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**STUDENT CREATIVE ACTIVITIES**

**AND**

**RESEARCH FORUM**

**APRIL 14, 2022**

**2022 SIU Carbondale**

**Student Creative Activities and Research Forum**

**Program and Abstract Guide**

**Undergraduate and Graduate**

**Student Creative Activities and Research Forum**

**April 14, 2022**

**Sponsored by the Office of the Vice Chancellor for Research, Graduate and Professional Student Council and Sigma Xi**

**Program**

Poster Judging Sessions: 9:35 AM – 12:15 PM

Session 1 9:35 AM – 10:50 PM

Session 2 11:00 PM – 12:15 PM

Public Viewing Session: 12:15 PM – 2:45 PM

Awards Ceremony: 3:00 PM – 4:30 PM

* Welcome by Dr. Gary Kinsel, Vice Chancellor for Research
* Best in Area Forum Awards, New 2022-2023 REACH Awards, Faculty Foundation Awardees, MTC Seed Grant Awardees and Closing Remarks by Dr. Gary Kinsel.
* Graduate School Remarks and The Outstanding Dissertation and Thesis Awards presented by Rose Moroz, Assistant Dean of Graduate School
* Sigma Xi Remarks and Awards by Dr. Mary Kinsel
* Closing remarks by Dr. Gary Kinsel

2022 Student Creative Activities and Research Forum

Undergraduate Poster Number :09

Physical Sciences, Engineering & Technology

Presenting Author: **Abunnur, Nezar**

Authors: Abunnur, Nezar and Sawar, Kinan

Advisor: Pre-approved for Non-Faculty Advised Project

Major/Field of Study: Biochemistry

**Evaluation of Interventions to Increase Vitamin Supplementation Adherence Amongst Children and Adolescents: A Systematic Review**

**Abstract**

Vitamin supplementation is a crucial component of the maintenance of health amongst all

individuals. Many people suffer from one or more vitamin deficiencies, with some of the most

common vitamin deficiencies being vitamin D or vitamin B6 deficiency which have essential

roles ranging in scope from bone mineralization to DNA synthesis. Adherence to medication and

supplementation has historically been reported to be one of the greatest contributing factors to

preventable patient morbidity. Furthermore, children and adolescents have been shown to have

the lowest adherence to medication and supplementation among all age groups. It has been

estimated that improving adherence to vitamin supplementation can save billions of dollars of

avoidable healthcare costs. In this study, we will be performing a systematic literature review

using the PubMed database with inclusion criteria containing studies that investigated quality

improvement measures that improved adherence to vitamin supplementation amongst patients

between ages 2-21 who were prescribed vitamin supplementation. Exclusion criteria included

studies with fewer than 30 patients and studies that more broadly focused on medication and

adherence rather than vitamin supplementation adherence. This systematic review suggests that

the greatest factor influencing child and adolescent adherence to vitamin supplementation is a

child or adolescent’s understanding of a vitamin’s use in his or her health.

Graduate Poster Number: 52

Life Sciences

Presenting Author: **Adeyemi, Oladapo Adeoye**

Advisor: Dr. Amir Sadeghpour

Major/Field of Study: Environmental Resource and Policy

**Wheat cover crop management changes corn nitrogen requirement, morphology, physiology, and profitability**

**Abstract**

Corn (Zea mays L.) grain is a major commodity crop in Illinois and its production largely relies

on timely application of nitrogen (N) fertilizers. Currently, growers in Illinois and other

neighboring states in the U.S. Midwest use the maximum return to N (MRTN) decision support

system to predict corn N requirements. However, the current tool does not factor in implications

of integrating cover crops into the rotation, which has recently gained attention among growers

due to several ecosystem services associated with cover cropping. The objective of the study

Evaluate the effect of wheat cover crop on corn morphology (plant height), physiology [leaf area

index (LAI)], grain yield, N balances, and end of season nitrate-N for 4 years (2018-2021).

Treatments were laid out in a randomized complete block design (RCBD) with split plot

arrangement and 4 replicates and N fertilizer application rates; for 2018 and 2019, the treatments

were (1) 56 kg N ha1 ; (2) 112 kg N ha-1 ; (3) 168 kg N ha-1 ; (4) 224 kg N ha-1 ; and (5) 280 kg

N ha-1 , and for 2020 and 2021, the treatments were (1) 56 kg N ha-1 ; (2) 112 kg N ha-1 ; (3)

168 kg N ha-1 ;(4) 224 kg N ha-1 ; (5) 280 kg N ha-1 ; and (6) 336 kg N ha-1 . A zero-N control

treatment was also included in the study. Corn yield was highest in the fallow treatment for all

four years and equally had the lowest EONR value except in 2019 where rainfall affected the

corn season. The end of season nitrate-N for fallow treatment tend to rapidly increase after

EONR rate has been deduced when regressed with N balance. For the other cover crop

treatments there is mostly flat or less linear increase nitrate-N concentration despite the higher N

rates because of N-immobilization. Corn was always taller and had greater LAI in the fallow

treatment reflecting on the higher corn grain yield. Residue removal consistently had smaller

plants and LAI. Overall, our findings revealed The EONR for fallow is less than other cover crop

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treatments resulting from yield penalty with inclusion of wheat. The higher N requirement by the

other cover crop treatments (except fallow) may likely result in higher N balance but not higher

end of season nitrate-N because of N-immobilization induced by high above- and below-ground

C-N ratio of the prior wheat.

Graduate Poster Number: 84

Social & Behavioral Sciences/ Health & Human Services

Presenting Author: **Alam, Taha**

Authors: Sawar, Kinan, & Alam, Taha

Advisor: Pre-Approved for Non-Faculty Advised Project

Major/Field of Study: Biological Sciences

**Evaluation of the Clinical Applicability of the HiTOP Psychopathology Classification System: A Systematic Review**

**Abstract**

There is a big debate amongst clinical psychologists, psychiatrists, counselors, and even

lawmakers about a proper method to classify psychopathology. Many systems have been

proposed including single-dimensional, multi-dimensional, and categorical approaches. The

current classification systems being used are the well-known categorical systems DSM-V and

ICD-10. In an effort to improve upon these systems there are new systems that are currently

being researched to determine whether they are more clinically useful with regards to improving

the accuracy of patient diagnosis and patient outcomes. One of these new psychopathology

classification systems is called HiTOP. It is an interlayered dimensional system that

encompasses specific categories into more broad categories. In this study, we will be performing

a systematic literature review using the PubMed database with inclusion criteria containing

studies that investigated the clinical application of the HiTOP system. Exclusion criteria included

studies with fewer than 30 participants. This systematic review suggests that the HiTOP system

is better than the DSM-V and ICD-10 at helping clinicians delineate pathophysiological

diagnoses from one another and is proposed to provide a better framework for improving patient

outcomes than both the DSM-V and ICD-10.

Graduate Poster Number: 16

Physical Sciences, Engineering and Technology

Presenting Author**: Ali, M. Aswad**

Authors: M. Aswad Aliand Punit Kohli

Advisor: Dr. Punit Kohli

Major/ Field of Study: Material Chemistry

**Ranking of Masks Through a Simple Electrical Measurement**

**Abstract**

One lesson we learnt in past couple of years is wearing mask can prevent transmission of COVID-19 viral particles. Although it has been a controversy in the US, but it is not a secret that wearing mask protects people from transmission of microbes. For example, the health professionals have been wearing masks (no exceptions there!) in hospitals and other care giving units for many decades which is known to reduce (minimize) spread of germs. However, the effectiveness of the masks against microbe spread is not completely known. This is because masks are composed of a variety of materials, different number of layers, and the physical and chemical properties of the mask materials also varied considerably. The question should be asked which mask I should wear and what duration a mask remains effective. Therefore, ranking of masks is a crucial question that can provide general public a reliable way communicating the effectiveness of a given mask. Importantly, an easy, cost-effective and reliable method to rank masks is crucial for increasing the public confidence for convincing them to wear masks in public.

In this study, we report a simple method to rank masks based on electrical signal generated by the respiratory moisture droplets from the wearer. Multiple commercial masks (N95, SIUC (cloth/polyester multi-layer mask), single-layer cotton and surgical) that are widely used by general public were categorized. The masks were ranked by comparing the changes in the electrical signal due to breathing and respiration during talking, running, reading, and coughing. The reported electrical sensing material is a soft self-healing conductive polymer composite (CPC) synthesized by infusing graphite micro-particles into three-dimensional poly(co-ester-amide)

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network. The flexibility of CPC allows it to easily coat non-planar surfaces such as masks and other human organs. Different masks were tested for their efficiency by comparing electrical resistance of the outward flow of exhaled breathing droplets/moisture with that of the electrical signals without a mask. We found that the relative efficiency of the pristine masks was >90% for N95 and SIUC masks, but it was <90% for surgical masks. However, when the mask was worn for 5 hours, the efficiency was reduced by 9% for N95 and SIUC, and ~40% surgical mask. These results suggested that long-term effectiveness of a given mask should be evaluated carefully because the initial effectiveness can pose a false sense of peace of mind, but the reality may be otherwise.

The sensor was also applied to measure exhaled moisture content for detecting volume capacity of individuals with asthma. Because the moisture content in the breath for individual with asthma are known to be lower than people without asthma, the sensor provided relevant signal for people with asthma. In addition, we employed the sensors to detect the moisture content variation in the exhaled breath after drinking coffee, coke, and smoking cigarette and vape. Interestingly, vape yielded the lowest signal 5 times lower than the control breathing, whereas others reduced to half. We believe the composition of the exhaled moisture contribute to difference in the electrical response of the sensor. Molecules containing -OH group appears to provide enhanced signal whereas molecules containing other functional groups (e.g., propylene glycol (PG), cinnamaldehyde, vegetable glycerin (VG) etc.) in the vape yielded a smaller signal. Therefore, potential increase in the polar molecules in the breath is attributed to increase in the signal. This is further confirmed in experiments where the signal for fully hydrated individual was about twice as compared to the same individual in under-hydrated and dehydrated conditions. Therefore, the reported methodological approach could be applied to variety of applications, and it potentially could provide crucial information regarding physical conditions of human body. Other potential applications of these flexible coatings include sensing relative humidity, breath rate monitoring, and hydration and water content in the breath of human and animals.

Graduate Poster Number: 04

Physical Sciences, Engineering & Technology

Presenting Author: **Azme, Anika**

Advisor: Dr. Mehnaz Shams

Major/Field of Study: Civil Engineering

**Co-transport Behavior of Microplastics and Heavy metal through Saturated Porous Media**

**Abstract**

Microplastics (MPs) are being produced everyday commercially or through degradation of discarded plastic-based products. This emerging contaminant has been observed to be widely accumulated in the environment for their inert nature. Due to their large surface areas to volume ratio and different functional groups, MPs can adsorb heavy metals, which themselves, due to their toxicity and bio-accumulative nature, are environmental pollutants. When present in the environment together, presence of heavy metals can influence the transport behavior of MPs. Focusing on this issue, this study investigated the co-transport behavior of polystyrene (PS) MPs and Cu under the influence of various ionic strength (IS). Bench scale sand packed column experiment and batch adsorption experiment were conducted to observe the transport behavior and the interaction mechanism between metal and MPs respectively. Results showed that, PS mobility decreased with increasing IS, in the absence of metals due to the secondary energy minima. Similarly, Cu showed very low mobility (maximum 10%) even at high IS with the absence of MPs, which could be due to the adsorption of positive metal on the negatively

charged sand. However, during co-transport, PS mobility decreased even further (30%) compared to their transport phenomena in absence of metal. This might be due to MP- Cu complex formation and their subsequent adsorption of the porous media. On the other hand, metal showed higher mobility during their co-transport with MPs, which can be caused by competition between MPs and Cu for the adsorption sites on the porous media. Overall, the results of this study indicated that the interaction between MPs and Cu influenced their transport behaviors in the saturated sand columns under various IS. This study would be helpful in predicting fate and transport of MPs in the presence of other contaminants in the aquatic environment.

Graduate Poster Number: 33

Physical Scimeces, Engineering & Technology

Presenting Author:**Barfknecht, David**

Authors: Barfknecht, David, Alice Heiken, and David J. Gibson

Advisor: Dr, David Gibson

Major/Field of Study: Plant Biology

**Taxonomic, phylogenetic and functional shifts in natural xeric forest openings over 31 Years**

**Abstract**

Before pre-European settlement, a large majority of Illinois land was prairies or hardwood forest.

However, several ecosystems have been anthropogenically modified, resulting in severe fragmentation of these natural ecosystems. Natural xeric forest openings (NXFOs), some of the remaining natural areas in southern Illinois, harbor transitional plant communities between the previously-vast prairies and hardwood forests. Previous research in NXFOs identify that their vegetation depends upon edaphic conditions. Also, continuous threats to community stability and resilience persist, including exotic invasion and climate change. This research attempted to evaluate community compositional shifts, 2) determine community drivers, 3) identify indicator species for substrate types and surveys, and 4) investigate phylogenetic and functional signal in these NXFO communities. Surveys and environmental data collection occurred in 1989 and 2019 across 19 NXFOs, and both phylogenies (based on rbcL and matK nucleotide sequences from GenBank) and functional trait dendrograms (based on leaf nitrogen content, specific leaf area, plant height, and growth form traits from the TRY database) were constructed. Multivariate analyses (NMDS, repeated-measures PERMANOVA, PERMDISP, and vector analyses) were used to assess compositional shifts and significant drivers based on community composition for

substrates and surveys. Indicator species analyses were conducted to identify indicator species for substrates and surveys. Using both phylogenies and the dominant species-based functional dendrogram, phylogenetic and functional signal (based on Blomberg’s K) was investigated for each substrate during individual surveys and across surveys. Results showed community compositions stable and resilient over surveys, while still distinct based on substrate type. Vector

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analyses identified soil and light variables as the most influential environmental drivers of community dissimilarity. Several indicator species were identified for each substrate across surveys, but only indicators for the 2019 surveys were observed. No incidence of phylogenetic signal was observed, but significant functional signal was observed for overall sandstone and shale substrates and for sandstone sites in 2019. In conclusion, regardless of potential

disturbance threats to NXFO communities, they remain stable and resilient, while distinct based

on substrates. Environmental drivers related to light and soil conditions strongly drive differences in community composition. Indicator species discovered are representative of different substrate types in these NXFO communities and many are similar to those observed in previous studies. While lack of overall phylogenetic signal indicates evolutionary relationships do not determine community assembly, certain substrates exhibit functional signal and indicate that sites may favor certain functional groups.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 08

Physical Scimeces, Engineering & Technology

Presenting Author: **Bartelsmeyer, Nicholas**

Advisor: Dr. Prabir Kolay

Major/Field of Study: Civil Engineering

**Effect of Pueraria Montana as Natural Fiber Reinforcement in Ordinary Portland Cement Concrete**

**Abstract**

Concrete is often reinforced to help cope with the pulling or tensile forces being exerted. By utilizing an invasive species of vine as reinforcement which already grows well in North America, a ready source of material could be realized and put into use quickly and effectively cutting emissions and spending on reinforcement. Tensile reinforcement in Ordinary Portland Cement concrete comes in many forms and is currently made of many different materials. Natural fibers such as hemp and sisal have been explored mainly in the form of non-orientated strain reinforcement. In this method of reinforcement, the fibers create a non-uniform, non-orientated matrix within the concrete form as they are randomly poured into place with the concrete. This method has proved successful with steel, glass, and to a lesser extent, sisal and hemp. By using similar methods Kudzu or Pueraria Montana, has been explored as a natural fiber reinforcement. Preliminary results based on ASTM C39 provide an outlook on the feasibility of Kudzu as a fiber reinforcement material. This preliminary data is attached in a graph. More tests will provide further data on the fiber’s impact on compressive strength. The least concrete mixture showing the least

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degradation to compressive strength will be tested for tensile strength against a non-reinforced sample. These samples will then be submitted for micro and macro structural analysis.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 54

Life Sciences

Presenting Author: **Bates, Valerie**

Advisor: Amer AbuGhazaleh

Major/Field of Study: Animal Science - pre-vet

**The Use of Nanoparticles to Reduce Polyunsaturated Fatty Acids Biohydrogenation in Ruminant Animals**

**Abstract**

Polyunsaturated fatty acids (PUFA), such as the omega-3 and 6, are considered essential fatty acids in animals’ diets. Microbes present in the rumen of cows saturate most of the dietary PUFA through the process of biohydrogenation causing few of them to make it all the way to the small intestine for absorption. The purpose of this experiment was to see if dietary PUFA could be partially protected from rumen biohydrogenation by using oil nanoparticles. To test this, we created a nanoparticle from an emulsified flaxseed oil which is high in PUFA. The oil was first emulsified in a solution made of flaxseed oil, water, and Tween 80, and mixed continuously for 1 hour and 40 minutes. Immediately afterwards, the emulsified oil was subjected to sonication for different amounts of time. The first sample (A) was the control and was not sonicated; sample B was sonicated for 1 minute on, 10 seconds off for a total of 4 minutes; sample C was sonicated for 4 minutes straight. The oil samples were then tested for PUFA biohydrogenation using a batch rumen culture. The batch culture was carried under anaerobic condition in three 250 mL glass jars containing 80 mL rumen fluid, 120 mL buffer, plus the oil samples. Samples for fatty acids analysis were collected from jars at 0 and 10 hours while being stirred to estimate the degree of PUFA biohydrogenation. Collected samples were freeze dried, then analyzed for fatty acids composition using gas chromatography (GC). At 10 hours, results showed that sonicated treatments for 4 minutes straight have reduced biohydrogenation of C18:2n6 to 29.0% and C18:3n3 by 20.9%, as compared to the control which was 45.6% and 51.5%, respectively. The

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experiment was thus successful in reducing the biohydrogenation of PUFA in the rumen through the production of nanoparticle oils. This can be used to significantly increase the supply of PUFA to cow’s body tissues to improve cow’s heath and increase fertility, changing the world of animal nutrition.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 39

Life Sciences

Presenting Author**: Becker, Lily**

Authors**:** Becker, Lily, Elysia J. Lewis, Mirian F. Pimentel, Jason P. Bond, and Ahmad M. Fakhoury

Advisor: Dr. Fakhoury/ Dr. Bond

Major/Field of Study: Crop, soil, environmental management

**Characterization of endophytes with potential biocontrol activity against soilborne**

**pathogens and their beneficial effects on plant health**

**Abstract**

Endophytes are microorganisms that reside within plant tissue, with the hosts remaining asymptomatic. Endophytes colonizing plant tissue can provide the plant with essential metabolites, improve fitness, and help with enhancing resistance to pathogens. *Fusarium graminearum* is a corn, wheat, rice, barley, and soybean fungal pathogen. It is also responsible for the disease Fusarium head blight (FHB) and the contamination of infected grain by the mycotoxin Deoxynivalenol (DON). We evaluated six different fungal endophyte species against *F. graminearum*. We characterized the endophyte isolates and assessed their effect on corn plant health in vitro and in vivo, and their biocontrol activity against *F. graminearum*. We were able to evaluate this through greenhouse trials, seed pathogenicity assays, as well as dual plate assays. We found that all six endophyte isolates were able to reduce *F. graminearum* severity in vitro. We also found that some isolates increase corn root and shoot weight in the presence of the pathogen and reduce root rot in vivo. We also evaluated the interactions between *F. graminearum* and each endophyte isolate in vitro. This preliminary data will allow us to evaluate

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the biocontrol potential of these species further, and to investigate the biology of their interaction with *F. graminearum.*

Graduate Poster Number: 46

Life Sciences

Presenting Auithor: **Berberich, Justin**

Authors:Berberich, Justin, Andrew Margenot, Rosa Ibarra López, John Pike, Amir Sadeghpour

Advisor: Amir Sadegepour

Major/Field of Study: Soil Science

**Does Precision Planting of Cover Crop Mixtures Improve Soil Health Indicators?**

**Abstract**

Growing winter cereal cover crops (WCCCs) has been identified as an effective in-field practice to reduce nitrate-N and phosphorus (P) losses to Upper Mississippi River Basin, USA. In the Midwestern USA, growers are reluctant to plant WCCCs prior to corn (Zea mays L.) due to N immobilization and establishment issues. Two tactics to minimize these issues are (i) incorporating legumes and brassicas into WCCCs as mixtures and (ii) precision planting of cover crops. The objective of this study was to (i) evaluate the effect of cover crop mixtures vs a no-cover crop control on soil chemical and biological properties and (ii) assess whether precision planting increase or decrease soil nutrients, soil permanganate oxidizable carbon (POXC) and carbon (SOC) stocks “on” and “off” the corn row over three depths (0-5, 5-20, and 20-90 cm) after five years. Treatments were (i) a no-cover crop control (NCC); (ii) no cover on corn row, hairy vetch (V) on middle row, and winter cereal rye (WCR) on the outside row of corn (NOVR); and (iii) oats and radishes on the corn row, V on the middle row, and WCR on the outside row (ORVR). Our results indicated NCC had lower SOC stocks than the NOVR and ORVR only at 0-5 cm depth. We found that POXC was more sensitive to changes in soil C and POXC was higher in ORVR at 2-8 cm than NCC. At 0-5 cm depth, cover cropping increased soil test P (STP). Soil test P declined over depth reflecting its immobility in the soil. Soil test K (STK) was higher in cover crop treatments than the no-cover crop control at 0-5 cm depth. Soil test K was higher on corn row indicating both cover crops (oats plus radishes) and corn decomposition and release of K increases STK. Soil test sulfur was similar among treatments but

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higher at 20-90 cm depth reflecting S leaching. These results indicate cover cropping can benefit soil after five years.

Undergraduate Poster Number: 82

Social & Behavioral Sciences/Health & Human Services

Presenting Author: **Blonigen, Sterling**

Advisor: Ankitah Sahu

Major/ Field of Study: Psychology

**Understanding the Role of U.S. History Education on Cultural Competency**

**Abstract**

Cultural competency, as defined in past research, is a form of knowledge one showcases in diverse cultural groups; this can be in terms of both attitude and skill in response to cultural diversity. Though society recognizes its importance, it can be argued how mindful the United States school system is of this concept, specifically regarding its history education. In terms of United States history education, there is an overall lack of consideration regarding cultural competency which can be detrimental to students. This study analyzes previous and current studies of American history education in relation to level of cultural competency in American students to examine if there is correlation. Cultural competency in students is calculated in this study through utilization of the QDI (Quick Discrimination Index) instrument.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 01

Physical Sciences, Engineering & Technology

Presenting Authors: **Boehl, Zachary, Fernandez, Nelson**

Advisor: Dr. James Mathias

Major/Field of Study: Mechanical Engineering

**Weatherization of Polylactide for Rapid Manufacturing Affordable Wind Turbines with Common Materials for Disaster Relief**

**Abstract**

Natural disasters result in billions of dollars of destroyed items and grid infrastructure in developing areas until relief is provided. Providing educational resources and specialized parts to empower individuals living in developing, disaster-prone areas with high wind resources may lead to the energy opportunity of power generation for small electrical devices. With the use of polylactide (PLA), a thermoplastic polyester, the most commonly used filament for personal use 3D-printers, parts for small wind turbines can be rapidly manufactured. However, PLA is known to rapidly deteriorate due to exposure to the sun and inclement weather. This research explores methods for minimizing the material’s deterioration. 3D printed PLA specimens in compliance with the ASTM D638 standard for performing a tensile test was implemented. Various post-treatments of widely available materials accessible to the average person were applied to the specimens with a thin coating. \* The specimens were placed on a green roof, with half of each specimen anchored into the soil. This exposed each to the moisture in the ground and the UV rays of the sun. After three weeks, the specimens were gathered and their strengths were tested using a Universal Testing Machine (UTM). Based on the results, none of the post-treatments resulted in significant characteristics than either the control groups. For furthering our research, we will continue to seek post-treatment materials for reducing the deterioration due to weather exposure as well as methods for enhancing the parts while printing to yield longer design life. *\*The control groups included one exposed to weather and one sealed in a weatherproof container indoors.*

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*Index Terms—Wind Turbine, Optimization, Wind sensors, Blade Design, Material Selection, Computational Fluid Dynamics.*

Undergraduate Poster Number: 37

Life Sciences

Presenting Author: **Budde, Emily**

Advisor: Diana Sarko, PhD

Major/Field of Study: Biomedical Sciences, Pre-veterinary

**Effects of Common Anesthetic and Analgesic Administration in Naked Mole-Rats**

**Abstract**

Naked mole-rats are atypical animal models but are increasingly being used for scientific

research. Their irregular pain sensitivity, metabolic adaptations, and thermoregulation make

them an interesting model but create unknowns in our understanding of their responsiveness to

varying anesthetics and analgesics. Examples of common anesthetic drugs used in rodent

research are ketamine, urethane, xylazine, sodium pentobarbital, and isoflurane. While these

drugs have proven to be successful anesthetics (alone or in combination), they caused different

responses in the animals. However, comparisons of the effectiveness of these drugs and their

ideal dosages have yet to be reported in naked mole-rats. The purpose of this project was to

report our findings regarding the optimal drug and dose combinations to use in different

experimental procedures. Urethane (ethyl carbamate; 1.4 g/kg, i.p.) was the most successful drug

for non-survival surgeries keeping the animals sedated for up to 12 hours. A mixture of 75 mg/kg

ketamine and 5 mg/kg xylazine (i.p.), but not ketamine alone, proved to be the most successful

for acute survival surgeries such as tooth extraction. We also demonstrated that a 2-3%

concentration of isoflurane (inhalation) worked well for procedures requiring short-term sedation

(e.g., microchipping or neuronal tract tracing). Euthasol administered in high doses was effective

for euthanasia, whereas sodium pentobarbital administered in low doses could be useful for

short-term surgeries. Lidocaine and articaine worked efficiently as topical, subcutaneous, or

intra-gingival analgesics. These results shed light on optimal drugs and doses for inducing and

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maintaining anesthesia and analgesia in naked mole-rats, allowing future studies to target

mechanisms of nociception in this atypical animal model.

Graduate Poster Number : 24

Life Sciences

Presenting Author: **Burkett, Carmen**

Advisor: Sedonia Sipes

Major/Field of Study: Plant Biology

**Assessing the Efficacy of Lepidopterans as Pollinators in a Midwestern Pollination Network**

**Abstract**

Understanding pollinator-plant interactions within a community is of immense importance to both conservation and agriculture. Not all floral visitors are pollinators though as pollinator quality is variable and dependent on several factors, and the efficacy of lepidopterans as pollinators is not particularly well known. Butterflies seem to exhibit higher floral constancy than bees in many cases, however many studies suggest that the relationship between butterflies and plants in many cases may be more parasitic than mutualistic. This project explores the role of lepidopterans as pollinators in southern Illinois using a regional pollinator collection and associated database, using a combination of pollen analysis and a network approach. One way to assess pollinator efficacy is examining the placement and quantity of pollen carried on a pollinator. In this project, pollen presence was scored by estimating the amount of pollen grains carried on a pollinator to the nearest ten grains. Another tool for assessing an insect's potential role as a pollinator is to examine pollination or visitation networks, so floral associations recorded with each specimen were used to form visitation networks. As expected, the specimens in the families Papilionidae, Sphingidae, and Nymphalidae had the highest percentage of individuals carrying pollen. No individuals were recorded with pollen from the specimens in the families Attevidae, Crambidae, Tortricidae, or Geometridae. Comparison of pollen presence data with visitation networks suggests that many species that seem to be “important” pollinators according to the visitation networks are in most cases actually carrying little to no pollen.

Undergraduate Poster Number : 07

Physical Sciences, Engineering & Technology

Presenting Author: **Burkett, Francesca**

Advisors: Dr. Hummer, Dr. Ken Anderson

Major/Field of Study: Geology and History

**Modeling Magma Production Beneath Subduction Zones**

**Abstract**

The Earth’s crust is separated into many plates of various sizes, which are called tectonics plates. When tectonic plates interact with each other, three different types of boundaries can occur. Subduction zones occur at convergent boundaries, where two plates are colliding with each other. The denser, older, and colder plate is subducted under the other plate. As the heavier plate pushes under the younger, lighter plate, it pulls down on the mantle, creating a convection cell that brings hotter material up under the younger plate. Since pressure decreases, this hotter material can keep rising and melting, which creates the volcanic activity behind a subduction zone. My research focused on determining what parameters affect the total amount of magma, under fractional conditions, in subduction zones. Melt production depends on a multitude of variables, such as mineral composition, water content, age of the plate, dip angle of the plate subducting, rate of convergence, age of the slab, and length of the forearc. It has proven challenging to understand how melting changes when any single factor, or combination of these factors, changes. This project modeled how different parameters influenced total melt in a subduction zones when held under fractional melting conditions as compared to batch melting conditions.

Undergraduate Poster Number : 02

Physical Sciences, Engineering & Technology

Presenting Author: **Burkett, Francesca**

Advisors: Dr. Hummer, Dr. Ken Anderson

Major/Field of Study: Geology and History

**Abstract Mineral Analysis of Roman Concrete**

**Abstract**

For centuries, Roman architecture has amazed visitors with wonders such as the Pantheon, Colosseum, Roman Forum, and aqueducts. One reason these buildings stood for so long was that the Romans created them with their own form of concrete, *opus caementicium*, decorated with frescos or rock slabs, especially marbles. Many of these structures have withstood the elements for over 2,000 years. Several ancient scholars referenced the concrete, including both Pliny the Elder and Marcus Vitruvius Pollio. The first known uses of Roman Concrete seem to be from about 200BC, in the town of Pozzuoli, Italy, where builders incorporated volcanic ash in a lime mortar, giving the ash used in Roman concretes the name pozzolana ash or *pulvis puteolanus*. Pozzolana volcanic ash is composed of siliceous and aluminous minerals, or siliceous-aluminous materials. When combined with room temperature seawater and calcium hydroxide, the ash reacts with calcium hydroxide (slaked calcium oxide). Insoluble calcium silicate hydrate and calcium aluminate compounds form in this reaction, and these binds, creating mortar with cementitious properties. This project examined how the combination of seawater, lime, and volcanic ash changes the minerology of volcanic ash in Roman Concrete. Additionally, samples were subjected to the ASTM C39 Concrete Cylinder Compression Tests

Graduate Poster Number: 72

Social & Behavioral Sciences/Health & Human Services

Presenting Author: **Campbell, Sarah & Orozco-Barrios, Laurent**

Advisors: Lesley Shawler, Lilith Reuter-Yuill, Manish Goyal

Major/Field of Study: Behavior Analysis and Therapy

**Enhancing Discriminated Communication for Emergent Communicators**

**Abstract**

Recent studies have extended the research on multiple schedules since it has brought benefits to the field of behavior analysis with socially significant applications. Currently, practitioners are using multiple schedules to promote stimulus control on high-rate appropriate behaviors, to implement functional communication training, and to gain stimulus control over challenging behaviors maintained by negative reinforcement. This study was conducted with a five-year-old, male, diagnosed with Autism Spectrum Disorder (ASD) and no vocal behavior. A multiple schedule was implemented during ABA sessions to evaluate the effects of different signaled exposure times on communication discrimination. Secondary effects on challenging behaviors were also evaluated.

Key words: Multiple schedules, Picture Exchange Communication System

Graduate Poster Number: 17

Physical Sciences, Engineering & Technology

Presenting Author: **Caselato Gandia, Guilherme & Winn, Jackson**

Authors: Guilherme C. Gandia, Jackson Winn, Connor C. Seavers, Dr. James Mathias, Dr. Tsuchin P. Chu

Advisor: Dr. Tsuchin P. Chu

Major/Field of Study: Mechanical, Aerospace, and Materials Engineering

**Rail Base Defect Detection via Line Scan Thermography**

**Abstract**

High-speed, in-motion detection of defects in active railways has become a primary focus in nondestructive testing (NDT) research and development efforts in the rail industry today. This investigation aims to provide further insight regarding the dynamic application of infrared thermography (IRT), namely line-scanning thermography (LST), for the detection of rail-base defects. A 3D finite element analysis (FEA) model was developed to first determine feasible parameters for the experimental setup, then subsequently employed for comparison with experimental results. To perform the experiments, mild steel samples were heated first by passing beneath an IR line heater (2000W) then immediately observed with an IR camera to capture the thermal response. Results showed that for a thin steel specimen having stepped thickness (3.175 mm, 6.350 mm), a thermal contrast of 4.1ºC could be detected when inspections were performed at ~48.0 mm/s, revealing an agreement of roughly 95% with experimental results. In the case of thick steel samples containing bottom-drilled holes (BDHs), both experimental and analytical results showed that thermal contrasts of ~1ºC could be detected in regions above BDHs. Finally, performing LST on a rail-base sample containing BDHs yielded a contrast of 4.2ºC when moving at 40 mm/s.

Keywords: infrared thermography, line scanning thermography, rail inspection.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 55

Creative Expressions

Presenting Author: **Cicero, Julia**

Advisor: Prof. Darryl Kent Clark

Major/Field of Study**:** Musical Theater

**Dance to Live: Keeping the Arts Alive**

**Abstract**

The coronavirus pandemic severely limited the amount of performance opportunities available to both undergraduate theatre students and working professionals. The goal of this project was to revitalize the artistic community by creating an original dance piece during the Covid-19 pandemic. Specifically, this project focused on creating choreography that combined tap dance and Baroque music, and it was to be performed by SIU Musical Theatre students and members of the professional dance company #TapLife. The completion of this piece would subsequently enrich the education and career trajectory of SIU Musical Theater students, and it would demonstrate to both the Carbondale and wider theatre community that the arts were still flourishing. To achieve this goal, three SIU Musical Theatre students rehearsed weekly at SIU from August through February, the students participated in a week-long residency with the #TapLife company in New York City, and the students performed the piece publicly three times: at a preliminary showing in NYC with #TapLife, via life performance and livestream; a second live showing at SIU with members of the Southern Illinois Dance Company; and a final performance of the piece at SIU with the #TapLife company, which was also livestreamed. This project successfully fostered artistic growth in SIU students and members of the Carbondale community, indicated by improvement in the students’ tap technique and the establishment of professional connections, an increasingly large turnout for each performance of the piece, and positive responses from audience members following the final performance.

Undergraduate Poster Number: 49

Life Sciences

Presenting Author: **Collins, Carter & Stoecker, Cas**

Advisor: Dr. Harvey Henson

Major/Field of Study: Zoology, Biological Sciences/Microbiology

**Abstract**

Modern day horsetails (genus Equisetum) have been shown to utilize Silicon dioxide (silica)

within their tissues to aid in structural integrity, prevent water loss, and possibly aid in the

deterrence of herbivory. The necessity of silica for survival of modern-day horsetails raises

questions regarding the evolutionary history of this requirement, especially in extinct lineages

that are well preserved in the fossil record. One such extinct lineage, genus Calamites, which

lived in the Pennsylvanian period (Carboniferous 290-300 MYA) is well preserved in the Illinois

Basin fossil record. Using fossil samples collected from the energy shale member of the

Carbondale formation, scanning electron microscopy (SEM) and energy dispersive X-

ray spectroscopy (EDS) were used in an attempt to detect the usage of silica in these

ancient horsetail ancestors.

Undergraduate Poster Number: 63

Social & Behavioral Sciences/Health & Human Services

Presenting Author: **Cooper, Kayla**

Advisor: Dr. Karla K. Fehr

Major/Field of Study: Psychology

**The Relationship Between Disruptive Behavior and Imagination, Organization, and Comfort in Pretend Play**

**Abstract**

Both disruptive behavior and pretend play have been identified as influential factors in child development, and more specifically in the development of adaptive functioning, such as coping. Despite both factors occupying influential roles in child development, existing research has neglected to examine connections between disruptive behavior and pretend play. Existing literature has also singularly focused on parent and teacher measures of disruptive behavior in relation to play without considering how relationships may shift when these behaviors occur during play. The present study attempted to address these gaps by assessing: (1) the relationship between disruptive behavior outside of play and imagination, organization, and comfort, (2) the relationship between disruptive behavior during pretend play and imagination, organization, and comfort. Participants included 67 children ages 4-5 who were collected as part of a larger longitudinal study looking at pretend play and coping. Disruptive behavior outside of play was measured using the BASC-2 Externalizing Problems score and a frequency count was used to determine the total amount of disruptive behavior present during a five-minute standardized pretend play task. The APS-P-BR was used to gather participant scores of Imagination, Organization, and Comfort. Results of this study indicated that disruptive behavior during play is significantly negatively correlated with organization and comfort in play, and negatively related

to imagination. Results also indicated that a weak positive trend exists between disruptive behavior outside of play and imagination, organization, or comfort in play. These findings suggest that disruptive behavior that occurs during play can impact certain play processes.

Key Words: disruptive behavior, pretend play, imagination, organization, comfort

REACH Award Winner 2021-2022

Undergraduate Poster Number: 40

Life Sciences

Presenting Author: **Daniels, Tiana**

Authors: Daniels, Tiana, Michael E. Egan, Nicole T. Gorman, Dr. Guillaume Bastille-Rousseau

Advisor: Dr. Guillaume Bastille -Rousseau

Major/Field of Study: Zoology, Animal Biology

**lmpact of student presence on space-use of SIU white-tailed deer**

**Abstract**

White-tailed deer are a part of the natural fauna of Carbondale and easily spotted on SIU's campus and around town. As the student population prepares to return to campus, encounters with wildlife may become more frequent, potentially altering deer behavior. The goal of this project is to evaluate how deer on SIU's campus are changing their movement as the student population on campus fluctuates. This preliminary project will focus on developing approaches for characterizing deer movement to evaluate changes in the use of campus grounds and in deer behavior. GIS data for the month of June will be used to characterize deer hotspots. Hotspots will be mapped and observed to quantify the variables potentially appealing to white-tailed deer. Collared deer will be observed in their natural habitat and categorized as individuals or groups. The overall project will provide a better understanding of deer behavior in an urban setting and could assist campus leaders regarding potential issues associated with deer-human interactions.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 36

Life Sciences

Presenting Author: **Dennis, Samantha**

Advisor: Harvey Henson

Major/Field of Study: Zoology

**Multidisciplinary Geophysical and Zoological Investigation of Burrowing Crayfish**

**Abstract**

A geophysical technique known as ground penetrating radar (GPR) uses electromagnetic energy to image and recognize objects and structures below the ground surface. This practice has been used in multiple engineering, geological and archaeological areas of study. However, with more modern research, this GPR practice has become even more interdisciplinary and is now being used for zoological research. For example, some studies have used GPR to image burrows of wombats, badger, and pocket gopher tunnels. SIU researchers were the first to image crayfish burrows using GPR methods. Building on this work, I explored using a newly developed GPR antenna technology to collect ultra-high resolution (1-5cm) subsurface images at two different crayfish sites possibly occupied by primary burrowers in an upland setting and secondary burrowers located closer to a lake.

Graduate Poster Number: 19

Physical Sciences, Engineering & Technology

Presenting Author: **Dennison, Mead Merrill**

Advisor: Dr. Tsuchin Chu

Major/Field of Study: Mechanical Engineering

**Labeling Seeded Defect regions in In-situ Optical Tomography Images**

**Abstract**

Methods for automatically detecting and localizing defects are highly sought after in the world of

non-destructive testing and evaluation (NDT&E). Machine Learning (ML) and Deep Learning (DL) algorithms have performed well in this area but require labeled training examples. Production of such labeled examples often requires human intervention and the performance of a given ML/DL model depends on the quality of the features used for training. This investigation aims to provide insight into the process of obtaining labeled training examples from NDE image data for application to ML and DL. The need for accurate defect detection methodologies is particularly stark in metal additive manufacturing (AM) processes, which are prone to producing numerous and disparate process defects. This propensity for metal AM processes to produce defects severely limits their incorporation into end-use component production lines. Methodologies that can accurately detect and localize defects during the manufacturing process are critical to additively manufactured component qualification efforts. This investigation details just one step in the ML/DL training process, specifically the defect labeling process, applied to optical tomography images obtained from in-situ monitoring the selective laser melting (SLM)

process.

Graduate Poster Number: 20

Life Sciences

Presenting Author: **Dissanayake, Lakshika**

Authors:Dissanayake, Lakshika**,** Sandipty Kayasth, Ryaan Ligon, Abigail Sparks, Ahmad Zatar, Sandhya Jayasekara, Lily Becker, Lahiru N. Jayakody

Advisor: Dr Lahiru Jayakody

Major/Field of Study: Microbiology

**Rewiring aromatic catabolism of *Erwinia aphidicola* LJJL01 to produce high-value platform chemicals**

**Abstract**

Novel synthetic biology tools and metabolic engineering approaches enable the development of efficient cell factories that converts lignocellulosic biomass and synthetic feedstock into high value compounds1,2. In this aspect, using a novel ‘non-model’ host strain for industrial applications looks encouraging3. A novel, robust bacterium Erwinia aphidicola LJJL01 genome sequence reveals the metabolic potential, which was further confirmed by our phenomic studies. Despite the strain lacking the capability to catabolize compounds such as protocatechuate (PCA), which is an important intermediate of the aromatic metabolic pathway, we identified that one of the native plasmids harbors the entire homoprotocatechuate gene cluster for PCA catabolism. We engineered E. aphidicola LJJL01 to overexpress PCA catabolic genes, and whereby the engineered strain could utilize both PCA and 4-hydroxy benzoate as the sole source of carbon. Enabling PCA catabolism ensures the biofunneling of lignin-derived compounds and synthetic aromatics to produce high-value platform chemicals such as β-ketoadipate. In addition, we are currently working on connecting the pathways to valorize synthetic plastic-derived terephthalic acid (TPA) to produce cis,cis-muconate via PCA. For this purpose, we have heterologously expressed TPA transporter and catabolic genes from Comamonas sp. strain E6 to gain the ability to use TPA as a sole source of carbon while deleting the catB gene that is responsible for

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directing cis,cis-muconate towards tricarboxylic acid (TCA) cycle. We expressed the protocatechuate decarboxylase gene to convert PCA to catechol and currently exploring the overexpression of catA gene for efficient conversion of catechol into cis,cis-muconate. Overall, we demonstrated through our study that E. aphidicola LJJL01 is a promising candidate as a model organism for upcycling aromatics into high-value platform chemicals.

Keywords: *E. aphidicola* LJJL01, protocatechuate, *cis, cis*-muconate, synthetic biology, metabolic engineering

Reference: 1Dissanayake and Jayakody., Front. Bioeng. Biotechnol., 2021, 9:656465, 2Mohendano et al., Synth. Syst. Biotechnol., 2022, 7:533-540, 3Riley and Guss., Biotechnol. Biofuels., 2021, 14:30-36

Acknowledgements: New faculty startup funding from the OVCR and the FSI at Southern Illinois University Carbondale.

Undergraduate Poster Number :30

Life Sciences

Presenting Author: **Dix, Sydney**

Authors: Dix, Sydney, Zachary Gutenkauf, Bethany Egge, Dominique Lavorini, Jonathan W.F. Remo, Marjorie Brooks, Scott D. Hamilton-Brehm

Advisor: Dr. Scott Hamilton-Brehm

Major/Field of Study: Biological Sciences

**Microbially Mediated Denitrification of The Dogtooth Bend Floodplain**

**Abstract**

The overall mechanisms by which floodplains store and process nutrients such as nitrogen, carbon, and phosphorus are not well understood. Over the last decade, a significant increase in nitrate in the Mississippi River (primarily caused by runoff from agricultural fertilization) has led to eutrophication. Eutrophic conditions promote and exasperate harmful algal blooms that in turn cause light reduction from excessive macroalgae and phytoplankton blooms and hypoxia, a reduction of dissolved oxygen levels through increased decomposition. These events negatively impact recreational and commercial fisheries harming marine organisms, threatening spawning, and disrupting migration habitats, ultimately causing hundreds of millions of dollars in damages yearly in the United States alone. In 2016 the Mississippi River swelled and breached the Len Small Levee causing flooding across the Dogtooth Bend region. Geochemical monitoring recorded a significant decrease in nitrate across the floodplains of the Dogtooth Bend region, amounting to gigatons of nitrogen being removed. The cause was unknown, but it was hypothesized that the soil microbial communities could be involved through a metabolic process called denitrification. Through four key enzymatic steps, denitrification reduces nitrate to nitrite to nitric oxide to nitrous oxide and finally to dinitrogen which is a gas. To test this hypothesis soil core samples have been collected in a transect across a four-mile stretch throughout the floodplains of the Dogtooth Bend region periodically for one year. Total DNA was extracted

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from the soil core samples to be assayed by PCR for the presence of the key denitrification enzymes. Here we present our preliminary findings of denitrification enzyme screening of sediment samples. The primary goal of the ongoing work at Dogtooth Bend is to quantify denitrification rates and develop a more robust understanding of the transformation of nitrogen within the groundwater system beneath this floodplain area.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 66

Social & Behavioral Sciences/Health & Human Services

Presenting Author: **Dodson, Kaitlyn**

Advisor: Dr. Karla Fehr

Major/Field of Study: Psychology

**Abstract**

The evaluation of the relationship between pretend play and positive affect in children is valuable due to the crucial role of pretend play in social and emotional development and the importance of positive affect in the overall well-being of children. In this study, 36 children (58.3% female; 77.8% white, non-Hispanic) between 4-5 years of age (M = 55.47 months; SD = 5.62) were recorded as part of a larger study on pretend play. Participants completed a 2-hour long assessment and participated in an unstructured play condition. The APS-P was coded to obtain pretend play scores. In addition, the PCIRS was used to code the mood of the child immediately prior and following the play intervention. I hypothesized that there would be a significant change in affect from before to after the play condition. Further, I hypothesized that each subscale in the APS-P (Organization, Elaboration, Imagination, Comfort, and Variety and Frequency of Affective Themes) would individually predict change in positive affect. Results showed no significant change in affect from before to after the play condition. The overall model predicted seven percent of the variability in change of positive affect, but none of the individual

predictors showed statistical significance. These findings suggest that engagement in a brief 5-

minute play task did not contribute to change in positive affect and that specific aspects of play

did not predict change in affect.

Undergraduate Poster Number: 61

Social & Behavioral Sciences/Health & Human Services

Presenting Author: **Doyle, Shannon**

Advisor: Dr. Mary Louise Cashel

Major/Field of Study: Psychology

**Stress and Coping Among DCFS Child Welfare Professionals: Identifying Strategies to Address Turnover**

**Abstract**

Child welfare is a demanding industry that requires significant emotional labor on the part of

workers. Although there is plenty of research on stress and burnout amongst child welfare

workers, little of that research is specific to the United States Department of Child and Family

Services (DCFS). This study aims to analyze information on the Illinois DCFS to identify the

most stressful elements of employment at the agency, what coping strategies are being utilized

by employees and what further resources could be provided by DCFS in order to increase job

satisfaction and decrease job turnover. This study analyzes data collected by the Department of

Quality Enhancement at DCFS, from the Southern Illinois region (5A), using an online survey.

The survey measures stress using the Child Welfare Worker Stress Inventory (Levy et al, 2014)

and the Brief COPE (Carver, 1997), and Trauma-Informed Self Care (Salloum, et al. 2015).

Additional questions collected quantitative data on demographics and length of employment, and

an open-ended portion collected qualitative data on the resources employees would like to see

provided by the agency. The present study aims to analyze data from said survey, to

understand relationships between specific stressful elements of employment, strategies for

coping, and practices of trauma-informed self-care in hopes to address high levels of caseworker

turnover that ultimately have a negative impact on children in foster care.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 26

Life Sciences

Presenting Author: **Duran, Emily**

Advisor: Dr. Karen Renzaglia

Major/Field of Study: Plant Biology

**Abstract**

Many mosses are desiccation tolerant, meaning they can withstand drought and resurrect upon

rehydration. Current research on desiccation tolerance focuses primarily on the physiology of plants. However, much less research has gone into the morphological and mechanical properties. This research aims to deepen the understanding of how dehydration affects cell walls in mosses by examining leptoids in the moss Polytrichum commune. Leptoids are specialized food-conducting cells that surround the water-conducting tissue at the core of the stem. Interestingly, the leptoids form wall ingrowths upon water loss and disappear once hydration is reestablished. Dehydration has been demonstrated to have varying effects on specific cell wall polymers like pectins and hemicelluloses. This project used immunogold-labelling and transmission electron microscopy to probe cell wall composition before and after dehydration in this moss. Three monoclonal antibodies (MAbs) were selected because they target pectins and hemicelluloses involved in drying cycles, porosity, and cell wall flexibility.

Undergraduate Poster Number: 78

Social & Behavioral Sciences

Presenting Author: **Echevarria, Emily**

Advisor: Chad Drake, Ph.D.

Major/Field of Study: Psychology

**Examining Undergraduate Perceptions of the Multidimensional Psychological Flexibility Inventory**

**Abstract**

Researchers developed the Multidimensional Psychological Flexibility Inventory (MPFI) for use in Acceptance and Commitment Therapy (ACT) to provide a comprehensive measure of the 12 components of the Hexaflex model (e.g., values, committed action, or fusion; Rolffs et al., 2016). The present study aims to evaluate the face validity of the MPFI in an undergraduate sample to determine if the measure appears to assess the intended constructs. Participants were shown each of the MPFI long-form subscale questions and asked to report what they thought the scale was measuring. The researchers recorded the open-ended responses and recoded them into categories with varying degrees of correctness.

Graduate Poster Number: 48

Life Sciences

Presenting Author: **Eduardo Palomino, Fiorella**

Advisor: Dr. Alan Walters

Major/Field of Study: Agricultural Sciences

**Weed Assessment of Flora Diversity on Altiplano Grasslands of South Peru**

**Abstract**

Based on a thorough review of the current literature, an assessment of the weeds of 133 species found on altiplano grasslands was developed. An inventory of plant species was carried out on "Hacienda Ventilla", a private farm located in Cumo Huacullani settlement in the south part of Puno Peru. Weeds were grouped for crops, mixed forages, and the grassland in general. A total of 52 weed species were identified in the site, and 8 potential weeds were also detected. Additionally, 6 introduced species, and 1 noxious weed, Pennisetum clandestinum, were recorded in the place. Constant monitoring, meta-analysis and comparison with other studies could help to understand the concentration of weeds on the place. Also, integrated weed management practices including the prevention of weed recruitment could help to control the spreading of weeds over the place, especially exotic invasive species.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 53

Life Sciences

Presenting Author: **Egge, Bethany**

Advisor: Scott D Hamilton-Brehm

Major/Field of Study: Microbiology

**Evaluation of novel chemical treatments to reduce microcystin toxin production in harmful algal blooms caused by the cyanobacterium Microcystis aeruginosa**

**Abstract**

The economic and ecological damage caused by cyanobacterial harmful algal blooms (cHABs) is profound (100s of millions of dollars per state in the United States alone). There are limited mechanical, chemical, and biological means to prevent cHABs from forming. In freshwater systems, cHABs occur when blue-green algae (known as cyanobacteria) grow unrestrictedly. The growth of these photosynthetic microorganisms is exacerbated by the excess nutrients (i.e. agricultural runoff and urban wastewaters), slow-moving or stagnant water, and concurrent increasing atmospheric carbon dioxide and rising temperatures. The bacterium Microcystis aeruginosa is one of the major microorganisms causing cHABs. It is of significant concern because it can produce a toxin called microcystin. Microcystin is a potent eukaryotic protein phosphatase I and IIa inhibitor, which poses a significant threat against fish and animal populations. In this study, we evaluated the effectiveness of two chemical treatments that can potentially limit or stop the production of microcystin from M. aeruginosa. The first chemical is the red pigment (prodigiosin or PG) produced by the common bathroom/sink bacterium Serratia marcescens that has previously been shown to inhibit toxin production in M. aeruginosa. PG pigment was procured from a strain of S. marcescens, called SIUC2, which was isolated from SIUC campus lake during a cHAB event, in an area where M. aeruginosa did not grow. The second chemical is a designer antisense oligonucleotide (ASO) which was developed by Dr.

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Hamilton-Brehm and Dr. Brooks from Southern Illinois University Carbondale to directly interrupt the transcription of microcystin mRNA within the M. aeruginosa cells. We monitored the production of microcystin in M. aeruginosa cultures over time, in quadruplicate replicates sets, after treatment with PG, ASO, and PG + ASO with respect to an untreated control set. Here we present the results of a potential, novel treatment to control microcystin production from M. aeruginosa cHABs.

Graduate Poster Number: 57

Social & Behavioral Sciences/Health & Human

Presenting Author: **Eyre, Connor**

Advisors: Lesley Shawler, Lilith Reuter-Yuill, Manish Goyal

Major/Field of Study: Behavior Analysis and Therapy

**A Variation of Matrix Training: Using an Echoic-to-Intraverbal Transfer Trial Procedure to Increase Tacts from One to Two Words (Color-Noun Combinations)**

**Abstract**

Creating novel word combinations and sentences is a fundamental characteristic of vocal verbal behavior. This propensity has been coined generative language. Individuals with Autism Spectrum Disorders often face challenges regarding developing their vocal language skills, especially in relation to unique word combinations, known as generative language. One effective technique is matrix training which is a teaching tool designed to create novel word combinations and sentences (Kohler & Malott, 2014). The current investigation employs a variation of the traditional matrix training model. The current matrix incorporates a 4x4 matrix with colors (blue, red, green, and purple) and nouns (cup, ball, duck, and chair). This matrix has been further broken down into two sub matrixes. An Echoic-to-intraverbal transfer trial procedure with a stimulus fading component was implemented until mastery. Investigators used a multiple baseline across stimulus classes experimental design to evaluate the effects of the procedure. The study’s participant is a young child receiving applied behavior-analytic and speech-language services at a university-based clinic. A generativity probe within/across the matrix phase will be conducted to test for generative transfer to the other 12 color-noun combinations. Implications regarding the use of matrix training for children with speech difficulties will be discussed in relation to our participant.

Undergraduate Poster Number: 76

Social & Behavioral Sciences/Health & Human

Presenting Author: **Fountain, Raisa**

Advisor: Dr. Mary Louise Cashel

Major/Field of Study: Psychology

**Adverse Childhood Experiences, School Bullying Retrospection, and the Impact on Resilience in Adulthood**

**Abstract**

Adverse childhood experiences (ACEs) have been repeatedly documented to have substantial

effects on individual resilience in adulthood. Experiences of ACEs and bullying are linked to

school disengagement, depression, anxiety disorders, and substance abuse. ACEs alone appear to

be linked to lower life expectancy, higher risk of heart disease and cancer. Bullying victimization

has been associated with lower educational levels in midlife, unemployment, lower income, and

overall poorer general health and cognitive functioning at early and midlife. There is a gap in

research on how ACEs and bullying may affect and compound each other’s overall effects on

resilience in adulthood. The purpose of this study is to examine how ACEs and bullying may

amplify each other’s effects on resilience score totals. Our participants were 255 Amazon MTurk

workers selected by CloudResearch from the United States who were under 40 years of age.

Somewhat counter to expectations, we observed that scores reflecting mild to moderate past

bullying experiences were significantly and positively linked to scores for resilience, consistent

with some models of resilience. In contrast, ACEs and resilience scores were unrelated. Our

findings may be an artifact of using an MTurk sample; implications relating to future research

are discussed.

Keywords: Adverse Childhood Experiences, ACEs, Bullying, Resilience, Trauma

REACH Award Winner 2021-2022

Undergraduate Poster Number: 25

Physical Sciences, Engineering & Technology

Presenting Author: **Gahagan, Hannah**

Advisor: Dr. Karen Hales

Major/Field of Study: Physiology

**Abstract**

P53 is known as the guardian of the genome and has been found to be mutated in 50% of all human tumors. The purpose of this project was to analyze the cellular distribution of p53 within hen ovarian tumor cells as well as the distribution within the entirety of the tumor. Additionally, the presence, expression, and size of p53 was analyzed in cancerous and normal ovaries which can be used to better understand the profile of p53 in ovarian carcinogenesis in the laying hen. End-point PCR, Western blotting, and immunohistochemistry were the main methods of analysis. Results from PCR showed amplification of the expected fragments in late stage tumor samples with variable amplification of fragments in an early stage tumor and normal ovaries. It was found that p53 protein of the correct molecular weight is present in late stage ovarian tumors, but undetectable in an early stage tumor and normal ovaries. Immunohistochemistry of late stage ovarian tumors showed variable staining patterns while normal ovaries showed no specific staining.

Graduate Poster Number: 51

Life Sciences

Presenting Author: **Gamble, Nicole**

Authors: Gamble, Nicole, Kara E. Huff Hartz, Helen Poynton, Michael J. Lydy

Advisor Michael Lydy

Major/Field of Study: Zoology

**Development of Resistance to Insecticides in Hyalella azteca**

**Abstract**

Streams, estuaries, and other bodies of freshwater are contaminated with a variety of different insecticides due to runoff from agricultural and urban landscapes. Currently, Hyalella azteca, a non-target epibenthic amphipod, have developed resistance to pyrethroid and organophosphate insecticides due to single amino acid mutations in the voltage gated sodium channel gene and acetylcholinesterase-1, respectively. The degree of resistance in H. azteca is similar to that observed in several target species, including Musca domestica, Cimex lectularius, Blattella germanica, and Rhipicephalus microplus. Aquatic systems are often contaminated with several different types of insecticides, therefore there is a possibility that H. azteca have also developed resistance to other classes of insecticides. The aim of this study was to determine if pyrethroid and organophosphate resistant H. azteca have developed resistance to other insecticides. Three laboratory-cultured H. azteca populations (non-resistant, and pyrethroid and organophosphate resistant Escondido Creek and Mosher Slough) were exposed to fipronil (phenylpyrazole) and imidacloprid (neonicotinoid), in addition to revisiting the resistance of bifenthrin (pyrethroid) and chlorpyrifos (organophosphate) through a series of 96-h water-only acute toxicity tests.

Escondido Creek and Mosher Slough H. azteca populations both had high tolerance for bifenthrin and chlorpyrifos likely due to long-term exposures at higher toxic concentrations in the field. Additionally, high tolerances observed in Escondido Creek and Mosher Slough populations for bifenthrin and chlorpyrifos suggests resistance has been maintained in these populations even though they have been cultured in an insecticide-free environment. There were no signs of resistance to fipronil or imidacloprid, since their LC50 values were similar for the

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three populations, suggesting other detoxification mechanisms may be responsible for their high tolerance. The development of resistance may have associated fitness cost including reduced reproductive rates, decreased thermal tolerance, and decreased tolerance to salinity, but is necessary for these amphipods to survive in pesticide rich environments.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 70

Social & Behavioral Sciences / Health & Human Services

Presenting Author: **Goss, Arianna**

Advisor: Jessica Cataldo

Major/Field of Study: Health Care Management

**Feasibilty of Virtual Reality for Mental Health in Long-Term Care in Rural Populations**

**Abstract**

Throughout the COVID-19 pandemic, long-term care residents have been disproportionately affected both physically and mentally. Increased restrictions have worsened long-term care residents’ mental health and have increased feelings of isolation and loneliness. This pilot study explores the feasibility of virtual reality technology use by long-term care residents for mental health in a rural area of Southern Illinois. Long-term care residents used pre-tests, post-tests, and mood scales to gauge their current thoughts, feelings, and knowledge of virtual reality. Participants were offered the opportunity to use the technology with 9 out of the 11 participants completing a virtual reality experience. All participants who tried the VR headset noted that they were more willing to try VR in the future. Next, the Wilcoxon Sign-Rank test found that there were no statistically significant changes in mood from before and after the informational session on virtual reality, but the small sample size is believed to have impacted this result. We found that virtual reality for mental health in long-term care populations is more feasible when paired with an educational session before intervention.

Keywords: Virtual Reality, Long-term Care, Mood, Mental Health, Feasibility

Undergraduate Poster Number: 42

Life Sciences

Presenting Author: **Grey, Kayla**

Advisor: Dr. Francisco Jimenez

Major/Field of Study: Zoology/Parasitology

**Of Intestinal Helminths and Mephitis mephitis: The Importance of DNA Barcoding**

**Abstract**

This research aims at updating the helminthological (parasite) record for the striped skunk in Southern Illinois and producing DNA barcodes for these endoparasites. The generation of these barcodes are important because some of these helminths are often widespread with potential genetic variability among populations that still need to be documented. Further, changes in taxonomy or neglect of the process of species level identification may result in the assignation of different names for the same species. The generation of the sequences and their dissemination in public databases will assist other researchers to achieve a more precise identification of helminths encountered

Undergraduate Poster Number: 00

unable to present

Presenting Author: **Grizzell, Rheanna**

Advisor: Dr. Lisabeth DiLalla

Major/Field of Study: Psychology

**The Implications of Prematurity and Low Birth Weight for Emotion Recognition in Childhood**

**Abstract**

Both prematurity and low birth weight have been shown to hinder development physiologically, behaviorally, and cognitively. Emotion recognition, the ability to correctly identify emotions, is an early-developing core ability for effective social interaction. Emotion recognition skills, as a critical part of social development, may be negatively affected by preterm birth and low birth weight. Therefore, it was hypothesized that both prematurity and low birth weight would be correlated with decreased emotion recognition skills. 179 children aged 6-13 years participated in testing sessions that included the Diagnostic Analysis of Nonverbal Accuracy, a test administered to children by computer software to test their emotion recognition skills. Children were presented with one face at a time of varying emotions (happy, sad, angry, and fearful), and they were asked to identify the corresponding emotion by pushing a button on a keyboard. This study utilized these emotion skills data as well as a parental report providing perinatal birth information and birth complications. For analyses, one twin from each family was randomly placed in subsample 1, and the other twin was placed in subsample 2. Significant correlations were found between gestational age and both total number of emotion errors, subsample 1 (r = -.119, p = .297) and subsample 2 (r = -.252, p = .028) as well as errors missing the sad emotion, subsample 1 (r = -.314, p = .005) and subsample 2 (r = -.259, p = .024). However, no significant correlations were found with low birth weight. These results show that low birth weight is less

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predictive than gestational age of delays or errors in emotion recognition. The more premature children were, the more likely they were to make

REACH Award Winner 2021-2022

Undergraduate Poster Number: 75

Social & Behavioral Sciences /Health & Human Services

Presenting Author: **Grover, Chloe**

Advisor: Dr. Maria Claudia Franca

Major/Field of Study: Communication Disorders and Sciences

**Abstract**

Vocal hygiene is imperative for professional and pre-professional voice users in order to obtain and sustain optimal vocal quality. This research entails a comprehensive review of literature on evidence in this area, an examination of current vocal hygiene strategies for higher education faculty, and current implementation of methods to prevent phonotrauma in this target population. Professional voice users such as educators, are significantly more likely to have voice disorders and lower voice quality compared to non professional voice users (Roy et al., 2004). With the current global pandemic, life for professional voice users have changed drastically, causing them to change their vocal habits and increasing the need for additional research to be completed. The research is essential for preventing voice disorders and improving vocal health methods amongst faculty at the university.

Undergraduate Poster Number: 56

Life Sciences

Presenting Author: **Hall, Leah**

Authors: Hall, Leah and Dr. Amer AbuGhazaleh

Advisor: Dr. Amer AbuGhazaleh

Major/Field of Study: Animal Science

**An Exploration of the Digestibility of Proteins using a Modified Three-Step in Vitro Procedure**

**Abstract**

A ruminant animal with a Cannula port was used in addition to a modified version of a well-known in vitro procedure in hopes of reducing the associated cost and labor required to investigate the intestinal digestion of proteins within various feeds. Nylon bags were used to incase the feed samples, crucial for allowing protein digestion within the rumen and α-amylase enzyme solution without degradation of the bag or disruption of the remaining Amino Acids. The experiment was conducted by allowing protein samples to incubate in the rumen of a cannulated cow for 16 hours to estimate Rumen Degradable Protein (RDP) and Rumen Undegradable Protein (RUP). The RUP portion that was remaining was then incubated within a liquid solution designed to simulate the environment of the small intestine to estimate intestinal protein digestion of different commercial protein sources. The nylon bags were prepped and filled with a similar amount (grams) of various protein sources. Each bag was placed in the cow’s rumen after being attached to a specialized cord designed to allow entry and exit via the cannula port more reliable. The samples were then left to allow for adequate digestion and consistency of time length between each protein source being tested. It was necessary to dry each sample, weigh them, and measure the protein in the feed prior to digestion using the LECO analysis machine to collect data on the existing protein percentage that could be compared with the samples post-digestion. Lastly, the bags were then removed from the rumen, washed several times with cold water to remove bacteria, and then returned to the lab for further analysis. The results of this experiment concluded the average percentage of protein digestion that would occur in both the rumen and small intestine for various commercial cattle feeds. It was found that the

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modified in-vitro procedure could adequately replicate the conditions of the small intestine when replicated using an α-amylase enzyme solution.

ABREVIATION KEY: RUP= Rumen Undegradable Protein, RDP= Rumen Degradable Protein, α-amylase= Alpha-amylase, CP= Crude Protein, VFA=Volatile Fatty Acid

Graduate Poster Number: 59

Social & Behavioral Sciences/Health & Human Services

Presenting Author: **Harouna Ada, Idrissa & Burdin, Vitalii**

Advisor: Katherine Martin

Major/Field of Study: TESOL

**Teaching Strategies for Foreign Language Verbs**

**Abstract**

Vocabulary is a key building block across all the four skills of listening, speaking, reading, and writing. An individual cannot communicate effectively without being conversant in the words needed to express relevant concepts, regardless of how much grammar knowledge he or she possesses (Rice & Tokowicz, 2020). Neglecting focus on lexis, the cornerstone of language, no one can become an effective language user. Therefore, it is important to pay special attention to teaching and learning this language area. In order to be effective in this, vocabulary strategies must be taken into account. However, relatively little work examines the effects of different vocabulary learning strategies on the acquisition of verbs, even in heavily researched languages such as English. In light of this, this study compares and contrasts the relative efficacy of three vocabulary learning conditions: rote repetition, reading the target word in a meaningful sentence, and writing a meaningful sentence for the target word. Data will be collected from a total of 55 adults (both monolingual English speakers and proficient speakers of English as an additional language). Participants will learn 21 English-Hausa verb pairs, 7 pairs in each of the three conditions (rote repetition, reading sentences, and writing sentences). In addition, participants will complete a working memory task, an English vocabulary size test, and a background questionnaire. The results are expected to show that the least effective method is rote repetition and will inform teachers' understanding of whether the additional effort required from asking students to write their own example sentences is beneficial (predicted from the Involvement Load Hypothesis) or whether it may interfere with learning the forms of the target words. Future research and implications will be discussed.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 20

Life Sciences

Presenting Author: **Hernandez, David**

Advisor: Dr. Kamal Ibrahim

Major/Field of Study: Animal Science

**Genotyping of Ethiopian Macrotermes Microsatellites**

**Abstract**

The termite genus of Macrotermes has a wide distribution from Africa to Southeast Asia with about 330 species. It was much to the surprise of my lab in 200x to find that despite this wide diversity, only 63 species of termites in total were found in the region. Through use of Cytochrome Oxidase, I sequencing we were able to detect 4 species of Macrotermes from the Western, Central, and Southern regions of Ethiopia which contained ideal ecosystems for Macrotermes. My project involved amplifying the DNA in these same samples to genotype microsatellites using fragment analysis with the help of the Roy J. Carver Biotechnology Center at the University of Illinois in Urbana Champaign. These microsatellites can be used to investigate population relationships within the three regions of Ethiopia.

Undergraduate Poster Number: 35

Physical Sciences, Engineering & Technology

Presenting Author: **Honey, Alyssa**

Advisor: Dr. Matt Geisler

Major/Field of Study: Plant Biology

**Abstract**

We have obtained a transgenic strain of Arabidopsis thaliana (Lik1 knowckoutmutant) and we are currently testing for homozygous and heterozygous members of our sample group. First, the plants are grown up and DNA is extracted using CTAB or quick DNA procedures. Next, the quality of the DNA is examined using the spectrophotometer. If acceptable quality is found then the DNA is put through PCR (Polymerase Chain Reaction) using a combination of 3primers, a Wild Type, Mutant Type, and one intermediary as a cap. The results of the PCR are then examined using gel electrophoresis. A single band around700 base pairs indicated wild type, a single band around 1100 indicated mutant, and two bands indicates a heterozygous member. The reason for this experiment to ensure we have a true knockout of the gene, Lik1, which encodes for a kinase that we believe contributes to interplant signaling through the roots.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 29

Physical Sciences, Engineering & Technology

Presenting Author: **Kaplan, Daisy**

Advisor: Dr. Erin Perry

Major/Field of Study: Animal Sciences

**Abstract**

Fecal scoring is a simple method for standardized assessment of gross changes in the consistency of canine fecal output. Gastrointestinal (GI) issues, including diarrhea, are commonly reported among military working dogs. Causes may include environmental extremes, travel, exertion, dietary intolerance, and non-medical factors. An improved understanding of fecal scoring and its

relationship to gastrointestinal health is essential. Sudden dietary change is frequently implicated in acute diarrhea. GI upset may be exacerbated by other medical or environmental conditions with little data regarding the gut microbiome impacts. Improved understanding of the GI microbial population may inform decision-making strategies for mitigating fecal changes due

to GI upset. Labrador retrievers (n = 20) were assigned to either FIBER or CONTROL

treatments in a two-day study (IACUC Protocol # 21-001) with the following objectives: characterize fecal scores associated with rapid dietary change for dogs with and without

supplemental dietary fiber; measure moisture content associated with differing fecal scores.

Although fecal scores were significantly increased by rapid dietary change, changes in moisture

content was not well correlated with fecal score (R2 = 0.0109) (P = 0.5626). Fecal score showed

dependence on the diet administered and the day it was administered. Statistical analysis

revealed that fiber supplementation did alter the fecal scores of the dogs in this trial (P = 0 .009).

This showed that dogs supplemented with fiber during the diet change had lower fecal scores

than dogs given the control. Further research regarding this study would include correlation

between water content and fecal score

Undergraduate Poster Number: 34

Life Sciences,

Presenting Author: **Khader, Omar**

Advisor: Amber Pond

Major/Field of Study: Biological Sciences

**The HERG K+ Channel Increases Intracelluar Calcium Concentration by Modulation of IP3 Signaling**

**Abstract**

The HERG K+ channel is detected at a higher abundance in skeletal muscle undergoing atrophy as a result of disuse, denervation, and cancer. We have reported that over-expression of the HERG channel in C2C12 myotubes transduced with HERG-encoded virus, increases basal intracellular calcium concentration; however, the mechanism by which HERG modulates intracellular calcium levels is not known. To explore this observation, we depolarized myotubes with 100 mM KCI and used Fura2 dyes to monitor intracellular calcium concentration. Using nicardipine to block L-type calcium channels with the Fura2 assays, we discovered that HERG does not modulate calcium flux through skeletal muscle Cav1 .1 channels. lmmunoblot and rtPCR confirms that HERG has no effect on Cav1 .1 gene expression or protein abundance for 48 hours. We then applied the SERCA blocking agent thapsigargin to our Fura2 assays and revealed that the HERG-mediated increase in calcium occurs through modulation of intracellular calcium stores. Thus, we hypothesized that HERG might be modulating the phospholipase C (PLC)-PIP2-IP3 pathway. To investigate this, we used bethanechol to produce an increase in intracellular calcium by activation of muscarinic receptors, which activate the PLC-PIP2-IP3 pathway. Both population and single cell calcium imaging analyses demonstrate that, relative to myotubes transduced with an appropriate control virus, bethanechol treatment of HERG-expressing myotubes produces a significant increase in intracellular calcium levels. The data suggest that HERG may indeed modulate the PLC-PIP2-IP3 pathway.

Key Words: HERG, IP3 signaling, intracellular calcium, myotubes

Undergraduate Poster Number: 100

Physical Sciences, Engineering & Technology

Presenting Author: **King, Brenda**

Advisor: Dr. Karla Gage

Major/Field of Study: Horticulture

**Sensitivity of Germinating Hemp Seeds to Glyphosate Residue in Soil**

**Abstract**

Hemp (Cannabis sativa L.) has been cultivated since ancient times, and is harvested for its seeds, oil, fiber, and medicinal properties. Hemp production is growing, and the market value of hemp is expected to increase. However, basic agronomic information is lacking since the 1970 Controlled Substances Act prohibited hemp cultivation until the 2014 and 2018 Farm Bills (H.R.2 2018). As with any cultivated crop, weed control is considered one of the most important factors in crop success, and hemp appears to be most affected by weeds in the seedling stage, making a weed free field desirable for planting hemp (Gage, unpublished). While glyphosate is promoted as having no residual activity in the soil after application (Roundup® PowerMAX3 2020), sensitivity of germinating seeds has been documented for other crops (Helander et al. 2019). Initial observations suggest that hemp appears to be highly sensitive to glyphosate, compared to surrounding weedy vegetation, and therefore, sowing of hemp seed may require a waiting period between glyphosate burndown application and planting. The objective of this study is to determine the sensitivity of germinating hemp seeds to glyphosate at various planting timings following glyphosate application, testing the null hypotheses: There is no difference in sensitivity of hemp at any planting date following a glyphosate application. While results are not conclusive, this study suggests that cautious hemp growers may need to wait 6 days after glyphosate application to plant a crop. These results can be added to the knowledge of best management practices for hemp production. An understanding of hemp production and glyphosate usage will become increasingly important information to add to knowledge of best management practices for hemp growers.

Graduate Poster Number: 44

Physical Sciences, Engineering & Technology

Presenting Author: **Kula, Casey**

Advisor: Dr. Amir Sadeghpour

Major/Field of Study: Plant, Soil, and Agricultural Systems

**Precision Planting of Clover and Rye-Clover Mixture Effect on Corn Nitrogen Requirement**

**Abstract**

Nutrient Loss Reduction Strategy (Illinois NLRS, 2017), suggests winter cereal cover crops (WCCCs) are the best on-farm practices to reduce N loss in corn (Zea mays L.)–corn or corn–soybean (Glycine max L.) cropping systems. Solid planting (NP) of a WCCC such as winter cereal rye (WCR) (Secale cereale L.) before corn could decrease corn yield as a result of reduced N availability in spring due to N immobilization caused by high C:N ratio of WCR residue or soil moisture depletion by the WCR early in the spring. A management practice to reduce WCR negative effect on the following corn is by mixing rye with a legume cover crop such as crimson clover (CL) (Trifolium incarnatum). Precision planting (PP), skipping the future corn row when planting CC, is another strategy to further reduce the yield drag in corn following WCR. In this study, we integrate cover crop mixture with PP approach to evaluate cover crop performance, corn stand density, grain yield, N requirement and balances. Experimental design was split plot arranged in a randomized complete block design with four replicates. Main plots were cover crop treatments: NoCC control (NOCC), crimson clover precision planted (CLPP), crimson clover solid planted (CLNP), crimson clover on corn row WCR on middle rows (CLRMIXPP), crimson clover mixed with WCR (CLRMIX), and solid planted WCR (RNP). Subplots were the fertilizer N treatments: 0, 40, 80, 160, 240, 320 lbs. ac-1. We found that all CC treatments decreased weed biomass compared to the NOCC. Cover crop biomass was highest in treatments with rye and CLPP produced similar biomass to CLNP. Corn stand density was decreased only by RNP treatment. Economic optimum N rate for corn was 179 lbs. ac-1 across all CC treatments.

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Nitrogen balance was 100 lbs. ac-1 at the OENR. Future research should focus on assessing PP at different soil and environment.

Undergraduate Poster Number: 50

Life Sciences

Presenting Author: **Lagerhausen, Emma**

Advisor: Dr. Karla Gage

Major/Field of Study: Crop, Soil, and Environmental Management

**Germination of Giant Ragweed (Ambrosia trifida) in Greenhouse Conditions**

**Abstract**

Giant ragweed (Ambrosia trifida) is an agronomic weed native to the United States, Canada, and Mexico. Considered noxious by the USDA, it causes many problems for farmers, because it can reach almost 5 meters in height and tower over crops, produce 2,000 to 5,000 seeds, and can reduce crop yield by half in high density populations. In addition, there are many populations that have resistance to our most effective herbicides. Screening for the presence of herbicide resistance and quantifying the LD50 for an herbicide requires the germination of weed seeds in a greenhouse setting. Giant ragweed is notoriously difficult to germinate in greenhouse conditions, due to its thick seed coat and necessary stratification period. These requirements cause problems for researchers, as it is difficult to germinate a large enough population to conduct herbicide screenings and other experiments. The goals of this study are to 1) determine the best method to germinate giant ragweed seedlings and to 2) determine the populations with the highest germination rate from SIU weed science seed accessions.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 12

Physical Sciences, Engineering & Technology

Presenting Author: **Lanier, Elle**

Advisor: Dr. Jia Liu

Major/Field of Study: Civil Engineering

**Exploring Cost-Effective Treatment of Per- and Polyfluoroalkyl Subtances (PFAS) Comingled with Chlorindated Solvents using Iron-Based Nanohybrids**

**Abstract**

Per- and polyfluoroalkyl substances (PFAS) are ubiquitous in the environment due to their presence in products such as food packaging and waterproof fabrics, which leads to contaminated groundwater and surface water. Their wide presence in the environment, bioaccumulation potential, and possible negative effects on living organisms has created the need for a treatment method to remove PFAS from contaminated water. However, current treatment techniques applied have been based on either physical removal that requires PFAS to be further degraded, chemical removal that lacks cost effectiveness, or biological removal that takes a longtime. Here we show a cost-effective photocatalytic degradation treatment method to remove and degrade a type of PFAS called perfluorooctanoic acid (PFOA) comingled with the chlorinated solvent trichloroethylene (TCE) by using reduced graphene oxide-nano zero valent iron nanohybrids (rGO-nZVI NHs). We found that reduction of TCE and PFOA does occur under UV-C with rGO-nZVI nanohybrids.

Undergraduate Poster Number: 80

Social & Behavioral Sciences

Presenting Author: **LaPradd, Danielle**

**Authors: LaPradd Danielle , Dr. Audrey Hickert**

Advisor: Dr. Audrey Hickert

Major/Field of Study: Criminal Justice and Criminology/Psychology

**Gender Disparity and Sentencing Severity: The Role of Gender in Criminal Sentencing**

**Abstract**

The following study endeavors to understand the role of offender sex as a predicting determinant of public opinions regarding sentencing severity within the American criminal justice system. This is done by examining the social concept of gender through the lens of pre-established gender constructs and how they relate to criminal activity, particularly in terms of violent versus non-violent crime types. The goal of this study is to examine what influences the social expectations of gender roles play in the sentencing and punishment of offenders and how this cultural knowledge shapes the public’s punishment severity response. Using a 2 x 2 factorial design, this experimental survey design focuses on the decision-making process of the everyday citizen by asking participants to take on the role of a mock juror in which they are presented a case vignette of a hypothetical offender that has been found guilty of their crimes and asked to assign what they consider to be an appropriate punishment. Through use of experimental design and explanatory measures targeting beliefs of benevolent sexism and protective paternalism along with gender beliefs in relation to use and capability of violent acts this study will contribute to academic knowledge based on the nature of the relationship between societal gender beliefs and public opinions regarding punishment.

Keywords: Criminal Sentencing, Benevolent Sexism, Gender Roles, Female Violence

REACH Award Winner 2021-2022

Undergraduate Poster Number: 23

Physical Sciences, Engineering & Technology

Presenting Author: **Lehnhoff, Grace**

Advisor: Dr. Buck Hales

Major/Field of Study: Physiology

**Expression and Localization of Cannabinoid Receptors in Ovarian Cancer of the Hen**

**Abstract**

Ovarian cancer has been called the " silent killer" because a woman can have advanced late-stage disease without having any symptoms. The prognosis is very poor, and the treatment options are limited. The laying hen is the only animal afflicted with ovarian cancer the replicates the human disease. The hen is an excellent natural model for studying the etiology of ovarian cancer. G-protein coupled receptors in humans that are encoded by CNR-1 and CNR-2 genes are a part of the endocannabinoid system, which plays an important role in the central nervous system. The purpose of this study is to quantify the expression of CB-1 and CB-2 in normal and cancerous ovaries to determine if their expression is correlated with the disease. We hypothesize that CB-1, but not CB-2, will be highly expressed in ovarian cancer compared to normal ovaries and correlated with ovarian cancer severity. Paraffin-embedded tissue blocks from normal and cancerous ovaries were sectioned, stained by Hematoxylin and Eosin (H&E), and examined. lmmunohistochemistry was done to observe the distribution and localization of CB-1 and CB-2 in normal and cancerous ovaries. RNA was extracted, qPCR was conducted, and the amount of CB-1 and CB-2 mRNA was quantitated. RNA integrity was confirmed by agarose gel electrophoresis, prior to cDNA synthesis. Overall, the hypothesis for this study is that if cancer develops in the ovary, then CB-1 receptor expression increases, and CB-2 receptor expression stays the same.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 03

Physical Sciences, Engineering & Technology

Presenting Author: **Lindsay, Clark**

Advisor: Dr. Hossein Eslamiat

Major/Field of Study: Mechanical Engineering and Computer Science

**Active Fail-safe Safety System For UAVs**

**Abstract**

UAVs have grown in popularity recently in both the private and commercial space. From small hobby drones to large delivery drones, the market is ripe with opportunities for this technology to spread even further. One major obstacle facing UAVs currently is the FAA's restrictions on where drones can be flown. Very little research has been done into producing a product to ensure drone safety in a failure situation. This project proposes introducing a module that can be attached to most major drones on the market that will enable some level of maneuverability to be maintained, even when the primary control systems have been lost.

Graduate Poster Number: 71

Social & Behavioral Sciences/ Health & Human Services

Presenting Author: **Maha Ammar, Nine De Chiara, Estephany Poquechoque Gironda, & Quinn McBride**

Advisor: Katherine I. Martin

Major/Field of Study: TESOL

**EFL Teachers’ Beliefs and Practices Towards Teaching Reading and Reading Anxiety**

**Abstract**

Foreign language anxiety, the feeling of apprehension experienced when communicating in a foreign language (Gardner & Maclntyre, 1994), is a distinct type of anxiety that can be separated from general anxiety types. General foreign language anxiety is distinguishable from reading anxiety in that its existence is specific to the case of reading in a non-native language. Importantly, foreign language reading anxiety has a negative relationship with students’ overall reading performance (Saito, 1999).

Language speaking anxiety has been a heavily researched topic in second language acquisition; however, little research has been conducted to examine foreign language reading anxiety specifically, especially regarding teachers’ practices and how they might affect reading. Therefore, the present study aims at finding what practices English as a Foreign Language (EFL) teachers do that influence learners’ reading anxiety. Twelve experienced EFL instructors (six participants in Egypt and six participants in Bolivia) will be interviewed about their teaching reading practices and how those practices might influence learners’ foreign language reading anxiety. Participants will complete one online survey about their experiences teaching reading to EFL students and then complete a semi-structured interview of their familiarity with reading anxiety as well as the strategies they use to identify and help learners with reading anxiety. The results are expected to help researchers identify what teaching practices teachers follow that might trigger or reduce students' reading anxiety, if teachers know whether those practices affect anxiety, and finally what they do to address this potential problem. Pedagogical implications of awareness to this issue are expected to arise from the results**.**

Graduate Poster Number: 13

Physical Sciences, Engineering & Technology

Presenting Author: **Mahbub, Md. Shahriar**

Advisor: Dr. Mehnaz Shams

Major/Field of Study: Civil Engineering

**Release of Micro- and Nanoscale Plastics from Synthetic Textiles During Laundry and Quantification of Nanoscale Plastics by Single Particle Inductively Coupled Plasma Mass Spectrometry**

**Abstract**

The presence of the microplastics (MPs, Size < 5 mm) and nanoscale plastics (NPs, Size < 100 nm) have been witnessed worldwide in different aquatic and terrestrial environments. Microfibers (MFs) are one of the most abundant portions of MPs in the aquatic environment, which are shed during the washing and drying of fabrics. These tiny plastics have detrimental health impacts to aquatic organisms as well as human beings. However, their occurrences including identification and quantification in the environment are still a great challenge. Variation in washing and drying parameters can contribute significant amount of MFs in the environment, which can degrade under natural processes and produce NPs. Therefore, this study investigated the release pattern of MPs, in the form of acrylic MFs from portable washer and dryer during fabric washing and drying under different conditions. Furthermore, the released acrylic MFs were exposed to ultraviolet light (UV-A) irradiation in the aquatic environment for up to 182 days. Additionally, a robust method to detect NPs through coating with synthesized gold nanoparticles (AuNPs) by Single Particle Inductively Coupled Plasma Mass Spectrometry (SP-ICP-MS) was validated and optimized. The results indicated that longer washing and drying time, higher water temperature, and use of detergent promoted the MF releases. However, subsequent washing and drying cycles reduce the MF emissions by 67% in the 7th cycle compared to the 1st wash cycle. After 182 days of UV-A irradiation, released acrylic MFs showed significant changes in the surface morphology in the form of cracks, holes, and flakes which were proportional to the period of UV-A exposure. Dimensions of the formed holes and cracks on the UV-A degraded MFs suggested that MFs can turn into NPs in presence of water

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and UV-A exposure in the environment. Moreover, this study successfully detected the nanoscale plastics (polystyrene nanoscale plastics, PS NPs, size 61 nm) by particle-by-particle analysis in single quadrupole-based SP-ICP-MS. The detection limit of particle number concentration was reached up to 8.64 × 10^7 particles/L with 98% recovery. This study would be beneficial to understand MPs release pattern, their fate in environment and detect their presence in environmental samples.

Undergraduate Poster Number: 28

Life Sciences

Presenting Author: **Marinetti, Rylie**

Advisor: Katherine Martin

Major/Field of Study: Biomedical Science - Pre Dentistry

**Impact of Tooth Loss on Depression-Related Behaviors in Naked Mole-Rats**

**Abstract**

Tooth loss has a wide-ranging impact on human health, including negative effects on emotion and behavior. However, we do not know experimentally if tooth loss causes increases in depressive-like behaviors. In common research animal models such as mice, the tail suspension test is a behavioral experiment used to measure depression-related behaviors such as learned helplessness. However, to date, these tests have not been administered to naked mole-rats, an optimal model for tooth loss. Naked mole-rats rely on their incisors for a variety of behaviorally important activities such as digging, eating, carrying food or young, grooming, and defense. This reliance is also reflected in cortical territory, with 30% of their somatosensory cortex being dedicated to just the incisors, potentially amplifying any effects that tooth loss may have on these animals. To examine depression-like behaviors induced by tooth loss, we surgically removed the lower right incisors in experimental (tooth extraction) animals whereas sham-operated animals underwent the same surgical conditions with only an initial incision and no tooth extraction. We analyzed the time spent immobile during the tail suspension test to assess the extent of learned helplessness between the two separate animal groups. Our findings showed that tooth loss did not incur negative behavioral outcomes (learned helplessness) as determined by increased immobility; however, there were significant sex effects observed. Future research aims to identify the brain regions responsible for the observed behavioral alterations**.**

Undergraduate Poster Number: 11

Physical Sciences, Engineering & Technology

Presenting Author: **Masood, Zaheer**

Advisor: Dr. Qingfeng Ge

Major/Field of Study: Chemistry

**Tuning metal-oxide/Cu interface to control limiting potential and product selectivity for electrochemical reduction of CO2**

**Abstract**

Electrochemical reduction (ECR) of CO2 to value-added chemicals suffers from high overpotential and poor product selectivity. Copper-based catalysts can produce hydrocarbons and oxygenate from CO2 ECR at an applied potential of -1.44 V. To produce the highly desirable C2 products, C–C coupling is the essential step. Previous studies show that the activation barriers for the C–C coupling steps on Cu (100) are 1.38 eV through the dimerization of \*CO and 0.60 eV via coupling of \*CO and \*HCO. Clearly, C–C formation via coupling of \*CO and \*HCO has a low free energy barrier but the formation of \*HCO species on Cu (100) requires a limiting potential of -0.65 V. Lowering the limiting potential for \*HCO formation is expected to increase the overall reactivity, and therefore, the reactivity towards C–C coupling. Herein, using density functional theory calculation, we demonstrate that the metal-oxide/Cu (100) interfacial sites ((MO)4/Cu (100, M = Fe, Co and Ni) can lower the limiting potential for \*HCO formation. Our results show that limiting potentials for \*HCO formation are -0.18 V, -0.48 V and -0.28 V on (FeO)4/Cu (100), (CoO)4/Cu (100) and ((NiO)4/Cu (100), respectively. Combining with \*CO on the Cu surface, the metal-oxide/Cu catalysts are expected to offer a lower limiting potential path for C2 products via \*HCO and \*CO coupling than Cu.

Undergraduate Poster Number: 41

Life Sciences

Presenting Author: **May, Alec**

Advisor: Dr. Karla Gage

Major/Field of Study: Plant Biology

**Abstract**

The hairs on the leaf of a cannabis plant, or trichomes, are the structure of the plant responsible for producing and storing cannabinoids. These cannabinoids are the chemicals in the plant with medical and recreational significance. In this study, samples of trichome bearing leaves were taken from different parts of the plants apical inflorescence to determine what part produces the highest density of trichomes. The data collected indicates that the highest density with the lowest plant by plant variance is the top of the inflorescence. This indicates that if an individual wanted to produce the most potent product or wanted the most consistent results for a study trial, they would want to take samples from the top of the plants apical inflorescence

Graduate Poster Number: 64

Life Sciences

Presenting Author: **Morgavero, Taylor**

Advisor: Dr. James Garvey

Major/Field of Study: M.S. Zoology - Fisheries Ecology

**Movement responses to biotic and abiotic conditions in invasive Silver Carp**

**Abstract**

Knowledge of the movement, dispersal, and ultimate impact of mobile species is imperative for managing and mitigating the spread of invasive species. One such species, Silver Carp (*Hypophthalmichthys molitrix*), has established reproducing populations that are currently expanding on all fronts in the US, including towards the Laurentian Great Lakes through the Illinois River. Dispersal is potentially affected by individual conditions along with environmental factors. In order to see which conditions were influential, we used acoustic telemetry data from 2012-2020 to quantify Silver Carp movement in the Illinois River. We looked at internal (body condition, length) and external (temperature, discharge) factors and determined the relative impact of each on several different movement metrics (range, total movement upstream/downstream rate, upstream/downstream distance per detection). Temperature, either negatively or positively, affected every movement metric. Body condition negatively affected range (the entire distance covered by a carp). Length negatively affected total movement (the sum of every movement recorded) and upstream movements. Discharge affected total movement and downstream movements. These results can aid current and future management strategies to reduce the spread of Silver Carp and other invasive species. This study recommends targeting smaller Silver Carp during cooler months as an effective way to remove the fish that contribute the most to the invasion**.**

Graduate Poster Number: 10

Physical Sciences, Engineering & Technology

Presenting Author: **Mustafa, Khalid**

Advisor: Dr. Mehnaz Shams

Major/Field of Study: Civil Engineering

**Adsorption of Single (Hg, Cd, and Pb) and Ternary Metal Solutions on the Composite of Pinewood Derived Biochar and Graphene Oxide Nanomaterials from an Aqueous Solution along with Prediction of Adsorption Efficiency using different Machine Learning Techniques from its Toolbox**

**Abstract**

Accumulation of heavy metals in different environmental compartments and its toxicity even at trace level concentration necessitates the study on their efficient removal. Furthermore, metals could co-exist in the environment which is a complex scenario as there would be a competition among the metals in terms of removal efficiency. This study presents the effective removal of toxic metals (Hg2+, Cd2+, Pb2+) in both single and ternary metal solutions through adsorption on the successfully synthesized composite (SC) of pinewood-derived biochar (BC) and graphene oxide (GO) nanomaterials. Moreover, different linear regression tools (Gaussian Process (GP), Random Forest (RF), and Feed Forward Back Propagation (FFBP)) from the machine learning (ML) toolbox were used to compare their predicted adsorption. The structural and morphological analysis of the SC showed that GO was successfully coated on the surface of the BC. GO coating increased the surface area, porosity, functional groups, and adsorption efficiency of these toxic metals on the SC as compared to the unmodified BC. The factors affecting adsorption efficiency were metal concentration, pH, and the ratio of BC and GO in the SC. The adsorption efficiency in single metal solution was found 94-98% for Hg2+, 92-94% for Cd2+, and 96-99% for Pb2+ and for ternary metal solutions 94-96% for Hg2+, 95-97% for Cd2+, and 97-99% for Pb2+ at pH 6 and SC with BC/GO (w/w) ratio as 1:10. However, for unmodified BC, the adsorption efficiency was less in both single and ternary solutions. Thus, results indicate that modification of BC with GO increases adsorption efficiency as compared to unmodified BC. Furthermore, for all

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three metals, Freundlich adsorption isotherm was followed in both single and ternary solutions. Regeneration of the SC was also attained by adsorbate desorption, producing a competent and cost-effective adsorbent for the removal of toxic metals from our environment. Furthermore, from ML toolbox mean squared error (MSE) values between the actual efficiency and predicted efficiency was calculated which was negligible in case of GP, with regression coefficient (R2) equals to 1. This implied that GP was most suitable linear regression model among other models for the available data sets. These predicted values through different ML models could significantly reduce the experimental workload for various parameters in predicting the removal efficiency of the synthesized composite for the target toxic metals. Thus, these models help in reducing experimental time and predicting most appropriate combination for best result in future.

Keywords: Adsorption efficiency, Toxic metals, Pinewood biochar, Graphene oxide nanomaterials, Synthesized composite, Gaussian Process, Random Forest, Feed Forward Back

Propagation, and Mean Square Error (MSE)

REACH Award Winner 2021-2022

Undergraduate Poster Number: 38

Life Sciences

Presenting Author: **Pawar, Anuj**

Advisor: Dr. Charlotte Narr

Major/Field of Study: Zoology

**Examining Aquatic Nutrient Availability and How it May Drive Disease Fitness**

**Abstract**

Anthropogenic activities, such as those in agriculture and construction, impact local environments. These impacts don’t just alter physical terrains, but also add massive amounts of nutrients into freshwater systems. Parasites tend to grow in environments where nutrients are easily accessible and may deeply impact the organisms in which they inhabit or leech their nutrients from. Here, we examine how nutrients in a host’s diet influence the replication rate of a parasite in the host-parasite system between D. magna and H. tvaerminnensis. We manipulated the amount of phosphorous in the diet of infected D. magna but found that our diet treatments did not influence the spore loads of H. tvaerminnensis. As parasites are small and inhabit larger organisms, it is likely that they experience other forms of resource competition in order to survive and adapt to changing environments.

Undergraduate Poster Number: 38

Life Sciences

Presenting Author: **Payne, Tehya**

Authors: Tehya Payne, Dr. Matthew R. Jamnik, and Dr. Lisabeth F. DiLalla

Advisor: Dr. Charlotte Narr

Major/Field of Study: Zoology

**The Influence of Perinatal Stressors on Observed Activity Levels in Preschool-Aged Twins**

**Abstract**

Purpose: Theories of childhood temperament suggest that children naturally differ in their preferred level of activity (Thomas & Chess, 1977); however, other factors also impact activity level, such as perinatal stressors (e.g., low birth weight; Rogers et al., 2005) and biological sex (with boys being more active; Strelau & Zawadzki, 2012). We hypothesized that (1) preschoolers with lower birth weight or shorter gestational age would be rated lower on observed activity; (2) this effect would be greater for boys than for girls; (3) results using observer-rated activity levels would parallel those found using parent ratings. Procedure: Children were tested as part of a longitudinal study of twins. At ages 4 and 5 years, parents reported child temperament, including activity levels (the level, tempo, and frequency of motor behavior), and birth information, including birth weight, gestational age, and perinatal birth complications. At both ages, trained coders rated children’s activity levels (motor behavior, sedentary behavior, and postural shift; Jamnik, 2021) during a 10-minute family play interaction in the lab.

Results: For assumptions of sample independence, one twin from each family was randomly selected for analyses. Preliminary results examining only age 5 showed a significant positive correlation between birth weight and observed activity level, r (130) =.21, p=.017, see Figure. When examined separately by child sex (hypothesis 2), we found that this effect was only significant for boys, r (60) =.28, p=.033. Parent activity ratings were not significantly correlated with perinatal factors, so hypothesis 3 was not supported at age 5.

Conclusion: At age 5, a significant correlation between birth weight and observed activity, especially in boys, was found. It is possible that parents have a rating bias; we found differing results for observational ratings compared to parental ratings. Further analyses will include 4-year-old data to investigate whether developmental changes affect the impact of perinatal stressors on later activity level

Graduate Poster Number: 21

Physical Sciences, Engineering & Technology

Presenting Author: **Pierce, Jennifer**

Advisor: Dr. Hamilton-Brehm

Major/Field of Study: Biological Sciences

**XPRIZE Carbon Removal Challenge: Combining engineering, geology, and microbiology to solve global climate change**

**Abstract**

The atmospheric concentration of carbon dioxide (CO2) is steadily increasing due to the burning of carbon-based materials. These elevated CO2 levels increase the entrapment of long-wave radiation from the sun and contribute to rising temperatures, known as the “greenhouse effect”. The expected global surface temperature increase will result in environmental and socio-political damage, costing billions of US dollars. CO2 capture and sequestration (CCS) is considered a strategic and economically viable means to offset adverse effects on the environment and global economies. Unfortunately, the current methods of CCS are underdeveloped and lack the ability to address the gigatonne scales necessary to mitigate past and present CO2 emission rates.

Oxidative hydrothermal dissolution (OHD) is an efficient process that can break down recalcitrant biomass into water-soluble carbon products. The carbon products are ideal for storage in depleted oil reservoirs or other subsurface geologic sites. Here we present our preliminary geo- and bio- chemical results from OHD-processed agricultural waste biomass (corn Stover) injected into laboratory bioreactors designed to mimic subsurface ecosystems. The preliminary experiments with OHD-corn Stover revealed that subsurface microorganisms can survive and will biochemically transform the water-soluble carbon. This research supports a novel approach to sequester CO2 by leveraging OHD technology, which can scale to meet a global sized problem**.**

Graduate Poster Number: 67

Social & Behavioral Sciences/Health & Human Services

Presenting Author: **Ramos, Yeni & Petrilla, Alexis**

Advisor: Dr. Lesley Shawler

Major/Field of Study: Behavior Analysis and Therapy

**Assessing social validity across different FAs**

**Abstract**

The Treatment Acceptability Rating Form (TARF, Langthorne et al., 2011), a social validity questionnaire, was completed by two different families. Families participated in caregiver training to help identify the function of their child’s challenging behaviors. The TARF was utilized to assess the acceptability of FA (Iwata et al., 1984). After discussion of the TARF results between the researchers and supervisor, the traditional FA was terminated for Family A. However, for the study to be continued, a new FA assessment was created to properly determine the function of the child's target behavior. After further assessments, including indirect and descriptive measurements, a synthesized FA (SFA) was created for Family A. An additional TARF was completed by family, the result showed a higher agreement on willingness to use the procedure to assess their child challenging behavior after SFA was implemented.

Family B implemented an IISCA (Interview-Informed Synthesized Contingency Analysis) with their child to determine if the challenging behaviors have a synthesized function. After the IISCA was implemented, the caregiver completed a TARF to assess for social validity. This poster highlights caregiver acceptability in the development of the treatment. The data from the three TARF's asses the social validity across different types of FA. Additionally, it demonstrates how and why we used the results to determine our next steps as practitioners working with families while producing meaningful and effective results.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 05

Physical Sciences, Engineering & Technology

Presenting Author: **Rana, Prem**

Advisor: Dr. Koushik Sinha

Major/Field of Study: Computer Science

**Optimization of Irrigation System Through IoT Methods & Machine Learning**

**Abstract**

The need to save energy and water usage has subsequently caused an increased need for a reduction in water usage. This is compounded by the desire for improved research environments on the SIU Green Roof. Recent developments in both Internet Of Things (IoT) along with Machine Learning have enabled the development of an improved irrigation system. This irrigation system serves to reduce water usage, improve the health of soil moisture, and reduce manual labor while also increasing the analytics of a plot of land. Taking into account various features such as weather, temperature, humidity, and wind speed, the irrigation system uses Machine Learning techniques to predict soil moisture. This was utilized in conjunction with the decreasing cost of microcontroller technology to create a low-cost, low-maintenance, scalable irrigation system that is powered by off-the-shelf parts and removes the need for manual intervention. Implemented on the SIU Green Roof, this system has worked effectively, and the machine learning results are promising for further improvements.

Graduate Poster Number: 15

Physical Sciences, Engineering & Technology

Presenting Author: **Rativa Parada, Wilson Emilio**

Authors: Rativa Parada, Wilson & Nilufar, Sabrina

Advisor: Dr. Sabrina Nilufar

Major/Field of Study: Engineering Science

**Effect of Nanocarbon Addition on the Mechanical Characteristics of Al6061 nanocomposites**

**Abstract**

Aluminum alloys are extensively used in automobile, aerospace, structural, and electronics industries because of their lower density, better mechanical properties, and lower production cost. Yet, increasing demand for stronger and lightweight aluminum alloys has led to the development of aluminum matrix composites having two components: aluminum matrix and reinforcement. Carbides, oxides, and carbon allotropes are the most common among various reinforcements of aluminum matrix composite materials. Graphene, a 2D crystalline carbon allotrope, has remarkable properties, such as high strength, no band gap, highly efficient electrical and thermal conductivity. Activated carbon is another carbon allotrope with excellent surface properties and has also been used in metal matrix composites. The development of lightweight and high strength aluminum composites using carbon allotropes attracted researchers, as they provide mechanical properties favorable to the structural application. However, several issues related to the dispersion, formation of clusters, wettability of carbon, and a weak bond at the interface between matrix and reinforcement are still a challenge for the fabrication of aluminum-carbon composites. These challenges have been resolved with the implementation of multiple manufacturing procedures. In this research, Al6061 alloy matrix composites reinforced with 0.5, 1, and 2 vol% of activated nanocarbon and graphene nanoplatelets are fabricated through a powder metallurgy method. Mechanical properties are determined by Vickers micro-hardness tester and compressive tests by MTS machine. Samples show an increase in hardness, yield, and ultimate strength compared to unreinforced Al061 alloy. Nevertheless, a reduction in elongation and loss of ductility is observed in the tested samples.

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Morphology and fractography of the samples are obtained with Scanning Electron Microscopy and Raman Spectroscopy. The composites have presented a good distribution of the reinforcement inside the Al6061 alloy, as well as, structural changes and crystallite size reduction in the carbonaceous reinforcement as a result of the fabrication method.

Graduate Poster Number: 69

Social & Behavioral Sciences/ Health & Human Services

Presenting Author: **Robertson, Morgan**

Advisor: Erin Connelly

Major/Field of Study: Communication Sciences and Disorders

**Designing and Implementing a Transgender Voice Therapy Program on SIUC Campus**

**Abstract**

Voice modification therapy is a valuable part of gender-affirming care for an individual whose voice is incongruent with their social gender presentation. Student speech-language pathology clinicians at the SIUC Clinical Center designed and implemented an 8-week program for transgender voice therapy using evidence-based practices to address clients' goals for modifying voice pitch, voice resonance, voice stability, speech naturalness, and gendered communication behaviors. Through completion of the program’s treatment goals and interoceptive anatomy instruction, each client will develop the skills and awareness that support becoming a self-sufficient explorer and architect of their own authentic voice. The SIUC Clinical Center will continue to offer transgender voice therapy services each semester concurrently with other speech and language services

Graduate Poster Number: 47

Life Sciences

Presenting Author: **Robinson, Eleni**

Advisor: Dr. Michael Lydy

Major/Field of Study: Aquatic Toxicology

**Potential for Trophic Transfer of p,p’-DDT and it’s Metabolites to Juvenile Chinook Salmon (Oncorhynchus tshawytscha) from Consumption of Chironomus dilutus**

**Abstract**

Many populations of Chinook salmon (*Oncorhynchus tshawytscha*) in the western United States have experienced large declines in spawning numbers in the last decade. In the Central Valley, CA, both legacy and current-use pesticides have been detected in known Chinook dietary items, including the midge, *Chironomus dilutus*. Both larval and adult midges have been shown to be the most common dietary items for rearing juvenile Chinook in the Sacramento-San Joaquin Delta, however the capacity for contaminant uptake and biotransformation among midge life stages is poorly understood. One of the most commonly detected compounds in Chinook salmon rearing habitat is p,p’-DDT, its isomer, o,p’-DDT, and its biotransformation products, p,p’-DDE and p,p’-DDD. This study aims to observe bioaccumulation and biotransformation of p,p’-DDT across all life stages of midges, from larvae to flying adults, and assess the potential for trophic transfer to Chinook. First instar midges will be exposed to p,p’-DDT-spiked sediment and exposure will continue throughout their life cycle at a sublethal concentration. Midges will be removed at each life stage (2nd,3rd,4th, pupae, and adult) to measure bioaccumulation and biotransformation products. In future work, the life stage with the highest concentration will be fed to juvenile Chinook salmon for 7 days to simulate dietary uptake during rearing. Bioaccumulation of p,p’-DDT and biotransformation products will be assessed in juvenile Chinook, elucidating the potential for trophic transfer of contaminants and risk to rearing

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juvenile salmon. These studies are currently ongoing in our lab, though this study we aim to compare and contrast the different rates of bioaccumulation and biotransformation though each midge life stage and the resulting trophic transfer from midges to juvenile salmon. We expect the highest uptake and biotransformation to occur in 4th instar individuals, followed by decreases in update and biotransformation as midges pupate. Additionally, we expect that these compounds will be transferred to juvenile salmon through this feeding exposure. These findings will elucidate the potential risk for juvenile Chinook salmon feeding on midges throughout their lifecycle.

Undergraduate Poster Number: 60

Life Sciences

Presenting Author: **Sawar, Bilal**

Authors: Sawar, Kinan & Sawar, Bilal

Advisor: Pre-Approved for Non-Faculty Advised Project

Major/Field of Study: Microbiology

**Preoperative Factors Influencing Patient Satisfaction of Cosmetic Surgical Procedures: A Systematic Review**

**Abstract**

Cosmetic surgical procedures are unique operations most commonly performed by plastic surgeons that improve a patient’s quality of life by either providing improved functionality for activities of daily living or for cosmetic purposes to enhance a patient's self-confidence and improve feelings of belongingness in society. Many factors contribute to patient satisfaction in cosmetic surgical operations. However, a comprehensive list ranking the importance of these factors has not been compiled. These factors include psychological criteria, socioeconomic influences, and provider characteristics amongst other factors that may not be as well characterized. There are other factors as well that may be currently undiscovered. Being able to rank the importance of these factors can be clinically significant for determining the likelihood that a particular patient may benefit from a specific cosmetical surgical procedure preoperatively. In this study, we will be performing a systematic literature review using the PubMed database of studies that investigated the satisfaction of patients who underwent cosmetic surgical procedures. Specific preoperative factors investigated include preexisting patient psychopathology, patient expectations, and patient self-consciousness, amongst others. The aggregated data from this systematic review suggests that preexisting patient psychopathology is the single greatest preoperative predictive factor influencing patient satisfaction of cosmetic surgical procedures.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 31

Physical Sciences, Engineering & Technology

Presenting Author: **Scott, Maurince**

**Authors:** Erin B. Perry, Dakota R. Discepolo, Stephen Y. Liang, Maurnice Scott, Kyleigh Williamson and Kelly S. Bender

Advisor: Dr. Erin Perry

Major/Field of Study: Microbiology

**Biocidal effects of common veterinary cleansers on canine coats following wipe down**

**Abstract**

Recent public health concerns have given rise to questions regarding microbiological cross-contamination via working canines. Recent work demonstrated the reduction of aerosolized contamination via a wipe-down procedure using common veterinary antiseptics (Perry et al., 2021). Although, mechanical reduction maybe achieved via a wipe-down procedure, the biocidal impact for residual microbes is unknown. Therefore, the objective of this study was to assess the biocidal(bacterial) impact of common veterinary cleansers on the exterior microbial community of the canine coat. Disposable, lint-free towels were saturated with 2%chlorhexidine gluconate scrub (CHX), or 7.5% povidone-iodine scrub (PVD). Both CHX and PVD were diluted at a 1:4 ratio. Treatments were rotated between the left and right sides across the shoulders and back of kennel housed fox hounds (n = 30). Sterile cotton swabs were collected in triplicate prior to and following the wipe down and immediately stored in Amies solution at 4ºC. The swab solution was plated onto nutrient agar, reduction in colony forming units (cfu) was measured and compared across both treatments. Statistical analysis utilizing SAS version 9.4. PROC GLM one-way ANOVA test was completed to examine effects of treatment. Significance was set at 0.05. Additionally, molecular analysis of the 16S rRNA gene analyzed the identity of a subset of

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cfu obtained from 3separate hounds. Measured cfu reduction indicated a significant impact of the wipe down procedure (P < 0.001) for both veterinary cleansers. Furthermore, qualitative molecular data indicated that both PVD and CHX had a biocidal effect on the dominant microbial community detected on the exterior coat with gram-positive, spore-forming cfu related to common environmental bacteria predominating post-treatment. Effective wipe-down strategies using common veterinary cleansers should be further investigated and incorporated into decontamination practices to safeguard working canine health and prevent cross-contamination of human personnel working with these animals.

Graduate Poster Number: 06

Physical Sciences, Engineering & Technology

Presenting Author: **Seavers, Connor, Merrill Dennison**

Advisor: Dr. Tsuchin Chu

Major/Field of Study: Engineering Science

**In-situ Monitoring and Defect Detection for Selective Laser Melting**

**Abstract**

Selective laser melting (SLM) has become one of the most common metal additive manufacturing (AM) processes in the aerospace industry due to its ability to produce highly specialized end-use parts of great complexity. For this reason, NASA is looking to employ SLM technology for fabrication of various rocket engine components to fly aboard their new Space Launch System (SLS), the most powerful rocket ever built by NASA. The current state-of-the-art for SLM is limited though, as most SLM products are prone to process-induced defects, most importantly porosity, which can greatly alter the strength of the part. Since traditional post-process nondestructive testing methods have shown difficulty in detecting these defects, in-situ monitoring is being investigated as a method to detect the formation of defects during the SLM process. In this investigation, layerwise optical tomography (OT) images are collected during SLM fabrication of test samples with planned defects. An image processing framework has been developed and applied to the collected images to identify anomalous signatures during the build process. The data processing and analysis pipeline employs an average squared difference (ASD) metric to measure and visualize anomalous process signatures. Resulting distributions are then fed into an automated k-means clustering algorithm, which uses the elbow method to perform cluster validation to determine the optimal number of clusters for each image. Employing the output from cluster validation, defect detection is performed based on the optimal number of *k*-clusters

Undergraduate Poster Number: 45

Life Sciences

Presenting Author: **Staley, Savanna**

Advisor: Dr. Diana Sarko

Major/Field of Study: Physiology

**Differential Innervation of Upper and Lower Incisors: Optimization of Axon Quantification Techniques in Naked Mole-Rats**

**Abstract**

This project aimed to develop a method to compare the degree of innervation dedicated to the upper and lower incisors of naked mole-rats. The naked mole-rat is an ideal animal model for studying tooth sensation because of the impressively large representation of the incisors in its central nervous system, including the somatosensory (tactile) cortex and cerebellum. Although the large cortical representation of the incisors implies that they are well-innervated by peripheral nerves, this has not yet been quantified. In this project, the mandible and maxilla were dissected, and all soft tissue was carefully removed. The bones were then decalcified using formic acid and cut into cross sections of ~1 mm thick before being embedded in resin for further sectioning at ~100-200 µm thick. These sections were then stained with toluidine blue and imaged at 10x magnification using a light microscope. In these images, the branching of the superior and inferior alveolar nerves could be seen, allowing us to follow these nerves to their branches that directly and specifically innervate the incisors. Because the method for sample processing is a long and complex process, extensive troubleshooting was necessary to optimize this procedure for successful use in naked mole-rats. Now that the method is fine-tuned, it can be utilized for future investigation of peripheral plasticity following tooth loss.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 68

Social & Behavioral Sciences / Health & Human Services

Presenting Author: **Talbert, Claire**

Advisor: Dr. Ruopu Li

Major/Field of Study: Geography and Environmental Resources

**Using Deep Learning Models with ArcGIS Pro to Extract Road Culverts from Imagery**

**Abstract**

Hydrologic connectivity is critical to address a myriad of environmental management issues, such as nutrient transport and aquatic species passage. Ensuring hydrologic connectivity often involves delineating hydro-topographic boundaries using high-resolution Digital Elevation Models (HRDEMs). However, this task presents significant challenges as HRDEMs are highly sensitive to artifacts of topographic variations, including topographic depressions and flow barriers. Locations of flow barriers such as road culverts must be preprocessed before a delineation of watershed boundaries. However, the current practice of manually digitizing culvert locations is both time and labor intensive. Therefore, there was a critical need to develop a new approach to automatically identify the locations of road culverts. In this project, ArcGIS Pro’s computer vision and deep learning tools were used to detect culvert locations. A set of manually selected image samples were used to train deep learning models. Then, the selected model was used to identify culvert features on the imagery. Hydrologic modeling was then undertaken to further process the DEM.

REACH Award Winner 2021-2022

Undergraduate Poster Number: 73

Social & Behavioral Sciences/ Health & Human Services

Presenting Author: **Troutt, Lauren**

Advisor: Dr. Ryan Campbell

Major/Field of Study: Criminology and Criminal Justice

**Geophysical Exploration of Burial Plots in Historic Southern Illinois Cemeteries**

**Abstract**

Undocumented cemeteries occur throughout the forests of Southern Illinois. These burial sites provide valuable historical and anthropological data regarding the people who settled in this region from the early nineteenth to twentieth centuries. The goal of the project was to employ traditional archaeological survey and geophysical survey methods to document several previously undocumented cemeteries so they can be better preserved. Data were collected from September 2021 to March 2022 from a series of cemeteries within the Shawnee National Forest and on the campus of Southern Illinois University. Traditional archaeological survey methods were used to identify and record above ground features. This included using historic records to identify potential cemetery locations, visually inspecting those locations, and thoroughly documenting any features. Documentation included drawing a detailed map, photographing each headstone/footstone, and conducting some limited archival work on named individuals identified in the cemetery. Ground penetrating radar (GPR) was then used to determine if burials may extend beyond the observable boundaries of the cemetery. Areas throughout the cemeteries were sampled with GPR to explore the possibility that unmarked burials may exist. The results suggest that the cemetery boundaries likely extend beyond the location of current markers, suggesting care should be taken when ground-disturbing activities occur within the vicinity of

these cemeteries. Finally, the known boundaries of each cemetery were digitized and

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georeferenced in ArcGIS, creating shapefiles that will be shared with the USDA Forest Service and Southern Illinois University’s Facilities & Energy Management. This research has made a significant contribution to what was previously known about each site and has served to aid in the preservation of these endangered historic resources.

Graduate Poster Number: 22

Life Sciences

Presenting Author: **Valencia-D., Janice**

Advisor: Kurt Neubig

Major/Field of Study: PhD Plant Biology

**Fungal DNA transfers to Orchids: origin and fate in the host genome**

**Abstract**

Horizontal gene transfer (HGT), a process that involves the movement of DNA from one organism to another that does not belong to the same species (or form one genome to another in the same organism), is relatively common in bacteria, rare in eukaryotes, and even more uncommon between fungi and flowering plants. Surprisingly, two HGT events have been reported in orchids, both from Ustilaginaceae, a family of smut fungi. Here, we inspected the mitogenome of 60 orchid species and identified the extent of the two HGT DNA in those orchids. We estimated the timing of those events using phylogenetic tools and characterized the fate of the genes that were transferred in the main clades of orchids. These results shed light on the understanding of the HGT phenomenon and the composition of the mitochondrial DNA in plants.

Graduate Poster Number: 18

Physical Sciences, Engineering & Technology

Presenting Author: **Vargas Lizarazo, Annie Yojaira**

Authors: Miroslava Záborská, Kristen Murra\*, Annie Vargas, Kexin Jiao and Punit Kohli

Advisor: Kurt Neubig

Major/Field of Study: PhD Plant Biology

Concentrating and separating microplastics and oil from water using eco-friendly magnetic particles

**Abstract**

Water pollution caused by the contamination generated from human activities including over-consumption of materials and their misuse is a worldwide issue [1-3]. It is a threat to primordial ecosystems such as marine wildlife [3]. Marine environments are a source of food, oil, and minerals for humanity, and support key processes such as photosynthesis, oxygen production, climate regulation, and water quality. However, the oil and plastic contamination have adversely impacted these ecosystems [4]. Oil contamination such as spills from oil/gas production and petroleum refineries [5], grease, lubricants, and gasoline [4-6] cause a reduction in the available oxygen in water and increase the toxicity levels in plants and animals. Likewise, plastic trash floating in the oceans and its degradation products such as micro-plastics (particle size less than 5 mm) [3] affect the whole earth ecosystem ─ ranging from human, animals, plants, water ways, and soil [7]. In fact, separation and cleaning oils and micro-plastics from water is a worldwide challenge, due to their widespread use and their easy dispersion in large bodies of water without any rapid degradation [8, 9]. As a solution, three-dimensional silicon oxide (3DSiOx) materials have been introduced as an effective tool for water remediation; due to their ability to capture oil in a gel from aqueous environments by their high hydrophobicity. However, the aggregation of oil and micro-plastics into a gel and its removal from water is still a challenge. In this current research, we focus on concentrating oil and microplastics present in water into a thick gel using 3DSiOx. Iron oxide particles (FeOx) and hydrophobic iron oxide particles modified with C18-silanes (FeOx-C18) provided magnetic properties to the 3DSiOx. This allowed a rapid and easy separation of the concentrated pollutants containing gels from water. Other modifications

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including graphite and CdSe quantum dots were also accomplished – which can provide enhanced functionalities to the 3DSiOx. These materials were characterized by optical, fluorescence, atomic force microscopy (AFM), scanning electron microscopy (SEM), and energy dispersed X-ray spectroscopy to elucidate their physical (length, width, thickness, and surface morphology) and chemical properties (local and bulk elemental composition, magnetic and fluorescent functionality). Initially, a comparison between FeOx-functionalized microscope particles (3DSiOx-FeOx) and 3D silicon oxide ribbons (control materials) in the separation of oil and micro-plastic from the water was performed. 3DSiOx-FeOx microparticles exhibited enhanced removal efficiency of oil and microplastics. Importantly, the presence of magnetic. The presence of FeOx in 3DSiOx allowed fast concentration of oil and micro-plastics, forming a magnetic gel which was easily separated from water using an external magnet. Analytical methods including fluorescence microscopy/spectroscopy, UV-Vis, and viscosity measurements were used for characterizing the gel composed of oil, water and 3DSiOx. These experiments are important for the elucidation of possible mechanisms of oil and micro-plastic removal using 3DSiOx microscale particles. We found that the entanglement of the 3DSiOx architectures encapsulate oil and microplastics in its inner core surrounded by water. Most (not all) water molecules stayed out of gel due to hydrophobic nature of the inner entangled hierarchical structure. Importantly, the core-shell architecture captures hydrophobic microplastics and oily materials in its core which floats at the top of the container for easy separation using a magnet. Further experiments are being performed on non-planar surfaces such as spherical surfaces and surfaces with imprinted patters (DVDs). These experiments allow formation of 3DSiOx microparticles with different properties and can possess higher-order architectures. We estimate appropriate parameters needed for the formation of ribbons on non-planar surfaces including spinning speed and height. How physical properties such as thickness, flexibility, shape, and length change when 3DSiOx microparticles are formed on non-planar surface is an interesting open question. In conclusion, three-dimensional silicon oxide microparticles modified with magnetic iron-oxide nanoparticles demonstrated high efficiency of separation of oil and microplastic in a hydrophobic core-shell type architecture. This structure allowed easy and fast (in less than 10 minutes) removal of organic and microplastics using an external magnetic field.

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Future studies will focus on demonstration of large scale (multi-gallon of oil- and microplastics-water mixture) with appropriate salt and mineral at various pH conditions. Further studies involving understanding of crack and delamination process (polarization studies using high speed camera) during the synthesis of these materials will also be performed. These studies will allow us to boost the features of the 3DSiOx microparticles providing a highly versatile way for pollution control for a broad spectrum of industries.

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Graduate Poster Number: 74

Social & Behavioral Sciences / Health & Human Services

Presenting Author: **Weisbecker, Rachel**

Advisor: Lisabeth F. DiLalla, PhD

Major/Field of Study: Clinical Child Psychology

**Young Children's Temperamental Factors Predicting Parental Warmth and Control Behaviors**

**Abstract**

Temperament is a measure of individual differences in children that has a genetic basis and interacts with the environment throughout development. In previous research, some factors of temperament have shown associations with parental warmth and control behaviors; however, many of these studies use longitudinal designs, increasing the influence of confounding variables. Therefore, we investigated children’s temperament as a predictor of parental behaviors within families during one timepoint. Based on existing literature, we hypothesized that the factors of smiling/laughter, sadness, and fear would predict parental warmth behaviors, and the factors of anger/frustration, low soothability, and fear would predict parental control behaviors. Parenting behaviors were examined during a parent-child interaction task, and temperament was assessed via parent report in a sample of 4-year-old twins and triplets as part of a longitudinal twin study. Multilevel linear regression was used to include all children using a nested within-family design. Findings include child smiling/laughter positively predicting parent verbal warmth, and interaction between child sex and anger predicting parent discipline, suggesting that child temperament may elicit certain parenting behaviors. These results indicate that the role of child temperament, as well as child sex, should be considered when examining how parents engage in both positive and negative parenting behaviors**.**

Graduate Poster Number: 43

Life Sciences

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Advisor: Dr. Amir Sadeghpour

Major/Field of Study: Plant, Soil, Agriculture Systems

**Winter Cereal Rye Planting Method Influenced Corn Yield, Nitrogen Requirement and Balances**

**Abstract**

Nutrient Loss Reduction Strategy (Illinois NLRS, 2017), suggests winter cereal cover crops (WCCCs) are the best on-farm practices to reduce N loss in corn (Zea mays L.)–corn or corn–soybean (Glycine max L.) cropping systems. Solid row planting a WCCC such as winter cereal rye (WCR) before corn (NP)generally results in intersecting zones between WCR and corn that could decrease corn yield as a result of reduced N availability in spring. One strategy to alleviate WCR issues behind corn is precision planting or skipping the corn row (STCR). In this management approach, intersecting zones between corn roots and WCR roots can be avoided by omitting WCR on the row in which corn will be planted. Our objective was to evaluate a shift from solid planting WCR (NP) to STCR effect on rye performance and corn nitrogen(N) requirement and balances. Our results indicated no differences in cover crop dry matter biomass production between the STCR (2.40 Mg ha-1) and NP (2.41 Mg ha-1) supported by similar normalized difference vegetative index and plant height for both treatments. Phosphorus, potassium (K), calcium (Ca)and magnesium (Mg) accumulation in aboveground biomass was only influenced by site-yr and both STCR and NP removed similar amount of P, K, Ca and Mg indicating STCR could be as effective as NP in accumulating nutrients. Aboveground carbon (C) content (1086.26 kg ha-1 average over the two treatments) was similar between the two treatments and only influenced by site-yr differences. Lignin, lignin: N and C:N ratios were higher in STCR than NP in one out of three site-yrs (ARC2019) indicating greater chance of N

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immobilization when WCR was planted later than usual. Implementing STCR saved$8.4 ha-1 for growers and could incentivize growers to adopt this practice. Corn N requirement decreased by 6 and 8 kg ha-1 by implementing STCR compared to the NP indicating economic benefits of STCR goes beyond WCR production phase.

Graduate Poster Number: 62

Life Sciences

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Major/Field of Study: Zoology

**Phylogenomic analysis resolves the evolutionary relationship of cranes (Gruiformes: Gruidae)**

**Abstract**

Cranes (Aves:Gruidae) are 15 species of large, charismatic birds with a wide geographic distribution. Many attempts to reconstruct the phylogenetic relationships among cranes have been made using a variety of morphological and molecular data. These attempts have resulted in conflicting hypotheses for the relationships among cranes, especially regarding the older divergences in the clade. In this study, we've inferred the speciation history of cranes using a new genomic dataset of approximately 4,500 ultraconserved element (UCE) loci. Our phylogeny mostly supports the relationships inferred by a 2010 study using whole mitochondrial genomes, but differs in the placement of the Anthropoides species group. This fully resolved phylogeny will serve as a basis for exploring the divergence times and biogeographic history of cranes in the next stage of our project.