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Feeling meaningless? The effect of power on consumers’ nostalgia preferences

Primary Author: Sheng Bi
Co-Author(s): Huan Chen

College: Carson College of Business
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
Power is defined as a capacity to influence others or as immunity to the influence of others. Previous research suggests that the lack of power leads to an aversive experience associated with uncertainty, self-doubt, and negative emotions. To alleviate this aversive experience, consumers tend to restore the sense of power by purchasing status-related products. The present research extends this literature by suggesting nostalgic consumption as a new coping strategy for the lack of power. Specifically, we argue that low power makes consumers feel that their lives are meaningless, which would activate a need to search for meaning. Nostalgic products can help consumers attain meaning in life by activating memories of personally significant events and boosting perceptions of social connectedness. Thus, low power enhances consumers’ preferences for nostalgic products and this effect is mediated by the motivation to search for meaning in life.

We conducted four studies to test our hypotheses. Study 1 shows the correlation between long-term power status and consumers’ preference for nostalgic products. Study 2 establishes the causal relationship by manipulating consumers’ sense of power. Study 3 demonstrates the underlying process through a mediation test. We examine that the lack of power elicits motivation to search for meaning in life, which leads consumers to prefer nostalgic products. Study 4 tests a boundary condition of the proposed power effect. We find that the effect of power on preference for nostalgic products disappears when other sources of meaning in life are provided.
Cloud Computing Governance and its Effects on Firm Value

Primary Author: Mina Jafarijoo
Co-Author(s): KD Joshi

College: Carson College of Business
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
Gartner Inc., a technology research company, predicts that Cloud Computing (CC) would account for the bulk of new Information Technology (IT) spending in 2016 (Shetty 2013). The emergence of CC represents a fundamental change in the way IT services are designed and delivered (Armbrust et al. 2010, Iyer and Henderson 2010). In spite of the growth in the CC adoption, our understanding of how to govern CC investments to derive transformative value for the firms is limited. Therefore, this study examines the following question: How are firms designing and implementing IT governance structures and processes to generate value from CC investments? To answer this research question, first the IT governance structure and process configurations are conceptualized from the literature, and then based on these conceptualizations, a survey is designed and validated to capture the relationships among IT governance structures and processes, CC implementation, and firm value. We are in the process of completing our data collection process. After the data is collected, a latent profiling analysis will be conducted to uncover clusters of firms to understand how variations in governance structures and processes, firm characteristics, and CC investment characteristics collectively shape firm value.

References:
Information Technology Career Choices of Persons with Disabilities: The Case of Military Personnel and Veterans

Primary Author: K. D. Joshi
Co-Author(s): Eileen Trauth
Benyawarath Nithithanatchinnapat

College: Carson College of Business
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
This research project (supported by the National Science Foundation), advances our understanding of factors that influence the entrance into and persistence within programs of study for an information technology (IT) career for military personnel and veterans (MVP) with disabilities. Specifically, this research explored interest in pursuing a career in the IT field as a function of the following: IT roles, occupational role of persons with disabilities, IT self-efficacy, military identity, disability identity, and career choices. A total of 699 MPV with disabilities in 10 institutions participated in the survey. Three groups of people emerged from the analysis of this data using Latent Class Analysis. The first group has high levels of self-efficacy, interest, and intention, and they see no barriers to pursuing an IT career, despite their visible disabilities. This group consists of 93% male participants, most with visible disabilities, upper class, with the lowest number of participants who are in the lowest economic class. The second group had the lowest intent of pursuing a career in the IT field, though 21% have the training and experience to do so. They had high self-efficacy and confidence in their IT capabilities. They had fewer IT courses and less IT experience. They are capable of being recruited into the IT field, but perhaps they reject it due to misperceptions about the IT field. The third group is the most troubling group, with their low levels of self-efficacy and low interest in pursuing an IT career. They also had high disability incongruity, which means that they see their disability hindering their aspirations.
Review-fixing Programs and e-Retailer-driven Consumer Skepticism

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Category: Administrative & Information Systems
Campus: Pullman

Abstract:
Principal Topic
As consumers continue to shift their purchasing from brick-and-mortar to online stores, online reviews have become one of the most important pre-purchase information sources for consumers to utilize. Extant research finds that 88% of consumers trust online reviews to the same extent as personal recommendations and 72% of consumers say they are more likely to visit a business after reading positive reviews.

Method/Hypotheses
As such, review-fixing programs (RFPs), such as giving reviewers free products, have become more prevalent in the marketplace, most likely because e-retailers believe they have something to gain (at least in the short term) by their use. In the present research, we are interested in better understanding how consumers respond to products that receive positive reviews, and the extent to which knowledge of RFPs alters their purchase decisions.

Results/Implications
Across two experiments, we find that consumers generally do not see exceedingly positive reviews with much suspicion; however, after learning about RFPs, consumers were considerably more suspicious, resulting in lower purchasing preferences toward products that had the highest star ratings (4.9 out of 5) but not toward other ratings. The first implication of our work is that informing consumers with manipulation of reviews could punish the firms who engage in RFPs and help consumers make better purchasing decisions. Second, our work calls for more regulations on the degree to which retailers are free with managing their online reviewers. For example, retailers can cooperate with credible third party companies to have their online reviews verified.
Designing for the Commons: The Role of Digital Platforms in Driving Energy Efficiency Behaviors at a Community Level

Primary Author: Michael Kennedy
Co-Author(s): K.D. Joshi
John Correia

College: Carson College of Business
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
The objective of this research is to examine the role digital platforms play in harmonizing the conflicting interests of the utility companies, municipality, and home/building owners within a community to drive energy efficient (EE) behaviors. Using the collective action theory, which explains how entities with conflicting interests may collaborate for a common goal (de Reuver et al. 2015), we uncover values and artifact feature and function preferences of key stakeholders. We premise, these collective values, when implicated in the design of a digital platform that inventories, reports, and analyzes EE trends at a community level, can help drive collective action efforts towards advancing EE in buildings. Through semi-structured interviews with municipal government, community building owners, and energy service providers, this research uses a value sensitive design (VSD) method (Friedman 1996) to examine whether such a digital platform can advance collective action on EE improvements in a sample case community. Although the data collection for this project is still in progress, the preliminary findings indicate that a digital platform can advance the collective interests of the community. At the time of the conference, we will be able to share the findings and the resulting public policy implications of this work in a more comprehensive and detailed manner.
Impact of ICT Societal and Businesses’ ICT Factors on Economic and Social Development: Advanced and Emerging Economies

Primary Author: Benyawarath Nithihanatchinnapat
Co-Author(s): K. D. Joshi

College: Carson College of Business
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
This paper examines the impact of information and communication technology (ICT) and businesses’ ICT factors on countries’ ICT economic performance and ICT social development within the context of advanced and emerging economies. The influence-impact model (IIM) (Trauth, 1999, 2000) is used to extend ICT for development research in information systems (IS). This framework is used to formulate five research hypotheses explaining the development of the digital economy in advanced and emerging economies in recent years. These hypotheses are then tested using existing data collected from the World Economic Forum (WEF) and International Monetary Fund (IMF). Our results indicate that, in the past five years, emerging economies have increased their ICT economic performance primarily by improving their ICT government and educational structures; however, in advanced economies, businesses’ ICT structure is what drives ICT economic performance. Surprisingly, in emerging economies, the use of public social media in professional work has a significant positive relationship with ICT economic performance, but the relationship is significantly negative in advanced economies. For social development, both emerging and advanced economies are driven by ICT government structure and businesses’ innovation capability. In emerging economies, other strong drivers include ICT educational structure and the use of social media in professional work. The different results between emerging and advanced economies might stem from different levels of concern regarding information security or the nature of the national culture.
Does Restaurant Location matter?

Primary Author: Chris Rose
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College: Carson College of Business
Category: Hospitality Business Management
Campus: Pullman

Abstract:
In an effort to better serve their clientele of current and prospective restaurant owners, the Washington Hospitality Association (WHA) has asked WSU researchers to investigate the research question: Does restaurant location matter? The WHA has provided a considerable dataset to the The Hospitality Business Management (HBM) department at Washington State University (WSU) in an effort to track trends/correlations between restaurant type and location in the Seattle market. HBM researchers at WSU have been tasked with tracking different restaurant types/services in relation to Seattle locale. Being an industry with thin profit margins, and a high probability of failure, the restaurant industry seeks to improve the probability of restaurant success.

Merging Washington State Economic Services Division North American Industry Classification system (NAICS) records, the WHA dataset, and using mapping features of Seattle’s Tableau software, a location based data set was compiled, analyzed, and visualized. Using multiple geographical measures (address, city, and zip codes), the recording of the movement of these businesses over time has been made possible.

64 types of restaurant services are included in the database; the current research discretizes the cardinality to five restaurant types: food service contractors, food service and drinking places, restaurant buffets, travel services, as well as alcoholic services

The current research is foundational to a much larger four-year Industry Benchmarking project. Currently data from 2010-2016 has been analyzed. Descriptive analytics are reported to explain past and currently restaurant openings and closings. Over the next four years additional restaurant data predictors will help to support predictive analytics.
The impact of ICTs on National Innovation: the moderating influence of national culture

Primary Author: Terence Saldanha
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Michelle Wu
Sunil Mithas

College: Carson College of Business
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
Although the role of IT in innovation is an emerging area of focus in IS research, research examining the role of IT in innovation at the national level is scant. In this study, we examine the impact of IT on innovation and the moderating impact of culture at the national level. Our empirical analysis from multiple secondary sources of 68 countries across an 8 year period reveals a set of findings. We find that countries with greater IT are more innovative. We also find moderating effects of four dimensions of national culture on this relationship. Specifically, we find that IT has greater impact on innovation in countries with a culture characterized by more uncertainty avoidance, long-term orientation, individualism, and power distance. Taken together, the findings contribute to theory and practice by highlighting the role of IT in innovation levels across countries and the moderating influences of dimensions of national cultures.
Multiple acaricide resistance of Teteranchyus urticae in hops

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Doug Walsh**

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
The two-spotted spider mite, Teteranchyus urticae is a polyphagous pest feeding on over 1100 plant species including many highly valued economic crops such as hops (Humulus lupulus), which is a specialty crop cultivated mainly for its oils in flavoring craft beer. The U.S. hop industry is estimated to be worth over $350 million, with the key production area located in the Pacific northwestern (PNW) states of Washington, Oregon, and Idaho. In PNW hopyards, T. urticae is the dominant pest species that threatens hop quality and production. T. urticae management by hop growers in PNW and other production regions often includes the application of different classes of acaricides. Based on records of acaricide applications in PNW hopyards, as many as ten acaricides with different modes of action are applied in rotation over the course of the hop growing season. Unfortunately, T. urticae has been documented to quickly develop resistance to these acaricides which directly cause control failures. Here we evaluated the phenotypic and genotypic resistance on 3 major acaricides (i.e. etoxazole, spiridoclofen, and fenpyroximate) in susceptible and 35 field T. urticae populations collected from hopyards. Our study showed that many field T. urticae populations exhibited multiple acaricide resistance to the acaricides tested through harboring target site mutations and/or overexpression of metabolic genes such as cytochrome P450s, glutathione S transferases and carboxylesterase. Understanding the complexity of T. urticae adaptation to multiple acaricides will help in designing effective and sustainable pest control strategies.

**Denotes 2017 Celebrating Excellence Award Recipient
Investigating School Uniform Design of Adolescent Girls in Saudi Arabia

Primary Author: Rana Alblowi
Co-Author(s): Carol Salusso

College: College of Agricultural, Human and Natural Resource Sciences
Category: Visual Arts & Design
Campus: Pullman

Abstract:
Due to their use in many countries worldwide, there is high global demand for adolescent girls’ school uniforms. The purpose of this research was to apply a functional, aesthetic, expressive consumer needs (FEA) model (Kallal and Lamb, 1992) to designing and evaluating school uniforms to balance meeting the needs of adolescent girls in Saudi Arabia. Lack of Vitamin D is a big concern in Saudi Arabia as well as a global problem. Saudi lifestyle leads to diminished opportunity to absorb Vitamin D through the skin via outdoor activities. A total of 210 Saudi Arabian mothers responded to a FEA needs survey regarding their daughter’s school uniform needs relative to the newly adopted Current Uniform and proposed Designs A and B. The survey questions were on a 7-point Likert scale and included several open-ended questions designed to obtain critique of the three types of uniforms. Results were analyzed relative to the functional, expressive and aesthetic considerations of the three types of school uniforms; interest in Vitamin D absorption solutions through uniform design; and sample demographics. Analysis included descriptive statistics, factor analysis across FEA questions, paired T-Tests among the Current Uniform, Design A and Design B, and qualitative interpretation of open-ended questions. Results showed high receptivity for incorporating Vitamin D absorption, aesthetically pleasing, and culturally appropriate features into future school uniforms for adolescent girls. We recommend results of this study be presented to the Ministry of Education in Saudi Arabia for implementation within the design of future uniforms for adolescent girls.
In vitro and in vivo sensitivity of Penicillium expansum baseline isolates to difenoconazole

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College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Wenatchee

Abstract:
Penicillium expansum is a major pathogen that cause blue mold on apples postharvest. P. expansum is considered a high-risk pathogen for fungicide resistance development because of its short life cycle and abundant asexual spore production. Blue mold control relies mainly on the use of fungicides including thiabendazole (TBZ), fludioxonil and pyrimethanil. The widespread resistance to TBZ and the recent emergence of resistance to fludioxonil and pyrimethanil has become a concern due to reduced efficacy. Thus, there is a need for alternative fungicides with different mode of action to control P. expansum and other pathogens. In this study, we investigated the in vitro and in vivo sensitivity of 130 baseline isolates of P. expansum to the new demethylation inhibitor fungicide difenoconazole using mycelial growth inhibition, spore germination inhibition, and germ tube length assays. We determined effective concentration to inhibit 50% growth or germination (EC50 values). The mean EC50 values for difenoconazole were 0.17 and 0.32 µg/ml based on mycelial growth and germination inhibition, respectively. Respective EC50 values ranged from 0.12 to 0.29 and from 0.18 to 0.36 µg/ml. The minimum inhibitory concentration (MIC) was 1.0 µg/ml. The preventive and curative efficacies of difenoconazole to control P. expansum isolates were evaluated on detached apple fruit incubated at 0 and 20°C. Preliminary results indicate that difenoconazole applied preventively may provide better efficacy against blue mold, especially at room temperature. When combined with low temperature and controlled atmosphere (low O2 and high CO2 concentration), both preventive and curative applications should control blue mold effectively.

Primary Author: Esraa Alwan  
Co-Author(s):  
College: College of Agricultural, Human and Natural Resource Sciences  
Category: Agricultural & Natural Sciences  
Campus: Pullman  

Abstract: 
Hessian fly (HF) infestations continue to cause significant economic losses in spring wheat producing areas in the Pacific Northwest (PNW) of the United States. Genetic resistance is the most credible approach to reducing yield losses caused by HF and outpace biotype evolution. The primary goals of this study were to determine the chromosomal location of the Hessian fly resistance gene in the elite wheat germplasm ‘WA8076’, and to identify ‘breeder-friendly’ molecular markers tightly linked to the target gene. A doubled haploid (DH) mapping population consisting of 310 individuals was completed by crossing two elite spring wheat lines; ‘WA8076’, and ‘HT080158LU’. Seedling assessment for Hessian fly response of the mapping population progeny was conducted at the University of Idaho (UI) using a local mixed-biotype field population maintained in the lab. The DH population was genotyped with 90K SNP markers using the Illumina Infinium platform. A single Hessian fly resistance gene (HFR) from ‘WA8076’ was detected on the distal region of chromosome 6BS, flanked by two SNP markers IW871431 and IW861175 at a distance of 2.8 and 5.4 cM. The closely linked SNP markers identified in this study will provide an effective tool to accurately identify, select, and integrate the HF-resistance gene into existing wheat cultivars. Furthermore, the high-density genetic map offers the necessary basis needed for map-based cloning of the Hessian fly resistance gene.
Price Impacts of Tasting Notes Across Wine Segments

Primary Author: Kuan-Ju Chen
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College: College of Agricultural, Human and Natural Resource Sciences
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
The objective of this study is to investigate how tasting notes describing the sensory properties of wines and wine characteristics influence wine prices. We use a sample of tasting notes written for red wines by Wine Spectator in Washington State from 1997 to 2013. We run the hedonic pricing models to test the mixed effects of tasting notes and choice impact of wine characteristics on wine prices by controlling for the same region, weather variation, and reviewer. We find that a model accounting for the existence of wine categories has the greater explanatory power in the variability of the data.

This paper extends previous work done by Ramirez (2010) and finds that certain keywords other than the length of the tasting notes will deliver a significant effect on wine price. For example, spice and berry as wine sensory characteristics have significant negative impacts on wine prices, which means consumers do not prefer the taste of spice and berry in red wines. However, it seems that consumers prefer the taste of tannin, one of the common oak influences. For instance, the cost of a bottle of wine with “tannin” in the tasting note could be higher than the cost of a bottle of wine with “spice” in the tasting note. Therefore, researchers and industry participants can understand how the note information affects prices when they introduce new products. A wine producer could benefit from these tasting terms that are specific information compared to a numerical score to maximize its profit margin.
In demand, but unavailable: Purchasing swimwear as a barrier to physical activity for plus-size consumers

Primary Author: Deborah Christel  
Co-Author(s): Susan Dunn, Nicole O’Donnell

College: College of Agricultural, Human and Natural Resource Sciences  
Category: Visual Arts & Design  
Campus: Pullman

Abstract:  
The consumer decision making model consists of five stages in which individuals recognize a need, search for information, assess alternatives, make a purchase decision, and evaluate their decision. It is unknown how this model operates if consumers perceive there to be inadequate apparel options available. This topic is addressed in the current study with a mixed-methods analysis of how plus-size consumers purchase swimwear. First, focus groups were conducted with 18 plus-size women to explore their decision making processes when shopping for swimwear. Data indicated that plus-size consumers are dissatisfied with the availability, price, and limited size ranges of swimwear. To corroborate their experiences, a content analysis of the top one hundred retailers in the United States was conducted. Findings confirmed that plus-size swimwear options are limited, often offered at higher prices, and in fewer sizes compared to smaller sizes. As a result, a modified consumer decision making model is presented that illustrates the consequences of limited plus-size swimwear availability; including, decreased participation in swimming and suppressed positive movement experiences.
Characterization of interspecies variation in plastid-targeted proteins

Primary Author: Ryan Christian
Co-Author(s): Scott Schaeffer
Amit Dhingra

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
The expanding availability of sequenced plant genomes and the development of high-throughput targeting prediction algorithms has made it possible in the last few years to compare and contrast plastid-targeted genes at the bioinformatics level. While much is known about how plastids develop and diverge, little cross-species genetic work has been done to complement these observations. We approached this knowledge gap by combinatorial use of the subcellular localization program TargetP and the clustering algorithms UCLUST and ReMark to identify predicted shared and unique plastid-targeted peptides in seven sequenced plant genomes. This analysis has identified 741 chloroplast proteins shared between all species, while individual species had between 631 to 9185 proteins unique to their plastid proteome. Peptides which are plastid-localized in single species may exhibit novel traits even if their non-plastid targeted function is well known. Apple (Malus x domestica) and switchgrass (Panicum virgatum) were found to have an extreme richness of unique plastid-targeted genes, with 3,647 and 9,185 unique clusters. Because of the current economic importance of apple and the emerging importance of switchgrass for bioenergy, elucidating the function of these genes may help improve horticultural practices and breeding. Furthermore, this work offers an opportunity to shed light on the evolution of plastid-nuclear trafficking and on the evolutionary mechanisms through which proteins become plastid-targeted. And finally, our analysis will provide guidance for how to interpret gene data from one species and apply the results to homologs in other species which may or may not have similar transit peptides.
Green Paradox: The case of the Clean Power Plan

Primary Author: Isaac Duah
Co-Author(s): 

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
It is estimated that 40% of carbon emissions in the United States comes from the electric power industry. In an effort to reduce these emissions, the United States EPA proposed the Clean Power Plan (CPP) in June 2014 under the mandate of the Clean Air Act to be implemented in 2018. The CPP aims to reduce carbon emissions from the electricity industry by 32% below 2005 levels by 2030. Strand (2007) Sinn (2008, 2012), Hoel (2008) demonstrate that environmental policies such as the CPP may create paradoxical results if their implementation does not account for the potential supply side reaction to such policies. The supply side reaction comes about when the owners of carbon intensive resource anticipate reduction in demand in the future (because of the policy), thereby increasing supply in the immediate short term. In the case of the CPP, the interim period between the announcement of the proposal and implementation date (2018) provides room for such supply side reaction. The paper is developed on the premise that the use of coal as a fuel source for electricity generation increases after the announcement of the CPP. Thus, I use Difference-in-Difference estimation technique to measure the impact of the announcement of the CPP on the use of coal in electricity generation. I find that the use of coal in generating electricity has increased since the announcement of the CPP; and even more problematic is that the more dirty coal is driving out the cleaner coal from the electricity generation market.
Identification and expressional profiling of HSP101/CLPB family in bread wheat

Primary Author: Eva Erdayani
Co-Author(s):

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
High temperature stress during wheat growth causes major yield losses in all wheat growing regions of the world. Wheat adaptability to the changing climate conditions becomes one of desirable traits for wheat breeder to maintain and increase yields in a sustainable manner. Heat Shock Protein 101 (HSP101) from the ClpB family has been characterized in various organisms to play a role as a protein disaggregation machine. This role is essential for cell survival under various stress conditions that involve protein damages. Because of various possible mechanisms that involve HSP101/ClpB, a systematic study is needed to dissect their properties and find specific targets for improving heat tolerance. In this study, the homolog and homoeolog copies of wheat HSP101/ClpB genes are identified through bioinformatics analysis and gene cloning. Thirteen HSP101/ClpB genes were found in wheat genome including nuclear encoded organelle-targeted sequences. Protein 3D structure analysis showed 74-93% structural similarity of wheat HSP101/CLPB with the rice and arabidopsis orthologs. Several conserved motifs were predicted to play essential roles in protein functionality, especially at the unique coiled coil regions. The motifs were then correlated with the expression pattern of each copies under the in-silico transcript analysis of HSP101/ClpB at different stress conditions and during different developmental stages. Using realtime quantitative PCR, variations in homoeolog specific gene expressions were observed among heat tolerant and heat sensitive cultivars. These findings are important to provide basic knowledge on how HSP101/CLPB can be utilized to improve heat tolerance in wheat.
Reroute or Wait It Out? Estimating Optimal Route Decisions in the Presence of Unexpected Delays

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Co-Author(s): Jeremy Sage
Eric Jessup
Ken Casavant

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

Abstract:
On rural roads, unexpected delays significantly impact freight as there is rarely a practical alternate route that minimally impacts travel time. This is particularly evident in western states with mountain passes experiencing frequent weather related closures. Such closures generate significant uncertainty in travel time. Truck freight often face narrow expected delivery windows and time spent waiting for a road to reopen is unproductive and costly. As such, in the event of an unexpected weather related closure, drivers are faced with the question of which route is optimal if they decide to reroute at all. This paper develops a model using a recent origin-destination intercept survey of 4600 drivers on Washington’s Snoqualmie Pass. To evaluate driver decisions, over 40k route options are calculated using the Google Maps API, which is based on a shortest duration algorithm. Driver’s stated decisions are compared to the shortest duration output. Only 46% of drivers chose the optimal route as determined by the model. The base model was expanded to include the probability of alternate route closure and road congestion. Results suggest nearly half of drivers fail to correctly state a preference for the least cost routing decision in the face of uncertainty. Such discrepancies between stated and optimal routes generate additional transportation costs that are frequently passed on to the consumer.
Evaluating the Genetic Diversity of Pyrus communis Seedlings

Primary Author: Danielle Guzman
Co-Author(s): Seanna Hewitt
Nathan Tarlyn
Marco Galli
Kate Evans

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
The pear (Pyrus Communis) breeding efforts in the US are focused on developing rootstocks with desirable traits such as dwarffing, disease resistance, vigor, precocity, and cold tolerance. One of the challenges encountered towards this goal is finding genetically diverse parent material and genotypes that are adapted to the US environment. We have established a pear seedling population from crosses between ‘Bartlett’, ‘d’Anjou’, and ‘Comice’ genotypes that are acclimated to US environment. Further, we have also established a population where the pollen was exposed to gamma radiation prior to pollination. Pear leaf tissue was obtained from 185 individuals and DNA was isolated from the leaf tissue using a CTAB extraction protocol. We phenotyped the seedlings and analyzed the genetic relationship among these pear seedlings using Target region amplification polymorphism (TRAP) molecular markers. TRAP analysis involved PCR reactions containing one fixed primer and two fluorescently labeled arbitrary primers for each sample. PCR products were electrophoresed on an acrylamide gel using LICOR 4300 DNA Analyzer, resulting in the visualization of numerous polymorphic loci. A single PCR reaction produced a total of 32 polymorphic loci in a population of 185 individuals. From this analysis we identified 14 distinct sub-populations within the main pear population. This information is expected to strengthen the pear breeding efforts in the US as it will assist pear breeders in selecting genetically diverse individuals with desirable rootstock traits, which contributes to the advancement of pear rootstocks.
Evaluation of multiple approaches to identify genome wide polymorphisms in closely related genotypes of sweet cherry (Prunus avium L.)

Primary Author: Seanna Hewitt
Co-Author(s): Benjamin Kilian
Ramyya Hari
Richard Sharpe
Tyson Koepke
Amit Dhingra

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
Identification of genetic polymorphisms and subsequent development of molecular markers is important for marker assisted breeding of superior varieties of economically important species. Sweet cherry (Prunus avium L.) is an economically important non-climacteric tree fruit crop in the Rosaceae family and has undergone a genetic bottleneck due to breeding, resulting in limited genetic diversity in the germplasm that is utilized for breeding new varieties. Therefore, it is critical to recognize the best platforms for identifying genome-wide polymorphisms that can help identify and consequently preserve the diversity in a genetically constrained species.

For the identification of polymorphisms in five closely related genotypes of sweet cherry, a gel-based approach (TRAP), modified reduced representation sequencing (TRAPseq), a 6k cherry SNParray, and whole genome sequencing (WGS) approaches were evaluated in the identification of genome-wide polymorphisms in sweet cherry cultivars. All platforms facilitated detection of polymorphisms among the genotypes with variable efficiency. In assessing multiple SNP detection platforms, that study has demonstrated that a combination of appropriate approaches is necessary for efficient polymorphism identification, especially between closely related cultivars of a species. The information generated in this study provides a valuable resource for future genetic and genomic studies in sweet cherry, and the insights gained from the evaluation of multiple approaches can be utilized for other closely related species with limited genetic diversity in the germplasm.
Evidence of intralocus recombination at the Glu-3 loci in bread wheat  
(Triticum aestivum L.)

Primary Author: Maria Itria Ibba  
Co-Author(s): Alecia Kiszonas, Craig Morris  
College: College of Agricultural, Human and Natural Resource Sciences  
Category: Agricultural & Natural Sciences  
Campus: Pullman

Abstract:  
The low-molecular weight glutenin subunits (LMW-GSs) are a class of wheat seed storage proteins that play a critical role in the determination of wheat flour bread-making quality. These proteins are encoded by multigene families located at the orthologous Glu-3 loci (Glu-A3, Glu-B3 and Glu-D3), on the short arm of the homoeologous group 1 chromosomes. Due to the complexity of these chromosomal regions and the high sequence similarity between different LMW-GS genes, their genetic organization and recombination characteristics are still incompletely understood. In this study, the presence of intralocus recombination at the Glu-3 loci was investigated in two bread wheat recombinant inbred line (RIL) populations and one doubled haploid (DH) population, all segregating for the Glu-A3, Glu-B3 and Glu-D3 loci. The analysis was conducted using a LMW-GS gene marker system that consists of the amplification of the complete set of the LMW-GS genes and their successive visualization by capillary electrophoresis. Recombinant marker haplotypes were detected in the two RIL and the DH populations with different recombination rates depending on the locus and the population. Tight linkage was observed between amplicons representing i-type and s-type LMW-GS genes located, respectively, at the Glu-A3 and Glu-B3 loci. Results of this study will help to elucidate the genetic linkage present between different LMW-GS genes, the structure of this portion of the genome, and to develop more specific molecular markers that better represent the genetic diversity of these loci.
Biomass Response to Nutrient Stressed Tomato in Biochar and Potting Soil Mix

Primary Author: Daylen Isaac
Co-Author(s): Ryan Christian
Nathan Taryln
Seanna Hewitt
Amit Dhingra

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
Biochar is a product of pyrolysis created from sources of carbon rich plant derived waste biomass. Historically, biochar has been used by many cultures for soil enrichment as well as a source of heat. The Terra Preta soils of Brazil and some fertile areas of Japan are largely due to charcoal integration. However, literature tends to address all biochars as equal in inherent properties. The primary purpose of our study is to evaluate the inherent characteristics of biochar, such as porosity and intrinsic nutrient content, on plant growth and yield. Nutrient deficiencies can lead to physiological disorders impacting the marketability of fruits and vegetables. Ten technical replicates of four types of biochar and three concentrations of each biochar were applied to a variety of tomato, Oregon Spring, grown in a greenhouse setting. All plants were subjected to the same fertilization regime of only four applications in the 80-day growing period. Preliminary results indicate that the presence of some varieties of biochar may mitigate the occurrence of blossom end rot in nutrient deficient systems.
Improved Methodology for Benefit Estimation of Preservation Projects

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Category: Administrative & Information Systems  
Campus: Pullman

Abstract:  
Washington State Department of Transportation (WSDOT) currently utilizes the Federal Highway Administration (FHWA) developed Highway Economic Requirements System, State Version (HERS-ST) model to quantify the benefits associated with all new project construction and existing road preservation and maintenance projects. Traditional methods for estimating the economic benefits of highway projects is not explicitly focused on estimating the benefits of preservation and maintenance type project, this makes it both difficult to estimate and communicate the economic benefit of these types of investments.

The objective of this research is to evaluate and analyze the current process for calculating preservation project benefits and develop improved methods for measuring the benefits of these highway preservation projects. This will be applicable to infrastructure supporting both passenger and freight vehicles.

A survey was send out to all 50 state Department of Transportations to more fully understand those approaches and techniques that other states DOTs are currently utilizing for evaluating the benefits and costs of highway and bridge preservation projects. After a critical assessment of the current process and estimation procedure that WSDOT currently utilizes for project benefit-cost analysis, the research proposed improved modifications to the HERS-ST system. Three preservation projects are selected and evaluated for benefit calculation to compare between the prior and improved model process.
Horizontal Integration and Reputation in the Food Market Industry

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Co-Author(s): Ana Espinola-Arredondo

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

Abstract:
The demand for organic food has steadily increased over time since consumers are becoming more concerned about the negative impact of pesticides on health. This increase has led non-organic companies to acquire organic companies. However, it is unclear how mergers and acquisitions (M&A) affect consumers’ perception.

Our objective is to examine the effects of M&A on firm’s reputation by linking consumers’ subjective beliefs about the product quality which in our model represents firm’s reputation. We develop a theoretical framework to address the following questions: How does the change in consumers’ subjective beliefs affect firms’ incentives to merge and profitability? Conversely, how do mergers influence consumers’ subjective beliefs and purchase decisions?

In the model, we consider a two-stage game in which two firms produce a homogeneous good with different degrees of organic ingredients and quality. In the first stage, firms decide whether or not to merge; and in the second stage, if they do not merge, they compete in prices, otherwise they merge into a monopoly. We assume that consumers do not observe product quality until after they consume the good and they have different valuations for a high and low quality good.

Our results indicate that the more a consumer believes the quality of a product is of high, the more she purchases a good. We also find that consumers’ subjective beliefs about the quality of an organic good promote mergers between a non-organic and an organic producer.
Growing Pains - Government Road, Mattawa, WA

Primary Author: Robert Krikac  
Co-Author(s): Kathleen Ryan  

College: College of Agricultural, Human and Natural Resource Sciences  
Category: Visual Arts & Design  
Campus: Pullman

Abstract:  
Mattawa, Washington is a rural community located in central Washington with a young and growing population. It also has many challenges that are associated with growth, one of which is its main transportation route through the city, Government Road. The City of Mattawa requested the Rural Communities Development Initiative (RCDI) at WSU work with them to develop plans for a “main street” that would serve the many needs of the community.

The RCDI, using faculty and students from the design disciplines of the School of Design and Construction, led a series of two co-design workshops where community stakeholders provided input as to the challenges the community is facing as well as specific needs and wants of their main street. Co-design is “designing with” rather than “designing for”. The major issues identified were traffic congestion and safety, a safe path for children to get to the schools, and access to retail and service providers on Government Road.

The RCDI developed plans that gave the community graphic views of how Government Road could be designed to solve problems and serve the social needs of the town. The first workshop was documented and design possibilities and challenges were presented back to the community in a second workshop. Feedback from the second workshop was used to develop final conceptual plans.

The conceptual plans have been used by a collaboration of professional firms to write a feasibility study. The feasibility study has been submitted to Grant County for consideration of funding the project.
Dog’s Reactions to the Initiation of Animal-Assisted Activities with University Students

Primary Author: Stephanie Kuzara
Co-Author(s): Patricia Pendry

College: College of Agricultural, Human and Natural Resource Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Few studies have provided detailed analyses of animal behavior during Animal Assisted Activities (AAA). Understanding behavior and signs of stress during AAA is important for effective, safe and humane programs for humans and animals. This study examines observational data collected during the first semester of a 3-year, randomized controlled study assessing the effectiveness of incorporating human-dog interaction in an academic stress prevention programs on a university campus.

Analyses were conducted on a subset of data consisting of 400 minutes of continuous video recorded interactions between 35 undergraduate students and 12 registered canine comfort teams in a 4-week stress prevention program. Dog behaviors are described in the context of a transition period of 5 minutes in which dogs are alone with handlers, followed by the 5 minutes when dogs are approached by students. Observations were continuously coded for dog postural state and frequency of grouped dog behavior patterns in response to variation in human interaction behavior.

Recumbence and sitting were the most common postural states in the 5-minute period before interaction with students, while an increase in ambulation occurred during the 5-minute introduction period. Dogs displayed social approach, appeasement behaviors, and displacement behaviors frequently. Variations in these behaviors were related to human approach and petting behavior.

Dogs appear to experience an increased state of arousal during the initial approach of, and interaction with, students. Dogs often initiated contact and expressed social behaviors indicative of conflict avoidance.
Regenerated Cellulose Fibers Manufactured from Post-Consumer Cotton Waste

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Campus: Pullman

Abstract:
Cotton is the major cellulose fiber used in consumer products and its consumption has been increasing steadily in recent years. As a result, post-consumer cotton waste is generated in an accelerating rate. Statistics from the US Environmental Protection Agency indicated that 46 pounds cotton products were abandoned per US adult in 2014. Only a small percentage of the cotton waste (approximately 5%) is reused or recycled for lower grade products, such as paper and cleaning wipes. Majority of the cotton waste ends up in landfills, which creates environmental issues in greenhouse gases generation by anaerobic decomposition of cellulose in landfill. This research studies an innovative cotton waste recycling technique, i.e., manufacturing regenerated cellulose fibers via wet-spinning. Green chemicals (alkalis and mineral acids) that are non-toxic, inexpensive, and recyclable are used as both solvents and coagulation agents in fibers spinning. Continuous fibers with much better luster than cotton are obtained. Naturally colored regenerated fibers are produced by using colorful cotton waste. The results demonstrate the effectiveness of this new cotton waste recycling technique in efficiently using the abandoned natural resource and in reducing the environment impact of the fiber manufacturing process in multiple ways, including green chemicals, 100% recyclable chemicals, and dyeing process elimination.
Direct Pest Exclusion: A Potential Solution

Primary Author: Adrian Marshall
Co-Author(s):

College: College of Agricultural, Human and Natural Resource Sciences
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Shade netting has become increasingly popular over Washington orchards to reduce sun damage to tree fruit. Netting structures, which completely enclose an orchard, may create a barrier to direct pests: including codling moth, Cydia pomonella, and the invasive brown marmorated stink bug (BMSB), Halyomorpha halys. Conversely, the enclosures may disrupt biological control by excluding natural enemies. We tested shade net exclusion of pests and natural enemies at a WSU research orchard using four large (4 rows x 12 trees) and twelve small (3 trees) netted cages, compared to conventional codling moth treated and untreated plots. The native consperse stink bug, Euschistus conspersus, was used as a model organism to determine stink bug exclusion. Samples were from naturally occurring populations except consperse, which were from lab colonies and released near the treatment plots. Results of the 2016 field season revealed that stink bug damage was lower in the cages than in the conventional treatment and the untreated control. Codling moth adult densities and fruit damage were significantly lower in the caged plots. Woolly apple aphid densities were significantly higher in the caged plots, along with its parasitoid Aphelinus mali. Earwigs, an important aphid predator, were higher in small cages, but no differences among treatment means were found in the large cages. Lacewings and syrphid flies capture rates were greatly reduced in the cages compared to uncaged plots. These outcomes suggest that although netting can prevent direct pests, it can also exclude essential natural enemies and lead to disruption of biological control.
U.S. Consumer Response to Collection of Original Styles Featuring Burmese Fabrics

Primary Author: MonThu Myin
Co-Author(s): Carol Salusso

College: College of Agricultural, Human and Natural Resource Sciences
Category: Visual Arts & Design
Campus: Pullman

Abstract:
International fashion apparel integrating traditional fabrics are created by designers around the world. The purpose of this study was to measure consumer response to the aesthetics of traditional Burmese “Acheik” 80% silk and 20% cotton fabrics within five different visual styles of contemporary apparel designs targeted to U.S. consumers. The collection of modeled designs included five different visual art styles inspired by Burmese traditional costumes, and artifacts. In this study, Functional, Expressive and Aesthetic (FEA) Consumer Needs Model (Lamb & Kallal, 1992) was used as the conceptual framework for survey design and analysis. An Amazon Mechanical Turk online survey was used to obtain responses to five modeled designs from a sample 200 women. The purposive sample were 19-40 years of age, mostly white, college educated and from 40 U.S. states. The results of the analysis were two part: (1) quantitative results for demographics and Likert scale questions for five different styles of garments that incorporated the functional, expressive and aesthetic (FEA) considerations and (2) qualitative results as participants’ comments for open-ended questions. FEA analysis showed that a majority of participants agreed with functional considerations of Design A, B, and E and expressive considerations of Design A and B. Subjects enjoyed the aesthetics of all traditional Burmese fabrics used in the collection. Qualitative statements emphasized design strength and weakness across the five designs within aesthetic considerations of attractiveness of style, flattering body, and design character Future design research can build on these findings to create successful designs for U.S. target market.
PRELIMINARY EVALUATION OF A PROGRAM TO HELP LOW-INCOME LATINA MOTHERS HELP THEIR CHILDREN COPE WITH STRESS: A MIXED METHOD APPROACH

Primary Author: Yadira Olivera
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Lee SuYeon
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College: College of Agricultural, Human and Natural Resource Sciences
Category: Social Sciences
Campus: Chelan County Extension

Abstract:
Learning to cope with stress is one of the most important tasks of childhood. Middle childhood (ages 6 to 12) is a period when youth develop valuable coping skills. Although school-based child coping programs exist, the programs cannot provide tailored instruction to meet individual needs and are taught in a context removed from many of the stresses that children experience. Parents can help bridge these gaps by learning to guide or scaffold their children’s coping development. Few culturally sensitive programs are available for at-risk populations like low-income Latino families. The current study used the concurrent nested approach to examine the effects of a parenting education program designed to teach low-income Latina mothers how to help their children cope with stress and to identify program improvements to guide future program implementation. Seventeen mothers with children between the ages of 9 to 12 years old participated in a 7-week long pilot program. The results revealed that mothers were engaged, mothers utilized the program strategies, and mothers reported that their children were noticing changes in their behavior. Quantitative analyses showed that after participation in the program, mothers increased their use of positive scaffolding behaviors, decreased negative scaffolding behaviors, increased emotion coaching behaviors, and increased in some coping knowledge. Surprisingly, the program increased emotion dismissing behavior and maternal inconsistency significantly, whereas maternal nurturance and organization showed no significant differences. Results of the qualitative and quantitative analyses informed 27 recommendations to improve the program for implementation.
Earwigs help apple growers manage aphids and are underappreciated

Primary Author: Robert Orpet
Co-Author(s): 

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Wenatchee--Tree Fruit Research and Extension Center

Abstract:
Earwigs are usually considered to be nuisance pests and sometimes cause economic damage to crops. However, they also have a beneficial role as predators of aphids and other pests. In particular, many studies show that the common earwig (Fodicula auricularia) is an important predator of the woolly apple aphid (Eriosoma lanigerum), a pest of great concern to Washington State apple growers because it is abundant and difficult to manage. This interdisciplinary project addresses the hypothesis that the common earwig is more of a beneficial than detrimental insect in Washington State apple orchards, and to learn the perceptions and experiences that apple growers have with earwigs and woolly apple aphids. In each of five 39-tree sections of an apple orchard approximately 1,700 earwigs were released. In control sections with almost no naturally occurring earwigs (5 sections, 39 trees each), counts of woolly apple aphid colonies averaged about 2.4-fold higher over the whole growing season, with a maximum difference of 6-fold more on September 20, 2016, compared to the earwig-release sections. There was no evidence that earwigs caused damage to apple fruits. However, in-depth interviews with apple orchard managers indicate high uncertainty and low appreciation for earwigs as predators of woolly apple aphids. In conclusion, earwig conservation and a focus on the positive effects of earwigs in future extension activities could result in reduced insecticide sprays (against both earwigs and aphids), and improve pest management outcomes for apple growers.
Allies with Benefits: US Effect on European Demand for Military Expenditures

Primary Author: Ethan Spangler
Co-Author(s):

College: College of Agricultural, Human and Natural Resource Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
This paper examines the security relationship between the US and Europe, focusing on potential spill-over effects of US military expenditures on European demand for military expenditures during the early 21st Century. The goal is to determine whether or not European nations act as security cooperators with the US or free-riders with respect to their military expenditures. Past work in this area has found mixed results concerning the effect of US military expenditures, but focus strictly on the spill-overs within a formal alliance, specifically NATO, and use a time series dominated by Cold War dynamics. This study differentiates itself by accounting for both the US total military expenditures and its regional expenditures in Europe through incorporation of US military base and personnel deployments across Europe. Additionally, this paper also uses government revenue in it’s estimation to mitigate endogeneity. Results using Arellano-Bond dynamic analysis suggest that there is a strong probability of free-riding behavior among European states.
An Integrated Omics Guided Approach to Lignification and Gravitational Responses in International Space Station: The Final Frontier

Primary Author: Charles Conor Pezeshki
Co-Author(s): Michael Costa
Syed Moinuddin
Laurence Davin
Norman Lewis

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
WSU (Lewis lab) is leading a consortium, together with Pacific Northwest National Lab (PNNL), University of Mexico, New Mexico Consortium (NMC), and Los Alamos National Lab (LANL), for a $2M NASA project on International Space Station (ISS). As preparation for the upcoming ISS study, we are laying the groundwork for growing a model plant species on ISS, where we will conduct a comprehensive multi-omics study (metabolomics, proteomics and transcriptomics). The overall purpose here is to further our fundamental understanding of the effects of growing plants in the ISS microgravity environment at the system biology level. Our data will be used as a foundation for molecular, biochemical and chemical studies in space. This research is also important for long term perspectives of producing fresh food during long duration spaceflight, and obstacles to be overcome for settlements outside of earth.

The plant to be used is Arabidopsis (wild type, mutant, and transgenic plant lines) with altered lignin amounts, carbon concentrating mechanisms, and both. One purpose of these ground-based experiments is developing standardized methods for Arabidopsis growth, sampling and tissue preservation to be used by astronauts to collect samples. Various parameters currently being examined include humidity, light levels, nutrient composition, and delivery, to obtain good growth and to determine the effects on overall metabolism. The experiments here serve as a baseline in finalizing ISS conditions; when completed, it will be followed up by both a science verification test (SVT) and an experimental verification test (EVT) at Kennedy Space Center, Florida, prior to ISS.
Control of Bacterial RNA Structures in the Sinorhizobium-Alfalfa Symbiosis

Primary Author: Jason Price  
Co-Author(s): Xingkai Liu

College: College of Agricultural, Human and Natural Resource Sciences  
Category: Agricultural & Natural Sciences  
Campus: Pullman

Abstract:
Availability of fixed nitrogen in soil is a major factor limiting crop yield in agriculture. Rhizobia are soil bacteria that can associate with some legumes and participate in symbiotic nitrogen fixation (SNF). Improved application of SNF in agriculture can alleviate the requirement for the use of chemically fixed nitrogen fertilizers. We identified several small, single-stranded nucleic acid binding proteins, CspAs, as among the most significantly upregulated bacterial proteins in the rhizobia/legume symbiosis and hypothesized that this family of proteins was playing a significant role in SNF.

To investigate the role of CspAs in symbiosis we fluorescently tagged CspA proteins and located their expression to specific developmental zones in symbiotic root nodules using fluorescent microscopy. We generated cspA deletion strains and assessed stress sensitivity phenotypes and we found that a double cspA2/cspA4 deletion strain was less effective in symbiosis with alfalfa. Using RNA-seq, we identified RNAs that interact with CspA, including the unique αR14 family of highly structured sRNAs. We found that abundance of this family of sRNAs was significantly decreased in the double cspA deletion strain. Furthermore, we have developed a new fluorescent-reporter binding assay to investigate CspA-sRNA interactions and found that CspAs increase the switching efficiency between alternative sRNA structures.

We conclude that CspAs contribute to productive symbiotic development by controlling gene expression important for rhizobial stress adaptation through influencing the dynamics of αR14 RNA structures.
Active Community Participation is Vital in Developing Community Vision

Primary Author: Kathleen Ryan
Co-Author(s): Robert Krikac
Monica Babine
John Snyder

College: College of Agricultural, Human and Natural Resource Sciences
Category: Visual Arts & Design
Campus: Pullman

Abstract:
The Sauk-Suiattle Indian Tribes propose to expand their reservation in order to enhance geographic safety and opportunity for their community. The need for expansion was driven by threats to tribal infrastructure from flooding and intensified risks resulting from the SR 530 landslide. The Tribes requested that the Rural Communities Design Initiative (RCDI), WSU Extension and the Division of Governmental Studies and Services (DGSS) facilitate community design.

Community design planning workshops provide an ideal format to identify community issues, concerns and future goals, as all community members have the opportunity to participate. RCDI and DGSS first facilitated a community planning workshop in September 2016 at the Tribal center to frame the individuals’ perspectives on village expansion. Tribal members identified strengths and opportunities which in turn informed the development of a conceptual planning model for the expanded village.

This concept model is not only a visual and written documentation of those strengths and opportunities, it also forms the basis for a community master plan concept model for expansion. These models illustrate community perspectives and encourage continued community member involvement in the process: Tribal members can see the development of their concerns, needs and opportunities from the first workshop throughout the process. And, each stage of the process informs the next stage in a transparent process that is accessible to members.

The next step is a review of the concept model and narrative with the Sauk-Suiattle Tribal Council. The participatory process allows all members of the Tribe to contribute to their future community.
Minimizing Bitter Pit in 'Honeycrisp' Apples

Primary Author: Corina Serban
Co-Author(s): Lee Kalcsits
Jim Mattheis

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Tree Fruit Research and Extension Center Wenatchee

Abstract:
Bitter pit (BP) is a physiological disorder of apple fruit related to low levels of calcium in the fruit. BP symptoms include brown, dry depressions in skin of the fruit. BP is a primary cause of ‘Honeycrisp’ loss at harvest and after storage. The utilization of controlled atmosphere (CA) storage and an ethylene antagonist 1-methylocyclopropene (1-MCP) are common practices used to slow down fruit respiration and to extend the storage life of apples. This study focused on postharvest storage disorders and compared how 1-MCP and rapid CA establishment during temperature conditioning impacted physiological disorder development and fruit quality. In addition to visual disorder assessment, fruit was evaluated using X-ray computed tomography (CT), which is a non-destructive sensing method that helps to detect and quantify internal BP development during storage. Fruit from one commercial orchard near Quincy, WA was obtained and held at 50° F for 7 days. At harvest, maturity analyses (starch index, firmness, soluble solids content, titratable acidity, weight, color, internal ethylene content, dry mater) were performed. Fruit was then stored in air or CA (2.5% O2, 0.5% CO2) and either treated with 1-MCP or left untreated. Fruit remained in CA for 1, 2, 3 or 4 weeks followed by storage in air for 4 months. BP incidence was reduced by 1-4 weeks in CA followed by storage in air, or by 1-MCP treatment the day after harvest followed by CA or air storage.
Extension Economic Impact & Outcomes: A Multi-Method Evaluation Design

Primary Author: Rebecca Sero
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Season Hoard
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College: College of Agricultural, Human and Natural Resource Sciences
Category: Extension
Campus: Spokane

Abstract:
Overview:
Given its unique role as a link between the university and the state, as well as receiver of public funding, Extension is expected to demonstrate its economic impact. To do so, Extension must make use of a comprehensive evaluation. The most relevant and contextually accurate evaluations utilize a multi-method approach, as well as acknowledge the programmatic and geographical diversity within a state. In response, we designed the county level Extension Economic Outcomes and Impact evaluation process. The first piece – the qualitative portion – employs Ripple Effects Mapping (REM) as its primary data collection method. Using Appreciative Inquiry and mind-mapping, REM is an engaging participatory evaluation method that collects impact level findings from collaboratively focused stakeholders (Hansen, et al, 2012). The quantitative piece of this design gathers county-level benchmarks and indicators from a variety of sources, allowing for detailed economic analysis (Jablonski, et al, 2016).

Results:
Each county’s final product includes an infographic to convey the quantitative economic ripple effects of the county-level investment, as well as qualitatively obtained data and stories. The combination of this information articulates the economic impacts, while demonstrating the relevance and public value of Extension to funders and stakeholders. This poster will outline the innovative evaluation design, best practices and lessons learned, and the outcomes discovered during our pilot. This project has provided us the opportunity to explore local, regional, and statewide economic impact in a new and exciting way. The end result is the creation of an evaluation design worth sharing with a broader audience.
Evolution of C-Ph1 gene in polyploid wheat and its application in wheat breeding

Primary Author: Kanwardeep Singh
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Campus: Pullman

Abstract:
Wheat is an allohexaploid (2n=6x=42) that originated after two independent events of polyploidization with three sub-genomes that can pair with one another. In our previous study, we reported the cloning and functional characterization of major chromosome pairing control gene, Ph1 that regulates diploid-like pairing behavior of wheat (Bhullar et al 2014). We have also shown that the novel function of the 5B copy has evolved via neofunctionalization of the C-Ph1 gene that happened due to i) 29bp deletion and ii) 60bp insertion leading to the acquisition of unique motifs; iii) Alternate splicing; and iv) early PI to MI specific expression. Further cloning and structural comparison of gene in diploid progenitors of wheat revealed that 29bp deletion in the 5B copy is polyploidization specific. Similarly, expression analysis in diploid progenitors revealed that gene has highest expression during pollen developmental stages in comparison to hexaploid wheat, where maximum transcript of C-Ph1-5B copy is present during early meiotic stages. Cloning of C-Ph1-5B copy from Triticum dicoccoides with varying level of chromosome pairing control (Ozkan et al 2001) revealed that structurally there are no differences, whereas high pairing lines show weak expression during early meiotic stages in comparison to low pairing lines. Thus, suggesting that C-Ph1 gene evolved its function of chromosome pairing control via polyploidization specific changes in gene structure and expression. Ph1 locus of wheat was successfully used to induce to homoeologous recombination to transfer genes from distant wheat wild relatives and silencing of C-Ph1 gene also resulted in alien/homoeologous recombination.
The low Falling Number problem of wheat: applying knowledge about seed biology to a real world problem.

Primary Author: Stephanie Sjoberg
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Camille Steber

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Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
The Hagberg-Perten Falling Number (FN) test is used by the wheat industry to measure starch degradation caused by alpha-amylase enzyme activity in flour. Grain with high alpha-amylase activity must be sold at a severe discount because it results in poor-quality baked goods. Problems with an excess of alpha-amylase result from two independent genetic causes, insufficient seed dormancy to resist preharvest sprouting (PHS) and a developmental defect called late maturing alpha-amylase (LMA). PHS is the germination of physiologically matured grains on the mother plant when rainy, cool conditions break dormancy and induce germination. Alpha-amylase is naturally produced to mobilize stored reserves during sprouting. In susceptible varieties, LMA is the induction of alpha-amylase in response to an extreme temperature shock can during late seed maturation. Over 8,000 FN data points in 4 years have been collected on WSU Cereal Variety trials at locations across the state. FN data in years without challenging weather didn’t predict FN in environments with LMA or sprouting. Moreover, ANOVA analysis of the entire dataset suggested that genetics accounted for only 15% of the variability for FN. However, such analyses fail to address that there is more than one cause of the problem. When weather data was used to tease apart which low FN events were due to LMA and/or PHS a different picture of heritability emerged. Being able to see the data in terms of separate components will help to making better breeding decisions, and serve as a first step to understanding the genetics of this problem.
Next Generation Farmers: Impacts and Effectiveness of a Bilingual Farm Incubator Program

Primary Author: Kate Smith
Co-Author(s): Marcia Ostrom

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: WSU Mount Vernon NWREC

Abstract:
The question of who will be the next generation of farmers has been a recent focus of national discussion. By 2030, it is estimated that 500,000 US farmers will retire, approximately 25% of current American farmers. Farm Incubator programs have emerged to support beginning farmers through teaching the skills needed to launch a successful farm business and by reducing barriers to entry, including access to land, infrastructure, equipment, markets, and capital. Although many new farm incubator programs have been created, little research exists on the effectiveness and impact of these programs or the role they play in food systems and community development.

The goal of our in-depth case study of the bilingual Viva Farms Incubator Program in western Washington was to determine whether such models can contribute to sustainable community development through successful training and support of beginning organic farmers. This research was conducted in 2016 through interviews with current and past participants, participant observation, and interviews with Viva Farms staff.

Initial research findings indicate that a high percentage of Viva Farms graduates are still farming, utilize sustainable agriculture practices and plan to continue their farm businesses. Additionally, the research documents increased access to farming for minorities, those with limited levels of education, young farmers, and women. One challenge uncovered is that the model alone cannot solve all issues of access for participants after graduation. Overall, our results suggest that the program is successfully training beginning organic farmers and contributes environmentally, socially, and economically to the regional food system.
Response of ‘Gala’ and ‘Honeycrisp’ Apple Trees to Heat and Water Stress on Different Rootstocks

Primary Author: Nadia Valverdi
Co-Author(s):

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: TFREC - Wenatchee

Abstract: Extreme weather condition has been challenging apple rootstocks in Washington State production of high-quality fruit. Little research has been made testing their efficiency under abiotic stress. The aim of the study is to measure the tolerance to abiotic stress of ‘Honeycrisp’ and ‘Gala’ apple trees over different rootstocks (Bud-9, G-41, M-9-T337, and G-890). Abiotic stress treatments were applied to potted trees of one-year-old grown in a greenhouse at WSU-TFREC, Wenatchee in 2016. A water stress treatment of 65% of field capacity, a heat stressed treatment of heated pots and a control treatment were imposed. By the end of the growing season, all trees (72) from all the treatments were harvested and specific leaf area (SLA), stem length, stems dry mass (SDM) and roots dry mass (RDM) were recorded. Preliminary results showed that ‘Gala’ trees have a reduction on RDM of 26% in average for both stress treatments and for SDM shows a decrease of 20% for drought stress and 11% for heat stress in contrast with control treatment. In the other hand, ‘Honeycrisp’ trees RDM show to be less sensitive to both stress treatments showing a reduction of 3% in the water stress treatment and an increase of 3% for the heat stress treatment. For the first year of data collection, we can infer that ‘Gala’ is less tolerant to abiotic stress compare to ‘Honeycrisp’, particularly in combination with a dwarfing rootstock like Bud-9 while ‘Honeycrisp’ show to be more resistant to abiotic stress in all rootstocks combination.
Recounting vs. Reliving: Navigating visitor experience in memorial museum exhibition programming

Primary Author: Carrie Vielle
Co-Author(s):

College: College of Agricultural, Human and Natural Resource Sciences
Category: Visual Arts & Design
Campus: Pullman

Abstract:
Why we tell the stories of terrorism and genocide is evident: to document the atrocities, to honor the victims, to foster healing, and to bring awareness to future generations in the promotion of peace. But HOW do we tell the stories thoroughly and responsibly without forcing the visitor to live, or perhaps worse - to relive, the terrifying experiences?

This research explores the role of personal experience and active memory of the visitor as a chief consideration in the design of memorial museums. How do curators and exhibition designers “design around/design for” the anticipated memory of the visitor to ensure certain qualities of visitor experience while protecting the visitor from continued trauma? This work analyzes how the exhibition teams at the United States Holocaust Memorial Museum in Washington D.C. and the September 11 Memorial Museum in New York City have navigated these challenges.

Additional subject areas examined include: how exhibit designers select and edit which artifacts will be displayed, the issues of “theatricality” and “sensationalism” in memorial design, and how exhibit designs predict and accommodate unpredictable responses by visitors.

Findings have helped inform conclusions that have started to build a theoretical framework to guide future exhibition designers that must sensitively pilot through similar challenges to ensure engaged but insulated visitor experience.
Dual-Purpose Winter Canola: Forage, Silage, and Grain Production

Primary Author: Ely Walker
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College: College of Agricultural, Human and Natural Resource Sciences
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Campus: Benton Co.

Abstract:
Canola is a major oilseed crop. Utilizing canola as a dual-purpose crop can provide producers a low fiber, high-protein forage, as well as a grain crop. Our objective was to determine the feasibility of growing and ensiling dual-purpose winter canola in the Pacific Northwest. Winter canola was planted in mid-August of 2014 and 2015. Plots received one of eight fertilizer combinations. Plots were split in half with a dual-purpose treatment (DPWC) and a grain-only treatment (GOWC). Canola forage was harvested approximately 60 days after planting. Forage was combined per fertilizer treatment and ensiled in experimental silos. Forage was ensiled with alfalfa cubes (CA) and without alfalfa cubes (CO) as an absorbent to reduce effluent losses. After approximately 45 days, silages were removed from silos and samples were taken for fermentation analysis. Forage yields averaged 0.92 and 0.99 t DM/ac in 2014 and 2015, respectively with no differences between fertilizer treatments. As expected, forage DM was low, ranging from 9-13% in 2014 and 15-21% in 2015. Grain yields did not differ between fertilizer treatments, but GOWC grain yield was reduced (P<0.05) in 2015. Silage pH ranged between 4.2-4.7 across all treatments. Lactic acid concentrations ranged from 4.5 to 14.3% of DM across all treatments and acetic acid content averaged 2.4% across all treatments. Alfalfa cubes significantly (P<0.05) reduced effluent losses by 28-40 gal./t of silage, within fertilizer treatments. With the proper management DPWC can provide fall forage and recover to produce a significant grain crop the following summer.
The pruning effects on shoot structures of Fuji apple trees grafted on two rootstocks

Primary Author: Ying-Tsui Wang
Co-Author(s): Gerrit Hoogenboom

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Prosser

Abstract:
Tree architecture is determined by genotypes, vigor of the rootstocks, internal resource competition and external impacts of the environment and horticultural practices such as pruning and training. Many studies have been devoted to analyzing the natural growth patterns of lateral meristems between apple cultivars. However, only a few studies have reported the growth pattern analyses on different rootstocks and pruning treatments. The objective of this study was to conduct the quantitative analyses for investigating (1) the vigor differences between cultivar Fuji grafted on two rootstocks and (2) how pruning affects their vigor. Three types of pruning severities, including no prune, heading and thinning, were imposed on the trees grafted on the rootstocks M9-337 and Nic29 during the winter months. The measurements that were taken included the shoot length, the fate of the lateral bud and terminal bud. The analyses included the proportion of different types of lateral shoots, length of lateral shoots, shoot growth rate and the frequency of released shoots below pruning cut. The preliminary outcomes have shown the vigor differences between two rootstocks and the changes in the types and length of lateral shoots due to pruning. This study would aid adoption of desired pruning strategies for improving canopy form and ultimately increasing production efficiency.
Using calf jackets to minimize cold stress in Jersey calves

Primary Author: Xiaoyu Wen
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Amber Adams-Progar

College: College of Agricultural, Human and Natural Resource Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
Thirty-seven percent of preweaned dairy calves in the United States are diagnosed with an illness or disease each year, with 8 – 11% of these calves dying because of their illness. As homeothermic animals, calves maintain their body temperatures almost constantly, but when environmental temperatures are lower than their thermo-neutral zone (TNZ), cold stress occurs and incidences of illness increase. This study investigated the effectiveness of using calf jackets to minimize the effects of cold stress to improve health and growth performance in Jersey calves. Twenty Jersey heifer calves were randomly assigned to one of two treatments: 1) provided jacket for the first two weeks of life; or 2) not provided a jacket. Calf behavior was recorded using a time-lapse video camera, calf weights were recorded every seven days, and health treatment records were collected. No significant differences were detected between the two treatment groups for calf lying behavior (P = 0.15), average daily gain (ADG; P = 0.42), number of health treatments recorded (P ≥ 0.44), or body temperature (P = 0.71). Lower environmental temperatures caused decreases in hutch (P < 0.0001) and calf body temperatures (P < 0.0001). Lower hutch temperatures led to more calf lying behavior (P = 0.004) and the number of treatments recorded decreased as the calves aged (P = 0.002). Although the environmental temperatures documented during this study were below the TNZ for dairy calves, the temperatures may not have been sufficient to detect the impact of calf jackets on calf behavior, health, and growth.
Development of a dry inoculation method using freeze-dried Enterococcus faecium NRRL B-2354 for microbial thermal inactivation in low moisture foods

Primary Author: Jie Xu
Co-Author(s): Juming Tang

College: College of Agricultural, Human and Natural Resource Sciences
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Inoculation method influences heat resistance of microorganisms. Wet cultures are commonly used for low moisture food inoculation. However, wet-inoculation methods applied in low moisture foods influence moisture content and physical properties of the inoculated foods, e.g., caking and clumping, which may impact the results of thermal inactivation. The objective of this study was to develop a dry-inoculation method by using freeze-dried E. faecium NBRL-2354 for studying microbial thermal inactivation in low moisture foods.

Stock culture of E. faecium NRRL B-2354 grew in TSB broth for 24 h at 37°C. Two protectants, freeze-drying buffer and 10% skim milk solution, were mixed separately with E. faecium (designated as BD and SMD, separately). Their protective effects were examined by survival tests. Reproducibility of freeze-dried inoculum was evaluated in three independent batches. Heat resistance of freeze-dried inoculum in wheat flour (water activity 0.45 measured at room temperature) at 80°C was determined and compared using decimal reduction time (D80) by thermal inactivation. Stability of the freeze-dried inoculum over time (vacuum stored at -20°C for 35 days) was further compared.

SEM observation showed that both protectants formed slime layers around bacterial cells, which may yield freeze-dried inoculum with a higher survival probability compared with control. The preparation protocol was reproducible with a small standard deviation range in populations of freeze-dried inoculum among batches. BD and SMD showed similar heat resistance (D80, BD: 6.67±0.16 min, D80, SMD: 5.92±0.39 min) and inactivation behavior, compared to wet culture (WE). Freeze-dried inoculum was stable with a high population level (>9.5 CFU/g), while only SMD showed stable heat resistance during storage. SMD is the optimum dried inoculum and can be used as a substitute for wet-inoculation methods in thermal inactivation studies with low moisture foods.
Polymer assisted biogas production from flushed dairy manure in an Anaerobic Sequencing Batch Reactor

Primary Author: Iftikhar Zeb
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Gopi K kafle
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Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
Anaerobic digestion is an environment friendly way to extract bio-energy and reduce adverse environmental impact of manure produced in large livestock farms. However, its adoption is still low largely because of low biogas production. Cationic polyacrylamide (CPAM) flocculant has been used to separate manure followed by separate digestion of either solid or liquid fraction of manure to produce biogas. This study evaluated the effects of CPAM on biogas production from flushed dairy manure in anaerobic sequencing batch reactor (ASBR) without prior separation of solids from liquid. Three CPAM dosage treatments of 10 ppm, 25 ppm, and 50 ppm were tested in this study. Results showed that the 50–ppm dose resulted in highest specific biogas yield. At 6 d hydraulic retention time (HRT) and continuous treatment of the feed-substrate, steady state specific biogas yield for the 50–ppm treatment was 491 ± 7 mL/g TCOD (56% higher than control). Operating ASBR at 4 d HRT for the 50–ppm treatment resulted in 465 ± 8 mL/g TCOD (20% higher than control) at steady state. The ratio of total volatile fatty acid to that of alkalinity was 0.29 ± 0.08 during the 6 d HRT and 0.14± 0.02 during the 4 d HRT; indicating good digester health (no souring), for either HRT. Thus, flocculation of substrate with CPAM is a technically viable approach for enhancing biogas yield of flushed dairy manure.
Know your neighbor: spatial effects of state export promotion and infrastructure investment

Primary Author: You Zhou
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Eric Jessup
Kenneth Casavant

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

Abstract:
Highway infrastructure investment decisions are increasingly multifaceted. The last decade has witnessed environmental concerns rising to be one of the most important factors. Capital competition between U.S. states is often considered as a factor driving many states’ lax environmental standards. In this paper, the impact of investment in highway infrastructure on emissions from freight transportation is investigated. Highway investment can directly increase emissions through providing a better highway infrastructure, leading to more transportation activities. Additionally, government agencies are likely to favor investment projects in public infrastructure to the benefits of export. As a result, higher export volume further increases the demand for freight. A panel data model is employed to analyze the state-level freight carbon dioxide emissions from 1995 to 2011. The results show that both direct and indirect effects are positive and significant while the direct effect is seven times larger than the indirect effect. Additionally, by adding a neighbors’ emission variable, a spatial panel data model is used to further investigate the interaction between state’s own emissions and its neighbors. Interestingly, the results demonstrate a negative and significant relationship. This may imply that a transport policy promoting investment from neighbors can absorb some freight activities on own state roads. Our simulated emission trends indicate that the total effect of highway spending with the spatial effect is lower than the case excluding the spatial effect while the reduced extent varies in states with different emission levels.
The origins of cooperation: contingent movement, reproduction, and death

Primary Author: Tiffany Alvarez
Co-Author(s):

College: College of Arts and Sciences
Category: Liberal Arts & Humanities
Campus: Pullman

Abstract:
Work on the origins of cooperation has been aided by computer simulation and game theoretical approaches. Previous lines of work have evaluated the success of such strategies in environments that simulate agent interactions too abstracted from real-world processes (e.g. with agents interacting in a round-robin fashion and/or according to stochastic matching processes). Furthermore, previous simulations have not examined the effect evolutionary processes capable of constraining reproduction and moderating agent deaths have on the ability of a strategy to outcompete defectors.
The present work addresses the origins of cooperation by evaluating the evolutionary fitness of agents who employ a cooperative strategy of minimal cognitive complexity and who use contingent movement to avoid repeated interactions with defectors of comparable complexity (“Walk-Away strategists”). This study is a replication of a previous model that tested the viability of Walk-Away but differs in that it adds evolutionary parameters that affect agent survivability. Thus, the goal of the present study is three-fold: (1) to simulate an environment in which interactions systematically depend on the way agents move through space, (2) to explore the performance of a cooperative strategy (“Walk-Away”) when it is pitted against three strategies of comparable complexity and (3) to test the evolutionary success of this strategy when real-world reproduction, death, and senescence parameters are put in place.
The agent-based computer simulations reported here suggest that despite its simplicity the Walk-Away strategy can outcompete members of the population even when selection parameters mirroring real-world reproduction and death are put in place.
A Network Analysis of International Trade in Plastic Waste

Primary Author: Yikang Bai
Co-Author(s): Tom Rotolo

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
While a substantial number of network studies have examined the overall international trade, few have explored international trade in hazardous wastes. Drawing on the data from United Nations’ Comtrade Database, this study takes the approach of network analysis to examine international trade in plastic waste, one major type of hazardous wastes. The findings of this study are generally consistent with the propositions of ecologically unequal exchange, which hold that developed countries externalize environmental hazards to less developed countries. Developed countries, which occupy the core position in the world economic system, were extensively involved in plastic waste trade during the past two decades. Although the developed countries imported waste, they were the major exporters of plastic waste. Among the developed countries, countries at the top exported extremely large amount of plastic waste to other countries. Developing countries, especially China, imported a large proportion of plastic waste. In recent years, a few South and Southeastern Asian countries, such as India, Thailand and Malaysia, became more extensively involved in plastic import.
Abstract:
The Wyoming province contains some of the oldest rocks in North America, preserving a long history of magmatism and metamorphism from the Mesoarchean to the Mesoproterozoic. Determining when and how these rocks formed is important not only for understanding the geologic history of this region, but also for understanding how North America was formed and assembled. In this study we use U-Pb zircon Lu-Hf, and Sm-Nd garnet geochronology to determine magmatic and metamorphic ages to constrain the geologic history in the Ruby Range in southwestern Montana. In detail, the focus of this study is on the Christensen Ranch Metasedimentary Sequence (CRMS), a package of metasedimentary lithologies located along the western flank of the Ruby Range. Previous work by co-author Baldwin and students (Cramer, 2014) on a garnet-sillimanite paragneiss revealed monazite dates from 1.78 to 1.71 Ga, interpreted to indicate a major tectonic event involving the collision of two continental blocks during the Big Sky orogeny (Harms et. al. 2004). In the present study, we determined garnet Lu-Hf, Sm-Nd and zircon U-Pb ages from a mylonitic garnet leucogneiss. The garnet Lu-Hf analyses yield a well-defined date of 2428 ± 7 Ma based on 3 garnet fractions and associated whole rock. Zircons separated from this leucogneiss yield U-Pb dates identical to the garnet date: a weighted-average 207Pb/206Pb date of 2429±26 Ma. These new dates indicate a period of crustal melting preserved in the Ruby Range prior to the 1.78-1.71 Ga metamorphism attributed to the Big Sky orogeny.
Characterizing Omission Errors in Everyday Task Completion and Cognitive Correlates in Individuals with Mild Cognitive Impairment and Dementia

Primary Author: Jenna Beaver
Co-Author(s): Mary Boege
Kaci Wilson
Rachel Braley
Maureen Schmitter-Edgecombe

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Objective: Functional ability declines with age and cognitive impairment. This study investigated errors of omission made by community-dwelling older adults completing everyday tasks in a naturalistic setting.

Method: Sixty-five cognitively healthy older adults (HOA), 52 individuals with mild cognitive impairment (MCI), and 13 individuals with dementia completed neuropsychological measures of memory, processing speed, and executive functioning, as well as eight different activities of daily living in a naturalistic environment. Task steps were divided into preparatory, action-oriented, and concluding steps, and proportion of omission errors was calculated for each step type across the eight activities and compared across groups.

Results: For action-oriented steps, the number of omission errors increased with level of cognitive impairment (i.e., HOA < MCI < dementia). In contrast, for preparatory and concluding steps, the dementia group committed more omission errors than both the MCI and HOA groups, but the MCI and HOA groups did not differ. Memory consistently correlated with all three types of omission errors for the neurologically impaired group (i.e., MCI and dementia).

Conclusions: The results suggest that action-oriented steps in everyday task completion may be the first to be affected in the process of cognitive decline, whereas preparatory and concluding steps may be preserved longer, only beginning to show declines in later stages of impairment (i.e., dementia). Memory was found to be related to all types of omission errors in everyday activity completion in the neurologically impaired group.
The Importance of Context: Capturing a Person with Dementia’s Experience with Prompting Technology

Primary Author: Rachel Braley
Co-Author(s): Roschelle Fritz
Catherine Van Son
Maureen Schmitter-Edgecombe

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Purpose of the study. Technologies which aid in caring for persons with dementia (PWDs) are being developed to decrease caregiver stress and increase users’ functional independence. To improve prompt technologies, this study sought to inductively understand how PWDs respond to automated prompting.

Design and Methods. In this novel interdisciplinary qualitative descriptive study, two students viewed archived videos without audio of fifteen PWDs as they completed independent activities of daily living in a smart home testbed. Participants received verbal auto-prompting when needed for task completion. Students recorded in-the-moment behavioral observations and then reflected on their overall impression of the PWD’s experience with prompts, resulting in two transcripts per student per participant (N=30). Content analysis was the primary method of organizing data into themes.

Results. PWDs who respond well to prompting are moved to complete a task and generally complete it successfully, with focus. PWDs not responding well exhibit emotions and behaviors that appear incompatible with the idea that prompting can assist with improving quality of life and independence. Factors that may affect a PWD’s experience include stage of cognitive decline, fatigue level, environment, prompt personalization, and the option to communicate with another human rather than the prompting system.

Implications. To provide a positive experience for the user, prompting systems need to account for a multitude of contextual factors and should be developed in conjunction with users’ direct experiences with it. Such technologies would also benefit from further exploration of how to minimize human involvement.
Race War? Race Relations inside Wartime Japan

Primary Author: W. Puck Brecher
Co-Author(s): 

College: College of Arts and Sciences
Category: Liberal Arts & Humanities
Campus: Pullman

Abstract:
The brutality and racial hatred exhibited by Japan’s military during the Pacific War has piqued outrage in the West and fanned resentments throughout Asia. Public knowledge of Japan’s wartime atrocities, however, has failed to distinguish between the racial agendas of its military and government elites, and the racial values held by the Japanese people. While not denying the brutalities committed by the Japanese military, my new book Honored and Dishonored Guests: Westerners in Wartime Japan (Harvard University Asia Center, 2017) overturns standard narratives by demonstrating that Japan’s wartime racial attitudes are more accurately discerned not in its handling of enemy POWs, but in its treatment of Western civilians living in Japan. The book recovers and chronicles Western communities in wartime Japan and uses that body of experiences to reconsider allegations of Japanese racism and racial hatred. Its bold thesis is validated through a broad mosaic of stories from dozens of foreign families and individuals who variously endured police harassment, suspicion, relocation, starvation, denaturalization, internment, torture, as well as extraordinary acts of charity. The book’s accounts of stranded Westerners from Tokyo, Yokohama, and Kobe to the mountain resorts of Karuizawa and Hakone yield a unique interpretation of race relations and wartime life in Japan.
Cooperation and Competition in Face to Face and Computer-Mediated Interactions

Primary Author: Samantha Cacace
Co-Author(s): Craig Parks**

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Group cooperation has been extensively examined in face-to-face and online environments individually, but this study seeks to compare cooperation in mixed atmospheres. Participants engage in either a cooperative or competitive task with other students at Washington State University. Participants believe that they are either interacting with students at another university or with other WSU students against students at another university, respectively. The purpose of this study is to determine whether cooperative and competitive aspects of group dynamics comply with theory, and if face-to-face cooperation or online cooperation is more reliable. Additionally, this study is designed to determine if participants perceive a larger, umbrella team such as the Washington state university system as cohesive when compared to fellow Washington State University students. We hypothesize that competitive groups will be more cohesive than cooperative group, and competitive groups will be more productive on their assigned task. Cooperative groups will likely feel less motivation due to group dispersion in the larger organizational context, and competitive groups will feel closer to their fellow WSU students. Data collection for this project is still in progress.

**Denotes 2017 Celebrating Excellence Award Recipient
EXPLAINING INCREDIBLY BASIC INFORMATION TO DOLTS NEGATIVE REACTIONS TO FAILED PERSUASION ATTEMPTS

Primary Author: Mycah Harrold
Co-Author(s): Joyce Ehrlinger

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Classic research demonstrates that individuals consistently direct negative attitudes to members of out-groups. We proposed this effect would be amplified in cases where another person was viewed as definitively, rather than ambiguously, a member of the out-group. We hypothesized that people’s perceptions of political opponents’ attitudes as more changeable would predict greater perceptions of overlap between the self and the opponent and, in turn, more positive outgroup attitudes, compared to those who viewed the opponent’s attitude as more fixed. Our experimental condition did not successfully manipulate perceptions of attitude malleability. However, participants who viewed a hypothetical opponent’s opinion as fixed perceived less self-other overlap with this partner and, in turn, reported less liking of their partner, compared to participants who believed the opponent’s views to be more malleable. Higher endorsement of an opponent’s attitudes as unchangeable also correlated with greater infrahumanization directed at the partner. These findings suggest that perhaps it is not failing to persuade an opponent, but instead perceiving that such persuasion attempts would never work, that drives some of the animosity directed at political opponents.
Diversity, antimicrobial activity and chemical fingerprinting of marine actinomycetes

Primary Author: Ruhnaz Kashfi
Co-Author(s): David Gang

College: College of Arts and Sciences
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
The need for novel antibacterial compounds stimulated the exploration of marine environment for bioactive secondary metabolites. Many times marine bacterial screening rediscovered known species leading to a laborious and time consuming inefficient discovery process. Our approach involves, genus and possibly species level identification of samples from diverse locations, mass spectrometry based fingerprinting method and creation and expansion of database containing new actinobacterial species. In an initial study, replicate samples from 7 geographical locations and 54 collection sites were analyzed to investigate the diversity of marine actinobacteria in terms of antimicrobial properties and growth environment. 16S rRNA sequencing on extracted, PCR amplified DNA samples helped identification at least to the genus level. Chemical fingerprinting based on chemical analysis of secondary metabolites excreted during cultivation, helps to explore the chemical picture of the produced set of metabolites without their individual isolation. Ultra performance liquid chromatography (UPLC) is an excellent tool for natural product analysis. Ethyl acetate (EA) extracts of the bacterial samples were analyzed by UPLC, data being analyzed using Progenesis QI software. Antibacterial activity, tested for each actinobacterial culture using crude extracts against 5 different resistant pathogens.
Actinobacterial library creation is ongoing using Bruker Biotyper software, from samples analyzed in a Bruker UltrafleXtreme. Among 80 initial samples, 9 showed antimicrobial activity against Acinetobacter baumannii (AB), Methicillin resistant Staphylococcus aureus (MRSA), and Enterococcus faecalis (EPH). Extension of the database using samples from different geographical locations, combined with antimicrobial activity testing results will make future identification of new, novel actinobacterial species routine.
Mathematical modeling of ocular blood flow

Primary Author: Sergey Lapin
Co-Author(s):

College: College of Arts and Sciences
Category: Mathematics
Campus: Pullman

Abstract:
Open angle glaucoma (OAG) is the second leading cause of blindness in the world and is characterized by changes in the optic nerve head and retinal ganglion cell death, resulting in irreversible vision loss. The lack of understanding of the roles of various risk factors in OAG constitutes a major limitation in the diagnosis, management and treatment of OAG. One of the known risk factors for glaucoma is elevated intraocular pressure. Mathematical modeling offers an important tool for understanding the relative influence of risk factors by linking the mechanical action of IOP on ocular tissues to the blood flow and oxygen transport within the ocular tissues. The main objective of this work is to study the relationship between intraocular pressure, blood pressure and blood flow autoregulation in the retinal vasculature and develop mathematical models that can be used to model conditions specific to individual glaucoma patients.
No Barriers: A Blind Man's Journey to Kayak the Grand Canyon

Primary Author: Buddy Levy  
Co-Author(s): Moscow Moscow

College: College of Arts and Sciences  
Category: Liberal Arts & Humanities  
Campus: Pullman

Abstract:
Erik Weihenmayer is the first and only blind person to summit Mount Everest, the highest point on Earth. Descending carefully, he and his team picked their way across deep crevasses and through the deadly Khumbu Icefall; when the mountain was finally behind him, Erik knew he was going to live. His expedition leader slapped him on the back and said something that would affect the course of Erik’s life: “Don’t make Everest the greatest thing you ever do.”

No Barriers is Erik’s response to that challenge. It is the moving story of his journey since descending Mount Everest: from leading expeditions around the world with blind Tibetan teenagers to helping injured soldiers climb their way home from war, from adopting a son from Nepal to facing the most terrifying reach of his life: to solo kayak the thunderous whitewater of the Grand Canyon.

Along the course of Erik’s journey, he meets other trailblazers—adventurers, scientists, artists, and activists—who, despite trauma, hardship, and loss, have broken through barriers of their own. These pioneers show Erik surprising ways forward that surpass logic and defy traditional thinking.

Like the rapids of the Grand Canyon, created by inexorable forces far beneath the surface, No Barriers is a dive into the heart and mind at the core of the turbulent human experience. It is an exploration of the light that burns in all of us, the obstacles that threaten to extinguish that light, and the treacherous ascent towards growth and rebirth. (written by Erik Weihenmayer and Buddy Levy)
Ecological Response and Innovation in the Evolution of Social Learning Strategies

Primary Author: Aaron Lightner
Co-Author(s):

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Evolutionary game theoretic models of social and asocial learning strategies suggest that populations of asocial learners derive no fitness benefit from the inclusion of social learners, essentially because social learners gain information at low cost without contributing innovations of their own. This conclusion clashes with intuitive and empirical notions that social learning (i.e., culture) substantially enhances individual fitness among groups, a conflict referred to as Rogers’ paradox. Various approaches to resolving Rogers’ paradox have employed mathematical models, cultural theory and spatially explicit models. An example of the latter was conducted by Rendell et al (2010), accounting for parameters such as ecological variability and harshness, and for the ability to switch strategies in response to error. Moreover, some psychological research has suggested that creativity is a sexually selected trait, and thus enhances fitness. This could theoretically change the incentive structure of an evolutionary game as described in Rogers’ paradox, by adding favorability to asocial learners and increasing mean fitness in the population. For this study, the spatially explicit model by Rendell et al was replicated with a thoroughgoing exploration of their original parameter space. The simulation was then repeated with a new incentive structure which reflected sexual selection favoring creative (i.e., asocial) learners. Comparing the outcomes of these simulations will provide insight about the relative weights with which innovation, successful environment tracking, and cost minimization in ecological contexts all define culture as a vehicle for the evolutionary success of our species.
Genetic accounts of psychopathy and legal decision making: The moderating effect of gender

Primary Author: Joyce Lui
Co-Author(s):

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Research is mixed on the impact of presenting biological/genetic evidence in the courtroom. Some studies found that the presentation of biological/genetic explanations of violence leads to shorter sentencing (Aspinwall, Brown, & Tabery, 2012), while other studies found that the presentation of genetic information was not associated with reduced perceptions of guilt or criminal responsibility (Cheung & Heine, 2015). This highlights the “double-edged” nature of using biological/genetic information in the courtroom. This phenomenon has not been examined in the context of psychopathy. Previous research also found that females receive more lenient sentences than males for similar violent offenses (Rodriguez, Curry & Lee, 2006). The current research investigated how potential jurors view psychopathic violent offenders when presented with genetic versus environmental explanations of psychopathy, as well as how the gender of the offender may impact decisions. Participants read a hypothetical case about a physical assault involving either a male or female offender, and they read explanations of either genetic or environmental causes of psychopathy. Participants then completed questions related to legal decision-making (e.g., verdict, sentencing). Results showed that judgments of female offenders were more influenced by the accounts of their behaviors. When psychopathy was explained by environmental causes, females but not males were seen as more likely to change. When psychopathy was explained by genetic causes, females were seen as less likely to change. Consistent with the double-edged sword account, psychopathy was not clearly perceived as an aggravating or mitigating factor, and that this partially depended on the gender of the offender.
Race Differences in the Effect of Education on Depression Among Those From Poor Family Backgrounds: Evidence for Resource Substitution Theory

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

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Does minority status condition education's positive effect on psychological well-being among those coming from poor family backgrounds? Resource substitution theory predicts that education lowers depression more for racial minorities because their lower socioeconomic status (SES) makes them depend more on education to achieve mental health. Data from two waves of The National Longitudinal Study of Adolescent to Adult Health lend support for the theory of resource substitution. Personal earnings, and to a much greater extent, personal control, partially accounted for the conditioning effects of minority status in the relationship between earning a bachelor’s degree and mental health.
Sculpting the Past: Expanding 3D Printing in the Art History Curriculum  
(IRB 14933)

Primary Author: Hallie Meredith  
Co-Author(s): N/A

College: College of Arts and Sciences  
Category: Visual Arts & Design  
Campus: Pullman

Abstract:  
The focus of this investigation is whether 3D printed models have the potential to help students learn better as part of introductory and upper-level art history classes. In Spring 2016, 3D printed sculptures were integrated in the curriculum. This developed from a project begun in 2015. There is no local art museum with ancient material for students taking art history classes. To mitigate this and to give students the experience of viewing art from antiquity, in Autumn 2015 Fine Arts majors and non-majors enrolled in an art historical lecture class were given an assignment incorporating 3D printed sculptures. Material was selected from Prehistoric to Medieval times, western and non-western works. Resources were generously provided by Academic Outreach and Innovation.

The pilot study involved students in a course with over 100 students. Individually, students analyzed 3D printed sculptures. Qualitative research took the form of pre- and post-assignment questionnaires and student reflections. Student feedback was applied in Spring 2016 and the target audience was broadened to include upper level undergraduates. The overarching goals were to engage introductory level students new to the history of art by providing an experience working with three-dimensional versions of real works of art and, concurrently, to motivate majors and students familiar with the history of art by learning about and viewing lesser known pieces related to topics introduced in class. A selection of printed ancient sculptures will be on display in April as part of a joint exhibition with 3D printed work designed by Fine Arts students.
The Impact of Women’s Faculty and Leadership Representation on Women’s Undergraduate Engineering Enrollment in the U.S.

Primary Author: Sarah Morton
Co-Author(s):

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Women remain underrepresented in science, technology, engineering, and math in the United States. Previous studies examine individual level data, finding that factors such as perceptions and a lack of a sense of belonging perpetuate women’s underrepresentation. However, these studies do not take into account other structural characteristics that may impact this disparity.

This study uses department level data from the American Society for Engineering Education to examine how women’s presence in engineering faculty and educational leadership positions impacts women’s share of enrollees in engineering programs, including five popular engineering subfields (mechanical, electrical, chemical, biomedical, and civil). Using Kanter’s tokenism theory as a foundation, I hypothesize that engineering departments with higher proportions of women faculty and education leaders will have higher proportions of women enrolled in engineering. I analyze the data using regression analysis, and briefly examine potential tipping points to explore non-linear relationships.

I find a significant positive association between the share of women faculty and share of women students in engineering programs, especially in heavily male-dominated subfields. For engineering as a whole and civil engineering, I find that women’s representation in undergraduate engineering levels off at about 15 percent women faculty. Although this study is not without limitations, these results establish ideas for future research strategies and have implications for engineering education more broadly. Ultimately, understanding the mechanisms behind women’s underrepresentation in engineering could inform policies and practices to increase women’s representation in STEM fields, creating a more competitive and diverse STEM workforce.
Efimov studies of an ultracold cloud of K-39 atoms in microgravity: Numerical modelling and experimental design

Primary Author: Maren Mossman
Co-Author(s): Jose D'Incao
Peter Engels
Deborah Jin
Eric Cornell

College: College of Arts and Sciences
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
We present the design and modelling of experiments that exploit quantum degenerate gases on board the International Space Station (ISS) to investigate frontiers of few-body physics. Quantum degenerate gases are atomic vapors cooled to temperatures of just few billionths of a degree above absolute zero. At these ultracold temperatures, a gas becomes a powerful tool for investigating few-body physics. A particularly intriguing few-body phenomenon is the existence of a series of Efimov trimer states, which consist of three weakly bound atoms and follow universal geometric scaling relations. Despite tremendous progress over the past few years, the experimental characterization of these states is still very challenging. We present the results of analytic and numerical studies and simulations, demonstrating that a microgravity environment is an ideal setting for reaching the required ultracold temperatures and super-sparse densities. We have extensively modelled and simulated experiments that we plan to conduct on the ISS, exploiting NASA's Cold Atom Laboratory, a remote controlled instrument that is scheduled to launch in 2017. The planned experiments will provide significant new experimental data that is needed to advance our theoretical understanding of few-body physics. The insights gained will help us better understand the opportunities and difficulties we may encounter in our effort to develop future quantum technologies. In conclusion, our analysis reveals that few-body studies in microgravity onboard the ISS are an exciting new avenue to advance our understanding of fundamental quantum dynamics.
Interactions between indium solute atoms in intermetallic GdAl2

Primary Author: Ryan Murray  
Co-Author(s): Gary Collins

College: College of Arts and Sciences  
Category: Engineering & Physical Sciences  
Campus: Pullman

Abstract:  
GdAl2 samples containing extremely dilute 111In probe activity and up to 1 at.% of natural indium solute were studied using the technique of perturbed angular correlation of gamma rays. Two kinds of experiments were carried out. (1) Samples were prepared with 1 at.% natural indium while varying the proportions of Gd and Al to make Gd-poor, stoichiometric, and Gd-rich samples. Spectra were recorded in equilibrium at temperatures between 300°C and 800°C. Three quadrupole interaction signals were observed, two corresponding to 111In probes on Gd- and Al-sites without nearby defects, and a third attributed to In-probes with neighboring In-solute atoms. Site fractions did not vary appreciably with temperature, suggesting that the interaction enthalpy between a pair of indium solute atoms is very small. (2) Measurements were made of temperature dependences of site fractions for a series of samples in which the concentration of natural indium was varied between 0.1 and 1.0 at.%. With increasing temperature, transfer of probes from Gd- to Al-sites was observed, as in previous measurements on solute-free samples. However, addition of natural indium was found to suppress the transfer enthalpy of In-probes from Gd- to Al-sites by an amount proportional with the mole fraction of solute, from a value of 0.34 eV in the absence of solute to 0.00 eV for 0.5 at.% In. A thermodynamic model explaining how the presence of indium solute affects the transfer of indium probes will be presented and discussed.
Acute stress alters specific elements of cognitive flexibility in chronic cannabis users

Primary Author: Amy Nusbaum
Co-Author(s):

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
As recreational use of marijuana becomes increasingly common, there is an urgent need to better understand the long-term consequences of its use. In terms of effects on cognition, the current literature on chronic marijuana use is equivocal. Here we contrast chronic marijuana users and control subjects on multiple measures of cognitive flexibility (CF), the ability to adjust cognitive and behavioral strategies to changing environmental circumstances. We also manipulated acute stress using the Maastricht Acute Stress Test to determine if chronic cannabis use is associated with different physiological and cognitive stress reactions. Self-reported chronic users (N=40) and non-users (N=43) were randomly assigned to stress and control conditions, and then performed two different tasks measuring CF: (a) a well-established task switching measure, which also included assessment of the ability to overcome response competition, and (b) a novel measure of the ability to adjust top-down control of attention with shifts in the validity of cues that predicted the identity of target stimuli. The acute stress manipulation was effective, leading to increased cortisol levels and subjective stress ratings. Chronic cannabis users generally performed well on the CF measures, but when they were under acute stress they showed a larger effect of task switching on trials that required both inhibition of a dominant response and a switch from a previous rule. Our results suggest that investigations of the effects of chronic marijuana use on cognition should consider whether the effects vary depending on the degree to which situational challenges are also present.
Building a Christian Empire in Africa: Protestantism, Human Rights, and the American Congo Reform Movement

Primary Author: Randal Powell
Co-Author(s):

College: College of Arts and Sciences
Category: Liberal Arts & Humanities
Campus: Pullman

Abstract:
In general, historians and philosophers contend that human rights developed independently of religion. However, John Rawls’ conception of “overlapping consensus” illustrates the potential for secular and religious people to find common ground on social issues despite coming from different backgrounds. Expanding on Rawls, my work explores the contours of the American Congo Reform Movement from roughly 1890 to 1915. Throughout the period, I argue that Protestant Americans actively worked with more secular British reformers to stop colonial abuses in the African Congo in one of the first transnational human rights campaigns. Under the control of the Belgian king, Leopold II, natives of the Congo Free State basin suffered enormously as they were coerced by colonial officials to harvest rubber and other resources for the European market. Believing such abuses prevented them from spreading Christianity in Africa, American Protestant threw their efforts behind reform.

Through extensive analysis of primary sources such as magazines, letters, tracts, newspapers, books, and mission reports, I found that African American and white missionaries in the United States, hoping to build a Christian empire throughout the world, overwhelmingly led the charge in reforming Leopold’s Congo. To achieve their goals, Protestant men and women actively joined with secular reformers in the U.S. and Great Britain, who had little desire in propagating Protestant Christianity. While these reformers worked with disparate ideologies, secular and religious activists cooperated in crafting the human rights ideology that has prevailed in modern society.
Using Learning Interdependence to Promote Student Collective Action

Primary Author: Joshua Premo
Co-Author(s): Andy Cavagnetto

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Immersive science learning environments have been suggested as a vision of how science classrooms could optimize student learning. Generating immersive science learning environments require a higher level of cooperation with students functioning as a whole class collective. While cooperative learning research has focused on the impacts of interdependency on small group learning it may also have impacts on student collective action. This was tested in an undergraduate class learning science content (n = 19) through the periodic removal of social interdependency (task and resources) during student science learning. Students completed six science learning sessions each of which included a science learning activity followed by a collective assessment task. Student behavior during the collective task was video recorded and coded in ten second intervals for each student during the each session (n intervals = 5351) by two independent raters (k = .843). Generalized regression results showed that removing prior small group interdependency during learning predicted significantly less student discussion of science content (p < .01) and supporting of peers (p <.001) while predicting increased student voicing of science misunderstanding (p <.001) during the collective task. Moreover the combination of task and resource interdependency predicted increased student off task behavior with peers (p <.001) in comparison to task interdependency alone. Together these findings show that the social context in which students learn science has significant impacts on subsequent collective behavior. Additionally it suggests that task interdependency during science learning can be used to leverage increased collective student action in the classroom.
The effect of out of class communication on student achievement

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

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Low student achievement in higher education leads to problems for all involved. The students may drop out or not be able to pursue their career goals, it is demoralizing for instructors, and administrators are concerned with time to graduate and attrition. There are many aspects of a student’s background and life at a higher education institute that have been shown to impact achievement and retention, including peer and academic engagement. This study examined the effect of out-of-class communication between the instructor and student. The goal was to improve the outcome for students who showed early signs of low achievement. After the targeted group were identified (using the first lab and exam grades), the instructor emailed them with encouragement and suggestions for improvement. The study took place over four years; two years were the control and two the intervention. Every year the class was taught the content, instructor, and accompanying labs and assignments were the same; the only different was whether students were contacted or not. Various behaviors of students were analyzed to see which, if any, corresponded with improvement in class achievement. In addition, the final class grades were analyzed in relation to overall student GPA.
Zinc Sulfide Oxide Thin Film Alloying

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

College: College of Arts and Sciences
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Zinc Oxide (ZnO) is a transparent semiconducting oxide used in a wide variety of optoelectronic devices. ZnO is a cheap and nontoxic material with many favorable properties for light emitting devices, but suffers from the limitation of being extremely intrinsically n-type, and very challenging to make p-type. Zinc Sulfide (ZnS) is another wide direct bandgap semiconductor, also predominately n-type, that can be alloyed with ZnO. We are creating and studying Zinc Sulfide Oxide (ZnSO) alloys with different sulfur and oxygen ratios to investigate potential for p-type doping.
Our alloys are deposited onto sapphire and silicon substrates using an RF reactive magnetron sputtering system. Our target is ceramic ZnS and oxygen incorporation is controlled by O2 flow rate and substrate temperature.
X-ray diffraction and Raman Spectroscopy are used to measure resulting composition and local vibrational mode behavior. Optical properties are investigated through photoluminescence, photoluminescence excitation, and transmission.
We have found that small amounts of oxygen incorporation yields ZnO-like optical properties in transmission and previously unreported photoluminescent spectra. Vacuum studies are ongoing to investigate optical and vibrational surface effects. Tunable composition alloys will hopefully allow for band gap control and be important for the creation of p-type materials with ZnO properties.
Seeking the Voice in the Wilderness: The History of the American Evangelical Persecution Complex

Primary Author: Taylor Smith
Co-Author(s): Matthew Sutton

College: College of Arts and Sciences
Category: Liberal Arts & Humanities
Campus: Pullman

Abstract:
Since the early 1940s, the term “evangelical” has been used in the United States to describe a loosely joined group of conservative-minded Protestant Christians. Yet this attempt at conglomerating disparate Christian denominations under a single banner is problematic. It oversimplifies important differences of theology, style of worship, and history. As revealed by the recent presidential election, this results in the use of “evangelical” to describe a body in which many of its supposed constituents would deny membership.

The key to distinguishing between the incongruent pieces of the mislabeled evangelical bloc lies in the historical use of this broad term. With that in mind, this study focuses on the private and public correspondence of the men who formed the National Association of Evangelicals in 1942. Many of these men—such as Stephen W. Paine—have not been sufficiently scrutinized. These texts shed light on the myriad perspectives present even at the inception of this supposedly united group of conservative American Christians. Specifically, I use these writings to identify the origin of a disproportionately vocal portion of American evangelicals who loudly identify as a persecuted minority.
Abstract Title: Contemporary Music in the Twenty-First Century
Academy: Jazz Fusion/Progressive Rock for All University Jazz Ensembles Displayed Under: Liberal Arts Authors/Titles: F. David Snider

Primary Author: Frederick Snider
Co-Author(s):

College: College of Arts and Sciences
Category: Liberal Arts & Humanities
Campus: Pullman

Abstract:
“Jazz fusion” created by Miles Davis, was firmly established with his 1969 album, Bitches Brew, and has influenced contemporary musicians for nearly fifty years. “Progressive Rock” created by rock groups including King Crimson, Pink Floyd, and Yes, used jazz solos, scales, and rock chords and basic rhythms, and at times using different time signatures to include 7/4, 11/8, 11/4, and 5/4, has influenced contemporary musicians for nearly fifty years. F. David Snider, WSU Instructor of Jazz Bass and WSU Combo Program Coordinator, created twelve orchestrations using “jazz fusion” and “progressive rock” techniques. His arrangements include Edgar Winter’s Frankenstein, newly arranged for the WSU Big Band I, Lee Ritenour’s Night Rhythms, another newly created arrangement for the WSU Big Band I, Jeff Beck’s Led Boots, using a progressive groove in 7/8 for one of the solo sections, Mike Stern’s Chromazone, and John Coltrane’s Giant Steps. Each arrangement was scored in either a “contemporary fusion” or “progressive rock” style specifically for university jazz ensemble configurations: big bands, small big bands and jazz combos. Educationally, each orchestration will challenge every student, necessitating serious study. Additionally, these pieces will help students gain vital proficiency in an overall fusion style that will help them to mature into successful contemporary jazz musicians. University jazz ensembles, faculty ensembles and local jazz combos have successfully performed my orchestrations. These arrangements are going to be submitted to ejazzlines.com, a top firm that has expressed interest in publishing the works.
Cubical Coverings: Representing Sets of Real Numbers in Higher Dimensions

Primary Author: Kevin Vixie
Co-Author(s): Laramie Paxton

College: College of Arts and Sciences
Category: Mathematics
Campus: Pullman

Abstract:
Sets in multi-dimensional real space are just arbitrary collections of points and can be hard to represent mathematically and very hard to visualize, even in two or three dimensions. Thus, there exist many ways of characterizing sets with "nicer" sets, two of which we researched and will present in addition to a new approach that we developed. The primary method used is that of a cubical covering, which covers a set with arbitrarily small "cubes" in higher dimensions. We also studied certain classes of sets that have special properties and derived several formulas that tell us information about how "large" the coverings are compared to the sets themselves. This is valuable in that we do not need to know all the details of the original sets in order to work with them. Lastly, we made a conjecture for the "length" of boundaries of sets and solved several related problems using the formulas we derived. In general, we present old and new results with a view to illumination and exposition that we hope will motivate others to study these types of problems. With this in mind, the presentation of our findings features numerous detailed computer graphics to elucidate and make accessible the abstract topics discussed.
Incremental Theories Predict Use of Effective Self-Regulated Study Strategies and, in turn, Sustained Learning

Primary Author: Jordan Vossen
Co-Author(s): Joyce Ehrlinger
Marissa Hartwig
Kali Trzesniewski

College: College of Arts and Sciences
Category: Social Sciences
Campus: Pullman

Abstract:
Students’ theories of intelligence range from believing intelligence is malleable (incremental theory) to believing intelligence is fixed (entity theory). Past research has demonstrated that, compared to an entity theory, a stronger incremental theory predicts academic success; however, the mechanisms underlying this relationship are still unclear. We predicted that students’ theories of intelligence influence their study behaviors, which, in turn, impact their sustained learning. Consistent with this hypothesis, we found support for a model suggesting that students with more incremental theories of math intelligence more often self-reported using effective study strategies in the past. Self-reported strategy use then predicted participants’ use of quizzing themselves (a behaviorally measured extremely effective strategy), which, in turn, predicted increased sustained learning. This suggests that perhaps the reason that incremental theorists tend to academically outperform entity theorists is because they choose effortful study strategies that carry desirable difficulties, which, in turn, promote learning.
Constraining metamorphic timing by multiple dating techniques

Primary Author: Da Wang
Co-Author(s): Jeff Vervoort
Chris Fisher
Hui Cao
Guangxu Li

College: College of Arts and Sciences
Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
In this study, we collected samples throughout the Weihai area. Protolith ages of these samples range from Paleoproterozoic to Neoproterozoic (~1850 – 700 Ma) as indicated by U-Pb dating of zircon cores. Zircon metamorphic rims yield U-Pb ages of 240 – 220 Ma, likely indicating the UHP stage of the Sulu terrane [3]. Four eclogites yield Lu-Hf garnet isochrons with dates between 239 and 224 Ma, consistent with garnet Lu-Hf dates from Dabie UHP terrane [2]. Sm-Nd isochrons indicate systematic younger dates (220 – 210 Ma) interpreted as cooling ages. Titanites extracted from four samples give U-Pb ages ranging from ~220 to 200 Ma, in agreement with the titanite dates from the southern Sulu terrane [4]. Monazites from three samples give precise dates between 214 and 211 Ma. Collectively, monazite and titanite U-Pb ages are broadly consistent with the garnet Sm-Nd isochrons, and thus we interpret these as cooling ages. Based on the dates of different systems/minerals presented above, we suggest the prograde metamorphism of Weihai UHP terrane likely took place prior to ~240 Ma, and the peak of the UHP stage is likely between 240 Ma and 220 Ma.

Magnesium Amplification: The Last Missing Piece in Integrated Light Studies

Primary Author: Guy Worthey
Co-Author(s):

College: College of Arts and Sciences
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
In order to better measure the chemical compositions of distant galaxies, we have gauged the effects of altered C, N, O, Si, Na, and Fe, each element separately varied, on stellar evolutionary isochrones. Stellar temperatures, luminosities, and lifetimes in each evolutionary phase are affected. The effects have been gauged by using the MESA "star" routines with altered chemical mixtures for $0.06 < M < 3.0$ assuming a gray atmosphere outer boundary condition. We describe two polynomial based methods for extracting the trends in star lifetime, luminosity, and temperature as a function of stellar parameters and chemical composition. The temperature effects were carried through to integrated light models and then compared to galaxy observations.

"Magnesium amplification" is a hypothetical positive feedback where enhancement of (only) one element causes a slight cooling of the giant branch, increasing the line strength beyond the increase expected from increased numbers of absorbers. Our experiment shows that magnesium amplification is real, but that it mostly arises in dwarfs, not giants. Applied to elliptical galaxies, the literature enhancement of Mg is often quoted as $[\text{Mg/Fe}] = 0.3$, but with this effect properly included, for an abundance pattern approximating that of giant elliptical galaxies, that drops to $[\text{Mg/Fe}] = 0.15$. Similar, large recalibrations will apply to all of the most abundance heavy elements, significantly altering our perception of the giant elliptical abundance mixture.
Primary Author: Gregory Yasinitsky  
Co-Author(s): n/a  
College: College of Arts and Sciences  
Category: Liberal Arts & Humanities  
Campus: Pullman  

Abstract:  
On January 19, 2017, Gregory Yasinitsky’s Jazz Concerto for Piano and Orchestra was premiered by soloist Willis Delony and the Baton Rouge Symphony Orchestra, conducted by the orchestra’s Music Director, Timothy Muffitt, at the River Center Theatre in Baton Rouge, Louisiana. The performance, which closed a concert of American Music including works by Barber, Copland and Corigliano, received an enthusiastic, standing ovation. Yasinitsky is a Regents Professor, Eminent Faculty Award Winner and Director of the WSU School of Music. The Jazz Concerto, a major, three-movement work composed during 2015 and 2016, integrates composed passages demonstrating classical command of musical nuance and expression with jazz sections featuring improvisation. Delony, the Virginia Martin Howard Professor of Keyboard Studies & Professor of Jazz Studies at Louisiana State University, is the ideal soloist for this piece as he a unique pianist, able to musically move effortlessly between the worlds of jazz and classical music. Yasinitsky has extensive experience as a composer in both jazz and classical music. He has over 210 published musical works which are performed in over forty countries around the world. The Jazz Concerto will also be performed at WSU by Delony with the WSU Symphony Orchestra conducted by Director of Orchestras, Danh Pham, on March 2nd as part of WSU’s annual Festival of Contemporary Art Music which this year is also a regional conference of the Society of Composers Incorporated, a top academic organization for composers.
Using image moments for depth determination in confocal microscopy

Primary Author: Xianjun Ye
Co-Author(s): Matthew McCluskey

College: College of Arts and Sciences
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Confocal microscopy is a standard technique in biological research, which uses a physical pinhole to reject out-of-focus light such that optical resolution is significantly improved at selected depth. It measures the maximum light intensity of either fluorescence or reflection to determine the depth information.
In scanning confocal microscopy, only the light intensity at each spot of the sample is used. Here we are exploring the use of image moments to analyze the whole light profile. The light intensity at a single spot of the sample can be called a light pixel. Our method looks into the inner structure of a light pixel, extracting extra information. For example, a change in the centroid of the pixel may indicate absorption by a very small feature.
In this work, proof-of-concept experiments were carried out on a high-resolution US Air Force target and leaf sample by using our modular scanning confocal microscope with digital image processing. By using higher order and ratiometric image moment analysis, a lateral resolution enhancement and more accurate depth determination were achieved.
A Meta-Analysis of Signaling in Multimedia Learning Environments

Primary Author: David Alpizar
Co-Author(s): Olusola Adesope

College: College of Education
Category: Social Sciences
Campus: Pullman

Abstract:
In multimedia learning material, signals (or cues) are used to guide learners’ attention to critical elements of the materials. Yet, research on signaling has produced mixed findings on learning outcomes. On one hand, some studies have reported positive effects of signaling on learning outcomes (e.g., Jamet, 2013). On the other hand, other studies have found that signaling did not improve performance on learning related outcomes (e.g., Mayer & DaPra, 2012). The present meta-analysis 1) seeks to resolve the mixed findings on signaling research, 2) examine the effects of signaling on learning outcomes, and 3) identify potential moderating variables. Following an exhaustive search for studies meeting specified design criteria, data from 44 independent effect sizes were extracted from 29 experimental studies involving 2,726 participants. In addition, studies were coded for study, participants (e.g., grade level), presentation (e.g., pacing), and methodological (e.g., quality of study) features. Results indicated that signaling was associated with increased learning outcomes (g = .38, p < .01). This overall effect was moderated by study, participant, presentation, and methodological features. For example, beneficial and higher effect sizes occurred when studies reported reliability. The findings have significant implications for educators, instructional designers, and multimedia researchers.
A Bayesian Approach to Analyzing a Pretest/Posttest Media Literacy Intervention on Parents and Children

Primary Author: Bruce Austin  
Co-Author(s): Brian French, Erica Austin

College: College of Education  
Category: Social Sciences  
Campus: Pullman

Abstract:  
This study examined a pretest/posttest experiment with control group of a family-based media literacy curriculum (N=101 parent-child dyads) designed to improve parents' media management skills and decrease youths’ susceptibility to appealing but unrealistic food marketing. The six weekly sessions focused on minimizing marketing influences and strengthening the family communication environment for decision making about nutrition. The focus of this study was on how the research team made use of Bayesian statistical methods within a Structural Equation Model to obtain meaningful results from a small sample of preliminary data. The researchers were able to make use of data from prior studies using the same constructs to obtain more accurate model estimates than would have been possible with a standard Maximum Likelihood approach. The intervention results showed that the curriculum increased parental mediation to foster youths’ critical thinking about food marketing, increased parent efficacy for making healthy dietary changes for their families, and fostered family discussion about nutrition labels. In addition, the intervention reduced influences of perceived desirability and wishful identification affecting youths’ requests for marketed foods. The use of Bayesian methods increased model effect sizes on average compared with standard maximum likelihood, reduced standard errors, and improved model fit. Finally, our results are presented as an example of how small sample studies in the social sciences can be improved by using Bayesian methods.
The Effects of Dogs on Learning Outcomes with Elementary, Middle, and High School Students: A Meta-Analysis

Primary Author: Katie Barton
Co-Author(s): Olusola Adesope

College: College of Education
Category: Social Sciences
Campus: Pullman

Abstract:
The use of dogs within school settings is becoming more prevalent. However, there has been little research that investigates the overall impact dogs may have on student learning. This meta-analysis investigates the effects of dogs on learning outcomes with elementary, middle, and high school students. Specific learning outcomes under investigation include: reading skills, social skills, emotional/behavioral skills, cognitive skills, and motor skills. After an extensive search for studies meeting specified inclusion criteria, 66 studies were reviewed. Of those 66 studies, 23 have been deemed appropriate for inclusion in the meta-analysis. Next steps would be to code the sample characteristics, animal characteristics, and study characteristics that would provide insight to the conditions in which dogs might impact learning. Finally, data will be extracted from the studies to determine the overall effects dogs have on learning outcomes. The results of this meta-analysis could provide additional support for implementing human-animal interactions within educational settings.
Autism Spectrum Disorder Symptoms in Award-Winning Narrative Fiction

Primary Author: Christina Brando-Subis
Co-Author(s): Katherine Smith
Saeun Lee
Jane Kelley
Brenda Barrio
Teresa Cardon

College: College of Education
Category: Social Sciences
Campus: Pullman

Abstract:
Narrative fiction is often used as a teaching tool. More recently, educators have used narrative fiction to expand the knowledge and facilitate awareness about certain underrepresented populations, including those with disabilities. To date, very little has been written examining young adult fiction with characters depicting individuals with Autism Spectrum Disorder (ASD). The present study focused on conducting a content analysis of nine award-winning young-adult narrative fiction books with characters depicting individuals with ASD. The analysis yielded a total of 285 symptoms that were coded based on the American Psychiatric Association’s most recent definition of ASD symptoms. Analysis revealed that 71.9% of the total symptoms represented depicted repetitive or restrictive behaviors, and the remainder 28.1%, represented social communication difficulties or deficits as described by the DSM-5. The results of this study show that few fictional stories depict the difficulties of social communication as it is often observed in high-functioning individuals with ASD. Therefore, narrative fiction that overplays the restrictive, repetitive behaviors and underplays the social communication deficits, perpetuates misconceptions about ASD. Whether at the K-12 level or in higher education, narrative fiction with main characters clearly showing ASD symptoms can have large implications for stakeholders working with students with ASD, such as using them as case studies or examples to build, accommodate, and modify their teaching or supports within the K-12 setting. Therefore, it is of high importance that the portraying of underrepresented populations, such as students with ASD, is accurate and appropriate.
Balance changes during pregnancy and postpartum

Primary Author: Robert Catena
Co-Author(s): Chris Connolly

College: College of Education
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Falls during pregnancy continue to be a leading cause of gestational injury, accounting for 18% of visits to the emergency room during pregnancy (Weiss 08). While the general perception is that women are most at risk of fall the closer to deliver date, there remains little empirical evidence on when and why fall risk increases during pregnancy. In this preliminary study we looked to determine if, and when, balance deficits are experienced during pregnancy. We have recruited 30 participants for this study. Seven individuals have completed monthly testing starting at about 20 weeks pregnant to 6 months postpartum, while all other participants are currently at various stages in testing. We used force plate technology to determine how the body center of mass location changes. We then tracked the body center of mass during level walking using motion capture technology. Balance was determined by measuring how the center of mass moved within the base of support. Preliminary results indicate that medial-lateral center of mass motion (and thus lateral imbalance) peaks at the beginning of the 3rd trimester. This corresponds with the greatest change in mass during pregnancy. By one month postpartum, balance control has already returned to 1st trimester levels and continues to improve further along into postpartum. Our results show a misperception that pregnant women are most at risk when they have gained the most mass (closest to the delivery date), but rather are at most risk of fall when their body experience the greatest mass increases.
K9 Police Units: The human-animal bond and implications for veterinary practice

Primary Author: Phyllis Erdman
Co-Author(s): Lori Kogan

College: College of Education
Category: Social Sciences
Campus: Pullman

Abstract:
Dogs were first used for police work in the 14th century in France, but K9 police units in the United States became more common in the 1970s. An affectionate relationship between the handler and dog is essential in training as well as when providing service. Yet, this relationship is different than the bond between a pet owner and a dog. Understanding the unique aspects of this relationship is important for the community, as well as for veterinarians and veterinary staff. To better understand this relationship and possible unique veterinary needs, a survey was constructed related to veterinary needs, the human animal bond, and handler demographics. Participants, who were K9 handlers, were invited by email to complete an anonymous online survey. Descriptive statistics were performed using IBM SPSS Version 22. Total number of respondents was 207 (85% male). The answers to the question on veterinary needs were coded and fit within three broad categories: understand and treat dog as a working dog, not a pet; give handlers credit for understanding their dog and the unique bond they have with their dog; and understand the role of K9s in the police force and how this might impact veterinary care decisions. Responses to human animal bonding questions revealed that handlers share an extremely close bond with their service dogs. The impact of these results for veterinary medicine and the community at large are discussed with an emphasis on additional training and education for all those who interact with handlers and their K9 units.
Empowering teachers and students through classroom assessment

Primary Author: Chad Gotch  
Co-Author(s): Susan Brookhart  
Brian French  
Olusola Adespoe

College: College of Education  
Category: Social Sciences  
Campus: Pullman

Abstract:  
In schools these days, the topic of student assessment can arouse much anxiety, confusion, and distress. You may be able to quickly recall a time when you lost motivation because of an unfair test. Or maybe you felt frustrated because you didn’t know what information was most important to study. Assessment done poorly can certainly live up to its bad reputation. Assessment done well, however, can have a profound positive impact on how students learn and develop. A teacher who assesses well will make good decisions about students and instruction, and can stand out as a respected professional. It is one of the hardest skills for teachers to master, but few things impact student achievement as much as a teacher’s assessment practices.

In this creative project, professors in WSU’s College of Education teamed up with an internationally esteemed teacher educator to develop a brief video on the fundamentals of classroom assessment. The 7-minute video represents the best entry in a competition sponsored by the National Council on Measurement in Education. It features easy-to-understand “take home” messages with on-screen contributions from award-winning teachers and their students. Throughout, the presentation of lessons represents best-practices in multimedia learning. In sum, the video represents a unique and valuable resource for teachers, students, parents, policymakers, and anyone with an interest in the educational success of our youth.
Examining Teacher Learning Through Mathematics Studio

Primary Author: Melissa Graham
Co-Author(s): Kristin Lesseig

College: College of Education
Category: Social Sciences
Campus: Spokane

Abstract:
As part of the Common Core State Standards, the Standards for Mathematical Practice (SMP) are an essential part of the mathematics classroom of today. In this study, we followed teachers as they participated in Mathematics Studio, a year-long professional development experience designed to support teachers’ understanding of and instruction around SMP3: construct viable arguments and critique the reasoning of others. Mathematics Studio is a research-based professional development model that is similar to Japanese lesson study in that teachers collaboratively plan, observe/enact, and analyze a classroom lesson. Studio differs from Japanese lesson study in that the focus is not on creating a lesson to be used by others, but rather to increase teacher knowledge and transform mathematics instruction surrounding conjecturing, generalizing, and justifying, (CGJ) supporting teacher development surrounding SMP3. We collected video data and artifacts from four Studio cycles throughout the course of a year. Our qualitative analysis of teacher interactions revealed a deeper understanding of mathematical argumentation and awareness of what forms mathematical argumentation may take in 9th grade algebra. Our preliminary results describe how participation in Mathematics Studio enhanced teachers’ ability to design lessons in which students conjecture, generalize, and justify. We discuss what the teacher group learned with regard to planning and implementing lessons that promote CGJ. We describe what challenges or dilemmas teachers encountered when promoting conjecturing and justifying in the classroom. This study has implications for those designing professional development for teachers as well as for practicing teachers considering ways to incorporate SMP3 in their classroom.
Use of evidence-based practices by special education professionals working with students with autism spectrum disorders

Primary Author: Yun-Ju Hsiao
Co-Author(s): Brenda Barrio
Michael Dunn

College: College of Education
Category: Social Sciences
Campus: Tri-Cities

Abstract:
The initiative to require educators to implement practices supported by research (i.e., evidence-based practices) is one of the recent important educational reforms. This requirement is also addressed in federal legislation, such as the Individuals with Disabilities Education Improvement Act of 2004 and the Every Student Succeeds Act of 2015. Both address this requirement of using scientific, evidence-based practices (EBPs) for students with disabilities, including students with autism spectrum disorders (ASD). The purpose of this session is to report the results of a survey study which investigated to what extent special education professionals use the identified 25 EBPs for students with ASD in school. The research questions include: (a) How often did special education professionals use identified EBPs with students with ASD in school? (b) Why were some EBPs not used by special education professionals with their students with ASD in school? A total of 85 special education professionals of students with ASD completed an online questionnaire. Descriptive statistics showed a range of means between 2.05 and 4.71 on the implementation of EBPs when working with students with ASD, where 1 was never used and 5 was used daily. Qualitative data were analyzed using thematic analysis to show the reasons behind the lack of use of specific EBPs for students with ASD and will be presented. Overall, the present study contributes to the current literature as it offers a beginning to understand the use of EBPs by special education professionals for working with students with ASD.
Engendering situational interest in an innovative engineering classroom: What really matters?

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College: College of Education
Category: Social Sciences
Campus: Pullman

Abstract:
Stakeholders in students’ success often attribute low academic achievement to either a lack of ability to succeed or a failure to put in the effort needed to succeed in school. Instructors have little or no influence on student ability to learn, but could in many way influence their learning efforts. The effort students put into learning is associated with interest and influences achievement. Instructors often try out innovative interventions in their classrooms aimed at engendering students’ interest in order to promote learning engagement. While such efforts are commendable, thinking through how individual and environmental characteristics influence interest development in learners is crucial to meeting such teaching objectives.

In this study, we examined the role of personal interest, students’ perception of meaningfulness, and the instructional utility of an innovative intervention in the development of triggered and maintained situational interests in an engineering classroom that used hands-on learning modules. Triggered and maintained situational interests are emerging forms of interest in learners. Participants were undergraduate students enrolled in an engineering classroom who were taught fluid mechanics concepts using innovative hands-on learning modules in the first four weeks of the semester. Participants then took a survey that assessed forms of situational interests among other variables.

Our findings indicate that the instructional intervention and the meaningfulness of the learning material were significant predictors of situational interest. Our findings also suggest that personal interest prior to class contact may have no significant effect on triggering learner interest if the source of interest trigger is sufficiently stimulating.
Predictors of Paraprofessional Elementary Preservice Teachers’ Science Teaching Self-Efficacy

Primary Author: Lindsay Lightner
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Category: Social Sciences
Campus: Tri-Cities

Abstract:
Persistent teacher shortages in certain hard-to-staff subjects and geographic areas of the United States have increased interest in alternate routes to teacher certification as potential ways to produce committed, high-quality teachers. This study investigated an alternate route teacher certification program in which paraprofessionals study to become certified teachers while remaining employed in their schools. Although this route assumes that paraprofessionals can become effective teachers quickly because they possess work-based skills transferable to teaching positions, it is unclear to what extent these preservice teachers will feel confident teaching science, a subject which elementary teachers often feel less confident teaching compared to other subjects. To further the success of these preservice teachers and their future students, this study investigated whether paraprofessional preservice teachers’ prior work experiences, academic experiences, or overall teaching self-efficacy predicted their science teaching self-efficacy. Nineteen paraprofessional alternate route candidates completed scales measuring their science teaching self-efficacy and general teaching self-efficacy. Multiple regression analyses found a statistically significant relationship between candidates’ personal science teaching self-efficacy, general teaching self-efficacy, and prior academic experiences. However, general teaching self-efficacy was the only statistically significant predictor of personal science teaching self-efficacy. Implications for further development of alternate route programs include identifying factors that influence candidates’ general teaching self-efficacy and identifying the types of work-based experiences that affect self-efficacy in this population.
Contributors to Science Vocabulary Learning: Study 1 and Study 2

Primary Author: Anna-Karin Roo
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Abstract:
Study 1: This statistical modeling study explored contributions of disciplinary attitudes and self-conceptualization to science vocabulary learning of 252 Grade 8 students (31% current ELs; 69% former and non-ELs). The path model had a strong fit to the data, CFI = .98, RMSEA = .08, and accounted for 47% of the variance in science vocabulary learning. Results identified science anxiety—a variable potentially under influence of educational systems—as a strong predictor of science vocabulary learning. Furthermore, the model demonstrated that prior knowledge acts as a mitigator for the negative effects of anxiety on both learning and self-efficacy. Lower proportions of the variance explained in science anxiety (14%) and science and genetics self-efficacy (12%, 9% respectively) suggest the need to include other student- and classroom-level predictors in future studies.

Study 2: This quasi-experimental, matched-group design study investigated the effectiveness of the Science Vocabulary Support (SVS) program, a curriculum-specific science and academic vocabulary intervention. The sample consisted of 107 Grade 7 students (46% current ELs; 54% former/non-ELs). Results indicated that SVS participation, as contrasted with regular instruction, predicted growth on science vocabulary and targeted academic vocabulary by 23% and 16%, respectively; SVS participation also predicted 9% more correct responses on the science reading comprehension measure. Furthermore, there were no significant differences between treatment and control groups on non-SVS-targeted academic vocabulary. These results highlight the efficacy of explicit versus implicit vocabulary instruction methods. The lack of significant EL-status-by-condition interaction suggests that SVS did not disadvantage former/non-ELs.
A Needs Assessment Rubric to Identify Program Strengths, Priorities and Resources for Counseling English Language Learners at Middle Schools in Washington State

Primary Author: Tom Salsbury
Co-Author(s): Susan Jensen

College: College of Education
Category: Social Sciences
Campus: Pullman

Abstract:
This poster summarizes research in the second year of a three year project investigating the counseling needs and services of English language learners (ELLs) in eastern Washington middle schools. The researchers present results from a pilot of a needs assessment rubric that they developed based on data from semi-structured interviews with teachers, counselors, general educators, and middle school youth and their parents. The interviews were conducted and analyzed in the first year of the study. The premise for developing a needs assessment rubric was that school stakeholders are the best people to enact improvements at school. The rubric is divided into five categories: (1) connections (between/across programs and schools, to youth, and to families and communities); (2) assessment and student data; (3) awareness of culture and language; (4) leadership, social justice and efficacy; and (5) roles, responsibilities and workplace satisfaction. Each theme is supported by extant literature. Participants worked in teams (counselor, ELL teacher, principal, parent, general educator), discussing statements under each category of the rubric. An example statement is Information on ELL students is standardized within the district to facilitate interpretation across schools. Participants used guiding questions to structure the discussion: (1) How well do we already do this? (2) How important is this to us? (3) How available are resources under the current budget? There were 30 statements total for participants to discuss. Data from the work groups will be used for program improvement at the schools and for development of a survey instrument for further research.
Efficacy of Manualized Hypnosis in Treatment of Irritable Bowel Syndrome (IBS)

Primary Author: Alicia San Miguel  
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Abstract:  
Irritable Bowel Syndrome (IBS) is characterized as a re-occurring, chronic disorder of the gastrointestinal tract. Features present as primarily pain or discomfort that may or may not be alleviated by a bowel movement and is consistent with three subtypes: diarrhea, constipation, or mixed features. To date, no organic etiology has been found that explains the experience of dysregulation of bowel habits, visceral sensitivity, catastrophizing, or increased pain perception of the IBS patient. Due to the high rates of psychological co-morbidity and the influence of stress on the perception of symptoms including pain, IBS is now regarded as a biopsychosocial disorder. Research suggests that gut directed hypnosis might be the new treatment of choice, specifically the North Carolina Protocol. Few studies have evaluated the effects of the North Carolina Protocol on the symptoms of Irritable Bowel Syndrome, specifically pain. This study will test the effectiveness of a manualized hypnosis, using the North Carolina Protocol, (Palsson, Burnett, Meyer, & Whitehead, 1997) in patients diagnosed with IBS. To date, this study is in progress and has 8 participants (N = 8) currently with a projected completion of data analyzed by the following Fall semester in 2017.
Depressive Symptoms, Anxiety, and Perceived Social Support Do Not Predict Weight Change in Overweight and Obese Rural Adults with Low Education Attainment

Primary Author: Demetrius Abshire
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Abstract:
Purpose: To determine if psychosocial factors of depressive symptoms, anxiety, and perceived social support predict weight change in overweight and obese rural adults with a high school education or less.

Methods: This secondary analysis includes rural adults in Kentucky having a body mass index ≥25kg/m2 (n = 172, age = 56 ± 13; 71% female; 99% Caucasian) who participated in a comprehensive lifestyle intervention to reduce cardiovascular disease risk. Participants completed baseline assessments of depressive symptoms, anxiety, and social support using the 9-item Patient Health Questionnaire, Brief Symptom Inventory Anxiety subscale, and the Perceived Social Support scale, respectively. Body weight was assessed at baseline and approximately 4-6 months using professional-grade digital scales. Multivariable linear and binary logistic regressions were used to determine if baseline psychosocial factors predicted weight change controlling for age, sex, income, and baseline weight.

Results: Average percent weight change for the sample was -0.2 ± 3.5%. Average percent weight change was -2.8 ± 2.2% among those who maintained/lost weight and 2.6 ± 2.3% among those who gained weight. Psychosocial factors did not predict body weight change in any regression model. Older age predicted weight loss in all models.

Conclusion: These findings suggest that baseline depressive symptoms, anxiety, and poor social support do not interfere with weight loss in overweight and obese rural residents with low education attainment.
Pilot test of A Way Forward: A peer group program for people with persistent pain

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Crystal Smith

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Campus: Spokane

Abstract:
Experiencing persistent pain negatively impacts one’s quality of life. Novel, cost-effective solutions are desperately needed to assure that people with persistent pain conditions have access to non-opioid pain management strategies. This study used a prospective, randomized controlled trial design with repeated measures to evaluate a pilot program that used peer support to introduce alternatives to pharmacological pain treatments using a framework of self-management. Twelve wait-list control group participants were compared to 14 treatment group participants on pain measurements including the Brief Pain Inventory and Pain Catastrophizing Scale pre- and post-enrollment in the 8-week intervention. Two focus groups were conducted to collect additional qualitative data on participant perspectives regarding the peer group program.

A paired samples t-test showed significant improvement in pain intensity from pre-intervention (M=7.17, SD=2.22) to post-intervention (M=5.33, SD=1.68) in the treatment condition; t(13)=-4.72, p = 0.00, d=1.26, while the control group had no significant changes. Significant improvements were also detected on measures of Pain Catastrophizing. High satisfaction ratings of the peer group program were reported with averages >5 (on a 0-6 scale where 6 = high satisfaction). Positive themes identified from focus group participants included having a supportive group experience and learning new tools for cognitive restructuring. Suggestions for improvement included increasing number of group sessions. This study provides insight into how peer support can be used to address gaps in current pain care options. The program was well-attended and participants reported improvements in distressing symptoms. Participants value the group setting and tools to address negative thought patterns.
Nurses’ Perspectives on Barriers to Promoting Mobility in Hospitalized Older Patients

Primary Author: Gordana Dermody
Co-Author(s):

College: College of Nursing
Category: Medical & Life Sciences
Campus: Spokane

Abstract:

Purpose/Aims:
To examine the association between nurses’ knowledge, attitude and external barriers and the nurse’s mobility-promoting behavior. Nurse perception of the priority organizations place on mobility, and the relationship of nurses’ level of experience to nurse prioritization for promoting mobility was also investigated.

Methods:
Cross-sectional, descriptive, correlational study with convenience sampling.
Setting: Two community-based hospitals in the Pacific Northwest of the U.S. Participants: Eighty-five nurses caring for 98 inpatients 65 and older.
Measurement: Nurses’ knowledge, attitude and external barriers were examined with a validated 5-point Likert Scale. Patient-related and other clinical barriers and the nurses mobility-promoting behavior was obtained with the validated self-recorded mobility log. Patient Basic Metabolic Index (BMI) and severity of illness was obtained though data extraction.

Results: Nurses viewed the promotion of mobility as important, yet mobilizing older patients was infrequent. Nurses perceived a number of barriers to promoting mobility: Patient condition, the perception that patients could be harmed during mobilization, perceptions of heavy workload, difficulty prioritizing nursing care, and staffing shortages. While novice nurses had lower priority to promote mobility compared to more experienced nurses, novice nurses tended to promote more mobility.

Conclusion/Implications: This study shows that even experienced nurses need to overcome barriers to promoting mobility. Hospitals need to address the needs of the novice nurse while enhancing the practice of more experienced nurses in order to support nurse-promoted mobility. Further, nurses’ knowledge, attitude, and external barriers could play a role in the low levels of mobility in hospitalized older adults.
Pain and affective symptoms in chronic pain patients in opioid addiction treatment recruited to test an online pain self-management program

Primary Author: Myles Finlay
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Abstract:
Aims: The Centers for Disease Control (CDC) has recognized overdose from opioids as an epidemic. A meta-analysis of methadone maintenance patients by Eyler (2013) found 55-61% of patients reporting current chronic pain conditions. Self-management is an effective behavioral treatment for increasing one’s ability to manage chronic conditions. Our team has been exploring internet-based pain curricula as a way to deliver cost-effective treatment. This study investigated symptom burden in a population of participants enrolled in a medically supervised methadone maintenance program and who were recruited to test an online pain self-management program.

Methods: Sixty individuals submitted symptom measurements using The Brief Pain Inventory (BPI), Generalized Anxiety Score (GAD), The Patient Health Questionnaire (PHQ), as well as self-report data on previous substance use to control pain.

Results: Average pain interference score on the BPI was 5.22(1.49) and pain severity was 6.28 (1.92). GAD and PHQ measures averaged 12.13(5.63) and 13.61(5.19) respectively, indicating levels of moderate anxiety and depression. Participants reported using multiple substances to control pain, including heroin (66.7%), other opioids (81.4%), nicotine (67.8%), cannabis (57.1%), cocaine (19%), and methamphetamines (25.9%).

Conclusions: The studied participants have a high burden of undertreated pain, anxiety, and depression despite being under supervised medical care for opioid addiction. This may, in part, explain the high amount of substances they report using in an attempt to control pain symptoms. Understanding of the complex characteristics of this population might provide for enhanced pain and addiction treatment.

Financial support: Washington State University Alcohol and Drug Addiction Research Program
Interactive Spatial Analytics for State by State Medicaid Comparison

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Abstract:
Providing health insurance to low-income individuals, pregnant women, elderly, and people with disabilities is an important aspect of the United States health care system. Medicaid is a potential health insurance option for these population groups. The Medicaid program is funded by both state and federal governments but managed at the state level. Since each state is given autonomy to determine eligibility, receiving Medicaid looks different in nearly every state. The research project studies differences within the Medicaid program and compares eligibility pathways on a state by state basis.

Medicaid data was analyzed across a variety of measures focusing on state-level policies. Spatial data analytic techniques were utilized to create visual maps of the United States, displaying various levels and criteria of Medicaid eligibility in each state. The final product consists of a fully functional website embedded with interactive maps. Navigation and comparison of state by state Medicaid eligibility is accessible and possible.

While constructed for academic purposes as part of, The Collaborative on Health Reform and Independent Living (CHRIL), a 5-year Disability and Rehabilitation Research Program (DRRP); it is not limited to academic use. Intentional design elements were considered in the construction of the website and interactive maps. The possibility for consumer facing application is being considered.

Research conducted with funding from CHRIL (NIDILRR grant number 90DP0075-01-00) under the supervision and direction of Jae Kennedy Ph.D., WSU Health Policy and Administration - CHRIL Principal Investigator, and Elizabeth Geneva Wood M.H.P.A., WSU Health Policy and Administration - Research Associate.
A Randomized Controlled Analog Trial for Alcohol and Tobacco Smoking Co-Addiction Using Contingency Management

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College: College of Nursing
Category: Social Sciences
Campus: Spokane

Abstract:
Contingency management (CM) has been be associated with decreases in ‘off-target’ drug or alcohol use during primary target treatment. The hypothesis for this trial was that targeting alcohol use and tobacco smoking will yield the highest abstinence rates for use of both compared to using CM for either drug individually.
We used a 2 (CM for alcohol versus control) x 2 (CM for smoking tobacco versus control) factorial design, with alcohol (via ethylglucuronide) and tobacco smoking (via cotinine) as co-primary outcomes across 3 visits per week for 4 weeks. Thirty-five heavy drinking smokers were randomized into 1 of 4 groups wherein they received CM (or equivalent, non-contingent reinforcement) for: neither drug, alcohol abstinence, smoking abstinence, or both. Generalized estimating equations were used to analyze these outcomes.
The 3 remaining groups (the CM for smoking and alcohol use group only had 2 participants) did not differ across baseline demographics or addiction severity indices (p<0.05). Compared to the control group, both the CM for smoking (OR=12.03; 95%CI: 1.50-96.31) and the CM for alcohol (OR=37.55; 95%CI: 4.86-290.17) submitted significantly more smoking abstinent urinalyses. Similarly, compared to the control group, both the CM for smoking group (OR= 2.57; 95%CI: 1.00-6.60) and the CM for alcohol group (OR= 3.96; 95%CI: 1.47-10.62) submitted significantly more alcohol abstinent urinalyses.
Data from our trial support the hypothesis that there are cross-over effects of CM on indirect treatment targets. This is an important finding in a relatively small sample size that could be significantly leveraged in future treatment development.
Receptivity to an online pain self-management program among people with persistent pain in opioid addiction treatment

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Matt Layton
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Category: Medical & Life Sciences
Campus: Spokane

Abstract:
Symptoms of undermanaged pain interfere with quality of life and successful substance use treatment for people with opioid addiction. Pain self-management programs have been recommended to promote non-pharmacological approaches. Still, many of these programs remain inaccessible to patients because of cost, feasibility, and reliance on a biomedical model emphasizing pharmaceuticals for pain management. To explore the usefulness of alternative/non-pharmacological strategies for pain management, this randomized control trial piloted an online pain self-management program with 60 adults diagnosed with chronic pain and receiving medication-assisted treatment in an outpatient opioid treatment program.

Of 111 referrals screened, 51 (45.9%) self-referred and 60 (54.1%) were referred after invitation from clinic staff. The majority (n = 44; 73%) reported their first use of opioids was related to a physically painful event, while fewer reported first opioid use was for recreational purposes (n = 5; 8%) or for psychological stress (n = 4; 6%). Of 31 assigned to an immediate treatment intervention group, 20 (64.5%) engaged in at least some online pain self-management content. Mean program satisfaction ratings were favorable (> 5 on a 1 to 7 scale, where 7 = high satisfaction). Perceived benefits reported by participants included learning positive thinking, scheduling tasks, and tracking mood and activities. Reported barriers included difficulty navigating the computer program and poor internet access. Findings suggest that participants are receptive to online pain self-management but strategies are needed to increase engagement and maximize benefits.

Supported in part by a WSU Alcohol and Drug Addiction Research Program grant.
Multi-family Group Treatment for Persons with Spinal Cord Injury: Participants’ perspectives

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Abstract:
This study evaluated the acceptability and helpfulness of participation in multi-family group (MFG) treatment for spinal cord injury (SCI) among patients who had experienced the injury within three years and their primary caregivers/care partners. Outpatients with SCI and their caregivers who participated in the MFG arm of a randomized clinical trial attended a focus group at the conclusion of a 16-week intervention period. Participants were asked about their experience in the intervention, how useful it was, what they learned and found helpful, and what suggestions for improvements they had. A qualitative descriptive approach was used for this study and focus group transcripts were analyzed using qualitative content analysis.
Participants included six people with SCI and six caregivers (five caregivers were family members and 1 was a paid caregiver). Five themes were identified that provide description of the participants’ perspectives about the multi-family group intervention experience. Themes describing the benefits of the intervention included: belonging, socializing, and team work. Themes describing ideas for how participants would like to improve the intervention experience included increased opportunities for engagement and desire for the provision of more and earlier SCI management knowledge. The results supported the acceptability and helpfulness of the MFG group treatment for SCI. Specific recommendations to improve this psychoeducational intervention and its implementation are offered. Given the challenging nature of rehabilitation following SCI and the positive response to MFG, nurses in rehabilitation settings are encouraged to explore MFG for patients and caregivers.
The Effects of Mentoring to Enhance Teamwork: a Quality Improvement Project

Primary Author: Marnie Smith
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Category: Medical & Life Sciences
Campus: Spokane

Abstract:
Teamwork is an essential component for nurses to provide quality patient care. Nurses face barriers to collaboration every day, which impacts successful teamwork. Utilizing mentors can increase the level of teamwork in clinical settings. A quality improvement project was conducted that was aimed at increasing teamwork through a mentoring program. The program was twenty weeks in length. It focused on training and supporting new employees. The long-term goal of the program was to improve teamwork amongst employees. The first step was to identify mentors among the staff, then to train and pair with a new employee. They met weekly with purposely-focused interactions intended to evaluate the progress of the new employee’s training. This provided an opportunity to aim at increasing learning opportunities as needed. A quantitative pre and post-test survey were administered regarding staff satisfaction and confidence in team member’s performance. Pre-intervention scores showed a level of dissatisfaction within the clinic among the staff. Post intervention scores will be compared to assess if there is clinical significance from investing in a mentoring program. Lastly, a qualitative survey was administered to assess the usefulness of the program as perceived by the staff. This mixed methods approach was used to assess if the primary outcome of an increased level of teamwork in the clinic was achieved.
Bacterial membrane-derived nanovesicles as novel vaccines protect Bacterial-induced lethality.

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Category: Agricultural & Natural Sciences
Campus: Spokane

Abstract:
Bacterial-induced infections have been a long-term global burden to public health. Treatments of bacterial infections are mainly limited by the multiple drug resistance left by antibiotics, low efficacy of single antigen vaccines as well as the uncontrollability of OMVs (outer membrane vesicles) when being applied as vaccine candidates. Inspired by these gaps, we investigated a novel approach to generate bacteria membrane-derived nanovesicles (BMDNVs) and BMDNVs were able to be utilized as vaccines to prevent bacterial-induced infections. Our study showed that BMDNVs were double layered spherical vesicular structure nanovesicles which demonstrated multiple virulence factors. Moreover, BMDNVs had a high similarity with the cell wall of the source of bacteria as confirmed by proteomics study. Animal studies showed that immunization with P. aeruginosa derived-BMDNVs prevented P. aeruginosa-induced lethality. Further in vivo studies demonstrated that the protective effect of BMDNVs immunization relied on the stimulation of innate immunity and adaptive immunity, including the maturation of DCs and the activation of B cell and T cell response. At last, with the double layered membrane vesicular structure nanovesicles, BMDNVs showed great potential to work as both vaccine adjuvant and Ag carriers. Together, our study reveals a novel universal and controllable strategy to directly employ a pathogen to produce bacteria membrane-derived nanovesicles to be applied for the treatment of infectious diseases.
Overcoming plant nodulation regulation through expression of a unique Sinorhizobium medicae gene

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Co-Author(s): Michael Kahn

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Category: Agricultural & Natural Sciences
Campus: Pullman

Abstract:
Nitrogen is the major limiting nutrient in agriculture. The production of synthetic nitrogen fertilizers is expensive and a major source of greenhouse gas. Long-term use of synthetic nitrogen fertilizers causes soil acidification, which decreases crop yield. An alternate source of nitrogen for legume plants is through symbiosis with nitrogen-fixing soil bacteria called rhizobia. The bacteria infect the legume and form root nodules, specialized organs that maintain an environment in which the bacteria can convert inert atmospheric nitrogen into compounds the plant can use. Our goal is to improve this relationship, called symbiotic nitrogen fixation (SNF), to reduce crop dependence on synthetic fertilizers.

One legume host-symbiont pair, Sinorhizobium meliloti and barrel medic, is a model used to study SNF but it is not very effective and plants show signs of nitrogen deficiency. A closely related bacterium, Sinorhizobium medicae, is more productive. We identified a small set of proteins made in S. medicae that are not present in S. meliloti.

We hypothesized that some of these S. medicae proteins contribute to its more efficient symbiosis and tested this by moving genes encoding some of these proteins into S. meliloti. One protein, predicted to be involved in aromatic carbon metabolism, improved symbiotic efficiency, substantially increasing the frequency of bacterial infection and plant growth. This gene also increased nodulation in the pea symbiosis. In split-root plants, rhizobia with this gene overcome plant autoregulation of nodulation, a novel rhizobium characteristic. Overcoming plant regulated nodulation under stress conditions would have major agricultural applications.
Identification of Novel Genes Utilized in the Immune Response to West Nile Virus

Primary Author: Laura Ahlers
Co-Author(s): Grace Carrell, Alan Goodman

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Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Principal Topic
Arthropod-borne viruses, or arboviruses, such as West Nile virus (WNV) and Zika virus (ZIKV) have been the cause of several worldwide epidemics. Although these mosquito-borne viruses impact populations worldwide, treatment and vaccination options are limited. Because of the reliance on a mosquito vector for the transmission of WNV to humans, it is imperative to understand and control the insect vector to prevent mosquito-to-human transmission.

Method/Hypotheses
While the natural vector of WNV is the mosquito, genetic tools for its study are limited. In this work, we utilize the fruit fly Drosophila melanogaster, a well-established model organism, to model mosquito immunity to WNV.

We screened for novel components of insect immunity utilizing the Drosophila Genetic Reference Panel (DGRP), a living library of wild-type inbred fly lines with sequenced genomes. When paired with a Genome-Wide Association Study (GWAS), the genetic diversity of the DGRP identifies genetic variants with susceptibility or resistance to infection. Using the mortality rate for each fly line in a GWAS, we identified genes with a putative contribution to immunity by high significance values. Future work will validate the involvement of each of these genes to the immune response to WNV, both in Drosophila and in mosquitoes.

Results/Implications
Our work utilizes the fruit fly as a model for mosquito immunity and has identified candidate genes for future studies. Because human WNV morbidity is initiated by mosquito transmission, the study of the insect vector is foundational to the development of therapeutics for arboviruses to assist public health efforts worldwide.
Ovine herpesvirus 2 glycoproteins B, H, and L are sufficient for, and viral glycoprotein Ov8 can enhance, cell-cell membrane fusion

Primary Author: Salim AlHajri
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Abstract:
Ovine herpesvirus 2 (OvHV-2) is a gammaherpesvirus in the genus Macavirus that is carried asymptptomatically by domestic sheep. Infection of poorly adapted animals with OvHV-2 results in sheep-associated malignant catarrhal fever, a fatal disease characterized by lymphoproliferation and vasculitis. There is no treatment or vaccine for the disease and no cell culture system to propagate the virus. The lack of cell culture has hindered studies of OvHV-2 biology including its entry mechanism. As an alternative method to study OvHV-2 glycoproteins responsible for membrane fusion as a part of the entry mechanism, we developed a virus-free cell-to-cell membrane fusion assay to identify the minimum required OvHV-2 glycoproteins to induce membrane fusion. OvHV-2 glycoproteins gB, gH and gL were able to induce membrane fusion together but not when expressed individually. Cell-cell membrane fusion was detected by both fluorescence microscopy and reporter gene expression. Additionally, open reading frame Ov8, unique to OvHV-2, was found to encode a monomeric transmembrane glycoprotein that can significantly enhance membrane fusion. Thus, the OvHV-2 glycoproteins gB, gH and gL are sufficient to induce membrane fusion while glycoprotein Ov8 plays an enhancing role by an unknown mechanism. This is the first report identifying OvHV-2 glycoproteins sufficient to induce cell-cell membrane fusion. It is also the first report characterizing the novel OvHV-2 glycoprotein Ov8.
Bile-Extracted Asiatic Black Bears (Ursus thibetanus) in China: Serum Biochemistry Analyses and Survival Curves

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Abstract:
Over 10,000 endangered Asiatic black bears (Ursus thibetanus) are currently farmed for bile in China. Despite proven alternatives to bear bile, bile farms exist to extract bile from living bears, a significant animal welfare and conservation issue. Bears rescued from bile farms exhibit multiple, chronic health issues not commonly reported in any other bear species, including captive bears. Leading causes of death in bile-extracted bears are liver cancer and cardiovascular disease. We suspect the practice of bile farming is associated with increased incidence of systemic disease and reduced survival compared to non-farmed bears. We compared serum biochemistry values between bile-extracted and non-extracted Asiatic black bears. Boxplots revealed greater variability and elevations in liver enzymes and renal parameters in bile-extracted bears compared to non-extracted bears. This is consistent with expected bile extraction associated liver disease which may also contribute to development of renal disease. Analyzing serum biochemistry trends over time from day 0 (arrival at rescue center) up to 16 years post-arrival/rescue, bile-extracted bears continue to demonstrate marked elevations and variability in liver enzymes and renal parameters compared to non-extracted bears. These findings are consistent with long-term metabolic compromise in bile-extracted bears. Kaplan Meier Survival Curves in bile-extracted bears demonstrated markedly reduced survival in bears with liver and renal enzyme elevations providing further evidence that bile extraction from living bears is associated with significant health and welfare issues.
Novel High-throughput Screen Identifies Inhibitors of Sarcocystis neurona

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Co-Author(s):

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Category: Medical & Life Sciences
Campus: Pullman

Abstract:
The parasite Sarcocystis neurona is the primary cause of equine protozoal myeloencephalitis (EPM), the most significant infectious progressive neurologic disease in horses. Many horses in the U.S. are at risk of developing EPM; studies estimate that 50% of all U.S. horses have been exposed to S. neurona and treatments for EPM are at best 60-70% effective. Advancement of treatment for EPM requires new technology to identify novel compounds. To address this insufficiency, we developed, validated, and implemented a novel high-throughput screen using 725 FDA-approved chemical compounds of the NIH clinical collections library. Our screen identified 18 novel compounds with confirmed inhibitory activity against S. neurona growth, with some compounds being active at very low concentrations. Many of the inhibitory compounds identified have well-defined mechanisms of action, making them useful tools to study parasite biology in addition to being potential therapeutic agents. In comparing the activity of inhibitory compounds identified by our screen to that of other screens against other parasites, we found that almost all compounds (15/18; 83%) have activity against one or more related parasite. In addition, investigation of the recorded activity of library compounds on dopamine receptor subtypes identified many (10/15; 66%) inhibitory compounds with activity against dopamine receptors. These findings demonstrate the use of a robust new tool in discovering new chemotherapeutic agents for EPM and aid in the discovery of important biologic pathways required for successful S. neurona infection.
KsgA contributes to structural and functional integrity of the cell envelope in Salmonella Enteritidis

Primary Author: Kim Lam Chiok
Co-Author(s): Devendra Shah, Narayan Paul

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Dimethyl adenosine transferase (KsgA) is a conserved ribosomal biogenesis factor that provides adequate packing of the small ribosomal subunit (30S). This packed structure is relevant for assembly and function of the ribosomal complex. KsgA deficiency in S. Enteritidis leads to virulence attenuation in chickens and reduced survival in egg albumen. Deficiency also results in hypersensitivity to high osmolarity and oxidative stress. We aimed to investigate a potential role for KsgA in cell envelope fitness as a mechanism underlying these phenotypes.
We used two molecular models to dissect this potential role in cell envelope fitness: KsgA-deficiency and overexpression of catalytically inactive KsgA. Transmission electron microscopy revealed that both KsgA deficiency and overexpression of inactive KsgA compromised the structural integrity of the cell envelope. This structure became undulated, lost its continuity and often detached from the cell. Functional integrity was also compromised in both cases, with reduced permeability barrier allowing for increased uptake and accumulation of the hydrophobic dye Ethidium Bromide. Overexpression of inactive KsgA enhanced the loss of structural and functional integrity as well as growth kinetics defects in nutrient rich media and in high osmolarity conditions. Inactive KsgA also reduced association with and intracellular survival within human intestinal epithelial cells, and human and avian phagocytes. Our results strongly suggest that KsgA contributes to cell envelope fitness in S. Enteritidis. This finding positions KsgA as a new avenue to manipulate bacterial membranes, affording a candidate for development of new therapeutics targeting the cell envelope and potentially bypassing antimicrobial resistance mechanisms.
Central Control of Ghrelin Secretion

Primary Author: Pique Choi
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Kelly Breard
Bastian Stark
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College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Cues associated with palatable food can stimulate feeding in the absence of caloric need, to promote diet-induced obesity (DIO). Understanding how cues condition behavior may offer insight into DIO. Ghrelin is a hormone produced from gastrointestinal (GI) tract that targets the central nervous system (CNS) to stimulate meal initiation and increase meal size. GI ghrelin cells communicate with the CNS via the vagus nerve (VN), emphasizing a CNS-GI conduit capable of controlling ghrelin release. Importantly, cortical CNS regions that influence learning contact the VN, allowing learned information to interact with the ghrelin producing cells. Prior work from our lab indicates that expectation of palatable food promotes activation of the medial Prefrontal Cortex (mPFC) and peripheral ghrelin secretion. Based on these observations, we hypothesize that mPFC activity controls conditioned ghrelin secretion prior to palatable food delivery. To test this hypothesis, we conditioned non-restricted male Long-Evans rats to expect a high fat diet (HFD) every day for one month. After conditioning, the mPFC was rendered inactive through a chemical lesion. Subsequently HFD intake, and plasma levels of ghrelin were measured prior to HFD meal delivery. Results indicate that mPFC lesioned rats displayed normal HFD intake but reduced conditioned ghrelin release. These data suggest that mPFC is a CNS region that communicates with the GI tract to promote conditioned ghrelin release.
α6β4 integrin regulates the collective migration of epithelial cells

Primary Author: Zachary Colburn
Co-Author(s): Jonathan Jones

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
The expression of β4 integrin is increased in the alveolar compartment of the lungs of mice after lung injury and in highly metastatic cancers. Since β4 integrin does not affect the proliferation of alveolar epithelial cells, we hypothesized that β4 integrin regulates their motility. We tested this hypothesis in a tumorigenic cell line derived from the alveolar epithelium, A549. α6β4 integrin is localized in a unique punctate distribution at the cell-substratum interface along the leading front of single, front-rear polarized, A549 cells. Knockdown of β4 integrin in A549 cells inhibits their directed migration, with knockdown cells exhibiting large focal adhesions and reduced actin dynamics. Interestingly, in such cells, α6 integrin retains its punctate distribution. Moreover, in β4 integrin knockdown cells, we observe a loss of β1 integrin from focal adhesions and an enhanced association with α6 integrin. We confirmed this observation via immunoprecipitation. We next investigated the role of β4 integrin in collective cell migration. Wounded monolayers of β4 integrin knockdown cells exhibit reduced collective migration compared with controls. When we forced expression of β4 integrin in the leader cells of wounded monolayers, collective migration was restored. In addition, we interrogated the pathway via which β4 integrin regulates A549 cell directed migration. Constitutively active Rac1 rescues motility defects resulting from β4 integrin deficiency. Together, our results support the hypothesis that α6β4 integrin is a positive regulator of collective cell migration of A549 cells through influence on signaling pathways in leader cells.
Conditioned Ghrelin Release Regulates Behavioral Mechanisms and Neurobiological Processes that Promote Palatable Food Intake in Rodents.

Primary Author: Jon Davis
Co-Author(s): Pique Choi
Julianna Brutman
Zhuhua Zhang

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Ghrelin is the only orexigenic feeding peptide produced from the gastrointestinal (GI) tract that increases appetite, making it a logical candidate to target for reduction of excess feeding behavior in obese individuals. Results from our lab indicate that ghrelin promotes anticipation for food, food motivated behavior, and hedonic intake of palatable food in rodents. Once released, the nascent ghrelin peptide is modified via the ghrelin o-acyl transferase (GOAT) enzyme to become maximally active at the ghrelin-1a receptor (GHSR-1a) in the central nervous system (CNS). We find that genetic disruption of GOAT reduces motivated behavior for sucrose and hedonic intake of high fat diet (HFD). Our more recent work indicates that limited access to HFD in non-restricted rats leads to conditioned release of ghrelin 1hr prior to HFD delivery, escalation of HFD intake over time, and increased body weight gain. Notably, pharmacological blockade of conditioned ghrelin release attenuates conditioned HFD intake, indicating that this process is functional to control palatable food intake. Moreover, we detect increased mRNA expression of orexigenic hypothalamic transcripts under conditions of elevated conditioned ghrelin release and epigenetic changes of hypothalamic transcripts that regulate mRNA stability, synaptic plasticity, dopamine and glutamate signaling. These data highlight conditioned ghrelin release as an environmental event that induces genetic changes that may enhance the drive to consume palatable food. Collectively, our data indicate that learning-induced increases in peripheral ghrelin secretion are functionally relevant to promote behavioral mechanisms and neurobiological processes that control palatable food intake.
Prevalence of β-lactam resistance genes in bacteriophage fractions of environmental water samples, Washington State

Primary Author: Maragret Davis
Co-Author(s): Anyun Zhang
Lisa Jones
Thomas Besser
Margaret Davis

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Extended-spectrum β-lactamases (ESBLs) represent a serious public health challenge worldwide. Data indicate that commensal E. coli carrying blaCTX-M among Washington state dairy cattle emerged after the emergences of clinical blaCTX-M-positive bacteria in the region. Gene transmission from the enteric flora of humans to livestock could occur via phage transduction. We hypothesized that resistance genes would be detected in at least 10% of phage fractions of environmental water samples.

Water samples were collected from wastewater treatment plants (WWTP), irrigation canal systems and river. Phage and bacterial DNA were extracted from water samples and samples were tested for presence of bacterial DNA using universal 16S PCR primers. Resistance genes in phage and bacterial fractions of samples were detected using published PCR protocols. Target genes included: blaCTX-M, blaTEM, blaPSE, blaCMY-2, blaNDM-1, blaOXA-48TX-M, and blaKPC.

Overall, targeted genes were detected frequently in the samples’ phage fractions: blaTEM was most frequently detected (63.5%), followed by blaOXA-48 (56.5%), blaPSE (51.2%), blaCTX-M (50.6%), blaKPC (41.2%), blaCMY-2 (37.9%), and blaNDM-1 (7.6%). WWTP samples had the highest prevalence of resistance genes, followed by irrigation canals, and the river water had the lowest prevalence. blaNDM-1 was not found in any canal sample, and was found in only one river sample phage fraction, but was frequently (12 of 20) found in WWTP phage fractions. β-lactamase genes were detected at higher than expected frequencies in the phage fractions of water samples. These findings support the hypothesis that bacteriophage play a role in the dissemination of resistance genes through environmental water.
Babesia bovis Sexual Stages Induced in In Vitro Culture

Primary Author: Hala Elsayed  
Co-Author(s): Carlos Suarez, David Schneider, Wendell Johnson, Glen Scoles, Massaro Ueti

College: College of Veterinary Medicine  
Category: Medical & Life Sciences  
Campus: Pullman

Abstract:
Bovine babesiosis is an important tick-borne disease of cattle caused by Apicomplexan protozoan parasites. These parasites have a complex lifecycle including development within the mammalian host and tick vectors. Understanding the transmission cycle through the biological vector is critical for the development of bovine babesiosis control strategies. However, studying sexual stage transformation is limited by the difficulty in acquiring developing parasites ex vivo. In this study, we induced Babesia bovis sexual stages in vitro by decreasing the temperature and Xanthurenic acid exposure. Extra-erythrocytic parasites with long projections and large round parasite stages, indicative of parasite sexual stage development, were found in the induced B. bovis cultures. A comparative transcript analysis revealed the expression of sexual-stage specific genes 6-Cysteine A and B and hap2 genes exclusively in the in vitro B. bovis induced sexual stages. Furthermore, an immunofluorescence assay also detected HAP2 expression exclusively by B. bovis induced sexual stages. This study demonstrates that B. bovis sexual stages can be induced in vitro for the first time and confirms expression of the 6-Cys A and B and hap2 genes as markers for sexual stage development. The results presented herein provide an in vitro method to induce sexual stages without the need of the biological vector. This in vitro transformation of B. bovis will provide a novel research tool that will facilitate a better understanding the life cycle of B. bovis while providing a highly accessible experimental system towards identifying potential immunological targets to prevent parasite development within the tick midgut.
Sequential hypertonic-hypotonic treatment of Acinetobacter baumannii biofilm enhances penetration of hydrophilic antibiotics

Primary Author: Azeza Falghoush  
Co-Author(s): Douglas Call**  
Haluk Beyenal

College: College of Veterinary Medicine  
Category: Medical & Life Sciences  
Campus: Pullman

Abstract:  
Infections with bacterial biofilms are as serious challenges because biofilm communities are highly tolerant to antibiotics. This protection is attributed, in part, to a hydrated matrix that surrounds the bacterial community and that delays antibiotic diffusion. In this study, we evaluated whether it is possible to dehydrate a biofilm and then re-hydrate using distilled water with antibiotic as a means to increase antibiotic penetration and efficacy. Acinetobacter baumannii test-tube biofilms (24 h) were exposed to hypertonic concentrations of maltodextrin, sucrose or polyethylene glycol (PEG). These biofilms were then washed with distilled water containing 10 times the concentration of antibiotics needed to kill these bacteria in broth culture (50 µg/ml tobramycin, 300 µg/ml chloramphenicol, 20 µg/ml ciprofloxacin or 100 µg/ml erythromycin). Biofilms were then harvested and the number of viable cells (CFU) was determined. Depending on the treatment combination, this sequential strategy reduced the cell counts by 2-7 log (P < 0.05). Relative to tobramycin treatment alone, the efficacy of sequential treatment was evident for all osmotic compounds (P < 0.05). Sequential treatment with erythromycin or chloramphenicol was not different from using either antibiotic alone (P ≥ 0.2). The differences in antibiotic performance were correlated with the degree of antibiotic hydrophilicity. Our findings support the clinical evaluation of sequential regimens of hyper- and hypotonic solutions as a means to enhance antibiotic efficacy against chronic biofilm infections.

**Denotes 2017 Celebrating Excellence Award Recipient
A destructive relationship: Campylobacter bacteria and human intestinal cells

Primary Author: Christopher Gourley
Co-Author(s): Michael Konkel
Nicholas Negretti
Colby Corneau

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Campylobacter bacteria cause 400–500 million cases of diarrhea each year worldwide. Nearly 90% of commercial poultry flocks in the United States are contaminated, and consumption of food tainted with Campylobacter is responsible for most human infections. Campylobacter jejuni causes debilitating diarrhea with fever and abdominal cramps. While the relationship between C. jejuni and the human host is incompletely understood, in more severe disease, C. jejuni invade the cells lining the intestinal tract and cause their death. We hypothesized that C. jejuni become more metabolically active and synthesize disease-related proteins in the presence of human intestinal cells. We used radioactive methionine incorporation to measure the metabolic activity of C. jejuni and RNA-sequencing to determine gene expression of C. jejuni grown in culture with human intestinal cells versus in standard laboratory culture medium. C. jejuni grown in culture with human intestinal cells incorporated more radioactive methionine (showed increased metabolism) compared to bacteria grown in standard laboratory medium. In addition, we identified a subset of genes whose expression was increased when C. jejuni was cultured with human intestinal cells. Specifically, we observed upregulation of the gene encoding Campylobacter Invasion Antigen B (CiaB), a protein known to be associated with C. jejuni invasion of human intestinal cells. Our results demonstrate that C. jejuni increases its metabolic activity and alters its gene expression during infection of human intestinal cells. To identify new C. jejuni disease-related proteins and targets for new treatments, future studies will explore additional proteins synthesized during infection of human intestinal cells.
The Ral2 protein vicariously modulates the activity of the recombinase RadA through its interaction with the recombinase paralog, Ral1, in the archaeon Sulfolobus solfataricus.

Primary Author: Corey Knadler  
Co-Author(s): Cynthia Haseltine

College: College of Veterinary Medicine  
Category: Medical & Life Sciences  
Campus: Pullman

Abstract:  
The DNA of all living things is constantly being damaged by an array of endogenous and exogenous factors, and homologous recombination (HR) plays a key role in mitigating mutagenicity through proper repair of double-strand breaks. Central to this process are the recombinase proteins, which serve the function of finding homologous template sequences in HR. These recombinases play important roles in evolution as they serve the dual role of constraining mutations through proper repair and recombining sequences to improve genetic diversity. Therefore, control of recombinase activity could be a key in maintaining genetic stability and in adapting to new stimuli. Control of recombinase activity in archaea and eukaryotes is often highly complex and involves an array of proteins. Among these are the recombinase paralogs, which have been implicated in modification of recombinase activity. The archaeal genus Sulfolobus has been a popular model organism for understanding microbial evolution as well as mechanisms of HR. However, it is presently unclear how HR is controlled in archaea and what role this regulation may have on its evolution. Therefore, to better understand the mechanistic control of the Sulfolobus solfataricus RadA recombinase, the effects of the Ral2 paralog were examined biochemically. It was found that Ral2 modulates RadA activity by means of its interactions with another previously studied paralog, Ral1.
Autoinducer-2 Quorum Sensing Contributes to Microcin PDI Regulation in Escherichia coli

Primary Author: Shao Lu
Co-Author(s): Zhe Zhao
Johannetsy Avillan
Jinxin Liu
Douglas Call**

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Microcin PDI (mccPDI) is a recently described, naturally occurring peptide that inhibits growth of important pathogens such as Escherichia coli O157:H7. Quorum sensing (QS) is a bacterial system that alters and synchronizes the growth and “behavior” of bacteria once a critical concentration of a diffusible autoinducer is “sensed.” To determine if there is a link between these systems, we constructed E. coli-25ΔluxS and ΔlsrACDBFG (lsrH) mutants that are no longer able to produce or actively transport the autoinducer AI-2. MccPDI-susceptible E. coli BW25113 and its ΔluxS mutant were selected from a single-gene knockout library (Keio Collection). We then measured the inhibition of BW25113 when co-cultured with E. coli-25 by quantifying colony forming units (CFU). We used RT-qPCR and western blot assays to detect changes of microcin expression and synthesis under co-culture and monoculture conditions in M9 minimal media for 24 h. During the mid-to-late log growth phase, competition with E. coli-25 resulted in an expected 5-log reduction of BW25113 (CFU/ml), but competition between AI-2-negative strains resulted in a 1.8-log reduction of the susceptible strain. When only E. coli-25 or BW25113 was AI-2 deficient, the log reduction was 2.6 (P < 0.05). A comparison between E. coli-25ΔluxS against the isogenic wild-type E. coli-25 showed a 5-fold reduction in mcpM transcription and McpM concentration at mid-to-late log growth phase under co-culture or monoculture conditions. Different environment stimuli can regulate the production of microcins, but this is the first report that the regulation of an E. coli microcin is linked to quorum sensing.

**Denotes 2017 Celebrating Excellence Award Recipient
Use of Elemental iodine in Vapor Form for Water Disinfection

Primary Author: Petronella Magunda
Co-Author(s): Daniel Mobely
Douglas Call**

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Elemental iodine (I2) is a powerful oxidizing agent that provides biocidal activity in iodine preparations. The oxidizing effect is rapid, even at low concentrations, but limited solubility and rapid reactivity also means that I2 quickly complexes with surfaces and other compounds making it a relatively poor disinfectant in water. We evaluated a new technology, I2 Vapor Perfusion (I2VP), which passes an airstream through an I2-containing matrix to produce I2 vapor that is then introduced into a water column as bubbles using a simple diffuser. This procedure is dose and duration dependent, but for the conditions tested the iodine infusion quickly killed Gram-negative (Escherichia, Salmonella) and Gram–positive (Enterococcus) bacteria in water. Pre-formed Acinetobacter and Staphylococcus biofilm communities were eliminated after (90 s) exposure to I2-containing bubbles. Iodine infusion was not effective for water treatment in which high concentration of dissolved solids and organics was present (e.g. dairy lagoon water), but was effective against bacteria found in municipal waste water. A hand-pump operated unit was very effective at eliminating bacterial contamination with iodine residues <0.2 µg/ml (ppm). As expected, longer duration infusion and higher air volumes were associated with higher concentrations of residual iodine (up to 12 µg/ml). Iodine infusion has the potential to be useful for applications such as emergency water treatment, clearing biofilms from water delivery hoses, and potentially for reducing microbiological contamination of some waste streams such as municipal and hospital sewer. The technology is relatively simple to implement and it appears to be scalable for larger applications.

**Denotes 2017 Celebrating Excellence Award Recipient
Water, Sanitation and Hygiene: Key Risk factors for Community Antimicrobial Resistance Burden

Primary Author: Sylvia Omulo
Co-Author(s): Svetlana Lockwood
Eric Lofgren
Guy Palmer
Douglas Call**

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Key contributors to community-level antimicrobial resistance (AMR) remain largely uninvestigated, particularly with respect to low-income populations, where antibiotic use is unregulated and sanitation problematic. We conducted a 5-month longitudinal study of 200 households in a Kenyan slum to investigate how sanitation contributes to household load of resistant Escherichia coli. An adult and child (≤ 5 years) were enrolled per house, 1,516 interviews conducted and 6,692 samples collected (stool, hand-swabs and water). Presumptive E. coli (n = 34,042) were isolated and tested for susceptibility to nine antibiotics using breakpoint assays. Resistant-E. coli were common in stool (99%) than on hand-swabs or water samples (12% and 10%, respectively). Stool isolates were most resistant to trimethoprim (mean: 81.1%), sulfamethoxazole (80%), ampicillin (67.9%), streptomycin (60.1%) and tetracycline (55.2%). At the household level, using water from protected public sources (0.51, \( P = 0.001 \)) and constant water availability (-0.50, \( P = 0.004 \)) were associated with decreased AMR load included, whereas the number of days without water (0.09, \( P = 0.009 \)), children spending time outside the household (0.54, \( P = 0.023 \)) or eating soil (0.62, \( P < 0.001 \)) increased AMR risk. Antibiotic use was not an important risk factor. Paradoxically, E. coli load increased when hand-washing stations were present within a toilet facility (0.29, \( P = 0.035 \)) or around the household (0.43, \( P = 0.001 \)), possibly reflecting inconsistent use of soap, improper hand-washing technique or bacterial transmission from surfaces. Efforts to reduce antibiotic use, if not coupled with improved water, sanitation and hygiene, may not be beneficial.

**Denotes 2017 Celebrating Excellence Award Recipient
Extended-spectrum β-lactamases producing Salmonella Kentucky and Salmonella Typhimurium isolated from the US poultry

Primary Author: Narayan Paul
Co-Author(s): Devendra Shah

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Background: Extended-spectrum β-lactamases (ESBLs) confer resistance against third-generation cephalosporins. Emergence of ESBLs in members of Enterobacteriaceae family is a serious concern for both antimicrobial treatment and infection control in hospitals. Unlike E. coli, ESBL production in Salmonella is relatively uncommon. The aim of this study was to determine the prevalence of ESBLs among Salmonella Kentucky and S. Typhimurium isolated from the US poultry or poultry environment.

Methods: A total 305 strains (S. Heidelberg =165, S. Kentucky =140) strains were initially screened for resistance to 3rd generation cephalosporin (ceftiofur) to identify presumptive ESBL producers using disk diffusion test. Subsequently, isolates resistant to ceftiofur were tested for ESBLs by double-disk synergistic test (DDST) using cefotaxime, cefotaxime-clavulanic acid, ceftazidime and ceftazidime-clavulanic acid, and for carbapenemase by imipenem and ertapenem. Isolates were considered either as ESBLs producers or AmpC overproducers if zone size diameter between cephalosporins and respective clavulanate was ≥5mm or <5mm, respectively.

Results: Ceftiofur resistance (CefR) was detected in 4/140 (3%) S. Kentucky and 12/165 (7%) S. Heidelberg isolates. DDST identified a total of eight S. Heidelberg and one S. Kentucky strains as ESBLs producers. In addition, four S. Heidelberg and three S. Kentucky were identified as potential AmpC overproducers. None of the CefR isolates were resistant to carbapenem.

Sequencing of PCR amplification of genes responsible for ESBLs or AmpC cephalosporinases is ongoing to identify specific ESBLs or AmpC cephalosporinases types that might have public health significance.
CpG oligodeoxynucleotide motifs from Salmonella genome stimulate Interleukin 1-β and nitric oxide production in avian macrophages

Primary Author: Astia Sanjaya
Co-Author(s): Devendra Shah

College: College of Veterinary Medicine
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Synthetic oligodeoxynucleotides (ODNs) containing CpG motifs (CpG ODNs) are known to stimulate avian toll-like receptor 21 (equivalent of TLR 9 in mammals) expressing cells such as avian macrophages. However, the magnitude of immune-stimulation by CpG motifs greatly depends on specific type and pattern of the flanking bases within these motifs, implying the importance of identifying motifs with most immune-stimulatory activities. This study aims to identify the immune-stimulatory CpG motifs within Salmonella-pan genome using avian macrophages (HD11 cells) as a model. A total of 256 CpG motifs previously identified in Salmonella pan-genome were tested in four rounds of screening assays for their ability to stimulate the production of inflammatory cytokine IL-1β in HD11 cells. Relative expression of IL-1β in stimulated HD11 cells were assessed using q-RT PCR. A total of 7 CpG motifs were identified as highly immune stimulatory that consistently induced IL-1β expression similar to that of commercially available ODN2007 and LPS of Salmonella Enteritidis in HD11 cells. When subjected to Griess assay for measuring nitric oxide (NO) production, all identified CpG motifs induced high level of NO production in HD11 cells. Based on the ability to induce high IL-1β and NO in HD11 cells, this study identified 7 high immune-stimulatory CpG motifs from Salmonella pan-genome. In vivo studies in chicken host are ongoing to assess the immune-stimulation and protective effects of these 7 CpG motifs against Salmonella colonization.
A novel rodent attentional task is easily acquired and retained, and sensitive to sleep deprivation

Primary Author: Darian Sidebottom  
Co-Author(s): Chris Davis, Hans Van Dongen

College: College of Veterinary Medicine  
Category: Medical & Life Sciences  
Campus: Spokane

Abstract:
The Novel Rodent Attentional Task (NRAT) is an open-field performance task for rodents, conducted in a circular enclosure equipped with rotary vibration motors and no visual cues. Rodents use the frequency of floor vibrations to navigate to an unmarked target destination; as the rodent gets closer to the target, the vibration frequency decreases. The entry and target locations vary between trials. The goals of this study were to assess learning acquisition on the NRAT and determine whether task performance is sensitive to sleep deprivation. Adult, male Long-Evans rats were randomly assigned to a sleep-deprived group (SD; n=7) or control group (CONT; n=7). All rats completed 9 trials daily over 3 consecutive days. On day 3, prior to testing, the SD group was sleep deprived for 6 hours. Success rate, and distance and time to target, were analyzed with mixed-effects ANOVA. There were no significant effects for success rate. There was a main effect of day for distance (F(2,356)=3.57, p=0.029); rats took less distance to find the target on day 2, indicating that day 1 learning has been retained. There were significant main effects of group for distance (F(1,356)=7.65, p=0.006) and time (F(1,356)=7.81, p=0.006). Rats in the SD group took more time and distance to complete the task, and this was particularly pronounced on day 3 after sleep deprivation. Our findings suggest that the NRAT may be a useful model in sleep deprivation attention research, as it is easily acquired and retained and sensitive to sleep deprivation.
Building Relationships, Promoting Health: An Empirical Evaluation of a Culturally Based Substance Abuse Prevention and Outreach Program with Multicultural University Students

Primary Author: Patricia Maarhuis
Co-Author(s): Alicia San Miguel

College: Counseling and Psychological Services- ADCAPS
Category: Social Sciences
Campus: Pullman

Abstract:
This poster reports a multicultural outreach intervention program and evaluation of a novel treatment, which consists of a culturally based practice of substance use/abuse prevention, health psychoeducation, and outreach intervention to advance the health of underserved students at Washington State University. This culturally-based prevention and intervention model utilizes the peer/professional liaison model, various education modalities, and a combination of empirically-based strategies and culturally-focused strategies to create a comprehensive program. The intervention targets interrelated mental health concerns regarding substance use, mental health issues and comorbidity, violence, sexual decision making, sexual consent and other related health topics relevant for specific racial/ethnic populations and socioeconomically disadvantaged groups. Chi square analysis indicated that a moderately strong association exists between students’ perceptions that the content of the outreach was beneficial for their WSU social experiences (Strongly Disagree, Disagree, Neither, Agree, Strongly Agree) and students’ level of comfort contacting the WSU student health and counseling services after an ADCAPS outreach (More, less, same), \( \chi^2(df= 3, N= 279) = 23.109, \phi = 0.288, \ p = .000 \). These findings suggest that this culturally sound intervention regarding substance use/abuse prevention and health psychoeducation has positive implications for underserved communities.
Field Testing of a Family-based Media Literacy and Nutrition Program to Prevent Childhood Obesity

Primary Author: Erica Austin
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Mary Katherine Deen
Marilyn Cohen
Barbara Johnson
Thomas Power
Bruce Austin
Michelle Kistler
Zena Edwards
Kit Kaiser

College: Edward R. Murrow College of Communication
Category: Social Sciences
Campus: Pullman

Abstract:
The objective was to field test a curriculum fostering healthier family food behaviors through improved media literacy.

The first of two cycles of dyads of parents and youth age 9-14 years (n = 52) from five Washington State counties (sites) received the 6-session program, FoodMania: Kids and Food in a Media-Driven World, based on the Message Interpretation Processing Model. The program teaches media literacy to increase parental media management skills and information efficacy, children’s skepticism toward media messages and expectancies for healthy eating, family members efficacy for healthy nutrition changes, and ultimately nutrition behavior. Parent/youth dyads from the same counties served as controls (n = 50).

Intervention results compared to the control group based on MANOVA included increased frequency of child-initiated discussion reported by youth and parents about food messages in the media. Parental efficacy improved for resisting food advertising along with expectancies for positive family acceptance of healthier foods. Parents reported greater support by their participating child for purchasing fruits and vegetables. Improvements in the family home food environment were also reported by parents. Parents showed increased critical thinking about media and critical discussion of media with the child. Preliminary post-test findings showed no significant influence of site.

Preliminary results show that a media literacy and nutrition program based on the Message Interpretation Processing Model can have positive effects for both parents and youth attending
the program. A second wave of the family intervention, two waves of youth-only intervention, and delayed 6- and 12-month posttests will be conducted.

Academic Showcase Participant
Board Placement: 122

Assessing a Communication Campaign about Contaminants in the Arctic

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

College: Edward R. Murrow College of Communication
Category: Social Sciences
Campus: Pullman

Abstract:
Indigenous populations residing in the Arctic commonly rely on country foods for nutritional, spiritual and cultural benefits. However, some of these food sources have become contaminated with heavy metals or persistent organic pollutants. To address this challenge in the Canadian Inuit region of Nunavik, a working group was formed to advance risk management and communication recommendations about local country foods. The study presented in this manuscript assesses both the benefits and challenges of utilizing an inclusive participatory approach to health communication. In-depth interviews with members of the working group were completed to provide insight into the risk management approach and how communication materials were developed and delivered. Study results reveal the importance of including members of the Inuit population in the design and dissemination of communication material. In addition, researchers and healthcare professionals were better able to: (1) access important local knowledge; (2) understand the perceptions of the populations; and (3) assess behaviors that effected exposure to contaminants. By incorporating multiple perspectives and including the people residing in the affected region in the decision-making process, there was greater consensus in risk management and communication design. We discuss the barriers and facilitators to using a participatory advisory approach to develop and deliver health risk messages to Indigenous populations. This study ultimately provides insight into how a participatory approach to risk management and communication – that is inclusive of experiences, knowledge and skills – can result in potentially more culturally relevant health advisories and communication campaigns.
Viewers’ perceptions of sexualized and non-sexualized images of women in alcohol advertisements and their intentions to intervene in sexual assault situations

Primary Author: Nicole Cameron
Co-Founder(s): Stacey Hust
Kathleen Boyce-Rodgers

College: Edward R. Murrow College of Communication
Category: Social Sciences
Campus: Pullman

Abstract:
Bystanders or third-party witnesses to sexual assault or potential instances of sexual assault have tremendous potential to limit or prevent these acts of aggression from occurring. Previous research has established that gender, gender stereotype beliefs, and exposure to media, in general, can influence bystander intentions (Moynihan & Banyard, 2008; Hust, et al, 2013). Few studies, however, have investigated how exposure to and perception of sexualized images of women in the media are associated with viewers intentions to intervene.

The current study tested the association of the forced exposure to images of sexualized and non-sexualized women in magazine alcohol advertisements and college students’ bystander intentions. Undergraduates (N=1234) completed a web-based experiment in which they either viewed three alcohol advertisements that included images of sexualized women or three digitally altered alcohol advertisements that included images of non-sexualized women. Participants then recorded their perceptions of the women in the advertisements.

Hierarchical regression analyses indicate that women and participants who rejected gender stereotype beliefs were more likely to intervene in cases of sexual assault. Neither time spent reading men and women’s magazines nor was exposure to sexualized images of women in advertisements a significant predictor. Viewers who perceived the women in the alcohol advertisements had agency or were victims were significantly less likely to intervene; whereas, viewers who perceived the women to be attractive and sexualized were significantly more likely to intervene.

These and other results have implications for the media’s portrayal of women and viewer’s perceptions of these images. Additionally, there are implications for sexual assault intervention programming.
Arsenic Contamination in Bengal Basin: Reinventing Mitigation through Community-based Participatory Research

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Abstract:
Arsenic contamination of groundwater and soil in West Bengal, India is a serious environmental health issue. Approximately 40 million people are exposed to contamination, 20 million being seriously affected. Risk mitigation faces multiple challenges, much of which is historical, political, socio-cultural, and economic in nature. This study investigated the factors that affect perception and understanding of contamination risks by different stakeholders, and thus challenge mitigation; and how participatory communication can create better opportunities for mitigation. 100 interviews and 2 focus groups were conducted with villagers, local government representatives, doctors, scientists, teachers, and primary health-workers in 14 villages in West Bengal.
The study found four major issues with water - access, availability, quantity and quality. Only in villages with adequate availability and easy access, people concern for water quality. Even though awareness of water quality and its health impacts is significantly low, local governments do not have any risk communication plans. Arsenic causes multiple health issues- loss of stamina for work, chronic skin lesions, cancer, and death. Manpower loss impacts both family and village economy. People, especially women face difficulties in finding marriage partners. Patients are often discriminated for fear of contagiousness of diseases. When families lose male members, girls are often married off young that affect their overall well-being. These cause villages to remain in the vicious cycle of poverty. The study found need for community-based participatory research to empower communities to identify and mitigate water contamination risks. The study informs environmental and public health risk communication and mitigation literature.
Challenges of Cultural Adaptation in International Graduate Students in Engineering: an Ethnographic Investigation

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Abstract:
Recently, United States has emerged as the most popular academic destination among international students. In 2015-2016, international students’ enrollment has increased 7% from the last admission cycle. Despite record enrollment, retention of international students has caused some concern. Dissatisfaction relate to obvious financial reasons and greener pastures for better academic fit, but also to psychosocial issues such as meal plans, academic difficulties, inadequate English language skills and dissatisfaction with location, as brought out in annual NAFSA: Association of International Educators conference. Academic performance of international students has also been at the limelight. Many students academically excel in their home countries, but often fail to maintain same academic performance.
The study investigated the challenges of academic and cultural adaptation faced by international graduate students, and their individual coping mechanisms. It critically analyzed why such challenges exist and what systemic changes can be brought to facilitate better adaptation. Fifteen graduate students in engineering were interviewed and two engineering classrooms were observed.
Study identified that challenges were both individual and structural, and vary greatly: from differences in academic structure, academic and social culture, difficulties with English language; to food-habits, weather, homesickness, family’s expectations of academic excellence. Gender, racial and religious stereotypes often underlie communication between people from different cultures, which inhibits future communications. Peer-to-peer mentorship, greater opportunities for engagement in greater university/community life, and more time for academic/cultural adaptation are imperative. Prior preparation for coping cultural differences were thought to be useful. The study informs literature on intercultural/international communication, and higher education administration.
Smoking prevention in China from the perspective of cancer patients

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Abstract:
Lung cancer death rates have increased 465% in the past 30 years in China, much of this increase due to smoking (China Ministry of Health, 2008). To battle the smoking epidemic, health care professionals in China have launched various national anti-smoking campaign hoping to encourage behavior change. Though previous studies have looked at factors such as smokers’ demographic and psychological state in relation to smoking preference, little effort was put to understand qualitatively the motivations for quitting smoking and strategies smokers adopted to maintain abstinence. This study utilizes in-depth interviews with smokers, particularly 15 Chinese cancer patients, to gain valuable insight of their cessation experience, especially their evaluation on the current anti-smoking campaigns. We identified that cigarettes sharing and gifting culture poses serious threat on smoking prevention while the anti-smoking campaign exerted very little influence on smoker’s behavior. Recommendations were given to help design future campaigns.
React, share, comment: Measuring engagement with political news on Facebook during the 2016 election

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Abstract:
Political communication researchers are interested in the various ways the public encounters and interacts with news content online. Since a recent Pew study (2015) found that Facebook serves as a primary source of news for a majority (63%) of its users, it is important to ask what information is being engaged with online, and if the types of engagements available to online consumers (liking, sharing, or commenting) vary by the source or type of information shared. Using data gathered with an open-source scraping algorithm (Wolfe, 2015), this study examines five media outlets’ Facebook posts from the final 30 days of the 2016 election cycle. The media outlets examined include The New York Times, Fox News, MSNBC, Breitbart, and The Daily Kos. Analyses were conducted to measure the number of Facebook reactions, comments, and shares on each of the 30 days leading up to the 2016 election, and the topic of the posts with the most engagement. The results find that Facebook reactions (like, love, wow, haha, etc.) were the most common type of engagement, followed by sharing, and then commenting. Additionally, considering the posts with the most engagement from each week leading up to the election, it is clear that news users from each site were engaging with entirely different content. These results have important implications as partisan news consumption continues to divide Americans. It is also of relevance for researchers considering the benefits of the Internet as a platform to encounter diverse ideas and discuss them civilly.
“You Just Need to Watch What You Eat, Right?”: Exploring Social Interactions and Self-Identity of Adult Type 1 Diabetics

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Abstract:
With a chronic disease that impacts every facet of life, type 1 diabetics, generally diagnosed at a young age, face many distinct challenges in their daily lives. In addition to the challenges inherent in having this disease, social stigma primarily related to type 2 diabetes can also impact identity formation and health behaviors in type 1 diabetics (T1Ds). Understanding how T1Ds make sense of their disease and their identity, especially in relationship to public perceptions about diabetes and the public performance of their health behaviors required for diabetes management, can help the research community and health practitioners work more effectively with T1Ds to make positive health decisions. This study utilizes a modified grounded theory approach and semi-structured, open-ended interviews with adult T1Ds to understand the experiences and social interactions of individuals living with the disease. The interview data suggest three categories within the T1D experience: self identity, social interactions, and associated behaviors. After describing emergent themes within these categories, this study makes a number of recommendations to the health community and offers suggestions for future research.
Listening to Public Radio Listeners: Two Methods for Ascertaining Issues of Importance and Concern

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Abstract:
This paper offers an updated method that broadcast stations can use meet their community interest obligations to provide programming relevant to the issues of importance and concern within the community. This process, called ascertainment, was revised to better represent diverse communities.

In traditional ascertainment processes, community leaders representing those in appointed and elected positions of power are invited to discuss community problems with station personnel. This study revised this process to also include leaders with the reputation for power in the community, as well as leaders in formal and informal power structure within the Hispanic/Latino community.

Traditionally, leaders are asked to identify the main problems facing the community. This study also asked leaders to identify the main problems facing the Hispanic/Latino community. To provide a check on community leaders, audience members representing both public radio station members as well as members of the Hispanic/Latino community were asked to rank order the leader-created list of problems.

Results showed significant and interesting differences in perceptions of problems facing the community as a whole and problems perceived to be facing the Hispanic/Latino community. Interesting and significant differences also emerged between Hispanic and non-Hispanic leaders, between Hispanic and non-Hispanic citizens, and between leaders and citizens.

Stations seeking to serve the public interest must provide programming that is responsive to diverse audiences and to diverse leadership. But public radio stations in particular are also responsible for raising issues that are on the national news agenda and that are important to all audiences.
Examining the Differential Effects of Emotions: Anxiety, Despair, and Informed Futility

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Abstract:
Using survey data collected during the fall of 2015, we examine the role of different emotions in increasing and decreasing active information seeking and processing behaviors. We replicate results from the Risk Information Seeking and Processing (RISP) model focusing on anxiety as a key variable that triggers these active information seeking behaviors. We also test the informed futility hypothesis, which proposes that learning about an issue leads people to become disengaged with solving the problem.
Factors that Influence Public Perspectives of Energy Development in Canada: Results of a National Survey on Climate Change and Energy Systems

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Abstract:
Energy production is a critical component of the Canadian economy. Canada is not only the fifth-largest energy producer in the world; it is also one of the highest per-capita consumers of energy. This high production and consumption of energy results in high levels of greenhouse gas (GHG) emissions in Canada. There is an increasing concern about these GHG emissions and recognition that low carbon energy systems need to be developed and sited. The publics’ opinions about energy systems can impact the development of these technologies. A survey was administered to examine public views on and understanding of key issues surrounding energy systems, climate change and government regulation. The survey was administered via Internet and phone to a representative sample of 1,479 Canadians. Results indicate that multiple factors influence public opinion about the development of energy systems. The majority of participants indicated that impact to human health and the environment were the most important factors when thinking about energy sources. Fewer responded that reliability of energy supplies or independence from other countries’ fuels was the most important factor in their perspectives on energy. Trust in government to regulate technology and perceptions of industries ability to safely develop energy systems were shown to be important factors in the publics’ attitudes towards these developments. We conclude by discussing the policy challenges associated with the energy systems development and provide directions for future risk perception research on climate change and energy systems.
Risk Perceptions of Stimulant Medication Abuse: Testing the RISP Model in a Health Context

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Abstract:
This research tested the risk information seeking and processing (RISP) model in a health context with a goal of understanding the mechanisms through which college students seek and process information on the dangers of stimulant medication abuse. College campus stimulant abuse is on the rise, and it is unknown if students perceive this abuse as a risk. College students in the Northwestern United States (N= 649) completed a survey, revealing that over 32% reported using stimulants without a prescription and 55% did not perceive the abuse as a health problem. When applying the RISP model, relevant channel beliefs, perceived information gathering capacity, current knowledge, and information (in)sufficiency were factors associated with systematic processing of stimulant information, while the same factors did not predict heuristic processing. Furthermore, moderation analyses revealed that neither perceived information gathering capacity nor relevant channel beliefs moderated the relationship between information (in)sufficiency and information seeking behaviors.
Predicting Support of Renewable and Nonrenewable Energy Systems in Canada through Familiarity and Perceived Safety

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Abstract:
This research investigates Canadians’ perceptions of renewable energy resources (wind, solar, biomass, geothermal, hydroelectric, and biofuels) compared to nonrenewable (coal, natural gas, and oil). Health, safety, and environmental risks are associated with both nonrenewable and renewable energy sources. During the past few decades, energy systems have experienced dramatic evolutions with a transformation from maximum exploitation of nonrenewable resources to the growing exploration and production of renewable resources. A primary goal of the transformation from nonrenewable to renewable energy systems is to reduce potential threats to the citizens, and the factors that lead to public support for these transformations in Canada are in need of further investigation. Prior research shows that public familiarity with energy systems can predict support for energy technologies. A component of familiarity is perceived safety and past analyses of risk reveal that if individuals feel threatened by a new technology, their support decreases. The current study tested this relationship between familiarity and perceived safety for both renewable and nonrenewable energy systems using Internet and phone surveys (N = 1479) from a representative national sample of Canadians. Results show that individuals who were more familiar with both types of energy systems were more likely to support the construction of nonrenewable power plants and the higher the safety perceptions of both renewable and nonrenewable energy systems the more favorable that individuals support the construction of those energy systems. Findings from this study can be used to inform risk communication procedures on increasing support for energy systems.
Exploring the Associations Across Adolescence of Perceived Desirability for Alcohol Advertising and Skepticism about Advertising with Alcohol Expectancies

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Abstract:
Many studies suggest adolescents in different age groups have different levels of understanding about persuasive media messages. Previous research has uncovered the basic age when adolescents are more likely to become critical thinkers, but this research has not examined the dynamics underneath this critical media interpretation. Hence, this study aims at understanding the differences in perceived desirability of alcohol advertisements across various adolescent age groups to see if there are concomitant increases in media literacy. The study demonstrates the extent to which reductions in alcohol marketing desirability follow increases in skepticism during adolescence. Data from a diverse age range of adolescent participants showed that that desirability is based on perceptions of similarity in advertising and that desirability increases across adolescent age groups. Even though skepticism also increases with age it is not a sufficient protective factor, at least on its own, as a marker of cognitive maturation.
Refuse Unwanted Sex— the Integrative Model and Media Effects

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Abstract:
A large percentage of undergraduates on the United States campus have reported consenting to unwanted sexual activities, which has been associated with negative outcomes such as emotional discomfort and risk behaviors. Media exposure is often used as an important predictor to understand young people’s sexual health related outcomes, yet there is not enough knowledge about how media influences young people’s intentions to refuse unwanted sex. The current study uses integrative model of behavioral prediction to explore the determinants of college students’ intentions to refuse unwanted sex. Particularly, the present study separates passive media exposure and active information seeking as two types of media exposure. Survey data were collected from 310 undergraduate students from a large university in the United States. Findings for Structural Equation Modeling (SEM) suggested that media exposure, rape myth acceptance, perceived norms, and self-efficacy are all associated with college students’ intentions to negotiate sexual consent. It also points out the importance of testing the effects of media exposure through its influence on mediators such as rape myth acceptance, perceived norms, and self-efficacy.
Public Sphere and Loathing: Liking, Tagging and Sharing During the 2016 Presidential Election

Primary Author: Kyle Lorenzano
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Abstract:
Recently, political polarization and incivility towards political opponents has manifested itself in online contexts with respect to the 2016 U.S. Presidential Election. Various efforts have been made to improve the state of online political discussion, but Habermas’ vision of a public sphere continues to function as a guiding principle for civil discussion. Although previous research has examined online and SNS-based political discussion as it relates to the public sphere, no attempt has been made to understand the relationship between specific social media mechanics (e.g. tagging, sharing) and characteristics associated with Habermas' work, as well as how these social media tools facilitate or prevent exposure to cross-cutting political views. Using qualitative interview data, this study finds that participants' use of these social media tools detracted from the possibility of an online public sphere and acted as a catalyst for characteristics commonly associated with selective exposure.
Investigating Relevant Predictors of News Story Prominence During the 2012 Presidential Election

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Abstract:
A significant body of communication research concerns itself with understanding the extent to which the news media impacts society. Recent media effects theories like Agenda-Setting and Framing continually emphasize the media’s role in attributing salience or prominence to certain stories over others as a key function of its impact. Many of these theories attempt to measure the impact these decisions have on the public. In turn, scholarly work has flipped this initial question on its head, focusing on factors that affect the media’s decision to make one story more prominent than another (e.g. Frame Building). Still, existing media effects research has not explored specific story characteristics like word count and geographic focus as a way of understanding how news outlets assign prominence to one story over another. Furthermore, little to no work has been done on these story characteristics in the context of covering electoral politics. In this study, we address this gap in the literature by conducting a quantitative analysis of the Pew Research Center’s 2012 News Coverage Index (NCI) dataset. Our results reveal that shorter stories that relied on wire news services and focused less on local news stories were assigned more prominence in the lead-up to the 2012 U.S. Presidential Election.
Creating a Consensus? Examining the Persuasive and Backfiring Effects of Consensus Messages

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Abstract:
Scholars continue to search for solutions to shift climate change skeptics’ views on climate science and policy. One recent approach that has gained interested among scholars is the gateway belief model (GBM), which proposes that emphasizing the scientific consensus around climate change can persuade people across the political spectrum about the science of and risks posed by climate change. However, previous GBM research has focused on persuading Republicans and conservatives while generally ignoring people’s existing beliefs about climate change. To address this gap, we examine the GBM’s effectiveness based on people’s prior views of climate change. Our results show that a consensus message is effective at improving people’s views on climate change, but only if they initially believe climate change is happening. However, this same message backfires for people who initially do not believe climate change is happening, resulting in greater skepticism, attenuated risk perception and lower support for mitigation policy. This backfiring effect was strongest for political conservatives who were initial skeptics of climate change. Thus, using the GBM to address climate change skepticism may do more harm than good.
Media Representations of Water Resource Issues

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Abstract:
Water is a natural resource that is critical to sustaining human life. The media has largely overlooked evidence that climatic and environmental changes to water resources affect human health. However, media representations are key to forming public risk perceptions and informing water conservation and health promotion behaviors. The objective of this research is to identify how the media framed the public health risks associated with water resource issues. A content analysis was conducted to consolidate newspaper articles focusing on water resource issues published during a three-year timeframe from January 2012 to December 2014 in a sample of newspapers in five Western U.S. states. Online archives and databases were searched to collect newspaper articles. Articles were coded based on the presence of all health risks or issues mentioned in articles that focused on water resources. The searches initially returned 4,232 articles about water issues. Of the articles primarily about water, only 8% contained any mention of a health related impact. The three major health themes present in the newspapers were: (1) risks from water contamination, (2) general health risks, and (3) illness or disease. The results indicate that while health risks are seldom mentioned, the risks most frequently discussed in relation to water resources are those with direct and immediate impacts. These findings suggest the issues being reported in the media may not be consistent with the nature of the health impacts of water resource issues, which are most often long-term and indirect.
Photo-sharing social media for eHealth: Analyzing perceived message effectiveness of sexual health information on Instagram

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Abstract:
Objective. The spread of STIs, HIV, and the event of unplanned pregnancy are health risks that young adults face. One place to reach individuals with sexual health messages is on social media. Young adults use the Internet to seek sexual health information more than any other source and most health departments in the United States report having at least one affiliated social networking site (Buhi, 2009; Neiger, 2012). It is unknown how visual message presentation on these platforms affects message reception. Thus, the current study aimed to analyze how theory-based message strategies can increase message reception and in turn promote prosocial attitudes and beliefs regarding safe sex behaviors.

Methods. An experiment was conducted with 839 young adults at Washington State University. Participants were exposed to one of four conditions based on visual message presentation: (1) health messages embedded in photos, (2) health messages split between photos and captions, (3) health message solely as captions, (4) and a control group.

Results. Individuals who viewed health messages embedded in photos rated them as more effective than participants in other conditions. Additionally, message sensation value, attitudes, and systematic processing were significant predictors of perceived message effectiveness.

Contribution. The contribution of this study to the field of communication is twofold: first, results theoretically contribute to information seeking research by parceling out the mechanisms necessary for individuals to perceive a message as effective. Second, results can guide best practices for creating health content for photo-sharing social media.
“Legal or illegal”: Representation of National Immigration Reforms in Ethnic Newspapers

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Abstract:
Ethnic media play a central role in the everyday practices that create and shape/reshape ethnic identity, culture and understanding of race, and challenge and reproduce dominant ideologies (Molina Guzman, 2006; Shi, 2009). Critical discourse analysis of four ethnic newspapers, India Abroad, India Bulletin, India Post and India West, identified the presence of three prominent discourse within the published articles. The first, Economic discourse, presented immigration reform as necessary for the economic progress of the United States where the immigrants were explicitly represented in terms of economic value. The second, Humanistic discourse, argued the need for a humane, sympathetic, reform for the immigrants who are vulnerable, helpless and victims of circumstances. The third, the Model Minority discourse, showed how the newspapers constructed the Asian Indian immigrants and the other immigrants in relation to immigration reforms. These discourses interacted with each other to present the imagery of the deserving immigrant. The results emphasize that for a group that has been historically ambiguously included in the U.S. national imagery, it is necessary to recognize the constitutive function of context and history in their construction of citizenship, nationhood, and rights. Further, it helps to realize how non-white immigrant groups participate in actively constructing and reconstructing meanings that are presented to them through competing ideologies.
“Why not give them a chance?”: Information seeking and perceptions of social media network credibility during the 2016 general election

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Abstract:
As social media continue to flourish as sources of information for younger voters, it is critical to consider how this demographic evaluates the credibility of the information they encounter in the online environment, especially with heightened concerns of misinformation and the prevalence of “fake news” circulating on social media during the 2016 U.S. presidential elections.

Relying on 37 in-depth interviews with politically motivated individuals, this study explores how young adults used social media to consume and evaluate political information during the 2016 U.S. presidential primaries. Interviews for this study were completed from March to May 2016, during the mid-to-late stages of the primary elections, and were analyzed for dominant themes and patterns.

Results of this study indicate that social media is a starting point for receiving political information, and that young adults are incredibly skeptical of media coverage from U.S. institutions and information shared by politicians and candidates online. Additional findings suggest that participants generally view the information they share online as credible, but are distrustful of the information shared by friends in their networks.

Overall, these findings offer a snapshot of how young adults are using social media to engage in the political process. Considering many of the participants in this study voted in a presidential election for the first time, this study provides communication scholars with a look into how young voters are seeking information, how that information is being evaluated, and what their motivations are for finding counter-attitudinal views in an increasingly polarized society.
Please exit through the gift shop: On the ethics of the 9/11 Memorial Museum Store

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Abstract:
Shortly after opening to the public in 2014, the 9/11 Memorial Museum was heavily criticized by family members of victims and politicians for including a gift shop, especially considering the store is located above the repository of the unidentified remains of more than 1,000 victims. While the hundreds of souvenirs and regalia commemorating 9/11 available for purchase in the Museum Store prompt questions of taste and sensitivity, they also provoke questions of morality, thus offering an opportunity for philosophical critique. Ultimately, is it ethical for the 9/11 Memorial Museum to have a gift shop?

Adopting Albert Bandura’s notion of moral disengagement, this paper addresses this question by arguing that the gift shop is an unethical business, because it forges an inhumane commercial space where visitors’ anxiety and need for closure is negotiated through consuming souvenirs. By selling these commodities directly over the repository of human remains in the museum, the victims of the September 11, 2001 terrorist attacks are dehumanized, ultimately alienating visitors from the devastation and turmoil associated with Ground Zero. Thus, this paper concludes that by prioritizing the commodification of 9/11, the museum dehumanizes 9/11 victims by depriving them of a peaceful, respectful resting place. Thus, the crass commercialization that operates over the graves of unidentified victims inhumanely erases the memory of their existence, and completely disregards the grief of the families who will forever mourn the loss of their loved ones within the walls of the spectacle that is the 9/11 Memorial Museum.
Come here often?: A feminist analysis of pick up artist online discourse

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Abstract:
Pick Up Artists (PUAs), or those who claim to use empirically-tested strategies to seduce women, have received significant popular attention. This interest in PUA subculture has implications for men and women’s sexual and emotional health, as PUA discourse often undermines or denies the importance of women’s consent in sexual interactions (Denes, 2011). Further, some PUAs have gained notoriety for the extreme misogyny of their published materials (Baker, 2013). Unfortunately, very little research has examined PUA discourses or ideologies at all, and even fewer studies have examined PUA discourse from a feminist perspective.

The present study uses a feminist critical discourse analysis to identify the ways in which forum participants discuss gender roles and the role of attractiveness and human sexuality in a popular PUA forum with over 230,000 subscribers. The data is drawn from forum materials, including the top forum posts of all time, multiple glossaries, multiple FAQ sheets, and noteworthy “threads” or discussions on PUA topics.

Preliminary results suggest that dominant PUA discourse emphasizes users’ traditional conceptions of masculinity, in which men must demonstrate their work ethic, knowledgeability, and mastery through attempts to seduce women. Further, the use of pseudo-scientific or philosophical discourse and jargon may serve to reinforce forum users’ perceptions of community, expertise, and legitimacy. The findings of this study have implications for understanding how ideological and cultural perspectives on gender roles and sexuality are disseminated or contested online. These perspectives, in turn, may have implications for men and women’s sexual and emotional health.
Who Cares about Fact Check? Implicit and Explicit Attitudes towards Presidential Candidates After Viewing Fact Checking Information

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Abstract:
Fact checking messages are frequently used by political practitioners to combat misinformation and misperceptions (Lewandowsky, Ecker, Seifert, Schwarz & Cook, 2012). However, previous research indicates individuals often counter argue against such messaging rather than being persuaded by it (Lewandowsky, et al., 2012). According to a recent study, majorities of both presidential candidates’ supporters think fact-checking is a major responsibility of the media (Barthel, Gottfried & Lu, 2016). Interestingly, in another recent report, 81% voters said Clinton and Trump supporters disagreed on “basic facts” (Doherty, Kiley & Johnson, 2016). The current study uses a within-subjects experimental design to investigate whether presenting fact checking messages after presidential candidates’ speeches affects voters’ implicit and explicit evaluations of these candidates. Forty-five undergraduate students were included in this analysis. Presidential candidates’ nomination acceptance speech videos were cut and selected. Six clips from Hillary Clinton and six clips from Donald Trump. Among the six clips from each candidate, three clips contained information that was fact checked as false and three contained information that was fact checked as true. Independents and Democrats rated Clinton as a much better President than Trump and Republicans rated Trump as a much better President than Clinton. However, there was no significant difference in the ratings between each candidates’ true and false blocks. In conclusion, people do not change their attitudes significantly after viewing fact check information.
Connecting with the audience: Testing the use of the entertainment education strategy and narrative in an SMS intervention

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Abstract:
BACKGROUND: While short message service for health promotion has grown in popularity, there is a paucity of research that examines specific characteristics of text message interventions to determine what may make them effective. Previous research has found that the use of entertainment education (EE) can effectively lead to positive health outcomes. One component of EE is narrative, which allows for audience members to reduce counter-arguing of a message and engage with the information presented.

OBJECTIVE: To determine the potential for the use of narratives in a text message intervention using alcohol and casual sex as a topic.

METHODS: A 3X1 posttest only experiment with 137 college females was conducted. Two sets of text messages about alcohol and casual sex used narrative and non-narrative to present the same information. The third set (control condition) focuses on campus events. Participants viewed the messages and took a survey.

RESULTS: Transportation differed by condition $F(2, 133) = 6.368, P < .01$, with those in the narrative condition experiencing greater transportation than those in the control condition. Counter-arguing differed by condition $F(2, 132) = 14.680, P<.001$, with greater counter-arguing in the narrative condition than the non-narrative.

CONCLUSIONS: The finding of transportation being greater for the narrative condition is promising, as it highlights that even through a series of six 160-character messages, young adult females who view narrative messages can feel somewhat more transported than participants who view messages about general campus events. Future work should examine other elements associated with narrative to assess potential effects.
HPV Vaccination, Framing, and Gender: Assessing Attitudes and Behavioral Intentions Among International Students in the United States

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Campus: Pullman

Abstract:
The most recent data revealed that over a million international students have been living and studying in the United States from 2014 to 2015, almost double the number from 2005 to 2006 (ProjectAtlas, 2016). A handful of studies looked into health-related issues such as mental health counseling of this special group of habitants in the United States. However, among international students, the awareness and attitudes of human papillomavirus (HPV) vaccination and the behavioral intention of getting vaccinated elicited by the exposure to gender-specific media messages remains overlooked.

Using framing and prospect theories as an overarching framework, the current study employs a 2 (female vs. male) x 2 (female-focused news vs. male-focused news) experiment to investigate the differential impacts of gender-framing in HPV vaccination news on female and male international students in terms of their awareness, attitudes, and intentions. 60 female and 60 male individuals were recruited and divided into four groups to read two excerpted and modified news stories; prior to the experiment, participants accomplished a pre-experiment survey for baseline information; A post-experiment questionnaire was administered to assess their responses.

The study is currently in the middle of data collection and is expected to have complete results by the end of February. The results will not only shed light on the status quo of international students regarding the HPV-related knowledge and behaviors, but also provide media with a more efficient framing strategy, motivating females and males to get vaccinated against HPV.
There and Back Again: Circadian Modulation of Sleep in Pilots Flying Ultra-Long Range Flights

Primary Author: Jane Chen  
Co-Author(s): Ekaterina Burduli  
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Gregory Belenky

College: Elson S. Floyd College of Medicine  
Category: Medical & Life Sciences  
Campus: Spokane

Abstract:
Ultra Long Range (ULR; 16+ hour) flights cross multiple time zones. Therefore during layover (26-40 hours), the light/dark cycle is radically out of phase relative to home base time. This study examined to what degree do pilots readjust their sleep/wake cycle during layover and post-flight days as measured by synchronization to home base time. Pilots’ sleep/wake history was recorded by actigraph and a sleep/work logbook from three days prior to the outbound flight through three days following the inbound flight. The sleep/wake history was then plotted as number of pilots sleeping in consecutive hour blocks. The flights studied originated in California and flew non-stop to either Australia, Taiwan, or China.

Results indicate that pilots anchored their sleep around the base time Windows of Circadian Low (WOCL; 0200-0600 h and mini-WOCL; 1500-1700 h) except when delayed by an early morning arrival or truncated by an early morning departure (relative to home base time). Pilots appear to favor naps and main sleep periods that fall within the normal home base sleep time. During the outbound flight, layover, and inbound flight strict synchronization of sleep to home base time is lost and sleep is likely modulated more by social factors including scheduling, meal timing, and interpersonal cues. Upon arrival at their home base, pilots immediately return to their normal base time circadian synchronization of sleep. Findings suggest that pilots do not readjust their circadian rhythms during ULR flights associated with layovers of up to 40 hours. Supported by United Airlines.
Association between Humanities Coursework and Empathy in Medical Education

Primary Author: Jeremy Graham
Co-Author(s): Spokane Spokane

College: Elson S. Floyd College of Medicine
Category: Medicine (and Humanities)
Campus: Spokane

Abstract:
Empathy among physicians is valued by society, patients, and families. Beyond being an intrinsic professional value, greater physician empathy correlates with better clinical outcomes (1). Low empathy associates with professional burnout among physicians (2). Confusingly, empathy is known to decline, rather than grow, during medical education.

We evaluated whether coursework in the Humanities would ameliorate students’ loss of empathy (3). Medical students enrolled for credit in elective Humanities courses at WSU Spokane were compared groupwise to the group of students who did not study humanities. We used the prior-validated Jefferson Scale of Empathy (Student Version).

Humanities coursework correlated with favorable empathy results. Of students not enrolled in Humanities 71% declined in JSE score, and 29% increased, which is consistent with the baseline expectation of empathy-loss reported in prior studies elsewhere. Among those who studied Humanities, 46% declined and 54% increased in empathy scores. The difference between groups was statistically significant (p=0.03).

These findings advance a growing dialogue about including Humanities in medical education, as is being built into the Elson S. Floyd College of Medicine curriculum. These existing results guide inquiry into how exactly medical education can utilize Humanities, and possibly selection for students who will opt for Humanities studies, to help produce graduate physicians with greater clinical empathy.

(2) Zensani et al, Brit Jnl of Gen Practice Gen Pract, 2012:62(602);p462
(3) Graham et al, American Journal of Medicine, 2016: 129(12);1334-1337
The neuropeptide receptor NMUR-1 mediates distinct innate immune responses to different pathogens in Caenorhabditis elegans

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College: Elson S. Floyd College of Medicine  
Category: Medical & Life Sciences  
Campus: Spokane

Abstract:  
Innate immune responses to microbial infection must be tightly regulated because insufficient or excessive responses have deleterious consequences to the host. Increasing evidence indicates that the nervous system regulates innate immunity. However, the precise mechanisms of this regulation remain largely unknown. Here we report that in Caenorhabditis elegans, NMUR-1, a neuronal G protein-coupled receptor homologous to the mammalian receptors for the neuropeptide neuromedin U, inhibits innate immune responses to Gram-negative pathogens but enhances such responses to Gram-positive pathogens. RNA sequencing reveal that NMUR-1 suppresses the expression of genes involved in protein phosphorylation. We used Pseudomonas aeruginosa and Enterococcus faecalis as prototypic Gram-negative and Gram-positive pathogenic bacteria to investigate the molecular basis of NMUR-1-dependent neural regulation of innate immunity. RNA sequencing and functional assays showed that NMUR-1 regulates distinct stress and immune signaling pathways in response to the two pathogens. Our study provides novel insights into the complex neural-immune communications and defines a role of NMUR-1 in immune specificity of C. elegans.
Managing Volunteer Conflict

Primary Author: Melissa Cummins
Co-Author(s): Dan Teuteberg, Lauren Hrncirik, Natalie Kinion, Eric Larsen, Jana Ferris, Brian Brandt

College: Extension
Category: Extension
Campus: Extension

Abstract:
Volunteers are essential in carrying out the mission of WSU Extension. Without a system wide approach to dealing with volunteer conflict and behavior, faculty, staff, and administrators were dedicating exorbitant amounts of time and effort handling situations created by volunteers. The Washington State Extension Volunteer Conflict Management Team formed as a request of the CAHNRS Dean to create an Extension system wide approach to handling conflict in the 4-H Volunteer system to manage disruptive behavior with volunteers.

The Washington State Volunteer Management system was implemented in fall 2016. This system involves a behavior matrix, disciplinary letters, and scripts for faculty and staff to use when dealing with disruptive behavior. One hundred people attended statewide trainings held in summer 2016. Evaluation results indicated the following (N=80): Before participating in training, only 21.5% (n=17) of survey respondents felt ‘very prepared’ or ‘quite a bit prepared’ in handling volunteer conflict in their county. After participating in the training, 86% (n=69) of respondents felt ‘very prepared’ or ‘quite a bit prepared’ in handling volunteer conflict in their county. Before participating in the conflict management training, only 29% (n=23) of survey respondents felt they ‘definitely’ or ‘mostly’ had the tools they needed to handle conflict in their county. However, after participating in the training, 97% (n=77) of respondents felt they ‘definitely’ or ‘mostly’ had the tools they needed to handle conflict in their county.

This system has prepared faculty and staff to better manage volunteer conflict and behavior disruptive to the mission of WSU Extension.
Cutting Irrigated Hay Costs by Using Soybeans

Primary Author: Steve Norberg
Co-Author(s): Don Llewellyn
Steve Fransen
Shannon Neibergs

College: Extension
Category: Agricultural & Natural Sciences
Campus: Franklin County Extension

Abstract:
Producers have limited impact on prices received for hay. However, producers can have large impact on expenses through creativity and detailed planning. In Washington State, producers spend approximately $256 per acre for cutting, raking and baling alfalfa (Medicago sativa L.). Part of this expense is moving from field to field and the labor that is required for haying all summer long. Growing soybeans (Glycine max (L.) Merr.) for hay has the benefit of nitrogen fixation similar to alfalfa but unlike alfalfa it requires only one cutting, which would eliminate some haying expenses. For soybean hay to be successful it must yield well and hay must be of good quality. Irrigated soybean hay research conducted at Othello, WA and Logan, UT produced 5.0, 5.8 and 6.5 tons per acre, averaged over three years and locations, when harvested on September 1st, 15th, and 30th, respectively. Maturity group of soybean for hay production needs to be later than for grain production as large seeds are hard to dry down and will likely cause molding problems in the bale. In Washington State a maturity group 4 or later provides full season hay production with only small seeds produced at haying time. In contrast, for seed production a maturity group 1.5 is optimum. Producers in WA State have successfully grown soybean hay yielding with yields as high as 4.7 tons/acre with no drying problems. Soybean hay typically has 16 to 22 percent protein and relative feed value (RFV) ranging from 100 to 174.
What Could Possibly Go Wrong?

Primary Author: Dan Teuteberg
Co-Author(s): Kevin Wright

College: Extension
Category: WSU Extension
Campus: WSU Extension

Abstract:
Identifying, understanding, and managing programmatic risk is essential to carry out the mission of WSU Extension. Lacking a standardized approach to handling risk management topics in the 4-H Youth Development program, faculty, staff, WSU volunteers, and administrators were expending large amounts of time and effort handling individual situations. The 4-H Risk Management Committee formed in response to the need created in 2015 by the vacant 4-H Youth Development Program Director position.

In 2016, the 4-H Risk Management Committee presented a webinar titled, “What Could Possibly Go Wrong?” Participants learned the various facets of risk management as it pertains to the 4-H Youth Development program. Follow up conversations with participants led to the creation of resource documents. This included an updated 4-H Incident Report Form, Accident and Health Insurance factsheet, Record Retention factsheet, Vehicle Usage factsheet, and a Risk Management Checklist. These resources were showcased to faculty, staff, and WSU volunteers at the 2016 State 4-H Forum. Participants expressed tremendous appreciation for these resources. There has been a documentable decline in the number of individual questions from staff pertaining to the topics covered.

The resources and support system developed by this committee has prepared faculty, staff, WSU volunteers and administrators to better identify, understand, and manage risk management topics that maybe disruptive to the mission of WSU Extension.
The Story of a Prototype for the Digital Classroom Building

Primary Author: NarayanKripa Sundararajan
Co-Author(s): Jonathan Manwaring
Bradley Clark
Rebecca Vandevord

College: Global Campus & College of Education
Category: Social Sciences
Campus: Pullman

Abstract:
During the Summer and Fall of 2015, Bryan 404 was redesigned to serve as a prototype of an active learning classroom, in advance of the Digital Classroom Building’s construction. The prototype space was designed to foster active and collaborative learning amongst students and to shift the focus of learning from the instructor to students. The prototype space has nine movable tables with five movable chairs each. Every table has a monitor equipped with screen sharing software Mersive Solstice. During the Summer and Fall of 2016, AOI Learning Innovations staff worked closely with faculty to problem solve, design, and implement activities that took advantage of the newly designed space. Feedback was collected through in-class observations, interviews, and end of semester surveys from faculty and students. Overall, faculty and students are satisfied with teaching and learning in Bryan 404. Success points, areas of improvement, and lessons learned are shared in this poster to generate discussions, collaborations, and feedback.
Virginia Woolf’s 'Antigone': An analysis of Woolf’s marginalia in her text of Sophocles’ plays from WSU MASC’s Collection, 'Personal Library of Leonard and Virginia Woolf'

Primary Author: Robin Bond
Co-Author(s):

College: Honors College
Category: Liberal Arts & Humanities
Campus: Pullman

Abstract:
Virginia Woolf’s notations found in her Oxford Greek text of Sophocles’ tragedies are the focus of this project. The volume of Sophocles’ plays, from the 'Personal Library of Leonard and Virginia Woolf' in the Manuscripts, Archives, and Special Collections of the WSU Libraries, contains the direct evidence of Virginia Woolf’s study and translation of the tragedy 'Antigone', a work which appeared regularly in her writings. Woolf’s interest in ancient Greek language and Greek literature have been explored by Woolf scholars through discussions of her reading notes and personal diary, where she logs her translation progress and her reactions to, among other details, the leading classical scholar, editor and translator of her day, Sir. Richard Jebb. In a letter to Saxon Sydney-Turner, Woolf complained about Jebb’s sense of language as being "stiff" and "safe": “he never risks anything in his guesses.”

As much as Woolf generally finds fault with Jebb, she may have relied on his translation of 'Antigone' as she read the tragedy in its original Greek. In her personal copy of the play, she has underlined words and phrases and then rendered their English translations in the margins. By examining her marginalia – reviewing her translation choices for Greek words and phrases – and then comparing them with Jebb’s translation, we can begin to evaluate the extent to which Woolf relied upon Jebb’s translation as a guide and draw conclusions about whether her own translation of 'Antigone' reflects an independent and more adventurous interpretation of the original Greek text.
Biofuels: an interactive learning system

Primary Author: Sharon White
Co-Author(s): Kathleen Ryan, Marcia Garrett, Charles Burke, Brian Clark

College: Interdisciplinary
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Cellulosic biofuels are an emerging resource for sustainable jet flight. Washington State University (WSU) was approached by the Future of Flight Aviation Center, Mukilteo, WA, to develop an educational exhibit highlighting aviation biofuels. A multi-disciplinary team developed a series of interpretive exhibits showcasing current WSU research in an interactive format for the Center’s 200,000 annual visitors. The team included experts in graphic and exhibit design, subject-area content development, science writing, and regional relations. Content experts ensured that the science was correct; the writer used rhetorical strategies to elicit questions and curiosity; the exhibit and graphics focus on presenting a hands-on and entertaining learning experience for young people.

The exhibit focuses on the opportunities and challenges of aviation biofuels produced from regionally sourced feedstocks by using the theme of plants as factories and of “growing fuel from the ground up.” Through the use of video, hands-on interactions, and sensory input (e.g., scent), this technical content was transformed into an exhibit that is compelling and educational.

The vision of producing aviation biofuels from sustainable regional biomass is achievable. Pacific Northwest airports and aviation-industry members are rapidly developing and deploying the infrastructure to accommodate a burgeoning biofuels industry. This exhibit incites enthusiasm for biofuels while communicating the basic science and how WSU researchers and others are making this vision a reality.
Information Literacy Skills Assessment: Search Query Construction

Primary Author: Corey Johnson
Co-Author(s): Chelsea Leachman
Erica Nicol

College: Libraries
Category: Information Literacy Skills, Libraries
Campus: Pullman

Abstract:
Information literacy (IL) is a central WSU learning outcome, one of the Seven Undergraduate Learning Goals. One of the WSU IL sub-goals and additionally a part of the ACRL Information Literacy Framework is the ability to implement a well-designed search strategy. Three different data collections are being used to analyze student development of information literacy skills and more specifically the crafting of a useful search query within library materials databases. The first data collection set includes approximately 6400 freshman student responses to a ten-question, multiple-choice, information literacy quiz over the course of three years in General Education 110, History 120, and History 121. The second data collection consists of approximately 500 indirect assessments of English 298 students about their perceived knowledge of the elements of search query construction. Finally, the third data set is from about 100 student responses to a standardized online activity from English 101. From the data analyzed, students struggled most with the use of Boolean Logic, search symbol expanders/constrictors, lack of productive keyword searching, and not utilizing quotes for multi-word concepts. The English 298 students claimed to understand Boolean logic at much higher rates than other expander/limiter functionalities. Data from these studies will be used to inform ongoing accreditation reporting and a greater portion of English 101 library session time will be devoted to improving student skills in this area. Librarians are currently planning projects to evaluate these IL skills at the upper undergraduate level.
NMR of Emulsions of Lignin Model Compounds

Primary Author: William Hiscox
Co-Author(s): Mohammadali Azadfar
Shulin Chen

College: Office of Research
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Nuclear Magnetic Resonance (NMR) Spectroscopy is used to characterize the interactions between lignin-based materials (or lignin model compounds) and micelle-forming polymers used in this study to emulsify the lignin-based materials. The work was performed to better understand these interactions, so that emulsification of lignin can be used as a cost effective means for further processing of lignin to manufacture valuable chemical products. We will show that NMR is capable of determining not only the incorporation of lignin compounds into the micelles, but can also be used to probe the nanostructural self assembly of lignins and model compounds within the micelles, to form highly ordered stacked structures.
Mechanism of the catalytic CO hydrogenation: A novel approach by chemical transients

Primary Author: Motahare Athariboroujeny
Co-Author(s): Viacheslava Lablokov
Yizhi Xiang
Norbert Kruse

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Principle Topics
The catalytic hydrogenation of CO according to Fischer Tropsch is usually used for production of long-chain hydrocarbons and its derivatives such as gasoline. Recently, our group reported the possibility of long-chain alcohol and aldehyde production used as feedstock for plasticizers, lubricants and detergents. However, a detailed understanding of the reaction mechanism is still missing and hampers the development of a target-oriented process control. We have developed Chemical Transient Kinetic (CTK) methods to elucidate mechanistic steps leading to these products. This will provide the necessary guidelines for a rational design of a new generation of highly active catalysts towards desired products.

Methods/Creative activity/Goal
Chemical transients are triggered by abrupt changes in the molecular fluxes of the reactants from unreactive H2/He to reactive H2/CO, which leads to the construction of the catalytically active surface. From the sequence of hydrocarbons/oxygenates appearance relative to that of different species such as CO, important information about the reaction mechanism can be obtained. Careful calibration of the method and reactor system allows counting atom amounts of species adsorbing on the surface and tracing changes of the catalysts’ surface composition. A direct link between surface composition and catalytic performances, which is the ultimate goal of this project, can be gleaned.

Results/Implications
Our previous CTK results on Co-MgO catalysts has supported the CO insertion mechanism for CO hydrogenation towards alkanes. Our preliminary CTK results on bimetallic Co-MnOx catalysts provides evidence that CO insertion applies to the production of olefins as well as alkanes.
A Green Approach for the Chemical Functionalization of Cellulose Powders for Demanding Applications

Primary Author: Mohammadali Azadfar
Co-Author(s): Michael Wolcott

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
This study presents a unique opportunity to make a major breakthrough in fundamental science that can accelerate the development of more efficient and cost-effective technology for utilization of waste cellulosic materials. This breakthrough overcomes the critical barrier—the lack of effective solvent-free chemical process for producing a form of cellulose powder with an enhanced dispersion ability in petroleum-based polymer (e.g. polypropylene) and/or non-aqueous solvents to make high performance bio-based products, for example, composite building and automobile interior panels and/or packaging or coating films.

In this regard a mechanochemical process comprising planetary ball milling in combination with an enolate-mediated cycloaddition reaction in dry media for simultaneous modification/activation and functionalization of waste cellulose powders has been investigated utilizing attenuated total reflectance- Fourier transform infrared spectroscopy (ATR-FTIR), nuclear magnetic resonance (13C/1H-NMR), scanning electron microscope (SEM) and thermo gravimetric analysis (TGA) techniques.

Here we show how the enol forms of carbohydrates prepared by co-milling cellulose powders and alkali metals hydroxides produced reactive structure, intermediate, for subsequent solid-state cycloaddition reaction. For example, using FTIR and NMR, results led us to identify the enolate resonance structures of glucose, as units of cellulose, and also SEM results have shown that grafting cellulose powder formed a noticeable new layer and exhibited a larger water contact angle, which confirms that hydrocarbon chains were grown from the surface of cellulose fiber forming a homogeneous coat that giving cellulose a noticeable hydrophobic feature.
Enhanced in Vivo Bone Formation by Iron and Silicon Doped 3D printed Tricalcium Phosphate Scaffolds

Primary Author: Dishary Banerjee
Co-Author(s): Sam Robertson
Susmita Bose

College: Voiland College of Engineering and Architecture
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Calcium phosphate (CaP) ceramic, being compositionally like the inorganic part of bone, show significant promise towards bone graft applications. With 3D printing (3DP), it is possible to create ceramic implants that more closely mimic the geometry of human bone, and can be custom-designed for unusual injuries or anatomy. The objective of the study is to understand the mechanical and biological effects of Fe+3 and Si+4 doped tricalcium phosphate (TCP) implants in a rat distal femur model. We hypothesize that the incorporation of dopants into TCP improves the mechanical interlocking between the bone and implant and enhances osteogenesis and angiogenesis. Silicon and iron are trace elements, that are commonly available in bone, and have also been shown to have many beneficial properties, from increased bone regeneration to angiogenesis. We have processed Fe+3 and Si+4 doped 3D printed CaP scaffolds with 3D interconnected channels, which is crucial for providing pathways for micronutrients and improved cell-material interactions through bioactive fixation. The fabricated implants were placed in rat distal femur defects for 4, 8 and 12 weeks. The addition of Fe+3 into TCP increased the capacity for new early bone formation by modulating collagen I production. Neovascularization was found to be increased by three times in the Si+4 doped samples than the pure TCP control group. The findings from this study emphasize that the combination of SiO2 and Fe+3 dopants in TCP may be a potential way to introduce angiogenetic and osteogenic properties to CaPs, which is essential for accelerated bone defect healing.
Bubble absorption by an air-filled superhydrophobic spring

Primary Author: Negar Beheshti Pour
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Gas-liquid phase separation under microgravity conditions where buoyancy is not active represents a challenge for two-phase liquid-continuous space systems. Similar challenges are present in micro-scale electrochemical systems on Earth that generate gas bubbles in geometries where surface tension prevails over gravity. A possible ground-based application would be the removal of carbon dioxide bubbles from large aspect ratio channels in a direct-methanol fuel cell that could otherwise occlude the channel. In this study we use a 3-mm diameter stretched stainless-steel spring coated with a superhydrophobic layer to create a helically-supported capillary channel. Such a channel that is submerged in water and filled with air while vented to the atmosphere was found to absorb a stream of 2.5-mm diameter air bubbles at a rate of at least 36 bubbles/s. A hydrophone and high-speed imaging system have been used to study bubble absorption dynamics. The hydrophone can detect both the bubble formation and coalescence events and this makes the hydrophone desirable for situations where imaging systems are not applicable. A significant finding is that the initial attachment of the bubble to the channel that involves the rupture of a thin film of water happens in less than 1 ms. The rapid rupture of the water film separating the bubble from the channel might be attributed to the multi-scale roughness of the hydrophobic coating.
Green Energy Solutions by Improving Solid Oxide Fuel Cell Catalysts

Primary Author: Qusay Bkour
Co-Author(s): 

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
International concerns over the environmental effects of CO2 emissions from fossil fuels recently culminated in the signing of the Paris Agreement. Hydrogen solid oxide fuel cells (SOFCs) are often cited as the solution since they use hydrogen and oxygen as fuel and emit only water as a byproduct. However, logistical problems arise due to a lack of hydrogen infrastructure, and high costs associated with distribution and storage limit its use as a cost-effective fuel. Our goal to solve these problems is to use liquid fuels as a renewable storage medium for H2 gas to produce electrical energy in fuel cells with lower emissions and higher fuel efficiency. However, conventional nickel(Ni) anode catalysts deactivate due to carbon deposition on the surface of anode during liquid fuels oxidation (reforming). To achieve this goal, we developed a SOFC capable of reforming liquid fuels using an active, coking-tolerant, and stable Ni-based bimetallic nanoparticles with molybdenum(Mo) promoter as an internal reforming layer over the conventionally used Ni-based anode. The results showed that small amounts of Mo play an important role in inhibiting of carbon deposition during partial oxidation of iso-octane fuel. We hypothesized that Mo reduces carbon solubility in the nickel crystallite due to formation of Ni-Mo alloy which repels carbon atoms to attach to nucleation sites on Ni surface. Our conclusions are based on experimental observations that Ni-Mo-based fuel cells showed high electrochemical performance with excellent catalytic activity and stability and less carbon deposition in the cell making it an effective alternative energy solution.
Catalyst Optimization for the Hydrodeoxygenation of Bio-oil Compounds

Primary Author: Jacob Bray
Co-Author(s): Alyssa Hensley
Fanglin Che
Jean-Sabin McEwen

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
The growing need for diverse, sustainable energy sources can be addressed using bio-oil produced via the fast pyrolysis of biomass. These bio-oils have high concentrations of oxygenated compounds, resulting in biofuel refining and quality issues. Catalytic hydrodeoxygenation is used to reduce oxygen content; however, these catalysts are often expensive and are prone to deactivation. Characterizing the behavior of these catalytic systems at the nano-scale level can allow for the use of more efficient and cost-effective catalyst materials for biofuel applications.

By understanding the interaction of water and its dissociation products on an iron surface, an inexpensive catalyst material, one can improve efficiency and prevent deactivation caused by the formation of an oxide layer. Adsorption behavior of oxygen, hydrogen, and hydroxide on three iron surfaces and various adsorbate coverages is studied under applied electric fields to prevent deactivation. An alternative way to prevent the deactivation of such a catalyst is to dope them with a minimal amount of a precious metal. As such, a first principles-based model for a single catalytic grain of iron will be developed to provide insight into its catalytic properties when it is doped with palladium or platinum.

The information gathered from this study will help reduce the use of expensive, precious metals in hydrodeoxygenation catalysts while increasing efficiency and preventing their deactivation. In this regard, the effect of an applied electric field shows promising potential. Overall, this work will help reduce the cost of biofuel production and thereby help to meet our sustainable energy needs.
Switchable Surfactants for the Preparation of Monodisperse, Supported Nanoparticle Catalysts

Primary Author: Kristin Bryant
Co-Author(s): Steven Saunders
Gasim Ibrahim

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Synthetic methods of preparing size-controlled, supported nanoparticles remain problematic as traditional methods require calcination or thermal degradation of stabilizing agents to activate the catalytic site. It is widely known that calcination leads to significant and unpredictable nanoparticle growth. This undesired increase in nanoparticle size may additionally lead to a decline in catalytic activity due to decreased surface area. We hypothesize that with the use of silylamines, a class of switchable solvents, we can synthesize supported nanoparticle catalysts without the need for calcination. Silylamines are switchable molecules that can be converted between ionic and molecular forms by reaction with CO2. Upon addition of an alkane, the switchable solvent becomes a switchable surfactant (SwiS). The SwiS is used to template nanoparticles to aid in synthesis then subsequently used to release bare nanoparticles for deposition on to a support material. Nanoparticle sizes were characterized with the use of transmission electron microscopy (TEM) and catalytic activity was evaluated by employing a well-studied reaction, the hydrogenation of 4-nitrophenol. While traditionally prepared nanoparticles showed an approximate 220% decrease in average diameter, the use of SwiS allowed preservation of nanoparticle size throughout the deposition processes. Additionally, we show that supported gold nanoparticle catalysts prepared using SwiS are up to 490% more catalytically active than their traditionally prepared analogs.
RepeatAnalyzer: A tool for Genotyping and Analyzing Bacterial Strains

Primary Author: Helen Catanese
Co-Author(s): Kelly Brayton
Assefaw Gebremedhin

College: Voiland College of Engineering and Architecture
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
Bacterial strain characterization is a long-standing problem which can impede the development of vaccines for pathogenic microbes. For example, Anaplasma marginale is a widespread pathogen which infects cattle and has been particularly difficult to develop a vaccine for due to its high genetic variability. However, A. marginale can be characterized using patterns of short-sequence DNA repeats (SSRs) which are distinctive exact or inexact repeating elements on the msp1a gene. Many other microbial species have similar SSRs, meaning this approach can potentially be used to characterize other highly variable bacterial species. Characterization of these repeat patterns and their geographic distribution will further the process toward developing a vaccine for anaplasmosis. To this end, we have developed RepeatAnalyzer, a tool for genotyping new bacterial strains for any species with SSRs, managing genotype data and plotting that data geographically. RepeatAnalyzer also performs graph-based clustering and other diversity analysis on the SSRs and genotypes it stores. We have also developed a new protein homology graph representation, called a relative distance graph, along with an efficient generation method for it. The relative distance graph removes the need for a distance threshold, instead linking each node with all its “nearest” neighbours. This representation has the sparsity of low threshold graphs and the connectedness of high threshold graphs while maintaining the same semantic structure.
Persulfate oxidizing power as a promising way to pretreat wheat straw

Primary Author: Maryam Davaritouchae
Co-Author(s): Shulin Chen

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Persulfate activation system was performed as a biomass pretreatment to validate the suspected effect of radical on degrading lignin and carbohydrate. We analyzed the sugar yield of wheat straw with the loading of 10% (w/v) when it was subjected to persulfate (2M) and FeSO₄ (0.5M) (at residence times of 1 h, 4 h, 7 h, and 10 h). The activation of persulfate by metal consequences in its decomposition into several reactive oxygen species including, superoxide anion radical, hydroxyl radical and sulfate radical. The formation of radicals was confirmed by chemical probes. Production of sulfate radical solved the instability and short lifetime of OH radical which is a limitation factor for biomass degradation. The highest sugar yield (83%) was obtained after 48 h of enzymatic hydrolysis during 7 h of reaction time. The compositional analysis revealed there was not a large change in acid soluble and acid insoluble lignin content of pretreated wheat straw and the raw materials, which provided the idea that reactive oxygen species in this method did not degrade lignin, yet did some modification which allowed the enzyme to have high accessibility to carbohydrate. It is concluded persulfate-based pretreatment method changed the surface features of biomass specifically lignin, and can be considered as an efficient technique for biomass pretreatment.
Data Mining the CougarCard for Student Fitness

Primary Author: Yunshu Du
Co-Author(s): 

College: Voiland College of Engineering and Architecture
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
The Student Recreation Center (SRC) is among the most frequently visited campus facilities in Washington State University, Pullman. However, students may prefer to avoid the SRC when it is most crowded. This work demonstrates how to use data collected from CougarCard, our school’s official ID card, to predict how crowded the SRC will be at different times.

CougarCard is used by all students when entering the SRC. We applied data-driven techniques to analyze the activities of CougarCard at the SRC and learned student exercise trends. A predictive random forest model was successfully built to predict the peak hours at the SRC. A link to the predicted crowdedness for Spring 2017 semester is currently available at SRC’s website, allowing students to check how busy the SRC is by day and time.

Our long-term goal is to make students more (quantitatively) satisfied with their experience at the SRC and/or (quantitatively) increase the number of times they visit the SRC to exercise. Our system can also assist SRC managers with shift scheduling and fitness event planning. Future developments include adding a log-in system to track individual exercise routines and send appropriate workout recommendations/reminders. We also plan to increase the number of areas the model monitors and predicts crowdedness (e.g., the CUB’s food court). It will be interesting to consider how the crowdedness at different places relate to each other. For example, if there are more people at the CUB there might be fewer people at the SRC.
Numerical Simulations of Aerodynamic and Snow Drift around Living Snow Fences

Primary Author: Mahmoud Ebrahim Mosa Shehata
Co-Author(s): John Petrie

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Drifting snow represents a serious issue with respect to road safety in cold climates. On one side, blowing snow decreases visibility and obscures traffic signs. On the other side, accumulated snow on the road surface causes vehicles to lose traction, reduces the accessible road width, accelerates pavement deterioration, and reduces the effective life span of the road. All these effects lead to increases in the number of accidents and road maintenance costs. One mitigation procedure is to install a snow fence to reduce wind speed and cause drifting snow to settle before reaching the road surface. Living snow fences (LSF), which consists of rows of trees, shrubs, and/or grasses, have a more natural appearance and are generally cheaper than traditionally-used wooden or wire structural fences. However, design criteria for LSFs is not well-established and are based mainly on experience or simple empirical relationships.
The objective of this research is to use numerical simulations with computational fluid dynamics to better understand the factors that control LSF efficiency and improve design criteria. First, a series of 2D numerical simulations were used to simulate the air flow around the LSF to understand the influence of different fence parameters like height and porosity on the aerodynamics around the fence. Then, the numerical model was expanded to simulate the drifting snow transport. The poster will include a description of the numerical models and preliminary results of the numerical simulations.
Ternary Cobalt-Chromium-Potassium Catalysts for the Selective CO Hydrogenation to Higher Alcohols

Primary Author: Enno Esser
Co-Author(s): Jenny Voss
Norbert Kruse

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
The catalytic conversion of CO and H2 (Fischer Tropsch (FT)) to higher alcohols is propelled by incentives to manufacture synthetic transportation fuels. If CO and H2 (syngas) is made available using natural gas or biomass, the dependence on petroleum and coal reserves would decrease and an environmentally benign process could be constructed. Traditional Co FT catalysts are known to produce very little oxygenates (alcohols and aldehydes). Recently, our research has demonstrated that CoCu and CoMn mixed-metal catalysts can be tuned to strongly enhance oxygenate production. In the present contribution, we explore the possibility of forming higher terminal alcohols over K-promoted CoCr mixed-metal catalysts.

Catalysts were synthesized via an oxalate co-precipitation route in which suitable metal precursors react with oxalic acid to produce a 3D metal-organic framework (MOF). H2-assisted thermal decomposition of these MOF structures resulted in active catalysts. Catalyst performance was investigated in a fixed-bed high pressure flow reactor at 40 bar and temperatures of 200 – 260oC.

In the absence of K, Co4Cr1 catalyst (subscripts represent atomic ratios) selectively favor 90 wt% alkanes. The addition of K tunes selectivity from predominantly alkanes to that of nearly 60 wt% long chain alcohols and alkenes in Co4Cr1K0.05 at 220oC. This drastic change in selectivity must be attributed to a change in the catalyst composition. Indeed, X-ray diffraction showed that K-promoted catalysts formed a cobalt carbide (Co2C) phase whereas unpromoted CoCr catalysts did not. We therefore suggest addition of K promotes formation of alcohols and alkenes in the presence of a Co2C phase.
Design and Implementation of a Mitigation Technique for Subsynchronous Interactions Induced by a Doubly Fed Induction Generator-Based Wind System

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Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
In recent years, due to high demand for electrical energy and limited fossils fuels resources, penetration of renewable energy resources into the power grid has increased significantly. Wind, as a renewable, clean, and widely available source of energy, plays an important role in moving away from conventional power generation to renewable power systems. To take maximum advantage of the wind energy, wind power plants are usually located far from the main grid. Long-distance transmission systems are used to transmit the generated electrical energy from the wind farms to the main grid. In order to increase the power transfer capability, series-compensated transmission lines are utilized. However, studies show that the radially connection a doubly fed induction generator (DFIG)-based wind farm to a compensated transmission line increases the risk of sub-synchronous interactions (SSI) between the generator and transmission system. SSIs are a family of physical interactions which involve exchange of energy between a generator and a transmission system”. Therefore, there is a need for a strategy that mitigates SSI in such a system under different operating scenarios.

In this project, a robust control strategy using a multiple-model adaptive control approach is proposed. The proposed method is used to increase positive damping and mitigate SSI between a radially connected compensated line and a DFIG-based wind farm. The proposed supplementary controller is added to the control loops of the back-to-back converters in the DFIG wind turbine.
Asynchronous models for High Performance Computing

Primary Author: Sayan Ghosh
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College: Voiland College of Engineering and Architecture
Category: Computer Science
Campus: Pullman

Abstract:
Advances in High Performance Computing (HPC) systems over the last decade has enabled solving scientific problems at scales that were not previously possible. In order to achieve the highest possible computation performance on the next generation of supercomputers (consisting of multiple millions of computation cores), algorithms would need to be increasingly designed in a manner that allows asynchronous computation. In particular, each processing element should be able to asynchronously handle its chunk of computation, without requiring global synchronization, which could stall computation on a set of processors, seen globally.

Message Passing Interface (MPI) is a widely portable low level programming model for building parallel applications efficiently. Classically, most of the parallel scientific application codes have relied on the Send-Recv model of MPI, where a send operation invoked on a process must have a matching receive operation on another process. The Send-Recv model may introduce excessive synchronization for developing some distributed applications, especially those that require a particular process to access data in a one-sided manner. In MPI one-sided model, communication is non-blocking asynchronous, i.e., occurs concurrently with normal program execution, and, synchronization is required at a later point to ensure communication completion. We establish the efficacy of MPI one-sided programming model by demonstrating improved programmability and competitive performance in building a variety of scientific applications.
Bird Deterrence via Drones

Primary Author: Shivam Goel
Co-Author(s): Pullman Pullman

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Cherry, grape, honeycrisp apple, and blueberry growers lose $80 million annually to bird damage in Washington state. Growers of a wide range of crops have a critical need for a safe, cost effective method for persistent bird deterrence, which would lead to significantly reduced production costs. Our long-term objective is to build an autonomous Unmanned Aerial System (UAS) to deter birds from high-value crops. Towards this end, we have been researching the effectiveness of the method in the fields using a drone system driven by human subjects and hence, find out the effectiveness of using a Drone System to scare away birds from the fields. We also have been implementing a vision system to detect and localize birds using low-cost cameras, which will be used to intercept and scare birds in future work. In the poster, we discuss the results of our experiments in the fields to find out the effectiveness of this approach. We also discuss the performance of different object detection algorithms, compare their efficiency, and discuss the techniques to improve the computational efficiency. To localize and estimate bird trajectories, we implement and benchmark a low-cost stereo vision system. Both systems are discussed in the context of the fully autonomous multi-UAS system currently under development.
Hydroamination of Alkynes using Gold Nanoparticles Encapsulated by Functionalized Silica

Primary Author: Trent Graham
Co-Author(s): Josh Smith

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
The hydroamination of alkynes is a chemical reaction used to produce imines for the pharmaceutical industry. The reaction requires catalysts and necessitates the availability of hydrogen molecules. We hypothesized that catalyst performance would be improved by the colocalization hydrogen donors in proximity to the catalytically-active metal surface. We explored different methods of producing gold nanoparticle catalysts encapsulated by a support that was functionalized with grafted hydrogen donors. We found a reproducible method to synthesize gold nanoparticles supported by silicon dioxide functionalized with silylamines. Silylamines can donate hydrogen molecules. The formation of a hollow, porous silica dioxide shell with encapsulated gold nanoparticles was validated with transmission electron microscopy. The chemical structure of the grafted hydrogen donors on the catalyst surface was characterized with solid-state magic angle spinning nuclear magnetic resonance spectroscopy and Fourier-transform infra-red spectroscopy. We quantified the amount of grafted hydrogen donors with thermogravimetric analysis and chemical transient kinetics. After validating the production of gold nanoparticle catalyst with colocalized donatable hydrogen molecules, we began to test our hypothesis. We conducted hydroamination reactions to compare our catalysts to catalysts that had the donatable hydrogen molecules removed. The conversion of reactants to products was monitored with high-performance gas chromatography mass spectrometry and nuclear magnetic resonance spectroscopy. We concluded that the colocalization of hydrogen donors does improve catalyst performance. Future work is underway to apply our catalyst design to additional reactions of interest that also necessitate hydrogen molecule donation in the petroleum industry.
A Case Study focused on a Trend Back to the Future: General Contractors doing more Self-Performed Work

Primary Author: David Gunderson
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Category: Administrative & Information Systems
Campus: Pullman

Abstract:
According to FMI’s 2016 U.S. Markets Construction Overview, general construction firms are “seeking to proactively address labor risks as well as improve operating margins and project efficiency by increasing their self-performed capabilities. In a 2015 study published by FMI, 45% of survey respondents across the construction industry indicated they plan to increase the amount of work they self-perform in the future, with another 20% responding that they are considering expanding their capabilities.” FMI also stated that general contractors are also increasing self-performed capabilities to control the project schedule. This reported trend is contrary to the trend reported in most construction management texts. Gould and Joyce (2014) state that in the past “general contractors directly hired carpenters, laborers, bricklayers, ironworkers and painters. Only the mechanical and electrical trades were subcontracted. Today, [commercial] builders hire specialty contractors to do all the trade work.” This case study looks at how one general contractor, Swinerton Builders, is going back to doing various aspects of self-performed work for all the reasons identified in the FMI report. This transformation is a work in progress.
Additive Manufacturing via High Speed Sintering

Primary Author: Alex Hurst
Co-Author(s): Amit Avhad
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Huicong Jiang
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Abstract:
High speed sintering (HSS) has emerged in recent years as a new powder-based additive manufacturing process similar to selective laser sintering (SLS). Instead of using a high power laser to selectively sinter desired cross-sections, HSS uses thermal radiation absorbent inks with a low-cost IR source (heat lamp) to selectively sinter the powders. In order to study the HSS process, a test set-up/prototype was built using commercially available and open source designs. A combination of manual and automated control was implemented. The current HSS test set-up was used to study sintering parameters such as IR exposure time and layer thickness. Establishing HSS parameters for the test rig and their effects on printed Nylon samples is the primary goal of this research. The interaction between ink droplets and powder particles is also investigated using a high speed imaging system. Preliminary evidence shows some powder dislocation during ink deposition due to impact force of the droplet. Another important aspect of powder-droplet interaction is the absorption of the liquid droplets by the powder substrate due to capillary force. The effects of surface tension of the fluid and substrate compaction on the absorption have been studied using millimeter-sized drops. A preliminary study on micron-sized drops impact on powder materials has been carried out using the high-speed imaging system.
Distributed – Coordinated Signal Timing Optimization in Connected Transportation Networks

Primary Author: S M A Bin Al Islam
Co-Author(s): Ali Hajbabaie

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
This work presents a Distributed-Coordinated methodology for signal timing optimization in connected urban street networks. The underlying assumption is that all vehicles and intersections are connected and intersections can share information with each other. The novelty of the work arises from reformulating the signal timing optimization problem from a central architecture, where all signal timing parameters are optimized in one mathematical program, to a decentralized approach, where a mathematical program controls the timing of only a single intersection. As a result of this distribution, the complexity of the problem is significantly reduced thus, the proposed approach is real-time and scale-able. Furthermore, distributed mathematical programs continuously coordinate with each other to avoid finding locally optimal solutions and to move towards global optimality. We proposed a real-time and scale-able solution technique to solve the problem and applied it to several case study networks under various demand patterns. The algorithm controlled queue length and maximized intersection throughput (between 1% to 5% increase compared to the actuated coordinated signals optimized in VISTRO) and reduced travel time (between 17% to 48% decrease compared to actuated coordinated signals) in all cases.
Fe-based catalysts for the CO hydrogenation to alkenes: preparation, characterization and catalytic tests

Primary Author: Hafsa Karroum
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Iron based catalysts are most frequently used in the catalytic CO hydrogenation according to Fischer Tropsch (FT). In the present studies their performance in the production of alkenes was explored. Different from traditional methods, they were prepared by oxalate precipitation in the absence of a generic support material. The as-prepared iron II oxalate was decomposed by temperature-programmed heating (TPDec) in different gas atmospheres, i.e. H2 and Ar. Both the precursor and the final catalyst, after H2- or Ar-TPDec, were characterized for their chemical phase composition using X-ray diffraction (XRD). Using the BET method, specific surface areas were determined to be about 10 m2/g. The average particle size was close to 60 nm while Transmission Electron Microscopy (TEM) indicated particles were also larger in size. XRD showed that mainly magnetite was formed after activation, besides smaller amounts of cohenite. No metallic Fe was detected, in agreement with the absence of any measurable hydrogen-deuterium isotope exchange over these catalysts at room temperature. Catalytic CO hydrogenation tests with activated catalysts initially resulted in an alkene selectivity of 85% at 22% CO conversion. However, after 23 h the alkene selectivity had decreased to 50% (in favor of unwanted methane) and the CO conversion was only a few percent. XRD measurements showed that the entire catalyst had turned into cohenite during CO hydrogenation. Moreover, sintering was observed by TEM and made responsible for the loss of activity and alkene selectivity. Future efforts will focus on the stabilization of Fe-based catalysts by using suitable support materials.
Growth of detector grade cadmium zinc telluride via implementation of crucible rotation in modified Bridgman growth

Primary Author: Jedidiah McCoy
Co-Author(s): Santosh Swain
Saketh Kakkireni
Kelvin Lynn**

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
With the goal of overcoming low radiation detector grade yield in vertical Bridgman growth of cadmium zinc telluride (CZT), a modified growth system has been developed in which the accelerated crucible rotation method is implemented, ACRT for short. During growth, the melt containing crucible is rotated at various speeds to induce fluid flow patterns which homogenize melt composition. For a given rotation scheme, crucible acceleration, deceleration, maximum velocity, and hold times at that velocity were distinguishable parameters. Adjustable system variables included crucible rotation scheme, growth composition, as well as growth temperature profile. CZT growth composition was varied between 0.25 and 7.5 weight percent of excess tellurium. Growth rates were varied between 0.5 and 2.0 mm/hr. and gradients between 10 and 30 C°/cm. A study of nucleation control in seeded vs. self-seeded growth was also conducted. The system was implemented with and without pyrolytic boron nitride crucibles. Analysis of grown ingots revealed highly uniform material. Zn uniformity was achieved in asymmetric rotation schemes where velocity hold times were zero. Flat to convex solid/liquid interface shapes were achieved, ideal for Bridgman growth. Axial slices from ingots grown with sequential intervals of static versus rotational growth resulted in striated Zn distributions. Large wafers, 38 cm2, approaching single crystal yields of 100% have been obtained. Fabrication of planar detectors yielded favorable detector properties with some growth composition dependent variation. In conclusion, our modified growth method does indeed pose a significant increase in radiation detector grade yield of CZT per growth.

**Denotes 2017 Celebrating Excellence Award Recipient
A Novel Distributed-Coordinated Approach for Real-Time Signal Control

Primary Author: Mehrzad Mehrabipour
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
This paper develops an efficient methodology to optimize the timing of signalized intersections in urban street networks. Our approach distributes a network-level mixed-integer linear program (MILP) to intersection level. This distribution significantly reduces the complexity of the MILP and makes it real-time and scalable. We create coordination between MILPs to reduce the probability of finding locally optimal solutions. The formulation accounts for oversaturated conditions by using an appropriate objective function and explicit constraints on queue length. We develop a rolling horizon solution algorithm and apply it to several case study networks under various demand patterns. The algorithm controls queue length and maximize intersection throughput. We compared the solution to the optimal solutions (found by a central optimization approach) and observed differences of less than 1% on a number of performance measures over different conditions.
Optimal Parking Utilization Management under Uncertain Demand and Real-Time Decisions

Primary Author: Amir Mirheli
Co-Author(s): Leila Hajibabai

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Excessive search for parking spots (a.k.a. cruising) in congested areas contributes to additional delays and hence, impose indirect costs as well as safety and health concerns. While planning for urban congestion mitigation, it is important to take into account travelers' and parking agency's diverse objectives. Parking utilization management under such miscellaneous perspectives and uncertain demand, on the other hand, is often very challenging, particularly on congested urban areas with limited parking capacity. Inefficient strategies yield minor short-term returns for limited travelers and impose huge social costs on the rest on a daily basis. This research develops a bi-level stochastic dynamic parking management model under uncertain demand to simultaneously minimize total costs due to drivers’ decisions, maximize parking agency's revenue, and push parking utilization towards a target occupancy. The problem is solved using a hybrid technique including an approximate dynamic programming with an embedded single-level conversion. Numerical experiments on an empirical case study are conducted to show performance of the proposed algorithm and to draw managerial insights.
Dynamic Traffic Metering in Urban Street Networks

Primary Author: Rasool Mohebifard
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Traffic metering offers great potential for reducing congestion and enhancing network performance in oversaturated urban street networks. While most available metering approaches integrate macroscopic fundamental diagrams (MFD) and control theory, this paper presents a linear program (based on the Cell Transmission Model - CTM) for traffic metering in urban street networks to optimize the rate of incoming flow at each individual network gate. We also present a Mixed-Integer Linear Program (MILP) to address the flow holding-back problem of the linear program. We propose a novel and efficient solution algorithm and show that it converts the MILP to a linear program and several CTM simulation runs. The solution algorithm was applied to two case studies under different conditions. The proposed solution approach found the optimal solutions and guaranteed the maximum throughput by keeping some vehicles at network gates and only allowing enough vehicles enter the network to prevent gridlocks. This was confirmed by comparing the case studies with and without metering. The results are promising and show a positive system-level effect of metering in networks.
A practical and non-intrusive eating moment detection system

Primary Author: Marjan Nourollahi Darabad
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
Eating habits are highly correlated with health condition. It is not only what you eat that contributes in your health but is also about when and how often you eat. An automated health monitoring system can accommodate users with special health conditions, like diabetes, who need to take medication after or in between a meal or assist users who want to follow a special dietary plan. Detecting when eating happens is a key challenge in automated health monitoring systems.

Most current approaches to detect eating moment requires multiple on-body sensors or specialized devices such as neck collars for swallow detection that are impractical for everyday usage. The aim of this research is to design a practical solution for eating moment detection. We use an off-the-shelf smartwatch and records inertial sensor data to design a non-intrusive detection system.

We design different eating scenarios and collect training data in the controlled setting while subjects following designed scenarios and a camera recording provide the ground truth labels. Leveraging state-of-art machine learning and signal processing techniques, we build an intelligent prediction model to identify eating gestures. Then, we connect high density eating gestures across the time dimension using a special density-based clustering method to build up an eating moment. To validate the generalizability of our intelligent model on subjects in free-living conditions. Assessing the quality of our prediction model in validation phase, the controlled setting scenarios will be refined by emphasizing on actions that are likely to be mistaken with eating.
A practical and non-intrusive eating moment detection system

Primary Author: Marjan Nourollahi Darabad
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Medical & Life Sciences
Campus: Pullman

Abstract:
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Supporting Learning Analytics in Computing Education

Primary Author: Daniel Olivares
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Administrative & Information Systems
Campus: Pullman

Abstract:
Computing degree programs commonly struggle with high attrition rates of 35 to 50 percent, especially in early courses. Learning analytics, which focuses on the measurement, collection, and analysis of learning data, can help address this problem by allowing learning experiences to be better tailored to learners’ needs. In order to support learning analytics in computing education, we have developed OSBLE+, an online learning environment that facilitates the collection and analysis of programming and social data in computing courses. Past data collection and analysis efforts in computing science have been mainly focused on programming process. In capturing additional social and learning process data as students work on computer programming assignments, we aim to better understand their struggles, and ultimately to better tailor instruction to their needs.

To date, versions of OSBLE+ have been used in large CS1 and CS2 courses at Washington State University. An empirical study of the CS2 course showed that student social participation was strongly correlated with assignment success. Motivated by this result and by social learning theory, ongoing work explores two possibilities: (a) leveraging learning process and social data to deliver automated interventions, and (b) presenting learners with visualizations of their learning data prompting them to reflect on and discuss their learning processes. Comparison of known achievement metrics (e.g. grades and participation levels) between control and intervention semesters are being used to measure the impact of these interventions on student success.
Curriculum Design for Machine Learners in Sequential Decision Tasks

Primary Author: Bei Peng
Co-Author(s): James MacGlashan
Robert Loftin
Michael Littman
David Roberts
Matthew Taylor

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Category: Administrative & Information Systems
Campus: Pullman

Abstract:
Principal Topic
As more robots and virtual agents become deployed, it is important to enable non-expert humans to teach autonomous agents new skills without programming. Decades of research in human education have emphasized the role of curriculum design to promote learning. While most existing work on curriculum learning (in the context of machine learning) focuses on developing automatic methods to order training examples, how humans design curricula is one neglected topic. We aim to better understand the curriculum-design strategies used by humans when teaching the agent.

Method/Hypotheses
This work defines the curriculum-design problem in the context of sequential decision tasks, analyzes how different curricula affect agent learning in a Sokoban-like domain, and presents results of a user study (80 user data from Amazon’s Mechanical Turk) that explores whether non-experts generate such curricula.

Results/Implications
Our simulation results show that 1) different curricula can have substantial impact on training speeds while longer curricula do not always result in better agent performance, 2) more benefits of curricula can be found as the target task’s complexity increases, and 3) the method for providing reward feedback to the agent as it learns within a curriculum does not change which curricula are best. The user-study results show that non-expert users can 1) successfully design curricula that result in better agent performance in learning the target task than learning from scratch, and 2) discover and follow salient principles when selecting tasks in a curriculum.
Quantifying the Role of Groundwater for Drought Mitigation in Washington State

Primary Author: Sasha Richey
Co-Author(s): Muhammad Barik

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Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
The 2015 drought in Washington State had a severe impact on the more than 300 crops grown in the state, including an initial estimated loss of $86.52 million on the iconic Washington apple industry alone [Washington State Department of Agriculture, Interim Report: 2015 Drought and Agriculture, 2015]. The full agricultural impact of the 2015 Washington drought has yet to be assessed. Groundwater plays an important role in drought mitigation in Washington’s agricultural industry, just as it does in California’s Central Valley. However, a key difference is Washington’s requirement for permit applications to use emergency drought wells; a process that occurs only after an official drought declaration. The 2001, 2005, and 2015 droughts saw significant differences in the number of emergency drought permit applications that were reported back to the state, though the severity of drought in each year did not differ to the same extreme. Understanding the drivers to using groundwater during drought will help to better manage future groundwater use in the face of more frequent and severe droughts. The goal of this study is to identify the drivers and impacts to using groundwater for drought mitigation in Washington State, by both characterizing the differences in the 2001, 2005, and 2015 droughts and estimating groundwater use in the Columbia River Basin in Washington. Preliminary results show a mismatch between groundwater use estimated from permit applications compared to modeled groundwater demand for irrigation from the coupled hydrologic and cropping systems model, VIC-CropSyst. We explore drivers of this discrepancy and its relation to drought with observation wells, reported emergency well permits, models, and remote sensing. Ultimately, this work lays the foundation to assess the economic value of groundwater to mitigate crop losses in agricultural regions, especially into the future with changing regulatory structures and climate change.
Plug-n-Learn: Automatic Learning of Activity Recognition in Human-Centered Internet-of-Things Applications

Primary Author: Seyed Ali Rokni Dezfooli
Co-Author(s):

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Many emerging applications of Internet of Things (IoT), from medical monitoring to automotive engineering, involve human subjects where humans and things operate synergistically towards satisfying objectives of the application. At the heart of these systems is human monitoring where physiological and behavioral context of the human subjects are assessed using wearable and environmental sensors. Smartphones, wrist-band sensors, smart-home sensors, sports shoes, and sensors embedded in clothing are examples of sensors utilized for human monitoring. These human-centered systems have proved effective in applications such as activity recognition, and anomaly detection. A major obstacle in largescale utilization of current wearables is that their computational algorithms need to be re-built from scratch upon any changes in the configuration of the network. Retraining of these algorithms requires significant amount of labeled training data, a process that is labor-intensive, time-consuming, and infeasible. We propose an approach for automatic retraining of the machine learning algorithms in real-time without need for any labeled training data. We measure the inherent correlation between observations made by an old sensor view for which trained algorithms exist and the new sensor view for which an algorithm needs to be developed. By applying our real-time multi-view autonomous learning approach, we achieve an accuracy of 80.66% in activity recognition, which is an improvement of 15.96% in the accuracy due to the automatic labeling of the data in the new sensor node. This performance is only 7.96% lower than the experimental upper bound where labeled training data are collected with the new sensor.
A Context-aware Framework for Reconfiguration of Mobile Health Monitoring Systems

Primary Author: Ramyar Saeedi
Co-Author(s): Pullman Pullman

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Campus: Pullman

Abstract:
As health-care analytic systems continue to be more and more deployed in real world settings, data mining techniques that specifically address challenges associated with dynamic environments (e.g. different users, signal heterogeneity) are needed. In particular, in addition to traditional pattern recognition, data mining algorithms in dynamic environments need also consider decision making systems to handle context awareness, signal heterogeneity, subject specific models, and personalization. In addition, automated anomaly detection on health-care systems is more critical compared to other applications. Early detection of anomalies plays a key role in maintaining users’ health and quality of life.

Our goal is to develop a robust and personalized data-mining framework for health-care applications. This framework includes components for data classification, data cleaning, and anomaly detection. Alongside these components, a reconfiguration component that maintains the system’s performance is included. The system reconfiguration component exploits the available knowledge as well as feedback from users/physicians to maintain the systems accuracy specifically for critical applications (e.g. heart failure patients monitoring). We are developing algorithms that employ effective methods for finding related knowledge based on available data and active feedback to learn the new contexts. In this presentation, we demonstrate the efficacy of the algorithms as well as the overall framework using real data of human activity collected in different contexts.
Ultralight, high strength, and strain tolerant micro engineered materials

Primary Author: Mohammad Sadeq Saleh
Co-Author(s):

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Campus: Pullman

Abstract:
Mechanical and electrochemical properties of material can be improved by modifying the microstructure. In this research we invented a new micro fabrication for large scale production of material with controlled 3D microstructure in form of nano-lattices and micro devices. This novel technique utilizes nanoparticle ink of target material to build a structure in a droplet by droplet fashion with elements down to 10um in three dimension space.
This technique has been used to fabricate 1) stretchable accordion shape interconnects which can be stretched up to 150% of its original length, 2) strain tolerant anode materials to accommodate high electrochemical stresses resulting in improvement of Li-ion batteries capacity up to 3 times, and 3) ultralight high strength metallic structures for energy absorption and super-hydrophilic materials for advanced aerospace and biomedical applications. A large of samples with optimized structure have been fabricated and tested to characterize the performance.
This research has been done at Advanced Manufacturing Laboratory (AML) WSU and the complete results have been published in ScienceAdvances journal.
Curcumin loaded 3D printed calcium phosphate scaffolds for improved bone formation in rat distal femur model

Primary Author: Naboneeta Sarkar
Co-Author(s): Dishary Banerjee
Susmita Bose

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Campus: Pullman

Abstract:
Calcium phosphates are widely used as bone substitutes due to their excellent biocompatibility, controllable bioresorbability, and compositional similarity to bone. Sustained and controlled releases of drugs or osteogenic factors from scaffolds over a desired period of time are required for effective treatment of various musculoskeletal disorders. Curcumin, the active ingredient of turmeric or yellow spice we use in cooking is known as an antioxidant and anti-inflammatory molecule, which enhances osteoblastic activity and thus promotes new bone formation. However, previous preclinical and clinical studies reported curcumin’s limited oral efficacy due to its poor solubility and high intestinal liver metabolism. The objective of this study was to enhance bioavailability and to provide controlled release from scaffolds, by using poly ε-caprolactone (PCL), poly ethylene glycol (PEG) and poly lactide co glycolide (PLGA) as the polymeric system. In addition, 3D printed interconnected macro porous β-TCP scaffolds were prepared and curcumin was loaded to assess the effects of curcumin on in vivo bone regeneration. We hypothesized that increased bioavailability of curcumin will result in controlled release from TCP scaffolds, which will enhance bone formation in rat distal femur model. Continuous release of curcumin from the hydroxyapatite matrix was observed for 15 days. Complete mineralized bone formation increased from 29.6 % to 44.9% in curcumin-coated scaffolds compared to pure TCP after 6 weeks. Results show that sustained release of curcumin from calcium phosphate scaffolds can be designed with the aid of polymers, which can be considered as excellent candidate for wound healing and tissue regeneration applications.
High Density Turbo TDMR Detection with Local Area Influence Probabilistic Model

Primary Author: xueliang sun
Co-Author(s): Ben Belzer
Krish Sivakumar

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Campus: Pullman

Abstract:
Industry is developing hard disk for next generation with great increment in information capacity. One of the widely used techniques is two dimensional magnetic recording (TDMR), which adopts two or more magnetic readers on the disk to enable better read back signals at high grain density. This poster proposes probabilistic message-passing turbo-detection algorithms for TDMR that locally estimate magnetic grain interactions with coded data bits, and thus iteratively assist channel decoding to retrieve user information. Such local area influence probabilistic (LAIP) techniques are especially effective at grain densities ranging from about 4 magnetic grains per coded bit (GPB) down to about 1 GPB, where interaction between grains and bits is significant and occasionally a bit will not be written on any grain, and hence will effectively be “overwritten” by bits on surrounding grains. By modeling the interaction among magnetic grains, LAIP enables detection of both overwritten bits and wrong-sign non-overwritten bits so that their log-likelihood ratios (LLRs) are assigned small magnitudes for overwritten bits and correct signs for non-overwritten bits. Simulation results with a random Voronoi magnetic media model show that the LAIP-based detector can accurately detect both overwritten bits and severely influenced non-overwritten bits, and that higher user densities and lower bit error rates (BERs) can be achieved compared to our previously proposed generalized-belief-propagation (GBP) detector presented at the 2015 Magnetic Recording Conference (TMRC 2015). In addition, the LAIP-based detector’s computer run time is 10000 times faster than the GBP-based detector.
On the Relationships Between Commuting Mode Choice and Public Health

Primary Author: Mehrdad Tajalli
Co-Author(s): Ali Hajbabaie

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
This paper studies the associations that may exist between commuting mode choice and public health. For this purpose, we used Community Health Survey data collected in New York City in 2010. Obesity, blood pressure, and diabetes are used as indicators of respondents’ physical health, and Non-Specific Psychological Distress as an indicator of respondents’ mental health. After rigorous statistical analyses, a binary probit model was fitted for each physical and mental health indicator to quantify the associations between different commuting modes and physical/mental health.
Results show that walking, as expected, is associated with a lower probability of obesity, hypertension, diabetes, and mental disorders (all statistically significant) when compared to using private transportation. Using subway is related to a lower probability of obesity and diabetes while using the city bus was linked with a higher probability of obesity (all statistically significant) compared to using personal vehicles. Finally, in comparison with using personal vehicles, working at home is associated with a higher probability of having mental disorders (statistically significant).
Dynamic Speed Harmonization In Urban Transportation Network

Primary Author: Mehrdad Tajalli
Co-Author(s): Ali Hajbabaie

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Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
With advancement of intelligent transportation systems which includes the connected vehicle technology, new possibilities are created to facilitate the movement of vehicles through transportation networks and reduce their travel time. Furthermore, by varying speed limits in different links of a network, not only the capacity of the network is utilized efficiently but also the movement of vehicles is ordered for a “smoother” flow. This study hires a mathematical nonlinear formulation to find the optimal speed to assign to the road segments dynamically to make the speed harmonized and improve the performance of the network. In this study, cell transmission model is used to incorporate varying speed values. The nonlinear problem is converted to linear programming by utilizing fundamental diagram of traffic flow and it could be solved efficiently. In addition, using time rolling horizon approach makes the formulation applicable for real time implementations. The results show the reduction of speed variance and the number of stops significantly, while the travel time is almost the same.
High-speed FSW aluminum alloy 7075 microstructure and corrosion properties

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Piyush Upadhyay
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Campus: Pullman

Abstract:
High-speed friction stir welding provides an opportunity to enable high-volume aluminum joining, thus lowering the expense of the process. To better understand this important industrial process the properties of the welds must be fully characterized. In this study we examined the microstructures of AA7075 butt welds with welding speeds of 1 m/min, 2 m/min and 3 m/min. The welds were also tested for their corrosion resistance in a diluted EXCO solution at room temperature. The welds with higher speeds had a smaller corrosion sensitive area along with smaller HAZs, but the nugget zone became more corrosion susceptible. Their microstructure features were used to explain the non-uniform corrosion behavior across the weld. Both constituent particles and precipitate distribution were altered by the friction stir process and resulted in an overall sensitized weld affected region compared to the base material.
Sensitivity of XANES and XES to the local environment: Multiple adsorption of H2O and NH3 on Cu-SSZ-13

Primary Author: Renqin Zhang
Co-Author(s): Jean-Sabin McEwen
Hui Li

College: Voiland College of Engineering and Architecture
Category: Engineering & Physical Sciences
Campus: Pullman

Abstract:
Copper-exchanged zeolite with the chabazite structure (Cu/CHA), such as Cu-SSZ-13, display excellent catalytic activity and hydrothermal stability in selective catalytic reduction (SCR) of NOx, which is one of the main air pollutants present in the exhaust from diesel engines. Although Cu-SSZ-13 have been commercialized as diesel after-treatment catalysts, the fundamental chemical and physical properties need to be characterized in order to aid in the design of new and better catalysts. X-ray absorption spectroscopy (XAS) is a versatile tool to determine the oxidation state and the local structure of Cu in Cu/CHA. In this work, we examine how the geometry of a Cu+ ion with a linear configuration and Cu2+ ion with a square planar configuration in Cu-SSZ-13 correlate with the XAS features. When water and ammonia binds to a Cu+ ion with a linear configuration, a strong intensity peak around 8983 eV in Cu K-edge XANES appears. Concerning the case of Cu2+ ions with a square planar configuration bounded to four ammonia molecules, it is found that there are two feature peaks around 8986 and 8993 eV in their Cu K-edge XANES. However, an important limitation of XANES is that it is difficult to distinguish the nitrogen and oxygen atoms in the proximity of the metal center. X-ray emission spectroscopy (XES) could overcome this limitation. By comparing the XES results between H2O and NH3 adsorbed on Cu-SSZ-13, it is found that the kbeta" peak of Cu-O bond appears at lower energy than that of Cu-N bond.
The extent to which antimicrobial resistance genes crossover in bacteria

Primary Author: Abu Chowdhury
Co-Author(s): Douglas Call**
Shira Broschat

College: Voiland College of Engineering and Architecture & College of Veterinary Medicine
Category: Engineering & Architecture and Veterinary Medicine
Campus: Pullman

Abstract:
Background: Horizontal gene transfer within bacteria may pose risks to public health because antimicrobial resistance (AMR) genes might be shared between non-pathogen bacteria and pathogens. Currently it is assumed that the reservoir of genes that are spread via non-pathogen bacteria is important, but this has not actually been verified. If this assumption is incorrect, then the spread of AMR genes is not as great a risk as believed. In this work, we examined plasmid genomes from four different species of bacteria, two human pathogens (Salmonella enterica serovar Typhi and Shigella spp) and two non-pathogens (Escherichia coli and Salmonella enterica serovar Typhimurium), to determine whether resistance traits have been shared between the pathogens and non-pathogens. First we clustered protein sequences collected from the plasmids, then we analyzed a phylogenetic network to determine clusters of potential interest, next we eliminated clusters with proteins not related to resistance traits, and finally we computed similarity matrices for each of the candidate clusters using multiple sequence alignment to determine the similarity of the protein sequences.

Results: We considered a total of 79 unique plasmid strains encoding a total of 24,002 protein sequences. Of the 2,456 non-singleton clusters, 260 were found to contain potential genes of interest common to pathogens and non-pathogens. Six clusters contained AMR genes shared by both pathogens and non-pathogens.

Conclusion: The patterns of similarity between sequences suggest different histories with respect to when AMR genes were shared between species. Our analysis is ongoing.

**Denotes 2017 Celebrating Excellence Award Recipient
Brain transmembrane TNF signals upon soluble TNF receptor stimulation to inhibit evoked response potential amplitudes

Primary Author: Liangyu Chen
Co-Author(s): Dinuka Sahabandu
Ping Taishi
Cody M. Gibbons
Sandip Roy
James M. Krueger

College: WSU Spokane
Category: Basic Neuroscience
Campus: Spokane

Abstract:
Tumor necrosis factor alpha (TNF) can induce whole organism sleep, local unilateral intense sleep, sleep-like states within cortical columns, and a deep sleep like state in neuronal/glial co-cultures in vitro. In brain, the dominate form of TNF is the 26kD transmembrane TNF (tmTNF). In sympathetic axons, the soluble TNF receptor (sTNFR) reverse signals via tmTNF. We determined whether the sTNFR, and if the absence of TNFRs affected electrically-induced evoked response potentials (ERP) in neuronal/glial co-cultures using cells from wild type (WT) and double TNFR knockout (KO) mice. During sleep in vivo cortical ERPs are of greater magnitude than during waking. In vivo and in vitro neuronal/glial co-cultures, ERPs are enhanced by the soluble 17kD form of TNF which signals via the transmembrane TNFRs. Neuronal/glial co-cultures of cells from WT and double TNFR KO mice were prepared and ERPs were determined on development days 5, 10, and 14, and on day 14 with and without the addition of 2 different doses of the sTNFR.
ERP peak to peak amplitudes were about 20% lower in the TNFR KO mice than in WT mice on culture days 10 and 14; on day 5 values were similar in cells from both strains. After addition of sTNFR to the cultures on day 14, ERP amplitudes and ERP energy were less in the cells derived from the TNFR KO mice than in those derived from WT cells. The sTNFR, either by its absence or by the addition of exogenous sTNFR, affects the emergent network property, ERPs.
Effects of Fatigue on Officer Performance in Deadly Force Simulations

Primary Author: Elizabeth Dotson
Co-Author(s): Stephen James
Lois James
Bryan Vila

College: WSU Spokane
Category: Social Sciences
Campus: Spokane

Abstract:
Introduction: Police officers are expected to function under conditions of fatigue as a result of job strains and shift requirements. While fatigued, officers may be required to use deadly force. This study assessed the effects of fatigue from shift work on performance in simulated deadly force scenarios.

Methods: 80 experienced patrol officers participated in two to four separate 5-hour sessions in the laboratory. In half the sessions (randomized counterbalanced), officers came to the laboratory following five 10.7-hour shifts (fatigued condition); in the other half, they came to the laboratory after 72 hours off shift (control condition). Each laboratory session included six deadly force scenarios, during which performance was observed and demonstrated behavior was recorded.

Results: Officers showed greater immersion within the simulated deadly force scenarios when they were fatigued, as evidenced by appropriate tactical and dynamic movement, appropriate levels of aggression/assertiveness, emotional involvement/tenacity, and perceived professionalism within the simulation. Some aspects of officer performance were not different between conditions as evidenced by threat assessment, adhering to rules of engagement, and weapon handling.

Conclusion: Fatigue affected simulated deadly force performance primarily on measures of emotional involvement with the simulated scenarios. This suggests that fatigue may lower the suspension of disbelief barrier seen within deadly force simulations. However, there was no significant effect of fatigue on other aspects of performance in deadly force simulations in this study. Recent findings from our laboratory suggest that scenarios requiring cognitive flexibility to maintain situational awareness may reveal adverse effects of fatigue on deadly force performance.
Interleukin-1 enhances the burstiness of neuronal/glial co-cultures only when both isoforms of the interleukin-1 accessory protein are present.

Primary Author: Cody M. Gibbons
Co-Author(s): Joseph T. Nguyen
Ping Taishi
Dinuka Sahabandu
Kathryn A. Jewett
Sandip Roy
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College: WSU Spokane
Category: Basic Neuroscience
Campus: Spokane

Abstract:
The synchronization of electroencephalogram (EEG) electrical potentials, action potential (AP) burst-pause patterns, and EEG slow wave power are used to characterize sleep in mammals. Comparable measures are used to define sleep-like states in co-cultures of cortical neurons and glia in vitro (Jewett et al. Eur. J. Neurobiol. 2015). In culture, AP burstiness (BI; burstiness index) increases after long periods of electrical stimulation-induced wake-like states suggesting a homeostatic sleep rebound in vitro. Interleukin-1 (IL1) is a sleep regulatory substance which requires the IL1 receptor (R) and a receptor accessory protein to signal. There is a neuron-specific IL1R accessory protein (AcPb) and an alternatively spliced accessory protein (AcP) which is found on most cell types including neurons.

Our goal was to determine the effects of exogenous IL1 treatment on the number of APs/sec and the BI in cell cultures obtained from wild type (WT), AcPb knockout (KO), and AcPKO mice in vitro.

Co-cultures of neurons/glia derived from 1-day old AcPbKO, AcPKO, and WT mice were grown on multi-electrode arrays (MEAs). Upon maturation (14 days), cells were treated with 0.0 or 0.01 ng IL1. After the additions, cells were recorded for 1hr and APs/sec and BI were determined.

We found that the 0.01 ng IL1 dose doubled the number of APs/sec for all cell types across the entire hour recording period compared to the control dose. In contrast, IL1 enhanced the BI only in WT cells.

IL1 requires the presence of both AcP and AcPb to increase the BI, an emergent network property.
Prevention, Assessment, and Treatment of Pediatric Hearing Loss: Socioeconomic Status Reporting Practices in Research

Primary Author: Ella Inglebret  
Co-Author(s): Kayla Monson  
Amy Meredith

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Category: Medical & Life Sciences  
Campus: Spokane

Abstract:  
Research evidence indicates that a family’s socioeconomic status (SES) relates to the prevention, assessment, and treatment of hearing loss in children. The purpose of this study was to examine patterns of reporting SES for pediatric research participants described in articles published in two journals of the American Speech-Language-Hearing Association (ASHA) over a 16-year period. Articles were selected for review based on the criteria: (a) the research focused on prevention, assessment, and treatment of hearing loss in children, (b) the participants involved all or some children ages birth to 18 years, (c) a research method described participants, (d) original data were examined, and (e) participants resided in the U.S. Between 2000 and 2015, less than 25% of the 146 selected articles reported the SES of pediatric participants (35/146). Indicators used to represent SES varied across studies. The first step toward consistent consideration of SES variables in clinical practice is to emphasize the importance of collecting and reporting the SES characteristics of participants in research. The inclusion of SES data can provide essential insight into the participants’ access to pre-, peri-, and post-natal health care, nutrition, environmental risk exposure, educational opportunities, and resources available to follow up on hearing assessment and treatment recommendations. Of further concern, SES appears to relate to conditions, such as chronic otitis media, which put children at risk for receptive and expressive language impairments. Broadly, SES reporting adds to our professional knowledge base and understanding of universals and variations that exist among diverse populations.
Interleukin-1 enhances delta wave power in neuronal/glial co-cultures of wild type cells but not in cells lacking the neuron-specific IL1 receptor accessory protein.

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Co-Author(s): Taishi Ping
Dinuka Sahabandu
Cody Gibbons
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Sandip Roy
James Krueger

College: WSU Spokane
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Campus: Spokane

Abstract:
Synchronization (SYN) of electrical potentials and high amplitude slow wave (SW, delta) power are cardinal features of non-rapid eye movement sleep, and also characterize sleep-like states in neuronal/glial co-cultures. Interleukin-1 beta (IL1) is a well-characterized sleep regulatory substance. A neuron-specific IL1 receptor accessory protein (AcPb) is required for full expression of sleep homeostasis in vivo and in vitro. AcPb expression is enhanced by sleep deprivation, the alternatively spliced gene product, AcP, found in almost all cells, is not. We determined whether exogenous IL1 treatment of cells from wild type (WT) and AcPb knockout (KO), and AcPKO mice alters SYN and SW power in vitro.

Co-cultures of neurons/glia derived from 1-day old AcPbKO, AcPKO, and WT mice were grown on multi-electrode arrays as described by Jewett et al. After one hour of acclimation, cells were treated with 0.0, 0.01, or 0.1 ng IL1. After the additions, cells were recorded for 1 hr and SYN, and SW power were determined.

The 0.1 ng IL1 dose, but not the 0.01 ng dose, enhanced SYN and SW power across the hour recording in WT cells. In contrast, AcPbKO cells were not responsive to IL1. AcPKO cells exhibited slightly enhanced SYN after both IL1 doses, but SW power was enhanced only after the 0.01 ng IL1 dose but not after the 0.1 ng dose compared to the 0.0 ng dose.

IL1 promotes SYN of electrical potentials and enhancement of SW power in neuronal/glial tissue cultures. Neuron-specific AcPb is required for these actions.
Effects of Colored Light Exposure on Sleep Disturbance, Fatigue, and Functional Outcomes Following a Traumatic Brain Injury

Primary Author: Katie O'Brien
Co-Author(s): Kimberly Honn
Douglas Weeks

College: WSU Spokane
Category: Medical & Life Sciences
Campus: Spokane

Abstract:
Background: Traumatic Brain Injury (TBI) is a major cause for inpatient rehabilitation hospital admission in military and civilian populations. In the US, around 1.7 million people sustain a TBI annually. A persistent complaint in over 50% of patients with TBI is disruption of the sleep-wake cycle. Poor sleep quality inhibits formation of new neural connections, which is vital for neurorehabilitation and improvement of functional therapeutic outcomes. Therefore, restoring sleep quality may aid recovery in these patients. However, standard pharmacological treatments for disrupted sleep may be detrimental to recovery, as they have the potential to worsen neurological deficits. Alternate, non-pharmacological methods of treating sleep disruption in patients with TBI are needed. A growing body of literature suggests that colored light exposure may serve this purpose.

Method: Recruitment of patients with TBI is currently underway at a local inpatient rehabilitation facility. Patients enrolled in the study will be randomized to a blue or red light condition, with 30 minutes of daily morning colored light exposure throughout their stay. Sleep will be objectively measured through a wrist-worn activity monitor and sleep and fatigue subjectively measured through patient questionnaires. Cognitive abilities and functional independence will be measured at baseline and discharge through a series of assessments.

Hypotheses: We hypothesize that blue light has the ability to synchronize the biological clock involved in the regulation of the sleep-wake cycle. We anticipate this will help patients to obtain consolidated sleep, leading to improved sleep quality, fatigue and functional outcomes compared to red light.
Sleep Patterns during Work Days and Off Days in Hospital Employees Working 12-Hour Night Shifts

Primary Author: Samantha Riedy
Co-Author(s): Ashley English
Sandra Albritton
Josh Burton
Maddy Himmel
Patricia Morgan
Kaitlyn Kadel
Hans Van Dongen
Marian Wilson

College: WSU Spokane
Category: Medical & Life Sciences
Campus: Spokane

Abstract:
Principal Topic: Around-the-clock operations are common in hospital settings. Night workers have to work at times when their biological clock promotes sleep, and sleep at times when their biological clock promotes wakefulness. Little is known about hospital night workers’ sleep patterns during off days when not constrained by work schedules. We compared the sleep patterns of 12-hour night workers to those of 12-hour day workers during work days and off days.

Methods: 1,340 employees at two regional hospitals in the Inland Northwest responded to an online survey. Responses of 12-hour shift workers with duty start times of 07:00 AM or PM were selected, yielding 193 day worker and 134 night worker surveys. We investigated their self-reported bedtimes during work days and off days, and scores on the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS).

Results/Conclusion: Night workers reported bedtimes in the morning during work days (mean ± SD: 08:53 AM ± 46 minutes) and in the evening during off days (11:53 PM ± 152 minutes). Day workers maintained nighttime bedtimes during work days (10:00 PM ± 53 minutes) and off days (10:40 PM ± 63 minutes). Night workers reported poorer sleep on the PSQI (Z=2.89, P=0.004) and greater sleepiness on the ESS (Z=2.18, P=0.030). PSQI scores indicated clinically relevant poor sleep quality for both groups. Thus, 12-hour night shifts had a greater impact on self-reported sleep quality and sleepiness than 12-hour day shifts, and hospital night workers reverted to a nighttime sleep schedule on days off.
Characterization of neuronal receptor NPR-8 for its role in regulating C. elegans immunity

Primary Author: Durai Sellegounder
Co-Author(s): Yiyong Liu
Chung-Hsiang Yuan
Jingru Sun

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Category: Medical & Life Sciences
Campus: Spokane

Abstract:
G protein-coupled receptors (GPCRs) are membrane-bound signaling receptors with diverse functions regulating important pathways from development to immunity. Caenorhabditis elegans evolved as a powerful model for studying the effect of G-protein signaling in tissues as well as an entire organism. In C. elegans, single neuron expresses many GPCRs responding to diverse stimuli including the damage signals from non-neuronal cells. Currently, we know functions of only a few GPCRs and many others persist unexplored. Hence, the distinct mechanisms by which distant non-neuronal cells communicate with the nervous system remains still unclear. In this context, the current study characterized npr-8 encoding a GPCR related to mammalian neuropeptide Y-like receptor. Expression of npr-8 was localized to AWB, AWC, and ASJ sensory neurons. Through forward and reverse genetic approaches we identified that NPR-8 functions to 1) suppress abu genes involved in maintaining proteostasis through unfolded protein response pathway at an early stage of infection, and 2) regulate structural integrity in non-neuronal tissues by controlling the expression of collagen genes during late phase against bacterial infection. This study emphasizes that alongside the immune activation the structural components play a crucial role in enhancing resistance and improving longevity against pathogenic insults. Also, NPR-8 could be a prospective neuronal receptor involved in multiple functions of sensing and responding to structural damage during pathogenesis. Our findings identified the role of previously unexplored neuronal receptor NPR-8 to regulate C. elegans immunity by maintaining the organismal proteostasis and structural integrity.
Statistical correlations between bioclimatic indices and wine grape harvest qualities as a prediction of weather effects

Primary Author: Corydon Funk
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Bernardo Chaves
Bill Riley
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Category: Agricultural & Natural Sciences
Campus: WSU Irrigated Agriculture Research Extension Center - Prosser

Abstract:
There are few studies that have directly correlated wine grape harvest qualities and bioclimatic indices. While wine grape qualities do depend on the baseline climate of an area, the exact time periods where these qualities are affected are usually less defined.

Four bioclimatic indices were applied to four varieties and four location in Eastern Washington. These indices included the Winkler and Huglin Indices, the Cool Night Index, as well as the Branas, Bernon, and Levadoux Index. In addition, a multidimensional preference analysis (MPA) biplot was created to visualize some of the relationships between whine chemistry and climatic variability. The MPA represented some of the expected relationships, however lacked others. The varieties include Cabernet Sauvignon, Chardonnay, Merlot, and White Riesling. Our results indicate that temperature has a broad relationship with all qualities during the growing season, positive for sugar and pH levels, but negative for titratable acidity. Cool nights also were shown to have a very influential effect on grape development during the month of July, as well as the months of September and October immediately before harvest. Finally, when mildew susceptibility was highest, it seems that sugar production was shown to have a marked decrease.

In the future, more data will provide for a more in-depth analysis. Further research is still needed on applications of the MPA. The study establishes different critical time periods for the chemical development of wine grapes in Eastern Washington.
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