices.

Academic Showcase Participant
Board Placement: 21

E-Fitness - Online Fitness Program for High School Students

Primary Author: Holly Curry
Co-Author(s):Tami Goetz

Faculty Sponsor: Tami Goetz

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

E-Fitness is an eight-week long online fitness program designed to motivate and encourage high school age students to move their body by engaging in daily physical activities. This program included livestreams hosted via Zoom and take-home modules. During the livestreams, we did a weekly check-in, present a lecture on the topic of the week, then end with a ten-minute exercise. The modules included questions regarding that week's topic, so students know what to expect and feel prepared for the upcoming livestream. For example, one week is dedicated to sports, so the questions focused on if they play a sport or not and what sport would they be interested in trying for the first time. The topics discussed during the program were outdoor recreation, strength training, group fitness, and how to apply short- and long-term goals created during E-Fitness post-program. This program allowed students to engage in a variety of physical activities they may or may not have participated in before, learn from WSU undergraduate and graduate students within the Kinesiology and Educational Psychology program, create both short- and long-term goals to incorporate daily movement after the program, and understand how exercise can play a tremendous role in our everyday lives. The program received positive feedback from the participating students, their lead PE instructor, and from WSU student volunteers all investing their time in the program. Leading exercise and healthy activity for a rural eastern Washington high school was a gratifying experience to facilitate as a Kinesiology graduate student.

GPSA Research Exposition Participant
Board Placement: 183

The synthesis of proto-replicator and self-replicating molecular machines

Primary Author: Aditi Dahiya
Co-Author(s):James Brozik

Faculty Sponsor: James Brozik

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal topic
The synthetic effort to create self-replicating polymer machines that would allow for complete selectivity in chain size and monomeric pattern. Tectons are molecules that self-assemble through intermolecular hydrogen bonding. The synthetic effort focuses on generating two types of tectons hydrogen Donor-Acceptor-Donor (DAD) and a hydrogen Acceptor-Donor-Acceptor (ADA), which will bind to each other through a specific hydrogen bonding network. Hypothetically, these tectons are either natively fluorescent or will become fluorescent on pairing. Careful consideration of the physical properties of each tecton will be assayed using single-molecule experiments.

Method
Tectons are made up of DAD/ADA heads attached to group 14 dye. The DAD head is a pyridine derivative and the ADA head is a uracil derivative and are synthesized in house. After completion of the synthesis, these tectons will be subjected to the single molecule experiments like Fluorescence Cross Correlation Spectroscopy (FCCS), Fluorescence Lifetime Correlation Spectroscopy (FLCS), and Total Internal Reflection Fluorescence (TIRF) to find various thermodynamic properties, on instruments which are designed by Brozik group.

Results/Implications
Through this study, we were able to synthesis the building blocks of tectons. Using single-molecule analysis, thermodynamic parameters can be determined, and from this, we can conclude that these are indeed natively fluorescent after interacting through hydrogen bonding. This is the foundational work that will lead to future studies of proto-replicator and self-replicating polymer machines under different environmental conditions.

Academic Showcase Participant
Board Placement: 65

PISA Reading Achievement: Identifying Predictors and Examining Model Generalizability for Multilingual Students

Primary Author: Shenghai Dai
Co-Author(s):Tao Hao
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Onur Ramazan
Robert Danielson
Bruce Austin

Faculty Sponsor:

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

Reading literacy is foundational for achievement across content areas, especially for multilingual students (MLs) with still-developing skills in the language of schooling and testing. However, reading research in the United States has focused mainly on monolingual (or English-only) students (MNs) in early or, more rarely, middle grades.

To address this gap, we first used machine learning to identify proximal and distal predictors of high school students' reading achievement on the reading component of the 2018 Programme for International Student Assessment (PISA). A total of 1482 variables (943, 347, and 192 at the student, teacher, and school levels) served as the initial pool for variable selection. Among these, 24, 22, and 22 variables at each level, respectively, were selected using the Elastic Net approach as the most salient predictors of achievement. In the next steps, we first conducted multilevel modeling analysis on the entire sample and then tested the model's generalizability to ML and MN populations.

The results suggest that ML students would especially benefit from instruction focused on enhancing their reading self-efficacy and increased learning opportunities for extracurricular reading activities. The results also suggest that students, especially ML students, would benefit from schools avoiding grade retention policies and focusing on minimizing truancy and supporting positive peer and teacher relationships. This study is also paramount to focus more attention on high school ML students, a burgeoning and often at-risk student population in our schools.

Academic Showcase Participant
Board Placement: 58

Smart power strips feasibility: Testing applications of advanced power management at university office workstations

Primary Author: Julia Day
Co-Author(s):Shelby Ruiz
Robin Olson

Faculty Sponsor: Shelby Ruiz

Primary College/Unit: Engineering and Architecture
Category Visual Arts & Design
Campus: Pullman

Abstract:

The purpose of this study was to assess the energy and cost savings potential of Smart Power Strips implemented in commercial office settings. “Smart” Power Strips (SPS’s), are controlled power surge protectors that manage the on/off state of connected electronic devices. SPS’s use timers and automated scheduling to turn power off to select devices eliminating energy consumption during non-business hours. Previous studies have indicated that the use of non-behavioral interventions such as SPS’s in office settings can reduce overall building energy consumption by 10%.
With grant funding from Northwest Energy Efficiency Alliance (NEEA), 50 Smart Power Strips were purchased and installed in offices and workstations in select buildings on the WSU-Pullman campus. Through the SPS installation process, the data for each device plugged into the strip was metered, recorded, and analyzed to determine total energy consumption in kilowatt hours (kWh) and utility cost per device. Device usage calculations were used to project savings in kWh energy use and utility costs over time (1-10 years) and based on the number of installed SPS devices (Quantity 50, 100).
The goal metrics, established by WSU Facilities Services, were to save an estimated 74,693 kWh, or $5,766 in utility costs, annually. Preliminary study results suggest that through the implementation of 100 smart strips those initial metrics could be exceeded by 42%. By eliminating the energy consumption of electronic devices during non-business hours, the university has the potential for a significant savings in energy use and utility costs across campus facilities.

Academic Showcase Participant
Board Placement: 38

Exotic Terrane

Primary Author: Dennis DeHart
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Visual Arts & Design
Campus: Pullman

Abstract:

"An exotic terrane terrain is a piece of the Earth's crust that has merged with another landmass and has a separate and entirely different geologic history."

Exotic Terrane (working title) is an interdisciplinary artist project, centered around Hells Canyon Wilderness / National Recreation Area and adjacent environs. The works focus on place, including a visual celebration of natural beauty, quality of light, and aesthetics. Exotic Terrane also engages with contemporary issues related to public lands, water, and borders. The creative research is both a celebration and critique of western spaces, in relationships to identity, mythology, technology, and power.

The project is supported by a Fellowship from WSU's Center for Arts and Humanities. Works from the project will be exhibited in the WSU's MASC gallery in the fall of 2022.

Academic Showcase Participant
Board Placement: 199

Panorama: A Solitary View of Solo Tuba Music

Primary Author: Chris Dickey
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

The global pandemic drastically altered the world of the performing arts. Performances of all kinds came to a screeching halt in order to ensure the safety of performers and audiences alike. Many aerosol-producing instrumentalists wishing to perform recitals had to rely on programming unaccompanied works or music with electronics. Dr. Chris Dickey's fourth solo album, titled Panorama, features compositions for solo tuba or tuba with electronics, all of which are welcome additions to recital programs for undergraduate and graduate tubists. Furthermore, the tracks appearing on this album are the premiere recordings of all compositions. The recording project took place in the state-of-the-art WSU Recording Studio from fall 2020 to summer 2021. Dickey produced this album alongside WSU recording engineer David Bjur. Reflecting Dickey's commitment to intentional programming, this recording project also demonstrates the rich variety of unaccompanied tuba music available, including music written by composers who hold marginalized identities.

Academic Showcase Participant
Board Placement: 158

Single-atom catalysts as artificial enzymes for biomedical applications

Primary Author: Shichao Ding
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Dan Du
Yuehe Lin

Faculty Sponsor: Yuehe Lin

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal topic: Natural enzymes are one of the most important compounds in biomedical applications. However, their wide application is limited by expensive production costs and instability in complex conditions like high temperature or harsh pH environments. It is urgent to develop artificial enzyme alternatives for natural enzymes with high stability and low-cost biomedical applications.
Methods: We designed artificial enzymes using a single-atom architecture that was able to work as efficiently as natural enzymes. The artificial enzyme, called a nanozyme, is made of single iron atoms embedded in nitrogen-doped carbon nanomaterials (with Fe-Nx active site), which mimic the active site of heme enzymes from an atomic/molecular structure perspective. The single-atom structure was fully characterized, and enzyme-like properties were evaluated. For investigating practical applying ability, electrochemical sensors, immunosorbent assays, and intercellular nanoprobe based on single-atom catalysts were developed for H2O2-based biosensing and bioimaging applications.
Results: The artificial enzyme based on a single-atom catalyst that we created has a similar active site structure as a natural enzyme with remarkable enzyme-like activity for H2O2, which paved the way for high-sensitive biosensing. The single-atom artificial enzyme was also more robust than natural enzymes, which show excellent stability under pH or temperature changes. Their unique electronic/geometrical have significant advantages in biocatalytic activity, stability, and selectivity, which show massive potential in substituting natural enzymes for various biomedical applications.

Academic Showcase Participant
Board Placement: 131

Passing the Baton

Primary Author: Anjuli Dodhia
Co-Author(s):Gigi Yellen

Faculty Sponsor:

Primary College/Unit: Communication
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

How does “classical music” endure? Throughout generations, humans have used rhythm and melody to express emotion and devotion, fury and festivity, developing instruments and the skills to refine the sounds they can make. Northwest Public Broadcasting’s Classical Music staff created “Passing the Baton” to highlight the role of the teacher or mentor in the transmission of musical skills from one generation to the next.
NWPB is a service of the Edward R. Murrow College of Communication at WSU. In service to NWPB’s mission—to enrich our community by creating and sharing programs which engage, enlighten and entertain—the staff of 4 announcers researched, scripted, mixed, and broadcast on radio a series of short vignettes illustrating teacher-student connections past and present. These vignettes were dropped into the station’s announcer breaks during regularly scheduled music hours.
In addition, the music staff selected outstanding music teachers from WSU and elsewhere in the region, interviewed them and presented these as regional features on NWPB’s Morning Edition and All Things Considered.
The project remains available at www.nwpb.org/passing-the-baton.
In preparing this project, NWPB established a connection to the Washington State Music Teachers Association. Some of the interviewees presented at WSMTA’s 2020 virtual conference, originally to have been hosted on the WSU Pullman campus. “Passing the Baton” enabled WSU and WSMTA to connect despite the pandemic’s cancellation of the WSU residency. In the future, we hope to further develop the relationship between the WSMTA and NWPB, including expansion of the project to NWPB TV.

Academic Showcase Participant
Board Placement: 180

The Role of Trait Boredom in the Meaning and Attentional Components (MAC) model: A Step Towards Promoting Healthy Boredom Coping

Primary Author: Erica Doering
Co-Author(s):Elizabeth Weybright

Faculty Sponsor: Elizabeth Weybright

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Social Sciences
Campus: Vancouver

Abstract:

Principal Topic
State boredom is a normative experience, while trait boredom is associated with risk behaviors (e.g., substance use, poor mental health). The Meaning and Attentional Components model (MAC; Westgate & Wilson, 2018) outlines how understanding causes of boredom can be used to alleviate boredom. Although promising, this model is relatively new and only looked at state boredom. Therefore, the current study aims to test how trait boredom contributes to the MAC model components.

Method
A sample of undergraduate students (N=414, Mage=19.55, 84.5% female; 64.3% White) enrolled at a public northwestern university completed an online survey measuring trait boredom, attention, and meaning. Two hierarchical regressions were conducted where boredom proneness and boredom susceptibility—two types of trait boredom—were regressed onto age, sex, and race (control variables; block 1); boredom susceptibility or boredom proneness (confounding influences; block 2); and attention and meaning (target predictor variables; block 3).

Results/implications
Results indicated the predictors explained 43% and 4% of the variability in boredom proneness and boredom susceptibility, respectively. The addition of attention and meaning significantly improved the model for boredom proneness ($p<.001$) and boredom susceptibility ($p=.003$). Attention and meaning were significant predictors of boredom proneness while attention was the only significant predictor of boredom susceptibility. Findings inform our understanding of how trait boredom interacts with the MAC model and suggests the model operates differently for proneness and susceptibility. This has implications for targeted and universal prevention approaches addressing boredom risk behaviors and future research on intervention components focused on boredom coping.

Academic Showcase Participant
Board Placement: 119

Industry Data of Economic Sectors

Primary Author: Tanner Dryden
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Minh Nguyen
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Mark Beattie
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Faculty Sponsor:

Primary College/Unit: Other
Category Administrative & Information Systems
Campus: Everett

Abstract:

The ongoing COVID-19 pandemic has continued to be a detriment to businesses worldwide. Thus, comprehensive, up-to-date data of local businesses proves to be an invaluable resource for both business owners and local government officials alike in making decisions that can both ensure the health and safety of the general public, as well as the prosperity of businesses. However, collected data tends to remain in its raw format stored in some colossal secure database with little interpretation or analysis provided in a manner most people can easily understand.
Ares is an ongoing project that aims to provide an interactive and accessible dashboard that the public can use to see the status of local businesses, as well as options for filtering and comparing data across different regions and time periods. For more privileged personnel (such as researchers or journalists), a system for generating visuals and writing articles are also provided, as well as access to obfuscated data for verification. While the system is still currently in progress, an alpha prototype demonstration suggests that the project is, for the most part, en route to its intended goal: the clients were content with the functionality of the project, however some design choices were also suggested that will make the dashboard more consistent and legible; these suggestions are to be incorporated later on. The current scope of the project is only for data within the state of Washington; however, the project will eventually be expanded to accommodate the entire United States.

SHOWCASE

Academic Showcase Participant
Board Placement: 157

Program Evaluation: Evaluating a Primary Care Nurse Practitioner Residency Program

Primary Author: Kelsey Eidem
Co-Author(s):Renee Hoeksel

Faculty Sponsor: Roschelle Fritz

Primary College/Unit: Nursing
Category Medical & Life Sciences
Campus: Vancouver

Abstract:

Background: Veterans have unique and complex healthcare needs that require their primary care providers to be adequately trained. Veteran Affairs (VA) medical centers are experiencing escalating workforce shortages. Residency programs are on the rise as a solution to comprehensively prepare newly graduated nurse practitioners to care for Veterans.

Purpose: The purpose of this project was to evaluate the inaugural Primary Care Nurse Practitioner Residency program launched in September of 2020 at the Portland VA Medical Center.

Data: This program evaluation was guided by Meleis' Transition Theory and the Center for Disease Control and Prevention (CDC) Program Evaluation Framework. Both a curriculum evaluation questionnaire with Likert scaled and open-ended questions plus a focus group interview were utilized to gather data.

Analysis: Quantitative descriptive statistics and qualitative thematic analysis were utilized.

Results: The twenty-four individuals who had direct program involvement were invited to participate. The questionnaire had a 54% (n=13) response rate. The focus group interview attendance was also 54% (n=13). The focus group results highlighted the strengths of the program and provided an opportunity to identify areas of improvement. The questionnaire provided insight to the curriculum's readiness for national accreditation.

Conclusion: Residency programs are heavily curriculum focused. This evaluation of the curriculum allowed for identification of what topics are important for successfully supporting newly graduated nurse practitioners working with Veterans. These findings will immediately benefit not only the Portland VA as they seek national accreditation, but other VA and private institutions as they develop their residency programs.

SHOWCASE

Academic Showcase Participant
Board Placement: 100

Nuclear-localized T4SS Effectors of Anaplasma phagocytophilum

Primary Author: Deirdre Fahy
Co-Author(s):Jason Park
Ian Cadby
Kelly Brayton

Faculty Sponsor:

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Anaplasma phagocytophilum (Ap) is a tick-transmitted obligate intracellular pathogen of ruminants, other mammals, and humans. It has a Type IV secretion system capable of injecting bacterial proteins, termed effectors, from the infection vacuole into the host cell cytoplasm. Effectors can modify cellular processes to favor survival and replication of the bacteria. To better understand this pathogen, we need to identify and characterize its effectors. Using a heterologous translocation assay, we have identified several Ap effectors from the HGE14 family of proteins; the family comprise eight paralogs unique to Ap. Six of these localize to the host cell nucleus when ectopically expressed in mammalian cell culture; they each have a predicted C-terminal nuclear localization signal (NLS) and deletion of these sequences eliminates nuclear-specific localization. The C-terminal region also appears to be important for T4SS translocation in the assay. An antibody raised against one of the effectors recognizes all three HGE14 proteins shown to be effectors, but does not cross react with the other three nuclear members. Immunostaining Ap infected cells using the antibody confirms that one or more of the effector proteins is expressed and trafficked to the nucleus of the host cell. Transcript analysis shows that all paralogs are expressed in cells; one is consistently more highly expressed than the others. Functional characterization of these effectors will inform their role in Ap replication, pathogenesis, and transmission.

Academic Showcase Participant
Board Placement: 172

Efficacy evaluation of Anaplasma centrale Msp2 Hypervariable Regions on Protecting from bovine anaplasmoses

Primary Author: Azeza Falghoush
Co-Author(s):kelly Brayton

Faculty Sponsor: Kelly Brayton

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Bovine Anaplasmosis is a disease caused by Anaplasma marginale, a tick- transmitted rickettsial pathogen. It can evade the adaptive immunity by recombining the hypervariable region (HVR) of the gene encoding the major surface protein Msp2 with pseudogene alleles. This recombination allows persistence of the organism. The study goal was to test whether the Msp2 HVR encoded by the A. centrale (a subspecies of A. marginale) live vaccine strain are a sufficient source of immune stimulation to provide clinical protection. Calves were inoculated with recombinant expressed HVRs. Control groups were inoculated with saponin or infected with the A. centrale live vaccine and compared with the test group. Clinical parameters of packed cell volume (PCV) and percent-parasitized erythrocytes (PPE) were measured following tick challenge with the A. marginale St. Maries strain. Western blot analysis demonstrated that the HVR immunizations and A. centrale live vaccine stimulated an immune response. All animals in the study become infected upon tick challenge. The saponized control group had high PPE's (5.4%) and larger drops in PCV's (14.6%). As expected, the A. centrale immunized animals were protected from acute diseases with lower (0.6%) parasitemia and lower drops in PCV (8.6%). The HVR immunized group had intermediate results that were not statistically significant different from either the negative or positive controls. This suggests that the HVR immunogen does not fully recapitulate the protective capacity of the live vaccine.

Academic Showcase Participant
Board Placement: 208

Customer Trust in their Utility Company and Interest in Household-Level Battery Storage

Primary Author: Thomas Familia
Co-Author(s):Christine Horne

Faculty Sponsor: Christine Horne

Primary College/Unit: Arts and Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Principal topic
The US electricity industry is increasingly incorporating renewable energy resources into the electric grid. These renewable sources are more variable than fossil fuels. This lack of predictability poses major challenges to electric utilities in maintaining a reliable grid. But with the increasing quality of battery storage and the development of household-level options, there are now opportunities for households to help address the lack of. However, because residential battery storage is relatively new, researchers know little about the factors that drive interest. This paper seeks to contribute to the understanding of household interest in battery storage, in particular, the role of customer trust in their utility company and how respondents' perceptions of the benefits and costs of battery storage contribute to interest.
Method
Using OLS regression, hypotheses are tested with survey data collected from California households in the fall of 2019.

- H1: Customer trust in their electric utility will be negatively associated with interest in battery storage.
- H2: Perceptions that battery storage is financially and environmentally beneficial will increase interest.
- H3: Perceptions that battery storage is costly will decrease interest.

Results/implications
The results are consistent with existing research highlighting consumer concern with costs and benefits, but also show that customer distrust of their utility company is associated with greater interest in battery storage. The findings highlight the potential importance of consumer trust for the transition to a greener electricity delivery system and suggest that utility companies interested in engaging their customers may need to pay attention to trust.

Academic Showcase Participant
Board Placement: 120

Accelerated Global Lake Evaporation Driven by Vapor Pressure Deficit

Primary Author: Umar Farooq
Co-Author(s):Heping Liu

Faculty Sponsor: Heping Liu

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Lake evaporation direct response to atmospheric forcings make it ideal proxy of potential evaporation and a robust indicator of climate change impacts on hydrological cycles. However, the interannual variability in global lake evaporation in response to climate change remains less studied. Here using a well validated lake model, we report that the global lake evaporation accelerated with an average rate of 0.68 mm yr-2 from 1981 to 2016. The nighttime E change, which is about 32% higher than its daytime counterpart, dominates these trends across seasons. Further, the significantly higher relative change in the high latitude lakes implies the exacerbate climate change impacts at high latitudes. We attribute more than 45% of accelerated E to elevated vapor pressure deficit (VPD), and it remains the dominant contributor across seasons. The VPD is projected to increase in a warmer climate, thus we conclude that climate change will exacerbate global hydrological cycle.

Academic Showcase Participant
Board Placement: 164

Intersections between psychological and physiological stress and cannabis use in reproductive-aged women

Primary Author: Sierra Forler
Co-Author(s):

Faculty Sponsor: Erica Crespi

Primary College/Unit: Arts and Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Cannabis is one of the most used substances worldwide. In the United States, cannabis use and its perceived safety are increasing as a growing number of states legalize its use. In the proposed research, we aim to test the hypothesis that cannabis use will be associated with lower cortisol levels in reproductive-aged women and dissociate the positive relationship between reported psychological stress and hair cortisol levels. Alternatively, high levels of cannabis use could activate the hypothalamo-pituitary-adrenal (HPA) axis particularly in those who smoke or vape cannabis, resulting in higher hair cortisol levels. Hair cortisol concentration is a non-invasive measure of average HPA axis activity over a period of time, and therefore, is much less variable than plasma or saliva samples. Hair samples will also give us the opportunity to measure reproductive hormones such as estradiol, testosterone and progesterone. We will recruit women ages 18-45 in Washington State, who will complete cannabis and substance use surveys, psychological stress and anxiety questionnaires, reproductive health surveys, and will provide samples of hair. To recruit a diverse sample, we will recruit in rural and urban areas across the State, using social media and posting flyers in cannabis dispensaries. We will also recruit non-cannabis users to determine whether the relationships between self-reported psychological stress, hair cortisol, and reproductive health differ between cannabis users and non-users. The results of this study will help better understand the effects of cannabis use on the health and wellbeing of reproductive-aged women and improve standards of care.

SHOWCASE

Academic Showcase Participant
Board Placement: 8

Modeling the Growth Kinetics of a Human Leukemia Cell Line with Applications in Expansion of Cytotoxic T Cells in a Centrifugal Bioreactor System

Primary Author: Brenden Fraser-Hevlin
Co-Author(s):Kitana Kaiphanliam
Bernard Van Wie
William Davis

Faculty Sponsor: Bernard Van Wie

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Cancer is one of the most critical challenges facing the medical field. Common treatments such as radiation and chemotherapy can attack healthy cells in the process of destroying cancerous tissue, leading to negative side effects. Thus, recent years have seen the rise of new treatment methods including immunotherapy, which modifies patients' immune cells to specifically target cancerous cells. Widespread implementation of this treatment has been difficult due to the high treatment cost and inefficient methods used to expand the modified cells. To address the need for an economically feasible process to expand cells for immunotherapy, our laboratory has recently designed a centrifugal bioreactor (CBR). The CBR uses a balance of forces to quickly expand cytotoxic T lymphocytes (CTLs) to high densities. To validate the CBR prototype, we began by recently optimizing the growth of CEM (human lymphoblastic leukemia) cells, which behave similarly to CTLs. We hypothesized that by designing a kinetic model from static culture experiments, we could predict the parameters necessary to achieve peak CEM and eventually CTL growth in the CBR. We will report on kinetic studies in which different glucose concentrations were tested with the CEM line, and a maximum specific growth rate was determined, as well as studies where the critical concentrations of the inhibitory byproducts ammonium and lactate were determined. We also used the resulting data to develop a baseline kinetic model. In brief, achieving optimal kinetic models for the CBR system has the potential to significantly enhance culture efficiency and availability of immunotherapy treatments.

Academic Showcase Participant
Board Placement: 71

Ventilated Closed Space COVID-19 Model

Primary Author: Matthew Gaddis
Co-Author(s):Valipuram Manoranjan

Faculty Sponsor: Valipuram Manoranjan

Primary College/Unit: Arts and Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

SEIR models are typically conjured for populations in open environments; however, there seems to be a lack of these types of models that deal with infection rates amongst enclosed spaces.
We have also seen certain age groups struggle to deal with COVID-19 more than others, and to this
end, we have constructed an age-structured SEIR model that incorporates the Gammaitoni–Nucci
model, which is used for infective material in an enclosed space with ventilation. We apply some
sensitivity analysis to better understand which parameters have the biggest impact on overall
infection rates, as well as create a realistic scenario in which we apply our model to see the
comparison in sickness rates amongst four different age groups with different ventilation filtration
systems (UVGI, HEPA) and differing quanta production rates

GPSA Research Exposition Participant
Board Placement: 159

The Effect of Climate Change on Labor Allocation in the Manufacturing and Services Sectors in the Philippines

Primary Author: Kairon Shayne Garcia
Co-Author(s):

Faculty Sponsor: Benjamin Cowan

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal Topic
The literature on the labor impacts of climate change suggests that sectors with outdoor production experience labor contraction due to climatic changes. We contribute to this literature by showing how climate change affects the type of labor hired. Our theoretical model indicates that climate change reduces available electricity resulting in a decrease in a firm's energy demand and capital. If all inputs are substitutable, higher temperatures would reduce energy and capital but increase labor.

Method
We estimate the effect of temperature on different labor types in the manufacturing and services sectors in the Philippines, and explain its mechanism. We pooled firm-level data from the 2008 and 2014 World Bank Enterprise Surveys, and matched it with the annualized temperature data from the Philippine weather bureau. We exploit the annual variation of maximum temperature across regions to examine its impact on labor allocation. Our dependent variable is the labor type for the main specification, and capital expenditure or electricity cost for the mechanism check. The independent variables include the maximum temperature as the variable of interest, firm characteristics, and region, industry and year indicators.

Results/Implications
Our results show that labor substitutes for energy and capital. Because an average increase of 0.26℃ in extreme temperature decreases annual capital expenditure by Php2 million and annual electricity cost by PhP0.5-1.5 million, firms tend to hire 2-5 more employees each year to continue production. Our findings offer a new perspective on assessing how climate change can potentially benefit some industries, implying labor policy reconsiderations.

GPSA Research Exposition Participant
Board Placement: 163

Studying the Mechanisms of Light Activated Shape Shifting Polymeric Materials

Primary Author: Zoya Ghorbanishiadeh
Co-Author(s):

Faculty Sponsor: Mark G. Kuzyk

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

PRINCIPAL TOPIC
This research seeks to understand the microscopic origins of light-induced shape changes in poly (methyl methacrylate) polymer doped with Disperse Red 1 dye. We test the hypothesis that light-induced heating of the polymer – mediated by the molecules – and molecular shape changes are responsible. An understanding of the contributions to the bulk response of each mechanism as a function of polymer chain length and dye composition will provide guidance in developing more efficient shape-shifting materials that have a broad range of applications ranging from deep brain stimulation to smart morphing materials.
METHOD
The approach couples two newly developed theories and experiments. Temperature-dependent measurements isolate thermal processes while optical measurements that are sensitive to the molecular alignment of the molecules separate contributions from thermal and molecular shape changes. The set of data as a function of multiple parameters are like pieces of a puzzle that are brought together by the theory. The results yield the efficiency of converting light energy to mechanical work, which we evaluate as a function of material parameters, providing guidance for developing better material.
RESULTS/IMPLICATIONS
I concluded that the dominant mechanism in DR1-doped PMMA fibers is the thermal response and the efficiency is independent of the polymer's chain length. Light-induced molecular shape change of DR1 has a negligible contribution.

Academic Showcase Participant
Board Placement: 56

Hijacking of host metabolism by Potato virus Y: A case study using an important virus of Potato

Primary Author: PRABU GNANASEKARAN
Co-Author(s):Ying Zhai
Hira Kamal
Hanu Pappu

Faculty Sponsor: HANU PAPPU

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Potato virus Y (PVY) is one of the most economically important plant pathogens that affects staples such as potato and several other solanaceous plants and is considered as top-five economically important viruses in the world. The PVY genome encodes a single polyprotein which is then post-translationally cleaved into P1-pro, HC-pro, P3, CI, VPg, NIa-pro, NIb, and coat protein (CP). In this study, to better understand the PVY-host interactions, we screened the yeast-two-hybrid (Y2H) cDNA library of model plant Nicotiana benthamiana to identify potential host proteins that interact with viral coat protein. One of the plant proteins that was found to interact with PVY-CP was cytosolic Phosphoglucomutase (cPGM). cPGM is an enzyme that catalyzes the reversible conversion of glucose-6-phosphate to glucose-1-phosphate and is involved in controlling the partitioning of sugar-phosphate into respiratory pathway, cell wall synthesis, and sucrose synthesis pathways. This interaction between the CP and cPGM was further confirmed by Y2H assay. Y2H assay shows if two proteins are physically interacting with each other. To understand the biological significance of CP-cPGM interaction in the perspective of viral pathogenesis, we suppressed the expression of cPGM in N. benthamiana plants using tobacco rattle virus-based silencing vector. The inactivation of this gene resulted in restricted disease development, and reduced virus accumulation suggesting that PVY requires the metabolite of cPGM-mediated pathways. Overexpression of cPGM protein in N. benthamiana plants enhanced pathogenicity and viral accumulation. Taken together, it appears that PVY-CP interacts with the cPGM and modulates the carbohydrate metabolism probably to facilitate viral replication and accumulation. Ongoing studies include investigation of the downstream effect(s) of CP-PGM interaction on carbohydrate metabolism and PVY pathogenesis.

GPSA Research Exposition Participant
Board Placement: 167

Sustainable Development in the Textile and Apparel Industry: A Lifecycle Assessment (LCA) Approach

Primary Author: Victoria Gonzalez
Co-Author(s):Xingqiu Lou
Ting Chi

Faculty Sponsor: Xingqiu Lou

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal Topic:

Sustainability in the fashion industry has been gaining more attention and becoming a pressing concern for consumers. The Life Cycle Assessment (LCA) is a test gaining popularity in use. It quantifies the amounts of impact created by each stage of the supply chain. This study applied an environmental lens regarding the inputs and outputs of business operations across the supply chain. Lifecycle Assessment (LCA) has been used to evaluate the environmental impact of textile and apparel products in each of their lifecycle stages.

Methodology:

The purpose of this study was to examine the application of LCA in the fashion industry through a set of three objectives

1. to explore the present state of research on fashion sustainability,
2. to provide an overview of the current applications of LCA in the industry, and
3. to analyze the LCA application on various apparel and textiles.

A systematic literature review was selected as the methodology for this study. Twenty-eight articles published between 2004 and 2021 were reviewed, each of which utilized LCA.

Results:

In conclusion, the fiber with the most data regarding its impacts is cotton and some of its varieties. The cultivation and textile production phases create the heaviest environmental ramifications. Raw material extraction and textile manufacturing are the two substages with the most evidence in these categories; it is the opposite for the transportation and garment manufacturing stages. Further investigation is needed in these specific sub-processes. Yarn width and fiber structure were two other focuses of this review.

Academic Showcase Participant
Board Placement: 106

“The Politics of Survey Cinema History Textbooks”

Primary Author: Ruth Gregory
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

Cinema history textbooks have long served as an introduction to the discipline and, for as long as they have been used, they have been criticized. Writing in 1950, James Card states, “The student turns to the film histories and there finds confusion, gossip, and the wildest sort of speculation.” [1] This essay uncovers the politics of contemporary survey cinema textbooks, including Flashback: A Brief History of Film (2009) by Louis Giannetti and Scott Eyman, A Short History of the Movies (2010) by Gerald Mast and Bruce Kawin, Movie History: A Survey (2011) by Douglas Gomery and Clara Pafort-Overduin, and Film History: An Introduction (2018) by Kristin Thompson and David Bordwell. Building on work in education and cultural studies, the author analyzes problematic canonized patterns, which include a tendency to obscure the contributions of women and people of color, a preference for framing film as an art form, and a general simplification of film history that discourages students from thinking critically about what is missing or marginalized in the historical narrative.
[1] Card, James. 1950. "Problems of Film History." Hollywood Quarterly 4(3): 279 - 288.

Academic Showcase Participant
Board Placement: 173

Improving potato system sustainability through locally relevant soil health assessments

Primary Author: Deirdre Griffin LaHue
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Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Other

Abstract:

Soil health, like human health, describes the ability of a system to be resilient, fight diseases, cycle carbon-based inputs, and efficiently use nutrients to feed the system. Improving soil health is an important focus for agriculture nationally, and there is need to develop standardized indicators to be measured by agricultural professionals to track improvements from alternative management practices. However, expected indicator ranges were established from soils in the northeastern US and are not nationally relevant. Variation in soils must be considered to calibrate regionally based benchmarks for soil health metrics.
Our goal was to develop scoring functions for soil health indicators relevant to northwest Washington's soils and to evaluate how management practices affect soil health. We focused on fresh-market potato systems, a major cropping system in northwestern WA. Our hypotheses were: 1) soil indicator scoring curves based on northwestern WA would be unique from those developed in other parts of the US; 2) fields under practices that promote soil biological activity (e.g. cover cropping, organic amendments) would have higher soil health indicator values.
In summers 2020 and 2021, the team worked with local farmers to identify fields to sample and collected soil samples from 50 potato fields in Skagit County representing a range of soil management histories. Samples were analyzed for a suite of properties related to soil health functions (e.g. nutrient cycling, biological activity). Data were analyzed to develop scoring curves for each measurement and to test the impacts of cover cropping, rotation, and amendment management on key measurements.

Academic Showcase Participant
Board Placement: 50

A New Viral Protein Induces Programmed Cell Death in its Host Plant

Primary Author: Neha Gupta
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Prabu Gnanasekaran
Ying Zhai
Supriya Chakraborty
Hanu Pappu

Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Whitefly-transmitted begomoviruses infect and damage a wide range of food, feed, and fiber crops worldwide. In addition to their genomic DNA, some of these viruses are associated with single-stranded, circular DNA molecules, called betasatellite. These beta satellites make the disease more severe. Radish leaf curl betasatellite (RaLCB) infection causes severe leaf curl disease in radish, tomato, and model plant Nicotiana benthamiana.

We investigated the function of a novel βV1 protein coded by RaLCB by overexpressing the protein using Potato virus X (PVX)-based virus vector in N. benthamiana. βV1 protein induced lesions suggestive of hypersensitive response (HR) indicating cell death usually not observed during infection by begomoviruses. HR is a form of resistance response of the plant during the compatible interaction of a host resistance gene (R-gene) and a pathogen-associated avirulence gene or elicitor. The HR reaction induced by βV1 protein was accompanied by an increased accumulation of reactive oxygen species (ROS) and free radicals. Interestingly, the plants overexpressing RaLCB-encoded βC1 protein also generated ROS and free radicals but did not induce necrotic spots on leaves. HR-related and defense-related RNA transcripts were altered in both βV1 and βC1 overexpressing plants. We also found out that βV1 localizes to the plasma membrane. Altogether, our findings suggest that βV1 functions as an elicitor of HR, localizes in the plasma membrane, and may interact with any host resistance factor(s) to generate a defense response in the form of HR. Our findings lay the groundwork to generate active resistance against begomoviruses in susceptible crops.

SHOWCASE

Academic Showcase Participant
Board Placement: 193

Potato virus Y co-opts a host protein to overcome host plant's defense

Primary Author: Aflaq Hamid
Co-Author(s):Sahar Saleem
Ying Zhai
Jagmohan Singh
Hanu Pappu

Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Potato industry and its value chain contribute to WA State's economy to the tune of more than $4 billion annually. Potato virus Y (PVY; genus Potyvirus, family Potyviridae) is an economically important pathogen of potato in WA and elsewhere. The virus codes for proteins whose function is to overcome host plant's defense. One such viral protein is helper-component proteinase (HC-Pro).

Computational modelling and molecular dynamics simulation showed that HC-Pro potentially interacts with tobacco calmodulin-related protein regulator of gene silencing CaM (rgs-CaM) to overcome host plant's defense response, referred to as post-transcriptional gene silencing (PTGS). Quantitative PCR (qPCR) showed an increase in rgs-CaM expression in PVY-infected tobacco plants. The interaction between PVY's HC-Pro and plant's rgs-CAM was further validated using three independent assays yeast two-hybrid (Y2H), bimolecular fluorescence complementation (BiFC), and pull-down assays. These assays show if two proteins physically interact with each other.

Taken together, our results suggest a possible silencing suppression effect of HC-Pro via direct binding with the calmodulin rgs-CaM. The rgs-CaM expression increased in response to PVY infection and that in turn may lead to the activation of downstream defense genes after binding calcium. Calcium appears to be involved, at least partially, in triggering PTGS following infection by PVY.

SHOWCASE

Academic Showcase Participant
Board Placement: 79

Training Needs of Opioid Prevention, Treatment, and Recovery Providers in Rural Washington

Primary Author: Katherine Hampilos
Co-Author(s):Liat Kriegel
Julianne Jett
Michael McDonell
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Faculty Sponsor:

Primary College/Unit: Other
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Background: Washington state is amid an opioid overdose epidemic that has significantly impacted rural communities. Rural settings present unique challenges to addressing opioid misuse including geographic barriers and slow adoption of evidence-based approaches by providers. The purpose of this study is to identify barriers to providing opioid-related services experienced by rural Washington prevention, treatment, and recovery providers, as well as current training needs.

Methods: Washington-based opioid-related service providers (N=78) completed an online survey between July and September 2020. Most participants described their work communities as rural (64%) or urban but rural serving (28%). Participants' work organizations focused on substance use prevention (30%), healthcare (19%), community-based education (12%), and substance use treatment (9%). 17 respondents (22%) worked with or for Tribal governments or organizations.

Results: Respondents ranked the top barriers to providing opioid-related services in rural communities as: 1) stigma preventing people from seeking services; 2) limited access to behavioral health resources; and 3) lack of community knowledge of opioid misuse. Providers were "extremely interested" in training on topics across the spectrum of prevention, treatment, and recovery including community education on opioid misuse prevention (62%), community-based prevention interventions (60%) and recovery support services (55%), treatment and recovery services for youth (54%), and trauma-informed approaches (54%). Providers preferred training delivered during the workday (80%) in the form of phone or video conferencing (75%) or self-paced e-learning materials (69%).

Conclusions: Needs assessment findings can be used to guide the development of training and technical assistance for providers of opioid-related services in rural Washington.

SHOWCASE

Academic Showcase Participant
Board Placement: 114

Holistic GME Admissions: Meeting Diversity and Mission-Alignment Goals

Primary Author: Matthew Hansen
Co-Author(s):Delaney Goulet
David Aufdencamp Aufdencamp
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Jonathan Espenschied

Faculty Sponsor:

Primary College/Unit: Other
Category Medical & Life Sciences
Campus: Everett

Abstract:

BACKGROUND
Both UME and GME accreditors stress increasing the diversity and mission-alignment of medical students in a holistic review (HR) admission process. Not widely adopted in GME, this approach in UME has improved underrepresented in medicine (URiM) and mission fit admissions. We implemented HR into our GME selection process.

OBJECTIVES
We sought a holistic selection process in our new GME program, establishing HR criteria, including personal experiences, individual attributes, competencies, and mission-alignment metrics to standardize our candidate assessment and foster inclusivity within the program.

METHODS
We identified attributes, experiences, and candidate goals that aligned with our mission, including mission alignment data such as Pacific Northwest roots, commitment to the underserved, rural upbringing, and nontraditional paths to medicine. To limit variation and bias, standardized interview questions were created to evaluate other characteristics and screeners were blinded to applicant photos, accommodations, and standardized test scores. We used a structured process to rank candidates.

RESULTS/OUTCOMES/IMPROVEMENTS
After HR screening of 1935 applicants, we offered 248 interviews, completed 206, ranked 205 and matched all 16 positions. Matched residents had mean/median scores of 4.2 out of 5. Half had in-state ties, 63% had lived or worked in a rural community, 38% had a non-traditional path, 6% had previous military experience, and 19% were URiM (Hispanic, African American, and American Indian or Alaska Native).

SIGNIFICANCE/IMPLICATIONS/RELEVANCE:
We incorporated HR into a successful GME admission model that may help reduce bias and improve mission alignment matching.

GPSA Research Exposition Participant
Board Placement: 146

p38 MAPK and HIF-1 Signaling in Leiomyosarcoma Under Hypoxia

Primary Author: Nuha Haque
Co-Author(s):

Faculty Sponsor: Eric Shelden

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Cancer cells are exposed to hypoxic conditions during tumor growth, which can result in selection for adaptive traits. These changes can promote cell proliferation and metastasis, or allow cells to enter a reversible cell cycle arrest (dormancy). Factors that determine which fate cancer cells select have not been well established. Both the hypoxia inducible transcription factor, HIF-1, and the stress activated protein kinase p38 are activated by hypoxia. Here, we tested the hypothesis that p38 MAPK activates HIF-1 leading to expression of hypoxia inducible genes that promote cancer cell dormancy. We analyzed HIF-1 and downstream target gene expression in hypoxic human leiomyosarcoma cells using immunoblotting and transcriptome-wide gene expression analysis. We then examined expression of HIF-1 and hypoxia-inducible genes after p38 MAPK inhibition. Finally, we examined cell migration under normoxic and hypoxic conditions in the presence or absence of p38 and HIF-1 inhibitors. Our results reveal that p38 MAPK promotes HIF-1 expression and downstream expression of some, but not all hypoxia inducible genes, and slows the migration of cells under hypoxic conditions. These genes include IGFBP3, a protein that attenuates growth factor responses and inhibits cell proliferation. Together, our results suggest that p38 MAPK mediated signaling through HIF-1 promotes cell characteristics enabling dormant behavior while inhibiting proliferation and migration. Future studies will further delineate this pathway and its significance to cancer cell behavior. Our results help clarify the signaling pathway involved in the response of cancer cells to hypoxia and may provide new avenues for intervention in cancer progression.

Academic Showcase Participant
Board Placement: 169

Developing a Growth Mindset in Math Anxious Prospective Elementary Teachers at the Community College

Primary Author: Kristen Harvey
Co-Author(s):Kristin Lesseig

Faculty Sponsor: Amy Roth McDuffie

Primary College/Unit: Education
Category Social Sciences
Campus: Tri-Cities

Abstract:

The vast majority of community college students report experiencing math anxiety. This has serious implications for their academic success. Additionally, elementary education majors have been found to have the highest levels of math anxiety as compared to other college majors. This is even more alarming, given that these prospective teachers have an enormous influence on student achievement and have a high likelihood of passing on their negative emotions and attitudes towards math to their future students. There is a clear need for supporting preservice teachers in overcoming their math anxiety, not only for themselves, but for their future students.

Research on the connection between emotion regulation and math achievement has found promising results towards reducing math anxiety. These interventions can change mindsets and boost success in math class. This study evaluates the effects of a Growth Mindset Module implemented in a Math for Elementary Education course at a Washington state community college. Throughout the module, participants examine how a fixed mindset can affect their ability to learn and how their own mindset will impact the achievements of their future students. The module also includes opportunities to practice strategies for developing a growth mindset and classroom activities to reinforce and reflect on these strategies. It is anticipated that prospective teachers will report a shift in mindset (from fixed to growth) by the conclusion of the study as well as an increase in their math achievement. The study is currently underway, with final results anticipated Spring 2022.

Academic Showcase Participant
Board Placement: 126

Toward a Practice of Liberation: Feminism, Chicanismo and Catholicism in the United Farm Worker Movement

Primary Author: L Heidenreich
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

In May of 1972 the state of Arizona had just passed House Bill 2134, a piece of legislation that outlawed secondary boycotts and strikes at harvest time. César Chávez, in protest began a fast, one that would last 21 days and end with his hospitalization. In the Santa Rita Center, in Tempe, Arizona, Fr. Joe Melton, held Masses in a packed room, consecrated wine crushed from union grapes and the people sang union songs. Thirty-eight religious leaders signed a letter calling on their communities and all people of faith to take a public stand against the Bill, including Sr. Dorothy Vigil, a Dominican Sister and active member of Las Hermanas, a community of Chicana and Latina women religious. By 1972 women religious were active in the UFW, not only marching in picket lines and pilgrimages, but serving as nurses in farmworker clinics and heading district boycotts; laywomen who taught in Catholic schools brought their students to UFW protests, and Helen Chávez, the spouse of César Chavez, directly confronted the bishop of her diocese.
Drawing on archived issues of El Malcriado, as well interviews housed at the Farmworker Documentation Project, this paper maps how, in the 1960s and 70s, a convergence of national, hemispheric, and global changes converged to fuel the activism of Roman Catholic women, leading them to become active agents in the struggle for farmworker rights.

GPSA Research Exposition Participant
Board Placement: 113

Towards Increased Genetic Gain: Utilizing Spectral Data in a Large Scale Wheat Breeding Program under a Drought Year

Primary Author: Andrew Herr
Co-Author(s):Arron Carter

Faculty Sponsor: Arron Carter

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal Topic
Multispectral imaging with unmanned aircraft systems (UAS) is a promising high-throughput phenotyping technology that has been shown to help understand the mechanisms associated with crop productivity. This imaging technology can accurately predict complex agronomic traits like grain yield within a given generation, creating the potential to fast-track selections in plant breeding and increase genetic gains. Unfortunately, multispectral imaging has not been evaluated at selecting performance across years, limiting our understanding of predicting environmental variation. The objective of this study was to determine the effectiveness of prediction on grain yield in an abnormal drought year across locations within a breeding program.
Methods
Spectral reflectance indices (SRI) such as NDVI and NWI were used to evaluate Washington State University winter wheat breeding lines between 2018 and 2021. Data was collected using a DJI Inspire 2 drone, equipped with a Sentera Quad Multispectral Sensor, and collected at the heading date. Lines were observed from single location, single replication preliminary yield trials to multi-location, replicated advanced yield trials. Lines advanced in the breeding program were evaluated across 13 different location-year trials. The calculated SRIs were used as fixed effects in mixed model prediction for grain yield under drought conditions. Models were independently validated with 2021 data.
Results/Implications
Across locations, SRIs are shown to improve the prediction performance for grain yield under abnormal drought conditions by as much as 40%. This research is vital for plant breeders to understand the utility of UAS imaging in variety improvement when dealing with abnormal growing seasons.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 207

N-acetylcysteine reduces alcohol self-administration in maternal immune activation offspring

Primary Author: Kelly Hewitt
Co-Author(s):Madilyn Peterson
Angela Henricks

Faculty Sponsor: Angela Henricks

Primary College/Unit: Arts and Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Prenatal exposure to infection has been demonstrated to be a risk factor for psychiatric disorders that are commonly comorbid with alcohol misuse. Maternal immune activation (MIA) is a model of prenatal infection exposure which has shown to lead to increased alcohol consumption in adult rats. The underlying mechanism of this model is currently unknown. Oxidative stress allegedly contributes to the behavioral symptoms of MIA; therefore, the antioxidant n-acetylcysteine (NAC) was investigated to decrease the increased alcohol self-administration caused by MIA.

We aimed to reverse the increased alcohol consumption by pretreating with NAC prior to alcohol self-administration opportunity. This was assessed by using pregnant Sprague-Dawley rats who received MIA at gestational day 15. The offspring were trained to self-administer 10% alcohol for 30 minutes/day, 5 days/week. After 15 days of baseline self-administration, rats were assigned to receive an injection of NAC (0, 50, or 100 mg/kg) one hour prior to self-administration for 5 consecutive days followed by 5 days of a non-treatment washout period. Using a Latin-square design, this procedure was repeated so all rats received each treatment.

Both 50 and 100 mg/kg NAC reduced drinking behavior in both MIA and control animals. This indicates that NAC does not target the oxidative stresses induced by MIA. Further studies are needed to help target how prenatal exposure to infection increases risk of adult alcohol misuse and how to prevent this.

Academic Showcase Participant
Board Placement: 53

Literature review of goals, services, and target patient populations of community paramedicine in rural United States

Primary Author: Chelsea Higgins
Co-Author(s):John Roll
Mitchell McAuslan

Faculty Sponsor:

Primary College/Unit: Other
Category Rural healthcare delivery
Campus: Spokane

Abstract:

Rural areas contain one-fifth of the US population and only 10% of the nation's physicians. Community paramedicine (CP) is a growing healthcare delivery model in which emergency medical personnel provide non-emergent medical care. Community paramedics may help fill the primary healthcare gap for rural residents. The objective of this literature review is to provide an overview of the common goals, services, and target populations of rural CP programs in the US.

Two investigators searched pub med database and identified 12 articles independently.

Rural CP programs' most common goals are to aid patients in chronic disease management and to reduce emergency department visits, hospital admissions/readmissions, and healthcare costs. Programs target services toward patients who are chronically ill, post-hospital discharge, and frequent EMS users.

CP provision of preventative and primary care services has improved health outcomes for patients with chronic disease. Rural CP programs report cost savings for the healthcare payer and patient and a reduction in ED transports and hospital readmissions. The problems identified are acquiring sustainable funding to develop CP programs and reimburse CP services, lack of consistency between CP scope of practice and educational requirements across states, role tensions with other healthcare professions, and lack of research about the safety of CP programs for patients.

Future research is needed to investigate patient outcomes secondary to CP preventative and primary care services, which may identify if CPs are an effective means of helping fill the primary care gap for rural communities.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 74

Analyzing Benzalkonium Chlorides (BACs) Using 3D-Printed Ion-Selective Membranes

Primary Author: Nguyen Ho
Co-Author(s):Dalton Glasco
Jeffrey Bell

Faculty Sponsor: Jeffrey Bell

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

The most used antimicrobial preservative in antiseptics, disinfectants, hair products, and eye, ear, and nasal drops is benzalkonium chloride (BAC). However, numerous studies have revealed deleterious corneal effects associated with BACs leading to unwanted effects such as destabilization of the tear film and death of the corneal and conjunctival epithelial cells. It has been suggested that the risks of these effects are likely dose-dependent. Currently, BACs are detected using gas chromatography, high-performance liquid chromatography, thin-layer chromatography, and chemical ionization mass spectroscopy. However, these methods are not suitable for ophthalmic gels or viscous solutions because they have low detection sensitivity and need long run-time sequences. To address these problems, this research is focusing on an alternative way using an ion-selective electrode (ISE) to measure the concentration of BACs rapidly and accurately. These BAC-ISEs are fabricated using a new 3D-printing methodology which significantly decreases both the time and cost associated with ISE fabrication. To be able to selectively detect BAC, we have incorporated a molecular recognition element (calix[6]arene) into our sensing membrane. Results demonstrate that our BAC-ISE is capable of detecting BAC concentrations between 1.0 mM and 20.0 microM in the presence of common positively charged interferences such as sodium, calcium, potassium, and magnesium. The data results have proven our ISE is able to detect BACs from other interference ions in eye drops and hand sanitizer.

Academic Showcase Participant
Board Placement: 178

Why Don't We Trust Other Countries? A Systematic Review Of Correlation Between Social Identity And International Trust

Primary Author: Yezi Hu
Co-Author(s):

Faculty Sponsor: alex tan

Primary College/Unit: Communication
Category Social Sciences
Campus: Pullman

Abstract:

Trust between countries is an empirical request of globalization, especially in this global pandemic era, but lack of trust between countries has been seen frequently in global news. In-group bias could be one explanation since people favoring members of their same groups more has been confirmed by many theories and studies. However, whether such bias affects peoples' trust towards out-groups is uncertain and mixed. To understand in the context of international trust, how people identify groups, the theoretical foundation behind it, the conceptual and operational definitions of the trust, and the correlation between international trust and group identification, this study selected from 1,155 articles, following strict inclusion criterium, and performed a systematic review to synthesize 13 quantitative studies from 2005 to 2020. After coding 25 variables, this study discussed the variation and nuances of the "trust" concept in previous researches, summarized an explication of "trust" in the "international trust" context, and confirmed the correlation between trust and group identification. In addition, it found that people categorized groups not only by nationality, but also by language, value similarity, religion, and income. Thus, the study suggested it is possible for each country to re-frame their information to better communicate with other countries to highlight value similarity or same religion, in order to increase foreigners' trust.

Academic Showcase Participant
Board Placement: 170

Effects of Total Sleep Deprivation on Performance on a Continuous Performance Matching Task

Primary Author: Amanda Hudson
Co-Author(s):John Hinson
Paul Whitney
Darian Lawrence-Sidebottom
Hans Van Dongen
Kimberly Honn

Faculty Sponsor: Kimberly Honn

Primary College/Unit: Spokane
Category Social Sciences
Campus: Spokane

Abstract:

Tasks requiring identification of specific stimuli and creating response/non-response conflict may impair performance depending on the degree of stimulus feature overlap. Whether total sleep deprivation (TSD) interacts with such impairment is unknown.

N=85 healthy adults (ages 21–40; 50 women) completed a 4-day laboratory study with a 38h TSD condition (n=58) and a well-rested control condition (n=27). A continuous performance matching task (CPMT) was administered every 2–4h during wakefulness. Participants completed 300 trials where a 3-digit number was flashed on the screen. They were instructed to mouse-click if the number was identical to the preceding number (i.e., a repeat); for all other trials, a response was to be withheld. Five daytime tests administered at baseline (day 2) and after TSD/control (day 3) were analyzed. Trials were classified by number of digits matching the preceding trial (stimulus feature overlap): none (180 trials), one (30 trials), two (near-repeat; 30 trials), or all (repeat; 60 trials). Hit and false alarm (FA) rates were analyzed with mixed-effects ANOVA for day, condition, trial type, and their interactions. Mean response time (MRT) was analyzed equivalently for repeat trials.

Hit rate declined after TSD ($p<0.001$); and FA rate increased after TSD ($p<0.005$), especially for near-repeat trials ($p<0.001$). Changes in MRT were statistically significant, but negligible (<20ms). Although interpretation is limited as no responses were required for non-repeat trials, these results indicate that greater stimulus feature overlap was associated with greater costs required to resolve conflict during TSD. Research support by PRMRP awards W81XWH-16-1-0319 and W81XWH-20-1-0442.

Academic Showcase Participant
Board Placement: 203

New Ln-based Coordination Polymers for Sensing and Separation of Dyes

Primary Author: Matthew Hurlock
Co-Author(s):Fidelia Lare

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

The objective of this project is to develop rare earth elements-based Metal–Organic Frameworks (RE-MOFs) and study their luminescent properties for potential sensing and separation applications. To obtain unique RE-MOF structures, we have designed a highly luminescent organic ligand, m-H4ETTC. Using the solvothermal method, we have synthesized 14 different fluorescent RE-MOFs, named WSU-57 through WSU-71, from Ln(NO3)3 (Ln = La3+, Ce3+, Pr3+, Nd3+, Sm3+, Eu3+, Gd3+, Tb3+, Ho3+, Er3+, Tm3+, Yb3+, and Lu3+) and the m-H4ETTC linker. Crystallographic analysis revealed that the 14 compounds possess three distinct underlying structures. The first of these is a 3-dimensional structure that only forms when La3+ is used. The structure contains a rare La4 cluster. The second structure is 2-dimensional that only forms when using Lu3+ and contains Lu2 clusters. The last structure forms when the metals Ce3+ through Tm3+ are used. Similar to the Lu3+, this structure is 2-dimensional and contains Ln2 clusters, but this structure is anionic due to the coordination of the ligands at the metal clusters. This phenomenon has never been reported before.
All synthesized compounds exhibit strong ligand-based fluorescence properties. Interestingly, no RE-metal-based fluorescence is observed in these compounds. The compounds WSU-57 – WSU-71 exhibit irreversible piezofluorochromic behavior. The luminescence of the compounds shifts from blue to green when external stimuli are applied, such as grinding. We also found that the anionic nature of the RE-MOFs is capable of separating cationic dyes based on their molecular size, while the neutral compound adsorbs both cationic and anionic dyes.

GPSA Research Exposition Participant
Board Placement: 174

Finding Colita

Primary Author: Amanda Hussein
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

Principal Topic:
The purpose of this presentation is to analyze the portrayal of a young black woman in the short story La llamaban Aurora (Pasión for Donna Summer) by Aída Cartagena Portalatín using the theory of history and memory by Patrick Hutton.

Colita García is a young black teenager from Santo Domingo in the Dominican Republic who works as a housekeeper/maid for a white family. Colita knows her humanity is under question by her white mistress as well as the world she lives in in Santo Domingo. Colita dares to question the role set before her as well as to continually say No. Noo. And noo. Aída Cartagena Portalatín, through Colita, challenges the world to look at race, gender, history, and memory through vastly different eyes than those permitted by the historical narrative.

Method:

Patrick Hutton, in his work History as an art of memory, states: “Historical memory… is a function of the power to determine the way in which the past is to be presented” (xxiv). Hutton also states that history is best appreciated as an art of memory (xxiv). Hutton describes how the lines between history and memory become blurred. For this reason, other voices, those not always described in history books, are worthy of memory and must be included in the “official narrative”.

Results/implications:
The manner in which Cartagena Portalatín remembers a young, black woman in the Dominican Republic provides an ethical perspective of justice and an examination of injustice in a voice unheard and not respected.

Academic Showcase Participant
Board Placement: 72

Alcohol & Sex in the Media: Contributions to sexual consent seeking and refusal of unwanted sexual advances

Primary Author: Stacey Hust
Co-Author(s):Jessica Willoughby
Leticia Couto
Christina Steinberg
Soojung Kang

Faculty Sponsor: Stacey Hust

Primary College/Unit: Communication
Category Social Sciences
Campus: Pullman

Abstract:

Media frequently depicts alcohol-involved sexual activity, even though evidence suggests alcohol consumption impacts decision making and negatively influences the sexual consent negotiation process. Sexual consent negotiation (SCN) involves seeking sexual consent, refusing unwanted sexual advances, and adherence to consent. Despite its association with risky sexual outcomes, alcohol-involved sexual activity is common among U.S. college students, and women are disproportionately the victims of alcohol-facilitated sexual assault.
We conducted an online survey with sorority members (N = 1101) of a large American university in February 2020. We hypothesized that exposure to negative media portrayals of alcohol-involving sexual activities will be negatively associated with SCN, exposure to positive media portrayals of alcohol-involving sexual content, sexual consent efficacy, and perceived peer norms will be will be positively associated with SCN; whereas perceived realism of media's portrayals of alcohol-involving sexual content, wishful identification with characters in the media that consume alcohol before, during or after sexual activity, and sex-related alcohol expectancies will be negatively associated with SCN.
Using hierarchical regression analysis, we found that media exposure plays a significant role in sexual consent negotiation, specifically where alcohol is concerned. Wishful identification was associated with refusal of unwanted sexual advances behavior. Media's depictions of sexual consent negotiation behavior influence the audience, especially in alcohol-involved sexual context among the at-risk population.

Academic Showcase Participant
Board Placement: 15

Fingerprinting Onion Thrips: A Destructive Insect pest and virus vector

Primary Author: Romana Iftikhar
Co-Author(s):Amalendu Ghosh
Hanu Pappu

Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Thrips tabaci is a major thrips pest in onion crops causing severe damage by not only feeding on the leaves but also by transmitting Iris yellow spot virus (IYSV). Genetic characterization of thrips populations could provide important clues on the evolution and diversity of this pest. However, the genetic variation within and among populations of this pest on onion crops in WA and the region is not well understood.

A total of 84 T. tabaci specimens were collected from onion crops from 15 locations in four states that included ID, NY, OR, and WA. Genetic diversity was estimated based on mitochondrial cytochrome oxidase subunit 1 (COI) gene sequences.

A total of 12 haplotypes were found in the collected samples. The highest genetic variation was found in Raleigh and Elba populations with 7 haplotype identified. The results showed that haplotypes 2 and 4 are the more frequently prevailing haplotypes in the pacific northwestern US while the eastern US has more diverse groups of T. tabaci haplotypes with more commonly found haplotype 4. Samples from certain locations showed potential population bottleneck and accumulation of mutations. T. tabaci haplotype geographical distribution shows the possible invasion history of the insect and the role production and distribution practices of crop plants. The diversity of T. tabaci could reflect in differential spread of IYSV in various onion-growing states in the US. These findings have potential application for the management of T. tabaci both as a crop pest and virus vector.

Academic Showcase Participant
Board Placement: 45

Scaffolded Research Assignment Analysis for Roots of Contemporary Issues

Primary Author: Corey Johnson
Co-Author(s):Jen Saulnier Lange

Faculty Sponsor:

Primary College/Unit: Libraries
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

Since Fall 2012, Roots of Contemporary Issues (RCI; HISTORY 105/305) has served as the foundational, and only required, course for Washington State University undergraduates. All sections feature a term length individual research project with a scaffolded series of Library Research Assignments (LRAs) and a culminating final research paper. In 2019, a group of RCI instructors and librarians received a WSU Smith Teaching Grant to study the LRAs and their role in producing quality final papers. The project involved 445 randomly selected student cases spread evenly across nine semesters from Fall 2012 to Spring 2017. The presenters and content of this poster will explain when and how topic formation / thesis development, source selection, and citation skills develop over the span of the LRA sequence. Readers of this poster will get a better understanding of the ways students refine topics. For example, when comparing student success within the topic refinement categories “who,” “what,” “when,” and “where,” student had most success with “what” (sub-topic) type narrowing. Poster viewers will gain knowledge about the kinds of sources and how often sources consulted in the preliminary stages of research ultimately appear in their final papers. For instance, only 57% of the sources listed in the final paper bibliography appeared in any of the preliminary LRAs. Finally, information about scaffolding assignment components like annotated bibliographies and outlines, will be offered in reference to which students utilize most effectively and why.

Academic Showcase Participant
Board Placement: 128

CLASSIFICATION OF EXERCISE-ASSOCIATED MUSCLE CRAMPS IN IRONMAN-DISTANCE TRIATHLETES OVER THREE DECADES

Primary Author: Kasey Johnson
Co-Author(s):Chris Connolly
Paal Nilssen
Thomas Miller
Doug Hiller

Faculty Sponsor:

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

PURPOSE: Exercise-associated muscle cramps (EAMC) is a common condition in ultra-endurance athletic events. Despite its high incidence, the etiology and risk factors are not fully understood. The purpose of this study was to explore trends in Ironman-distance triathletes that presented to the medical tent during competition with muscle cramping. METHODS: Medical records (n=10,553) from the 1989-2019 Ironman World Championship (Kona, HI) were reviewed. Independent samples t-tests were run and odds ratios were calculated to compare athletes with cramping (n=2,859) to those without (n=7670). RESULTS: Triathletes who presented with muscle cramps were more likely to have a history of previously reporting to the medical tent with muscle cramps within the same race compared to those presenting without muscle cramps (OR=2.40; 95% CI=1.91-3.03). Triathletes who presented with muscle cramps had slightly higher serum sodium (140+/-7 vs. 139+/-7 mEq/L, p=.007) and potassium (4.3+/-0.7 vs. 4.2+/-0.6 mEq/L, p<.001) concentrations than those without muscle cramps. Dehydration was more common in triathletes with muscle cramps (OR=1.63; 95% CI=1.49-1.78) compared to those without. Male triathletes were much more likely to present with muscle cramps than female triathletes (29 vs. 22%, p < .001). CONCLUSION: Our findings from nearly 30 years of elite ultra-endurance data indicate that muscle cramps are likely to be a reoccurring issue throughout the race and are more common among males. We confirm that electrolyte abnormalities are not associated with muscle cramps during ultra-endurance competition. Our finding that dehydration is associated with muscle cramps is somewhat contradictory to current literature.

Academic Showcase Participant
Board Placement: 181

The Relation Between Language Fluency and Language Application with Executive Functioning in Monolingual and Bi/Multilingual College-aged Individuals

Primary Author: Shelby Johnson
Co-Author(s):Tammy Barry

Faculty Sponsor: Tammy Barry

Primary College/Unit: Arts and Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Principal topic
Research has shown that bilingual individuals may have an advantage pertaining to tasks of executive functioning (EF) due to greater mental flexibility and inhibition of non-relevant stimuli (e.g., Marian & Shook, 2012). However, the extent of this advantage is unknown especially related to how often the additional language(s) is used, the level of language fluency in one or more languages, and, if any, when additional languages were learned.
Method
The current study aimed to understand the relation between language fluency and EF among monolingual and bi/multilingual individuals, how language usage frequency may relate to EF, and the importance of age of acquisition of language. Data were collected from 88 participants who reported their demographic and language usage information. EF testing results were also collected using virtual neurocognitive testing through Inquisit.
Results/implications
Language acquisition, fluency, and application were all significantly positively intercorrelated and all component parts of EF were also interrelated. However, no significant relation between language fluency and EF or between language application and EF was found for the full sample. Likewise, age of acquisition did not predict EF among the bi/multilingual group, nor did it moderate the relation of other language variables with EF. Interestingly, there was an unexpected, significant, negative correlation between inhibition and language acquisition for the full sample. Potential explanations for the lack of significant findings related to specific neurocognitive measures given and demographics of participants are explored.

Academic Showcase Participant
Board Placement: 148

Understanding Student Perspectives of University Counseling Centers

Primary Author: Rachel Jupina
Co-Author(s):Alana Pulay
Minyoung Cerruti
Andrew Parker

Faculty Sponsor: Alana Pulay

Primary College/Unit: Engineering and Architecture
Category Visual Arts & Design
Campus: Pullman

Abstract:

This study begins to explore how interior design elements can be used in college counseling centers to reduce stress and stigma and increase access. Mental health and the under-usage of counseling centers are growing issues on college campuses. For designers, there is a lack of understanding of how the interior space can be used to mitigate these problems. Additionally, there is a lack of research on college counseling centers, creating a gap in the literature. In this study, Roger Ulrich's Theory of Supportive design is implemented to understand if it can alleviate these issues. This theory has three components: sense of control, social support, and positive distractions. Four spaces in the WSU Counseling Center environment were chosen, the entry, the waiting room, a counseling room, and a group counseling room. Design elements were identified from the literature review and case study analysis that aligned with the components of the theoretical framework (sense of control, social support, and positive distractions). The chosen elements were then applied into the newly designed spaces to compare to the current counseling center. Students' reactions to the spaces were then recorded through a survey. This survey measured the effectiveness of the new design elements based on perceived feelings of stress and stigma and usage of the space. Students viewed images of the current and newly designed space and rated their feelings of stress and stigma and usage. The results begin to show that students have a more positive reaction to the newly designed spaces.

Academic Showcase Participant
Board Placement: 130

An Analysis of Street Medicine Chief Complaints and Treatments for The Homeless Population of Spokane, Washington

Primary Author: Tevyn Kagele
Co-Author(s):Athena Hoppe
Bailey Hall
Anna Nichols
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Faculty Sponsor: Luis Manriquez

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Vancouver

Abstract:

The Spokane Street Medicine (SSM) Program aims to deliver medical care to those experiencing homelessness in Spokane, Washington. Street medicine functions in a non-traditional setting to provide healthcare to the underserved homeless population. In this analysis, clinical charts from street and shelter encounters made by the Spokane Street Medicine Program in early 2021 have been reviewed to better understand the healthcare inequities prevalent among people experiencing homelessness in Spokane. Pain, wound care, and follow-up efforts were predominant concerns among the homeless population. More than half of the conditions addressed were acute, and almost a quarter of all chief complaints involved chronic, unmanaged conditions. This analysis gives reason for the priorities of the SSM Program to be focused on pain, wound care, and follow-up efforts. Understanding the specific medical needs of this population will allow for better resource allocation and improved health outcomes among people experiencing homelessness.

SHOWCASE

Academic Showcase Participant
Board Placement: 152

Using virus to understand a virus: Investigating the pathology of potato mop top virus

Primary Author: Hira Kamal
Co-Author(s):Natalia Moroz
Kiwamu Tanaka
Hanu Pappu

Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Washington's potato industry value chain is valued at more than $4 billion. Potato is vegetatively propagated through tubers resulting in accumulation of pathogens, especially viruses which are a major constraint to potato production. Potato mop top virus (PMTV), an emerging viral pathogen of potato, causes necrosis of the tubers, and infected tubers lead to rejection of seed crop. PMTV is spread by a soil-borne fungus-like protist, Spongospora subterranea f. sp. subterranea (Sss), which causes powdery scab disease in potato. Limited options are available for reducing the damage caused by PMTV and Sss.

To investigate the role(s) of PMTV-encoded proteins in causing disease, we used another potato virus, Potato virus X (PVX) as a delivery vehicle to express PMTV genes in the model plant Nicotiana benthamiana. The coat protein (CP), triple gene block (TGB)-2 and TGB-3 genes of PMTV were expressed in plants and their effect on plant phenotype was monitored.

Plants expressing the CP showed severe symptoms with leaf crumpling and downward curling and yellowing in newly emerging younger leaves, and stunting of the plant, while plants expressing TGB-2 or TGB-3 developed milder symptoms. When CP and TGB-3 were expressed together, plants produced a hypersensitive response (HR). In contrast, very mild chlorotic spots were observed in plants inoculated with the PVX vector alone. These results suggest that CP plays a potentially important role in symptom development during PMTV infection. The PVX-based expression system is a useful platform for studying the virulence of PMTV proteins in plants.

Academic Showcase Participant
Board Placement: 31

Culturally Conscious and Social Conscience in Award Winning Children's Literature

Primary Author: Jane Kelley
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Stephanie Mahar
Alesia Gittins
Emily Coombs

Faculty Sponsor:

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

As the diversity of the American population has increased, the honors and awards offered to authors and illustrators who publish literature with a focus on culturally diverse representation have expanded. The Coretta Scott King Award, the Pura Belpré Award, the American Indian Youth Literature Award, and the Asian/Pacific American Literature Award all offer recognition to multicultural children’s books in America and contain culturally rich and authentic details. However, some books explicitly depict social action topics. Therefore, we coded 106 books for cultural specifics and social action details. This study intends to provide classroom teachers with a detailed list of culturally diverse texts placed on a continuum from a melting pot, to culturally conscious, to social conscience. From this list, teachers can determine which multicultural literature award and honor-winning books are developmentally appropriate literature for their students. While award-winning multicultural books are an excellent place to look for supplemental classroom material, the children's developmental stage will determine their readiness to discuss social conscience/justice topics. Culturally conscious books will allow students a window, mirror, or door into diverse cultures, and social conscience books will guide social justice.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 99

Liquid contact potentiometric sensor for detection of quinine

Primary Author: Melissa King
Co-Author(s):

Faculty Sponsor: Jeffrey Bell

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal/Topic
The use of quinine as an anti-malarial drug has been documented from as early as the 1600s. Despite the development of newer and better tolerated therapies with less adverse effects, the use of quinine has increased in resource limited settings due to supply issues of newer therapies and increasing resistance to chloroquine and antifolates. Quinine treatment is effective but causes serious side effects when present at higher concentrations in the body. A potentiometric sensor has been developed for the quantification of quinine concentration using an ion-selective electrode.

Method
The fabricated sensor utilizes potentiometry where a potential meter is used to measure the potential difference between a working electrode and reference electrode placed into a sample. The working electrode designed was a liquid contact ion-selective electrode (ISE) created in Tygon® tubing, with a silver-silver chloride wire, and a customized PVC-based ion selective membrane. When placed in a sample, the membrane successfully generated a potential difference at the sample/membrane interface that is directly related to the amount of quinine present.

Results/implications
Preliminary results show that the quinine-ISE was able to measure quinine concentrations that exceeded the target treatment range and concentrations above the potential toxicity level. Being able to accurately quantify quinine levels in patients provides healthcare workers the information they need to treat their patients while avoiding preventable adverse effects. This potentiometric quinine sensor is simple in design and requires no advanced instrumentation for sample measurement or data readout, making the design ideal for future potential use in point-of-care devices.

GPSA Research Exposition Participant
Board Placement: 90

Determinants of Dairy Trade: Do Subsidies Matter?

Primary Author: Magdana Kondaridze
Co-Author(s):Jeff Luckstead

Faculty Sponsor: Jeff Luckstead

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Given changes in supply and demand over the last two decades, the dairy industry has undergone many challenges throughout the world. A key challenge faced by dairy industry is that world supply of dairy products is continually outpaced by world demand. Dairy policies, factor endowments, and institutions play an important role for farms in many countries being efficient dairy producers. However, larger populations and comparative disadvantages lead to many countries consuming more dairy products than they produce. Therefore, trade plays an important role in this industry. Hence, this paper examines determinants of dairy trade by applying the Poisson Pseudo-Maximum Likelihood method to the gravity model using data on 51 exporting and 238 importing countries for the 17-year period from 2000 to 2016. The gravity model is estimated using both interval data and lagged-policy data approaches. The results show that domestic subsidies have a modest impact on dairy trade across the models. A 1% increase in subsidies leads to a roughly 0.02% increase in trade for an average country. Memberships in free trade agreements, market size factors, and government institutions also positively affect the dairy trade. However dynamic analysis offers additional insights. The impact of subsidies disappears from the second year after distribution, FTAs have immediate and delayed effects, and countries take time to adjust WTO regulations and policy changes. Therefore, these results further highlight the importance of observing dynamic analysis of policy factors as previous models can generate misleading effects on when and how policy variables impact bilateral trade flows.

Academic Showcase Participant
Board Placement: 212

A Comparison of Women in STEM to Women Composers

Primary Author: Stasia Kulsa
Co-Author(s):Sophia Tegart

Faculty Sponsor: Sophia Tegart

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

In this project, I investigate and compare the commonalities of women in STEM with women composers who compose electro-acoustic music and music that utilizes extended techniques. These two fields have been primarily dominated by men throughout history, yet more women are entering the field each year. This project aims to establish the similarities and differences between the experiences of women in the two fields so that we may better understand how the diversification efforts are working.

To investigate this, statistics concerning the number of women working in both STEM and music composition were examined. Several women in STEM and music were profiled through accounts of their lives, biographies, and interviews. Their experiences were compared to identify parallels. The composers' compositional processes were also explored to better understand the techniques and output of these women in a male-dominated field.

There are many similarities between the experiences of women in STEM and women in composition. The similarities found during this study indicate that women in the past did not frequently receive recognition for their achievements, but they did receive support for their education. The main difference that was established concerns the history of women in each field. Efforts to support women in STEM were started earlier in history than within the electro-acoustic music field. Much progress has been made in both fields; however, there is room to grow in terms of acceptance and recognizing the accomplishments of women.

GPSA Research Exposition Participant
Board Placement: 135

Expression profiling of canine soft tissue sarcomas identifies distinct molecular subtypes

Primary Author: Lydia Lam
Co-Author(s):

Faculty Sponsor: Eric Shelden

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

PRINCIPAL TOPIC
Soft tissue sarcomas (STS) make up about 15% of all skin and subcutaneous canine cancers. The current standard course of treatment for canine STS is surgery and/or radiation. Unfortunately, even with aggressive surgical margins, 15-20% of patients develop local recurrence. Though there are at least 10 canine STS subtypes, all subtypes are treated the same. This contrasts with human STS where disease management is increasingly subtype dependent. Human STS subtype has been shown to predict a favorable or unfavorable prognosis. Our objective is to show that canine STS subtypes are distinct enough to warrant exploring subtype dependent treatment.

METHOD
Gene expression patterns were assessed using RNA sequencing in 16 archived canine STS tumor samples from three different subtypes. Histological typing was combined with unsupervised clustering based on variable gene expression to devise a pseudo-unsupervised clustering method. Groups identified through our cluster method were compared to normal tissue to find group specific upregulated differentially expressed genes. Gene Set Enrichment Analysis was then conducted to identify transcription factors, kinases, and signaling pathways associated with each group.

RESULTS/IMPLICATIONS
Our study shows that canine STS subtypes are molecularly distinct. We were able to distinguish three tumor groups, based on gene expression, that aligned with the three STS subtypes in the study. We also identified subtype specific, tumorigenesis-associated expression patterns that were enriched in signaling pathways that could be potential therapeutic targets for specific tumor types. Overall, movement towards a subtype specific treatment modality for canine STS has molecular support.

SHOWCASE

Academic Showcase Participant
Board Placement: 125

The astrocyte brain-type fatty acid binding protein, Fabp7, regulates electroshock seizure threshold in mice

Primary Author: Micah Lefton
Co-Author(s):Vivian Wei
Carlos Coleman
Jason Gerstner

Faculty Sponsor:

Primary College/Unit: Other
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Patients with epilepsy often experience increased frequency of seizures at night. The molecular pathways regulating sleep and wake are therefore likely linked to seizure susceptibility. Given the crucial role glial cells play in modulating neuronal excitability, we hypothesize that circadian changes in glial cells may also affect changes in seizure threshold. Fatty acid binding protein 7 (Fabp7) is expressed in brain astrocytes and is involved with the transportation of fatty acids, signal transduction, and gene transcription. Its mRNA expression levels rise and fall in a circadian rhythm and is necessary for normal sleep regulation. We examined if Fabp7 influences seizure threshold upon electrical stimulation.

Male C57/BL6N wild type (WT) and Fabp7 knockout (KO) mice were maintained on a 12/12 hour light/dark cycle. Seizure thresholds were measured by administering a regularly increasing, once per day, electroshock stimulus at ZT12, the beginning of the dark cycle. Seizure type, either general or maximal, was determined by the mouse's behavioral and motor response to the stimulus.

Results showed that KO mice required a higher current to elicit both general and maximal seizure compared to WT mice (unpaired t test).

Astrocyte expressed Fabp7 plays an integral role in modulating neuronal excitability. Mice without functioning Fabp7 have an increased seizure threshold to electrical stimulus and therefore have reduced excitability in brain regions where Fabp7 is normally expressed. Further work is now needed to examine time-of-day effects and elucidate the pathway by which Fabp7 alters seizure threshold.

Academic Showcase Participant
Board Placement: 197

The Adverse Effect of Obligation in Late-Paying Accounts on Salespeople's Engagement in Customer-Directed Deviance

Primary Author: Muzi Liu
Co-Author(s):Uchila Umesh
Jeffrey Joireman

Faculty Sponsor: Uchila Umesh

Primary College/Unit: Business
Category Marketing
Campus: Pullman

Abstract:

Late payment by customers is one of the primary causes of business financial distress and failure (Wilson 2008). Some sales organizations impose responsibilities of late payment collection on their salespeople. However, whether salespeople should engage in late payment collection remains controversial among industry insiders. The current research is the first to introduce salespeople's obligation in late-paying accounts to the literature. We address the controversy by examining the adverse impacts of holding salespeople responsible for late-paying accounts.

First, findings from a qualitative study of 20 in-depth interviews identified four different approaches sales organizations use to hold their salespeople responsible for late-paying accounts: no responsibility, collection only, compensation on paid accounts, and full responsibility. Further, in a second study, we collected data from 304 business-to-business salespeople from multiple firms and industries to examine the influence of holding salespeople responsible for late-paying accounts on salespeople's engagement in customer-directed deviance. The results showed that salespeople were more likely to engage in customer-directed deviance when being held responsible for late-paying accounts regardless of which approach was used. We found that this relationship had a significant indirect effect via role clarity and job stress in sequential order.

The current research suggests how to minimize unethical behaviors by having sales organizations not hold salespeople responsible for late-paying accounts and, thus, minimizing customer-directed deviance. On the other hand, if holding salespeople responsible for late-paying accounts is inevitable (e.g., small businesses), sales organizations should prioritize increasing salespeople's role clarity to prevent increased job stress and customer-directed deviance.

Academic Showcase Participant
Board Placement: 200

Combing Satellite Images and Processes Based Agriculture Model for Estimating Field Scale Evapotranspiration and Irrigation Water Demand: Case Study over the Columbia Basin Project

Primary Author: Mingliang Liu
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Sunil Kadam
Fabio Scarpare
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Kirti Rajagopalan
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Faculty Sponsor:

Primary College/Unit: Engineering and Architecture
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Satellite based evapotranspiration (ET) estimation, such as METRIC (Mapping EvapoTranspiration at high Resolution with Internalized Calibration) and MODIS-ET, has been developed and applied widely in recent years. However, many challenges exist to meet the high-spatial and -temporal resolution needed for estimation of irrigation water demand, biomass gain, and crop yields for field-scale agricultural management. Process-based agricultural models have been used for many decades in assisting regional and point scale agricultural decision-making, thereby increasing our understanding of hydrologic and nutrient cycles within managed agricultural systems. However, process-based agricultural models require intensive work and data in initialization, parameterization, and evaluation for field-scale applications. In this study, we used canopy cover and fitted plant phenology stages (with logistic regression and Harmonic regression methods, or the raw data for alfalfa and grass hay crops) derived from high-spatial resolution satellite images to drive a simplified version of the CropSyst model customized for estimation of actual crop evapotranspiration and biomass gain (CropSyst-ET) under diverse irrigation technology. We also used the Google Earth Engine based METRIC-EEFlux data products with temporal interpolation to estimate ET and compared with CropSyst-ET estimations. The irrigation water demands estimated from CropSyst-ET were evaluated against survey data. Preliminary results indicate that satellite data assimilation can significantly improve CropSyst-ET simulations of plant growth and ET. In particularly, the application of real-time canopy cover for hay crops significantly improved the capability of CropSyst-ET for assisting with real-time irrigation water requirement and hay yields. As found in earlier studies, EEFlux normally overestimates ET during crop senescence, but agrees well with CropSyst-ET for the early and middle portions of the

growing season. In field-scale CropSyst-ET simulations, agricultural management (planting and harvest dates and irrigation scheduling) is conducted at whole field scale, but each pixel (30 meter by 30 meter) has its own specific growing curve and water requirements so that it can represent the spatial variability of ET within each field as needed for precision farming practices.

SHOWCASE

Academic Showcase Participant
Board Placement: 10

Survival and thermal resistance of Listeria monocytogenes in dry and hydrated milk powders during 180 days of storage.

Primary Author: Sonali LNU
Co-Author(s):

Faculty Sponsor: Minto Michael

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal topic: Listeria monocytogenes (LM) could survive in low water activity foods, such as milk powders, for prolonged periods if post-pasteurization contamination of milk occurs. Therefore, objective of this study was to determine the survivability and thermal resistance of LM in dry and hydrated nonfat dry milk (NFDM) and whole milk powder (WMP) during 180 days of ambient temperature storage.

Method: Milk powders were spray inoculated with a 3-strain LM cocktail and dried back to original pre-inoculation water activity to achieve ~7 log CFU/g. The D-values of LM in inoculated dry and hydrated NFDM and WMP were determined every 30 days. The D- and z-values were determined using thermal-death-time disks held in hot water baths for pre-determined time intervals at 70, 75 and 80˚C for milk powders, and at 54, 57 and 60˚C for hydrated milk powders.

Results/implications: LM population in milk powders decreased from 7.0 to 2.2 log CFU/g during the storage. The D70°C, D75˚C, and D80˚C of LM in NFDM at day 1 were 13.1, 6.0, and 4.0 min, respectively, and 12.0, 6.3, and 3.3 min, respectively, for WMP. Whereas, D70°C, D75°C, and D80°C of LM in NFDM at day 180 were 19.2, 10.4, and 3.8 min, respectively, and for WMP were 16.4, 9.1 and 5.2 min, respectively. The z-value of LM in milk powders stayed similar throughout the storage with overall z-values of 17.9°C. Data from this work could be employed for validating thermal processes of milk powders to ensure their microbiological safety.

Academic Showcase Participant
Board Placement: 144

Biobanking perspectives of AI/AN community members-a mixed methods study

Primary Author: Sara London
Co-Author(s):Ka'imi Sinclair
Dedra Buchwald

Faculty Sponsor:

Primary College/Unit: Other
Category Public health
Campus: Other

Abstract:

Biobanking- a gathering of biological information to improve health treatments and solve health disparities and diseases- is widely disputed within American Indian/Alaska Native (AI/AN) communities. Through surveys and deliberative discussions, this mixed-methods study explored the perspectives of AI/AN community members and health care workers toward Biobanking research and their willingness to participate. Six major themes were identified: There were six major themes identified from the focus groups. 1) The participants described their willingness to donate-some were more than willing to donate, some were not, and some would donate with specific conditions; 2) The participants described reasons as to why they feel mistrust related to biobanking research; 3) Cultural aspects surrounding donating biobanking specimens were also identified; 4) There were generational aspects participants described when it comes to benefitting future generations as well as how biobanking affects their families; 5) a prominent theme pertained to how settler colonialism affects biobanking research within Native communities; 6) lastly, the participants widely proclaimed there needs to be more education for the community regarding biobanking research and gathering specimens. This study has uncovered perspectives that could inform future research and inspire studies within other AI/AN communities to bring awareness to distinct cultural perspectives and access and awareness to Biobanking research to solve health disparities and benefit these communities. The researcher has analyzed the surveys and discussion transcripts and is working on finishing the manuscript with the data given. She intends to finish the manuscript by the end of March 2022.

Academic Showcase Participant
Board Placement: 105

Sleep Deprivation Alters Physiological Response to Repeated Stressors

Primary Author: Kirsie Lundholm
Co-Author(s):Steven M. James
Kimberly A. Honn
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Brieann C. Satterfield

Faculty Sponsor: Kimberly Honn

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Salivary α-amylase (sAA) is believed to reflect physiological responsiveness to stressors. Although exposure to stressors often co-occurs with sleep deprivation, little is known about their combined effects. We investigated sAA response following repeated exposure to acute stressors at well-rested baseline and during total sleep deprivation (TSD).
N=8 healthy subjects (ages 29.0±6.6; 4 females) participated in a laboratory-based study involving 38h TSD preceded and followed by 10h sleep opportunities. On days 2 (baseline) and 3 (TSD), subjects completed two simulation sessions in a high-fidelity shooting simulator with 30min rest between sessions. During each session, civilian subjects acted as police officers while viewing interactive videos depicting stressful law enforcement emergency response scenarios involving deadly-force decision-making. Subjects attempted to verbally de-escalate the situations. If unsuccessful, they determined if (simulated) deadly force was necessary and responded accordingly. Saliva samples were collected immediately before the first session of the baseline and TSD days, and immediately, 15min, and 30min after each session.
Samples were assayed in duplicate using a sAA kinetic enzyme assay. Results were normalized against the first pre-stressor sample of the baseline day and analyzed with mixed-effects ANOVA with fixed effects of day and sample and their interaction and a random intercept over subjects. There was a significant effect of sample ($F[5,76]=3.38$, $p=0.008$) indicating that sAA spiked immediately after each session. Planned comparisons revealed significantly blunted sAA during TSD compared to baseline immediately after the second session, suggesting that TSD mediates the biological response to repeated stressor exposure. Research supported by ONR N00014-13-1-0302.

GPSA Research Exposition Participant
Board Placement: 143

Reverse Timing of Insider Trading

Primary Author: Yun Ma
Co-Author(s):George Jiang
David Whidbee

Faculty Sponsor: George Jiang

Primary College/Unit: Business
Category Finance - Asset Pricing - Insider Trading
Campus: Pullman

Abstract:

Insiders are prohibited from trading on nonpublic material information. However, do insiders influence the timing and content of information disclosure to benefit their preplanned trades? We examine cumulative abnormal returns (CARs) around insider transactions and document a pattern suggesting that insiders appear to be “perfect” timers. That is, stock prices go up (go down) prior to but drop (back up) after insider sells (buys). To examine what drives the return patterns, we classify insider trades into preplanned and non-preplanned trades using Rule 10b5-1 and routine and opportunistic trades classified based on insider trading patterns. We show that the patterns in stock returns hold for both preplanned and non-preplanned trades and for both routine and opportunistic trades. Consistent with the hypothesis on the timing of information disclosure, we show that there are more frequent 8-K filings prior to insider trades than during normal time. While news coverage on insider trading, as expected, has a significant effect on stock prices, we find that analyst activities and news release by managers both contribute significantly to the return patterns around insider transactions.

Academic Showcase Participant
Board Placement: 137

Genotypic Variation in Sweet Cherry Cold Tolerance From Winter to Spring Bud Break

Primary Author: Jonathan Magby
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Dr. Matthew Whiting

Faculty Sponsor: Per McCord

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Other

Abstract:

One of the most influential environmental factors limiting crop production is low temperature stress leading to bud damage. Around half of the total value of insurance payments reported for crop loss (2010-2016) are due to cold injury. As a result of climate change, the frequency of frost events are increasing too. This is mainly due to abnormal warm spring temperatures leading to bud break, followed by low temperatures. Data was collected on thirty unique genotypes of sweet cherry to determine the range of susceptibility to cold stress, including variation across each season. Floral buds were collected from the start of fall through bud break in the spring. During winter, differential thermal analysis (DTA) was used to assess cold tolerance (as low temperature exotherms signal death) in dormant buds. After bud break, when DTA is no longer viable, an updated cooler pull method was utilized. Six of the thirty cultivars of sweet cherry exhibited high winter tolerance, while seven displayed high winter susceptibility. Winter tolerance was notably disconnected from spring tolerance, as seen by winter tolerant cultivars becoming spring susceptible, while the opposite was true for winter susceptible. This data assists growers in determining when to apply mitigation techniques and what cultivars to grow in orchards. In addition, cold tolerance data helps breeders provide long term solutions to cold protection, as it assists in cultivar selection to develop superior cultivars. Together the project provides both short and long term solutions to help maintain a sustainable food industry in Washington State.

GPSA Research Exposition Participant
Board Placement: 78

Media Polarization and Its Impact on American Politics

Primary Author: Michael Mahoney
Co-Author(s):Joseph Navelski
Kennedy Odongo

Faculty Sponsor: Salvador Ortigueira

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Over the last thirty years, political polarization his risen sparkly in the United State. Yet, it remains unclear the extent to which political polarization can be explained by changes in the American media environment. In this analysis, we quantify both political and media polarization using millions of lines of text data from political reporting and the proceedings of Congress. We utilize the estimator proposed in Gentzkow, Shapiro, and Taddy (2019) to construct an index representing the divergence in speech patterns between Fox News and CNN; we build a similar index to measure political polarization using speech data captured on the floor of Congress. We next use an Instrumental Variables approach to demonstrate that changes in media polarization precede changes in political polarization

Academic Showcase Participant
Board Placement: 194

Using Technology in the Classroom: Building Teachers' Self-Efficacy

Primary Author: Danielle Malone
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Judith Morrison
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Faculty Sponsor: Judith Morrison

Primary College/Unit: Education
Category Social Sciences
Campus: Tri-Cities

Abstract:

The focus of this research is to identify how educators describe their use of technology in the classroom and how comfortable they are integrating technology in their lessons. This study is the first step in determining what professional development educators need to successfully integrate technology into K-12 classrooms. The use of digital technologies in education is critical for students participating in an our increasingly technologically advanced economy and society. Students must learn problem-solving skills, technology concepts, develop geospatial thinking and reasoning (GTR) skills, and practice effective communication through learning activities centered on technological tools to be prepared to participate in STEM fields. This research seeks to answer the following questions: (1) How are teachers defining technology in their classrooms? (2) What are teachers' beliefs about technology and perceived readiness to utilize new technological tools for learning? The researchers administered a questionnaire to five secondary school teachers, focusing on the use of technology and transdisciplinary studies in the classroom. From this questionnaire, follow-up interviews were conducted as well as a geospatial technology survey (GS-TPACK). According to teacher interviews, most instructors utilize technology to present and disseminate information rather than instrumental in the learning process. Other interesting findings regarding the teachers' perceptions of new technologies and administrative support help further plan future PD sessions. The project aims to help instructors integrate technology as an essential component of the learning process and develop the skills required to prepare students to be successful citizens for the technological workforce.

Academic Showcase Participant
Board Placement: 36

Metabolic responses of potato to potato virus Y infection: Toward developing biomarkers for disease resistance

Primary Author: Richard Manasseh
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Faculty Sponsor: Hanu Pappu

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal topic
Worldwide, nearly half of the emerging plant disease epidemics have viral etiology. In potato (Solanum tuberosum L.), an important food crop in the world, several viral pathogens attack globally, with the most economically damaging being potato virus Y (PVY). At least nine biologically distinct variants of PVY are known to attack potato, with recombinant types named PVYNTN and PVYN-Wilga being the most recent addition to the list. In susceptible cultivars, these recombinants induce tuber necrosis. So far, studies of the molecular host-virus interactions underlying PVY pathogenicity have focused primarily on the analysis of host gene expression. Far less is known about the metabolic responses, which often correlate poorly with gene expression but directly mediate phenotypic outcomes of infection.

Method
In this study, we used gas chromatography in tandem with mass spectrometry (GC-MS) to investigate the metabolic response of potato to infection with PVYNTN and PVYN-Wilga, and their parental strain PVYO.

Results/implications
Using a combination of univariate and multivariate methods, we uncovered sets of common and unique differentially expressed metabolites (DEMs) responding to these three strains of PVY. Under PVYNTN, 21 DEMs were obtained. Among them, 15 matched the DEM set obtained for PVY-O. In the resistant cultivar, this overlap was more between PVYN-Wilga and PVY-O, where the 16 DEMs obtained for PVY-O matched the 21 DEMs obtained for PVYN-Wilga. Several DEMs that occurred across the three PVY strains were also found in both cultivars. DEMs can be considered potential targets for engineering strain-specific as well as broad-spectrum resistance against PVY.

GPSA Research Exposition Participant
Board Placement: 129

Mechanics and durability of concrete-shotcrete interface bonds

Primary Author: Ayumi Manawadu
Co-Author(s):

Faculty Sponsor: Haifang Wen

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Repair and strengthening of concrete structures have become more critical with the aging of existing infrastructure and the rising reconstruction costs. A popular and economical method to extend the structures' service life is to place a bonded shotcrete (high velocity sprayed concrete) overlay on the concrete substrate. However, the mechanical property mismatch between the two layers makes the substrate-to-overlay interface the weakest link in the composite system. Hence, the performance of repaired concrete structures depends on the quality of this interface bond. Nevertheless, the conventional test methods fail to ensure failure at a specific location and often measure the strength near the bond rather than at the bond interface.
As a solution, a compact fracture-based test method has been developed to measure the Mode-II fracture toughness (resistance to propagation of flaws) at the bond interface for different concrete-shotcrete specimens. The results have been compared with traditional tests. Numerical and experimental investigations indicate that the bond strength varies with the test method and substrate surface preparation techniques. Furthermore, in some cases, the fracture toughness could be relatively lower in specimen categories with higher bond strengths, indicating the importance of fracture-based tests to identify any premature bond failure. Ongoing research evaluates the sensitivity of fracture toughness of concrete-shotcrete interface bonds subjected to long-term freezing-thawing cyclic weather, compared to the sensitivity of shear and tensile bond strengths. The proposed method can successfully capture the behavior of concrete-to-shotcrete interface bonds and could be used to evaluate cementitious bonded concrete repairs of civil infrastructure.

Academic Showcase Participant
Board Placement: 139

Understanding the function of the Chlamydia trachomatis GreA ortholog

Primary Author: Cameron Mandel
Co-Author(s):Hong Yang
Anders Omsland

Faculty Sponsor: Anders Omsland

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Chlamydia trachomatis is a leading cause of infectious blindness (serovars A-C), and the most prevalent venereal bacterial pathogen in the United States (serovars D-L). Upon infection, C. trachomatis invades mucosal epithelial cells and replicates intracellularly via an asynchronous biphasic developmental cycle consisting of a vegetative, non-infectious Reticulate Body (RB) and an infectious, non-replicative Elementary Body (EB). Genetic determinants of C. trachomatis morphological transitions are poorly defined, but likely include genes encoding proteins involved in sensing nutrients required for replication. In Escherichia coli, guanosine pentaphosphate ((p)ppGpp) allosterically modulates RNA polymerase in conjunction with the transcription elongation factor GreA to mediate nutrient related stress. C. trachomatis does not encode orthologous genes responsible for (p)ppGpp synthesis but does encode greA (greACt) as an apparent orphan regulator of unknown function. Ectopic overexpression of GreACt results in a 98% reduction in C. trachomatis infectivity when compared to non-induced control cultures. This decrease in infectivity occurs without a significant reduction in enumerated genomes, suggesting that bacterial replication is unaffected by GreACt overexpression. This disconnect between replication and infectivity may be explained by GreACt mediated disruption of asynchronous transitions from the non-infectious RB to the infectious EB. TEM micrographs of inclusions affected by ectopic overexpression of GreACt show primarily RBs compared to a mixed population of EBs and RBs in control cultures. In addition, native expression of greACt was identified via transcriptional fusion constructs linking native greACt promoters to GFPLVA. These findings are consistent with a regulatory role for GreACt in the C. trachomatis developmental cycle.

Academic Showcase Participant
Board Placement: 161

Characterization of the Anaplasma phagocytophilum Type IV Secreted Protein HGE1_2492

Primary Author: Brittany Martin
Co-Author(s):

Faculty Sponsor: Kelly Brayton

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

The bacterium Anaplasma phagocytophilum is the second most prevalent tick-borne pathogen in North America and is the causative agent of anaplasmosis. A. phagocytophilum is an obligate intracellular pathogen of the order Rickettsiales. A central virulence mechanism of all Rickettsiales is the Type IV Secretion System (T4SS), which is essential for establishing infection within host cells. T4SS translocated effectors have been identified and examined in the context of mammalian cells but the molecular interactions and targets of T4SS effectors within tick cells is entirely unknown. Machine learning programs have predicted an A. phagocytophilum effector, HGE1_2492, which we confirmed to be T4SS translocatable by Legionella pneumophila in a CyaA reporter assay. Our transcriptional analyses of HGE1_2492 found it is expressed specifically during tick cell infection. We found HGE1_2492 is essential for growth within tick cells but dispensable for growth within mammalian cells. The mutation of HGE1_2492 did not affect A. phagocytophilum burden within mice, but HGE1_2492 is necessary for bacterial acquisition by the tick from a blood meal. Ectopically expressed GFP tagged HGE1_2492 localizes to host cell actin filaments where it accumulates tyrosine phosphorylation and alters actin cytoskeleton morphology. Through domain mapping of HGE1_2492, we found that the N-terminus associates with host cell membrane, the central region is responsible for tyrosine phosphorylation, and the C-terminus localizes to actin filaments. Our research presented here identifies the first Rickettsial T4SS effector specific to tick cell infection.

Academic Showcase Participant
Board Placement: 83

Sustainable aviation fuel: challenges to include environmental and social benefits in supply chain configurations

Primary Author: Lina Martinez
Co-Author(s):

Faculty Sponsor: Michael Wolcott

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

The efficient configuration of supply chains is a current challenge for deploying sustainable aviation fuel (SAF), a key element of the decarbonization of the aviation industry. Despite advances in the modeling of biorefinery location siting, transportation network design, and co-products use, current supply chains and business models for renewable fuel production do not result in costs that are competitive with fossil fuels. Various elements for process efficiency enhancement, risk mitigation, total cost reduction, and profit maximization have been studied in supply chain design. In this work, we study the conceptual components needed for the design and analysis of supply chains. We emphasize the impact that monetization of environmental and social services could have on the overall viability of SAF production. The current state of the supply chain configuration of SAF is compared with other supply chain and value-chain strategies, mainly: (1) lean, used for staple commodities, (2) agile, intended for innovative products and services, (3) green, meant to reduce the environmental impacts, and (4) risk-adverse, used to minimize supply risk disruptions. A summary of models and simulation approaches used to synthesize and solve supply chain problems is included. Our review highlights the uniqueness of the supply chain for SAF and proposes ways to enrich the existing approach with methods used by other industries. The SAF business model could be improved by including ecosystem and social services to generate additional revenue. New strategies accounting for the dynamic interactions between the components of the supply chain of SAF, including services, are needed.

Academic Showcase Participant
Board Placement: 96

Ambiguous Traces: Pan Pacific Ensemble

Primary Author: Keri McCarthy
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Martin King
Shannon Scott
Michael Garza

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

Building upon its established body of work, the Pan Pacific Ensemble has recorded and is releasing its third album, Ambiguous Traces, to audiences nationwide. This group, comprised of four WSU faculty members and the former principal bassoonist of the Guangzhou Symphony Orchestra (China), has been collecting, commissioning, recording, and performing works by artists from Asia and the Americas since 2016, and received strong reviews and awards for its first two albums, Feng and ironhorses.
Ambiguous Traces, was recorded in January 2020, and features music commissioned by the Pan Pacific Ensemble (with generous support from the 2017 Arts and Humanities Fellowship and 2017 New Faculty Seed Grant) from internationally-recognized composers, including Narong Prangchareon (Thailand), and Kenji Bunch (United States), as well as Chen Yi (China-United States), Kee Yong Chong (Malaysia/Singapore), Austin Yip (Hong Kong), and WSU Professor Emeritus of Music, David Jarvis (United States). Works on Ambiguous Traces honor Chinese and Thai traditional musics (Chen and Prangchareon), describe the disconnect between modernity and nature (Yip), and facilitate cross-arts synthesis though the musical depictions of murals in Miami's famed Wynwood Art District (Jarvis).
The Pan Pacific Ensemble was selected from a competitive list of American performing ensembles to be featured in Chamber Music America's Showcase concert series at the January 2022 CMA conference. The group performed virtually for an appreciative audience of concert promoters and professional musicians. This summer the ensemble performs at the International Double Reed Society (Boulder, CO) and the National Flute Association (Chicago, IL), to stimulate other wind quintets to familiarize themselves with the musical languages of Asia, and propagate performances of the repertoire that the Pan Pacific Ensemble champions.

Academic Showcase Participant
Board Placement: 66

Enhancement of paper-based microfluidic devices with cationic isotachophoresis (ITP)

Primary Author: Devon McCornack
Co-Author(s):Wenji Dong

Faculty Sponsor: WenJi Dong

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Liquid biopsy is the collection of body fluid samples to test for relevant biomarkers to inform patient management and is considered to be the holy grail for disease management. Liquid biopsies have the potential to revolutionize personalized medicine and change the healthcare industry by providing a non-invasive, precise, real-time, and cost effective method for disease management. The challenge faced with implementing liquid biopsy for malicious diseases such as cancer stems from the rarity of disease derived targets in the sample; making up less than 1% of the total volume of the liquid draw. Current technology limitations necessitate complicated and costly procedures that require significant hands-on time to draw actionable conclusions from the small percentage of the draw. As such, there is a significant need to develop cost effective strategies for liquid biopsy testing at the point of care. Traditionally, paper-based substrates have been used to construct diagnostic devices thanks to their ease of use and robustness, the reason credited for their high level of commercial success. However, the complex samples with low analyte concentrations require significant sample extraction and preconcentration techniques, which are not well suited for paper-based analytical devices. To remedy this, we describe a method to integrate an electrokinetic extraction and concentration technique called isotachophoresis (ITP) that is compatible with traditional lateral flow assays to improve its limit of detection. Additionally, we demonstrate the feasibility of using immunobinding techniques to alter target electrophoretic mobility to favor cationic ITP, further enhancing the device sensitivity.

Academic Showcase Participant
Board Placement: 82

The application of permanent magnets for controlling the morphology of polyaniline

Primary Author: William McLeod
Co-Author(s):

Faculty Sponsor: Jeffrey Bell

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal topic

Supercapacitors are energy storage devices useful for their rapid charging and discharging but held back by poor total energy density. To increase the energy storage of supercapacitors, electrode conductivity and surface area are often increased. Polyaniline (PANI) is an electroactive polymer that is commonly used in supercapacitors for its high conductivity. It has also been shown that the application of a constant magnetic field can alter the morphology of electrodeposited polymers.

Method

In this work, we used a permanent magnet as a zero-energy-input method to control the morphology of PANI for the fabrication of electrodes with high capacitance for improved energy storage. The polymer was deposited onto a glassy carbon or platinum electrode using cyclic voltammetry (sweeping potential) or potentiostatic (constant potential) techniques, and the capacitance of the fabricated electrodes was measured by cyclic voltammetry.

Results/implications

When the polymer was deposited under potentiostatic conditions, no difference was found between electrodes fabricated under a magnetic field and those fabricated under no magnetic field. When the polymer was deposited using cyclic voltammetry, the application of a magnetic field improved the capacitance over electrodes fabricated under no magnetic field. This improvement increased under slower scan rates but decreased again at ultra-slow scan rates. With an optimized method, the application of a magnetic field increased the electrodes capacitance by more than 50% over the traditional method. This presents a method for the fabrication of higher energy density supercapacitors with no additional energy input.

Academic Showcase Participant
Board Placement: 14

Cultivating Educational Equity Through Podcasting: Co-Generative Grappling Toward New Questions and Uncertain Answers

Primary Author: Emma McMain
Co-Author(s):Sequoia Dance-Leighton
Brandon Edwards-Schuth

Faculty Sponsor: Zoe Higheagle Strong

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

As critical scholar-activists, we frequently contend with questions such as, “How can our research and teaching foster socio-ecological equity and disrupt systemic injustices? Can we dismantle injustices within the same institutions that were built to perpetuate them? Who do we assume will provide answers, and who remains unheard?” From our positionalities as an Indigenous woman, white woman, and white man in doctoral programs, we seek to explore questions of transformative education in a way that does not privilege answers over questions, linear arguments over rhizomatic imaginings, or ownership of knowledge over relationships with knowledge. We advocate for podcasting as a means of critical inquiry toward such explorations.

By turning to podcasting as a medium for discussing critical topics in education, we provide insights for educational stakeholders while illuminating an underacknowledged method of public pedagogy. Podcasting opens new spaces for the collaborative, messy, and meandering conversation that is desperately needed in educational inquiry. In the summer of 2021, we recorded a podcast on the theme of cultivating equitable education systems in the 21st-century. From our transcription of this podcast, we analyzed two key threads: 1) the importance of not only bringing new practices “into education” but also bringing education “into communities,” and 2) considering whether “how can we promote equitable education?” is even the best or most critical question to be asking. Rather than following each thread to its “end,” we leave them open to future weaving with new voices from those in and outside of traditional academic spaces.

Academic Showcase Participant
Board Placement: 51

Primary Author: Tracy Morgan
Co-Author(s):Nancy Derringer
Christine King
Melinda McCormick
Vicki Leach
Catherine Glen

Faculty Sponsor:

Primary College/Unit: Other
Category
Campus:

Abstract:

Academic Showcase Participant
Board Placement: 4

Performance on a Computerized Threat Elimination Task in an Animated Environment during Total Sleep Deprivation

Primary Author: Emily Moslener
Co-Author(s):Kimberly Honn

Faculty Sponsor: Kimberly Honn

Primary College/Unit: Other
Category Social Sciences
Campus: Spokane

Abstract:

Military and law enforcement operators must make split-second decisions on whether to shoot during confrontations. Quick responses are crucial when force is necessary, but accurate decision-making is also imperative. Often, decisions are made while fatigued, which could impair speed and/or accuracy. Furthermore, the reliability of background information may impact performance.

N=86 adults completed a custom computerized shooting task after 32h or 8h of wakefulness (total sleep deprivation (TSD) and control groups). Participants were to shoot enemy robots and not shoot friendly robots that were revealed inside shipping crates. The introduction described which crates contained enemies, but the intel's accuracy varied across four phases: 100%, 80%, 20%, then irrelevant in a new environment. Reaction time (RT) and accuracy (hits and false alarms (FAs)) were analyzed using 2x4 mixed-effects ANOVAs to determine the effects of condition, phase, and their interaction.

There was a significant effect of phase on RT ($p<0.001$); participants reacted faster in phase 1 than all other phases. There were significant effects of condition on hits ($p<0.001$) and FAs ($p=0.004$); TSD had fewer hits and more FAs than the control group. There was an effect of phase on hits ($p=0.045$), with fewer hits in phase 1, and a condition-phase interaction ($p=0.026$) showing that the TSD group experienced less improvement in hits.

In both groups, the RT slowing from phase 1 to subsequent phases suggests that participants initially used the intel to facilitate quicker decision-making but disregarded it once it was not completely reliable. Research supported by CDMRP W81XWH-16-1-0319 and W81XWH-20-1-0442.

Academic Showcase Participant
Board Placement: 17

Is the Timing of the Endogenous Circadian Rhythm of Neurobehavioral Functioning Inherently Task-Dependent?

Primary Author: Rachael Muck
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Kimberly Honn
Hans Van Dongen

Faculty Sponsor: Kimberly Honn

Primary College/Unit: Spokane
Category Social Sciences
Campus: Spokane

Abstract:

Time-dependent changes in waking neurobehavioral functioning (NF) are governed by biological, sleep/wake homeostatic and circadian processes. However, the optimal circadian timing for NF may be task-dependent. We investigated this using simulated shift work schedules followed by a 24h waking period under constant conditions ("constant routine") in order to expose the endogenous circadian rhythm in NF.

N=13 healthy adults (ages 25.5±3.2y; 9 men) completed a 7-day/6-night in-laboratory study. Subjects were randomized to a 3-day simulated day shift condition (n=7, awake 06:00–22:00) or night shift condition (n=6, awake 18:00–10:00), followed by a 24h constant routine (CR) protocol when they stayed awake under constant behavioral and environmental conditions. During the CR, blood was collected to measure melatonin, a marker of biological night; and subjects completed three distinct NF assessments at 2h intervals: Karolinska Sleepiness Scale (KSS), Digit Symbol Substitution Test (DSST), and Psychomotor Vigilance Test (PVT).

After the night shift condition with a 12h shift in sleep timing, there was a modest, 1.4±0.8h delay in melatonin onset ($F[1,11]=3.68$, $p=0.082$), resulting in a net 10.6h alignment shift of the sleep/wake homeostatic process relative to the circadian process. Regardless of prior shift condition, however, the peak of the circadian rhythm effect on NF occurred 16.8±1.0h (KSS), 15.9±1.4h (DSST), and 18.6±1.0h (PVT) after melatonin onset, which was not significantly different between NF tasks ($F[2,9]=1.45$, $p=0.28$). This finding does not support the idea of inherent task-dependent differences in the timing of the endogenous circadian rhythm's influence on NF. Research supported by CDMRP W81XWH-16-1-0319 and W81XWH-20-1-0442.

Academic Showcase Participant
Board Placement: 22

Collisions and scattering in ultracold atomic clouds

Primary Author: Annesh Mukhopadhyay
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Faculty Sponsor: Peter Engels

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

This project combines experimental and theoretical techniques to investigate the quantum mechanical scattering between two particles. When a cloud of atoms is cooled to ultracold temperatures, the atoms start behaving like waves and, under appropriate conditions, can form a new state of matter known as a Bose-Einstein condensate (BEC). The matter wave behavior is described by quantum mechanics and can directly be imaged in our experiments by applying modern laser cooling and trapping techniques. The images reveal interesting scattering spheres and halos when a fraction of the atoms in a BEC is accelerated by applying a brief laser pulse. As an outcome of these experiments and the comparison with theoretical models, it is observed that the scattering spheres indicate a multiple scattering cascade, instead of single scattering events. This can lead to counter-intuitive backward scattering and presents a proving ground for advanced theoretical models. The significance of this work lies in the fact that it provides a powerful way to visualize and study quantum scattering, which is an elementary process in many physical processes. In conclusion, this study adds to the development of efficient scattering models by extending the formalism to include multiple scattering events in the context of a BEC experiment.

This work is supported by NSF under grants PHY-1912540 and PHY-2110158.

Academic Showcase Participant
Board Placement: 87

Three Feet Deep: Abiotic and Biotic Drivers of Organic and Mineral Soil Carbon Cycling

Primary Author: Katherine Naasko
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Faculty Sponsor: Haiying Tao

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Arid calcareous soil profiles are often classified as marginal and unsuitable for food crops. However, they are promising for growth of hardy perennial grasses as forage and bioenergy feedstock crops. They also present an opportunity to understand microbial and plant interactions with mineral and organic carbon (C) pools with high soil pH and calcium carbonate horizons just a few feet deep. In surface soils, soil organic C (SOC) cycling is regulated by soil pH, moisture, and plant cover. Deep soil profiles are characterized by resource gradients of nutrients and mobile plant and microbial residues. This study focuses on the influence of soil moisture and plant cover on multi-omic, microbial, and chemical indicators of C cycling at different depths through a calcareous soil profile. We hypothesized these soils would have a lower microbial diversity and complexity compared to more fertile soils and thus allow us to pinpoint specific interactions with the microbial community that are key for C sequestration. We analyzed soils from our tall wheatgrass (Thinopyrum ponticum) irrigation experiment located in the Columbia Basin of Washington state from the drip irrigated plots and adjacent non-irrigated bare soil. We tested our hypotheses using a multi-omics approach to determine the composition and diversity of the soil microbiome, and the metabolome, lipidome, and proteome from 0 to 1 m depth into the soil profile, and how these relate to soil moisture and C chemistry. Our study illustrates that calcareous, marginal soils hold the potential for storage of select forms of C.

GPSA Research Exposition Participant
Board Placement: 149

The Differential Impact of Body- versus Self-Referent Food-Related Branding on Consumers' Health Perceptions

Primary Author: Deepika Naidu
Co-Author(s):Andrew Perkins
Elizabeth Howlett

Faculty Sponsor: Andrew Perkins

Primary College/Unit: Business
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Principal topic:

Body-referent marketing is becoming more prevalent in the marketplace; however, extant research has yet to explore how body-referent marketing influences consumer perceptions. The current research investigates a specific type of body-referent marketing – body-referent food-related branding (BFB) – in which marketers use marketing appeals that focus on the consumer's corporeal body to make their food and food-related products appear healthier.

Method:

Two experimental studies were conducted to study the effects of BFB (versus self-referent branding (SFB) and control branding) on consumers' health perceptions using two different food-related products: a cookbook and grape juice. Participants were recruited to participate in this online study. Analysis of variance and PROCESS were used to test how BFB influences consumers' health perceptions.

Results/Implications:
The results of these studies suggest that BFB leads consumers to perceive food-related products to be healthier than both SFB and control branding. Furthermore, self-esteem plays a key role in these results: consumers high in self-esteem were most likely to perceive BFB products to be healthier.
Given that previous research has found that health perceptions influence consumers' food choice and consumption quantity decisions, it is important for consumers, marketing managers, and policymakers to understand the impact that BFB practices have on consumers' health perceptions. Moreover, these findings shine light on the ways in which seemingly small marketing choices can influence both consumer perceptions and well-being. Additional behavioral studies will be run to better understand how BFB influences food choice, consumption quantity, and consumer health and well-being.

GPSA Research Exposition Participant
Board Placement: 75

Methods in Analyzing Consumer Acceptance and Social Interactions Using Social Media Data: An Application to the Topic of Genome Editing in Domestic Livestock

Primary Author: Joseph Navelski
Co-Author(s):Jill McCluskey

Faculty Sponsor: Jill McCluskey

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Given a particular topic of interest, I estimate the sentiment, ideology and social influence in a representative population of social media users using the text, social network structure and demographic information for each user. I use different machine learning techniques to estimate sentiment, a latent variable spatial following MCMC model to uncover ideology, and an information driven social learning model to derive social influence. I present the theoretical foundation for each estimation process, and then apply each method to a representative sample of Twitter users that have an interest in genome editing in domestic livestock. The derived estimates are then used in a theoretical Industrial Organization (IO) economic model to show how sentiment, ideology and social influence change equilibrium predictions. Results show that the quantity consumed and price of genome edited products decreases as social influence (advocacy) increases, while the quantity consumed and price of non-genome edited products has an opposing effect. Policy makers should adopt these methods to better understand how sentiment, ideology and social influence in social media impact economic equilibrium.

Academic Showcase Participant
Board Placement: 107

Measuring Graduate Students' Attitudes Toward Evidence-Based Practice: A Confirmatory Factor Analysis of the EBPAS-36

Primary Author: Jordan Newburg
Co-Author(s):

Faculty Sponsor: Brittany Cooper

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Principal Topic
Practitioners' attitude toward evidence-based practice (EBP) is important when promoting EBPs (Damschroder et al., 2009). Practitioners with more positive attitudes toward and less misunderstandings about EBP are more likely to implement them (Becker et al., 2013). This study explores the structure and utility of the Evidence-Based Practice Attitude Scale-36 (EBPAS-36; Rye et al., 2017) with a sample of doctoral psychology students (i.e., future practitioners).
Methods
Students in a doctoral psychology program (N = 226) completed measures for another study, including a measure of misunderstanding about EBP and the EBPAS-36. The aims of this analysis were to: 1) determine if the original structure of the EBPAS-36 was acceptable in this sample, and 2) explore the predictive utility of the EBPAS-36 by examining associations between its subscales and misunderstanding about EBP.
Results/Implications
A confirmatory factor analysis of the EBPAS-36 was conducted in Mplus v.8.6 using MLR estimation. The test of the model was significant, $\chi2(528) = 772.92$, $p < .001$, but relative fit values indicated acceptable fit, RMSEA = 0.05, SRMR = 0.06. Next, a standard regression was conducted; averages on the Divergence, $\beta = -0.11$, $p = .047$, Limitations, $\beta = -0.62$, $p < .001$, and Job Security, $\beta = -0.21$, $p = .001$, subscales were significant predictors of less misunderstanding about EBP, $F(12, 200) = 23.71$, $p < .001$, $R = .77$. Overall, the EBPAS-36 appears to be an acceptable measure of doctoral students' attitudes toward EBP and implementation science should take advantage of its utility.

Academic Showcase Participant
Board Placement: 127

Covid Narrative Collection

Primary Author: Melissa Nicolas
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Liberal Arts & Humanities
Campus: Pullman

Abstract:

The Covid Narrative Collection (CNC) is an open-access digital archive of personal narratives about living through the COVID-19 pandemic. Oral history projects, such as the United States Holocaust Memorial Museum Holocaust survivors' stories and the archive of enslaved peoples' oral histories housed by the Library of Congress, serve a vital function as they preserve the first-hand accounts of the people who lived through an experience. Like these well-known oral history projects, the CNC will capture personal accounts of lived experience, and, at the same time, the CNC will enable people to share their experience as it is happening, before time and distance add layers to memory. As a living archive, it will be possible to continue adding to it as we recover from the pandemic, perhaps even adding reflections from initial participants at the 1-year, 5-year, 10-year marks and so on.

The COVID Narrative Collection has three objectives:
1. to collect personal stories in situ in order to preserve, for posterity, the lived reality of this historic moment
2. to create an open-access living repository that scholars, students, researchers, and the broader public can both contribute to and utilize for their own purposes (professional or personal).
3. to engage in public scholarship that connects WSU to its local communities

The CNC website is 75% done. Stories will begin being collected in late February 2022.

Academic Showcase Participant
Board Placement: 116

Learning about buildings from older adults: A qualitative study

Primary Author: Shelby Nicole Ruiz
Co-Author(s):Julia Day
Nany Swanger

Faculty Sponsor:

Primary College/Unit: Engineering and Architecture
Category Social Sciences
Campus: Pullman

Abstract:

Life has changed significantly since the silent and baby boomer generations were born. Due to advances and automation in building controls, people today and younger generations use buildings differently; people formerly relied on passive or adaptive comfort strategies to manage interior environments: e.g., opening windows, changing clothing, and using their physical building interfaces to improve their spaces – these simple behaviors to maintain comfort, increase well-being, and save energy are becoming a lost art. To learn from these generations, such as how they lived in buildings, strategies they used to make themselves more comfortable, as well as how buildings have changed to automate the occupant out of the equation, the ID+CL worked with WSU's Granger Cobb Institute of Senior Living to conduct a scholarly study in nine senior living communities in western Washington in July and August of 2021. This pilot study implemented qualitative and narrative methods through interviews and observations of older adults in buildings (homes and senior living facilities) to better understand how the passing of time has changed their relationship with and their interactions within the built environment. Data collected documents firsthand experiences on topics such as thermal and visual comfort, interface usability, indoor air quality (IAQ), design of their environments, and safety in their homes. This qualitative approach has garnered meaningful stories, lessons learned, habits, lifestyle changes, and more, that will inform future senior living developments and occupant training in the communities. Final steps of this project include reporting and further qualitative trend analysis.

Academic Showcase Participant
Board Placement: 89

Measurement of a Goldstone Energy Spectrum in a Bose-Einstein Condensate

Primary Author: Md Kamrul Hoque Ome
Co-Author(s):Annesh Mukhopadhyay
Sean Mossman
Peter Engels

Faculty Sponsor: Peter Engels

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

The topic of this research is the investigation of Goldstone excitations in a dilute-gas Bose-Einstein condensate (BEC). A BEC is a state of matter that can form when a cloud of atoms is cooled down to a temperature near absolute zero. BECs are versatile testbeds for investigating exotic atomic phenomena. By placing BECs in carefully engineered laser fields, we experimentally realize a periodic structure in which the possible energies of the atoms are given by a so-called Goldstone energy spectrum. In our experiments, we directly measure these energies and characterize how they depend on various parameters. Our results agree with computer simulations of the related theory. This provides experimental evidence for fundamental processes of nature and enhances our understanding of the atomic world.

We begin our experiment by preparing BECs in a focused laser trap using advanced laser cooling and atom trapping technologies. Then we apply additional lasers to create conditions leading to the emergence of a Goldstone spectrum. By suddenly changing the frequency of one of the lasers, we excite the atoms to higher energy levels. During the process, we record the system's response to determine the energy spectrum.

The observed energy spectrum is the first direct experimental signature of the Goldstone energy spectrum in the context of BECs. This work demonstrates the use of ultracold atoms to find answers to profound and open questions about fundamental physics. It will also guide the development of future quantum technologies.

GPSA Research Exposition Participant
Board Placement: 103

Self-constructed concept map and peer feedback

Primary Author: Oluwasola Oni
Co-Author(s):Olusola Adesope

Faculty Sponsor: Olusola Adesope

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

Concept mapping remains widely used in education. However, studies have shown that lack of guidance in the concept mapping process may lead to negative effects of learning and perception for students with low prior knowledge. To contribute to the ongoing debate on effectiveness of peer feedback and concept mapping, we investigated the effects of peer feedback on concept mapping and how it improves students' learning performance in a large introductory chemistry course.
The following research questions were considered: (1) What is the effect of self-constructed concept maps with peer feedback and student prior GPA on chemistry learning performance? (2) How do student perceptions of helpfulness, prior knowledge, and achievement (GPA) predict student chemistry learning outcome? Three hundred and twenty students were randomly assigned to one of two concept mapping conditions: self-constructed concept map with peer feedback and self-constructed concept map without peer feedback.
Overall, our findings provide promising evidence that self-constructed concept maps with peer feedback were found to be superior to self-constructed concept maps without peer feedback and found higher prior GPA students outperformed students with low prior GPA in learning performance. Prior GPA and prior knowledge were found to be significant predictors of student learning performance. Educators may consider using peer feedback-based concept mapping as one of the tools to achieve higher student performance and provide more support or guidance for students when using an entirely learner-generated concept map.

Academic Showcase Participant
Board Placement: 7

The neuronal GPCR NPR-8 regulates the integrity of C. elegans genome in response to pathogen infection

Primary Author: Sankara Naynar Palani
Co-Author(s):Durai Sellegounder
Yiyong Liu

Faculty Sponsor: Yiyong Liu

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

DNA replication and repair are two crucial biological processes that maintain genomic integrity and the health of cells, as deficient DNA replication and repair cause cellular dysfunction or cell death. However, very little is known about how these processes are regulated in response to pathogen infection. We have previously shown that NPR-8, a neuronal G protein-coupled receptor, functions in amphid sensory neurons to regulate Caenorhabditis elegans defense against Pseudomonas aeruginosa infection by controlling collagen expression and the dynamics of cuticle structure. In the current study, we analyzed P. aeruginosa infection-triggered proteome profiles of wild-type and npr-8 mutant animals [npr-8(ok1439) null animals] using a mass spectrometry-based quantitative proteomics approach. Gene Ontology (GO) analysis revealed enhanced survival-exhibiting npr-8 mutants downregulated DNA replication and DNA repair-related proteins five of which function in DNA double-strand repair. Transcriptional silencing of DNA repair gene expression and X-ray-induced DNA damage assays revealed that P. aeruginosa-infected npr-8 (ok1439) animals possess higher DNA double-strand break repair activity than infected wild-type control animals, indicating that NPR-8 suppresses DNA repair activity in wild-type animals in response to infection. How DNA replication activity is affected by the npr-8 mutation and P. aeruginosa infection as well as whether DNA replication and repair are regulated by the NPR-8-expressing amphid sensory neurons are currently under investigation. Our study suggests that DNA replication and repair processes could be modulated by the nervous system during extrinsic stress such as infection and irradiation.

SHOWCASE

Academic Showcase Participant
Board Placement: 13

Neural regulation of the longevity response to warm temperature is mediated by the transcription factor FKH-7 in Caenorhabditis elegans

Primary Author: Sankara Naynar Palani
Co-Author(s):Yiyong Liu

Faculty Sponsor: Yiyong Liu

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Our previous studies have demonstrated that NPR-8, a neuronal G protein-coupled receptor, functions in amphid sensory neurons to regulate Caenorhabditis elegans defense against Pseudomonas aeruginosa infection as well as lifespan at 25°C by controlling collagen genes expression and the dynamics of cuticle structure. In this study, we aim to understand the molecular mechanisms behind the regulation of collagen genes expression by NPR-8 and how the differential expression of collagen genes regulates the organismal lifespan. RNA-seq and transcriptional silencing assays of collagens genes showed that NPR-8 modulates the expression of rol-1, and col-77 to control organismal lifespan at 25°C. Further, transcription factors functioning downstream of the NPR-8 signaling pathway were screened by RNA interference gene silencing assays, and fkh-7 was found to be essential to the temperature-induced longevity phenotype of npr-8 animals. Our study indicates that NPR-8-expressing chemosensory neurons regulate the aging process through the FKH-7 transcription factor. FKH-7 transcribing longevity genes and their molecular interactions with collagens are under investigation.

GPSA Research Exposition Participant
Board Placement: 111

Riding the Microtubule Array: Protein Interactions that Regulate Phragmoplast Dynamics

Primary Author: Alyssa Parish
Co-Author(s):Andrei Smertenko

Faculty Sponsor: Andrei Smertenko

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Cell division is essential for reproduction and development for all organisms. However, there are fundamental differences between plant and animal cell division. One major difference occurs at the end of cell division, cytokinesis, when a unique cellular machine called the phragmoplast orchestrates the formation of a partition called the cell plate which separates the daughter cells. Yet, most proteins reported to associate with the phragmoplast are highly conserved in animals. We hypothesize there must be plant-specific proteins involved in phragmoplast function and regulation, but few reported plant-specific proteins are known to be involved in the phragmoplast. The phragmoplast structure is composed of cellular proteins that form tube-like shapes called microtubules. Cell plate components move along phragmoplast microtubules to the center of the phragmoplastF where cell plate formation occurs. Phragmoplast microtubule function is essential for cell plate formation. Thus, all processes inside the phragmoplast are under tight control by the cell. I will present my research on regulatory mechanisms of MACET4, a plant-specific protein involved in phragmoplast microtubule activity. I have identified 5 proteins that interact with MACET4. These interactors were identified using 2 types of protein pull-down assays and liquid chromatography tandem mass spectrometry, then verified using bi-molecular fluorescence complementation. To study MACET4 regulation by phosphorylation, I have designed MACET4 phospho-mutants and analyzed their impact on microtubule dynamics. Understanding protein-protein interactions and protein regulation of phragmoplast microtubules will provide a more detailed look into the cellular processes that are unique to plant cell division.

SHOWCASE

Academic Showcase Participant
Board Placement: 102

Early Performance Deficit in Bi-transgenic Rat Model of Alzheimer's Disease Suggests Prodromal Phenotype.

Primary Author: Nickolas Pasetto
Co-Author(s):Christopher J. Davis
Daniel O. Harvey
Michelle A. Schmidt

Faculty Sponsor:

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

The Vibration- and Lux-Actuating Search Tasks (VAST and LAST, respectively) are novel open-field spatial navigation tasks that employ graded floor vibrations or ambient light intensities as a function of the proximity of a rodent to an unmarked target destination. Because these tasks are rapidly learned and have high trial success rates, we hypothesized that they would be efficient behavioral assays to accentuate cognitive deficits in rodent models of neurodegenerative disease. We tested this hypothesis by comparing performance of wild-type rats (Fisher-344) with transgenic rats (TgF344-AD) that overexpress amyloid precursor protein (responsible for beta-amyloid plaques) and presenilin-1 (responsible for neurofibrillary tangles), both upregulated in Alzheimer's disease.

VAST and LAST training consisted of 5 sessions on consecutive days with 9 trials/session. VAST and LAST outcome measures included: percent failure (%), distance traveled (cm), time to target(s), speed(m/s), and time still(<5cm/s).

While LAST results were not statistically significant on any variables, two-way ANOVAs (session and genotype) indicate that distance traveled in the VAST was shorter in wild-type (GENOTYPE: $F(1,12)=6.50$, $p=0.025$) compared to transgenic rats. Moreover, trends in percent failure (INTERACTION: $F(4,48)=2.21$, $p=0.082$), time still (SESSION: $F(4,48)=2.46$, $p=0.058$) and perhaps time to target (GENOTYPE: $F(1,12)=2.60$, $p=0.133$) were also observed. Pairwise comparisons suggest increased VAST failures on session 4 ($p=0.045$) and 5 ($p=0.007$), longer session 5 path distances ($p= 0.083$) and times to target ($p=0.020$) in transgenic rats compared to wild-types.

These data show VAST performance decrements in Alzheimer's rats younger than three months old, several months prior to the detection of neuropathologies.

GPSA Research Exposition Participant
Board Placement: 101

Influences of soils on the development and survival of juvenile Culex pipiens complex mosquitoes

Primary Author: Kellen Pautzke
Co-Author(s):

Faculty Sponsor: Jeb Owen

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principal topic
Mosquitoes belonging to the Culex pipiens complex (Diptera: Culicidae) are the principal vectors of West Nile Virus in the United States. Understanding the ways in which the environment influences the success and dispersal of these mosquitoes is key to controlling and preventing further spread of the pathogens they transmit.

Method
The juvenile stages of Cx. pipiens mosquitoes are aquatic, often taking place in temporary pools of water in the ground formed by rainfall or flooding. This study explored the influence and limitations of various soils on water quality and juvenile mosquito survival. Soils were collected locally and chosen based on soil texture – an indicator of particle size and therefore soil chemical and biotic characteristics. Larvae were reared in water infused with soil to replicate ephemeral pool conditions, with increasing amounts of soil substrate in the various treatments. Development and survival rates were monitored every day through the juvenile life cycle, and any surviving adults were measured for size.

Results/implications
There is strong evidence that differences in soils result in significant differences in larval mosquito survival. While there are many proposed aspects of the environment that play a role in the distribution and success of mosquitoes, the biotic and abiotic features of soils have previously been underexplored. With further research, we may apply the influence of soil to better understand the effects of microclimates on mosquito success and expand our current predictions of mosquito and pathogen spread, aiding in our abilities of control and prevention.

Academic Showcase Participant
Board Placement: 32

Measuring Evapotranspiration Suppression from the Wind Drift and Spray Water Losses for LESA and MESA Sprinklers in a Center Pivot Irrigation System

Primary Author: R. Troy Peters
Co-Author(s):R. Troy Peters

Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Wind drift and evaporation loss (WDEL) of mid-elevation spray application (MESA) and low elevation spray application (LESA) sprinklers on a center pivot and linear-move irrigation machines are measured and reported to be about 20% and 3%, respectively. It is important to measure the fraction of WDEL that is the actual water loss separate from the fraction that cools and humidifies the microclimate causing evapotranspiration (ET) suppression. This experiment was conducted in 2018 and 2019 in a spearmint field near Toppenish, WA. The field was irrigated with an 8-span center pivot equipped with MESA but had three spans that were converted to LESA. All-in-one weather sensors were installed just above the crop canopy in the middle of each MESA and LESA span to record meteorological parameters at 1-minute intervals. The ASCE standardized reference equations were used to calculate grass reference evapotranspiration (ET0). In addition, a small unmanned aerial system (UAS) was used to capture 5-band multispectral and thermal infrared images while the center pivot irrigation system was irrigating the field. This imagery data were used to estimate crop evapotranspiration (ETc) using a UAS-METRIC energy balance model. The UAS-METRIC model showed that the estimated ETc under MESA was suppressed by 0.16 mm/day compared to the LESA. The results of ET by ASCE standard method showed the ET0 rate under MESA was suppressed between 8% to 18% compared to the LESA. The total amount of estimated suppressed ET of MESA was less than 0.5% of the total applied water.

GPSA Research Exposition Participant
Board Placement: 202

New approaches for improving sweet cherry breeding efficiency

Primary Author: Rainier Peters
Co-Author(s):

Faculty Sponsor: Per McCord

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Other

Abstract:

The sweet cherry breeding program(CBP) at Washington State University has been a source of improved genotypes for growers across the country. Famous cultivars created in the CBP are: Rainier, Benton and ChelanTM. Within the CBP it is challenging to generate a large amount of seed from the bi-parental crosses. This research addresses two issues that reduce seed yield in the program; poor fruit set from hand pollinations and poor seed set in early-maturing genotypes. We investigated the potential for plant growth regulators (AVG, 1-MCP, NAA, AVG 1-MCP combination) involved in ethylene sensing and production to improve fruit set when applied pre-emasculation. Each treatment was applied in the field to approximately 155 blossoms for 5 independent crosses (755 blossoms/treatment). The AVG 1-MCP combination treatment improved fruit set by 14% over the untreated control. In Spring 2022, we will continue to evaluate the effect of ethylene-disturbing plant growth regulators on more genotypes and further investigate the effect of emasculation and the roll of ethylene in this. In another trial, we evaluated the potential for embryo rescue to increase seedling number from crosses between early-maturing genotypes. This work compared different agar-based media constituents and the role of hormones in the media on embryo survival, seedlings from 14 crosses participated in this experiment. The average survival rate was 54% with the best media demonstrating a survival rate of 64%. Overall, these results show the potential to improve fruit set and sweet cherry breeding efficiency.

Academic Showcase Participant
Board Placement: 98

Assessing Nitrogen Deposition in Mountainous Regions

Primary Author: Meaghan Petix
Co-Author(s):

Faculty Sponsor: R. Dave Evans

Primary College/Unit: Arts and Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Principal topic

Anthropogenic nitrogen (N) deposition (Ndep) contributes globally to disruptions in nutrient cycling and ecosystem functioning. Public lands, including North Cascades National Park (NOCA), contain ecosystems that are potentially sensitive to Ndep. Accurate Ndep measurements are needed to determine N critical loads, levels of Ndep that can be sustained without adverse biological effects. However, model estimates have a high degree of uncertainty, especially in mountainous regions. The N concentration of epiphytic (tree-dwelling) lichens can be utilized as a bioindicator of Ndep because their tissue N is pulled from atmospheric sources and their N stable isotope composition (δ15N) can assess contributions of different N pollution sources.

Method

My research is utilizing epiphytic lichens to advance our understanding of patterns of Ndep across NOCA, determine the extent to which ecosystems are being affected by Ndep, and identify predominant N pollution sources. We established 30 plots across NOCA to determine lichen N content and δ15N.

Results/implications

Lichen N content indicated low, background levels of Ndep across NOCA. δ15N was very negative, suggesting that reduced-N forms, derived from agricultural sources, may be a large component of Ndep in this region. Results will be incorporated with atmospheric chemistry models in a GIS framework to develop a powerful approach to evaluate N critical load exceedance in the park. Ultimately the goal is for air regulators to utilize N critical loads to develop strategies and policies to reduce N emissions, resulting in the long-term health of ecosystems on public lands for the benefit of future generations.

GPSA Research Exposition Participant
Board Placement: 97

Spatiotemporal Impact Assessment of Hurricanes on Electric Power Systems

Primary Author: Abodh Poudyal
Co-Author(s):

Faculty Sponsor: Anamika Dubey

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal topic:
Hurricanes are the primary cause of extensive damages in the electric power systems resulting in widespread customer outages and expensive recovery. After landfall, hurricanes travel inland and affect the electric power grid in both space and time (spatiotemporal) dimensions. The impact of any hurricane depends on the location of its landfall and the space covered by the hurricane at each time. Thus, it is essential to plan against such extreme events so that resources can be utilized effectively to enhance the resilience of the power system. In this work, we aim to develop a probabilistic impact assessment framework to model and quantify the spatiotemporal impacts of hurricanes on the electric power grid.

Method:
The variations in hurricane trajectory and wind speed are modeled using historical data from past events in the US. The impacts of individual power systems components are evaluated using fragility curves typically obtained using historical outage data. Finally, the system losses are modeled using a loss metric quantifying the total electrical power disconnected due to the impact of the hurricane as it travels inland. The simulation is performed on the 2000-bus synthetic Texas grid mapped on the geographical footprint of Texas.

Results/Implications:
The simulation results show that the loss increases significantly for a few time steps when the hurricane's wind field is intense and saturates gradually when the hurricane's intensity decays while traversing further inland. The proposed analysis can provide some insights for proactive planning methods on improving the resilience of the power grid.

GPSA Research Exposition Participant
Board Placement: 12

Biodegradation of Low Temperature Dissolved Pyrogenic Organic Matter

Primary Author: Saraf Islam Promi
Co-Author(s):Amanda Hohner

Faculty Sponsor: Amanda Hohner

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal Topic

Fires produce pyrogenic organic matter (PyOM) that is mobilized from the landscape to downstream water bodies with rainfall as particulate and dissolved PyOM (dPyOM). dPyOM composition primarily consists of dissolved black carbon and dissolved black nitrogen (DBN), which vary with combustion temperature. The biodegradation potential of organic matter affects nutrient cycling and aquatic ecosystem function.

Method

We hypothesize low-temperature dPyOM is bioavailable due to its composition. This study compared the biodegradation of unburned dissolved organic matter (DOM) and low-temperature (250°C) dPyOM leachates. DOM and dPyOM samples were inoculated with river water containing bacteria, compared to sterile controls, and the dissolved organic carbon (DOC) and nitrogen (DON) concentrations were monitored.

Results/Implications

A greater decrease in DOC was observed for dPyOM samples. After five weeks of incubation, DOC decreased 56% for dPyOM and 38% for DOM samples inoculated with bacteria. This greater decrease in DOC may be explained by a higher proportion of microbially available oxygen-rich aliphatics in dPyOM than DOM. DON decreased 33% for dPyOM and 10.5% for DOM after the first week, suggesting, DBN present in dPyOM is more biodegradable due to the microbially available heteroaromatic pyrrole type DBN structure. For control samples, DOC decreased 53% for dPyOM and 23% for DOM samples after five weeks, while after the first week, DON decreased 30% for dPyOM and 50% for DOM samples, indicating degradation by bacteria present in the soils. Overall, results suggest low-temperature dPyOM is more biodegradable than DOM, which has implications for biogeochemical cycling in fire-impacted watersheds.

Academic Showcase Participant
Board Placement: 46

Climate change implications and management options for sunburn risk in apples.

Primary Author: Matthew Pruett
Co-Author(s):Kirti Rajagopalan
Lee Kalcits
Lav Khot
Troy Peters
Lailang Cheng

Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Climate change will affect multiple aspects of the U.S. agricultural production – e.g., crop yield and quality, irrigation demands, weeds, pests, and diseases. One unquantified aspect is the effect of warmer temperatures on tree fruit crops, especially sunburn risk – a major source of fruit loss. Taking high-value apple production regions in the U.S., and two popular apple varieties with varying sunburn susceptibility as a case study, our goal is to (a) quantify the impact of climate change on sunburn risk and (b) evaluate potential adaptation strategies to manage this risk. Sunburn is typically managed via evaporative cooling of canopy and fruits, covering the crop with overhead nets, and applying protectant sprays. Increased sunburn risk can result in an increased water footprint exacerbating water scarcity issues. Therefore, we explore whether netting can continue to alleviate sunburn risk without an associated water footprint. We drive an energy-balance based apple fruit-surface temperature model with historical data (1950-2006) and future climate projections (17 General Circulation Models under two different representative concentration pathways, 2007-2099) under no netting and two netting scenarios. While netting does reduce exposure to damaging fruit surface temperatures, it is unable to completely mitigate risk even in the near-future and supplemental evaporative cooling and other management tools will be critical. Our results will allow growers to understand changing risk patterns, plan for future investments, allow creation of ideotypes for breeding programs, and contribute to building a U.S. agricultural enterprise that is resilient to climate change.

Academic Showcase Participant
Board Placement: 124

Assessing fitness cost in Penicillium expansum isolates with resistance to multiple fungicides

Primary Author: Jonathan Puglisi
Co-Author(s):Prashant Swamy
Achour Amiri

Faculty Sponsor: Achour Amiri

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Other

Abstract:

Blue mold (BM), primarily caused by Penicillium expansum, is the most important postharvest disease of apple and pear in the Pacific Northwest (PNW). BM is controlled through sanitation and application of postharvest fungicides. P. expansum has begun to show resistance to the three most common postharvest fungicides registered in the PNW: thiabendazole (TBZ), pyrimethanil (PYR), and fludioxonil (FDL). Whether evolution of fungicide resistance in P. expansum isolates alters saprophytic and pathogenic fitness and its impact on BM management remains unknown. Fitness costs in eight P. expansum isolates with different fungicide resistance phenotypes to TBZ, PYR, and FDL were evaluated in this study. Isolates were assessed in vitro at 20° and 1°C for spore germination, mycelial growth, sensitivity to reactive oxygen species and to osmotic stress, and resistance stability, while virulence was assessed on detached fruit at 1°C. Preliminary data from in vitro trials at 1°C showed reduced conidial germination in many dual- and triple fungicide-resistant isolates. Additionally, triple-resistant isolates showed susceptibility to osmotic stress. Preliminary fruit assay data indicates that resistant isolates can compete with sensitive isolates in cold storage. These findings suggest that while the evolution of fungicide resistance P. expansum isolates may result in some fitness penalties, the latter do not impact the ability of resistant isolates to compete with sensitive isolates in storage. Understanding fitness penalties present in resistant populations of P. expansum will help growers make informed decisions on fungicide application at harvest.

GPSA Research Exposition Participant
Board Placement: 138

The Onset of Proliferation in the Developing Spermatogenic Lineage

Primary Author: Mustika Rahmawati
Co-Author(s):

Faculty Sponsor: Nathan Law

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

An estimated 48 million couples suffer from infertility globally, with men contributing 50% of the overall cases. Infertility in men is frequently associated with damage at the molecular level of the germline. Hence, to better understand potential causes of male infertility, we must understand the mechanisms and dynamics of sperm production. The spermatogonial stem cell (SSC) pool is fundamental for continuous sperm production, and its maintenance is regulated by complex mechanisms that remain largely unknown. We aim to elucidate the molecular framework that regulates SSC self-renewal. Preliminary data in mouse models identified a distinct pattern of elevated expression of the transcription factor RUNX1 among neonatal SSCs during mitotic cell cycle progression. The interaction between RUNX1 and DNA is stabilized by the co-factor CBFβ. Studies suggest that CBFβ is indispensable for RUNX1 function. Thus, we utilized Cbfb conditional knockout (cKO) mice to begin exploring the functional role of RUNX1 in spermatogenesis. Preliminary analysis of Cbfb cKO testes indicated major disruption of spermatogenesis. Collectively, our findings suggest that RUNX1 serves a critical role in SSC self-renewal and proliferation. To functionally evaluate the role of RUNX1, we will utilize a Runx1 cKO approach in mice to investigate the proliferative role of RUNX1 in SSC self-renewal. Ultimately, this study will address knowledge gaps regarding the formation of the foundational SSC pool as it relates to idiopathic male infertility and provide critical insights for reconstructing sperm production in vitro, which is a promising new technology to treat male-factor infertility or assist in endangered species preservation.

GPSA Research Exposition Participant
Board Placement: 147

Tracing back the contaminant transport in river/stream using novel numerical method

Primary Author: Priyanka Rao
Co-Author(s):Valipuram Manoranjan

Faculty Sponsor: Valipuram Manoranjan

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Pollution of surface water bodies with various chemical and microbial contaminants due to human activities has been a major global threat to freshwater resources. Our goal is to understand the transport of contaminants in surface water to help with any remediation efforts. The question we pose is, if a contaminant is detected at certain location in a river stream, is it possible to trace backwards to identify the polluting source and possibly, the responsible parties? This is essentially solving a challenging inverse problem using mathematical and computational tools that reverse-engineers the diffusion, advection, and sorption processes of the contaminant.
Recovering the source of a contaminant plume from measurements of its current distribution is a challenging problem in hydrology. Contaminant transport is a dispersive and an irreversible process. So, modeling it with reversed time results in an ill-posed problem. Ill-posed problems are extremely sensitive to errors in data and so small errors in the measurement of the existing plume may result in a wrong plume history. Also, conventional computational methods applied to ill-posed problems fail due to instability. Our work tries to overcome these challenges by developing a two-step numerical method along with a mathematical transformation that addresses the issue of stability. The numerical method that we developed was able to trace back the contaminant source and showed promising results when implemented. One can conclude that the approach developed is an effective and useful computational tool in tracing back the plume history and can provide valuable information for remediation efforts.

Academic Showcase Participant
Board Placement: 39

Photoluminescence and Raman Mapping of β-Ga2O3

Primary Author: Cassi Remple
Co-Author(s):Jesse Huso
Matt McCluskey

Faculty Sponsor: Matt McCluskey

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal Topic
Semi-insulating single-crystal β-Ga2O3, is becoming increasingly used as a substrate for device fabrication in power electronics. Therefore, it is useful to characterize surface defects where other material will be deposited to fabricate these devices. Photoluminescence (PL) and Raman mapping are the two primary tools used in this work to understand surface contamination or defects.

Method
In this case, the material studied is single-crystal β-Ga2O3 doped with Fe, which makes it a semi-insulating material. Photoluminescence (PL) and Raman mapping were performed. Photoluminescence is the process by which a light source, or excitation, is focused onto a sample. This generates electron-hole pairs and can result in emitted light called photoluminescence. PL and Raman Spectra are collected spatially across a sample during mapping, and this provides insight into the various defects and chemical compositions across the sample surface.

Results/implications
β-Ga2O3:Fe contains Cr3+ which has well-known PL emission peaks at 690 nm and 696 nm. PL mapping of the 690 nm emission showed intensity bands due to impurity striations introduced during crystal growth. PL mapping also revealed surface defects showing broad emissions around 983 nm and 886 nm that were spatially localized, occurring at discrete spots across the sample surface. Raman mapping of 886 nm and 983 nm emission centers revealed results consistent with hydrocarbon compounds. Bright UV emission centers showed Raman peaks which are attributed to Si-CH3 groups that may originate from silica polishing compounds or annealing in a silica ampoule.

Academic Showcase Participant
Board Placement: 175

EXPERIMENTAL CHEMICAL CONTROLS FOR VARROA DESTRUCTOR IN APIS MELLIFERA

Primary Author: Emily Rendleman
Co-Author(s):Brandon Hopkins

Faculty Sponsor: Brandon Hopkins

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principal Topic
Pollination is an essential part of the global agricultural system, and in the current state of industrialized agriculture there is one pollinator that serves as a stanchion: the European honey bee, Apis mellifera. Despite their success, honey bee life is not always sweet. The globalization of the insect has led to a plethora of diseases and pest factors that beekeepers must now combat to effectively manage and retain their colonies. Honey bees are affected by four general classes of hazard known as the four “P’s”: poor nutrition, pesticides, pathogens, and parasites. The single greatest enemy of modern beekeepers is the parasitic mite Varroa destructor, which vectors viruses and can decimate healthy colonies in a matter of months. Beekeepers are constantly battling this pervasive parasite, and the problems are only exacerbated by the recent development of resistance to various acaricides. This study tested two experimental mite control applications against two industry standards to evaluate efficacy.
Method
48 colonies were subdivided into four treatment groups: two experimental treatments and two positive controls. Experimental treatments included an oxalic acid-glycerin strip and a novel amitraz strip, while the controls were amitraz and tau-fluvalinate. Strips were applied and mite fall was monitored using sticky cards. After 56 days, treatments were removed and chemical shocks were applied to kill remaining mites. Statistical analysis was performed using R Studio.
Results
Preliminary analysis indicates many findings of interest, including evidence of possible resistance to the industry-standard miticides and promising efficacy in the experimental oxalic acid strip.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 95

Investigating the activin receptor signaling pathway as a key regulator of muscle growth following whole genome duplication events.

Primary Author: Jasmine Richman
Co-Author(s):

Faculty Sponsor: Michael Phelps

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

The transforming growth factor beta (TGF-β) superfamily and within it, the activin receptor signaling pathway, is a key regulator of many biological processes in vertebrates. Its role in skeletal muscle growth is profound and yet it is not yet fully understood. Some members of this pathway, such as myostatin, have been well characterized as individual units. However, the interactions between activin receptor signaling pathway members, such as Activin A, remain uncharacterized in both mammals and fish. Additionally, the activin receptor signaling pathway in salmonids has been made more complex by two whole-genome duplication (WDG) events (Ts3R and Ss4R) resulting in two to four ohnologues (duplicated genes) for most of the genes in this pathway. To study the interactions in the activin receptor signaling pathway in the presence of these ohnologues, we utilized NanoString technology to quantify the expression of fifty-five genes across twenty-three adult tissues in rainbow trout (RBT). From this data, we were able to characterize potential relationships between genes for each tissue as well as to identify the ligands that are produced within skeletal muscle. We were also able to identify divergence of gene function and silencing among some ohnologues. Research is ongoing to confirm the function of Activin signaling in vivo, using gene-edited RBT. This study provides the first complete picture of the expression dynamics of the Activin receptor signaling pathway and thus is a significant initial step toward both understanding WDG duplication event's important role in evolution and using the pathway for biomedical and agricultural applications.

Academic Showcase Participant
Board Placement: 132

WEIGHT STATUS AND WELL-BEING IN ADOLESCENTS: THE ROLES OF BULLYING VICTIMIZATION AND BODY IMAGE

Primary Author: Sadie Ridgeway
Co-Author(s):

Faculty Sponsor: Monica Kirkpatrick Johnson

Primary College/Unit: Arts and Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Principal topic:
Research on adolescent weight and well-being is understudied and has yielded inconclusive results. Much research approaches this topic from a biomedical perspective, but social processes are of great importance and less investigated. Examining the role of key social mechanisms in the relationship between weight and well-being could help explain the inconsistent and inconclusive findings in past research.
Method:
The purpose of this study is to investigate the relationship between weight status and key indicators of well-being for adolescents (i.e., self-rated health, mental health, and life satisfaction), and test two social mechanisms that may explain these relationships: stigma enacted as bullying victimization and body image, representing the “outside” and “inside” views of the body respectively. These relationships were tested using the United States Health Behaviors in School-aged Children (HBSC) 2009/2010 data set (n=10,641) and quantitative statistical methods, specifically OLS and logistic regression.
Results/Implications:
Results demonstrated that higher weight status is associated with higher levels of bullying victimization and worse body image. As weight status and bullying victimization increase, well-being worsens. However, there is minimal evidence that bullying victimization explains the relationship between weight and well-being. In contrast, body image is an important mechanism in the relationship between weight status and the indicators of well-being. Body image partly, if not fully, accounts for the relationship between weight and well-being, demonstrating the importance of this social factor for adipose youth. Additionally, results showed that body image partially explains girls’ worse mental and self-rated health relative to boys.

Academic Showcase Participant
Board Placement: 168

The flipped classroom- pros and cons from a 300-level science class

Primary Author: Sian Ritchie
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Social Sciences
Campus: Pullman

Abstract:

During our online year I did not want to lecture to a sea of blank squares during zoom; I decided to flip the classroom. Because I had developed all the materials for this instructional style, and a majority of students reported liking it, I decided to do the same thing when we went back in-person in fall 21. Some students expressed really liking this method, it is trendy since it encourages active learning; but I want to determine if students really mastered the material any better. I am looking at exam results from this semester and comparing them with previous in person semesters when I used a more traditional style. I am also analyzing class evaluations from the different formats to find which aspects students found helpful / or not.

SHOWCASE

Academic Showcase Participant
Board Placement: 198

The Effects of a Mindfulness Program to Reduce Compassion Fatigue and Burnout Among Nurse and Certified Nurse Assistants: A Quality Improvement Project.

Primary Author: Teresa Robinson
Co-Author(s):Angela Hamel

Faculty Sponsor: Angela Hamel

Primary College/Unit: Nursing
Category Social Sciences
Campus: Tri-Cities

Abstract:

Purpose: Compassion fatigue (CF) and burnout (BO) among healthcare workers continue to increase. Current studies estimate between 50% to 70% of healthcare workers report CF and BO. The pandemic adds increased stress, pressure, and exposure that intensifies CF and BO. Current literature indicates that mindfulness practices can decrease CF and BO. The goal of the quality improvement (QI) project was to determine if the cost-effective approach of implementing a mindfulness program that would decrease CF and BO and increase compassion satisfaction (CS).

Methods/Approach: The Professional Quality of Life (ProQOL) evidence-based questionnaire was administered using a pre and post-program study design. Mindfulness practice habits were introduced to hospital nurses (RN) and certified nurse assistants (CNA) at daily safety huddles for 6 weeks. The pre and post ProQOL was analyzed to determine if the mindfulness program intervention decreased CF and BO and increased CS.

Results: Evaluation of pre and post scores in CF and BO “low” category showed an overall decrease by 24% and 46% respectively. Furthermore, CS scores in the “high” category showed an overall increase of 26%. Correspondingly, a comparison of pre and post average scores for both CF and BO decreased by 6 and 10 points respectively, whereas CF increased by 6 points.

Conclusion: RNs and CNAs experience CF and BO, especially during the pandemic. This project confirms mindfulness practice habits are effective in decreasing CF and BO, and increases CS. Healthcare organizations must address CF and BO and implementing a mindfulness program is a simple and cost-effective approach.

Academic Showcase Participant
Board Placement: 112

Patterns in Perceived Stigma Reported in a Mixed-Mode Survey of Behavioral Health Enrollees in Washington State

Primary Author: Felix Rodriguez
Co-Author(s):Rose Krebill-Prather
Danna Moore
Kent Miller

Faculty Sponsor:

Primary College/Unit: Communication
Category Social Sciences
Campus: Pullman

Abstract:

Individuals with behavioral health problems face negative stereotypes, potentially leading to feelings of being stigmatized. Measurement of self-perceived stigma in behavioral health surveys can be challenging because behavioral health issues are a sensitive topic and prone to socially desirable responses. This study seeks to answer three questions: (1) Does survey mode influence self-reports of stigma? (2) Does survey mode influence the reporting of stigma when other measures of enrollee well-being are considered? (3) Do differences in self-reports of stigma by survey mode influence client-reported outcomes of behavioral health services?

The study uses data from an annual statewide survey administered through a partnership between the Washington State Health Care Authority and Washington State University. Employing a mixed-mode design with telephone, web, and mail-in options, the 2019 survey collected responses from 1,878 randomly selected adults who received publicly funded behavioral health treatment services in Washington State.

Results reveal that perceived stigma is reported more often in self-administered questionnaires than in telephone interviews. When controlling for a person's well-being, the reporting of perceived stigma can still be affected by survey mode, i.e., whether a response is being provided to an interviewer or not. Client-reported psychosocial measures of behavioral health can be affected by survey mode and perceived stigma. Results offer a case for researchers and professionals to: (1) Factor in the role of survey mode in understanding perceived stigma; and (2) Devise strategies for addressing bias, satisficing, and reporting of sensitive issues in surveys.

GPSA Research Exposition Participant
Board Placement: 92

Grid Modernization: Distributed Optimization for Electric Power Distribution Systems

Primary Author: Rabayet Sadnan
Co-Author(s):

Faculty Sponsor: Anamika Dubey

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principle topic: Optimized operation of electric power system is essential for an economic and reliable supply of electricity. Traditional centralized-method, where a single computing agent is responsible for such optimal operations, has several limitations. Failure of that agent can jeopardize the whole operation. Also, the large size of power networks with thousands of variables causes added computational complexity. These led to the distributed computing paradigm; however, the existing distributed techniques are not viable for practical power systems. The primary drawback is the high number of required communication rounds among the distributed agents – typically in the order of 1000. Here, a novel distributed optimization method is proposed for the optimal operation of power systems that reduces the communication rounds by the order of 100 (~20 iterations instead of 1000). The algorithm will facilitate a computationally simpler method to study the future electric power grids with thousands of newly added technologies, required by the modern electric grids.
Method: Proposed method leverages the structure of the electric power distribution networks. Proper approximation of the networks reduces the optimization problem size for each distributed agent, and significantly reduces the complexity of the computations. Further, this approximation exploits the physics of power systems.
Result: The novel proposed method has been simulated for large IEEE test-systems. It requires less than 15 iterations to converge. While the state-of-the-art method requires almost 1000 iterations, which is computationally expensive and impractical for power systems. Besides the simulated results, we also analytically proved the guaranteed convergence of the proposed method.

GPSA Research Exposition Participant
Board Placement: 88

Detecting Stress using Sensor Data Collected from Patients Suffering from Alcohol Use Disorder

Primary Author: Ramesh Sah
Co-Author(s):

Faculty Sponsor: Hassan Ghasemzadeh

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Many physical and mental health problems escalate with the degree of stress. Stress is particularly effective in making livelihood worse in a population already suffering from health and addiction issues. One such population group is individuals suffering from Alcohol Use Disorder (AUD). We present a proof-of-concept study to discover how daily experiences of alcohol-addicted patients correspond with physiological biomarkers of stress. Our study included three components: 1) four times daily survey to measure self-reported emotions, cravings, and stress; 2) a wearable wristband to measure heart rate, skin conductance, skin temperature, and body movement; 3) qualitative interviews to assess participants experiences with the study. We aimed to evaluate the association between sensor data and stress in alcohol-dependent individuals. We found a significant correlation between statistical features computed from sensor data and the number of stressful events, positive and negative emotions, and pain and discomfort. Comparing different sensor modalities using machine learning and a greedy search algorithm showed skin conductance most indicative of stress.
Furthermore, we determined the optimal segment length for stressful events and trained a Convolutional Neural Network (CNN) for binary stress classification. The trained CNN model achieved an accuracy of 97% and an f1-score of 0.96 on the test data. Our results demonstrate that sensor data collected in real-life settings from alcohol-dependent individuals can be used to develop stress detection algorithms. We aim to use the trained stress detection models to develop tailored mobile health interventions to enhance sustained recovery from alcohol use disorder.

GPSA Research Exposition Participant
Board Placement: 123

An optimized pneumatic fixed spray system for efficient chemical applications in modern apple orchards

Primary Author: Ramesh Sahni
Co-Author(s):Rakesh Ranjan
Lav Khot
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Faculty Sponsor: Lav Khot

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Other

Abstract:

Commercial apple orchards in the Pacific Northwest are transitioning to high-density planting systems to increase orchard productivity. However, spray application equipment has not evolved to optimize application in these modern orchards, leading to off-target chemical losses. Fixed spray delivery system variants, including pneumatic-based solid set canopy delivery system (PSSCDS), have emerged for better spray efficiency in modern orchards. PSSCDS uses a series of reservoirs along the spray line to apply consistent application volume for better spray uniformity. Currently, PSSCDS uses numerous reservoirs (370 ml per reservoir, 1200 reservoirs per ha) which leads to high installation costs. Therefore, this study aimed to (i) reduce reservoirs required for PSSCDS and (ii) compare resulting spray and biological efficacy performance against a conventional airblast sprayer in a commercial modern apple orchard. Initially, reservoir size (370, 740, and 1110 ml) and placement interval (3, 6, and 9 m) along the spray lines were evaluated for spray uniformity and coverage. Results suggested that 740 ml reservoir with 6 m placement interval performed best in terms of spray uniformity and coverage. Furthermore, optimized PSSCDS had similar spray deposition, 10.2% lower coverage, 630% higher ground run-off, 76.3% lower ground drift and negligible aerial drift compared to airblast sprayer. Biological efficacy was then evaluated using leaf and fruit bioassay on oblique banded leaf roller (OBLR) and codling moth larva. Similar OBLR and codling moth larval mortality was observed on leaf and fruit bioassays for both the spray systems. Overall, PSSCDS could be used as a potential alternative to airblast sprayer.

Academic Showcase Participant
Board Placement: 104

The evolution of the Mt. Edgar Complex and Warrawoona greenstone belt – visualized with Hf and Nd isotopes; and U-Pb, Lu-Hf, and Sm-Nd geochronology

Primary Author: Ross Salerno
Co-Author(s):Jeff Vervoort
Chris Fisher
Nick Roberts
Tony Kemp

Faculty Sponsor: Jeff Vervoort

Primary College/Unit: Arts and Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

The origin and evolution of the earliest continental crust is recorded by the age and isotope composition of Earth's oldest rocks. These rocks, however, are complicated as they give conflicting accounts about crust-mantle evolution in the early Archean. The Hf isotope record is
broadly chondritic, suggesting limited differentiation of continental crust in the Archean. The Nd isotope record, however, is highly variable a suggests early differentiation of the continents. Moreover, the original histories of these rocks are overprinted by events since the Archean. To better address questions about how the earliest crust formed, we focus on the exceptionally well-preserved rocks in the East Pilbara Craton, of the Mt. Edgar Complex.

To understand the source of rocks in the Pilbara, our approach integrates Hf and Nd isotope compositions of WR and minerals with U-Pb geochronology. We show these rocks have agreeing U-Pb zircon and Sm-Nd isochron ages between 3.47 and 3.28 Ga. This demonstrates the U-Pb and Sm-Nd systems have not been modified since igneous crystallization. Further, these rocks all have agreeing chondritic initial Hf and Nd isotope compositions.

We suggest these rocks were derived from a source that was chondritic with respect to both Hf and Nd isotopes; indicating neither a strongly depleted mantle nor enriched crustal source in the Early Archean. Furthermore, the Lu-Hf and Sm-Nd isotope systems in the Pilbara samples are in full agreement. This stands in stark contrast to the of rocks from Eo-Paleoarchean terranes of where the Hf and Nd isotope compositions have been "decoupled".

GPSA Research Exposition Participant
Board Placement: 59

Structure/Function Analysis of Human Progranulin

Primary Author: Eduardo Sanchez Diaz
Co-Author(s):Dmitri Tolkatchev
Joshua Lockey

Faculty Sponsor: Alla Kostyukova

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Principal Topic
Progranulin, a secreted glycoprotein of 75-80 kDa containing 7.5 granulin modules (p,G,F,B,A,C,D and E), is encoded by the GRN gene. Mutations within the GRN gene have been linked to frontotemporal lobar degeneration (FTLD). FTLD is an early-onset dementia syndrome characterized by a progressive decline in behavior or language, associated with degeneration of the frontal and temporal lobes of the brain. So far, the molecular basis for neuroprotective properties of progranulin is not well understood. Progress in elucidating the specific functions of granulins is severely impeded by challenges in production of tractable amounts of granulins with well-defined structural characteristics and unique cysteine-cysteine pairing pattern.
Method
Our goal is to purify human granulins to study the cause for variation in granulin conformation and how to control it. We cloned, expressed and tested multiple redox conditions for refolding fragments A and F of human progranulin. To study refolding processes of the purified proteins, we used circular dichroism (CD).
Results/Implications
Using the developed purification conditions, we were able to increase the yield of tractable amounts of human granulin A and F. The purified fragments were refolded and their stabilities were analyzed using CD. This work will help characterize the structure/function relationships in human granulins.

GPSA Research Exposition Participant
Board Placement: 122

Pasture Productivity Assessment under Mob Grazing and Fertility Management using Satellite and UAS Imagery

Primary Author: Worasit Sangjan
Co-Author(s):Lynne Carpenter-Boggs
Tipton Hudson
Sindhuja Sankaran

Faculty Sponsor: Sindhuja Sankaran

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Pasture management approaches can determine the productivity, sustainability, and ecological balance of livestock production. Sensing techniques potentially provide methods to assess the performance of different grazing practices that are more labor and time efficient than traditional methods (e.g., soil, crop sampling). This study utilized high-resolution satellite and unmanned aerial system (UAS) imagery to evaluate vegetation characteristics of a pasture field location with two grazing densities (low and high, applied in years 2015–2019) and four fertility treatments (control, manure, mineral, and compost tea, applied annually in years 2015–2019). The pasture productivity was assessed through satellite imagery annually from years 2017 to 2019. The relation and variation within and between the years were evaluated using vegetation indices extracted from satellite and UAS imagery. The data from the two sensing systems (satellite and UAS) demonstrated that grazing density showed a significant effect ($p < 0.05$) on pasture crop status in 2019. Furthermore, the mean vegetation index data extracted from satellite and UAS imagery (2019) had a high correlation ($r \geq 0.78$, $p < 0.001$). These results show the potential of utilizing satellite and UAS imagery for crop productivity assessment applications in small to medium pasture research and management.

GPSA Research Exposition Participant
Board Placement: 69

Errors in temporal disaggregation of daily meteorological data lead to non-negligible biases in agroecosystem risk assessment.

Primary Author: Supriya Savalkar
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Bhupinderjeet Singh
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Kirti Rajagopalan

Faculty Sponsor: Kirti Rajagopalan

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Gridded meteorological datasets are a primary input for agroecosystem applications as they provide continuous spatial and temporal coverage, although at daily timesteps. Multiple agroecosystem applications require data at hourly timesteps necessitating temporal disaggregation with inaccuracies. How these inaccuracies propagate down to decision variables is important to know but unclear. We bridge this knowledge gap by quantifying disaggregation inaccuracies for temperature and solar radiation and how they propagate down as inaccuracies for apple sunburn risk and investigating methods to reduce inaccuracies. We aggregated hourly weather station data from the Washington State Agricultural Weather Network to daily values and subsequently disaggregated them using the methods commonly used with gridded products, and quantified inaccuracies. We ran a sunburn model with observed and disaggregated hourly data and compared sunburn risk. Results indicated that hotter days (daily T-max > 32°C) – with a higher chance of sunburn – were susceptible to higher disaggregation errors and resulted in overestimating annual sunburn risk by 7-100% depending on the location and year. The magnitude of overestimation in sunburn risk was non-negligible and potentially larger than other sources of uncertainty commonly reported in agroecosystem applications. We adjusted the shape of the disaggregation curve and achieved more than 50% reductions in inaccuracy. While we used apple sunburn modeling as a case study, it is possible that these errors manifest differently in cold season processes such as chill accumulation, or accumulative processes such as phenology assessment. An understanding of these differences in a breadth of contexts can advance bias adjustment in agroecosystems modeling.

Academic Showcase Participant
Board Placement: 182

Demographic Differences in Methamphetamine Urinalysis Results in Rural Opioid Treatment Practices

Primary Author: Alex Schmidt
Co-Author(s):Julie Hwang
Andre Miguel

Faculty Sponsor:

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Aim: We aimed to determine whether there were demographic and differences among people who had a positive urinalysis result for methamphetamine (MA) in rural locations providing opioid treatment practices.

Background: There is a higher rate of drug overdose deaths in rural areas compared to those living in metropolitan areas (CDC 2017). In order to decrease the number of deaths, it is important to understand the factors that lead people to use MA.

Methods: In collaboration with four Oregon Rehabilitation and Treatment Centers (ORTC) located in rural cities, we analyzed data of 553 individuals enrolled in treatment for substance use disorders. Demographics, opioid use disorder diagnoses, drug urinalyses, and mental disorder diagnoses were analyzed using Strata data software.

Results: Of the 553 individuals that participated, 90.2% of the sample were white (n=499). 55.3% were males (n=305) and 50.1% of participants (n=277) had positive MA urinalyses. Participants who had positive MA urinalysis results were more likely to have positive opiate urinalysis results and a mild opioid use disorder (OUD) diagnosis than moderate or severe OUD. Our data suggested that people who were unemployed were more likely to have positive urinalysis results for MA. Additionally, those that were considered homeless or who were facing legal trouble had a higher rate of positive MA urinalyses results.

Conclusions: By understanding the profile differences among individuals with positive MA results, we can begin to improve intervention and treatment plans to better fit the needs of rural populations.

Academic Showcase Participant
Board Placement: 57

Understanding the Response of Enzyme Kinetics in a Plant Adapted to the Extreme High Temperatures of Death Valley

Primary Author: Haley Schrader
Co-Author(s):Robert DiMario
Asaph Cousins

Faculty Sponsor: Asaph Cousins

Primary College/Unit: Arts and Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principal Topic:
The inhibition of photosynthesis at high temperatures often limits crop yield. This limitation will become more relevant as temperatures increase with global climate change. To increase crop resilience to changing temperature and ensure food security under future climate conditions it is important to determine how key steps of photosynthesis have adapted to extreme temperatures. To address this, my research investigates the plant Tidestromia oblongifolia, which is native to the extreme desert environment of Death Valley, California. This plant has a uniquely high photosynthetic temperature optimum, and utilizes a photosynthetic system called the C4 pathway. The C4 pathway is initiated by the enzyme Phosphoenolpyruvate carboxylase (PEPC) fixing inorganic carbon and catalyzing the first irreversible step of photosynthesis.

Methods:
The hypothesis is that PEPC from T. oblongifolia is more stable at high temperatures compared to non-heat adapted C4 species. To test this hypothesis, the T. oblongifolia PEPC sequence was synthesized and expressed in PEPC-less Escherichia coli for enzyme purification. Kinetic properties of the T. oblongifolia PEPC were measured using membrane-inlet mass spectrometry (MIMS), which measures consumption of inorganic carbon, at 5°C increments between 25 and 50°C.

Results/Implications:
Preliminary measurements show at higher temperatures, the PEPC from T. oblongifolia has higher rates of PEPC activity compared to non-heat adapted C4 species. I am currently measuring the kinetic properties of this PEPC under varying temperatures to determine if this enzyme's thermal stability is key for optimizing C4 photosynthesis. This research has important implications for the sustainability and security of future food production.

Academic Showcase Participant
Board Placement: 94

Monitoring activity of domesticated solitary bees using remote sensing technologies

Primary Author: Mark Schrader
Co-Author(s):Doug Walsh
Lav Khot

Faculty Sponsor: Lav Khot

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Other

Abstract:

Alfalfa seed production in Washington State relies on a specialized pollinator known as alfalfa leaf cutter bee. A product has recently been registered to control a significant pest, Alfalfa Seed-Lygus Bug, with indirect impact on foraging activity of the bees. Unlike typical domesticated bee species, alfalfa leaf cutter bees are solitary, occupying individual holes in specially designed domiciles. These domiciles are typically 1.2 m tall × 2.4 m wide × 1.2 m deep, containing 3–4 columns of bee boards, with each board containing thousands of holes for bee occupancy. In comparison to traditional colony-style domiciles, the spatial freedom of alfalfa leaf cutter bee domiciles complicates the technological solutions needed for monitoring bee health. This study is aimed to evaluate the feasibility of an imaging (thermal infrared, RGB) and non-imaging (RFID tagging) based monitoring systems for tracking bee activity. Lab studies indicated that RFID technology would fail in the field conditions. Thus, a thermal-RGB imager was installed in an alfalfa bee domicile to monitor bee activity of 79 holes over the course of four days. Images were captured at one-minute interval to monitor optimal frequency of bee visitation. Individual bee temperatures were often too similar to distinguish from the background objects, invalidating use of thermal imaging for bee movement monitoring. However, for daylight hours, the RGB imaging (resolution: 1920 × 1080) was able to distinguish when the bees were present in the bee board. RGB image data is being further analyzed using a custom algorithm developed in MATLAB (version: R2021b).

Academic Showcase Participant
Board Placement: 73

Social Desirability Mediates Self-Reported Sleepiness during a Laboratory Total Sleep Deprivation Study

Primary Author: Jonah Scott
Co-Author(s):Rachael Muck
Hans Van Dongen
Kimberly Honn

Faculty Sponsor:

Primary College/Unit: Spokane
Category Social Sciences
Campus: Spokane

Abstract:

Total sleep deprivation (TSD) increases sleepiness and impairs vigilant attention. However, individuals' self-ratings of sleepiness often do not align with their objective performance impairment. Here we investigated whether the trait of social desirability – the desire to conform to social standards – plays a role.
N=39 healthy adults (ages 27.6±4.6y; 22 men) completed a 3-night/4-day in-laboratory study with10h baseline and recovery sleep opportunities (22:00–08:00) preceding and following 38h of TSD. Every 2–4h during TSD, subjects completed the Karolinska Sleepiness Scale (KSS) and Psychomotor Vigilance Test (PVT) to assess subjective sleepiness and vigilant attention. Prior to the study, subjects completed the Marlow-Crowne Social Desirability (MCSD) scale, which categorized them into average (n=13) and high (n=26) social desirability groups.
Mixed-effects ANOVA revealed main effects of time awake for KSS score ($F[12,441]=31.48$, $p<0.001$) and PVT lapses ($F[12,441]=16.27$, $p<0.001$), with sleepiness and lapses increasing during TSD as expected. We also found a main effect of MCSD group for KSS score ($F[1,441]=4.56$, $p=0.033$), with the high MCSD group reporting lower levels of sleepiness than the average MCSD group. There was no effect of MCSD group for PVT lapses ($p=0.93$) and no time awake by MCSD interaction for either KSS ($p=0.86$) or PVT ($p=0.99$). Subjects high in social desirability reported less sleepiness during TSD than those with average social desirability, yet their objective performance was no less impaired. This finding has implications for fatigue risk management, because individuals with high social desirability may underreport their sleepiness, which may impact one's ability to work safely.

Research supported by ONR N00014-13-1-0302 and PRMRP W81XWH-20-1-0442.

SHOWCASE

Academic Showcase Participant
Board Placement: 201

Developing standard reference libraries of Shiga toxin producing Escherichia coli, Listeria monocytogenes, Salmonella, and Staphylococcus aureus using an affordable custom assembled hyperspectral imaging system

Primary Author: Amninder Singh Sekhon
Co-Author(s):Phoebe Unger
Xiongzhi Chen
Minto Michael

Faculty Sponsor: Minto Michael

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Introduction: With increased reported incidences of foodborne diseases in recent past, there is a need for pathogen detection systems that are rapid and affordable. Hyperspectral imaging (HSI) is one such technique which amalgamates imaging and spectroscopy methods to capture both spatial and spectral features of bacterial cells.

Purpose: To obtain hyperspectral data of individual bacterial cells grown on selective agars using a custom assembled HSI system and to create reference libraries using environment for visualizing images (ENVI) software.

Methods: This study was designed as a randomized complete block design with six replications. Three strains of Listeria monocytogenes (LM), 4-strains of Escherichia coli O157: H7 (EC), big six non O157:H7 EC, 3-strains of Staphylococcus aureus (SA), and 10-serovars of Salmonella were used in this study. Freshly prepared strains or serovars of respective pathogens were streaked for isolation on respective selective media. A single colony of desired pathogen was selected and mixed in 1-ml of HPLC grade water and vortexed for 1-minute. Subsequently, using a sterile loop, slide preparation was performed, and then analyzed using HSI setup. Acquired images were imported into ENVI software and 3-regions of interest (ROI) were selected for each image. Hyperspectral data was imported into R-software for statistical analysis.

Results: Difference between scattering intensities of various bacteria were discernable at wavelength range of 500-700 and 850-950 nm. For future work, milk and milk powders will be inoculated with above-mentioned pathogens and hyperspectral data will be collected. Subsequently, reference libraries will be used to examine the classification accuracy of this system.

GPSA Research Exposition Participant
Board Placement: 55

Does stringency of enforcement lead to intra-firm pollution leakage or pollution decline?

Primary Author: Jui Sen
Co-Author(s):

Faculty Sponsor: Michael Brady

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Administrative & Information Systems
Campus: Pullman

Abstract:

The role of environmental regulations to reduce emissions is substantial. An estimation of the trade-off of emissions among the sister-plants within the multi-plant firms(s) is necessary to evaluate the net impact of environmental regulation. I examine the impact of a specific environmental regulation, i.e., High Priority Violation (HPV) to a compliant facility due to the violation of at least one of its sister facilities belonging to the same industrial classification. Utilizing Toxic Release Inventory data, I estimate changes in the emissions response of compliant manufacturing plants. Since the level of toxicity varies across different pollutants, I test the change in total weighted emissions of the compliant facility. I find that manufacturing compliant plants decrease total toxic weighted emissions by approximately 13 percent and Hazardous Air Pollution by approximately 13 to 28 percent if one of their sister facilities with the same 6-digit NAICS code is under HPV violation. I also find that the weighted water emissions of compliant manufacturing facilities go down by approximately 20 percent if one of their sister facilities with the same 6-digit NAICS code is currently under HPV violation. To the best of my knowledge, this is the first paper that estimates the influence of environmental regulation on compliant facilities' cross-media emissions. Perhaps, this is also the first paper that estimates the change in the firms' response to total weighted emissions. In my paper, I particularly focus on HPV. However, we can apply the same approach in other settings to test the effectiveness of different regulations.

Academic Showcase Participant
Board Placement: 54

Community-level changes in substance use-related outcomes in Washington State communities implementing the Community Prevention and Wellness Initiative

Primary Author: Gitanjali Shrestha
Co-Author(s):Elizabeth Weybright
Brittany Cooper

Faculty Sponsor: Brittany Cooper

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Introduction: The Community Prevention and Wellness Initiative (CPWI) is a strategic, data-informed community coalition model aimed at bringing together key stakeholders to reduce underage substance use and related risk factors among adolescents in high-need Washington State communities. The purpose of the community-level evaluation is to examine whether substance use-related outcomes have changed significantly from baseline to 2018 for 10th grade students in CPWI communities.

Method: We measured 18 alcohol-, tobacco-, cannabis-, and other drug-related outcomes (e.g., perceived risk from binge drinking). Our sample included students participating in the biennial Healthy Youth Survey from 63 CPWI communities. We used chi-square analysis to evaluate whether change from baseline to 2018 was statistically significant at p=<.10. We also calculated percent change to measure the magnitude of change. We evaluated outcomes for each community separately.

Results: A majority of substance use-related outcomes either decreased significantly or remained neutral (no significant change) in 94% of CPWI communities. The results were especially noteworthy for alcohol- and tobacco-related outcomes. Results for all four alcohol outcomes were positive or neutral for all but one community. For instance, 73% of communities showed significant reductions in heavy drinking by youth, while the results for the remaining communities were neutral. Similarly, 76% of communities showed significant reductions in youth access to cigarettes, while the results for remaining communities were neutral.

Conclusion: Community coalition approaches addressing substance use prevention are working well, especially when targeting high-need communities. Future work will focus on incorporating health equity lens in evaluation.

GPSA Research Exposition Participant
Board Placement: 52

The "Woke Model": The Pschychological Implication of Body Image Politics

Primary Author: Arpita Sinha
Co-Author(s):

Faculty Sponsor: Clare Wilkinson

Primary College/Unit: Arts and Sciences
Category Social Sciences
Campus: Pullman

Abstract:

Principal topic
Social media platforms, in the last few years, has increasingly made space for conversations regarding social awareness. These conversations follow a certain model of communication of being in sync with political correctness and feminist insights, and encompass a kind of social awareness that can be categorized as “woke.” I call this model of communication the “woke model.” One of its many concerns is the impact the fashion industry has on creating body image issues as fashion industries, especially fashion models, are often held accountable for setting unrealistic beauty standards. Here, by comparing two sets of ethnographic data collected on Indian female fashion models, I present a critique of the “woke model.” I investigate whether this wokeness is a performance which pushes models to live two different realities: one trying to achieve pre-existing beauty standards and the other resisting these standards online to project a “woke" self-image.
Method
The ethnographic data consists of two parts (in-person pre-pandemic and virtually during the pandemic): part one comprises interviews from my fieldwork in Kolkata, India conducted in 2019. The second part was completed virtually from Pullman, USA between August and October 2020 on the same research population.
Results/implications
By comparing these two sets of data and critiquing the “woke model,” I explore how psychological symptoms resulting from body image issues affect female fashion models. This study also suggests that it is crucial to be skeptical of industrial claims to diversity, inclusivity, and “wokeness” around the issue of beauty standards and body positivity.

Academic Showcase Participant
Board Placement: 184

Mantle Source Lithologies of the Columbia River Basalt Group: Insights into Magma Production During the Ramp-up Stage of a Flood Basalt Province

Primary Author: Evan Soderberg
Co-Author(s):John Wolff
Rachelle Hart

Faculty Sponsor: John Wolff

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Here, we focus on the earlier true basalts (Steens, Imnaha and Picture Gorge basalts) of the mid-Miocene Columbia River Basalt Group (CRBG), which erupted mostly before and some during (~17 to 15.9 Ma) the most productive period (Grande Ronde basaltic andesite) in the Flood basalt province's lifespan. Nickel, Fe/Mn ratios, and Tb/Yb ratios of basaltic lavas can vary depending on the mineral proportions (lithology) of the mantle from which they are produced. For the CRBG basalts, High-Ni lavas have high Fe/Mn and Tb/Yb which is systematic at the formation level, with some members as exceptions. We attribute the variations to different proportions of olivine:(pyroxene + garnet) in the mantle source. Analysis of olivine phenocrysts allows for more detailed examination of source variations for individual formations and flows, avoiding the muddying of whole rock compositions by crystal sorting. Olivine data exhibit the same Ni – Fe/Mn relationship that is observed in whole rock data. Olivine-Ni chemical evolution trends for Steens basalts require a pyroxenite source, whereas trends for the Picture Gorge lavas are consistent with a peridotite source. Olivine-Ni trends differ between the two chemical types that make up the Imnaha, with some overlap. Olivine-Ni trends in many individual Imnaha flows are distinct and diverge towards more Magnesium rich olivine compositions, suggesting that most Imnaha lavas record distinct mantle source compositions and therefore melting events. These trends observed in successive flows suggests that an integrated crustal magma system did not exist prior to maximum magma flux during Grande Ronde time.

Academic Showcase Participant
Board Placement: 206

Globally disseminating Salmonella Kentucky ST198 is metabolically more efficient than domestically prevalent ST52 lineage

Primary Author: Rachel Soltys
Co-Author(s):Jean Guard
Devendra Shah

Faculty Sponsor: Devendra Shah

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Salmonella Kentucky is an emerging foodborne pathogen comprised of two major genetic lineages, ST198 and ST152. ST152 is prevalent in US poultry and sporadically associated with human disease while ST198 is globally prevalent and commonly associated with human disease. We recently reported that these lineages can be distinguished by lineage-specific mutations. Here, we hypothesized that the lineage-specific mutations underlie metabolic phenotypes, contributing to the metabolic adaptation of ST198 strains to human hosts. The objective of this study was to identify lineage-specific metabolic differences between ST152 and ST198 and their potential link to differential nutritional virulence and/or host adaptation.

A total of 8 S. Kentucky strains (ST198 n=3; ST152 n=5) isolated from US poultry and human sources were tested using Phenotype Microarray to compare their respiratory activity (RA) in the presence of 192 carbon compounds as sole energy sources. The RA of ST198 strains was significantly higher in the presence of 18 (9.4%) out of 192 energy sources. These included 1,2-propanediol and m-inositol. The differential RA of ST198 for these two energy sources correlated with lineage-specific mutations in genes involved in their respective metabolic pathways.

Both 1,2-propanediol and m-inositol have been reported to play a role in Salmonella virulence and therefore may also play a role in increased virulence and/or host adaptation of ST198 strains in human host. These phenotypes may serve as an epidemiologic indicator for differential detection of ST198 and ST152 lineages, and potentially as targets for the development of therapeutics or prophylaxis to prevent S. Kentucky infection.

GPSA Research Exposition Participant
Board Placement: 48

Elucidation of Regulatory Response of Potato (Solanum tuberosum L.) to In-Season Heat Stress

Primary Author: Morgan Southern
Co-Author(s):

Faculty Sponsor: Jacob Blauer

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Potatoes (Solanum tuberosum L.) are a temperate, heat-sensitive crop that are particularly threatened by increased stress from abiotic factors such as heat. Due to climate change, both global and regional heat events are predicted to increase in intensity and frequency, causing significant decreases in potato production worldwide by the end of the century. The future of potato production is dependent on understanding the implications of climate change on potato physiology and for the potato industry's ability to adapt grower practices to the changing environment. Heat has been demonstrated to play a critical role in physiological aging (PAGE) of potato tubers with alterations in PAGE resulting in measurable phenotypic responses that directly impact quality, yield, and grower returns. Each season's expected spring warming patterns provide a window of opportunity for improved practices and crop performance. Altered planting times have the potential for practical responses to heat stress by understanding its modification of heat unit accumulation rate and intensity, oxidative stress, respiration rate, and the tuber size and yield distribution. Preliminary findings from the 2021 season show evidence that delayed planting times contribute to the PAGE of tubers through increased basal respiration rates. Similar changes have been demonstrated to impact the subsequent year's crop performance by altering the expected phenotype and associated grower returns. Continued understanding of heat stress as it relates to PAGE and planting timing, may provide growers with an opportunity to maximize returns and minimize waste while potentially increasing food security both domestically and internationally.

Academic Showcase Participant
Board Placement: 30

Implications of social support for perinatal people and healthy pregnancies in the setting of the COVID-19 pandemic.

Primary Author: Danielle Spellacy
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Other
Category Medical & Life Sciences
Campus: Vancouver

Abstract:

Principal topic: Studies have examined the impact of the COVID-19 pandemic on health outcomes of pregnancies; however, it remains unclear what changes associated with the pandemic resulted in these outcomes. This study explores socio-environmental experiences of perinatal people during COVID-19 and the interplay between these experiences and birth outcomes.
Method: Mothers in the U.S. who gave birth during the COVID-19 pandemic (N=105) completed a cross-sectional survey through the Qualtrics survey platform in July 2021 under IRB approval by Washington State University. Birth outcomes, stressors, and health/coping behaviors related to the pandemic were assessed using regression analysis.
Results/implications: Social support, controlling for demographic variables, significantly impacted participants' endorsement that COVID-19 impacted their perinatal care (p less than 0.05; OR equal to 0.75), as well as that their experience of having healthy changes during the pandemic (p less than 0.05; OR equal to 1.29). Social support was also negatively related to financial strain associated with COVID-19 (b equal to 0.379, p less than .05). Our findings highlight the importance of social support for pregnant people, allowing both for healthy practices and diminishing the potentially negative impacts of COVID-19, such as hindrance of perinatal medical care and financial strain. Future research should examine how varying levels of social support relate to health outcomes in pregnancy and how we can best support pregnant people socially.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 204

The Transcription Factor RUNX3 and its Downstream Networks in Germline Development and Differentiation

Primary Author: Kassie Stadler
Co-Author(s):

Faculty Sponsor: Nathan Law

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Spermatogenesis is a complex process where male germ cells undergo differentiation and meiotic division to develop sperm. The progression of spermatogenesis involves the regulation of thousands of genes; however, the transcription factors (TFs) that regulate these genes are largely unknown. Our recent studies suggest that runt-related transcription factors (RUNX) may be important for spermatogenesis, but their role in the germline has not been explored. RUNX proteins (RUNX1, RUNX2, and RUNX3) are key regulators of diverse developmental processes throughout the body. Core-binding factor β (CBFβ) is necessary for RUNX TFs to bind to DNA, and studies have shown that CBFβ is indispensable for RUNX TF function. In our preliminary studies, germline conditional knockout of Cbfβ resulted in complex disruption of spermatogenesis, including blocked differentiation and meiotic division. These results support the hypothesis that RUNX TFs are necessary for spermatogenesis. Further preliminary expression analysis indicated that among the three RUNX members, RUNX3 is upregulated in cells fated to differentiate during germline development. Using immunohistochemical staining of mouse testes, we determined that RUNX3 is expressed in a subset of the spermatogenic cell populations, spanning the undifferentiated and differentiated cell pools. Utilizing Ddx4-Cre to ablate Runx3 in the male germline, we discovered tubules that phenocopy Cbfβ knockout mice, including spermatogenic breakdown and disruption of differentiation and meiotic division. Our current data suggests that among thousands of genes involved in spermatogenesis, RUNX3 regulates pathways that are critical for spermatogenesis and may help in the diagnosis of male-factor infertility.

GPSA Research Exposition Participant
Board Placement: 44

Impact of Wildlife Crossing Structures on Vehicle-Wildlife Collisions

Primary Author: Wisnu Sugiarto
Co-Author(s):

Faculty Sponsor: Jia Yan

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Administrative & Information Systems
Campus: Pullman

Abstract:

The number of vehicle-wildlife collisions in the United States poses a safety concern, as one to two million collisions between vehicles and large animals occur every year (Huijser et al., 2017). In Washington, highway U.S. 97 in Okanogan Valley alone has more than 350 deer carcasses each year in a 12.5 mile stretch of the highway (Safe Passage Highway 97, 2021). One method to mitigate the presence of animals on roads is to provide wildlife crossing structures. This paper examines whether wildlife crossing structures reduce the number of vehicle-wildlife collisions. Using Washington state crash data, I compare the annual number of vehicle-wildlife collisions before and after the construction of a wildlife crossing structure between the treatment and control area. Vehicle-wildlife collisions within 10 miles of a wildlife crossing structure serve as the treatment group, and the control group consists of vehicle-wildlife collisions that are 60-70 miles away from the same wildlife crossing structure. I apply the research methodology to 13 observed wildlife crossing structures in Washington and find evidence that wildlife crossing structures result in 1-3 fewer vehicle-wildlife collisions on average per mile per year. Furthermore, I monetize the reductions in vehicle-wildlife collisions using information from the literature. In 2021 dollars, this back-of-the-envelope approach suggests that every wildlife crossing structure yields US$235,000-443,000 in annual benefit. Findings from this study contribute to the assessment and improvement of road safety for wildlife and humans, and have implications on transportation policy and wildlife conservation efforts.

GPSA Research Exposition Participant
Board Placement: 141

Reversible Ionic Liquids (RevILs) for the Preparation of Thermally Stable SBA-15 Supported Gold Nanoparticle Catalysts

Primary Author: Zengran Sun
Co-Author(s):Steven Saunders

Faculty Sponsor: Steven Saunders

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Catalysts can facilitate the production of synthetic chemicals that enable modern life, and small improvements in their efficiency create more sustainable chemical synthesis processes. The nanocatalysts which are prepared by combining metallic nanoparticles and the mesoporous silica (e.g., SBA-15) are more efficient due to the combination of the highly active nanoparticle surface and the pore confinement effects. The catalyst preparation involves the functionalization of the SBA-15 surface that necessitates calcination, which deteriorates the nanoparticle morphology before reactions. Reversible ionic liquids (RevILs) can facilitate the preparation of monodisperse nanoparticles and the deposition of surface-clean nanoparticles on the non-porous SiO2. RevILs can reverse to the molecular liquids by applying gentle heat or sparging with the inert gas. Herein, we demonstrate a facile RevIL catalyst synthesis technique for preparing the thermally stable and active SBA-15 supported gold nanoparticle catalysts. By microscopically characterizing the prepared catalysts, we confirmed that nanoparticles are inside of pores, indicating that the functionalization of the SBA-15 surface is unnecessary. Subjected to high temperature, the porous catalysts showed significantly less nanoparticle morphology changes than the non-porous catalysts, implying improved thermal stability. The prepared catalysts are active in the oxidation of benzyl alcohol, and their infrared spectrums indicate that RevILs completely reverse to the molecular liquids during the catalyst preparation, resulting in clean gold surfaces. The catalysts' activity was improved following low-temperature calcination. The prepared catalysts are more active than literature examples by an order of magnitude, thereby enabling chemistries to require less energy and produce less environmental impacts.

Academic Showcase Participant
Board Placement: 64

The Effects of Choice and Concept Map Activities on Promoting Students' Learning Performance in Chemistry.

Primary Author: Oluwafemi Sunday
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Faculty Sponsor: Olusola Adesope

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

Research on the effectiveness of concept maps in improving students' conceptual knowledge is extensive. Many of these studies have investigated how concept maps improve students' cognitive function to foster active engagement in learning. However, little is known about the effects of choice on improving learning with concept maps. Hence the objective of this study is to examine whether providing students with choice regarding concept maps activities facilitates chemistry learning performance in ecologically-valid environments. Students (N = 647) enrolled in an introductory chemistry course were randomly assigned to two conditions (choice or no-choice conditions). Students constructed three concept map activities (fill-in-the-blanks, map correction, and map translation). A two-way ANCOVA was conducted to examine the effects of choice on different concept map activities after controlling for prior knowledge. Learning performance was measured via immediate posttest. Results showed a significant two-way interaction between choice and concept map activities on learning retention, after controlling for prior knowledge, $F(2,3719) = 4.57$, $p = .001$, $d = .3$. Findings showed that the effects of concept map activities on learning retention were higher for fill-in-the-blank and map correction choice conditions than no-choice conditions. These results suggest that offering students choice on tasks relevant to their competencies and prior knowledge may foster engagement and learning performance, thus reducing cognitive load for processing unfamiliar activity. Theoretical and practical implications will be discussed.

Keywords: Concept maps, choice, learning retention, chemistry, prior knowledge, cognitive load

Academic Showcase Participant
Board Placement: 93

4-H Club Kit

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Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Social Sciences
Campus: Other

Abstract:

The 4-H Youth Development program helps youth develop critical life skills such as decision-making, responsibility, interpersonal and social skills. This is often accomplished using the traditional 4-H Community Club model. This model is led by an adult 4-H volunteer that organizes and supports youth and their families from throughout the local community. Families and communities are adjusting to meet the current demands of society, leading to a decline in local 4-H clubs. The decrease in 4-H clubs leads to less opportunities for youth.
Running a 4-H club can be an over-whelming experience. This role is often met with uncertainty and hesitation. A tool called the “4-H Club Kits” was created to help 4-H leaders overcome this challenge.
Volunteers were provided education on how to use “4-H Club Kits” from their County Extension offices. Items in this tool include sample meeting agendas, activity lessons, promotional material, project curriculum, policy, as well instructions on how to run an effective 4-H club meeting. Each volunteer received a customized “4-H Club Kits” to accommodate the individuals in their club.
Evaluation data suggests that “4-H Club Kits” are a successful addition to the volunteer education process. 4-H staff in the Extension offices report they are seeing 4-H clubs running more efficiently and effectively. Volunteers using the 4-H Club Kit are reporting smoother running 4-H meetings and programs.
One volunteer says, “Having a kit allows me to spend my time getting to know the youth and families. I feel so much more supported with this tool.”

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 40

Coupled small molecules target RNA interference and JAK/STAT signaling to reduce Zika virus infection in Aedes aegypti

Primary Author: Chasity Trammell
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Faculty Sponsor: Alan Goodman

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principal Topic
The recent global Zika epidemics have revealed the significant threat that mosquito-borne viruses pose. There are currently no effective vaccines or prophylactics to prevent Zika virus (ZIKV) infection. Limiting exposure to infected mosquitoes is the best way to reduce disease incidence. Recent studies have focused on targeting mosquito reproduction and immune responses to reduce transmission. Previous work evaluated the effect of insulin signaling on antiviral JAK/STAT and RNAi in vector mosquitoes.

Method
In this work, we demonstrate that targeting insulin signaling through the repurposing of small molecule drugs results in the activation of both antiviral pathways in vitro and in vivo. We hypothesize that simultaneous activation of RNAi and JAK/STAT results in a significant reduction in ZIKV levels in vector-competent mosquitoes and potentially decreased likelihood in transmission. Specifically, mosquitoes are treated with demethylasterriquinone B1 (DMAQ-B1), a potent insulin mimetic, and AKT inhibitor VIII prior to or during ZIKV infection. Mosquitoes are then collected at 3, 7 and 11 days-post infection to measure signal induction and ZIKV concentration in the midgut, salivary glands, and carcass.

Results
We demonstrate that combine small molecule treatment provided a coordinated response that additively reduced ZIKV levels in mosquitoes. This effect included a quantitatively greater reduction in salivary gland ZIKV levels relative to single pathway

activation, indicating the potential for field delivery of these small molecules to substantially reduce virus transmission. This study identifies a novel means of reducing ZIKV in field populations and possibly reduce disease burden for this immediate global pathogen.

Academic Showcase Participant
Board Placement: 160

Disrupting the global refugee crisis or celebrity humanitarianism? Media frames of the refugee Olympic team at 2016 Rio and 2020 Tokyo summer games

Primary Author: Ryan Turcott
Co-Author(s):Emma Ariyo

Faculty Sponsor:

Primary College/Unit: Education
Category Social Sciences
Campus: Pullman

Abstract:

The world is witnessing the highest levels of human displacement on record. Journalists play an active role shaping the evolution and magnitude of a crisis as well as how they frame refugees in media. The Refugee Olympic Team (EOR) was introduced by IOC President Thomas Bach in October 2015. The purpose of this paper was to examine how the EOR team was referenced in relation to the current global refugee crisis across international news media during the 2016 Rio and 2020 Tokyo Summer Olympic Games. We conducted a content analysis of the EOR team and athletes as they appeared in international news media from October 2015 until August 2021. After removing duplicate articles, the analysis capped at 310 original articles from 23 countries. Three central frames emerged from the international news media to characterize the EOR team and athletes: disrupting the crisis frame, Olympic celebrity humanitarian frame, and flat frame. Thomas Bach and representatives from the IOC and UNHCR were quoted most often in over 50% of all articles. EOR athlete, Yusra Mardini, of Syria, was the most individually covered and quoted athlete. Based off our media analysis, we discuss whether the Olympics public involvement with the global refugee crisis can be viewed as a form of celebrity humanitarianism, which rather than “helping” communities in the global South, can reproduce the same hierarchies and inequalities.

Academic Showcase Participant
Board Placement: 20

Regulatory light chain phosphorylation modulates contractile dynamics in cardiac myosin binding protein-C knockout mice

Primary Author: Kyrah Turner
Co-Author(s):

Faculty Sponsor: Bertrand Tanner

Primary College/Unit: Veterinary Medicine
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Hypertrophic cardiomyopathy (HCM) is a common heritable heart disease which can cause decreased cardiac output, arrythmias, and sudden death. Despite its frequency, patients with HCM have limited therapeutic options. The heart is comprised of several contractile proteins which work together to facilitate force production, powering blood flow throughout the body. Mutations in these contractile proteins often precede HCM development. Cardiac myosin binding protein-C (cMyBP-C) is a commonly mutated protein in HCM clinical cases. It has been shown that loss of this protein contributes to defective contractile dynamics, leading to over-contraction and hypertrophic remodeling of the heart. Regulatory light chain (RLC) is a regulatory protein located in the myosin neck region. Post-translational phosphorylation of RLC influences myosin heads to adopt a position that favors binding to actin to facilitate greater force production. Thick-filament proteins such as cMyBP-C and RLC remain understudied and poorly understood. Understanding the role of these thick filament proteins and their interactions together in the HCM disease state may provide insight into a potential therapeutic target for individuals with HCM. In this study, we explore how RLC and cMyBP-C work together by utilizing a cMyBP-C knockout mouse model. Histology of hearts from cMyBP-C knockout animals suggest that HCM stems from cMyBP-C loss. Preliminary contractility assays support that RLC phosphorylation amplifies changes in contractile function when cMyBP-C is absent from the sarcomere. This provides valuable insight into protein-protein interactions in the HCM disease state and the potential role of RLC phosphorylation modulation as a therapeutic target.

GPSA Research Exposition Participant
Board Placement: 151

Impact of gas ultrafine bubbles on the efficacy of commonly used antimicrobials for apple washing

Primary Author: Phoebe Unger
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Faculty Sponsor: Minto Michael

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principal topic: Ultrafine bubble (UFB) technology is a novel tool in food safety with the potential to improve the potency of antimicrobials during produce washing. This research investigated the impact of incorporating gas (air and CO2) UFBs on the potency of chlorine (Cl2; 100 and 200 ppm) and peracetic acid (PAA; 40 and 80 ppm) solutions against Escherichia coli O157:H7 (EC) and Listeria monocytogenes (LM) on inoculated Gala apples.

Methods: Apples were dip-inoculated with either EC or LM and allowed to dry at room temperature for 1 h. Apples were then treated by dipping into Cl2 or PAA solutions with or without UFBs for 1 or 2 min. Apples were then directly transferred into bags containing Dey-Engley neutralizing broth, and hand messaged for 90 s. Microbial enumerations were performed using injury-recovery media.

Results/Implications: The incorporation of CO2-UFBs in antimicrobial solutions resulted in significantly greater EC and LM reductions (2.1 and 2.4 Log CFU/apple, respectively) on apples compared to solutions without UFBs (1.4 and 1.9 Log CFU/apple, respectively). However, the incorporation of air-UFBs resulted in similar log reductions of EC and LM (1.9 and 2.2 Log CFU/apple, respectively) on apples compared to antimicrobials with CO2-UFBs and without UFBs. The 2 min treatment time for various antimicrobials resulted in significant LM reductions (2.4 Log CFU/apple) compared to 1 min treatment time (2.0 Log CFU/apple), but no differences were observed for EC. This study demonstrated that using CO2-UFBs in Cl2 and PAA solutions significantly increases their potency against EC and LM on apples.

Academic Showcase Participant
Board Placement: 115

Trauma-exposure increases active-phase sleep duration in FABP7 knockout mice

Primary Author: William Vanderheyden
Co-Author(s):Micah Lefton
Jasmine Birch
Jason Gerstner

Faculty Sponsor:

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Trauma-induced sleep disorders are mediated by the astrocyte brain-fatty acid binding protein 7 (FABP7)

Humans with post-traumatic stress disorder (PTSD) exhibit sleep disturbances that include insomnia, nightmares, and enhanced daytime sleepiness. Sleep disturbances are considered a hallmark feature of PTSD; however, little is known about the cellular and molecular mechanisms regulating trauma-induced sleep disorders. Using a rodent model of PTSD called “Single Prolonged Stress” (SPS) we examined the requirement of FABP7, an astrocyte-expressed sleep-regulatory molecule, in mediating trauma-induced sleep disturbances. We measured baseline sleep/wake parameters and then exposed FABP7 knockout (KO) and wild-type (WT) C57BL6/N background control animals to SPS. Sleep and wake measurements were obtained immediately following the initial trauma exposure of SPS and 7 days after.

We found that active phase (ZT 12- ZT24 – lights off) baseline sleep/wake measures were not significantly different between FABP7 KO animals and WT. However, 7 days after the initial trauma, FABP7 KO animals showed decreased waking activity and increased sleep duration compared to WT controls. Increased active phase sleep duration mimics the enhanced daytime sleepiness shown in trauma-exposed human populations. These data indicate that FABP7 signaling cascades within astrocytes may be involved in neural circuits that influence susceptibility to trauma-induced sleep behavior. Future work is aimed at assessing the role of FABP7 in hyperarousal and fear-associated memory impairments using this model.

Academic Showcase Participant
Board Placement: 162

IDENTIFYING LEARNER AND NON-LEARNER RATS FOR CHARACTERIZING BRAIN CIRCUITRY ON THE VIBRATION ACTUATING SEARCH TASK

Primary Author: Abby Velarde
Co-Author(s):Michelle Schmidt
Daniel Harvey
Christopher Davis

Faculty Sponsor:

Primary College/Unit: Other
Category Medical & Life Sciences
Campus: Spokane

Abstract:

The Vibration Actuating Search Task (VAST) is a rapidly learned open-field spatial navigation task shown to motivate and guide rodents to a target destination based on haptic feedback from graded intensity floor vibrations. However, the neural circuitry of the VAST is unknown. The VAST is executed under low red-light conditions to avoid visual distractions. We hypothesized that illuminating the arena during training would impede task acquisition, allowing comparison of brains from a cohort of Non-Learners with Learners in an effort to determine the neurocircuits activated by the VAST.

The VAST is a walled, circular arena with four weight-offset vibration motors at the base of each support leg to create real-time graded floor vibrations contingent on the rat's proximity to an unmarked target location. Rats were handled and habituated for 5 days followed by 15 trials of truncated VAST training. Following the 15th trial rat brains were collected and fixed for Subsequent immunohistochemical comparison. Path distance (cm), time to target (s), and number of failures were averaged for the 15 trials. Four Learners and Non-learners were classified by a composite of these three outcome variables. Compared to Non-learners, VAST Learners showed significant performance improvements.

Next, we will use neural activity markers c-fos, b-fos, and brain derived neurotrophic factor in Learner vs. Non-learner brain slices to immunohistologically determine which brain regions are activated during VAST acquisition.

Academic Showcase Participant
Board Placement: 165

Gathering, Visualizing and Annotating United Stated Covid-19 Data at The New York Times

Primary Author: Lisa Waananen Jones
Co-Author(s):

Faculty Sponsor:

Primary College/Unit: Communication
Category Social Sciences
Campus: Pullman

Abstract:

In March 2020, as Covid-19 cases in the United States rapidly grew from dozens to thousands, The New York Times launched an ambitious project to track known cases and deaths from hundreds of government sources and share this data in real-time data visualizations and a public data repository. Data journalism is a growing professional practice in newsrooms globally [1], and newsrooms with existing data and technology teams were poised to rapidly respond to public information needs during the Covid-19 pandemic [2].

Because of the decentralized health department system in the United States, Covid-19 data is fundamentally local and messy. Bringing these disparate sources together on a daily basis into a methodologically consistent county-level dataset requires the ongoing creative decisions of a small group of editors working at the intersection of software and technology practices, visual design, and traditional reporting.

One visually small but critical example of this process is the development of annotations for data anomalies in Covid-19 data. Amanda Cox, a former Times graphics editor, has said the "annotation layer is the most important thing we do" [3]. Annotations include both text notes and visual styles, such as dotted lines and color variations, to indicate issues with data sources that are important for accurate interpretation of the data. These annotations are applied programmatically based on a spreadsheet updated through daily reporting.

[1] Hermida, A., & Young, M.L. (2019). Data Journalism and the Regeneration of News (1st ed.). Routledge.

[2] Desai, A., Nouvellet, P., Bhatia, S., Cori, A., & Lassmann, B. (2021). Data journalism and the COVID-19 pandemic: Opportunities and challenges. The Lancet Digital Health, 3(10). https://doi.org/10.1016/s2589-7500(21)00178-3

[3] Drucker, S., Huron, S., Kosara, R., Schwabish, J., & Diakopoulos, N. (2019). Communicating Data to an Audience. Data-Driven Storytelling (1st ed., pp. 211–231). A K Peters/CRC Press.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 61

Tamarind seed gum improves the extrusion expansion characteristics of native corn starch at low inclusion levels.

Primary Author: Caleb Wagner
Co-Author(s):

Faculty Sponsor: Girish Ganjyal

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principle topic

Tamarind seed gum (TSG) is a soluble fiber with remarkable processing stability and synergies with starch. Its use in extruded puff snacks has not been documented, but other gums like guar are known to have a beneficial effect on puffing. This work evaluated TSG use in starchy extruded puffs.

Method

The physical properties of six TSG and native starch blends were characterized by differential scanning calorimetry (DSC) and Brabender ViscoQuick (BVQ). These same blends were then extruded at four different screw speeds (SS) while key process variables were monitored and recorded. Extrudate quality metrics including expansion ratio (ER) and water absorption or solubility index (WAI or WSI) were measured.

Results/implications

The BVQ analysis verified the strong TSG-starch relationship given that small amounts of TSG inclusion resulted in large pasting viscosity increases. The DSC analysis showed that TSG inclusion lowers the total energy needed to achieve starch melting ($p < 0.05$). The extrusion process variables indicated that increasing TSG correlates with a decrease in processing energy input ($p < 0.05$). The ER of the puffs reached a maximum of 3.73 at a 2.5% TSG level extruded at 150 RPM ($p < 0.05$), showing that small amounts of TSG help stabilize starch expansion. Analysis of the WAI and WSI values indicated that changing both TSG and processing SS are effective ways to modulate the puff's texture ($p < 0.05$).

The inclusion of TSG in extrusion puffed products improves the expansion properties of the native starch while simultaneously decreasing the energy input required to process the material.

GPSA Research Exposition Participant
Board Placement: 33

A Generic Learned Spatial Index for Multidimensional Shapes

Primary Author: Congying Wang
Co-Author(s):

Faculty Sponsor: Jia Yu

Primary College/Unit: Engineering and Architecture
Category Administrative & Information Systems
Campus: Pullman

Abstract:

In the past decade, there has been a tremendous rise in the use of geospatial data in various fields, such as agriculture, geosciences, and transportation. To meet the real-time response requirements of applications, domain experts usually index massive-scale geospatial datasets, which possibly occupy hundreds of GigaBytes or TeraBytes on hard disks, using a spatial data structure such as R-Tree or Quad-Tree. Although geospatial index structures shorten the query response time by avoiding full dataset scans, they introduce additional storage overhead and maintenance overhead, which results in non-neglectable dollar costs in big data scenarios. We developed Glin, a machine learning (ML) enhanced spatial index to remedy these two overheads. Glin replaces traditional spatial indexes' complex hierarchical data structures with a set of lightweight ML models. It first transforms complex geospatial objects, such as polygons and trajectories, to one-dimension keys and then trains ML models to learn the relationship between keys and their positions on hard disks. Given a spatial query that finds spatial objects falling inside a rectangular window, Glin predicts the approximate on-disk positions by leveraging pre-built ML models and refines the query results to guarantee accuracy. Our experiments on more than 10Gigabyte real-world geospatial datasets confirm that the index size of Glin is 4 times smaller than the existing spatial indices, including R-Tree. Its index maintenance speed is 10 times higher than R-Tree. Meanwhile, Glin still achieves a similar query response time as opposed to other indices in most typical application scenarios.

GPSA Research Exposition Participant
Board Placement: 37

A protein-enabled protective film with functions of self-adapting and anion-anchoring for stabilizing lithium-metal batteries

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Faculty Sponsor: Weihong Zhong

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Practical implementations of rechargeable lithium (Li) metal batteries have long been plagued by multiple problems of Li anode, such as Li dendrite growth, large volume change, low Coulombic efficiency. Here, we report a protein-enabled film that can provide effective protection for Li metal. The protective film with an integrated design of high flexibility, strong adhesion and high Li-ion transference number (0.80) is fabricated by incorporating denatured zein (corn protein) with polyethylene oxide (PEO) acting as an agent for sustaining the denatured protein chains against refolding via the intermolecular interactions between them. Thus, a conformable zein-enabled protective film (zein@PEO) with simultaneous enhancement in flexibility, modulus and adhesion strength is generated to offer both functions of self-adapting and anion-anchoring abilities. The results show that the zein@PEO film is able to accommodate the volume change, reduce the side reactions, and homogenize the ion deposition. Benefiting from these significant properties/functions, the Li/Cu cell with the zein@PEO film delivers prolonged cycle life for over 500 hours with stable performance. Paired with LiMn2O4 cathode, the capacity, cycle stability and rate performance of the cell are remarkably improved as well, demonstrating the effectiveness in stabilizing Li metal batteries.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 155

Sarcomere Length Dependent Activation of Myocardial Regulation

Primary Author: Xutu Wang
Co-Author(s):

Faculty Sponsor: Wenji Dong

Primary College/Unit: Engineering and Architecture
Category Medical & Life Sciences
Campus: Pullman

Abstract:

Principle topic
The Ca2+ sensitivity and maximal force of the myofilament can be regulated by a mechanical stretch of the filament at diastolic state, defined as sarcomere length dependent activation (LDA), which describes the Frank-Starling law at the cellular level. Although the popular hypothesized mechanism of sarcomere LDA is that the Ca2+ sensitivity and maximal force of the stretched myofilament are regulated by the cross-bridge feedback pathway, it has many questions that can't be answered. Sarcomere LDA has been found to be strongly related to the sudden death caused by cardiomyopathy, however the mechanism underlying this is not clear.
Our group hypothesizes that the thin filament regulatory protein troponin complex participates in a dual regulatory pathway with crossbridge feedback for the sarcomere LDA since troponin C is responsible for Ca2+ binding and troponin I participates in crossbridge inhibition.
Method:
To study the relationship between regulatory troponin protein complex and sarcomere LDA of a myofilament, our group uses a rodent cardiac muscle fiber reconstituted with Troponin I lacking the switch peptide and fluorescent-labeled Troponin C to measure the Ca2+ sensitivity and maximal force changes of the myofilament at different sarcomere lengths during Ca2+ titration.
Result:
The reconstituted muscle fiber had a similar fluorescent pCa50 shift at 1.8 to 2.2 sarcomere length, but no force generation compared to the wild type fiber during the Ca2+ titration. This result that shows the sarcomere LDA can occur without crossbridge generation, and that the troponin complex plays an important role in the LDA pathway.

Academic Showcase Participant
Board Placement: 41

A Search for Galaxies with Varying Active Central Black Holes

Primary Author: Erik Wasleske
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Christopher Carroll

Faculty Sponsor: Vivienne Baldassare

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Finding and studying massive black holes at the centers of galaxies is essential for understanding how black holes form and grow. However, smaller black holes or those hidden by dust and gas can be hard to find. We use variability to search for galaxies with active central black holes. Variability is an underutilized technique for selecting active galaxy candidates. It identifies galaxies with fluctuating light at their centers due to the presence of a black hole. We search for galaxies that are variable in the ultraviolet (UV) wavelength regime, indicating activity from elusive black holes. We use observations from the GALEX Time-Domain Survey (TDS). Using the NASA Sloan Atlas (NSA) catalog of galaxies, we start with a parent population of 1,819 galaxies within the footprint of the GALEX TDS. From this parent population, 48 galaxies were selected as highly variable in the UV. We investigate those galaxies further using alternate selection criteria for black hole activity. Of the 48 selected galaxies, 8 were categorized as having active centers based on their optical spectroscopy, 2 were categorized as having activity from infrared data, and 28 galaxies met our requirement for black hole activity from their spectrum energy distribution models. In employing our variability selection, we identified six dwarf galaxies that would have not been selected by spectroscopic selection techniques from the literature. Almost all our candidates are not previously listed in active galaxy catalogs from the Sloan Digital Sky Survey.

Academic Showcase Participant
Board Placement: 6

A Study of Adsorption of Water-Derivate Species and CO2 on the surface of LaNiO3

Primary Author: Ariel Whitten
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Faculty Sponsor: Jean-Sabin McEwen

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Alternative fuel sources need to meet the needs of the growing energy sector while also decreasing the concentration of greenhouse gases in the atmosphere. Although many solutions currently exist, these solutions are unsuitable due to low energy density and no existing infrastructure for the process. In this project, we propose utilizing perovskites in a solid oxide electrolysis cell to perform the co-electrolysis of CO2 and H2O to create syngas, a prerequisite for creating high order hydrocarbons. Perovskites are classified as a mixed ionic and electronic conducting oxide and take the form ABOδ-3 where the A-site is a rare earth metal, and the B-site is a metal cation. These materials have several advantages over traditional metal electrocatalysts as they are more stable under redox conditions. Perovskites benefit from having many possible combinations of A-sites and B-sites meaning they can be fine-tuned for specific applications. Our project focuses on the adsorption of CO2 and H2O on the surface of LaNiO3 using density functional theory calculations compared to experimental results. First, we investigate the effects of adsorption of water-deviate species on the surface XPS spectra as well as the effects of antiferromagnetic ordering on the surface chemistry. We also explore the adsorption of CO2 on the surface as well as the effects of surface defects on adsorption. Due to the limited knowledge of these systems, we hope to investigate the underlying mechanism of the reduction reaction on the surface to foster a better understanding of the properties needed to create an effective electrocatalyst.

SHOWCASE

Academic Showcase Participant
Board Placement: 47

Neuronal GPCR NMUR-1 regulates immune specificity by controlling energy production proteins in Caenorhabditis elegans

Primary Author: Phillip Wibisono
Co-Author(s):Dodge Baluya
David Gang
Jingru Sun

Faculty Sponsor: Jingru Sun

Primary College/Unit: Pharmacy
Category Medical & Life Sciences
Campus: Spokane

Abstract:

The neuronal GPCR, NMUR-1, a homolog to mammalian neuromedin U receptor has been implicated in the specificity of Caenorhabditis elegans innate immune response. NMUR-1 controls C. elegans transcription activity by regulating transcription factors which in turn control the expression of distinct defense genes. This study further investigates NMUR-1 regulation on the innate immune response against Salmonella enterica and Enterococcus faecalis by utilizing a mass spectrometry-based quantitative proteomics approach. We found that NMUR-1 controls a class of proteins responsible for transmembrane transport. More specifically, a group of proteins forming F0F1 ATP synthase responsible for ATP biosynthesis is downregulated in NMUR-1 loss of function mutants during both S. enterica and E. faecalis infection. Functional assays inhibiting F0F1 ATP synthase by silencing the expression of specific subunits of the F1 catalytic site or chemical modification of the F0 motor increases survival of wild-type C. elegans during S. enterica infection and decreased survival against E. faecalis infection. ATP quantification also showed NMUR-1 mutants have a reduced ability to change ATP production in response to infection. This study uncovers how NMUR-1 regulates energy production at a protein level against specific pathogens as part of an innate immune response.

Academic Showcase Participant
Board Placement: 77

The role of stress responder ATF-4 in regulationg innate immunity in C. elegans

Primary Author: Shawndra Wibisono
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Jingru Sun

Faculty Sponsor:

Primary College/Unit: Spokane
Category Medical & Life Sciences
Campus: Spokane

Abstract:

Loss of stress-response transcription factor ATF-4 compromises innate immunity in Drosophila model. However, we observed that atf-4(ok576) Caenorhabditis elegans mutants live significantly longer than wild-type animals in response to bacteria Salmonella enterica SL1344, Serratia marcescens Db11, and Escherichia coli OP50. Further studies showed that there is no difference observed in defecation or pumping rates between wild-type and mutant animals. Interestingly, the lifespan of atf-4(ok576) mutants is similar to that of wild-type animals when grown on heat-killed bacteria, suggesting that active infection is required to induce innate immune response in C. elegans. Several evolutionarily conserved innate immune signaling pathways have been identified in C. elegans in response to bacterial infection, including the p38/PMK-1 mitogen-activated protein kinase (MAPK) pathway, the DAF-2/insulin-like receptor pathway, the DBL-1/transforming growth factor β (TGF-β) pathway, and the unfolded protein response (UPR) pathway. We are in the process of investigating how stress responder ATF-4 mediates these pathways to regulate innate immunity against pathogen infections. Our study is likely to identify novel molecular mechanisms underlying host-pathogen interactions.

Academic Showcase Participant
Board Placement: 108

Examining the impact of exposure to and perceptions of risky cannabis brand-generated Instagram posts on college students' sex-related cannabis expectancies and intentions to use cannabis prior to sex

Primary Author: Jessica Willoughby
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Jiayu Li
Leticia Couto
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Faculty Sponsor: Stacey Hust

Primary College/Unit: Communication
Category Social Sciences
Campus: Pullman

Abstract:

With the legalization of cannabis expanding across the United States, media outlets have underscored the combination of sex and cannabis (e.g., Michelson, 2020; Weisman, 2021) in a positive light. However, cannabis is the second most used drug in sexual assault situations behind only alcohol (Floyd, 2017). In this study, we conducted a 3×1 online experiment with 816 college students by exposing them to brand-generated cannabis Instagram posts that used sexual appeals, romantic appeals, or a control condition. We hypothesized that exposure to brand-generated cannabis posts that used romantic and sexual appeals will influence sex-related cannabis expectancies and intentions to use cannabis before sex. Further, perceptions related to the stimuli, including perceptions of sexual and romance appeals, perceived realism, and wishful identification with the models, will be associated with sex-related cannabis expectancies and intentions to use cannabis before sex. We found that there were gender differences in how effects differ among participants. Men in the sexual appeal group reported lower cannabis-related expectancies that it is associated with sexual risk. Men in the romance appeal condition reported lower intentions to use cannabis before sex. Both men and women that perceived the post suggest cannabis enhances sex expected cannabis to enhance sex and lower nervousness, as well as being associated with intentions to use before sex. Men who perceived posts as realistic and indicated wishful identification expected cannabis to enhance sex. Women who perceived posts as realistic expected cannabis to reduce nervousness. Further results will be discussed in poster and presentation.

Academic Showcase Participant
Board Placement: 85

Adapting Team-Based Learning for Online Learning In Biochemistry

Primary Author: Jacob Woodbury
Co-Author(s):

Faculty Sponsor: Erika Offerdahl

Primary College/Unit: Veterinary Medicine
Category Social Sciences
Campus: Pullman

Abstract:

In a Team-Based Learning (TBL) course, does the switch to the online delivery of an undergraduate biochemistry course result in changes to student performance?
While TBL is implemented across undergraduate and professional STEM education contexts, it is almost exclusively delivered in-person. The benefits of TBL in improving student performance, motivation, engagement, and scientific self-efficacy is thought to rely upon students working together in-person and creating relationships. TBL is also a high-intensity active learning practice, where students spend more than two-thirds of class on group activities. High-intensity active learning practices like TBL are thought to produce more equitable outcomes for all students in a course, but are infrequently attempted online. The reduced ability to interpret face-to-face cues and difficulty of giving feedback to groups online may adversely affect outcomes during online TBL. In this design, we compared student performance during an in-person semester of TBL to a semester of TBL delivered exclusively online.
Student performance on two unit exams and one comprehensive exam was compared between semesters using the Mann-Whitney U test. Student performance on unit exams was similar between the in-person and online semester ($p = 0.354$, 0.205 respectively). Student performance on the comprehensive exam increased during the online semester, possibly due to university rules ($p = 0.000119$). Results from exam performance data indicate it is possible to implement high-intensity active learning like TBL online without sacrificing student performance. This research raises questions as to whether TBL could be further modified to increase student performance or other benefits.

Academic Showcase Participant
Board Placement: 49

Cleaning the Hubble Space Telescope

Primary Author: Guy Worthey
Co-Author(s):Tathagata Pal
Islam Khan
Xiang Shi
Ralph Bohlin

Faculty Sponsor:

Primary College/Unit: Arts and Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

The Hubble Space Telescope still orbits, as productive as ever. One of its instruments is a spectrograph called STIS, which can reach into the ultraviolet portion of the spectrum.

This project uses new HST/STIS observations to gauge how much unwanted scattered light is present in ultraviolet spectral observations. The trick is to use redundant detector-and-grating combinations to cover the same spectrum. The first mode (CCD detector + G230LB grating) suffers from scattered red light while the second (MAMA detector + G230L grating) is blind to optical light. The amount of light scattered into the beam was measured and correction formulae were developed.

The corrections can be applied to all low-resolution ultraviolet spectra taken throughout the history of HST, 3000 observations and counting.

SHOWCASE

GPSA Research Exposition Participant
Board Placement: 117

Can we speak out/up? Cultural intelligence of employees in multicultural hotels

Primary Author: Lu Yuan
Co-Author(s):Hyounae (Kelly) Min

Faculty Sponsor: Hyun Jeong Kim

Primary College/Unit: Business
Category Administrative & Information Systems
Campus: Pullman

Abstract:

Principal Topic
Coordinated teamwork within or between departments is often required (Ma et al., 2020) in the hospitality industry, thus employees' voice behavior is very essential. Prior research has reported antecedents of voice behavior ranging from organizational factors to individual characteristics. Since culturally diverse employees have become an integral part of hospitality organizations (Manoharan et al., 2019), cultural intelligence (CQ) is a crucial ability in promoting employee voice.

Method
Drawing upon the model of career self-management, this paper examines the impact of hospitality employees' cultural intelligence (CQ) on their voice behavior and job satisfaction through self-efficacy. Data were collected from 256 contact employees working for restaurants in three major cities in the U.S.
Hypotheses include:
H1: Hospitality employees' CQ is positively related to self-efficacy.
H2: Hospitality employees' CQ is positively related to voice behavior.
H3:Hospitality employees' CQ is positively related to job satisfaction.
H4: Hospitality employees' self-efficacy is positively related to voice behavior.
H5: Hospitality employees' self-efficacy is positively related to job satisfaction.
H6: Hospitality employees' CQ increases voice behavior through self-efficacy.
H7: Hospitality employees' CQ increases job satisfaction through self-efficacy.

Results/Implications
The results show that CQ directly and positively influences both employees' voice behavior and job satisfaction; self-efficacy serves as a partial mediator in the relationships between CQ and voice as well as between CQ and satisfaction. This study has important practical implications for hospitality operators to promote their employees' voice behavior in a multicultural environment.

Academic Showcase Participant
Board Placement: 84

Wildfire Smoke and Renewable Energy – Examining the Impacts of the 2020 Wildfire Season in the State of Washington

Primary Author: Augusto Zanin Bertoletti
Co-Author(s):Josue Campos do Prado
Theresa Phan

Faculty Sponsor: Josue Campos do Prado

Primary College/Unit: Other
Category Engineering & Physical Sciences
Campus: Vancouver

Abstract:

PRINCIPAL TOPIC
The 2020 Wildfire Season was globally devastating, setting negative records all over the world. Five of the six largest fires in California's recorded history burned in 2020. In the Pacific Northwest (PNW) region of the USA, Oregon and eastside Washington almost doubled their 10-year average of burnt acres recently.
The stemming smoke of wildfires diminishes the air quality and significantly impact the solar photovoltaic (PV) generation even if the locations are hundreds of kilometers away from high-risk zones. Thus, during those periods, it is important to decide how to best meet the demand for electricity and not to harm even more the air quality.
METHODS
This work analyses the influence of the 2020 wildfire season in the state of Washington, verifying the sun irradiance and the wind speed data, obtained from the WSU AgWeatherNet database, and the particulate matter 2.5 concentration data, obtained from Washington Air Quality Monitoring program.

RESULTS/IMPLICATIONS
During the first three weeks of 2020's September, for selected cities in the state of Washington, we verified a decrease in sun irradiance and its correlation with the particulate matter 2.5 increase, during moments of high wildfire activity. Also, the wind speed in those moments is considerably low, directly impacting wind power generation. The results show that renewable energy production can be significantly reduced during the periods of high concentration of wildfire smoke, thus highlighting the need for more power system resilient preparation and planning for wildfires.

SHOWCASE

Academic Showcase Participant
Board Placement: 2

A Never Ending Arms Race: How Viruses Overcome their Hosts' Defense?

Primary Author: Ying Zhai
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Hao Peng
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Sunil Mukherjee
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Faculty Sponsor:

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Agricultural & Natural Sciences
Campus: Pullman

Abstract:

Plants developed a sophisticated defense system to defend themselves against virus infections. However, viruses evolved to overcome the host defense by producing protein(s) that disable the host defense machinery. We used a single-stranded DNA virus of plants, Croton yellow vein mosaic virus (CYVMV) that infects multiple crops, to identify the viral proteins involved in overcoming host defense. Referred to as 'silencing suppressor proteins', all plant viruses are now known to produce these for their own survival.

We characterized four such silencing suppressors, namely, V2, C2, and C4 encoded by CYVMV and betasatellite-encoded C1 protein (bC1). Their silencing suppressor functions were verified by the ability of restoring the β-glucuronidase (GUS) activity that was suppressed by RNA silencing.

We show that V2 was capable of self-interacting, as well as interacting with the V1 protein, and could be translocalized to the plasmodesmata in the presence of CYVMV. The knockout of either V2 or V1 impaired the intercellular mobility of CYVMV, indicating their novel coordinated roles in the cell-to-cell movement of the virus. As pathogenicity determinants, V2, C2, and C4 could induce typical leaf curl symptoms in Nicotiana benthamiana plants even under transient expression. Interestingly, the transcripts and proteins of all four suppressors could be detected in younger leaves with no correlation to symptom induction. Overall, our work identified four silencing suppressors encoded by CYVMV and its cognate beta satellite and reveals their subcellular localization, interaction behavior, intercellular virus movement and roles in disease induction.

Academic Showcase Participant
Board Placement: 150

Elucidating the Role and Interplay of Nickel and Molybdenum Carbide Particles Supported on Zeolite Y in Methane Steam Reforming

Primary Author: Xianghui Zhang
Co-Author(s):

Faculty Sponsor: Di Wu

Primary College/Unit: Engineering and Architecture
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

Molybdenum carbide (Mo2C) has been used in various cases as promoter because of its noble metal-like properties and low price. One common example is Mo2C promoted nickel catalysts in fuel reforming. However, Mo2C, in these studies, was added to where severe coke easily forms on the unpromoted nickel catalysts. It is concluded that Mo2C inhibits coke formation through enhancing water activation rate. To fully understand the capability of Mo2C, a new scenario must be created in which no coke forms on nickel. Study of roles of Mo2C added to such system will significantly promote its application in chemical industry.

The coke-resistance nickel catalyst was prepared using Ni2+ to replace the proton in H+-FAU zeolite in aqueous solution. Then Mo2C precursor was introduced through impregnation method. The resulted samples were calcined and reduced/carburized to obtain the Ni-FAU and Ni-Mo2C/FAU catalysts.

In methane steam reforming (MSR) reaction, Ni-FAU exhibited ~40% initial CH4 conversion and deactivated fast during the test. 70% CH4 conversion was achieved on Ni-Mo2C/FAU which was stable during the whole test. Characterizations indicate Ni on spent Ni-FAU sintered to ~97 nm with no coke forming. On spent Ni-Mo2C/FAU, sintering is much less severe, and coke whose amount increased with Mo2C loading was detected. CH4 pulse reactions revealed ~2 times higher CH4 decomposition rate on Ni-Mo2C/FAU, indicating Mo2C dramatically enhances the activity of CH4 activation. This study will enable insights into an alternative design principle of transition metal carbide – Ni catalysts with high activity and stability for effective MSR.

GPSA Research Exposition Participant
Board Placement: 29

Microwave frying of French fries: system design and experimental test

Primary Author: XU ZHOU
Co-Author(s):

Faculty Sponsor: Juming Tang

Primary College/Unit: Agricultural, Human and Natural Resource Sciences
Category Engineering & Physical Sciences
Campus: Pullman

Abstract:

French fries are popular items in the diets of many countries, but the relatively high-fat content of French fries is a major health concern for consumers. Reduced-fat French fries have been the driving force to improve frying techniques in the food processing and fast food service industry. This research aimed to study the influence of microwave heating in frying on fat reduction in French fries. A microwave frying test unit was designed and developed at Washington State University. A 3-dimensional computer simulation model based on Maxwell's equations and heat transfer was developed to guide the design of the microwave fryer. Simulation results were verified with frying tests. The experimental results showed that microwave frying reduced the frying time by 30 – 40%, with equivalent product quality attributes, as compared to deep-fat frying. Fat intakes increased with increasing moisture loss during frying, regardless of frying methods. Post-frying holding was the key to fat reduction. Microwave-assisted post-frying could reduce the fat content of French fries by 9 – 18%, depending on microwave frequencies. This study provided a design concept of domestic microwave fryers and highlighted the potential of microwave heating to produce deep-fried French fries with lower fat content and higher quality.

Academic Showcase Participant
Board Placement: 134

WikiProject: Chinese Culture and Heritage

Primary Author: Lihong Zhu
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Faculty Sponsor:

Primary College/Unit: Libraries
Category Library and Information Science
Campus: Pullman

Abstract:

Traditionally, library data has been designed for the use and consumption of humans, and it is not integrated with the Semantic Web. If we transform library data into linked open data, it will increase the visibility and usage of library data on the Semantic Web. Within the past few years, the calls for transforming library data into linked open data have become more and more frequent. In order to increase the value and discoverability of library data, libraries have been exploring options for making library data available and useful outside of the data silos of the library world through the adoption of linked open data. Wikidata is a powerful platform for library linked open data. In October 2020, a group of Chinese American librarians from several institutions formed a WikiProject: Chinese Culture and Heritage group in hopes of expanding their horizon in library Linked Data and seeking collaboration opportunities. WikiProject: Chinese Culture and Heritage has been exploring the following research questions:

1) What are the characteristics of Wikidata on Chinese related topics?
2) How to create data models for special projects?
3) What are the challenges in creating Chinese related Wikidata entries?
4) How to use external data to enhance existing Wikidata?
5) How to use Wikidata SPARQL Query for discovery and presentation?

The poster will present their research findings, discuss lessons learned and explore future opportunities.