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Formation of a thin, porous, collagen-chitosan scaffold as part of a tissue-equivalent respiratory model

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Subject Area: Biomedical Sciences

Our goal is to develop a tissue-equivalent respiratory model (TERM) that exhibits a normal immunological response against infectious agents. The TERM will resemble alveolar sac-like structures based on a diverse group of primary human cells, grown within a 3D scaffold to allow for the correct cell physiological function and cell-to-cell interactions. As a first step in the creation of the TERM, the goal of this project was to form a porous support scaffold composed of a blend of collagen (type I) and chitosan, directly within a membrane well. In order to support cell growth and interaction, certain properties of the scaffold, including the thickness, pore size, and porosity, must fall within a set range. The scaffold was prepared via freeze-drying and subsequent crosslinking. The effect of several parameters on final scaffold properties was studied. We determined that a chitosan and collagen concentration of 40 mg/ml and 2 mg/ml, respectively, an initial solution volume of 30 µl, and freezing the solution at -20°C for one hour and then at -80°C for one hour resulted in the following desired scaffold properties: mean major and minor pore sizes, porosity and thickness of 91.6±7.6 µm and 54.3±7.1 µm, 77.5±7.2%, and 364±165 µm, respectively.

Student Participation in Bilingual Programs: Transitional Bilingual Education and Dual Language Immersion, a Comparative Study

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Subject Area: Education

There is a current drive for changing the education of English learners (EL’s) from transitional bilingual education (TBE) programs to dual language immersion (DLI) programs in the U.S. Research that establishes connections between student participation and the bilingual education program of enrollment is essential for establishing connections between bilingual instruction and student success. Using a mixed-method research approach, observations have been conducted in a fifth grade TBE classroom and in a fifth grade DLI classroom with the purpose of noting students' classroom participation in each of the two bilingual programs. The TBE program follows a subtractive model of bilingualism while the DLI program is additive. In a subtractive model of bilingual education, students loose their first language (L1) as they gain a second language (L2). An additive model of bilingual education builds the student’s L2 by fully developing the student’s L1 and using it to develop the L2. The hypothesis for this research is that the students in the DLI program display more student participation in the classroom in comparison to the students in the TBE program. Preliminary results have shown that among students with low English proficiency, the DLI program allows for student participation at much higher rates than the TBE. However, among teachers that teach in both programs, there is a misconception that both programs illicit equal participation from EL’s.

Cervical flexion does not produce additional neural tension to alter the resistance to stretch during passive ankle dorsiflexion

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The incorporation of cervical flexion sensitizing maneuvers during the slump test has been shown to increase tension on the neural structures. Previous studies have suggested that the higher neural tension
created by additional maneuvers such as cervical flexion may play a role in the resistance produced during passive stretch of the ankle. The purpose of this study was to determine if 10° of cervical flexion influenced ankle dorsiflexion range of motion (ROM), plantarflexor torque (PT), musculotendinous stiffness (MTS) and electromyography (EMG) responses during passive ankle dorsiflexion. We used a 2-way (gender x condition) factorial measure on all factors. Twenty-six recreationally active college-aged participants performed two randomly ordered passive ankle dorsiflexion at two different cervical positions: 0° and 10° of cervical flexion, on an isokinetic dynamometer at 5°/s. There were no differences between conditions for MTS, PT, ROM, or EMG responses (Tukey-Kramer, \( P > .05 \)). When PT and MTS were normalized to corrected calf-girth measures, no differences were observed between conditions (Tukey-Kramer, \( P > .05 \)). Regardless of the cervical position, males had higher PT and MTS compared to females (Tukey-Kramer, \( P < .05 \)). Therefore, cervical flexion did not produce additional tension on the neural structures to alter the resistance to stretch during passive ankle dorsiflexion.

Investigating the chemical and Isotopic evolution of Carbon in groundwater of the Okavango Delta, Botswana

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Subject Area: Physical Sciences and Technology

This paper studies the origin, the chemical and isotopic evolution of carbon in groundwater as part of the goal of understanding carbon sequestration in the Okavango Delta in Botswana. We addressed the processes involved in groundwater recycling with surface water and the source of carbon in the groundwater of the Delta. We measured dissolved inorganic carbon (DIC), major ions and the stable isotopes of carbon of DIC (\( \delta^{13}C_{\text{DIC}} \)), hydrogen (\( \delta_D \)) and oxygen (\( \delta^{18}O \)) in groundwater. We devised a conceptual model to analyze the way DIC originates and the factors that modify the DIC evolution during the groundwater recharge. The results show that DIC concentrations increase progressively from surface water to shallow groundwater (<5 m) below floodplains to deep groundwater (<50 m) inside and outside the delta. The DIC concentrations are two to ten times higher than the concentrations of DIC in surface water. The chemical evolution indicated by the major ionic proportion clearly distinguishes groundwater recharged by river water. Carbon in groundwater of the Okavango Delta is higher than in surface water; modified by water-rock interactions and trapped in aquifers which do not affect the isotopic fractionation and hence the lighter isotopic composition of the groundwater.

Effector Role of Invasion Plasmid Antigen D (IpaD) of the T3SA from Shigella flexneri

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*Shigella flexneri* is causative agent of bacillary dysentery. Virulence of this organism depends on a type III secretion system (T3SS) promoting pathogen invasion, evasion of the host immune system, and lateral spread through the intestinal epithelium. Functionality of this system relies on its type III secretion apparatus (T3SA), composed of a basal body and an extracellular needle. Invasion plasmid antigen D (IpaD) is a structural element at the tip of the needle that controls secretion of effectors to alter host cell functions. We propose IpaD has a novel effector role in addition to its structural function. To test this, we transfected a humanized *ipaD* gene into human cell lines and probed its expression and effect through immunofluorescence microscopy (IF), co-immunoprecipitation (Co-IP) and phenotypic assays. IF revealed morphological changes in cells expressing IpaD, where it co-localizes with F-actin and induces formation of lamellipodia and filopodia. Co-IP and LC-MS/MS show several cytoskeletal binding partners, including
actin and vimentin (an abundant intermediate filament protein). Sedimentation assays confirmed that a portion of IpaD is preferentially bound to F-actin. A pull-down assay with recombinant proteins confirmed binding of IpaD and vimentin. These findings support an effector role of IpaD through binding to host cytoskeletal elements.

Automated Silverware Sorting Using Vision Based Detection and Recognition Driving Pneumatically Actuated Mechanisms

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Manual Sorting of silverware pieces after being washed by a high-volume commercial dishwasher is a costly and time consuming process which can be improved by automation. This paper describes the design, construction, and testing of an automated silverware sorting process. This process employs machine vision with simple, but effective, high-volume mechanisms to detect the type and orientation of different types of silverware pieces and place them into different bins. The detection and sorting processes are independent of the material of which the pieces are made, such that the process sorts any type of piece composed of any material. One of multiple working modes places all pieces of same type and same orientation together. Other working modes are easily implementable with simple programmable logic changes. The project was conducted in two major phases:

1) Design and Construction of the Mechanism
2) Design of the Control System

The machine was tested with different silverware input sequences. The accuracy of the software in identifying the type and direction of the pieces, the accuracy of the mechanical system in sorting the pieces, and the accuracy of the overall system were found to be %100, %90.63 and %88.75 respectively.

Development and Assessment of a Sustainable Processes for Production of Precursors for Polymer Grade Lactic Acid and Phenol

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Subject Area: Physical Sciences and Technology

In today’s world traditional plastics (polymers) are ubiquitous; rather, unavoidable. Our real concern is to limit the amount of traditional plastics used so as to minimize its effect on the environment and decrease carbon footprint.

Bio-degradable polymers offer a potential solution to this problem. Not only do they overcome the aforesaid shortcomings of traditional (non-bio-degradable) polymers, but they also have the potential to be economically more beneficial.

This work involves development and assessment of sustainable processes for manufacture of precursors for two polymers. The two polymers selected are poly-lactic acid and phenol, one being bio-degradable and the other non-bio-degradable.

Production processes for both the precursors were simulated in Aspen Plus v8.2. The process parameters and design conditions were optimized in-line with Green Design principles to obtain energy intensified processes. Life Cycle Assessment studies, based on the optimized simulation data, were performed on both the processes using SimaPro.

The study provides a clear evaluation of the merits and demerits of both, bio-degradable and traditional polymers along with the challenges involved in making bio-degradable polymers economically viable.
State-dependent inducible defenses and timing of fitness maxima in organisms with complex life histories

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Subject Area: Biological Sciences

For organisms with complex life histories, metamorphosis is not a new beginning. Latent effects from the larval environment have been shown to transcend into later stages and have substantial effects on phenotype and fitness. This interconnectedness of life stages suggests that individuals must begin making choices about their adult phenotype prior to metamorphosis in order to maximize lifetime fitness. Because inducible defenses vary in cost depending on the type of defense (behavioral or morphological) and the developmental time at which they are initiated, individuals must decide when and how much to invest in anti-predator defenses. How, then, do organisms with complex life histories decide to invest in inducible defenses during their larval period in order to maximize their fitness at metamorphosis and later in life? By constructing two dynamic state variable models with terminal fitness set at metamorphosis and at the time of death in adulthood, we compared how larvae differentially invested in behavioral and morphological anti-predator defenses depending on when they maximized fitness. In addition, we explored how differing levels of predation risk, resource availability, and morphological plasticity influence larval defense decisions.

High variability of urinary iodine concentrations (UIC) and iodine in salt from rural households in Sidama zone, southern Ethiopia

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Subject Area: Biological Sciences

Iodine deficiency has been a serious public health problem in Ethiopia and a salt iodization program was launched in 2011. Salt was collected from 193 rural households. Salt iodine concentrations (SIC) was analyzed with a portable digital electronic iodine checker and re-analyzed using inductively-coupled-plasma mass spectrometry (ICP-MS). Correlation between methods was 0.69 (p<0.001). The recommended household SIC should be 15-40 ppm but in this survey varied from 0 to 163 ppm; only 21% of households had SIC >15 ppm. Urine samples were collected from 100 members of 40 randomly selected rural households. UIC was analyzed by ICP-MS. Iodine deficient were 18% which included 2% severe, 5% moderate, and 11% mild. 32% of participants were adequate while 26% were more than adequate and 24% were classified as excessive UIC. The median (25, 75 percentile) UIC was 200 (118,296) with a range from 17 to 767 µg/L. Compared to previous UIC from the area, iodine deficiency is decreasing; however UICs now suggest some excessive iodine intakes. Salt may not be homogenously or appropriately iodized, and storage and handling may not be optimal. Hence a strong monitoring strategy from production to the household level for Ethiopia’s salt iodization program is of great importance.

Anabolic growth promotants equally improve cattle performance and production efficiency independent of exposure time

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Subject Area: Whiteman Award Presentation

Black-hided heifers (n = 187; 362 kg) were used in a 122 d finishing study to determine the effects of a trenbolone acetate-estradiol implant [Revalor® 200 (200 mg of trenbolone acetate and 20 mg of estradiol)] on feedlot performance and carcass characteristics when administered at specific stages of production.
Treatments included 1) no implant (Con); 2) implantation on d 0 (Early); or 3) implantation on d 56 (Late). After d 55, ADG and G:F were improved for Early vs. non-implanted heifers ($P<0.05$). From d 56 to 122, ADG improved with implantation and was greatest for Late ($P<0.05$). While, G:F was only improved by Late ($P<0.01$). Overall, ADG and G:F were improved by implantation ($P<0.01$), and Early tended to have the greatest ADG ($P=0.10$). Similar DMI was concluded ($P=0.41$). Implantation increased HCW, dressing percentage, and REA vs. Con ($P<0.05$). Back-fat, marbling score, and REA/HCW ratio were unaffected ($P>0.18$). Treatment affected yield grade ($P=0.06$), with Late having a lower yield grade than Con or Early ($P<0.07$). Quality and yield grade distributions were unaffected by treatment ($P>0.21$). The results of this study suggest that anabolic growth promotants improve cattle performance and production efficiency without altering carcass quality, independent of stage of production.

**Use of hydrophilic interaction liquid chromatography–tandem mass spectrometry for the quantification of pyridostigmine in human plasma**

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Subject Area: Biomedical Sciences

An analytical method was developed to quantify pyridostigmine (PYR) in human plasma using a sensitive liquid chromatography–electrospray ionization–mass spectrometry assay. Plasma was processed by a solid phase extraction procedure, using weak cation exchange cartridges. Hydrophilic interaction liquid chromatography separation was performed with a Restek® Ultra PFPP (3µm, 150 X 4.6mm) column. The mobile phase consisted of 30% of 50 mM ammonium formate (pH 3.25) and 70% of 1:1 acetonitrile:methanol. Peak areas of PYR were not linear over the range of anticipated plasma concentrations, so the calibration curve was split into two, 0.25–10 ng/mL and 5–100 ng/mL for the low and a high calibration curves, respectively. The intra and inter-day accuracy was above 94% and coefficient of variation was at or below 6%. At a concentration of 0.25 ng/mL the intra and inter-day accuracy was above 89% and precision was below 7%. The average recovery of PYR from plasma was 107%, 103% and 116% at 0.3, 8 and 80 ng/mL, respectively. The average recovery for the internal standard, neostigmine was similar to that of PYR at 108%. The newly developed assay will be applied to a current population pharmacokinetic/pharmacodynamic study of PYR in congestive heart failure patients.

**Growth Effects of the Federal Indian Land Tax Credit in Oklahoma**

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Subject Area: Social Sciences

In 1993, the U.S. Congress introduced tax incentives for businesses located on Indian reservations. Though there are no Indian reservations in the state of Oklahoma, accelerated depreciation and employee tax credit incentives were extended to "lands within boundaries of the last treaties with the Oklahoma tribes," which includes about two-thirds of the state. With benefits similar to those offered to Federal Empowerment Zones, this offers a unique experimental opportunity in examining place-based policy. Between 1989 and 1999, the poverty rate in qualifying counties fell by nearly three percentage points while the poverty rate in non-qualifying counties was virtually unchanged. However, difference-in-differences estimations on over 40 years of annual county-level data fail to show positive effects on jobs, wages, or population due to the tax credit.
The relationship between maintenance energy requirements and plasma concentrations of thyroxine and triiodothyronine in gestating beef cows

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Subject Area: Whiteman Award Presentation

Spring calving, Angus cows (n = 29) were used to evaluate the effects of maintenance energy requirements (MR) on concentrations of thyroxine (T₄) and triiodothyronine (T₃) in plasma and rectal temperature (RT). Nonlactating cows (BW: 552 ± 8 kg, BCS: 4.3 ± 0.1, Age: 5 to 10 yr, 144 ± 2 d of gestation) were individually fed diets for 30 d, based on MR (Model 1, NRC 1996). Body weights were obtained twice weekly. Daily feed intake was adjusted every 2 wk until constant BW was achieved (regression analysis). Cows were infused with TRH (0.33 ug/kg BW) after BW was constant for 21 d, blood samples were collected, and T₃ and T₄ were quantified in plasma by RIA. Cows were classified by MR as low (L), moderate (M), or high (H). Triiodothyronine concentrations were greater in H and M cows (P = 0.04; 0.63 and 0.66 ng/ml, respectively) compared with L cows (0.58 ng/ml). There was a MR x time effect (P < 0.05) for T₄ in plasma and MR did not influence T₃:T₄ in plasma (P = 0.59) or RT (P = 0.46). Thyroid hormones, as influenced by MR, may be useful to determine metabolic efficiency in beef cows.

Using a partial correlation algorithm to derive gene networks underlying fatty acid composition in Angus longissimus muscle

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The fatty acid profile of beef is a complex trait that can benefit from a gene-interaction network analysis to understand the functional relationship among important loci contributing to phenotypic variation. Phenotypic measures of fatty acid profile from the triacylglycerol fraction of longissimus muscle, pedigree information, and Illumina 54k bovine SNPchip genotypes were utilized to derive an annotated gene network underlying the fatty acid composition in 2,285 Angus beef cattle. The BayesB statistical model was utilized to perform a genome wide association study to estimate effects between 54k SNP genotypes and 39 individual fatty acid phenotypes. A partial correlation algorithm was used to illustrate correlated regions of the genome with a set of 17 different 1 Mb windows explaining 90 percent of the genetic variation in the phenotype. Elements within those windows were annotated using the bovine UMD3.1 assembly. Functional annotation, KEGG pathway analysis, and gene cluster scoring was carried out using DAVID. Significant pathways implicated in fatty acid metabolism through network analysis included glycerophospholipid metabolism, fatty acid synthesis, and the adipocytokine signaling pathway. A network analysis using partial correlations and annotation of significant SNP’s can yield functional information about the genetic mechanisms underlying the fatty acid profile of beef.

RISK PROPENSITY AND IMPROVISATION IN THE ENTREPRENEURSHIP PROCESS

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Subject Area: Social Sciences

This study explores the relationship between risk propensity and improvisation in the context of the entrepreneurship process. By linking the improvisation literature and entrepreneurship literature, this research aims at explaining the influence of individual entrepreneurial characteristics in situations where planning is not enough to solve practical challenges of building a new business. Specifically, the study
introduces the concept of strategic improvisation to the entrepreneurship literature. Also, it proposes that the entrepreneur’s risk propensity will affect the levels of strategic improvisation, which in turn will impact new venture success. Within the context of the entrepreneurship context, it claims that a dynamic environment will moderate positively the relationship between entrepreneur’s strategic improvisation and new venture creation but negatively the relationship between entrepreneur’s improvisational efficiency and new venture growth.

Developmental Changes in Relations between Looking Behavior and Attention in Infants 3 to 9 Months of Age

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Subject Area: Social Sciences

Attention and information processing can be measured in infancy and are predictive of later cognitive development (Colombo, et al., 2004). The present study addressed the interactions of these constructs in infancy. At 3, 6, and 9 months of age, 117 infants were habituated to an adult face; longest look (LL) duration was measured as an indicator of encoding speed. Three groups were formed based on LL change from 3-9 months: Large decrease, Small decrease, and Increase. Attention was measured through ECG recordings and the percentage of looking time in orienting (%OR), sustained attention (%SA), and attention termination (%AT). Looks away from the stimulus were assessed in each attentional phase. %AT decreased for the Large and Small LL Decrease groups but increased non-significantly for the LL Increase group, suggesting more efficient processing for the Decrease groups. The proportion of looks away from the stimulus in OR and AT differed significantly from SA, suggesting SA indicates focused attention. These findings are consistent with Colombo (Colombo et al., 2009) and Richards (Richards & Turner, 2001) by demonstrating focused attention during SA, and a correspondence between AT and LL. Hypotheses regarding the information processing of the LL Increase group are discussed.

Rates of Suicidal Ideation Among Majority, Single-Minority, and Multiple-Minority Groups

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Identifying with multiple minority groups may lead to increased negative mental health outcomes, such as helplessness, anxiety, and depression (Clark, Anderson, Clark, & Williams, 1999). Several studies have examined specific combinations of multiple minority identities in relation to suicide risk. However, no previous study has focused on the broader concept of belonging to multiple minority groups. The current study examined suicidal ideation across three groups (majority, single-minority, and multiple-minority). It was hypothesized that 1) the group with the most minority identities would be at the highest risk of suicide; 2) the single-minority group would be at an increased risk for suicide compared to the majority group; and 3) the two minority groups would experience significantly higher rates of suicidal ideation compared to the majority group. Four hundred eleven participants completed self-report measures of demographic variables and suicidal ideation. Results indicated the overall model was not significant; however, exploratory planned comparisons were conducted. Results indicated that the majority group was significantly lower in levels of suicidal ideation when simultaneously compared to the single and multiple minority groups. Implications of this finding indicate that simply belonging to a minority group may increase suicide risk.
Effects of an Acute Resistance Training Bout on Peak Torque of the Leg Extensors
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Subject Area: Education

PURPOSE: To examine the effects of a dynamic free weight squat protocol on peak torque (PT) of the leg extensors in young men. METHODS: Seventeen resistance-trained men (mean ± SD age = 22.0 ± 2.6 years; stature = 174.2 ± 8.6 cm; mass = 86.2 ± 9.4 kg) participated in a familiarization trial followed by two squat testing sessions separated by seven days. Participants were randomly assigned to either a 5 x 16 (5 sets of 16 repetitions at 40% 1-RM) or 5 x 8 (5 sets of 8 repetitions at 80% 1-RM) squat protocol. PT of the right leg was assessed using an isokinetic dynamometer with the knee joint angle set at 60° below the horizontal plane of the right thigh. Participants performed two maximal voluntary contractions before (Pre) and at immediately post (Post), seven (recov7), fifteen (recov15) and thirty (recov30) minutes following the completion of the squat protocols. RESULTS: For PT, there was no significant difference between intensities (P = 0.095), however there was a main effect for time (P = 0.001), collapsed across intensity, PT recovered by recov15. CONCLUSIONS: These findings suggest that dynamic free weight squats may induce neuromuscular fatigue for an extended period of time.

Mirror Image: Analysis of College aged African American women and their social and economic investment in their hair and its effect on their perception of self
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Subject Area: Social Sciences

The cultural and social meaning of hair is significant for the black female identity (Banks, 2000). Hair can serve as a tool of everyday resistance that challenges mainstream notions of beauty, and can also give African American women a voice and empowerment (Weitz, 2001). The significance of hair has been demonstrated and is most evident in the high proportion of income that African American women have been noted to spend on their hair. (Delener, 1985). This study examines college-aged African American women's hair maintenance and styling choices, the factors that motivate these choices, and the relationship between hair and perceptions of self. Drawing on focus groups, interviews, and survey data, this study will examine the raced and gendered ideologies surrounding hair, the economic and social pressures African American women confront in styling their hair, and its implications for how they navigate their social world. This study is significant in that it both draws on and extends black feminist theories that focus on the experiences of black women to highlight the intersections of race, gender and class. It also has theoretical implications for previous research that suggests women can use hair as a site of agency.
Empathic Design for Fugitive Denim
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Subject Area: Social Sciences

Denim clothing has become an icon of American culture. A $50 billion business, approximately 450 million pairs of jeans are sold in the U.S. alone each year, primarily to young consumers. Environmental concerns are growing about this level of production, as it is a material- and chemical-intensive process. Dissatisfaction with the product often leads to disengagement with the item, leading to storage or early disposal. This project asks: can a more emotional relationship with denim be fostered between product and user?

The purpose of this project was to understand denim consumption and use practices among young consumers. This understanding was then used to inspire design and merchandising concepts that may be used to reengage consumers in denim products they may own but not wear.

In the current project, an international study by scholar Kate Fletcher called Craft in Use was replicated but focused on denim products. Men and women, ages 18-24 were recruited to participate in the study. Research participants were asked to share a photograph and story about a denim garment that they have changed over time and complete a one-page survey. Data were used to identify themes related to ownership and use practices. Findings are to be determined.

Who Makes a Greater Impact on Adolescent Substance Use and Depressive Symptoms: Parents or Peers?
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Subject Area: Social Sciences

The present study examines the influence of physical parental involvement, parental communication, and peer behaviors on adolescent depressive symptoms and alcohol use using the family systems theory. Linear regression was conducted using two waves of data from the National Longitudinal Study of Adolescent Health (Add Health) with a sample of 12,889 parents and adolescents in grades 7th through 12th ranging in age from 11 to 18 years. Parental involvement consisted of 8-items. Parental communication consisted of 6-items. Adolescent depressive symptoms consisted of 18 items from the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). Results indicate that parental involvement negatively and significantly predicts adolescent alcohol use until peer alcohol use; adolescent alcohol use, adolescent depressive symptoms, and demographic variables were added. Results for adolescent depressive symptoms reflect that both parental involvement and parental communication are negatively significant predictors for adolescent depressive symptoms until adolescent alcohol use (waves 1 & 2); adolescent depressive symptoms (Wave 1); peer alcohol use (Wave 1 & 2); and demographic variables were included. Only parental involvement remained significant for adolescent depressive symptoms especially for girls as well as minorities.
Determing an Optimal Media System for Multiple Cell Types within an Advanced Allergy Tissue Model

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Subject Area: Biological Sciences

Our goal is to create an advanced 3D allergy tissue model that can be used for testing and studying human allergic inflammatory responses. The tissue model includes mast cells (MCs), which are considered the central effector cells in the early events associated with allergic inflammatory responses, fibroblast cells, which support the growth and development of MCs, and endothelial cells (ECs), which are involved in leukocyte recruitment during inflammation. The goal of this study was to determine the type of media system that would contribute to the growth and function of all cell types. Fibroblast and ECs were cultured in various media systems, and the viability, proliferation, and release of key soluble factors of the cells were monitored over time. MC progenitor cells were cultured in various media systems and were characterized by measuring cell viability and proliferation, expression of the FceRI receptor, presence of formed factors, and the release of histamine after activation. The results show that the media system that best supports MC growth and development resulted in good fibroblast cell viability, but poor EC viability and proliferation. The results indicate that MCs may need to be developed within the model, prior to the addition of the ECs.

The Dark Triad and Five-Factor Model of Personality in Predicting Counterproductive Workplace Behaviors

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Subject Area: Social Sciences

Counterproductive Workplace Behaviors (CWBs) have resulted in the loss of billions of dollars per year for many industries (Jones, 1997; Zemke, 1986). One avenue of understanding why some people engage in these behaviors is personality differences, a link previously established in the literature (Elliot, 2010). The current study assessed personality and CWBs within a sample of undergraduates who were working at least 20 hours per week. Participants completed the Dirty Dozen, a measure of the Dark Triad personality constructs (Psychopathy, Narcissism, and Machiavellianism), the NEO-PI-R, a measure of the Five Factor Model of personality (Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness), and the Workplace Deviance Scale, a measure of organizational and interpersonal CWBs. It is predicted that the FFM domains will be the stronger predictors of CWBs compared to the Dark Triad constructs. Furthermore, the data will be analyzed using an SEM path analysis to assess the overall fit of the model. It is predicted that the Conscientiousness domain will be the strongest predictor for both types of CWBs. Further results and implications of the study will be discussed.

Reduction in Anxiety with Massage Therapy

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This study measured the effects of massage therapy on mental (anxiety) and physical fatigues; and salivary cortisol to gauge levels of stress (Keir, Calhoun-Eagan, Swartz, Saleh & Friedman, 2008) before and after the intervention. Thirty-eight women and 27 men undergraduate students, average age 20 years, were randomly assigned to a professional massage therapy group (48%) and a control group. Participants in both groups completed State Trait Anxiety Inventory (Spielberger, 1983), Situational Fatigue Survey (Yang &
Wu, 2005) and granted a saliva sample before massage, and provided the above measures again after the massage. We were interested in the effects of massage therapy on state anxiety, physical and mental fatigues, and cortisol concentration; and used a generic 2(Massage Therapy) X 2(Gender) X 2(Phase X S) mixed factorial design to carry out four separate analyses (ANOVA) on the dependent variables. Results suggested that a 10-minute massage did significantly lower state anxiety \( F(1, 61) = 92.11, p < .000001 \) and cortisol levels \( F(1, 50) = 6.44, p < .01 \) across the groups. However, physical and mental fatigues decreased less, not enough to warrant significance \( (p < .08) \). Study implies that stressed adults can lower their anxiety through a short massage.

**Hip-Hop's Kendrick Lamar and the Black Women's Voice: A Need for a Black Feminist Approach towards Critical Media Literacy**

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Subject Area: Social Sciences

An abundance of influential literature addresses the discourse of popular stereotypes and negative images about Black women. For decades Black women have been depicted in the media as jezebels, a hypersexual, shameless, and impudent woman who does not mind allowing men to objectify her body. Scholars Patricia Hill Collins and Tricia Rose both posit arguments about how the social construction of a Black woman’s identity contributes to larger ramifications such as sexism and low-self esteem, and how this affects Black communities. Among the findings, this paper supports the vital need for critical media literacies that gives insight into the politics and economics of mainstream hip-hop and its relationship to race, gender, American history, and Black cultural which are palpable for high-school age youth, as well as a rise in safe spaces for Black women to express their own stories.

**The Examination of Place Attachment in Camp Staff and its Association with Connectedness to Nature over the Course of a Seven Day Camp**

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Leisure  
Subject Area: Education

The purpose of this study was to expand on the limited body of knowledge that exists on place attachment (PA) to a site specific area after participating in an activity over a short period of time; and to assess if there is a relationship between increased levels of PA and preexisting levels of connectedness to nature (CN). This study examined PA in camp staff \((n=62)\), in relation to Muir Woods, and its association with CN over the course of a seven day camp. A PA Scale (Williams & Vaske, 2003) and CN Scale (Mayer & Frantz, 2004) were administered to participants before and after camp staff training in Muir Woods. A repeated measures ANOVA found a significant increase in camp staff’s PA to Muir Woods, in sub-constructs place identity \( (p < .01) \) and place dependence \( (p < .01) \), and an insignificant difference in CN \( (p < .10) \) after experiencing a weeklong activity. Spearman Rho correlations based on place dependence, place identity, and CN indicated that overall there is no relationship between PA and CN \( (r = -.123, r = -.001, r = -.071, r = .006, r = -.033, r = .011) \).
Performance of native and invasive warm-season grasses exposed to drought and elevated temperatures

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Subject Area: Biological Sciences

Exotic plant invasion is a major cause of native ecosystem loss. It has been suggested that climate change will increase the success of biological invaders, yet studies that combine these global changes are limited. Climate change may increase success of exotics as these species often possess traits that are favored by variable climates, or through impacts on native vegetation or alterations in native soil communities. Our study assesses the effect of warming and soil drought on biomass production, flowering, and soil microbial communities of native and invasive grasses. Our experiment consisted of fully factorial combinations of species (native \textit{Schizachyrium scoparium} and invasive \textit{Bothriochloa ischaemum} cespitose warm-season grasses, temperature (ambient/ambient+5C), and drought treatment combinations. Plant biomass was assessed at senescence and roots were subsampled for AM colonization. Preliminary data indicate invasives produced greater biomass regardless of treatment, compared to their paired native species. Furthermore, increased temperature and drought treatments did not affect reproductive effort of invasive grasses, compared to ambient treatments, while drought treatments reduced reproductive effort in native species. The overall goal of this research is to bridge the gap in understanding above- and belowground alterations of functionally similar native and problematic non-native grass species under current climate change scenarios.

Effects of water-level reduction and sedimentation on crayfish in the Ouachita Mountain Ecoregion

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Subject Area: Biological Sciences

Two lab experiments were conducted to evaluate the effects of ground-water reduction, and sedimentation on the survival of several Ouachita Mountain crayfish species. Substrate size (cobble or pebble) and either water-level reduction or sedimentation treatments were applied to the experiments. In the water-level reduction experiment, a control and three treatments (a 24-h water reduction of 15, 30 and 45 cm) were replicated six times each. Sedimentation and the interaction with water-level reduction were evaluated using a control (no sediment added), 45-cm water reduction (n = 16). Treatment groups had either 45\% (n = 16) or 90\% (n = 16) sedimentation. Regardless of treatment, each experiment allowed a 48 h stabilization period (water to drop and sediment to settle) before a four day evaluation of burrowing success began. Analyses revealed that substrate size was significant in determining the depth crayfish were able to burrow. Crayfish that were not able to reach the reduced water level displayed weight loss at the end of the trial. Increased sedimentation reduced the ability of the crayfish to reach the reduced water level, but change in weight was highly variable. Results from this study indicate increased sedimentation and water-table declines may impact the survival of crayfish.

\textsuperscript{1}U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit

Flight Cage Assays of Bats from Tar Creek Superfund Site

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Subject Area: Biological Sciences

This study investigates the community of bats within the heavily contaminated Tar Creek Superfund Site (TCSFS), in northeastern Oklahoma, compared to uncontaminated reference sites within Oologah Wildlife
Management Area (OWMA). *Lasiurus borealis* (Eastern Red Bat) was the most common species captured at all four sites. Flight cage assays were conducted on *L. borealis* (n = 19) to measure behavioral impacts of metal contamination. Flight videos were scored for three variables: number of strings dropped, movement between segments of the cage, and flight time (s). Means and ranges for these variables from OWMA and TCSFS, respectively, are: number of strings dropped—5.2 (0-16) and 4.1 (2-8); movement—87.4 (9-328) and 51.6 (10-141); flight time—185 (25-599) and 251 (21-503). Amount of time in flight was positively correlated with number of strings dropped ($r^2 = 0.60$) and movement ($r^2 =0.78$). Metal levels (Pb, Zn, and Cd) from liver, kidney, and hair tissues will be analyzed from each bat and correlated with results from flight cage assays.

**Growth of CdS films on structured surfaces and time dependent phase evolution**  
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Department of Chemistry  
Subject Area: Physical Sciences and Technology

There is a considerable current interest in preparing semiconducting nanostructures and thin films. In particular, semiconductor thin films have attracted a great deal of attention due to their superior optical, electrical and chemical properties compared to traditional bulk materials. As a semiconductor, CdS is an important material in areas such as lasing, transistors, flat panel displays, light emitting diodes and dye-sensitized solar cells. Due to these promising applications, several synthetic protocols have been developed to produce CdS thin films including spray pyrolysis, chemical bath deposition, physical vapor deposition and spin coating. Herein, we report the conformal and uniform CdS semiconductor film deposition on structured surfaces bearing an array of micropillars using chemical bath deposition. The crystal structure of the CdS films deposited on structured surfaces was tuned from cubic to hexagonal depending on the reaction conditions such as concentration, deposition time, and pH. The growth and the phase composition were examined by scanning electron microscopy (SEM) and X-ray diffraction (XRD).

**Development of Predictive Modeling for Estimating Fuel Use and Emission Rates using Multiple Linear Regression: A study for Excavators and Track Loaders**  
Heni Fitriani, Phil Lewis  
Oklahoma State University  
School of Civil and Environmental Engineering  
Subject Area: Physical Sciences and Technology

Air emissions have become major concerns nowadays. Construction activities play a significant role in contributing air pollutant emissions into the environment and human health problems. The purpose of this paper is to develop the predictive modeling for estimating fuel use and emission rates for specified HDD construction equipment. Portable emissions measurement systems (PEMS) was used to gather second-by-second data of fuel use and emission rates of nitrogen oxides (NOx), hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO2), and particulate matter (PM) as well as engine performance data. Predictive models were built using multiple linear regression (MLR) for each item of HDD construction equipment. Results showed that the MLR yielded a high percentage of variability based on the values of coefficient of determinations ($R^2$) in the model. Furthermore, a variable impact analysis was conducted to determine which variables have the most significant impact on fuel use and emission rates for the excavators and the track loaders.
Alternative hosts of spring dead spot-causing fungi
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Department of Entomology & Plant Pathology
Subject Area: Biological Sciences

Three fungi in the genus *Ophiobolus*, *O. herpotricha*, *O. korrae* and *O. narmari*, are the causal agents of spring dead spot of bermudagrass. These fungi can cause disease in grasses other than bermudagrass, including zoysiagrass and buffalograss. However, the extent to which *Ophiobolus* spp. can colonize and infect different hosts is unknown. To determine the potential host range of *Ophiobolus* spp. several grasses were evaluated for colonization by *O. korrae* and *O. herpotricha*. Plants were grown from seed under greenhouse conditions. Roots were washed with water, inoculated, and incubated at 17 °C. Intact and transverse sectioned roots were examined under a fluorescence microscope at 2-14 days after inoculation. The interaction with different plant species was similar for both fungal species. In creeping bentgrass, the fungi colonized the root vasculature without causing necrosis. In zoysiagrass and buffalograss, the fungi occasionally caused necrosis of the root cortex, but did not colonize the vasculature. Proso millet and blue panicgrass exhibited cortical colonization, but no visible necrosis. Broadleaf panicum and big bluestem were non-hosts, with minimum root surface colonization. *Ophiobolus* spp. appear to have a broader host range than previously recognized, though many of the plant-fungus interactions do not result in disease-associated necrosis.

Evolutionary relationship among species of the Pythium irregulare complex
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Department of Entomology & Plant Pathology
Subject Area: Biological Sciences

*Pythium irregulare* is an important plant pathogenic species complex with a broad host range. Two cryptic species, *P. irregulare* sensu stricto (s.s.) and *P. cryptoirregulare*, have been described within the complex, based on morphology, two DNA sequences, and AFLP fingerprints. However, additional groups have been tentatively identified within *P. irregulare* that require further analyses to resolve their phylogenetic status, including *P. 'vipa'*. To evaluate this issue, an international collection of 92 isolates collected from diverse host, was characterized using a multilocus approach. Phylogenetic analyses were performed on DNA sequences of the ITS including the 5.8S unit (ITS), β-tubulin (Btub), heat shock protein 90 (HSP90), and Cox I-II. DNA barcodes varied in their power to resolve closely related species within the *P. irregulare* species complex. HSP90 was the least informative barcode, providing no resolution among the species. Btub resolved *P. 'vipa'* with low support, but grouped *P. irregulare* s.s. and *P. cryptoirregulare* together. ITS and coxI-II resolved *P. irregulare* s.s., *P. cryptoirregulare* and *P. 'vipa'*. The results of this study supported the species complex status of *P. irregulare* and provided additional support for *P. cryptoirregulare* and *P. 'vipa'* as species distinct from *P. irregulare* s.s.

Modeling Liver Metabolism for Drug Development
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Subject Area: Biomedical Sciences

Controlled trials are used to test the efficiency and safety of new medicines and treatments. Due to the liver’s vital role in the metabolism of foreign substances, these cells are used to determine the toxicity of drugs. Drug development, including culturing, testing, and analyzing of toxicity, is costly in both time and

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money. The objective of this study was to develop a liver metabolism model in silico for the purpose of creating an artificial environment capable of supporting three-dimensional liver tissue cultures for use in improving the efficiency of the drug development process.

A CFD program was used to obtain concentration profiles for effective environment analysis. Initial concentrations, rate laws, scaffold porosity, fluid properties, and diffusion constants were used to determine the concentration profiles of oxygen, estrogen, and urea. Overall concentrations in the bioreactor were determined through multiple point analysis of a convection-diffusion equation at nodes throughout the three dimensional structure. Analysis of for 1mm and 2mm thick scaffolds of 0.85 and 0.25 porosities were performed to determine environmental limitations. Fluid velocity was varied to obtain sufficient nutrient distribution for cell survival. Experiments were performed using HepG-2 cells and simulation results were validated by oxygen consumption and urea production.

Derivation of a mathematical model to predict concentration gradients of monocyte chemoattractant protein – 1 (MCP-1) in a three-dimensional vascular tissue model.

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Subject Area: Biomedical Sciences

Atherosclerosis is known as an inflammatory disease, which is initiated by the accumulation of lipid substances in the subendothelial layer of major arteries, followed by adhesion and transmigration of monocytes to the extracellular-matrix (ECM). Previous in vitro studies illustrate that a monocyte chemoattractant protein-1 (MCP-1) concentration gradient has a major role in directing monocytes to the site of inflammation. A 3D in vitro vascular tissue model, consisting of human aortic endothelial cells (HAECs) grown on a collagen matrix, was used in this study to investigate MCP-1 release within a 3D environment. A mathematical model was derived to predict MCP-1 concentration at various time points and locations within the matrix. The unsteady-state transport model includes a source term to describe the MCP-1 production from the HAECs and a binding reaction term to describe the interaction of MCP-1 with the collagen matrix, both of which were determined experimentally. The mathematical model indicates that concentration gradients of both soluble and static MCP-1 are formed inside the collagen matrix, and the concentration of static MCP-1 surpasses the concentration of soluble MCP-1 after 18 hours. The model shows that the static gradient of MCP-1 is another potent factor that may mediate monocyte transendothelial migration.

Isoquinolin-1(2H)-ones and 1,6-naphthyridin-5(6H)-ones by an N-acylation-SNAr sequence

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Subject Area: Physical Sciences and Technology

A new method for the synthesis of 2, 3-dialkyl-4-carbomethoxyisoquinolin-1(2H)-ones and 6,7-dialkyl-8-cabomethoxy-1, 6-naphthyridin-5-(6H)-ones is developed, because Isoquinolin-1(2H)-one derivatives have potential biological activities and are also versatile building blocks for the synthesis of natural products. The reaction proceed through N-acylation-SnAr sequence, which involves treatment of a β-enaminoester with 2-fluoro-5-nitrobenzoyl chloride, 2-fluorobenzoyl chloride or 2-chloronicotonyl chloride followed by heating in the presence of base to afford a quantitative yield.
Evaluation of Automated Steady State and Transient State Detection Algorithms
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Subject Area: Physical Sciences and Technology

A comprehensive comparison of two statistical methods for automated identification of probable steady state and probable transient state in a noisy process signal is performed. Both approaches use R-statistic method, which is the ratio of estimated variances, for steady state identification and are independent of noise variance. The performance of both approaches is determined based on probability of occurrence of Type-I, Type-II errors and the Average run length (ARL) at points of change in the process signal. The effectiveness of both approaches with respect to computational burden, computational time, ease of understanding, storage, etc. is analyzed for step change as well as ramp change in the noisy process signal.

Increasing probability of finding global optimum and accelerating convergence of Leapfrogging optimization
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Subject Area: Physical Sciences and Technology

Leapfrogging (LF) is a recently developed direct search optimization method, potentially best-in-class that can handle surface aberrations. LF starts with a set of players (trial solutions), randomly placed in the decision variable (DV) space. The worst player (player with the worst OF value) leaps over the best player into a reflected hypervolume. The leapovers continue until all the players converge. Although, LF is potentially best-in-class, considerable opportunities exist for improving the computational efficiency and fundamental analysis of LF. The twin objectives of this work are – to develop methods for accelerating convergence of the LF algorithm, and increase the probability of finding the global optimum; achieved by modifying the leap-to window size. Expanding the window size, hastens movement of players close to the global, when they are far away from the optimum. Contracting the window size, speeds up convergence, when players are close to the optimum. LF and its improvements are tested extensively on standard optimization test functions and chemical engineering problems such as nonlinear model predictive control (NMPC) and process modeling. Demonstrating application to NMPC and process modeling opens up possibilities for using LF on large process automation problems such as real time optimization and refinery planning.

The Efficacy of the Bioactive Components of Dried Plum in Reversing Bone Loss
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Subject Area: Biological Sciences

Dried plum supplementation is effective at preventing and reversing bone loss in animal models of osteoporosis, but the bioactive components responsible for these osteoprotective effects remain in question. Much focus has been on the phenolic compounds due to their anti-inflammatory properties as well as non-digestible carbohydrates such as inulin that may lower colonic pH and increase calcium absorption. The purpose of this study was to determine whether synthetic forms of major chlorogenic isomers found in dried plum with or without inulin exert a similar beneficial effect on bone as dried plum in a model of postmenopausal osteoporosis. Twelve-week-old female C57BL/6 mice (n=50) were either sham-operated or ovariectomized (OVX) and allowed to lose bone two weeks prior to beginning an 8 wk treatment period in one of the following groups: Sham-control (Sham-CON), OVX-control (OVX-CON), OVX- 25% w/w
dried plum (OVX-DP), OVX- synthetic phenolics (OVX-Ph), or OVX- synthetic phenolics plus inulin (OVX-Ph+I). Bone densitometry and microCT data indicate bone restoration in the OVX-DP group, but only a slight improvement in cortical bone in OVX-Ph was observed. Gene expression analyses suggest alterations in inflammatory status may play a role in the ability of DP to restore bone loss due to ovarian hormone deficiency.

**Variation in the Reaction of Hard Red Winter Wheat Cultivars to Common Root Rot and Spot Blotch**

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Department of Entomology & Plant Pathology  
Subject Area: Biological Sciences

*Bipolaris sorokiniana* causes common root rot (CRR) and spot blotch (SB) of wheat that can significantly impact grain yield. Currently CRR and SB are not included in disease screening by the Oklahoma State University (OSU) Wheat Improvement Program. Hence, the objective of this study was to evaluate the reaction of hard red winter wheat (HRWW) varieties to CRR and SB using reported inoculation procedures. For SB, seedling foliage of 12 HRWW varieties was inoculated with a spore solution (concentration = 3x10⁵). After seven days, disease was assessed based on the percent infected leaf surface area. For CRR, seeds of three HRWW varieties were inoculated with a spore solution (1x10⁶) and placed into petri dishes between two layers of wet filter paper for 4 days. Total root length (mm) was determined using scanning software. Ten of the HRWW varieties showed moderate to high susceptibility to SB (avg = 42%), except Ruby Lee (16%) and Garrison (15%). CRR reduced total root length of Duster (13.4%), Endurance (34%), and Iba (43.7%). Although preliminary, these results indicate there are promising levels of resistance for SB and CRR that could be useful in breeding for resistance to SB and CRR.

**Female Protagonists and Themes of Social and Political Criticisms in Contemporary American Dystopian Literature**

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Subject Area: Humanities

This study defines dystopia versus utopia and explains the history of dystopian literature while taking an in-depth look at how women authors craft dystopian works of fiction with the focus on a female protagonist. Social and political criticisms from each of the following texts are addressed: Margaret Atwood’s *The Handmaid’s Tale*, Octavia Butler’s *Parable of the Sower* and *Parable of the Talents*, and Suzanne Collin’s *The Hunger Games*. Various media outlets, such as televised news, newspapers, and film, are utilized throughout the project to prove a direct correlation between the fiction presented in the novels and the social and political events of America at the time each novel was written, striving to prove that dystopian fiction is relevant to the world today as a valid, although unusual, source of information concerning world events that affect Americans, specifically women.
Does Plant Breeding Alter Invasibility of Exotic Forage Grasses?

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Subject Area: Biological Sciences

Exotic grasses have undergone extensive plant breeding procedures and have been planted throughout the US, primarily for livestock forage production and soil erosion control. Many of these species have escaped their intended boundaries and become invasive. To determine whether plant breeding procedures developed the invasiveness of these exotic grasses relative to their wildtype, we assessed the competitiveness of the "wildtype" Old World Bluestem (*Bothriochloa ischaemum*; OWB) from the Czech Republic, relative to our invasive OWB cultivar in the US, and two native grass species. To assess interspecific and intraspecific competition between species a substitutive design greenhouse competition experiment was conducted. Sixty pots filled with native soil were planted with all pair-wise combinations of species (total of ten species combinations; six replications). Measurements of above and belowground biomass, arbuscular mycorrhizal fungi (AMF) abundance, and AMF root colonization were quantified after fourteen weeks. Preliminary results indicate no differences in biomass production between the wildtype and US cultivar. Contrary to our hypothesis our results suggest that the invasive characteristics of the US OWB cultivar are also present in the wildtype.

Calcium induced two component regulatory system in *Pseudomonas aeruginosa*

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Subject Area: Biological Sciences

*Pseudomonas aeruginosa*, opportunistic human pathogen, is known to cause severe infections associated with cystic fibrosis, endocarditis, wounds, and implants. Earlier, we showed that *P. aeruginosa* responds to calcium (Ca$^{2+}$) by enhancing virulence, and transiently increasing its intracellular Ca$^{2+}$. However, the systems responsible for sensing environmental Ca$^{2+}$ in *P. aeruginosa* are not known. Many bacteria sense and respond to changes in the environment by using two component regulatory systems. Here, we aimed to identify a two component system in PAO1 that responds to Ca$^{2+}$ and study its role in the bacterial physiology and virulence. Microarray analysis of PAO1 cells grown at 0mM and 10mM Ca$^{2+}$ identified PA2656-2657 as the only two component system that was highly induced by Ca$^{2+}$. It also showed that PA2657 transcriptional regulator controls Ca$^{2+}$ mediated expression of two periplasmic proteins PA0320 and PA0327. The role of PA2657, PA0320, and PA0327 in maintaining cellular Ca$^{2+}$ homeostasis was studied using Ca$^{2+}$-binding luminescence protein aequorin. All three proteins contribute to maintenance of Ca$^{2+}$ homeostasis in cells grown at no added Ca$^{2+}$. These findings suggest that PA2656-2657 system plays role in sensing Ca$^{2+}$ and regulating PAO1 response to it, and thus likely belongs to a signaling network mediating Ca$^{2+}$ induced virulence.

Measuring Social Interaction Potential in Tulsa and Oklahoma City

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Subject Area: Social Sciences

Accessibility and transportation are topics that became popular during the quantitative revolution because they could easily be modeled mathematically. Recently, time geography has researchers rethinking traditional approaches to studies in transportation, accessibility, and mobility. The subdiscipline time geography involves using three different constraints to explain how people organize their activities on a day-to-day basis. (1) Capability constraints involve biological and financial constraints (2) coupling constraints
involve the locations a person is required to travel to such as work and home, (3) and authority constraints refer to those imposed on a person from outside forces. These three constraints allow geographers to explore social exclusion, social interaction, and urban form from a new perspective.

Using time geography as a theoretical framework, I evaluate the social interaction potential (SIP) of Tulsa and Oklahoma City through a comparative case study. I calculate the time it takes to drive from different work locations, to different activity locations, and ultimately end at a home location. I ask several main questions in my research: (1) Which city has greater SIP? (2) Are clear spatial patterns of SIP are present within the two cities? (3) How well does income correlate with SIP?

**DSM-5 Alternative Model for Personality Disorders and Maladaptive Variants of the Five-Factor Model**

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Subject Area: Social Sciences  

The recently updated Diagnostic and Statistical Manual (DSM-5; American Psychiatric Association, 2013) retained the DSM-IV-TR personality disorders and includes an alternative categorical-dimensional model in the Emerging Models and Measures section.

Attempts have been made to transition away from the current categorical model toward a dimensional model, and research is needed prior to implementation of a new model. A self-report measure, Personality Inventory for DSM-5 (PID-5), was developed to assess dimensional traits of the alternative model (Krueger et al., 2012). This model is similar to a well-validated dimensional model of general personality, the Five-Factor Model (FFM; Costa & McCrae, 1992; Thomas et al., 2012). There are measures that assess maladaptive variants of the FFM for the current 10 personality disorders (e.g., Five Factor Borderline Inventory, Mullins-Sweatt et al., 2006). The current study examines the relationship between PID-5 traits and FFM maladaptive personality variants. Pearson’s r correlational analyses were used to compare PID-5 scales with the corresponding FFM maladaptive trait scale (e.g., PID-5 Anxiousness & FFBI Anxious Uncertainty). Results included significant, positive correlations for a majority of the predicted relationships.

**Isotopic and Chemical Variability of CaCO₃ Microfacies in Early to Middle Triassic Limestones**

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Scholar Symposium Participant  
Subject Area: Physical Sciences and Technology  

The chemical composition and isotopic signature of calcium carbonate (CaCO₃) microfacies reflect the fluids from which they precipitated (e.g., seawater and early or deep burial diagenetic fluids). Consequently, the chemistry of each microfacies provides a fingerprint of the fluids from which it formed. However, the influence of these different microfacies on the bulk composition of CaCO₃ is not well understood. In this study, we sampled micrites, fossil grains, and diagenetic cements from two limestone rock samples that contain a variety of common depositional microenvironments. One sample is a Tubiphytes reef boundstone of Middle Triassic age containing multiple generations of CaCO₃ cement. The other sample is a thrombolitic microbialite of Early Triassic age containing micritic sediment, microbial framework, and aragonite crystal fans. We analyzed CaCO₃ powders from each microfacies in each sample for major and minor elements, including redox-sensitive trace metals, as well as δ¹³C and δ¹⁸O ratios, using an ICP-OES, ICP-MS, and IRMS. Preliminary results show that diagenesis influences microfacies differently for different chemical parameters. An improved understanding of the geochemical differences among microfacies and their source
fluids will aid the interpretation of bulk rock geochemical records for samples in which analysis of individual carbonate phases is not feasible.

**An Examination of the Relationship between Electromechanical Delay and Muscle Quality**

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Health and Human Performance  
Subject Area: Education

Electromechanical delay (EMD) is defined as the time delay between the onset of electrical activity at the muscle and the generation of force. Muscle quality (MQ) is a muscle's maximal strength relative to its cross-sectional area (CSA). **PURPOSE:** The purpose of this study was to examine the relationship between EMD and MQ in college-aged males. **METHODS:** Maximal isometric torque and EMD of the knee extensors were assessed in seventeen resistance-trained men (mean age = 22.7 years). Subjects performed three, 3 s isometric maximal voluntary contractions (MVCs) of the knee extensors. Electrical activity of the vastus lateralis muscle was measured during each contraction. Anthropometric measures consisting of skinfold thickness and circumference of the thigh were used to estimate CSA through a regression equation (Housh et al., 1995). MQ was calculated as PT/CSA. **RESULTS:** A Pearson correlation coefficient demonstrated a weak, and non-significant relationship ($r = -.245$) between EMD and MQ ($p = .344$). The removal of CSA produced a stronger ($r = -.406$) but still non-significant ($p = .106$) relationship between EMD and PT. **CONCLUSION:** These data suggest that there is little to no correlation between EMD and MQ, while the relationship between EMD and PT is only moderate.

**“What About Your Friends?”: Social Support Moderates Perceived Burdensomeness and Suicidal Ideation Relationship**

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Subject Area: Social Sciences

Suicide is currently the third leading cause of death in American young adults (Centers for Disease Control & Prevention, 2011). Research has demonstrated that perceived burdensomeness (perceptions of being a burden on others) is a robust predictor of suicidal ideation in young adults (Van Orden, Lynam, Hollar, & Joiner, 2006). Social support from family and friends has been identified as a protective factor against suicidal ideation (Peltzer, 2008). The current study hypothesized that social support from friends would moderate the relationship between perceived burdensomeness and suicidal ideation, while controlling for symptoms of depression and sex. It was also hypothesized that social support from family would moderate the same relationship. Moderation analyses revealed that social support from friends significantly moderated the relationship between perceived burdensomeness and suicidal ideation, $\beta = -.45$, $t(365) = -2.16$, $p = .031$. However, social support from family was not a significant moderator of the relationship. Results of this study imply that young adults who perceive they are a burden on others, but endorse high levels of support from friends may be at lower risk for suicidal behaviors.
The response of small mammal communities to low basal area management practices in southeastern Oklahoma

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Subject Area: Biological Sciences

Small mammals exercise key ecosystem functions, such as seed dispersal and germination, mycorrhizal fungal spore dispersal, and soil aeration. Therefore, it is important to assess the effect of land management practices on their communities. We determined how low basal area (BA) practices influenced small mammal communities in oak-pine tallgrass prairies in southeastern Oklahoma. We compared the small mammal communities at four sites where frequent prescribed fires followed thinning (low BA), with those at four sites that have not been thinned within the past 20 years and where prescribed fires were less frequent (high BA). We captured 117 individuals from 10 small mammal species during 3205.5 adjusted trap nights. Small mammal community composition differed between low and high BA. 22.41% of the variation could be significantly explained by thinning when partialling out the effects of fire frequency. Moreover, the overall small mammal capture frequency and the capture frequency of the most common species, white-footed mouse (*Peromyscus leucopus*), were significantly higher in low BA than in high BA. To retain a diversity of small mammal communities and maximize the number of small mammal species present, land managers in southeastern Oklahoma should maintain habitat patches with low and high BA.

Removal of Copper from Aqueous Solution using Spent Fluidized Cracking Catalyst (FCC)

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Subject Area: Physical Sciences and Technology

Deposition of heavy metals such as nickel and vanadium, in small amounts, primarily causes deactivation of the Fluidized Cracking Catalyst (FCC). Deactivated FCC – a solid refinery waste is sent to the landfill and other low value uses. Spent FCC can be utilized for removing heavy metals from wastewater. In this study, spent FCC has been tested without pretreatment “as received” for removal of copper from aqueous solution. Batch adsorption experiments define the capacity of copper on spent FCC in acidic pH range. The maximum capacity is ~ 4.7 mg/g and occurs at pH near 6. The capacity increases with pH until near 6 and then decreases. Ion-exchange seems to be a dominating mechanism for metal uptake; though other mechanisms such as metal complexation, pore filling cannot be neglected.

A Novel Approach to Process Design Optimization and Production of Biodiesel from Algae

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Subject Area: Physical Sciences and Technology

Moving towards sustainability, various technologies are being developed to produce oils and other bioproducts from renewable resources. Microalgae is a promising source of renewable biofuels, but engineering problems need to be addressed in order to make the process commercially viable. Algae is preferred over other sources because of its high lipid content. Model-based optimization of the growth time and the depth of the pond is done to make the process more profitable. Algal biomass is processed into algal oil in various ways. Algal oil is then converted into many useful products. This work explores the conversion of microalgal oil to biodiesel by the two-stage alkali catalyzed transesterification reaction in the
Scaffolds with patterned hydrogels for tissue engineering

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Subject Area: Physical Sciences and Technology

Hydrogels can mimic the biological environment due to high retention of water and biocompatibility. Hence hydrogels are considered as very important materials for tissue engineering applications such as scaffolds which provide support for the newly growing tissues. Recently it has been shown that the factors such as surface topography and stiffness play a key role in determining the fate of stem cells grown on a scaffold. This study was focused towards patterning the surface of hydrogels as it can help to develop a better scaffolding material with improved properties. The copolymer of 2-hydroxyethylmethacrylate and 2-dimethylaminoethylmethacrylate, (Poly(HEMA-co-DMAEMA)) was prepared and the surface was patterned with micro pillars using micromolding technique where a mold is used to transfer a pattern. Transferring of pillars on to the hydrogel was challenging and it was found to be highly dependent on swelling of the hydrogel which occurs due to the absorption of water. Effect of surface modification and the swelling agent towards transferring of pillars to the hydrogel and swelling of hydrogel in different solutions were also studied.

Ground states of sodium spinor Bose-Einstein condensates

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Subject Area: Physical Sciences and Technology

We have experimentally studied dynamics of a sodium spinor Bose-Einstein condensate (BEC) in microwave dressing fields. We have found that spin oscillations damped out and the antiferromagnetic BEC system reached its mean-field ground states after being held in an optical trap for 8 second at both negative and positive values of the net quadratic Zeeman energy \( q_{\text{net}} \). When the total magnetization \( m \) equals to zero, we have observed a quantum phase transition from a three-component BEC at \( q_{\text{net}} < 0 \) to a longitudinal polar state at \( q_{\text{net}} > 0 \) in the ground states. On the other hand, when \( m \neq 0 \) and \( q_{\text{net}} \) is positive, the ground states undergo another quantum phase transition from a two-component BEC to a three-component BEC. These observations have led to a better understanding of the mean-field phase diagram for spinor gases.

Antimicrobial effect of silver (I) cyanoximate - coated surfaces on biofilm formation of human pathogens

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Subject Area: Biological Sciences

Bacterial biofilm formation is the leading cause of post surgical medical implant infections. Incorporation of silver compounds into implants is a promising method in reducing infection rate, while exhibiting low toxicity towards cells and tissues. Eight novel silver(I) organic complexes were synthesized. They are water insoluble, and UV/visible light resistant, which potentiates their use as adjuncts or alternative implant materials. To determine whether the compounds exhibit antimicrobial qualities, we tested their effect on biofilm formation of three human pathogens: *Pseudomonas aeruginosa*, *Staphylococcus aureus* and
Streptococcus mutans. Quantitative 96-well plate biofilm assays showed that P. aeruginosa biofilm growth was inhibited completely in the presence of 1% to 5% of AgACO, AgCCO, AgECO, AgPiCO, and AgBCO. Similarly, S. aureus was not able to form biofilms at 0.5% to 5% of the compounds, and S. mutans showed complete inhibition of biofilm growth at 0.5% of AgMCO and AgPiPCO. Thus, several newly synthesized silver(I) complexes prevent biofilm development of multiple human pathogens, and therefore present a great potential in further applications as non-antibiotic antimicrobials.

Oral Histories of First-Generation Oklahoma Graduates

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SES/Higher Ed
Subject Area: Education

Higher education has always been a part of Oklahoma’s public policy; however, certain student populations struggle to matriculate through to graduation. One such population is first-generation college students. In order to understand the experiences of successful first-generation students, oral histories of first-generation students who graduated were collected and explored. These participants represent various times in Oklahoma’s history. This study examines the experiences of first generation Oklahoma college graduates within their unique social and cultural contexts in order to reveal trends, differences and similarities.

Lyrics, Laments & Literature: Don McLean and the Classics

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Subject Area: Humanities

Within a traditional collection of literature, classic examples of laments include passages from the Bible and portions of ancient poems. Literary mechanisms in these poems can be found throughout literature and, more recently, in popular songs of the 20th century. Singer-songwriter Don McLean claims an undeniable place in the arena of popular music with a substantial portfolio of evocative tunes. The purpose of this paper is to examine McLean’s lyrics and determine how the words of two specific songs display elements consistent with laments of classical literature. Among his most-recognized compositions, these songs are known and sung around the world and frequently referenced in popular culture. By delving into cultural contexts, examining syntax, and highlighting astute use of language, I hope to demonstrate that, though generally marginalized and overlooked, these popular songs have a literary foothold in American culture and serve as a powerful link between traditional literature and modern sensibilities.

Role of RND transport systems in Calcium-induced antibiotic resistance in Pseudomonas aeruginosa

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Subject Area: Biomedical Sciences

Pseudomonas aeruginosa is a facultative pathogen infecting lung airways in cystic fibrosis patients, causing infective endocarditis and severe device-related infections. It is highly resistant to antimicrobials available for clinical treatments and therefore represents a great challenge in medicine. Earlier we showed that Ca$^{2+}$ triggers biofilm formation and production of virulence factors in P. aeruginosa. Here we study the effect of Ca$^{2+}$ on antibiotic resistance in P. aeruginosa PAO1. We determined that Ca$^{2+}$ increases the minimal inhibitory concentrations (MICs) of tobramycin and polymixin B at least tenfold. LC-MS/MS analyses of
membrane and extracellular proteins identified four Ca\(^{2+}\)-induced multidrug efflux pumps of resistance-nodulation-cell division (RND) superfamily: MexAB-OprM, MexGHI-OpmD, TriABC-OpmD and MuxABC-OpmB. To study the role of 12 RND systems identified in PAO1 in Ca\(^{2+}\)-induced antibiotic resistance, we assessed the effect of Ca\(^{2+}\) on gene expression, growth, MICs, and virulence of the corresponding transposon mutants. MexB(PA0426), MuxC(PA2526), MexE(PA2493), MexJ(PA3677) and CzcB(PA2521) play role in tobramycin resistance, whereas MexB(PA0426), MexJ(PA3677), MexI (PA4207) and TriA (PA0156) play role in plant infectivity at high Ca\(^{2+}\). No significant change in the RND genes expression was observed in response to Ca\(^{2+}\). This suggests involvement of these RND systems in Ca\(^{2+}\)-dependent adaptations in *P. aeruginosa*.

**A Study of Spray Nozzles Using Phase Doppler Interferometry (PDI)**

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Subject Area: Physical Sciences and Technology

Spray nozzles are commonly applied in the refining, petrochemical, and chemical industries with a variety of systems. The design and optimization of nozzles for such applications is highly dependent on experimental data. Although experimental data is available for air-water systems, nozzle performance using non-air-water systems, particularly low surface tension liquids, are not widely reported. In this study, a comprehensive analysis of hollow and full cone spray nozzles focuses on using PDI to characterize water, aqueous amines, and hydrocarbon systems. An 8” I.D. column is used to study the effects of nozzle type, orientation, and pressure drop on droplet size distributions, droplet velocity distributions, and surface area for mass transfer. The use of PDI inside and outside the spray regime is investigated to determine entrainment rates, with and without a counter flowing gas.

**Economic activity analysis: A tool for determining the value of 4-H**

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Subject Area: Education

The scarcity of public funding for youth development programs is a major concern among educators. Organizations that once complimented each other in finding ways to engage youth, are now in competition with one another for limited resources. Harder and Hodges (2011) suggest that unlike organizations that produce tangible products, youth development programs make less readily quantifiable impacts. The great recession of 2008 put pressure on youth programs, yet also provided an opportunity for those within the field to acknowledge the lack in economic evidence needed to justify programing. Oklahoma 4-H Youth Development’s Shooting Sports Project was one group lacking documentation of its economic worth. In order to describe the value of the project, an economic activity analysis utilizing primary data and an IMPLAN model was conducted.
Processes for Achieving Advocacy Success: A Retrospective Case Study of The Okaloosa AIDS Support and Informational Services (OASIS) Positive Living Conference.

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Subject Area: Education

The AIDS United Southern REACH initiative provides grant funding to organizations such as The Okaloosa AIDS Support and Informational Services (OASIS) in the Southern United States in an effort to build community capacity for social and political change affecting people living with HIV/AIDS (PLWHA). As a part of their grantee work, OASIS hosts the annual Positive Living conference and the Activate U Advocacy Academy. The purpose of the conference is to equip and uplift PLWHA by providing evidence-based information and a place of emotional transparency. The Activate U Advocacy Academy provides skill-building workshops in political advocacy.

The 2012-13 evaluation of AIDS United grantees was designed as a retrospective case study. The purpose of the evaluation was to examine and describe methods utilized by grantees to effect policy and advocacy change. Findings indicate that strengthening PLWHA through education can lead to advocacy and policy success. For example, the federal poverty level eligibility standard for HIV/AIDS assistance programs was not lowered by Florida legislators due to grassroots mobilization by Positive Living conference attendees. Equipping PLWHA to advocate for themselves beyond the educational events is a realistic approach used by OASIS that has been effective in impacting policy.

Beyond high quality habitat corridors: Evaluating the effectiveness of realistic alternatives

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Subject Area: Biological Sciences

Habitat fragmentation results in isolated patches of habitat and reduces the movement of organisms between patches. Increasing connectivity can mitigate the negative effects of fragmentation, and is often implemented through the use of habitat corridors. Typically corridors are created of the same “high quality” habitat as the isolated patches they connect; however, this may not always be feasible. I used isopods as a model system to assess the efficacy of using lower quality habitat corridors to increase movement. I used food and water to represent “high quality” habitat for all patches and “high quality” corridors, and no supplemental food and water for the “low quality” corridors. I placed marked isopods under each release patch and recorded the locations of isopods for eight days. Isopod numbers did not significantly differ between low and high quality habitat corridors, suggesting that isopods used low quality corridors at the same rate as high quality corridors, and low quality corridors may serve as a successful conservation tool in some systems. However, extreme climate conditions (e.g. high temperatures, excessive rainfall), may have influenced my results, and additional research is needed to evaluate the effectiveness of low quality corridors for increasing connectivity among isolated patches.
The Role of Personality in Consumer Acceptance of Sustainable Fashion Product Service Systems: A Comparative Study in Finland and the United States

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Subject Area: Social Sciences

Programs for dematerializing consumption in clothing industry are becoming an important aspect of sustainable consumption. A concept called Product-Service Systems (PSS) has been introduced, which attempt to transition consumption from tangible products to intangible services, utilizing the ideas of renting, redesigning or upgrading to reduce reliance on natural resources while at the same time increasing product quality and longevity. However, PSS have not proven their viability in the clothing market. The study is to explore consumer profile pertain to personality evident in sustainable clothing consumption, and how these traits are linked to acceptance of PSS. Eight hypothetical PSS scenarios were developed, including concepts like redesign and repair, take-back, customized and participatory design, make-it-yourself, consultancy, rent/lease, clothing swaps, and selling a fashion result. Seventeen focus groups were conducted in Finland and the United States, involving 101 female participants who were required to discuss their opinions on each scenario. Four personality traits were identified to be related to consumer willingness to accept PSS in both countries. They are innovativeness, use innovativeness, materialism and fashion leadership. The study revealed that women across a wide age range and with dissimilar types of personality in two countries responded differently to different fashion-related PSS models.

Barriers to Adult Student Success at a Reach Higher Program

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Subject Area: Education

This study explores the perceptions and preferences of adult learners in a south central state to identify the barriers they are facing in getting a college degree. Conducted over a seven-month period among adults who expressed interest in the Reach Higher program but have not completed a college program, the study includes analysis of their employment status, enrollment status, degree completion, reasons for not completing degrees, reasons for choosing an institution to enroll, and their perception of a degree program. The quantitative study utilized an online survey sent to them via their contact information on record at the Regents’ Office. Results indicated that adult learners wanted to complete a degree for career advancement, salary increase, and personal fulfillment; they chose not to complete a degree because of their full-time employment, family commitments, and lack of funds; and the main reason why they chose an institution to enroll is its location. The study builds on Braxton’s economic theory and finds that the characteristics of the individual adults influenced not only their perception of the benefits of getting a college degree but also the steps that some of them utilized to return the investment in college. These distinctions produced noteworthy implications for policy change.

Impulsivity and nonsuicidal self-injury: Examining the role of affect manipulation

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Subject Area: Social Sciences

Impulsivity is a clinically relevant personality trait. However, impulsivity assessment is complicated by the fact that it may be a multi-faceted construct. Further, poor correspondence has been found between self-report and behavioral impulsivity measures. Notably, this finding extends to individuals with a history of nonsuicidal self-injury (NSSI), a population that is anecdotally described as impulsive. Research has shown
that self-injurers self-report high impulsivity, primarily negative urgency (i.e., acting rashly when in a negative mood state). Accordingly, negative affect may be a necessary prerequisite for increased impulsivity on behavioral tasks in an NSSI population. However, researchers have yet to examine this hypothesis within an NSSI sample. In the present study, undergraduates with and without an NSSI history participated in a laboratory-based study that sought to replicate self-report differences between self-injurers and non-self-injurers, and determine if self-injurers demonstrate behavioral impulsivity when experiencing negative affect. Individuals completed self-report measures of impulsivity. Behavioral impulsivity measures were administered before and after a mood induction task (negative or neutral) to determine if affect impacted behavioral impulsivity task performance. Most expected self-report differences were found between self-injurers and non-self-injurers. Individuals with an NSSI history did not display impulsivity on behavioral measures, even under conditions of negative affect.

**Effect of Fungal Combining Liquid Hot Water Pretreatment on the Degradation of Switchgrass**

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Subject Area: Biological Sciences

Switchgrass is a kind of good biomass feedstocks to produce fuel ethanol substituting petroleum resources which is using up. Efficient pretreatment of switchgrass is one of the most important steps for ethanol scale up production. *Pleurotus Ostreatus* is the fungus to produce mushroom, which has been shown a good effect of degrading the complex structure of switchgrass and decreasing content of the inhibitory by-products for next step hydrolysis. In this work, first we investigated the compositional changes under fungal pretreatment of different periods (30 days, 60 days, 90 days, 180 days, 210 days). Then liquid hot water pretreatment with three different conditions (180 °C/20min, 190 °C/15min, 200 °C/10min) were applied and the contents of structural carbohydrates and inhibitory by-products were analyzed. Composition analysis showed that fungal treatment significantly helped release more sugar and decrease inhibitory by-products content under less severe liquid hot water pretreatment condition.

**Effects of including Rumensin® and Optimase® in a protein supplement on in situ ruminal degradation of low quality prairie hay**

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Department of Animal Science

Subject Area: Whiteman Award Presentation

Seven ruminally cannulated crossbred steers (BW = 758 ± 62 kg) were used in a randomized crossover design (4 periods each 16 d) to evaluate change in rumen VFA concentration and pH over a 24-h time period and in situ N, NDF, and DM degradation characteristics of low quality prairie hay. Steers were allowed access to prairie hay (4.8% CP and 52% TDN) and provided one of four dietary supplements (38% CP) daily. Treatments included: 1) Cottonseed meal/wheat midd (CONTROL), 2) Control plus soybean hulls, corn, and 34 g steer⁻¹ d⁻¹ slow-release urea with a fibrolytic feed enzyme (Optimase®; Alltech, Inc., Nicholasville, KY) (SRFE), 3) CONTROL plus soybean hulls, corn, and 0.25 g steer⁻¹ d⁻¹ Rumensin (Rumensin 90®; Elanco Animal Health; Greenfield, IN) (RUMENSIN), and 4) UREA plus RUMENSIN (COMBO). Duplicate forage samples were incubated for 0, 2, 4, 6, 8, 12, 16, 24, 36, 48, 72, and 96 h. On d 15, rumen fluid samples were collected every 2.5 h. Dry matter intake was not affected by treatment (P = 0.13). Steers consuming RUMENSIN has lower (P < 0.01) pH than cows consuming all other treatments. RUMENSIN fed steers had a lower (P = 0.01) % acetate than steers fed all other treatments.
Crime: A Study of Contributive Factors

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Scholar Symposium Participant
Subject Area: Social Sciences

There are many factors that are proposed to contributing to violent crime. There has been significant research on possible causes and contributive factors of crime. This study seeks to understand exactly what factors may or may not contribute significantly to violent crime. This study will look at these relationships at a nationwide level with Metropolitan Statistical Areas. After examining the results, the researcher hopes to achieve a better understanding of these factors. With this understanding comes the potential to better shape policies to curb and deter crime.

Pseudomonas aeruginosa carbonic anhydrases and their role in calcification and virulence

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Subject Area: Biological Sciences

Calcium (Ca$^{2+}$), a key signaling molecule in eukaryotes, is part of a hyperinflammatory host response to bacterial infections. Abnormalities in Ca$^{2+}$ homeostasis may lead to soft tissue calcification commonly associated with human diseases. However the origin and mechanisms of such calcification remain unknown. Pseudomonas aeruginosa is an opportunistic human pathogen and leading cause of life threatening biofilm infections. Our hypothesis is that P. aeruginosa PAO1 carbonic anhydrases (CA) may be involved in CaCO$_3$ deposition. Quantitative analysis of Ca$^{2+}$ showed that PAO1 precipitates 0.12 and 0.35 mM Ca$^{2+}$ when grown at 1 and 5 mM Ca$^{2+}$, respectively. Transmission electron microscopy followed by X-Ray elemental analysis confirmed the formation of 0.08-0.1 µm deposits containing Ca$^{2+}$ during PAO1 growth at 10mM Ca$^{2+}$. Three identified β-class CAs PA0102, PA2053, and PA4676 were purified and confirmed to have specific CA activity. Quantitative analysis of deposited Ca$^{2+}$ showed that the lack of PA2053 and PA4676 reduced Ca$^{2+}$ precipitation by 3 and 1.8 fold, respectively, when grown at 5 mM Ca$^{2+}$. However, the lack of CAs did no alter biofilm formation in P. aeruginosa. Overall, the results suggest that β-CAs contribute to calcification and therefore may enhance P. aeruginosa virulence.

SiO$_2$ Inverse opal films as potential photonic band gap materials

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Subject Area: Physical Sciences and Technology

Certain types of materials having a periodic microstructure can modulate light. These types of materials are known as photonic materials and have potential applications in high-energy lasers, optical communications, sensors and catalysis. Recent studies show that SiO2 inverse opal films can be used as photonic band gap materials due to their uniform porous structures with high and low dielectric regions that allow the manipulation of light in the visible region. In this study, inverse opal films were fabricated using poly(methyl methacrylate) (PMMA) as the sacrificial colloidal template. Voids in between the PMMA colloids were filled with TEOS (tetraethylorthosilicate) and the colloidal template was removed by calcination, which resulted a porous SiO2 network. The formation of cracks produced during the formation of the porous SiO2 network, however, reduces the quality of the films and limits the generation of a complete photonic band gap. We are exploring the co-assembly method in which both colloids and TEOS are deposited in one step over the infiltration of TEOS into to close packed PMMA colloidal template due to
the improved uniformity in the resulting films. We have also fabricated films having variations of pore sizes
in order to fine-tune the photonic band gap.

Winners and Losers Reproduce Differently in an Invasive Lizard
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Subject Area: Biological Sciences
Territorial species must show an appropriate level of aggression in contests, as overly cautious individuals
lose resources and overly bold individuals risk injury and waste energy. Some species are influenced by the
outcomes of past fights independent of other factors. Most studies of this influence (“experience effects”) focus
on males; we used female lizards to measure the reproductive consequences of winning and losing
experience for individuals who allocate energy to reproduction at the expense of self-maintenance. Female
Anolis sagrei gained winning or losing experience through resident/intruder trials during the breeding
season. Females with winning experience produced heavier hatchlings than females with losing experience
due to differential maternal investment in offspring. Experience did not affect the number of eggs laid or the
offspring’s sex ratio. Winning females also lost weight likely due to increased investment in reproductive
output. Results suggest that winning experience prompts greater investment in offspring relative to lizards
with losing experience in this species, possibly due to correlations between dominant status and access to
resources. This invasive species appears to adjust reproductive output differently in response to stress
compared to the native Anolis species, which could contribute to the displacement of the native species.

Nonlinear Heat Exchanger Modeling Using Leapfrogging
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Subject Area: Physical Sciences and Technology
Leapfrogging is a recently developed multiplayer optimization technique based on a set of heuristic rules.
Through fundamental analysis, an initial surface exploration is added to the original Leapfrogging
optimization technique to improve its efficiency. In order to establish the applicability of Leapfrogging and
its improvement on process systems engineering applications, this work focuses on implementation of both
original and modified Leapfrogging to model a pilot scale Shell and Tube Heat Exchanger (HX 001)
process, which is nonlinear. The HX 001 is a four-pass Shell and Tube Heat Exchanger with steam on the
hot side and water on the cold side. Steam is used to increase the temperature of the water on the cold side.
For this study, the outlet temperature of the cold side fluid was considered as the control variable (CV). The
flow rate of the steam on the hot side was considered as the manipulated variable (MV). This CV-MV
relation was modeled and both original and modified Leapfrogging optimization technique is used to find
the model parameters that best fit the experimental data. Experimental data using a skyline function is
generated for modeling purpose in the Unit Operations Lab, OSU-Stillwater.
Formulation and characterization of an ultrasound imageable Low Temperature Sensitive Liposome for Image Guided Drug Delivery

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Subject Area: Biomedical Sciences

Current nanocarrier-based solid tumor chemotherapy is limited by low intratumoral drug release rates, heterogeneous distribution, and lack of real-time control over drug delivery. To address these critical limitations, the objective of this study was to develop a heat-activated liposome encapsulating an ultrasound contrast agent (E-LTSL) that permits real-time in vivo tracking and locally inducible drug release in combination with High Intensity Focused Ultrasound (HIFU). E-LTSL was passively loaded with a perfluoropentane (PFP)/1,3-propanediol (PD) contrast agent emulsion and actively loaded with antitumor agent doxorubicin (Dox). E-LTSL was characterized for size, encapsulation efficiency, and ability to encapsulate PFP/PD emulsion by TEM. Doxorubicin release and imageability was examined in a tissue-mimicking phantom to ease preclinical translation. Synthesized E-LTSL was 144.1 nm in diameter and Dox encapsulation was 60-70%. TEM shows that E-LTSL effectively emulsifies PFP within the liposome core, and this has no effect on Dox release as a function of temperature. Incubation at 37°C for >20 minutes under continuous-wave focused ultrasound (13-24 MHz), vs. its release from conventional LTSL phantom study demonstrated a progressive contrast enhancement with increased temperature, thereby confirming the imageability of our nanocarrier. Our data suggests that E-LTSL can allow real-time control of image-guided drug delivery (IGDD) in combination with HIFU.

Discourses of a Cancer Diagnosis: Narratives of Women in Academia

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Social Foundations
Subject Area: Education

The purpose of this study is to explore female faculty members experiences’ with a breast cancer diagnosis during their tenure-track role in academia. This qualitative study used online journaling and photovoice to examine how the experience of breast cancer shaped participants’ personal and professional roles. Aspects of gender in a faculty position were examined through the lens of feminist theory. Although existing literature discusses experiences of female faculty members in academia as well as women’s experiences dealing with breast cancer, there is a gap in research investigating women’s experiences of cancer while in a tenure track position. The responsibilities and requirements associated with tenure-track roles are challenging for anyone going through the process. This research will provide important insight that is truly lacking in regards to women in higher education who have had to deal with cancer while navigating a tenure-track professional role. This study is also intended to increase administrators’ awareness of female faculty experiences and to promote a more positive environment for faculty dealing with illness while working in institutions of higher education.

Developing a Measure of Online Teaching Competence and Self-efficacy: Findings from a Pilot Study

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Subject Area: Education

Purpose: A search of relevant databases for measures of online teaching competence does not yield much. The area of online teaching has evolved rapidly with many changes in technology over a short period of time posing challenges for instructors who need to adopt the latest such technologies. Thus a measure that
takes into account the context, the instructor’s online teaching self-efficacy, and which captures a substantial spread of the construct of competence is elusive. This pilot study sought to expand the capacity of an existing measure.

**Method:** A two-in-one measure of online teaching competence and self-efficacy was created as a variation of the Braun and Leidner (2009) students’ measure of online learning competence. Thirty nine OSU instructors with online teaching experience responded to an online 35-item questionnaire during the fall semester of 2012.

**Findings and conclusion:** The scales proved to have moderate to high relevant correlations between subscale items, between whole subscales, and between subscales and the criterion variable. Communication, knowledge, and personal online teaching competencies and self-efficacies accounted for substantial variance in online instructional satisfaction. These findings indicate that a combination of the scales for the optimization of the criterion measure is possible.

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**Turning Vines into Trees: Phylogenetic Analysis of American Milkweed Vines (Apocynaceae, Gonolobinae)**

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Subject Area: Biological Sciences

Milkweed subtribe Gonolobinae is diverse (450 spp.) and originated in the Neotropics, but has undergone a significant diversification in seasonally dry grasslands, savannas, and desert scrub habitats of subtropical and temperate North America, making it an ideal group for studying the origin of temperate grassland flora. Before that inference can be attempted, it must be pointed out that a useful classification and an understanding of evolution within the American milkweed vines have been difficult to clarify due to extensive morphological variation within the group. To address this problem, we use a combination of DNA sequences from multiple nuclear and chloroplast regions to investigate the evolutionary relationships within the group. Reconstruction of a broadly sampled (30 spp.) subtribe is presented and implications for classification are discussed.

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**Characterization of Obsidian: A natural glass**

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Subject Area: Physical Science & Technology

Obsidian's superior properties in structure mechanics are reflected in almost all aspects such as fracture pattern, elastic modulus, hardness and fracture toughness when compared to glass. Previously, researchers have studied the mechanical, structural and chemical properties of obsidian and it distinguished the micro fracture behavior of volcanic glass vs artificial glass. Two types of obsidian are used in this research namely red tiger obsidian and black obsidian. Some preliminary experiments are also done on obsidian and the results are compared with artificial glass. These superior properties are speculated because of its structure and as thermal annealing would affect its structure. This present work is focused on the effect of thermal annealing on the mechanical properties of obsidian. Acoustic emission technique is also used to compare the fracture toughness of obsidian to glass.
Wnt/Beta-catenin inhibition reduces the influenza A virus RNA synthesis

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Subject Area: Biomedical Sciences

Wnt/β-catenin signaling pathway has been implicated in diseases such as Hepatitis C virus and HIV infections. Due to the continuous mutations, Influenza virus has become resistant to most of the antiviral drugs targeting the virus, thus there is an urgent need to identify host factors which will limit the virus infection. iCRT14 is an inhibitor of Wnt/β-catenin signaling that disrupts interaction between β catenin and TCF4, thereby preventing the expression of Wnt target genes. In order to study the role of Wnt/β-catenin pathway we examined the effects of iCRT14 on virus titer and influenza virus RNA synthesis in A549 cells. The results revealed that iCRT14 significantly reduced virus titer at 12 and 48 hours post infection. Furthermore, we found that iCRT14 acted on middle to the late stage of infection cycle of influenza virus. Since the virus undergoes replication and transcription at this time of life cycle, we further analyzed different RNA levels of influenza virus. The result showed that iCRT14 significantly reduced the levels of vRNA, cRNA and mRNA in all 8 segments of influenza A virus. In conclusion Wnt/β-catenin signaling inhibitor iCRT14 reduces the influenza virus infection by inhibiting RNA synthesis.

Effects of strawberry supplementation on plasma trace elements.

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Subject Area: Humanities

Obesity and dyslipidemia are strong risk factors for development and progression of cardiovascular disease (CVD). Berries have emerged as potent antioxidants. Few clinical studies have examined the effects of berries on biomarkers of oxidative stress and antioxidant status. We examined the hypothesis that supplementation of freeze-dried strawberries (FDS) will improve trace element status in adults with abdominal adiposity and elevated serum lipids. In a randomized controlled trial, 60 volunteers [5 men, 55 women; age: 49±10 years; BMI: 36±5] were assigned to one of the following: low dose FDS (25g/d), high dose FDS (50g/d), calorie- and fiber-matched low and high dose control beverages for 12 weeks. Blood draws and dietary data were collected at screen and at 12 weeks of the study. Inductively coupled plasma mass spectroscopy (ICP-MS) was used to assay plasma levels of iron, copper, zinc, and selenium at screen and 12 weeks. Plasma levels of iron, copper, zinc and selenium were quantified as follows: 1.15±0.36, 1.48±0.69, 1.08±0.66 and 0.13±0.08 µg/dL, (mean±SD) respectively, at screen; 1.08±0.56, 1.56±0.51, 1.41±0.47, and 0.11±0.08 µg/dL, respectively, at 12 weeks. Modulation of trace elements by berries needs further investigation in obesity and related CVD risk factors.

Physiology of Clostridium perfringens in Response to Azo Dye Exposure

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Subject Area: Biological Sciences

Clostridium perfringens, a strictly anaerobic microorganism and inhabitant of the human intestine, has been shown to produce the azoreductase enzyme. This enzyme reduces azo dyes from the products that we consume into aromatic amines, which are carcinogens. This study serves to fill a gap in the literature regarding the unknown effects of azo dyes on the physiological state of this important bacterium. A variety of common azo dyes with varying characteristics were examined for their effect on the generation time and kinetics of reduction under varying nutrient conditions. Effects of azo dyes on the cell wall were also
examined to understand cell permeability of proteins and dyes. It was found that the presence of azo dyes increases *C. perfringens* generation time. *C. perfringens* is capable of reducing a large variety of azo dyes of different sizes and polarities, suggesting the presence of multiple azoreductase enzymes. In addition, studies have also shown that, when exposed to sulfonated azo dyes, *C. perfringens* translocates proteins across the cell wall, one of which is hypothesized to be an azoreductase protein. The results of this study will serve to provide an important link between the azo dyes and the physiological state of *Clostridium perfringens* cells.

**Correlation of gluten, mixing and fermentation properties of wheat flour treated with transglutaminase (TG) to bread loaf volume**

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Department of Food Science  
Subject Area: Biological Sciences

This study is aimed to determine the correlation among gluten quality indices and mixing and fermentation properties of dough treated by TG and the bread loaf volumes obtained. A set of six commercial wheat flours with protein content of 11±0.5% was treated with TG (0, 0.1, 0.2% w/w) following a Randomized Complete Block Design with 3 replicates. Dough mixing properties, gluten quality, fermentation, and baking properties were determined. Pearson correlation was conducted to test the correlation among the dough and gluten properties with bread loaf volume. Bread loaf volume is not correlated to dough mixing properties. Two of fermentation properties, maximum dough height (*r* = 0.84) and dough height at the end of the test (*r* = 0.83), are highly correlated to bread loaf volume of samples treated with TG. Gluten recovery significantly correlates to bread loaf volume but the coefficient correlation (*r* = -0.31) is lower than the fermentation characteristics. However, gluten recovery test has a number of advantages compared to the fermentation test including a faster test (6-7 min vs 4 h) with a smaller sample size (10 g vs 250 g) and is suggested as a good alternative test when limitation of sample and time apply.

**Effect of polymorphisms in the LDH gene on beef color stability**

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Department of Animal Science  
Subject Area: Biological Sciences

The lactate dehydrogenase gene (LDH) catalyzes the interconversion of muscle lactate to NADH, which affects the oxidative capacity of muscles and potentially influences meat color stability. Meat color plays a crucial role in customer preference of retail beef cuts, and losses of $1 billion annually can be attributed to discolored products. This experiment was created to evaluate the influence of polymorphisms in the LDH gene on beef color stability. A population of 140 beef cattle finished on grain and grass based diets was harvested, and steaks from these animals were evaluated by panel and instrumental means. Measurements were taken every 12 hours for 156 hours to evaluate the overall appearance of the steaks. Steaks were separated into high, moderate, or low color stability groups. DNA was extracted from individual tissue samples and a SNP within the LDH gene was identified. Real time polymerase chain reaction (RT-PCR) and High Resolution Melt curve analysis were run on the extracted DNA samples to determine the genotypes of the cattle. A regression analysis was used to test the association between the new SNP in the LDH gene and the beef color stability.
Estimating Turbidity from Suspended Sediment Concentration in Runoff
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Department of Biosystems and Agricultural Engineering
Subject Area: Physical Sciences and Technology
The light scattering property of water called turbidity has been used for quantifying water clarity and sediment suspended concentration (SSC) in surface runoff. However, SSC estimation from turbidity is a qualitative measurement and has questionable accuracy. The measurement mainly depends on size, shape, distribution and amount of suspended sediment particles (sand, silt and clay). It is important to study effects of suspended sediment particles on turbidity measurement. Therefore, good measurement techniques need to develop which can accurately predict turbidity based on suspended sediment concentration and particle size distribution. To develop and quantify SSC-turbidity relation, five soils from Oklahoma and three soils from South Carolina were selected and suspended sediment particles were separated. Turbidities for various compositions of suspended sediment particles were measured and a regression model was developed. The model and techniques developed in this study can reliably estimate turbidity from suspended sediment concentration in surface runoff.

The Impact of Racial Microaggressions on Interpersonal Suicide Risk for American Indians
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Subject Area: Social Sciences
American Indian (AI) suicide rates continue to surpass the rates of other groups in the U.S. To date, research has not investigated whether discrimination may explain increased suicide risk for AIs. AIs have endured historical trauma through colonization and contemporary trauma in the form of racial microaggressions, everyday subtle racism (Sue, 2010). It was hypothesized that six types of racial microaggressions would significantly predict thwarted belongingness and perceived burdensomeness, two interpersonal suicide risk factors from the Interpersonal Theory of Suicide (Joiner, 2005). Participants were 85 self-identified AI college students. Hierarchical regression analyses results showed that after controlling for age, sex, and marital status, sexualization ($\beta = .429$, $t(80) = 3.88$, $p < .01$), foreigner/not belonging ($\beta = .240$, $t(80) = 2.11$, $p < .05$), environmental ($\beta = .306$, $t(80) = 2.74$, $p < .01$), and total microaggressions ($\beta = .342$, $t(80) = 2.75$, $p < .01$) significantly predicted thwarted belongingness. Additionally, sexualization ($\beta = .271$, $t(80) = 2.35$, $p < .05$) and environmental microaggressions ($\beta = .352$, $t(80) = 3.24$, $p < .01$) significantly predicted perceived burdensomeness. Criminality and low achieving types of microaggressions were not related to feelings of thwarted belongingness or perceived burdensomeness.

Media Literacy Education in Workforce Skills
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STCL
Subject Area: Education
Media literacy education has had a significant impact in developing students’ workforce skills. However, the implementation and the awareness of this skill have not really attracted major educational stakeholders’ attention. The possibility of engaging students in media literacy education has proven to help students be more marketable in the fluctuating industrial demand environments. While understanding of the employment market is not only required on the students’ side, it is vital for educational institutions and industry to agree in understanding what graduates possess through the process of teaching and learning. This
The Relationship of BPD and Functions of Drinking Behaviors

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Department of Psychology
Subject Area: Social Sciences

Borderline Personality Disorder (BPD) is characterized by rocky, unstable interpersonal relationships, impulsivity, and affective instability (DSM-5; APA, 2013). BPD is growing in importance to researchers and clinicians. BPD has a lifetime prevalence of 5.9% (Grant et al., 2008), as well as a high comorbidity with alcohol use disorders, with a rate of up to 86% (Trull, Sher, Minks-Brown, Durbin, & Burr, 2000). Despite a large volume of research focusing on BPD and alcohol use disorders, the specific functions of drinking episodes have not yet been studied in the literature. The proposed study will examine what role BPD plays in the functions of drinking behaviors. We hypothesize that individuals with BPD symptoms will engage in drinking behaviors due to more interpersonal and negative reasons than healthy individuals. Furthermore, subjects with BPD will drink more and exhibit a greater number of problems with alcohol use. Participants (n = 150) will be screened on the McLean Screening Inventory for Borderline Personality Disorder Inventory and will complete measures related to drinking and reasons for engaging in drinking behaviors. Results of the proposed study should suggest that individuals exhibiting BPD symptoms engage in drinking due to more negative and interpersonal functions than individuals who do not exhibit BPD symptoms. Implications for research and clinical practice will be discussed.

Wandering Ghosts in the Shape of Men: Fiscal Trauma, Zombies and Travel in the American Frontier

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Subject Area: Humanities

Resetting the conditions of the American frontier with large-scale catastrophe, narratives about zombies participate in the mythos of the catalytic wilderness and offer insight into the constitutive elements of American identity from the pioneering individualism of the frontiersman to the charitable selflessness of the incorporated social body. With the historical clock reset and government control compromised, the expansive geography of the wilderness serves as an important conceptual space for understanding the environment as individuals relearn how to exist as part of a community. When the insulative sinews of fiscal wellbeing begin to decompose, Americans tend to seek new life, or reanimation, in the mythic frontier. Science fiction and fantasy authors have long employed apocalyptic scenarios to envision the implications of complex social, technological and environmental contingencies, but the zombie apocalypse is a relatively recent innovation in the genre with cult cinema auteur George A. Romero’s Night of the Living Dead (1968) as “patient zero” of this new outbreak of zombie narratives. Earlier cultural antecedents to Romero’s gruesome critique of capitalism, however, can be found even in Puritan John Winthrop’s lament for the “wandering ghostes in the shape of men” excluded from the economic prosperity of the nation.
THE INFLUENCE OF ANKLE POSITION DURING A STRAIGHT-LEG RAISE ON THE PASSIVE RESISTANCE TO STRETCH

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Subject Area: Biomedical Sciences

PURPOSE: To examine the influence of ankle position during a straight-leg raise (SLR) on the passive torque (PT), range of motion (ROM), and hamstring electromyography (EMG) responses to passive stretch of the posterior hip and thigh muscles. METHODS: Thirteen healthy participants (mean±SD age=23±2yr; mass=69±15kg; height=169±10cm) performed six randomly ordered passive SLR assessments involving two assessments at each condition, which included the ankle positioned in dorsiflexion (DF), plantar flexion (PF), and a neutral (NTRL) position. All SLRs were performed using an isokinetic dynamometer programmed in passive mode to move the leg toward the head at 5°·s⁻¹. PT and EMG amplitude were determined at four common joint angles (θ) separated by 5° during the final common 15° ROM for each participant. RESULTS: PT was greater (P=0.008-0.032; Figure 1) at θ₃ and θ₄ and maximum ROM was lower (P≤0.001-0.003) for the DF compared to the NTRL and PF conditions. However, there were no differences (P>0.05) between conditions for EMG amplitude. CONCLUSION: These findings suggest that performing SLRs with the ankle positioned in DF may elicit greater PT and lower ROM compared to SLRs with the ankle positioned in PF or a NTRL position.

![Graph showing passive torque (Nm) values at each joint angle (θ₁, θ₂, θ₃, and θ₄) of the posterior muscles of the hip and thigh for dorsiflexion, neutral, and plantar flexion conditions. Values are means ± SE. *Significant differences (P < 0.05) between ankle conditions at θ₃ (dorsiflexion > neutral, dorsiflexion > plantar flexion) and θ₄ (dorsiflexion > neutral). †Significant differences (P < 0.05) between joint angles (θ₁ < θ₂ < θ₃ < θ₄) for the dorsiflexion, neutral, and plantar flexion conditions.](image-url)
Analysis of hydrodynamic shear stress and nutrient consumption in perfusion bioreactors

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Subject Area: Biomedical Sciences

Use of biodegradable porous scaffolds in tissue engineering have proved to be an attractive solution for creating functionally replaceable tissue parts, and producing synthetic surrogates to test diseases propagation. To grow tissues outside the body, porous scaffolds are seeded with appropriate cells, and cultured in a bioreactor to provide nutrients and regulate culture conditions to mimic the native environment. However, challenges associated with in vitro tissue regeneration include incomplete understanding of the nutrient distribution and stress applied due to the flow of growth medium. The objectives of this study were to analyze shear stress on scaffold due to media flow, nutrient distribution inside the bioreactor, and validate the model with an experimental setup using Hep G2 cells in freeze dried chitosan-gelatin scaffold.

The results showed uniform shear stress across the scaffold in axial flow bioreactor, however, higher shear stress were observed at the beginning of scaffold in flow-through configuration. On the other hand, axial flow bioreactor had relatively lower deformation at similar flowrates. The histology study showed uniform cell distribution in sample obtained from 5 different locations in the scaffold. Also, higher elastic modulus of PCL-CA scaffolds experienced significantly less shear stress relative to scaffolds with low elastic modulus.

Does Haploinsufficiency of Atp2c1 Promote Increased Apoptosis or Increased Apoptotic Load after UVB Irradiation?

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Scholar Symposium Participant
Subject Area: Biomedical Sciences

Systemic Lupus Erythematosus (SLE) is a prototypic autoimmune disorder and an intricate multi-genetic disease. Patients display a wide array of clinical symptoms. Preliminary studies from our laboratory suggest that the Chromosome 3q21 gene, ATP2C1, may promote the immunological disturbance of anti-La antinuclear antibody production in SLE patients. The ATP2C1 gene encodes Secretory Pathway Ca

ATPase (SPCA1), a Golgi membrane-localized calcium and manganese ion pump. Haploinsufficiency of SPCA1, caused by mutations in ATP2C1 is a known cause of Hailey-Hailey disease. HHD is a hereditary autosomal dominant blistering skin disease thought to be caused by altered calcium signaling in keratinocytes. Interestingly, UVB light is a known trigger for blister induction in HHD and a known trigger of flares in SLE. SLE patients with photosensitive skin disease are more likely to produce anti-La autoantibodies, possibly secondary to increases in availability of the La antigen from UVB-induced keratinocyte apoptosis. Our studies seek to test the hypothesis that UVB irradiation of the skin or keratinocytes from mice haploinsufficient for SPCA1 will produce an increased apoptotic keratinocyte load or increased keratinocyte apoptosis, respectively. These studies are expected to lead to a new understanding of how polymorphisms in ATP2C1 might promote anti-La autoantibodies in humans with SLE.

Experimental Investigations of Hydrate Formation in Water-In-Oil Emulsions

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Subject Area: Physical Sciences and Technology

Gas hydrates or clathrates are non-stoichiometric crystalline solids with a characteristic guest – host type structure, formed from mixtures of water and low molecular weight hydrocarbons. The agglomeration and
plug formation tendencies of hydrates in oil and gas production lines and the ensuing capital losses have provided an impetus to develop reliable, efficient and economical flow assurance strategies.

In this work, we present an experimental flow loop set-up to quantify emulsion behavior and hydrate formation in flowing conditions. The flow loop (8ft.x 8ft.) is comprised of 1” jacketed stainless steel tubing with a pressure rating of 150 psig, and a 5 hp progressive cavity pump is employed to circulate the process fluid throughout the loop. Fluid temperature is controlled in the range of -30°C to 150°C. Flow measurement is accomplished using a coriolis mass flow meter. An inline microscope provides quantitative drop size distributions of emulsions as well as hydrate particle size along with real time images of hydrate slurry flow, adhesion of hydrate particles to inner pipe walls, and eventual plug formation. Droplet/particle size data obtained are utilized to establish relationships between emulsion droplet sizes and hydrate behavior in flowing conditions to develop economical and efficient flow assurance strategies.

Methods in Optimal Wavelength Calculation for Laser-Stimulated Quantum Tunneling

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Subject Area: Physical Sciences and Technology

An exploration of the use of the electromagnetic fields of lasers to manipulate an electron in a one-dimensional double-dot system through quantum tunneling such that it can be trapped in either of the wells.

Interpersonal and Structural Stressors Associated with Depression among Latinas in Farmworker Families

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Subject Area: Social Sciences

The aims of this study were to describe the prevalence of depressive symptoms among farmworker Latinas, and identify the structural and interpersonal factors associated with depressive symptoms in this population. Data for this study were from the Niños Sanos project, a prospective study of 248 Latino mother-child dyads. The variables of interest were depressive symptoms and caseness, economic insecurity, residential mobility, social isolation, ethnic/racial discrimination, family conflict, family outward orientation, and acculturation. Descriptive statistics, multiple linear regression, and logistic regression analyses were computed to fulfill the aims of the study. Results indicated that most women were married or living as married (90.3%), born in Mexico (89.5%), had been living in the U.S. five years or longer (91%), and lived in seasonal farmworker households (72.6%). Thirty-one percent of the women met caseness for depression, that is, they presented clinically significant levels of depressive symptoms. Depressive symptoms were positive related to economic insecurity, racial/ethnic discrimination, family conflict, and social isolation, although the latter was not a predictor of depression caseness. In sum, the prevalence of depressive symptoms in this sample is significantly higher than the one found by population studies in US Latinos, an indicator of poor mental health.
Label-free Detection of Diabetes-type by Magnetic Nanoparticle Enhanced SPR-microarray Imager

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Subject Area: Biomedical Sciences

Diabetes mellitus, commonly known as “diabetes,” is a condition that describes abnormally high blood-glucose levels caused either by deficient insulin secretion (a peptide hormone that regulates cellular uptake of glucose) in the pancreas to metabolize glucose for energy, or metabolically inactive high-insulin conditions. The deficiency of insulin or resistance to insulin leads to Type 1 and Type 2 diabetes, respectively. The terminology “Type 3 diabetes” has been proposed recently for Alzheimer disease, which results from the resistance to insulin in the brain. In addition, a diabetes condition typically occurs from high glucose levels during pregnancy and is known as “gestational diabetes.” Monitoring insulin levels in serum or plasma is very important for the clinical diagnosis of diabetes type and can prevent the associated chronic disorders leading to heart diseases, kidney failure, eye and nerve diseases, or Alzheimer’s. Hence a rapid, robust, and label-free sensor for clinically relevant picomolar level insulin detection in human serum is valuable. Herein, we discuss a simple, and sensitive direct assay of insulin in human serum with a label-free SPRi sensor. We utilized magnetic nanoparticles to isolate target insulin from serum and thus achieved the clinically relevant detection of insulin.

Identification of genes responsible for calcium-induced antibiotic resistance in facultative pathogen Pseudomonas aeruginosa

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Department of Microbiology & Molecular Biology
Subject Area: Biological Sciences

Pseudomonas aeruginosa is a facultative pathogen infecting the lungs of cystic fibrosis patients, causing severe nosocomial and implant-related infections. It is resistant to antimicrobials, and therefore, the infections are difficult to treat. Previous studies have shown that Ca$^{2+}$ triggers biofilm formation and virulence in P. aeruginosa. In addition, we have determined that Ca$^{2+}$ increases the minimum inhibitory concentrations (MICs) of tobramycin and polymyxin-B in PAO1 strain of P. aeruginosa. To identify genes responsible for Ca$^{2+}$-induced antibiotic resistance, we used global transposon mutagenesis. The transposon mutants with increased or decreased antibiotic resistance in the presence of Ca$^{2+}$ were selected. A total of 1661 mutants were screened and out of those mutants, 9 and 38 clones showed significantly altered tobramycin and polymyxin-B resistance, respectively. To confirm changes in antibiotic resistance, MIC measurements using E-strips were performed. So far, two mutants showed greater than two-fold increased, and one mutant showed greater than two-fold decreased tobramycin resistance in response to 5mM Ca$^{2+}$. Current focus is to clone and sequence the disrupted genes. Once the sequence is obtained, we will use bioinformatic analysis to determine the genes’ functions and roles in Ca$^{2+}$-induced antibiotic resistance in P. aeruginosa.

Optimized Cubic Chebyshev Interpolator for Elementary Function Hardware Implementations

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Subject Area: Physical Sciences and Technology

This paper presents a cubic interpolator for computing elementary functions using truncated-matrix arithmetic units and an optimized number of coefficients bits. The pro- posed method optimizes the initial
coefficient values found using a Chebyshev series approximation, minimizing the maximum absolute error of the interpolator output. The resulting designs can be utilized for approximating any function up to 53-bits of precision (IEEE double precision significand). Area, delay and power estimates are given for 16, 24 and 32-bit cubic interpolators that compute the reciprocal function, targeting a 65nm CMOS technology from IBM. Results indicate the proposed method uses smaller arithmetic units and has reduced lookup table sizes than previously proposed methods.

Pension Freezes and Corporate Payout Policy
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Department of Finance
Subject Area: Social Sciences

Using a database of firms that have opted for a hard freeze of their pension plan in 2004 or 2005, this study (covering 2002-09) analyses if the freeze decision brought about any visible change in their payout policies. Results indicate that pension plan freezes do not have any impact on the payout policies of the firm. A moderate increase of dividends is observed in case of certain overvalued firms and some firms with underfunded plans.

Study of Mechanical Properties of Crumb Rubber Reinforced Polyurethane Foam
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School of Mechanical and Aerospace Engineering
Subject Area: Physical Sciences and Technology

Crumb rubber is a granular form of rubber obtained from scrap tires. Scrap tires from vehicles usually end up in landfills causing environmental issues. Recently researchers have demonstrated the enhancement of mechanical properties when scrap rubber is used as filler material. Polyurethane foam is a good choice for incorporating the rubber particles as it is used widely in industries due to its high load bearing capacity, sound and vibration damping properties. Rubber particles absorb large impact energy due to high elasticity and resilience. Li et al (2008) demonstrated the increase in fracture toughness of rubber reinforced foam. They found that the enhancement in fracture properties was due to crack pinning and crack bridging properties of the rubber particles. Previous researches reported increase in static compressive and flexural strengths due to crumb rubber reinforced foams.

In this work, an attempt is made to reinforce rigid polyurethane foam using crumb rubber particles such that the energy absorbing and toughness properties are enhanced. Also, the effect of size of crumb rubber particles on the foam composites is investigated.

Toxicity of a Current Use Insecticide to Resurrected Daphnia pulicaria: Impact of 700 Years of Evolution
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Department of Zoology
Subject Area: Biological Sciences

This study examined how the natural evolutionary progression of a resurrected Daphnia pulicaria population affects its sensitivity to novel anthropogenic stressors. This population was "resurrected" from preserved resting eggs, containing daphnid clones from three time periods: 2001-2007, 1967-1977, and 1301-1646 A.D. Toxicity of the organophosphate chlorpyrifos, an insecticide that has never been detected in the region, was determined through a series of acute toxicity tests, with immobility serving as the
measured effect. A trend can be seen when comparing the dose-response effect of clones from all three time periods. There was significant variation in toxicity to chlorpyrifos within each age class, as well as between age classes. In addition, the 1301-1646 clones were significantly more sensitive than the 1967-1977 clones. This trend can be explained by inherent differences in metabolism, likely due to evolutionary adaptations developed in response to heavy cultural eutrophication.

CREATING CONTROLLED SIZE MICROVESSELS USING BIODEGRADABLE HYDROGELS

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Subject Area: Biomedical Sciences

Organ or tissue transplantation is the common therapy for failure or loss of organs or tissues. To address the shortage of organ donors, engineering tissues using biodegradable structures has been an option. Although many products have been developed, these products are limited to tissues without vasculature. Structures without vasculature suffer from nutrient deficiency and poor engraftment of the engineered transplant. Hence for successful development of tissue engineered products, developing microvesseels embedded in those products is necessary. One approach relies on in vivo vascularization of scaffolds placed in the site of replacement. However, studies show that vessel ingrowth in these scaffolds is limited to 250 μm. Since gaining control over size during microvascularization is difficult, creation of microvessels with different sizes is a challenge. Other attempts using novel bio-printing technology suffer from cell viability issues attributed to unfavorable environmental conditions such as shear stresses, solvents used, and temperature at which printing is performed. Bio-printing of hydrogels and cells addresses the challenges of improving cell viability and formation of blood vessels of defined sizes. I use chitosan-gelatin hydrogels that have unique feature of gelling at physiological condition (37°C and pH 7.4) but remains in liquid state at lower temperature (4°C).

Effect of Solvent Concentration on Spray Absorption for CO2 Capture Applications

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Subject Area: Physical Sciences and Technology

Spray columns could potentially be useful in absorbing CO2 from large point sources using amine solvents. However, there is currently a lack of fundamental mass transfer data for these amine systems. The absorption efficiency of liquid sprays is strongly influenced by the available surface area of droplets in the sprays. Radial and axial measurements of drop size distributions are required to accurately estimate the surface area of these sprays. This work addresses that gap by characterizing the effect of solvent physical properties on drop size distributions, surface area, and absorption rates. This work presents drop size distribution data that are measured in an 8-inch laboratory spray column over a range of amine solvent concentrations. The drop size distributions, measured using a Phase Doppler Interferometer (PDI), are coupled with gas and liquid composition measurements to quantify the overall mass transfer in the column.
Simple and efficient all-optical production of spinor condensates
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Department of Physics
Subject Area: Physical Sciences and Technology

We present a simple and optimal experimental scheme for an all-optical production of a sodium spinor Bose-Einstein condensate (BEC). With this scheme, we demonstrate that the number of atoms in a pure BEC can be greatly boosted by a factor of 5 over some widely used schemes in a simple single-beam or crossed-beam optical trap. Our scheme avoids technical challenges associated with some all-optical BEC methods and may be applicable to other optically trappable atomic species. In addition, we discuss an upper limit for evaporative cooling efficiency in all-optical BEC approaches and a good agreement between our theoretical model and experimental data.

Postural Stability Differences between Young Adolescent and College-Aged Males
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Health and Human Performance
Subject Area: Education

Previous studies have looked at the effects of the aging process on postural stability, primarily focusing on elderly adult individuals. **Purpose:** To investigate static stance postural stability differences between recreationally-active young adolescents and college-aged males. **Methods:** Eight young adolescent (mean ± SD: age=11.4±yrs; height=152.6±12.1cm; mass=52.6±20.9kg) and eight college-aged (age= 23.8±2.5 years; height= 179.1±7.2 cm; mass= 89.2 ±6 kg) males performed balance testing on a commercially designed balance test unit, used to assess sway index (SI). Each balance assessment consisted of 4, 20-second static stance conditions: eyes-open firm surface (EOFS), eyes-closed firm surface (ECFS), eyes-open soft surface (EOSS) and eyes-closed soft surface (ECSS). **Results:** SI was greater (P=0.025) for EOFS and was greater (P= 0.003) for ECFS for the young adolescent males compared to the college-aged males. No differences (P>0.05) were observed for any other conditions. **Conclusion:** Although all four conditions may be valuable to assess postural stability, these findings revealed that SI for the firm surfaces may be a greater discriminator of balance performance between recreationally-active young adolescent and college-aged males. Postural stability assessments may have important performance and developmental implications as young adolescents mature.

Altering the nutrient supplement and stability of hydrogel
Christian Tormos, Sundararajan V. Madihally
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School of Chemical Engineering
Subject Area: Biomedical Sciences

Heart disease related deaths are among the top causes every year. Current treatment options to replace the necrotic tissue rely on cell-based therapy using injectable hydrogels. Although these treatments are promising, the largest obstacle still to overcome is to maintain cell viability. We hypothesized that the combination of hydrogel and growth media would help in the nutrient requirement. To test the possibility, we utilized chitosan-gelatin injectable hydrogels. Further, we tested the effect of transglutaminase on the durability of the gels with different types and molecular weights of gelatin. Presence of growth medium and low amount of TG did not hinder the gelation characteristics. Overall, Type A gelatin with the highest bloom number had the highest compressive modulus. The effect of chitosan molecular weight was determined and the high molecular weight chitosan hydrogel was the strongest. Finally, the effect of adding growth media and transglutaminase was determined. The combination of both growth medium and TG nearly tripled the compressive modulus. An additional effect of adding TG was determined while...
conducting seven day cell culture experiments. It was observed that the hydrogel with TG was more stable even when exposed to proteolytic enzyme.

**Effects of FGF9 on CCND1 and CDK4 gene expression in bovine theca cells**

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Subject Area: Whiteman Award Presentation

Fibroblast growth factor-9 (FGF9) stimulates proliferation of granulosa and theca cells (TC) of cattle. The objectives of these studies were to determine which mitosis-related genes are regulated by FGF9 in bovine TC. Analysis using Affymetrix GeneChip bovine Genome Arrays (n = 8) revealed that FGF9 up-regulated (P < 0.05) cyclin (CCN) D1, B2, E1 and G1, and CDK-2 and -5. Other mitosis-related genes expressed in TC but not altered by FGF9 were: CCNA2, B1, C, D2, D3, E2, H, and K; CDK-1, 3, 4, 6-10, 12, 13, 16, 18, and 20. Focusing on two of these genes, CCND1 and CDK4, a time-course analysis showed that abundance of CCND1 mRNA was 2.4- to 2.8-fold greater (P < 0.001) at 12 h and 24 h in FGF9-treated than control TC. Levels of CDK4 and CCND1 mRNA were greater (P < 0.05) at 48 h in controls than FGF9-treated TC. In TC treated with IGF1 for 12 h, FGF9 increased (P < 0.001) CCND1 expression by 9.6-fold, but did not affect CDK4 expression. Taken together, these results indicate that FGF9 rapidly up-regulates gene expression of several proteins that are involved in the transition from G1 to S phase of mitosis in bovine TC.

**Rumination, Suicidal Ideation, and the Indirect Effect of Self-Defeating Humor**

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Department of Psychology  
Subject Area: Social Sciences

Research has indicated that the constant devotion of one’s cognitive efforts to the causes and consequences of current distress (commonly referred to as rumination) is closely linked to suicidal thinking (Morrison & O’Connor, 2008). Although cognitive variables such as rumination are predictors of suicidal thinking, recent research has investigated interpersonal predictors of suicide. In one such study, Tucker and colleagues (2013) demonstrated that a self-defeating humor style, or the tendency to use self-deprecating humor in order to be perceived favorably, was related to increased levels of loneliness and suicidal ideation. The current study investigated the interplay between rumination, self-defeating humor, and suicidal thinking. An undergraduate sample from a large Midwestern University participated in this study by completing self-report measures of rumination, self-defeating humor, and suicidal ideation. Non-parametric bootstrapping mediation analyses indicated that self-defeating humor had a significant indirect effect on the relationship between rumination and suicidal ideation (point estimate = .0017, BCa = .0005 to .0041). These results indicate that the relationship between rumination and suicidal ideation works through the use of self-defeating humor. The assessment and treatment of individuals at risk for suicide may benefit from the monitoring of self-defeating humor during interpersonal interactions.
Characterization of concentrated dispersions in energy industry using acoustic spectroscopy

Deepika Venkataramani, Peter Clark, James E. Smay, Clint P. Aichele

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School of Chemical Engineering

Subject Area: Physical Sciences and Technology

Complex dispersions including emulsions and hydrates can be encountered during drilling, production, transporting, and processing of crude oils. These dispersions typically lead to higher operating costs as they currently require costly treatment strategies. The objectives of this work are emulsion characterization, measurement of particle size distribution, and quantification of surfactant behavior using acoustics. The project will also evaluate the flow characteristics of dispersions using advanced rheological techniques. Rheology utilizes the viscosity and elastic properties to measure complex rheological behavior of dispersed systems. The acoustic technique utilizes sound waves and the attenuation coefficient to characterize particle size, zeta potential, and conductivity. The particle size measurements coupled with rheology will lead to fundamental characterization of these complex systems that will lead to enhanced flow assurance management strategies.

Palate Morphology and Diet in Modern Homo sapiens

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Subject Area: Social Sciences

Establishing the range and types of palatal shape differences across modern Homo sapiens has important implications for understanding morphological changes that have occurred in response to shifts in substance strategies over the course of human evolution. While it has been previously established that mandibular morphology varies in response to diet, the association between palate shape and diet is poorly understood in Homo sapiens. This project will attempt to bridge this gap in our collective knowledge. We hypothesize that there are differences between the palate shape of non-agricultural human populations who subsist on coarser less easily processed food and agriculturists who largely consume softer more processed food items. Additionally, we suggest that hunter-gathers have palates that are wider and shallower than agricultural populations as a result of greater masticatory forces placed on the palate during growth and development and throughout the lifetime of the individual. So, test this hypothesis, we collected x,y,z coordinate landmarks on surface models of human crania, using three-dimensional geometric morphometric techniques. The sample of specimens includes individuals from the WM Bass Skeletal Collection of modern Americans primarily of European and African ancestry, agricultural French and Austrians, Khoisans, southwestern Amerindians, and sample from the Point Hope Collection of Native Alaskans. Preliminary results indicate a substantial amount of variation in palate shape with no clear partitioning along ancestry lines in the modern Americans— an important finding given the regional diversity of our sample.

Electrocatalytic Features of a Heme Protein Attached to Polymer Functionalized Magnetic Nanoparticles

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Subject Area: Physical Sciences and Technology

This study investigates the direct electron-transfer and electrocatalytic kinetics of covalently attached myoglobin (MB) films on magnetic nanoparticles (MB-MNP\textsubscript{covalent}), in comparison to the corresponding physisorbed films (MB/MNP\textsubscript{adsorbed}) and individual components, for the first time. Modified films of (MB-MNP\textsubscript{covalent}) and (MB/MNP\textsubscript{adsorbed}) are absorbed onto a cationic poly (ethyleneimine) layer (PEI) coated high-
purity graphite (HPG) electrodes. Similarly only Mb and only MNP films were constructed on HPG/PEI electrodes for the comparison. The electron-transfer rate constants \( k_e \) were found in the order of MB-MNP\textsubscript{covalent} > MB/MNP\textsubscript{adsorbed} > only MB > only MNP. The catalytic current densities were exhibited by the films related to model catalytic reduction reaction of tert-butylhydroperoxide into tert-butanol in the following order: MB-MNP\textsubscript{covalent} > MB/MNP\textsubscript{adsorbed} > only MNP > only MB which is in good agreement with the electron-transfer rates of MB-MNP\textsubscript{covalent} and MB/MNP\textsubscript{adsorbed} films. Also significantly lower Michaelis-Menten constants \( K_M \) for MB-MNP\textsubscript{covalent} and MB/MNP\textsubscript{adsorbed} films over either MB or MNP film alone reveals the enhancement of substrate binding affinity in MNP modified surfaces. Therefore nanostructure based surface modifications have enormous importance in developing modern high efficient biosensors and bioreactors due to enhanced electron-transfer and electrocatalytic properties.

**In vivo and in vitro Property Evaluation of Chitosan-based Anisotropic Hydrogels**

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Subject Area: Biomedical Sciences

Hydrogels offer an attractive approach for cartilage scaffolding because of the possibility of providing a biphasic environment similar to cartilage. Further, injectable hydrogels offer a minimally invasive alternative to arthroscopic surgeries and ease of incorporation of cells and biologically active agents. Although many types of injectable hydrogels have been developed using various chemistries, in general they lack practical use due to the conditions necessary for gelation, difficulty in creating anisotropic matrix configuration mimicking native cartilage, and the mechanical strength. Chitosan-based temperature sensitive hydrogels using \( \beta \)-glycerophosphate have attracted significant attention due to their gelation near body temperature and possibility of blending other molecules without compromising gelation characteristics. The objectives of this study were to investigate the bio-mimicry of an anisotropic chitosan-based hydrogel and evaluate the developed injectable hydrogels for gelation in the body, stability, and immune response. We evaluated the effect of blending gelatin, hyaluronic acid (HA), and beta tri-calcium phosphate (\( \beta \)-TCP) on in vitro and in vivo gelation, linear and cyclical mechanical strength.

**3D-Printed Bi-phasic Calcium Phosphate Scaffolds for Bone Regeneration: In Vivo model**

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Subject Area: Biomedical Sciences

The objective of this study was to use Long Bone Segmental Replacement (LBSR) scaffolds fabricated by three-dimensional printing (3DP), referred to as ‘robocasting’ of mesoporous resorbable/remodelable Calcium Phosphate ceramics. These forms of scaffolds have been previously designed, fabricated, and studied for craniofacial applications. Using the ‘robocasting’ technique allows for controlling multiple parameters with precise details as in: filament diameter in the range of 0.15-0.5mm and ‘printing’ speed, ~9mm/s. With such control the interior design can be made to mimic the trabecular design of various bones, with the purpose of facilitating bone resorption. The complex structure, which was designed, additionally accounted for a fugitive support structure/material, which is useful in printing intricate overall and interior design structures. This scaffold was then calcined; to ‘burn out’ the supporting material and subsequently sintered so eliminate porosity. Using this particular 3DP technique, the fabricated scaffolds in combination with fillers and bioactive molecules, such as calcium sulfate or Bone Morphogenic Protein (BMP), respectively, LBSR scaffolds may successfully regenerate bone over a critical sized defect. Thus eventually paving the way for synthetic, off-the-shelf, custom fabricated 3D scaffolds for repairing bone defects.

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Extraordinary Features and Capabilities of Metamaterials

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Subject Area: Physical Sciences and Technology

The experimental realization of unnatural phenomena such as invisibility cloaking, perfect lensing, negative refractive index, and many others all function to ignite the field of Condensed Matter Physics and the application and demonstration of devices becomes essential for the continued growth of this field. Metamaterials and other novel electromagnetic media, while being quite intriguing, also promise a great number of technological advances in the future to come. These advances are very exotic and applicable toward devices in a generation that sees much growth and prosper in these areas. In this paper, we explore the exotic properties of Metamaterials, tunable, artificially composite structures capable of many useful applications. Metamaterials have been shown to exhibit foreign properties not seen in nature. Utilizing these unique materials, one can demonstrate features such as the Metamaterials perfect absorber, emitter, negative-index material, and wave guiding, namely invisibility cloaking. I discuss our achievement of a Metamaterial invisibility cloak in the laboratory, the creation of a Metamaterial sample possessing a negative index of refraction, and our fabrication and characterization of a Metamaterial perfect absorber yielding near-unity absorption of 98% at a wavelength of 6 microns. The applications of these results will be the focus of this paper.

Phylogeny and Biogeography of a Semi-arid Adapted Clade of Milkweeds (Podostemma Clade, Asclepias L., Apocynaceae)

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Subject Area: Biological Sciences

Biogeographic disjunctions, separation of ranges between closely related species, raise questions of how biogeographic processes explain these patterns. Disjunctions are important because they are evidence of the ongoing story of speciation in response to geologic and environmental events. The Sierra Madre Occidental separates closely related milkweed species in the Podostemma clade (Asclepias L.). This group is a good system for studying the historical biogeography of semi-arid regions of North and Central America to better understand how species diverged in connection to related geologic or climatic events. Relationships among species in this clade were not fully resolved in the recently reconstructed chloroplast phylogeny. Conserved nuclear loci (COSII; orthologs across eurastrids) have been optimized for Asclepias and complete chloroplast genomes have been mostly obtained across Asclepias. These data sets will be used to estimate the Podostemma clade phylogeny. Biogeographic hypotheses of the Podostemma clade divergence will be explored using ecological niche modeling (ENM) and character mapping. A putative species in this group (A. aff. standleyi) will be evaluated for recognition at the species level using ENM, monophyly, and diagnostic (morphological) characters, under the unified species concept. Preliminary data will be presented on assessment of the utility of nuclear markers in phylogenetic estimation.
Perceptions of God
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Subject Area: Social Sciences

This study will explore how masculine or feminine people perceive themselves and how they perceive God in relation to those self-measurements. It covers three main concepts: How the participant perceives God or what they think religion teaches them about God, how the participant perceives what society says about how masculine and feminine they should be, and how the participant perceives themselves. Findings from this research will be of benefit to individuals seeking to understand how they view themselves and if it measures up to their belief in God.

This research focuses on The History of Religion by Karen Armstrong, a British writer and an expert in the area of comparative religion. Her book examines perceptions of God in each of the three major religions: Christianity, Islam, and Judaism. Lastly, what will be included in the literature is a Perceptions and The Awareness of God article by Daniel A. Drubach and Daniel O. Claassen.

A Pearson’s correlation coefficient is used to examine the relationships between self-attributed gender roles, expectations of society’s gender roles, and perceptions of God’s gender attributes. A multivariate analysis of variance (MANOVA) is used to examine differences in attachment to God and perceptions of God’s gender attributes by gender.

Analysis and Control of Large-Scale Dynamical Systems with Time Delays
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Subject Area: Physical Sciences and Technology

Control of large-scale dynamical systems in the presence of time delays is challenging due to the varying effect of time delay on the systems stability and performance. This study aims to investigate the effect of time delays and the design of control systems for large-scale interconnected systems, particularly on vehicle formations and roll-to-roll printing. In vehicle formations, time delays occur when vehicles in the collection communicate their information to others to maintain a specific formation. Communication delays affect formation stability as well as the ability to scale the formation. In roll-to-roll printing systems, there are inherent time delays in the print registration model due to the configuration of the print units and interaction between them as the flexible material is transported from one print unit to subsequent print units. This study reports preliminary investigations on the effect of time delays on closed-loop system stability and performance in both applications. It was found that the presence of delays with existing controllers can result in reduction in stability margins as well as degradation in the system performance. The objectives of this study going forward are to investigate the design and analysis of robust and adaptive controllers that can mitigate the detrimental effects of time delays.

Sequential Testing Procedures for Single-step Methods
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Subject Area: Physical Sciences and Technology

Sequentially rejective methods are one type of multiple comparison methods to control the familywise error rate (FWE), in which the current step result depends on the test results of previous steps. We propose three sequentially rejective methods that utilize single-step methods to achieve improved power in multiple testing. At each step, our proposed methods are reduced to single-step tests which control the FWE. We
suggest modifications to the critical values such that the modified critical values are monotone at all times. To facilitate computation, two of the three proposed methods are developed to modify monotone critical values along the rejection path. These three sequentially rejective methods are applicable to any single-step methods under mild conditions, and show the potential to uniformly improve power over their single-step counterparts, while still maintaining strong control of the FWE. Moreover, new sequentially rejective methods are developed from applying these modifications to the hybrid method proposed by McCann and Edwards (2000) and they are shown to often outperform Holm’s procedure and the stepdown Sidak’s method in a variety of multiple comparisons problems.

**Dynamics of spinor Bose-Einstein condensates in a microwave dressing field**

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Subject Area: Physical Sciences and Technology

We experimentally study spin dynamics in a sodium antiferromagnetic spinor condensate with off-resonant microwave pulses. In contrast to a magnetic field, a microwave dressing field enables us to explore rich spin dynamics under the influence of a negative net quadratic Zeeman shift $q_{\text{net}}$. We find an experimental signature to determine the sign of $q_{\text{net}}$, and observe harmonic spin population oscillations at every $q_{\text{net}}$ except near each separatrix in phase space where spin oscillation period diverges. In the negative and positive $q_{\text{net}}$ regions, we also observe a remarkably different relationship between each separatrix and the magnetization. Our data confirms an important prediction derived from the mean-field theory: spin-mixing dynamics in spin-1 condensates substantially depends on the sign of the ratio of $q_{\text{net}}$ and the spin-dependent interaction energy. This work may thus be the first to use only one atomic species to reveal mean-field spin dynamics, especially the separatrix, which are predicted to appear differently in spin-1 antiferromagnetic and ferromagnetic spinor condensates.