Poster Presentations

1. **Title:** The Role of the AXL Receptor in the Infectivity of Yellow Fever Virus in Permissive Cells  
   **Principal presenter:** Ajiboye A. Oloke  
   **Major:** Biology  
   **Faculty mentor:** Dr. Catherine Miller-Hunt

   **Abstract:** Yellow fever virus (YFV) belongs to the family Flaviviridae. The Flaviviridae family of viruses are positive sense, single-stranded, enveloped RNA viruses. YFV virus is transmitted to humans through mosquitos and it is commonly found in the tropical and subtropical areas of South America and Africa. Infected individuals usually present with the following symptoms: fever, chills, nausea, muscle pain, headaches and loss of appetite. Different permissive cells expressing the AXL receptor, including human macrophages, have been proven to contribute to the effective entry of YFV. Macrophages are white blood cells, are part of the human immune system, and aid in helping the body fight against infections. Macrophages are comprised of subset groups, including M1 and M2. The M1 subset is activated classically through IFN-γ and stimulates production of proinflammatory cytokines. The M2 subset is activated alternatively by the presences of cytokines such as IL-4 and IL-10. The purpose of this work is to assess the usage of the AXL receptor by YFV via inhibition assay with anti-AXL antibodies. The following methodology will be implemented: Macrophage sensitivity assay will be carried out. Macrophages, including subsets will be infected with yellow Fever Virus, immunostained and the interaction with the virus observed. Our results focus on the role AXL receptors during YFV infection as well as which of the macrophage subsets are infected with the virus. Based on their roles in viral infectivity, we can hypothesize that these receptors are important drug targets. And thus, inhibiting their functions may represent potential targets for antiviral therapies.

2. **Title:** Identification of Natural Compounds that Induce Immunogenic Cell Death Using a Novel Calreticulin CRT Reporter  
   **Principal presenter:** April Franco  
   **Major:** Biology  
   **Other presenters or co-authors:** Rebecca Bocian  
   **Faculty mentor:** Dr. Mette Soendergaard

   **Abstract:** Pancreatic cancer is an extremely lethal form of cancer, which is projected to surpass colorectal and breast cancer as the 2nd leading cause of death in the United States by 2020 (1). Unfortunately, pancreatic cancer patients have yet to attain significant enhancements for survival over the past 40 years (1). Therefore, improvements in pancreatic cancer therapies are needed. In particular, immunotherapeutic drugs that trigger immunogenic cell death (ICD) in preference to non-immunogenic programmed cell
death (apoptosis) is of interest (2, 3). Numerous damage-associated molecular patterns (DAMPs), such as calreticulin (CRT), are released as a result of ICD (4). Such DAMPs recruit antigen presenting cells (APCs) to the location of ICD, where they internalize and present released cancer antigens to T lymphocytes resulting in an anti-tumor response (4). Therefore, ICD triggering drugs may be employed to elicit an anti-tumor response, which may lead to elimination of cancer cells. The translocation of CRT from the endoplasmic reticulum to the cell membrane is a hallmark of ICD (4). Therefore, to quantify the induction of ICD in vitro, a bioluminescent HiBit-tagged CRT reporter (HiBit-CRT) was developed (unpublished data). In brief, the reporter forms a bioluminescent complex with LgBit when HiBit-CRT translocates to the cell membrane. The objective of this project is to discover natural compounds that trigger ICD in pancreatic cancer cells via the utilization of this novel HiBit-CRT reporter plasmid. Human pancreatic carcinoma cells (Mia-Paca-2 cells) will be grown on 24-well plates in Dulbecco’s Modified Eagle’s Medium (DMEM) supplemented with 10% fetal bovine serum as well as 2.5% horse serum at 37\(^\circ\), 5% CO\(_2\) until a confluency of 80% is reached. Next, 0.5 \(\mu\)g HiBit-CRT reporter plasmid will be mixed with 50 \(\mu\)L Opti-MEM reduced-serum medium and 1.5 \(\mu\)L TransIT-LT1 transfection reagent (Mirus Bio, WI) and incubated for 30 minutes at room temperature. The mixture will be added to the Mia-Paca-2 cells and incubated for 48 h at 37\(^\circ\), 5% CO\(_2\). The cells will then be treated with 10 \(\mu\)M of each natural compound from the Natural Products Set IV (National Cancer Institute) diluted in dimethyl sulfoxide (DMSO) in triplicates for 24 h. Necessary controls including DMSO (vehicle), doxorubicin (a known ICD inducer), and cell free medium will be utilized. The Nano-Glo® HiBit Extracellular Reagent (Promega, WI) will be added in equal volume to each well incubated for 10 min on an orbital shaker (300 rpm). A SpectraMax Gemini EM bioluminescent microplate reader (Molecular Devices, CA) will be used to measure bioluminescence. The intensity of bioluminescence resulting from each natural compound will be compared to the appropriate controls to identify molecules that induce ICD. In conclusion, discovery of natural compounds that induce ICD may ultimately lead to the development of enhanced therapeutics for the improved survival of pancreatic cancer patients.

3. **Title:** Evaluating Sub-lethal Infections of Sphaeridiotrema spp. and Cyathocotyle bushiensis Trematodes in Captive Lesser Scaup  

*Principal presenter:* Cheyenne R. Beach  

*Major:* Biology  

*Other presenters or co-authors:* Christopher N. Jacques, Rebecca A. Cole, Joseph D. Lancaster, Aaron P. Yetter, Heath M. Hagy  

*Faculty mentor:* Dr. Christopher N. Jacques  

**Abstract:** During fall and spring migrations throughout the upper Midwest, U.S., thousands of lesser scaup (Aythya affinis) die from Cyathocotyle bushiensis (Cb) and Sphaeridiotrema spp. (Ss) (Class: Trematoda) intestinal infections after consuming exotic faucet snails (Bithynia tentaculata). Lesser scaup serve as the final host for Cb and Ss while the faucet snail serves as the first and second intermediate host. As recommended by previous literature, this experimental study will evaluate the potential effects of sub-lethal trematode infections on the immunological response, body condition, and survival of migrating lesser scaup across the Upper Mississippi River System. Female lesser scaup will be captured at key mid-latitude stopover sites (Pool 19 of the Mississippi River and Emiquon Preserve) and held at Forbes Biological Station, Havana, IL. Faucet snails will be collected by hand from Pool 7 of the Mississippi River and dissected to recover mature Cb and Ss metacercariae for infection dosages. The captive lesser scaup will undergo repeated or single dose trematode infections and will be euthanized 10 days post-infection. Hopefully, information collected during this experiment will provide data to evaluate temporal changes in health along a continuum from initial infection to shedding eggs to point of euthanasia. Addressing basic questions related to physiological responses of lesser scaup to infection with trematodes may aid in formulating potential management strategies to minimize co-occurrence of lesser scaup and infected faucet snails.
4. **Title:** Modulating Antioxidant Activity of Salicylic Acid to Promote Soybean Seed Germination under High Salinity Stress  
**Principal presenter:** Opeyemi Oduniyi  
**Major:** Biology  
**Faculty mentor:** Dr. Sue Hum Musser  

**Abstract:** Soybean (Glycine max) is an important source of food, oil and protein, therefore more research studies should be promoted to increase its yield under adverse conditions such as salt stress. Soil salinity is major hindrance to legume production in all parts of the world. Salicylic acid (SA) is a phenolic phytohormone acting as a plant regulator and signaling molecule to reduce abiotic stress impact in soybean and plants generally. This experiment was conducted to screen treatments of SA to mitigate the concentration of salt (NaCl) on soybean. The soybean seeds were treated with 200 mM concentrations of NaCl and 10 μm concentrations of SA. Germination was recorded when the radicle broke through the seed coat. The results showed high salt severely limited seed germination but some of was alleviated by the SA treatment. The physiological effects of the treatments were also revealed through gene expression analysis. We found differences in gene expression in treated seeds compared to the control seeds. Although SA is not necessary under normal growth conditions for germination, it plays a vital role under salinity by reducing oxidative damage in seeds thereby relieve the signs of salinity stress.

5. **Title:** Expression of a Hemagglutinin Targeting Peptide on Modified Coat Protein VIII of Fd-tet Phage  
**Principal presenter:** Rajeev Roy  
**Major:** Biology  
**Faculty mentor:** Dr. Mette Soendergaard  

**Abstract:** Bacteriophages are viruses that utilize bacteria as their host. Since 1985 when phage display technology was developed by Dr. George Smith these viruses have been widely used to study protein-ligand interactions, receptor binding sites and identifying peptide and protein based ligands. The process involves expressing a foreign peptide on the coat proteins of the phage. Coat protein III (cpIII) and coat protein VIII (cpVIII) are commonly used for display. The f3 phage display vectors express five copies of cpIII, which allows expression of a low number of foreign peptides, often providing high affinity ligands. The f88 phage expresses 150 copies of recombinant cpVIII, which provides an avidity effect in regard to ligand binding. Previously we identified a novel peptide (TG1) using f3 phage display against hemagglutinin. The objective of this project is to express TG1 on cpVIII to develop a phage that promotes binding via the high affinity of the peptide and the avidity effect of f88 expression. Phage (Fd-tet f88) was grown from cultures (kind gift from Dr. George Smith) by infecting Blukan91 cells in NZ amine yeast (NZY), 0.04μg/mL tetracycline (TET), 100 μg/ml kanamycin (Kan) overnight at 37°C and 225 rpm. Next, the phage was purified by polyethyleneglycol (PEG)/NaCl precipitation and centrifugation (5000rpm, 4°C, 15 min). The phage DNA was then extracted by adding equal volume of phenol-chloroform followed by centrifugation (10000 rpm, 4°C, 5 min). The DNA was precipitated using 0.1 M sodium acetate and 100% ethanol overnight at -20°C. Precipitated DNA was collected after centrifugation (10000 rpm, 4°C, 30 min) and washed using 100% ethanol. The final pellet was air dried and dissolved in 100 μL elution buffer(10mM Tris-HCL, pH 8.5). The extracted DNA size (9214 bp) was verified by agarose gel electrophoresis, and the DNA concentration and purity was determined spectrophotometrically at 230, 260 and 280 nm. Next, TG1 DNA will be inserted into the phage vector by double restriction enzyme digestion (HindIII and PstI) followed by ligation using T4 DNA ligase. The ligated product will then be transformed into E.coli DH5α via heat shock at 42°C for 20 s and plated on lysogeny broth (LB) plates with 40 μg/mL tetracycline overnight growth at 37°C. Next, up to 10 colonies will be selected for screening of the correct size plasmid using gel electrophoresis. Likewise, verified plasmids will be sequenced (Genscript, NJ) to validate the insertion of TG1. These plasmids will then be
utilized to propagate phage particles expressing TG1 in E.coli BluKan91 in NZY/TET/KAN medium with 1mM isopropyl β-D-1-thiogalactopyranoside overnight at 37°C. Expression of TG1 will finally be verified by enzyme linked immunosorbent assay (ELISA) against hemagglutinin. The objective of this project is to develop a phage that express the TG1 peptide on cpVIII to develop a phage particle with both high affinity and avidity for the hemagglutinin target. This may be beneficial in binding to hemagglutinin with a stronger interaction compared to a single peptide.

6. **Title:** Identification of Chemotherapeutic Drugs that Induce Immunogenic Cell Death Using a Novel Calreticulin CRT Reporter

**Principal presenter:** Rebecca N Bocian

**Major:** Biology

**Faculty mentor:** Dr. Mette Soendergaard

**Abstract:** Immunogenic cell death (ICD) initiates a series of damage associated molecular patterns (DAMPs) that are able to activate an immune response. Of these, translocation of calreticulin (CRT) from the endoplasmic reticulum (ER) to the outer leaflet of the cell membrane is a hallmark event that leads to activation of antigen presenting cells (APC), thus priming an immune response. Induction of ICD in cancer cells may provide a manner of activating an immunological anti-tumor response, which may be utilized in immunotherapy. Currently, a few chemotherapeutic drugs, such as doxorubicin, are known to induce ICD, and have been proposed to be repurposed for this use. Thus, it is likely that other known drugs may exhibit ICD induction and may be utilized in immunotherapy. However, to evaluate such drugs, there is a need to develop a high throughput method of detecting ICD. Here, a novel ICD reporter based on translocation of CRT and the HiBit-tag expression system is described. This system utilizes a recombinant HiBit-tag that associates with cell impermeable LgBit, thereby forming a bioluminescent protein complex. Thus, HiBit-tagged CRT will complex with LgBit when translocated to the outer leaflet of the cell membrane, which may be detected bioluminescently by addition of D-luciferin. Thus, the intensity of bioluminescence may be correlated to translocation of CRT, a hallmark of ICD. To create the novel ICD reporter, the human CRT gene was amplified using polymerase chain reaction (PCR) from plasmid HsCD00322958 (Harvard Medical School, MA), and inserted onto the 3’ end of the HiBit tag (pBiT3.1-N, Promega, WI) using restriction enzyme digestion (PspXI and SbfI) followed by ligation. The recombinant HiBiT-CRT plasmid was transformed into competent DH5a E. coli cells using the heat-shock method. The HiBit-CRT cassette was validated by DNA Sanger sequencing (Genscript, Piscataway, NJ). In order to transfect human ovarian adenocarcinoma cells (SKOV-3) with the ICD reporter, the optical concentration of geneticin was determined by performing a kill curve. In brief, SKOV-3 cells were maintained in McCoy’s 5A cell medium supplemented with 10% fetal bovine serum (FBS) at 37°C and 5% CO2, and then treated with varying concentrations of geneticin (0.05 mg/mL, 0.1 mg/mL, 0.25 mg/mL, 0.5 mg/mL, 0.75 mg/mL, 1 mg/mL, 1.25 mg/mL, 1.5 mg/mL, 1.75 mg/mL, 2 mg/mL). The cell viability was evaluated daily for 7 days using bright field microscopy. The optimal concentration was determined to be 1.25 mg/mL. Next, SKOV-3 cells will be transfected with the ICD reporter, and used to screen the Approved Oncology Drug Set VI (kind gift from the National Cancer Institute) for compounds that induce ICD. Newly identified ICD inducers will be studied further and can potentially be used for cancer immunotherapy.

7. **Title:** Habitat Use of Larval Fish in Backwater Reaches of the Upper Mississippi River

**Principal presenter:** Tyler Thomsen and Madeline Tomczak

**Major:** Biology

**Other presenters or co-authors:** Boone LaHood, Illinois Department of Natural Resources, Division of Fisheries, Kevin Irons, Illinois Department of Natural Resources, Division of Fisheries, James Lamer, WIU / Illinois Natural History Survey, Illinois River Biological Field Station
Faculty mentor: Dr. James Lamer

Abstract: Since the unintended introduction into the water ways of the southern United States in the 1970's, Asian Carp have become widely established throughout a majority of the Mississippi River drainage basin. Abundances of Asian Carp have remained low in Pools 17, 18, and 19, due to the structural characteristics of Lock and Dam 19. Adult Asian Carp have been closely monitored, however larval fish communities in these pools have not been well characterized. The objectives of this study were to investigate and describe early life history of Asian Carp, as well as to describe larval fish habitat preference in the Upper Mississippi River. Early stages of Asian Carp require backwater reaches of riverine habitat to grow and develop. Quatrefoil light traps were used to sample for larval fishes from May to September of 2016 and 2017 when main channel water temperatures were above 17°C. To better determine habitat use, twelve light traps were deployed for a minimum of one hour at various locations representing several habitat conditions. The conditions sampled were recorded as woody or vegetation for cover, and open or shoreline for location. Weather conditions were recorded as calm or windy, as well as clear or rainy. Water quality was tested for each light trap location. Larval fish collected were enumerated, measured and identified to family. A total of 1,108 individual light trap samples were collected over the two-year period, representing twelve different families. A majority of the individuals identified were native cyprinid and centrarchids.

8. Title: Description of Novel Endophytic Taxa within the Pleosporales and Evaluation of Their Role on Plant Growth

Principal presenter: Xiomy Janiria Pinchi-Davila

Major: Biology

Other presenters or co-authors: Andrea Porras-Alfaro, Maria Jose Romero-Jimenez, Ari Jumpponen

Faculty mentor: Dr. Andrea Porras-Alfaro

Abstract: Most grasses in desert ecosystems and stressful conditions are colonized by dark septate endophytic fungi (DSE). These fungi are found worldwide and belong to multiple orders of the phylum Ascomycota including the order Pleosporales. They may play important and critical roles on plant survival and adaptations to drought, however, the distribution, interaction and host specificity remain poorly studied. The main objective of this project was to describe, characterize and determine the effects of a novel group of isolates on plant growth under drought stress. Fungi were isolated from roots of three native grasses distributed in 18 sampling sites with 3 replicate transects across a latitudinal gradient in the US and characterized using ITS and LSU sequencing. Additionally, cultures were characterized using different media and growth conditions. Colonies on MEA reach more than 35 mm diameter in 14 days, present aerial very diffuse white mycelium and, white, brownish or beige in the back of the plate. Some colonies on PDA are brown, olivaceous or beige, stain the media. Isolates have dark septate melanized hyphae when mycelium is more than 14 days old, chlamydospores are found in the mycelium, terminal or intercalar, sometimes solitary; smooth cell wall and oil-droplets were found in dark hyphae. So far, asexual structures are unknown. Plant bioassays to test host specificity and drought tolerance will be done using Bouteloua gracilis (blue grama), B. eriopoda (black grama,) and Buchloe dactyloides (buffalograss) as well as sequencing of the actin, calmodulin, elongation factor and β-tubulin genes to characterize these novel fungi.

9. Title: Size Selectivity of Gill Nets Used to Target Silver and Bighead Carp in the Upper Mississippi

Principal presenter: Zachary Witzel

Major: Biology

Other presenters or co-authors: Kevin S. Irons, Illinois Department of Natural Resources, James T. Lamer, Illinois River Biological Station
Faculty mentor: Dr. James T Lamer

Abstract: Bigheaded carp (bighead carp and silver carp) are highly invasive fishes in the Mississippi River System and can be detrimental to native fishes and ecosystems. To limit their impact and further expansion, fishermen have been contracted through state and federal agencies to remove bigheaded carp using predominantly gill nets. Mesh size of entanglement gears determines the size structure of fishes able to be captured. To increase efficiency and effectiveness of bigheaded carp harvest and minimize the capture of bycatch, it is important to understand the relationship of gill net mesh size with the size structure of persistent populations. Therefore, the objective of our study is to determine the size of bigheaded carp and commonly encountered bycatch that are effectively caught in different sized gill nets based on their size (bar size = 7.62, 8.89, 10.16, 10.8, 11.43, 12.7, 13.335, and 15.24 cm). Gill nets were used in pools 16 through 20 on the Mississippi River to capture silver carp (n=445) and bighead carp (n=72). Multiple areas were targeted for their capture including backwater, and main channel areas of bigheaded carp. With this information managers will be able to more efficiently target bigheaded carp if knowledge of population size structure is available.

Title: Eco-Friendly Oxidations Using Water-Soluble Oxidizing Agents

Principal presenter: Adeola Adesoro

Major: Chemistry

Faculty mentor: Dr. T. K. Vinod

Abstract: Hypervalent Iodine (V) reagents, o-iodoxybenzoic acid (IBX) prominent among them, have become reagents of choice for a wide range of selective oxidative transformations in synthetic organic chemistry. The currently accepted mechanism of oxidation of alcohols by IBX in polar aprotic solvents is the well-established ligand exchange mechanism. We have recently reported the synthesis of three new water-soluble IBX derivatives as user-friendly substitutes for the DMSO soluble parent reagent, IBX. While the ease and selectivity of oxidation of alcohols using the new IBX derivative parallel that of IBX in polar aprotic solvents, the new reagents exhibit unique selectivities in its oxidation of allylic and benzylic substrates. This poster will present our new results from the continued and ongoing investigation in this area. Oxidation of doubly allylic and homoallylic substrates using these reagents will be presented along with mechanistic details explaining the observed selectivities.

Title: Quantitative Analysis of the Organic Explosive HMX in Water By High Performance Liquid Chromatography with Ultraviolet Detection

Principal presenter: Alexandra Brisbin

Major: Chemistry

Other presenters or co-authors: Shashi Bhushan Pathipaka, Wei Chean Chuah, Liguo Song

Faculty mentor: Dr. Liguo Song

Abstract: In this study, a method using high performance liquid chromatography with ultraviolet detection (HPLC/UV) has been developed for the quantitative analysis of the organic explosive HMX in water samples. In order to avoid interference by other organic explosives, baseline separation of HMX from the other thirteen priority organic explosives defined by EPA were achieved using a C18 reversed-phase column. Subsequent quantification were accomplished through external calibration. Briefly, a series of HMX standard solutions prepared in HPLC mobile phase were analyzed by HPLC/UV and a HMX peak area versus concentration plot was fitted to a linear equation. After a HMX contaminated water sample was analyzed by HPLC/UV under identical conditions, the HMX concentration was calculated by using the linear equation and the HMX peak area.

Title: Trilobites in Limestone

Principal presenter: Bethany Esterlen
Major: Chemistry
Faculty mentor: Dr. Brian Bellott

Abstract: Current research has been focused on obtaining trilobite fossils that are captured within limestone rocks. It is important to maintain the integrity and structure of the fossils for further geological research. Currently, we possess fifteen limestone rocks that were obtained from local Illinois quarries. The limestone samples were analyzed with a high resolution microscope to identify the quantity of trilobite specimens within each rock sample, prior to being introduced to the acid. Hydrochloric acid is used to dissolve the limestone rock. Once the limestone is dissolved, we must sift through the sediment to obtain the trilobites. Again, this must be done with the microscope as the acid transforms the trilobites to a silica, which is easily missed by the naked eye.

13. Title: How Changing Different Variables in Foam Synthesis Affects its Cell Morphology

Principal presenter: Deanna Valdebenito

Major: Chemistry
Faculty mentor: Dr. Brian J. Bellott

Abstract: Foam is formed when foaming agents are added to rubber to create a matrix that is filled with air. Depending on what properties one wants for the final material, the formulation must be designed accordingly. It is important to change the formulation in ways that will maintain its thermal properties. One must also keep in consideration the curing rate. For this experiment different reactants were changed in the synthesis of the foam materials being examined. First the foam materials were observed through a Zeiss Microscope, to see the different cells, and whether they were open or closed. Open cell foams can be both low and high densities and are the more flexible foams. Closed cells are the rougher ones, which are caused by more cross-links. Once all the foam samples were observed through Zeiss, they were then observed with a Scanning Electron Microscope. This allowed to see in greater detail the cross-links in the materials. It is important to understand how properties change accordingly with the different reactants used and seeing how these changes affect the cell morphology of the foam, as well as its cross-link density. With this information formulations can be written to cater for specific properties.

14. Title: C-H Functionalization of Indoles

Principal presenter: Einsteen Ravi

Major: Chemistry
Faculty mentor: Dr. Jin Jin

Abstract: Indole is a heterocyclic aromatic compound with a benzene-ring fused to a five-membered nitrogen-containing pyrrole ring. Indole and its derivatives are found in many biologically active compounds. It is also present in tryptophan, an amino acid, serotonin, a neurotransmitter, strychnine, plant alkaloid and many pharmaceutical drugs, such as ondansetron (antiemetic), indomethacin (anti-inflammatory). Indole is widely used as antimicrobials, chemotherapy, antihistamines and antiviral. Indole undergoes benzene-like electrophilic aromatic substitution reactions because of delocalization of excessive π-electrons. The C-3 position in indole is the most reactive for electrophilic substitution reactions. The field of C-H activation and functionalization by the transition metal catalyst is identified as an effective tool for C-C and C-X bond formations, and it is an extremely attractive field in organic chemistry. C-H activations have interesting features including low toxicity, inexpensive method, environmentally friendly, characteristic selectivity, and atom-economical dehydrogenative transformations. In this research, C-H bond chalcogenation and alkenylation reactions of various indole compounds will be studied. Diphenyl ditelluride (PhTeTePh), diphenyl diselenide, (PhSeSePh), ethyl acrylate will be used as sources of chalcogens and alkenes along with various indole compounds to study their reactions. The optimum reaction conditions and yield of the final products will be...
investigated. The chemical structures of all the products from the reactions will be characterized and confirmed by NMR and mass spectroscopy.

15. **Title:** Quantification of phenylbutazone in equine plasma for doping control in horse racing using strong anion exchange solid phase extraction followed by liquid chromatography with UV detection

*Principal presenter:* Frank Lin

*Major:* Chemistry

*Other presenters or co-authors:* Nicole Heiser

*Faculty mentor:* Dr. Liguo Song

*Abstract:* Phenylbutazone (PBZ) is one most commonly administered nonsteroidal anti-inflammatory drugs (NSAIDS) for horses, often prescribed to reduce pain and inflammation for the musculoskeletal and joint regions. However, the misuse of PBZ has sparked a controversy in horseracing over the years, as such drugs can mask the lameness of an injured racehorse, which both endangers the horse and the rider. Today, many different performance associations have set strict regulations on the use of PBZ, as well as many other NSAIDS, in racehorses. For example, the plasma threshold of PBZ for a racehorse in Illinois should not exceed 2.0 μg/mL in a post-race analysis. Additionally, PBZ is often analyzed for in conjunction with its metabolite, oxyphenbutazone (OPBZ). Many methods have been developed to analyze the levels of NSAIDS in equine plasma, often through chromatographic methods such as liquid chromatography (LC) or gas chromatography (GC), which are then coupled with a detection method such as mass spectrometry (MS). Although MS is a popular detection method due to its high specificity and sensitivity, it is not as accessible for most laboratories. An alternative to this would be to utilize ultraviolet (UV) detection, which is sensitive enough to analyze for NSAIDS like PBZ. However, since UV is less specific than MS, a selective method will have to be developed to compensate for the loss in specificity. Thus, the objective of this study was to develop a method to selectively extract PBZ and OPBZ from interfering components in equine plasma and achieve a baseline separation of PBZ and OPBZ from other common NSAIDS. This was achieved through the use of strong anion exchange-solid phase extraction (SAX-SPE) followed by (LC-UV). With SAX-SPE, the NSAIDS of interest (PBZ and OPBZ) and an internal standard (tolfenamic acid) were selectively extracted from equine plasma, and a baseline separation was achieved with LC-UV under optimized LC conditions. The levels of PBZ and OPBZ were quantified with the use of an internal standard calibration curve that was generated from the results. An equine plasma with an unknown concentration of OPBZ and PBZ has also been analyzed in triplicate to validate the method, and the percent relative standard deviation of the analysis was 4.93% and 6.75% for PBZ and OPBZ respectively. Thus, the results demonstrate how this method is able to successfully quantify the levels of PBZ and OPBZ in equine plasma through this method, which can then be applied to common drug testing laboratory settings.

16. withdrawn

17. **Title:** Gene Editing of Secondary Alcohol Dehydrogenase in Nocardia Cholesterolicum NRRL 5767 using CRISPR/Cas9 Technology

*Principal presenter:* Kadidia Samassekou

*Major:* Chemistry

*Other presenters or co-authors:* Jenq-Kuen Huang, Lisa Wen, Scott Holt, Shawn McClenahan

*Faculty mentor:* Dr. Jenq-Kuen Huang
Abstract: Oleic acid is an abundant agricultural commodity which can be converted to value-added hydroxy fatty acid by chemical or enzymatic means. Nevertheless, enzymatic approach is better because it is operated under mild conditions and fewer by-products are formed. Nocardia cholesterolicum NRRL 5767 (NC NRRL 5767) is a well-known microorganism which converts oleic acid to 10-hydroxystearic acid (10-HSA) at a high yield (~90% w/w). A small amount of the 10-HSA is subsequently converted to 10-ketostearic acid (10-KSA). The 10-HSA is a valuable product in the industry as a lubricant and a cosmetic composition. The conversions of oleic acid to 10-HSA and then to 10-KSA are catalyzed by the enzymes oleate hydratase and secondary alcohol dehydrogenase, respectively. The objective of this research is to silence the secondary alcohol dehydrogenase gene responsible for the production of 10-KSA using CRISPR/Cas9 system so that oleic acid can be converted to 10-HSA only. Chimeric plasmids targeting the N-terminal and central region of the secondary alcohol dehydrogenase were constructed by Golden Gate Assembly, confirmed by DNA sequencing, and transformed into wild type NC NRRL 5767 via electroporation. The transformants were selected by apramycin resistance and screened for the presence of the target insert by colony PCR. The ability of selected transformants to transform oleic acid to 10-HSA and the absence of 10-KSA were examined via ether extraction followed by thin-layer chromatography (TLC). Our results showed that both 10-HSA and 10-KSA were produced from oleic acid by the selected transformants. It appears that the secondary alcohol dehydrogenase silencing was unsuccessful. This may result from either Cas9 not expressing or it was expressed but did not target the secondary alcohol dehydrogenase gene. Therefore, the expression of Cas9 in the cell-free extracts of selected transformants was examined by Western blotting using antibody against Cas9. Unfortunately, the Cas9 protein was undetectable in the transformants.

18. **Title:** Synthesis of Silver Nanoparticles with Capping Agents with Different Anions  

*Principal presenter:* Katelyn Nemeth  

*Major:* Chemistry  

*Other presenters or co-authors:* Brian Bellott, John Determan  

*Faculty mentor:* Brian Bellott  

**Abstract:** Silver nanoparticles have unique physical, chemical, and optical properties that are used in a wide array of applications, such as chemical/optical sensing. For this study it has been determined that nanoparticles with a larger face geometry, or more faces, and sharper corners have a higher sensing ability, therefore are more ideal for optical sensing. To synthesize these nanoparticles with cubic or octahedron geometry, there are a few variables that can be analyzed. These variables include reducing agents, capping agents, and etching agents. Capping agents will be of focus in this research because of their ability to limit the size and shape of the nanoparticle during aggregation. The size, geometry, and composition of the nanoparticles are analyzed through UV/VIS and STEM-EDS with respect to different capping agents and different concentrations of capping agents.

19. **Title:** Induction of Apoptosis by Peptide J18 in Ovarian Cancer Cells  

*Principal presenter:* Kimberly Oldenburg  

*Major:* Chemistry  

*Other presenters or co-authors:* Matt Weiskamp, Richard Musser, Mette Soendergaard  

*Faculty mentor:* Dr. Mette Soendergaard  

**Abstract:** Ovarian cancer is the fifth leading cause of cancer-related deaths for women, which is correlated to a low rate of early-stage detection. Currently, standard treatment involves cytoreductive surgery and chemotherapy. However, patients often present with recurrent and resistant disease leading to overall low 5-year survival rates of approximately 40%. Bacteriophage (phage) display technology using a fUSE5 15-mer library was previously used to identify peptide J18 that binds specifically to
human ovarian adenocarcinoma (SKOV-3) cells. In addition, J18 was shown to reduce cell viability via the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) reduction assay (unpublished data). In order to further investigate the cytotoxic effects of peptide J18, induction of apoptosis was measured by a caspase 3/7 assay. Briefly, SKOV-3 cells were grown to 90% confluency on 96-well plates in McCoy's 5A cell medium supplemented with 10% fetal bovine serum and 50 μg/mL gentamicin at 37°C and 5% CO2. Cells were then treated with 0.25 mg/mL peptide J18, 0.25 mg/mL peptide N35 (negative control), 100 nM paclitaxel, or dimethyl sulfoxide (DMSO; vehicle) for 12 h, after which 100 μL Apo-ONE Caspase-3/7 Reagent (Promega, WI) was added and incubated at 37°C for 3 h. The activity of caspase 3/7 was then measured fluorescently (λex=499 nm, λem=521 nm) using a microplate reader (SpectraMax Gemini EM, Molecular Devices, CA). The relative fluorescent units (RFU) was measured to be 409.7±96.0, 560.6±84.1, 652.5±149.1, and 648.0±47.5 (mean±standard deviation) for DMSO, N35, J18, and paclitaxel, respectively. Results showed that J18 and paclitaxel significantly (p<0.05) increased caspase 3/7 activity compared to DMSO (control), while N35 (negative control) was unchanged. Further, there was no significant difference (p>0.5) between J18 and paclitaxel at the concentrations measured. These results indicate that peptide J18 reduces cell viability in human ovarian adenocarcinoma SKOV-3 cells by apoptosis, and that the peptide may be utilized in the treatment of the disease.

20. **Title:** Solid-State Synthesis  
**Principal presenter:** Kyle Patrick Murphy  
**Major:** Chemistry  
**Other presenters or co-authors:** Brian Bellott  
**Faculty mentor:** Dr. Brian Bellott  
**Abstract:** The different forms of CsBa2SnS4Cl (α-CsBa2SnS4Cl and β-CsBa2SnS4Cl) will be compared by reflected light optical microscopy, polarized light optical microscopy, dark field optical microscopy, scanning electron microscopy, and X-ray diffraction. The samples were synthesized by combining the elements in the correct atomic ratios and heated in a computer controlled furnace. In order to produce crystals of significant quality different temperature programs were explored and the products from those reactions will be discussed. Preliminary results of the synthesis of CsBa2SnSe4Cl will be discussed in terms of what the change of sulfur to selenium does and how it impacts the extended structure of the samples.

21. **Title:** Phage Display Selection and Identification of Novel Pancreatic Cancer Targeting Peptides  
**Principal presenter:** Mallika Asar  
**Major:** Chemistry  
**Faculty mentor:** Dr. Mette Soendergaard  
**Abstract:** Pancreatic ductal adenocarcinoma (PDA) is currently the fourth leading cause of cancer deaths in the U.S. It has been recently estimated that the disease causes approximately 30,000 deaths per year in the U.S., and that pancreatic cancer patients exhibit a 5-year survival rate of only 3%. The high lethality of pancreatic cancer is due to the fact that most cases are diagnosed at advanced metastatic stages. While there are diagnostic methods in use clinically, most are inadequate, potentially leading to delayed diagnosis and further spreading of the cancer prior to treatment. Due to insufficient diagnostic techniques, it is imperative to develop new methods, which may facilitate early diagnosis. One such modality employs the use of peptides with high binding affinity and specificity to a pancreatic cancer biomarker. Bacteriophage (phage) display technology is a high throughput method for discovering peptides that confer specific binding properties to a single molecular target. The peptides are typically displayed on the distal end of coat protein III of the Fd filamentous phage. Here we report using phage display technology to select peptides with specific binding to human pancreatic cancer cells. To do so,
 naïve fUSE5 15-mer library (kind gift from Dr. George Smith) was negatively selected against normal pancreatic ductal cells (hTERT-hPNE). Unbound cells were collected, amplified by infection of E. coli K91BK overnight, and isolated using polyethylene glycol (PEG), NaCl precipitation and centrifugation. Amplified phage were then subjected to four rounds of positive selection against pancreatic cancer cells (Mia-Paca-2) grown to 80-90% confluency. Between each round of selection, phage were collected, amplified in E. coli K91BK and isolated as described above. Stringency was increased in the fourth round of selection by performing the selection against cells grown to 60% confluency. After the final round of selection, phage DNA was extracted and polymerase chain reaction (PCR) amplicons were identified by paired-end (2x150bp) next generation sequencing (MiSeq) followed by translation and sorting of the sequences (Genewiz, NJ). Two 15-mer peptides, MCA1 and MCA2, were selected as the top two peptides. The peptides will be screened in cell binding assays to determine individual binding constants. Peptides that exhibit high binding affinity and specificity for Mia-Paca-2 cells may subsequently be employed as probes in the detection of pancreatic cancer.

22. **Title:** Characterization of Invitro BPA Contamination on Cellular Glycoprotein and Protein Expression in African American Men Versus Caucasian American Men

**Principal presenter:** Matthew Klyman

**Major:** Chemistry

**Faculty mentor:** Dr. Erica McJimpsey

**Abstract:** Bisphenol A is a commonly used chemical in modern industry. It is utilized in the creation of polycarbonate, the hard plastic used in a myriad of products, as well as epoxy resins. Metal food cans employ epoxy resins to stop the food from sticking to the container. BPA can leach from the packaging or lining to the food, sparking concerns over the effect it may have on humans. The World Health Organization and the US Food and Drug Administration have launched several studies seeking to quantify the average person's exposure to BPA along with any possible risks, but areas of uncertainty remain.6,7 One unknown is the altered cellular glycoproteomic, as well as N-glycosylation expression of human neural stem cells, prostate, and mammary gland cells after exposure to BPA. Glycoproteins are proteins which possess covalently bound oligosaccharides called glycans. N-linked glycosylation occurs when a glycan chain adheres to an asparagine residue of a protein via the amide end.1,2 Breast and prostate cancer cells express prostatic specific antigen (PSA), a glycoprotein which serves as a biomarker for cancer.4,5 Elevated levels of PSA are interpreted as signs of the progression of the cancer.3,8 By studying PSA's expression after exposing the cells to BPA, one can deduce if BPA is increasing the rate of cancer development by observing the PSA variations. Characterization of cellular N-glycosylation, glycoprotein, and protein expression after BPA exposure will be achieved via several analytic techniques once control cells and cells spiked with BPA in their media of each cell line reach sufficient growth. Western Blot analysis will be employed to identify proteins and is able to give an approximate range for the concentration of PSA. In order to refine the concentration values, we'll utilize enzyme-linked immunosorbent assay. With respect to the glycoproteomic studies, glycoprotein N-linked glycans will be isolated from PSA from media via affinity chromatography and then undergo solid phase extraction to be purified. In order to classify the resulting glycans and peptides, they'll be run through liquid chromatography mass spectrometry.

**References:**


23. **Title:** Exploration of a new oxidizing agent on the oxidation of indole  
*Principal presenter:* Ravali Mekala  
*Major:* Chemistry  
*Faculty mentor:* Dr. Jin Jin  

**Abstract:** Indoles are probably the most widely present heterocyclic compounds in nature with medicinal importance. Many biological active molecules contain indole as part of their structures such as tryptophan and serotonin. Tryptophan is an essential amino acid and the constituent of most proteins. Serotonin is a very important neurotransmitter in the central nervous system in animals, and also in the cardiovascular and gastrointestinal systems. Therefore indole derivatives are very important heterocyclic compounds in the drug-discovery studies. There has been an increasing interest in the use of indole derivatives as bioactive molecules against microbes, cancer cells, and various kinds of disorder in the human body. The objective of our research is to explore the oxidation reaction on indole and its derivatives. It has been reported various oxidizing agents oxidize indole to a variety of products, the degree and extent of oxidation being dependent on the particular reagent and experimental conditions used. There are many oxidizing reagents causing the ring cleavage of indole which is undesired. In our research, we found a new oxidizing reagent which is the combination of tellurium tetrachloride (TeCl4) and iodine (I2). These two reagents working together will oxidize indole to oxindole at just room temperature and very mild conditions. We also used the combination of TeCl4 and I2 on the oxidation reaction of indole derivatives, and the oxygenated indoles were successfully obtained. We hope the combination of these two reagents can also be applied to catalyze other oxidation reactions.

24. **Title:** Determination of Phosphate and Nitrate Concentration in Soil and Water  
*Samples*  
*Principal presenter:* Rebecca Haughey  
*Major:* Chemistry  
*Other presenters or co-authors:* Brian Bellott, Terri Tobias, and Andrea Porras-Alfaro  
*Faculty mentor:* Dr. Brian Bellott  

**Abstract:** Phosphates and nitrates are naturally occurring nutrients that have many beneficial attributes to them. These nutrients are used as a food source for plants which allows them to grow, and why many fertilizers used have nitrates and phosphates in them. If the concentration of phosphates and nitrates becomes too high the water and soils become toxic to the organisms around. High concentrations of these nutrients creates algae blooms, which grow unchecked. The rapid growth and abundant amount cause a depletion of the oxygen in the water. The lack of oxygen in the water can create an anoxic event,
which will kill the organisms in the water that do not receive enough oxygen. The abundance of nitrates in water cause a problem, in humans, because they affect the ability of red blood cells to transport oxygen throughout the body. One of the natural ways to alleviate high phosphate and nitrates in creeks and streams is to use riparian buffer strips. These strips are buffer regions between agriculture fields and creeks that filter the runoff water from the field before it reaches the water to remove the pollutants from the water. In these buffer strips, the concentration of the phosphates and nitrates should be higher because it is removing these nutrients from the water that passes over them. The goal of this research is to determine the phosphate and nitrate concentration of the soil in the buffer strip as well as the water from a creek near the buffer strip. The determination of concentration of the phosphates in soil includes an extraction step, the method being used will be the Melich 3. To determine the phosphates in the extract from the soil and water colored a vanadomolybdophosphoric acid colorimetric method will be used. For the determination of the nitrates in the soil, the nitrates were extracted from the soil by making it a slurry and filtering the water. The concentration of the nitrates in the soil extract and in the water were measured using a probe.

25. **Title:** Quantitative Analysis of Limonene Content in Citrus Oil by Gas Chromatography Using Acetophenone as the Internal Standard  
   **Principal presenter:** Terrence D Petry Jr  
   **Major:** Chemistry  
   **Faculty mentor:** Dr. Liguo Song  
   **Abstract:** An experiment to integrate three significant topics in analytical chemistry and related disciplines, i.e., gas chromatography (GC), external calibrations and internal calibrations, has been successfully developed in the quantitative analysis of limonene content in citrus oil using acetophenone as the internal standard. Through this experiment, students are exposed to GC instrumentation, the optimization of GC separation, the advantages and disadvantages of external versus internal calibration, and the selection criteria of an internal standard. The technique and chemicals used in this experiment are simple, safe and easy. The experimental results show that this experiment is an ideal laboratory assignment for students at the undergraduate level.

26. **Title:** Quantification of naproxen in equine plasma for doping control in horse racing using strong anion exchange solid phase extraction followed by liquid chromatography with UV detection  
   **Principal presenter:** Tiwalola Ogunleye  
   **Major:** Chemistry  
   **Other presenters or co-authors:** Madison Chao  
   **Faculty mentor:** Dr. Liguo Song  
   **Abstract:** Nonsteroidal anti-inflammatory drugs (NSAIDs) are a group of drugs differing in structure and molecular weight but similar in their mechanism of action, side effects and therapeutic properties, a distinct feature of NSAIDs is that they are all acidic with pKa values ranging from 3 to 5, their pharmacological characteristic enable them to act as analgesic and antipyretic which enables them to reduce pain and fever respectively, this analgesic property can allow an injured horse to continue racing as NSAIDs can mask the lameness despite serious injury to tendons and joints. Naproxen (NAP) like all NSAIDs has the effect to mask lameness thus the need for its use to be monitored in race horses which is enforced by the United States Equestrian Federation (USEF) to ensure animals right to health protecting race horses and riders with NAP quantification in race Equine plasma, USEF controls doping and concealment of pathological conditions by setting specific thresholds with Naproxen's given as 40μg/ml of plasma to differentiate between it therapeutic use and doping. Determination of NAP concentration in equine plasma was achieved using High performance Liquid Chromatography (HPLC) with Ultraviolet
(UV) Spectroscopy as a means of detection coupled with Strong anion exchange Solid phase extraction (SPE) for sample pretreatment, though other means of detection like the Mass spectrometry is preferred in terms of sensitivity, the UV detection is usually more accessible for Equine plasma drug quantification. In the study, six equine plasma samples spiked with different concentrations; 1μg/ml, 2μg/ml, 5μg/ml, 10μg/ml, 25μg/ml and 50μg/ml of NAP and three samples with unknown concentrations of Naproxen were first pre-treated by (SPE) to reduce the amount of interference which ensures an easy detection of the drug by HPLC, the pretreated samples were then analyzed with HPLC using a mobile phase composing 68% (95: 5 Methanol: Acetonitrile) and 32% water with 0.1% acetic acid, and injection volume of 20μl, flow rate 1.0 ml/min and UV detection at 254nm, using this column conditions and internal calibration method with Tolfenamic acid as internal standard, the concentration of Naproxen in the unknown samples was determined from the calibration curve equation and was obtained to be close to the original values with a %RSD of 1.3. It can thus be concluded a HPLC-UV method had been developed for the quantification of Naproxen in equine plasma using Tolfenamic acid as an internal standard, the developed method is useful for doping control in race Equines.

27. **Title:** Barriers in upward communication channels from superiors to subordinates  
**Principal presenter:** Mercedes Joyner  
**Major:** Communication  
**Faculty mentor:** Dr. Peter Jorgensen

**Abstract:** The following paper exemplifies how communication is utilized as a tool to conquer upward barriers of communication between subordinates and superiors. Barriers that exist can prevent people from truly listening to each other, leading to misinterpretation, message distortion and the inability to get projects done successfully and on time (Richards, 2019). The specific upward communication barriers that are presented and described are risk, distortion, manager use of information and overriding sense of loyalty. Superior/Subordinate relationships are defined and explained through the interaction of upward communication. It is explained that upward communication channels may be crippled by the communication mediums that are available to lower-level employees (Vitez, 2019). The Leader Member Exchange model is introduced in efforts to further explain the relationship between superior and their subordinates. It is explained that as a person's power increases, their perceived trustworthiness goes down and this has a substantial effect on superior/subordinate relationship interactions. (DeSteno, 2018). Concluding the presented ideas are 6 best practices provided by Carolyn O'Hara, a writer and editor based from New York. O'Hara's practices are established in efforts to break down the barriers that exist between both parties within the communication channel. These 6 best practices are introduced as making a connection, being transparent and truthful, encourage rather than command, take blame, but give credit, don't play favorites and show competence.

28. **Title:** Integrated Mold Designing  
**Principal presenter:** Natasia McDade  
**Major:** Engineering Technology Leadership  
**Faculty mentor:** Dr. Brian Stone

**Abstract:** This is an independent research project of self-improvement and integrated processes covered in the Engineering Technology curriculum. It goes through the trial and error of designing and machining aluminum molds for casting traditional chess board pieces. The process uses Inventor an Autodesk designing software on a 2-inch cube metal stock. Machining the chess pieces is done on SURFCAM, which is a software that allows the user to make cut-paths and generate a visual model of the part after each cut process. This is a useful tool to use in that it decreases the chance of crashing the cutting tools on the CNC machine into the part. These steps are part of an integrated process where students learn to transform their ideas into reality. The addition of detail to the casted pieces are added
by using plasma cut outs. Before advancing to the final stages of creating metal casted chess pieces, they are casted out of plastic using an injection molding process. This will help to measure the surface finish and overall design of each piece. In the process of engineered manufacturing, students are taught the progressive stages of production including conceptualization, design, machine coding, prototyping, redesign modification and final production. However, with the current curriculum, they are not able to bring all of the processes together and create an individually designed item. While testing the theory if there is a significant difference between the amount of detail within a mold design and its ability to be machined and surface finish. Trying to get maximum detail in a mold makes it harder to machine depending on the tooling used and the actual design. These molds are machined once but the inner parts can be reproduced multiple times. I will create molds and chess pieces after testing my designs and produce a set of chess pieces. In hopes of getting my finished product displayed for future students. By doing so, students will understand that the hands on concepts learned in the program can be sequenced together to create products that can be used in the marketplace or industry. Students are only able to become creative in the Engineering Technology Leadership Master's program due to the production-based class. I want to potentially recruit more students to enter the master's program and expand their knowledge in the undergraduate program. This independent research will be used as a gateway to demonstrate the creative side of the students in the program. Allowing them to conceptualize ideas that they want to come to life In all the Engineering Technology major has many divisions of expertise, yet students are confined because they haven't expanded their creative side beyond the focus of classes taken. An Integrated project done by a student that has went through the entire Engineering Technology undergraduate and graduate program, shows students there is more to take away from the major.

29. *Title:* Impact of Sleep on the Mental Health of College Students: A Literature Review

*Principal presenter:* Alyssa Detrick and Alicia Guyette

*Major:* Health Sciences

*Faculty mentor:* Dr. Fetene Gebrewold

**Abstract:** Sleep is critical to the proper development and function of the human brain. Without the proper amount and timing of sleep, the body loses the ability to maintain focus, form new memories, and react quickly to stimuli. College students are known for not prioritizing sleep. As a result, up to 50% of college students report being significantly tired throughout the day, and up to 20% report that lack of sleep or sleep dysfunction has a major impact on their academic performance. Furthermore, the lack of quality sleep is a predictor of depression. Due to increased risk of stress and sleep deprivation, college students are particularly vulnerable to depression. Sleep deprived students cannot effectively manage stress and anxiety both of which are hallmarks of the college experience (Peach, Gaultney, Gray, & Walla, 2016). One major challenge is cell phone and technology use before bed, as this has been linked to a decrease in the quality of sleep attained, as well as, an increase in the amount of time it takes for a person to fall asleep. Studies have shown that overuse of smartphones, especially before bed, have been linked to an increased risk of depression and poor sleep quality. With 39.8% of college students falling into high smartphone usage, electronic media is a major risk factor for depression in the college population (Demirci, Akgönül, & Akpınar, 2015). By analyzing various studies on technology usage and sleep patterns we can see how different factors affect the likelihood of developing depression in college-aged students. This analysis will allow for the design of a sleep intervention and technology-use programs for students to effectively balance the stressors of college and sleep to promote overall wellness.

30. *Title:* A Picture is Worth a Thousand Words - History of Data Visualization

*Principal presenter:* Bolarinwa Akinwumi

*Major:* Health Sciences
Abstract: "A picture is worth a thousand words"? This statement accurately describes the importance of data visualization. Data visualization helps to represent information in the form of a chart, diagram, picture, etc. As an indispensable part of our lives and work, data visualization provides tools to present and depict the data to be more informative, efficient, appealing, and in some cases interactive and predictive. This study aims to examine the history of data visualization, detect the current trends and modern application, and explore the challenges and opportunities ahead. Data visualization rooted from the map-making years and evolved with the development of statistics. The concept of data visualization has revolutionized data presentation in the statistical world. This study highlights the importance of processing data and information faster for the purpose of clarity. With the aid of various visualization tools, we can understand the data and the implication in a more succinct way. With new concepts keep evolving year in year out, there is still a lot of challenges ahead, where lies a lot of opportunities.

31. **Title:** Exploration of the Factors Influencing Mammography Screening Participation

**Principal presenter:** John Agboola

**Major:** Health Sciences

**Faculty mentor:** Dr. Mei Wen

**Abstract:** Breast cancer is the most commonly seen cancer among females. A mammogram is a non-invasive X-ray used to check for breast cancer and other abnormalities so that cancer can be detected at an early stage. It has been proven to reduce breast cancer death significantly and currently is the most important single factor identified to be associated with improved breast cancer survival by ensuring early detection and treatment. It is recommended that all women should have their first mammogram from 40 years old. Despite the high level of breast cancer survival recorded in many developed countries due to screening mammography, many countries still witness low levels of participation in mammography screening. This study aims to explore and examine the factors influencing mammography screening participation in different countries based on the published data and literature, and to promulgate possible ways to enhance participation in countries where low participation of mammography screening is an issue associated with preventable death and high medical bills. This study also presents a global outlook on the rate of change in breast cancer mortality across countries and the role mammography screening has played in the trend.

32. **Title:** Burden and Coping Styles Among Informal Caregivers of Depressed Patients in Ondo State, Southwestern Nigeria

**Principal presenter:** Opeoluwa John Ponnle

**Major:** Health Sciences

**Other presenters or co-authors:** Mei Wen

**Faculty mentor:** Dr. Fetene Gebrewold

**Abstract:** The study examined the level of caregivers' burden and their coping styles in the care of depressed patients in Ondo State, Nigeria. It determined the factors that are associated with caregivers' burden, it further analyzed the relationship between caregivers burden and carers' quality of life. This was done with a view to providing reference information on family involvement in the care of depressive illness and as well addressing the needs of these informal caregivers so as to promote adaptive mechanisms with the stress of caregiving. The study employed an exploratory descriptive design and was conducted in 2 major hospitals in Ondo State, Nigeria. A sample size of 230 informal caregivers was arrived at using Rosner's Formula (2006). Purposive sampling technique was used to select a tertiary hospital and a specialist hospital while random sampling technique was also used to
select 230 informal caregivers from the hospitals. Zarit Burden Interview (ZBI), Zung Self Depression Scale (SDS), Coping Orientation to Problems Expressed (COPE), and Carers' Quality of Life (Carer QoL) was used for data collection. ZBI is to assess the caregivers' burden with a 22-item questionnaire on a 5-point scale (0 never to 4 nearly always); COPE is to determine the coping strategies of caregivers while CarerQoL assessed seven burden dimensions (the burden component to indicate whether they have 'no' 'some' or 'a lot' of problems or fulfillment/support). Analysis was done using description and inferential statistics. The results showed that majority of caregivers were women in both facilities. Also majority (49.1%) of informal caregivers had a mild level of burden. There are five factors out of the six presented that are significantly associated with level of burden. The majority of the informal caregivers utilized religion as their coping style. Caregiver burden was correlated with a lower quality of life in two dimensions of the CarerQoL. Inferential statistics showed there was significant relationship between burden and hours of duration of care (r=0.146; p=0.006). However, there was no significant relationship between burden and coping styles of caregivers (r=0.093; p=0.167) and the relationship between burden and level of depression of caregivers (r=0.103; p=0.131). It was concluded that caregiving has an impact on the informal caregivers' health status and quality of life in Ondo State.

33. **Title:** The Effects of Fatigue and Sleep Deprivation on Flexibility and Balance over the Course of an Ultra-Endurance Race  
*Principal presenter:* Mitchell Wendling  
*Major:* Kinesiology  
*Other presenters or co-authors:* Tim Piper, Steve Radlo, Cindy Piletic  
*Faculty mentor:* Dr. Tim Piper  
*Abstract:* The purpose of this study was to determine the effects of fatigue and sleep deprivation on flexibility and balance over the course of a 12-hour or 36-hour endurance event. Twenty-five participants volunteered for this study but only thirteen (10 males, 3 females) completed the event. Each participant was tested for posterior chain flexibility (cm) and single-leg balance (sec). Data was collected individually per participant before the start of the event and every 6-8 hours afterwards. An one-way analysis of variance (ANOVA) with repeated measures on the five trials (Pre-test, T1, T2, T3, Post-test) were conducted on the two dependent variables (Flexibility and balance) to determine significant differences, with the alpha level set at .05. No significant differences were found for posterior chain flexibility in both the 12-hour and 36-hour event. Significant differences were found in right-leg balance for the 12-hour event, F(2,22)=7.04, p<.01, and left-leg balance for the 12-hour event, F(2,22)=14.10, p<.01. Significant differences were only found in left-leg balance for the 36-hour event, F(4,36)=3.90, p=.01. In conclusion, left-leg balance showed significant differences in both 12-hour and 36-hour events while right-leg balance only showed significant differences in the 12-hour event.

34. **Title:** Effects of Ultra-Endurance Racing on Response Time and Memory Recall  
*Principal presenter:* Samuel Almendarez  
*Major:* Kinesiology  
*Other presenters or co-authors:* Tim Piper, Steven Radlo, Miguel Narvaez  
*Faculty mentor:* Dr. Tim Piper  
*Abstract:* The purpose of this study is to investigate the effects of a highly demanding ultra-endurance event on response time and delayed memory recall. The Ultimate Suck is a very challenging and intense event where participants enroll in either a 12- or 36-hour event. Twenty-four participants volunteered for this study but only thirteen of them (10 males, 3 females) actually completed the event. Each participant was tested on response time and delayed memory recall. Data was collected on every participant prior to the event, every 6-8 hours during the event, and immediately after completion. A
simple analysis of variance (ANOVA) test with repeated measures on the five trials (i.e., pre-test, trial 1, trial 2, trial 3, and post-test) were conducted on the two dependent variables (i.e., response time and delayed memory recall) to determine significant differences for both the 12-hour and 36-hour event participants. Alpha level was set at .05. The 12-hour event found significant differences across all testing sessions in average memory recall, F(2, 24) = 8.58, p = .005. The 36-hour event also found significant differences across all testing sessions in average memory recall, F(4, 36) = 6.77, p = .014. In conclusion, memory recall showed significant differences across the testing sessions in both the 12-hour and 36-hour events. Data for both events depicted an immediate difference (i.e., within the first six hours), but both results showed a plateauing in the results after the initial decrease. The participants' averages for memory recall do not increase or decrease following the immediate drop, but remain significantly lower than pre-test scores throughout both events.

35. **Title:** The Rejuvenation of a Physics Lab  
**Principal presenter:** Clay Burkholder  
**Major:** Physics  
**Faculty mentor:** Dr. Mark S. Boley  
**Abstract:** This project is about the pathway to a change from a career in industry to a teaching position at the university level. A specific area of focus was the laboratory section of a physics class at Hannibal-LaGrange University. At the beginning of the project, the truly experimental nature of the lab was mostly non-existent, even though the class was being held in a new building with new lab equipment. The responsibility was to rejuvenate the lab and re-engage the students in a hands-on learning atmosphere, all while pursuing a Master’s degree at Western Illinois University following the internship option. In developing the lab activities, it was important not only to re-engage the students, but to assess the effectiveness of the experiments themselves as well as the teaching methods. This assessment was to be accomplished by incorporating several activities using a research in STEM education approach. Among them were to develop an assessment whereby the students could critique the lab and the instructor, diagnostic testing at the beginning and end of the semester to clarify strengths and weaknesses in the methods applied, and comparative checks of lab reports at the beginning and end of the semester. The goal of these activities was to make sure that every student, regardless of educational or cultural background, was being presented with a valuable experience that would be beneficial to their educational goals. At this time, the lab has been re-established, experiments are being conducted, and students are being trained in physics laboratory methods. The assessment portion will be the next area of focus upon completion of the Master’s degree at Western Illinois University.

36. **Title:** Structural, Magnetic and optical properties of cobalt doped zinc oxide  
**Principal presenter:** Veerpal Kaur  
**Major:** Physics  
**Other presenters or co-authors:** Anumeet Kaur, Professor Anupinder Singh  
**Faculty mentor:** Dr. Mark S. Boley  
**Abstract:** Powder samples of Pure Zinc Oxide (ZnO) and Cobalt doped ZnO were synthesized by Sol Gel method. The X-Ray Diffraction confirmed the proper phase formation. The SEM micrographs showed proper grain growth and EDAX confirmed the presence of all the elements in samples. Magnetic measurements confirmed the ferromagnetic behavior. The presence of new vibrational bands with Co doping confirmed by Raman Spectroscopy. Keywords - Solid Gel Method, ZnO, XRD, SEM, VSM , Raman Spectroscopy

37. **Title:** The Impact of HIV/AIDS on Global Health  
**Principal presenter:** Bolade Adeyooye and Mylie Beard
**Major:** Public Health

**Faculty mentor:** Dr. Fetene Gebrewold

**Abstract:** Human Immunodeficiency Virus (HIV)/AIDS is a communicable disease that has crossed borders worldwide and is still highly infectious. Due to its rapid spread and undiscovered cure, prevention has been a major goal leading to the use of different means of personal protective equipment in the health care system around the world. This research reviews the impact of the deadly virus on the health of individuals and the public on a large scale. The main objective of this project is to examine the effect of the knowledge of HIV/AIDS on individuals and healthcare facilities. The project also seeks to estimate the level of preventive care towards this disease individually and globally. The proposed significance of this project is to understand the extent of preventive care towards HIV/AIDS and to discover and mend possible loopholes in preventive care. Questions such as how effective are protective equipment to preventing transmission of this virus and how well do users know this equipment.

According to the World Health Organization, 34.4 million people are living with HIV/AIDS worldwide, therefore, measures should be taken to ensure that the affected population does not increase. The methodology considered for this project includes the use of a wide range of data collected from different parts of the world with the use of world organizations data such as WHO and UNICEF to mention a few. Data collected from scholarly articles will be collated and interpreted, providing the necessary information needed to draw conclusions. Results would elicit the level of knowledge concerning preventive care and methods used to reduce the rate of transmission of the virus and also expose loopholes that need to be addressed in other to effectively curb HIV/AIDS.

38. Withdrawn

39. **Title:** Sexual Scripting through Netflix: LGBT Representation in Film

   **Principal presenter:** Rebecca Creager

   **Major:** Sociology

   **Faculty mentor:** Dr. Tawnya Adkins Covert

   **Abstract:** This is an exploratory qualitative content analysis as part of a thesis on how media targeted towards the LGBTQ population depicts sexual interaction among non-heterosexual characters. This thesis offers a new dimension of understanding the sexual socialization of queer youth by looking at films that are on the streaming service, Netflix. Using this platform ensures that this thesis will take into account both traditional and new media portrayals when collecting data. Collecting the sample from only the movies within the "LGBTQ" category also ensures that this is media in which LGBTQ peoples are the target audience. The literature on this topic suggests that LGBTQ youth look for any media relevant to them to model their behavior after due to their relatively low-exposure with the queer community throughout their everyday lives. Knowing that these depictions can have an impact on how queer youth understand and perform their own sexuality, it is important to study the types of sexual scripts being presented in LGBTQ-targeted media.

40. **Title:** Pre-transition Exercise as a De-escalation and/or Preventative Intervention

   **Principal presenter:** Terri Dobmann

   **Major:** Special Education

   **Faculty mentor:** Dr. Christian Anderson

   **Abstract:** This action research project investigated the use of a pre-transition exercise entitled, "Sitting Peacefully" from the Calm Classroom curriculum in a special education classroom with high school students who were considered to have maladaptive behaviors to determine if an academic gain in appropriate behaviors and compliance to work and break activities were to be impacted by the eight week exercise intervention. The high school students used the intervention twice a day for eight weeks
with the audio file for two minutes and seventeen seconds each day with least-to-most level of prompting utilized by classroom staff. Data was analyzed and found a significant gain, loss, or no significant impact on student behavior and compliance.

41. **Title:** The Socioeconomic Impact of Resource Accessibility and Diversity for Adolescent/High School Baseball Players in Chicagoland Urban Environments

*Principal presenter:* Jorion Tucker

*Major:* Sport Management

*Faculty mentor:* Dr. Algerian Hart

**Abstract:** The purpose of this study is to analyze existing factors that may contribute to the development and pursuit that an adolescent baseball player experiences in order to continue playing at a higher level of competition. Within this study, I will explore the socioeconomic influence of urban environments that can ultimately be the deciding factor for which a baseball player can base his experience within the sport. Adolescent baseball is the primary platform for which professional scouts and teams strategize and recruit potential players based on their athletic capabilities and overall potential to grow as a player within the sport. While examining the socioeconomic aspects of resource accessibility, it can be argued that there is a strong relationship between low income areas, lack of resources, and ethnicity. Taking a look at college level participation in division 1, "In baseball, white participation decreased slightly from 81.9 percent in 2015-2016 to 80.8 percent in 2016-2017. African-American participation increased from 3.3 percent to 3.7 percent. Latino participation remained the same at 6.5 percent." (Lapchick, 2018). With this in mind, the current MLB population of players of African descent account for 7.7% of the total league population while Latinos hold 31.9%. (ESPN, 2017). As there appears to be an evident lack of participation among minorities in baseball at several levels, this study will take into account the initial underlying causes that may lead to a lack of diversity within baseball. Among other sports, baseball is one of the more expensive sports to play, as it requires more equipment than sports such as soccer or basketball. This study will break down and analyze the costs associated with participation in baseball. Additionally, this study will analyze access resources such as equipment, travel teams, scout recognition and exposure which plays a pivotal role in the development of players as they continue to higher levels of participation within baseball. Ultimately, within this study, I will explore the relationship between socioeconomic urban environments and resource accessibility among adolescent baseball players.
Podium Presentations

1. **Title: Role of Macrophages and AXL Receptors in Dengue Virus Infection of Permissive Cells**
   
   **Principal presenter:** Adedayo Olabode Adelakun
   
   **Major:** Biology
   
   **Faculty mentor:** Dr. Catherine Miller-Hunt
   
   **Abstract:** Dengue virus is an Arbovirus belonging to the family Flaviviridae. Dengue virus is endemic in tropical and subtropical countries across the world. It is limited primarily to these regions because it is transmitted by a tropical female mosquito Aedes aegypti, but even with this limitation, 50-100 million people are infected each year. Previous studies have shown that Dengue virus uses a host cell receptor called AXL, a tyrosine kinase. Axl plays a vital role in the signal transduction of both normal and malignant cells and it is thought that Axl might play a role in cellular adhesion. Axl is highly expressed by human macrophages and other cells. This research is being carried out to study the role of Axl on macrophages in Dengue virus infection. In this study, we have analyzed the expression of the Axl receptor, using the highly Axl expressing human brain cancer cell line-SNB19 and the Rhesus monkey kidney cell line vero cells. To be able to determine the actual role of Axl, an antibody inhibition assay will be carried out using anti-Axl antibodies. Monocytes will be obtained from the peripheral blood of human volunteers and incubated for 6-8 days to mature into macrophages. Macrophages have two multiple subsets, including; M1 and M2. M1 is a proinflammatory macrophage which plays a crucial role during host defense, and is induced by IFNγ. M2 macrophages are induced by IL4, IL10, and decrease inflammatory responses and promote tissue repair. A macrophage sensitivity assay will be carried out. Macrophages, including subsets will be infected with Dengue Virus, immuno-stained and the interaction with the virus observed. Our results focus on the role Axl plays during DENV infection as well as which of the macrophage subsets are infected with the virus. Based on their roles in viral infectivity, we can hypothesize that these receptors are important drug targets. And thus, inhibiting their functions may represent potential targets for antiviral therapies.

2. **Title: Gene Expression of Corn Earworm (Helicoverpa zea) when infected with Pseudomonas aeruginosa Bacteria**
   
   **Principal presenter:** Bayan Aljamal
   
   **Major:** Biology
   
   **Other presenters or co-authors:** Sue Hum-Musser, Deji Adekanye
   
   **Faculty mentor:** Dr. Richard O. Musser
   
   **Abstract:** The Corn Earworm, Helicoverpa zea (Boddie), is the second most serious economic pest of agricultural corps in North and South America. In order to study the immune response of H. zea to infection by various pathogens we infected them with Pseudomonas aeruginosa bacteria. Pseudomonas aeruginosa is a pathogenic pest because of their ability to produce extracellular enzymes and toxins that destroy the physical barriers and infect host cells. This study examined H. zea’s immune response to infection as well as provide information on how to overcome their defense system for the development of biocontrol methods. One of the main focus of this experiment is to compare the growth, survival, and gene expression of H. zea when it consumed a diet treated with P. aeruginosa or bacteria-free diet for 72 hours. Larvae that fed on the diet containing P. aeruginosa
had a statistically significant increase in mortality compared with control. Microarray analysis was done to measure the expression level of larvae that fed on P. aeruginosa diet and bacteria-free diet. The expression of 3397 genes was significantly different between the two treatment groups. Out of this total, ~31% of the genes (1067 genes) have unknown functions, and ~ 69% of the genes (2290 genes) have known functions. The main categories that had significantly different gene expression were categorized according to their specific major functions including, but not limited to, encoding for metabolism, digestive, immune system, and cell growth. Caterpillars infected with P. aeruginosa showed a significantly different gene expression pattern compared to control. This research determined the immune reaction of H. zea in response to bacterial infection. This information will be useful in figuring out how to make H. zea more susceptible and increasing control of this pest.

3. **Title:** Paddlefish Movement and Habitat Use Using Acoustic Telemetry in the Upper Mississippi River (Pools 14-19)

*Principal presenter:* Dominique Turney

*Major:* Biology

*Other presenters or co-authors:* Kevin Irons, Kyle Mosel, and James Lamer

*Faculty mentor:* Dr. James Lamer

*Abstract:* The construction of navigational dams on the Upper Mississippi River (UMR) has disrupted movement and changed available habitat of the highly migratory paddlefish. The gates at each dam are open for different periods of time, allowing varying streamflow and opportunities for passage throughout the river. Lock and Dams (LD) 14, 15, and 19 are infrequently at open river conditions, making it difficult for fish passage. To better understand native fish passage and habitat use in this poorly understood region, we acoustically tagged 121 paddlefish and tracked their movements manually and with stationary receivers in Pools 14-19. Our manual and stationary receivers detected 88% of our tagged paddlefish. Our results indicated that 14 of our tagged fish successfully crossed over at least one dam barrier, either upstream or downstream direction. Paddlefish have demonstrated the ability to cross difficult barriers: 5 passages at LD15 and 3 passages at LD14. Most paddlefish detections were observed in backwater habitat for 2018 summer water conditions and have been observed to move towards channel borders in the late fall. A clear understanding of paddlefish movement and habitat use in the UMR will allow researchers and biologists to better understand dam passage of other fishes and evaluate the impacts of invasive species invaders in this area. Additionally, preliminary data of paddlefish movement provides beneficial information when evaluating the effects of invasive species sound deterrents at these locations on native migratory species.

4. **Title:** Evaluating survival and cause-specific mortality of bobcats in west-central Illinois

*Principal presenter:* Edward Davis

*Major:* Biology

*Other presenters or co-authors:* Tim C. Swearingen, Robert W. Klaver, Christopher N. Jacques

*Faculty mentor:* Dr. Christopher Jacques

*Abstract:* Increased understanding of mortality of bobcats (Lynx rufus) is a prerequisite to successful management programs, particularly as it relates to population dynamics and the role of population models in adaptive species management. Survival and cause-specific mortality of bobcats have been well documented in predominantly forested landscapes, but limited information has been collected in
agriculturally-dominated Midwestern landscapes. Thus, our objective was to evaluate survival and cause-specific mortality rates of bobcats across agriculturally dominated landscapes of west-central Illinois. We captured and radio-collared 38 (20 males, 18 females) bobcats from January 2016 to September 2018. We used known fate models with the logit link function in Program MARK to estimate annual survival of bobcats, which accommodated staggered entry and exit times of radiocollared bobcats during our analysis interval. Because mortality events were limited, covariate modeling was not conducted. Nevertheless, we constructed a survival model in which survival was constant (S{constant}) between years and across sexes. We documented 11 deaths during our study; vehicle collisions was the leading cause of mortality and accounted for 5 (45%) mortality events. We attributed remaining deaths to harvest (n = 3; [1 legal, 1 illegal, 1 incidental harvest]), unknown (n = 1), other (n = 1), and capture-related factors (n = 1); we censored capture-related deaths from analyses. The estimated annual survival rate using model S{constant} was 0.74 (95% CI = 0.55-0.87). Bobcat survival monitoring is ongoing through 2019 and will evaluate potential effects of intrinsic and habitat variables on seasonal and annual survival rates.

5. Title: Multigene Characterization of Darksidea Isolates and Description of a New Species

Principal presenter: Maria-Jose Romero-Jimenez
Major: Biology
Other presenters or co-authors: Andrea Porras-Alfaro
Faculty mentor: Dr. Andrea Porras-Alfaro

Abstract: Dark septate endophytes (DSE) include root-associated fungi known to be dominant colonizers of arid plants. They likely provide protection to their hosts against pathogens and stressful conditions such as drought and high temperatures. Darksidea is a DSE that has been found in semiarid plants in the United States, however its characterization and ecological role is yet to be determined. The objective of this research was to characterize a culture collection of Darksidea isolates using a multi-gene phylogeny. Roots of six grass species were sampled across central south states in the United States. Seventy-seven Darksidea isolates were identified using the ITS rDNA region and clustered in eight operational taxonomic units (OTU) based on a 97% similarity. Actin (ACT), β-tubulin (BTUB), calmodulin (CAL) and transcription elongation factor (TEF) genes were amplified and sequenced to characterize phylogenetic relationships between Darksidea species. Sequences were compared with curated databases; the Ribosomal Database Project and UNITE. Morphology of representative isolates of each OTU was determined using different media. Most Darksidea isolates were recovered from blue grama, black grama and buffalo grass in Texas and New Mexico. Using the ITS rDNA region five potential clades were identified. These are closely related to Darksidea isolated from grasses in Hungary and in the USA southwest. A new species was also identified. Darksidea isolates produced a variety of pigments, metabolites and microscopic structures including chlamydospores, conidia and hyphal loops. Darksidea shows a broad distribution in arid plants and the northern hemisphere indicating a potential role supporting plants growing on arid environments.

6. Title: Modification of peptide J18 for improved ovarian cancer targeting

Principal presenter: Michael Oni
Major: Biology
Faculty mentor: Dr. Mette Soendergaard
Abstract: In 2018, 22,000 new cases and 14,000 deaths of ovarian cancer is projected to occur in the United States. The low survival rate is due to inadequate means of detection, which emphasizes the need to develop effective screening techniques. Peptide J18 was discovered using in vivo bacteriophage (phage) display technology, and was found to bind specifically to ovarian cancer cells, showing moderate binding with half maximal effective concentration (EC50) of 68.3 ± 15.3 μM (mean ± SEM). To improve the binding properties of the peptide, an alanine scanning experiment was carried out. Results showed that substituting serine-5 (S5) and aspartic acid-6 (D6) with alanine decreased the EC50 values to 22.6 ± 5.9 μM and 8.6 ± 1.9 μM (mean ± SEM), respectively. Thus, it was hypothesized that a double alanine substitution of both S5 and D6 (J18-S5A-D6A) may lead to a further increased the binding affinity. The objective of this study was to determine and compare the binding affinities of peptides J18 and J18-S5A-D6A using a modified enzyme-linked immunosorbent assay (ELISA) and fluorescent microscopy. Human ovarian carcinoma (SKOV-3) cells were maintained in McCoy's 5A cell medium supplemented with 10% fetal bovine albumin (FBS) and 50 μg/mL gentamycin at 37°C and 5% CO2. Varying concentrations of the peptides (10 nM - 300 μM) in phosphate buffered saline (PBS) were incubated with SKOV-3 cells for 1 h at 37°C and 5% CO2. Unbound peptides were removed by washing with 1% bovine serum albumin (BSA) in PBS. Cells were then fixed with 10% formalin and blocked with 10% FBS, 0.3 M glycine, 0.05% Tween-20 in PBS. Probing was done by incubation with horseradish peroxidase (HRP)-conjugated streptavidin. The cells were then washed with 0.05% Tween-20 in PBS and 2, azino-bis 3-ethylbenzothiazoline-6-sulphonic acid (ABTS) substrate was added and incubated at room temperature for 20 m. Cell binding was measured spectrophotometrically at 405nm. Results showed that J18 and J18-S5A-D6A exhibited EC50 values of 208.1 and 1.86 μM, respectively. These results indicate an approximate 100-fold increase in binding affinity of J18-S5A-D6A compared to J18. Next, peptide binding to SKOV-3 cells was further investigated by fluorescent microscopy. Cells were maintained on chamber slides as previously described and then incubated with 10 μM of J18 and J18-S5A-D6A or dimethyl sulfoxide (DMSO; control) for 1 h at 37°C and 5% CO2. The slides were then washed (PBS) and blocked with 10% FBS, 0.3 M glycine, 0.05% Tween-20 in PBS. Bound peptides were probed with fluorescein isothiocyanate (FITC)-labeled mouse monoclonal anti-biotin antibody, and the slides were imaged using an epifluorescent EVOS FLoid cell imaging station. Results showed increased SKOV-3 binding of peptide J18-S5A-D6A compared to J18. In conclusion, peptide J18-S5A-D6A demonstrates increased binding to SKOV-3 cells compared to peptide J18, and may therefore be useful in the detection of ovarian cancer cells, thereby improving diagnosis, treatment and significantly reducing the disease fatality.

7. **Title:** Gene Expression of Soybeans (Glycine max) in Response to Inoculation with Trichoderma Fungi

**Principal presenter:** Nick Emory

**Major:** Biology

**Other presenters or co-authors:** Sue Hum-Musser

**Faculty mentor:** Dr. Sue Hum-Musser

**Abstract:** Soybean is a crucial staple food for human and animal consumption, as well as an important agricultural crop. Illinois is an important Midwestern producer of soybeans that heavily contributes to the US economy. However, the yield of soybean can be drastically impacted by adverse growing conditions. Therefore, increasing plant growth and yield in response to changing weather conditions is critical in maintaining productivity in this crop. Some fungal species are known to increase plant
growth. In this project, we examined the effect of a naturally occurring beneficial fungi on the growth and gene expression of soybean plants. Many species of the Trichoderma fungi promote plant growth and increase plant tolerance and immunity. We determined that Trichoderma-inoculated soybean plants have a statistically significant increase in seed dry weights compared to control uninoculated plants. Real-time quantitative polymerase chain reaction (rt-qPCR) was used to assess gene expression of the plants. There were differences in the level of gene expression of various physiological categories between the treatment groups. Since plant growth and defense pathways are complex due to numerous connections to one another, determining which pathways are affected will help elucidate the plant growth and defense mechanisms used in this beneficial plant-fungal interaction. The project will provide information on the effectiveness of Trichoderma fungal colonization on soybean, growth, yield and gene expression.

8. **Title:** Spring Foraging Ecology of Green-winged Teal in the Illinois River Valley  
   **Principal presenter:** Samuel T Klimas  
   **Major:** Biology  
   **Other presenters or co-authors:** Joshua M. Osborn, Heath M. Hagy, Christopher N. Jacques, Joseph D. Lancaster, Sean E. Jenkins, and Aaron P. Yetter  
   **Faculty mentor:** Dr. Christopher Jacques  
   **Abstract:** The Illinois River Valley (IRV) provides critical stopover habitat for migrating waterfowl during spring and autumn. Because spring migration is an important time for waterfowl as they enhance body condition in preparation for the breeding grounds, the UMRGLR Joint Venture relies on the IRV and other migratory focal areas in Illinois to protect, maintain, enhance, and restore more than 80,000 ha of wetland habitats for waterfowl. Green-winged teal (GWTE; Anas crecca) usually rank in the top 4 species in the Illinois duck harvest, and primarily consume natural foods during migration, often selecting for seeds and invertebrates over agricultural grains. In order to provide current information on wetland habitat needs for GWTE to wetland and natural resource managers, we experimentally collected foraging GWTE during the spring in the IRV from the confluence of the Illinois and Mississippi rivers extending north to Hennepin, Illinois, during springs 2016-2018. We removed upper digestive tracts and estimated food availability (benthic and nektonic samples) at foraging sites to evaluate food use. We analyzed diets from the upper gastrointestinal (GI) tract (proventriculus and esophagus), as well as gizzards. Further, we performed proximate analysis on the teal carcasses to analyze body condition in relation to diet. We will discuss overall food use and selection by GWTE, as well as preferences of plant and invertebrate taxa in comparison with food availability.

9. **Title:** Population Demographics of Silver Carp, Bighead Carp, Bigmouth Buffalo, and Paddlefish in Pools 16 through 19 of the Mississippi River  
   **Principal presenter:** Zachary J Witzel  
   **Major:** Biology  
   **Other presenters or co-authors:** Allison Lenaerts, US Fish and Wildlife Service Courtney Cox, US Fish and Wildlife Service, Boone M. La Hood, Illinois Department of Natural Resources, Kevin S. Irons, Illinois Department of Natural Resources, James T. Lamer, Illinois River Biological Station  
   **Faculty mentor:** Dr. James T Lamer
Silver carp and bighead carp (bigheaded carp) have spread throughout the Mississippi River basin since their introduction in the 1970's. Highly adaptable life history traits have contributed to their invasiveness and their ability negatively affect native fish populations and ecosystems. Bigheaded carp can drive density dependent reductions in their body condition and that of other native species (e.g., bigmouth buffalo, paddlefish). Detection of a deviation from body condition baselines in bigheaded carp and native species over time can be used as a surrogate to evaluate tools used to reduce bigheaded carp populations. Therefore, the objectives of our study are to track body condition of bighead carp, silver carp, paddlefish and bigmouth buffalo over time in Pools 16-19 in the Upper Mississippi River (low-density management zone). Gill nets (7.62, 8.89, 10.16, 10.8, 11.43, 12.7, 13.335, and 15.24 cm bar) were deployed in back water and main channel areas to capture silver carp (n=5023), bighead carp(n=1260), bigmouth buffalo(n=822), and paddlefish (n=623) in pools 16 through 19 on the Mississippi River (2015-2018 field seasons). Length and weight were recorded from all fishes and relative weight determined using standard weight equations for each species. If it is determined that there is an overall decrease in the population of bigheaded carp increased effort could be used to decrease populations even further. Demographic data can also help managers populate spatially explicit models to help guide fishing efforts in this region.

Title: High-throughput and simultaneous analysis of cannabinoids in products of Cannabis sativa L. using liquid chromatography with ultraviolet detection (LC-UV): Part I

Principal presenter: James Leese

Major: Chemistry

Other presenters or co-authors: Harley Davidson, Shashi Bhushan Pathipaka

Faculty mentor: Dr. Liguo Song

With the legalization of marijuana becoming increasingly popular in the United States, the need for an efficient analytical method of identifying cannabinoids, the compounds found in Cannabis Sativa L. responsible for its physiological and psychological effects, is of utmost importance. However, for the concentration of each cannabinoid to be determined, they must first be separated from one another. This study aims to accomplish this through the use of HPLC, high performance liquid chromatography. In this study, the LC separation of twelve cannabinoids, including CBC, CBD, CBDA, CBDV, CBDVA, CBG, CBGA, CBN, 8-THC, 9-THC, THCA A, and THCV, has been systematically optimized using a Phenomenex Luna Omega Polar C18 150 mm × 4.6 mm column with regard to the effects of the type of organic solvent, i.e. methanol and acetonitrile, the content of the organic solvent, and the pH of the mobile phase. The optimization has resulted in three LC conditions at 1.0 mL/minute able to separate the 12 cannabinoids: 1) a mobile phase consisting of water and methanol, both containing 0.1% formic acid (pH 2.69), with a gradient elution at 75% methanol for the first 3 minutes and then linearly increase to 100% methanol at 12.5 minutes; 2) a mobile phase consisting of water and 90% (v/v) acetonitrile in water, both containing 0.1% formic acid and 20 mM ammonium formate (pH 3.69), with an isocratic elution at 75% acetonitrile for 14 minutes; and 3) a mobile phase consisting of water and 90% (v/v) acetonitrile in water, both containing 0.03% formic acid and 20 mM ammonium formate (pH 4.20), with an isocratic elution at 75% acetonitrile for 14 minutes. These separation methods, when coupled with either UV or MS detection, allow for high throughput and simultaneous analysis of the cannabinoid products of Cannabis Sativa L.
Title: The Effect of Grafting on the Antioxidant Capacity in Heirloom Varieties of Tomato (Solanum lycopersicum) in Hydroponic Cultivation

Principal presenter: Jamie Greathouse

Major: Chemistry

Other presenters or co-authors: Mette Soendergaard, Shelby Henning

Faculty mentor: Dr. Mette Soendergaard

Abstract: Tomatoes are recognized for their high antioxidant levels, and for that reason especially the heirloom varieties are in high demand by consumers. However, these varieties are difficult to produce, as they are more prone to plant disease and low yield. To overcome these problems, heirloom tomatoes may be grafted onto more sustainable and disease resistant rootstocks. Similarly, hydroponic cultivation has shown to reduce soil-borne disease, and has the additional advantage of year-round production capabilities. Nevertheless, it is unknown if the antioxidant capacity of hydroponically grown heirloom tomatoes is affected by grafting onto disease resistant rootstocks. To investigate the effects of grafting on hydroponically cultivated tomatoes, heirloom (Black Krim, Green Zebra) and commercial (Big Beef) varieties were grafted onto wild type (WT) or disease resistant rootstocks (Arnold, Supernatural, Maxifort, RST-04-105-T). Tomatoes were harvested at maturity as determined by Brix testing (4.0-6.5 degrees Brix; °Bx), freeze dried, ground into a powder at 4°C, and stored until further analysis at -20°C. To determine the antioxidant capacity, extracts were made by incubating 100 mg tomato powder with 1 mL 80% (v/v) aqueous methanol, 1 % (v/v) HCl for 2 h while shaking, followed by centrifugation (3000 xg, 5 min) and collection of the supernatant. Antioxidant capacity was determined by the 2,2'-azino-di(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) assay. For this, 10 μL of tomato extract was combined with 90μL of 7 mM ABTS radical (ABTS⁻), and the absorbance at 734 nm was determined immediately. Results showed that the antioxidant capacity for Black Krim grafted onto RST-04-105-T was significantly reduced (p<0.05) compared to the WT rootstock. Tomatoes contain many phenolic antioxidant compounds, and the content of these were thus evaluated using the Folin-Ciocalteu (FC) assay. In brief, 20 μL tomato extract was combined with 2N Folin reagent and 7.5 % sodium carbonate, and the absorbance at 750 nm was immediately determined spectrophotometrically. These results showed that the phenolic content was significantly (p<0.05) reduced for Green Zebra grafted onto Arnold compared to WT rootstock. A third assay, the 2,2-diphenyl-1-picrylhydrazyl, DPPH, was done for a more complete picture of the antioxidant capacity. The assay was completed by combining 10μL tomato extract and 195μL of the DPPH radical solution and determined spectrophotometrically at 517 nm. The results showed one significant difference of the Black Krim grafted on the Arnold rootstock. Taken together, these results indicate that certain combinations of heirloom tomato varieties and disease resistant rootstocks may influence the overall antioxidant capacity and phenolic content as determined by the ABTS, FC, and DPPH assays. It is likely, that the RST-04-105-T and Arnold rootstocks affected the content of different types of antioxidants (phenolic versus non-phenolic) in the two heirloom varieties (Black Krim and Green Zebra). Further studies may reveal such mechanistic effects of grafting. For now, these results may be used to guide producers when choosing rootstocks for cultivating hydroponic tomatoes to ensure maintenance of antioxidant content.

Title: Expression of Streptavidin on Coat Protein III of Fd-tet Phage

Principal presenter: Olanrewaju Oni

Major: Chemistry
Faculty mentor: Dr. Mette Soendergaard

Abstract: Streptavidin is a protein, purified from the bacterium Streptomyces avidinii. It has several applications in molecular biology due to its high affinity interaction with the water soluble vitamin, biotin. The streptavidin-biotin complex is the strongest known non-covalent interaction (Kd = 10-15M) between a protein and ligand. The bond formation between biotin and streptavidin is rapid, specific and once formed, it is minimally affected by pH and denaturing agents. However, the interaction may be disrupted by high temperature and organic solvents like formamide. The covalent binding of biotin to biological molecules (biotinylation) have been utilized in the detection and purification of proteins by probing with streptavidin. For example, biotinylated antibodies may be immobilized by a streptavidin resin and used to purify a protein of interest. Conversely, proteins may be expressed with streptavidin to immobilize these onto a biotinylated surface. Bacteriophage (phage) is a virus, which infects bacteria. One class is the filamentous bacteriophage, which can be utilized to display foreign proteins/peptides on major coat protein VIII (cpVIII) and on minor coat protein cpIII by genetic modification. In this research, it is proposed to express streptavidin on cpIII on a type f88 filamentous phage (Fd-tet) for immobilization onto biotinylated materials. Fd-tet phage (gift from Dr. George Smith, University of Missouri) was propagated by transduction of K91BluKan E.coli and grown in NZ amine, yeast extract (NZY) medium containing tetracycline (0.04 ug/ml) and kanamycin (0.100mg/ml) overnight at 37°C at 225 rpm. The phage DNA was then isolated using phenol-chloroform. The streptavidin gene contained on a plasmid (pUC8-SZ) was transformed into E.coli DH5α cells, amplified in liquid lysogeny broth (LB) containing ampicillin (100 ug/ml) and plasmid was isolated using Qiagen Plasmid Midiprep. Both plasmids were analyzed by gel electrophoresis and spectrophotometry (260 and 280 nm) to confirm respective sizes, concentration and purity. Polymerase chain reaction (PCR) was done using primers specific for the streptavidin gene to amplify the gene and allowing the addition of MspA1I restriction enzyme sites. The amplified streptavidin gene was cloned into the Fd-tet plasmid after first partially digesting the Fd-tet plasmid with the MspA1I restriction enzyme. The digested products and streptavidin were ligated together by blunt ligase master mix enzyme. The ligated plasmid was transformed in E.coli DH5α cells and the colonies obtained were screened for those having the streptavidin insert by plasmid isolation and gel electrophoresis, which was then verified by DNA sequencing (Genscript). Plasmids of the phage expressing the streptavidin protein will next be transduced into E. coli K91BK and propagated phage will then be isolated using PEG/NaCl precipitation and centrifugation. The concentration of phage (virions per mL) and the ability of phage to infect E. coli (transducing units per mL) will be evaluated. In order to validate the expression of streptavidin on the phage, enzyme-linked immunosorbent assay (ELISA) at various concentrations of phage will be performed. In conclusion the expression of the streptavidin gene on cpIII of the Fd-tet phage will enable immobilization of phage onto biotinylated surfaces, which may be used in the purification of proteins.
bacterial cell lysing and can display large foreign proteins on their coat proteins. Utilizing phage to display foreign proteins to bind molecular targets has numerous applications, including protein isolation and binding assays. In such assays, the interaction between biotin and streptavidin is often used for immobilization. Biotin is a small molecule that displays extremely high binding affinity for the protein streptavidin. Due to the strong interaction between biotin and streptavidin, it is exceedingly difficult to break this bond. Thus, it is important if phage will maintain infectivity and replication within E. coli under conditions (10 mM EDTA in 95% formamide, >90°C) that break the biotin-streptavidin interaction. In short, 10^12 phage were diluted in 10 mM EDTA in 95% formamide, or Tris-buffered saline (TBS; mild buffer) and incubated at temperatures of 25-100°C (5°C increments) for 10 minutes. The degree of infection was then determined by measuring the number of transducing units (TU) per mL. To do so, phage were mixed with E. coli and incubated in terrific broth medium for 10 minutes at room temperature to allow infection. Next, (NZ amine, yeast extract) NZY medium was added, and the phage-E. coli solution was incubated at 37°C for 30 minutes to let the bacterial cells propagate. Finally, the mixture was spread on NZY agar plates with 20 μg/mL kanamycin and 40 μg/mL tetracycline, and colonies were allowed to grow overnight at 37°C. The number of colonies were then counted, and used to calculate the TU/mL, which is correlated to the degree of infectivity. Results showed that phage infectivity was lowered by high temperature and use of 10 mM EDTA, 95% formamide. However, approximately 10% of phage maintained infectivity, corresponding to approximately 1011 phage. This is a sufficiently high number to conclude that phage can be amplified after utilization in multiple affinity chromatography experiments.

14. **Title:** Misnomer of How Autistic Children Communicate  
   **Principal presenter:** Nicole Jones  
   **Major:** Communication  
   **Faculty mentor:** Dr. Josh Averbeck  
   **Abstract:** The purpose of this paper was to shed light on the communicative barriers and behaviors that take place when engaging a person with autism in an interpersonal setting. Between perceived interactions and self-monitoring, we will uncover problem areas that will better help the communication field. Incorporating research on autism spectrum disorder (ASD) and applying this information will enable researchers to strategize more appropriate and respectful mannerisms exploring interpersonal conflicts between neurotypical and autistic people. The present research will guide future analysis in the communication field and potentially offer more theoretical constructs. A survey of twenty-seven questions was administered via MTurk to collect data.

15. **Title:** The Effect of Imagined Interactions on the Conflict Styles Engaged by Relational Partners in Conflict Interactions  
   **Principal presenter:** Roseline Ajifolokun-Agboola  
   **Major:** Communication  
   **Faculty mentor:** Dr. Josh Averbeck  
   **Abstract:** A person may use imagined interactions (IIs) to work through a conflict situation both at the interpersonal and group relational levels. This study examined the relationship between imagined interactions(IIs)and the conflict style engaged by relational partners in actual conflict interactions. Research has established that people often think about conflict in the absence of their relational
partners. It is flowing from this findings that this research predicted that the thought of self-face, another's face and mutual face while engaged in imagined interactions will be positively related to the use of distributive or integrative conflict style in the actual conflict interaction. The conflict style used is indicated by the message produced by the actor in the actual conflict interaction. Results indicate a tendency to use avoiding, obliging, compromising and obliging conflict style in actual conflict interaction where a person thinks about the effect of the conflict interaction on the relationship with the relational partner in the imagined interactions. Prior to this study, the relationship between conflict style and imagined interactions about conflict had not been directly explored but earlier research has established that thinking about conflict in the imagined interactions has a dual effect on conflict management. It is for the reason that the present hypotheses were posed and investigated. The present study sheds some light on the relationship between imagined interactions and conflict styles that an actor uses with his/her relational partner in actual conflict as revealed by the message produced. Keywords: Imagined Interactions, Relational Partners, Conflict Styles, Face, Message Production

16. **Title: Response to a WEA Tornado Warning Text Message**

*Principal presenter:* Zachary Riel  
*Major:* Communication  
*Faculty mentor:* Nathan Miczo  

*Abstract:* You are outside of your house in the spring when your phone receives a WEA alert. The alert reads: "Tornado Warning in this area till 3:49 pm. Take shelter now. Check local media. -NWS". This study focuses on individuals' perceptions of, and reactions to, such a message. Tornadoes are a dangerous experience that can lead to loss of life and property. Those who live in Tornado Alley, which includes Midwestern states, are at a higher risk of experiencing a tornado because of their location. Nevertheless, not everyone follows the recommendation to seek shelter when they receive a tornado warning message. Research suggests that, though young adults are aware of the risks, many are not well-prepared and do not take appropriate action. This study will focus on young adults aged 18 to 25 who live in the Midwest. The survey includes items concerning secondary communication (motivation to share information with others), health beliefs (perceived vulnerability, barriers and benefits to action), perceived threat and past experience as they relate to intention to seek shelter. A more comprehensive understanding of variability in seeking shelter can lead to new studies aimed at lessening the loss of life from tornadoes.

17. **Title: The impact of Education on Income Inequality**

*Principal presenter:* Tolulope Olupona  
*Major:* Economics  
*Faculty mentor:* Dr. Ghimire Shankar  

*Abstract:* This study explains how education is linked to income inequality and how it impacts on economic growth. The paper presents new evidence on the relationship between education and income inequality by drawing evidence from 145 countries between 1996 to 2016. This paper adds to existing literature by using the most recent data in analyzing the impact of higher educational attainments on income distribution in high, middle and low-income countries. The literature gives a brief historical account on how education became a vital wage setting instrument. This paper briefly reviews the economic theories of Simon Kuznets on income inequality, the arguments of Theodore
Schultz on the economic value of education as well as some other empirical findings of similar literature. In quantifying income inequality, this study uses the Gini index by Barro and Lee (2010). The main independent variable is tertiary education enrollment, control variables are fertility rate, political stability, gross domestic output (GDP) per-capita growth, terms of trade, the rule-of-law and government expenditure. In addressing the persistence of endogeneity, the paper uses the panel estimation techniques, interaction terms and dummy variables for the three country categories. In high income countries and low-income countries, the result from the empirical analysis shows a positive and significant relationship in education and inequality, but the relationship is negative and statistically significant in middle-income countries. This study also shows that an interaction of education and per-capita growth in GDP worsens inequality while trade and education has a reducing effect on inequality. JEL Classification: H52; D63; D31, E24 Keywords: Education, Inequality; Earnings Inequality, Income Distribution

18. **Title:** Challenging Stereotypes: Nadeem Aslam's Approach in *The Blind Man's Garden*

*Principal presenter:* Bonita Akinbo

*Major:* English

*Faculty mentor:* Dr. Roberta Di Carmine

*Abstract:* The narrative of Islamic countries, as told by the mass media, has been the same for a long time. The oppression of Muslim women, the image of Islam as brutal, violent, and oppressive, and their direct relationship with terrorism, have been the mediated ideals of Islamic countries. Although, there has been a reworking from the undisguised stereotypes of the past, however, Muslim identities are still fundamentally related to terrorism. In this paper, I explore representations of Arab and Islamic countries in heterogeneous media platforms including cinematic portrayals, pre and post 9/11, using narratives from Nadeem Aslam's *The Blind Man's Garden*. Similarly, I engage Erin James' theories in evaluating how Aslam intelligibly provokes the imagination of the reader. Aslam presents new ideas to his readers and uses his fictional characters to challenge the one-sided narrative of Islamic countries as told by the western world.

19. **Title:** Markova: A Comfort Gay Victim or an Illusioned Drag Queen? His Stories of War, Homosexuality and Violence in the Philippines during the Japanese Occupation

*Principal presenter:* Rhobie Underwood

*Major:* English

*Faculty mentor:* Dr. Merrill Cole

*Abstract:* This research paper intends to claim and support the veracity of the story of comfort gays specifically in the Philippines during the Japanese occupation as narrated by Walter Dempster Jr. also known as Walterina Markova. Through a thorough historical research regarding the Japanese occupation and the utilization of comfort women in the Philippines, this research paper will prove the credibility of Markova's story and amplify the voice of comfort gays who were also abused during that period. This research paper's specific main goals are: 1. to identify and present the reasons and theories as to why Markova's story is undoubtedly worth skepticism yet reliable 2. to prove that comfort gays truly existed 3. to intensively study and expose the psychological tendencies, illusions, desperations and other effects of war not just to Japanese soldiers but also to Filipino homosexuals, and last but not the least, 4. cite the reasons and main points as to why her story is real. The purpose of this research paper is to bring queer studies and homosexuality in the history of
colonization of Philippines into a new light. By writing on and investigating more about the existence of comfort gays in the Philippines during Japanese occupation, this paper will be one of those helpful materials that in the future that Philippines can look back, remember history and make peace with the past as it looks forward and continue to move on in its journey. This paper's ultimate goal is for the World War II comfort gays to be heard, and that the whole gayness or queerness story is not an isolated or abandoned case. Where there are comfort women, there are comfort gays as well. By the end of the research, this paper will amplify more of the comfort gays' unheard story, while focusing and listening to them, taking their stories seriously as well as being open minded and knowing the facts through the help of history, culture and psychoanalysis.

20. Title: The processing of subliminal animate-inanimate images and effects of mood states

Principal presenter: An Le

Major: General/Experimental Psychology

Other presenters or co-authors: Jonathan Hammersley

Faculty mentor: Dr. Jonathan Hammersley

Abstract: Prior research has shown that threatening and emotional stimuli can be processed more quickly through a shorter brain pathway, in which information passes from the senses to the thalamus and to the lateral amygdala, bypassing the visual cortex. Furthermore, a body of research suggests that the amygdala only responds more strongly to animate, versus inanimate, threats. Thus, animate stimuli are processed more quickly than inanimate ones. A quick process of threatening, emotional or animate stimuli allows for quicker responses to potential danger. In this study, subliminal attentional cueing in an Animate-Inanimate Cued Attention (AICAT) Task was examined. Scores from mood inventories including the Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) were obtained from participants who did the AICAT task. We conducted a 2 (animate vs. inanimate) × 2 (short 80ms vs. longer 160ms delay between cue and target) × 2 (valid cue vs. invalid cue) mixed design repeated measures ANOVA, including depression, anxiety, and gender as between subjects variables ANOVA in order to test if levels of depression and anxiety would have any effect on the processing of animate and inanimate stimuli. · Response times (RTs) were measured in milliseconds for all appropriate responses. Half of the participants were trained that animate images predicted the target would appear on the left side and vice-versa (animate = right) for the other half. For 80% of the trials, the image content corresponded with the correct target appearance (valid trials) while 20% of trials were incorrectly cued (invalid). · Significant validity effects in the AICAT task, F(1, 65) = 19.83, p < .001, partial eta2 = 0.23, indicated that valid image cues significantly speeded RTs in comparison to invalid cues. There was also a significant effect of mask delay in Experiment 1, F(1, 65) = 15.5, p < .001, partial eta2 = 0.19, and in Experiment 2, F(1, 61) = 31.2, p < .001, partial eta2 = 0.34, indicating significantly faster responses when targets followed longer delays after cues. · Thus, in the present experiments, participants were able to not only perceive subliminal animate imagery, but also process and utilize these subliminal images as cues for subsequent attentional orienting. Implications include brain pathways to process and utilize animate imagery, which may be in alignment with prior research on amygdala activation and pathways involved in the processing and categorization of visual stimuli. In contrast to the results found in our prior emotional cueing tasks that showed significant effects of current anxiety and depression symptoms, we did not find any significant effect for anxiety and depression in the animate-inanimate cued attention task. More specifically, when cued by subliminal, emotionally negative versus emotionally neutral imagery, depression seemed to interfere with (slow) task performance while anxiety seemed to speed task
performance in the previous study. Therefore, though participants could clearly discriminate subliminal animate from inanimate images, anxiety or depression did not seem to be associated with task performance impairment or benefits. Emotional content seems to be the key to assess anxiety and depression effects in subliminal tasks.

21. **Title:** Is Event Related Alpha Synchronization Associated with the Attenuation of Vigilance Decrement Effects through Task Switching?

**Principal presenter:** Kyle Reterstoff

**Major:** General/Experimental Psychology

**Faculty mentor:** Dr. Sandra McFadden

**Abstract:** Effective sustained attention can be the difference between life or death for some first responders, military personnel and even drivers making their daily commute. Recent research has identified neural oscillators as physiological mechanisms for sustained attention processing. The alpha brain wave, in particular, is considered a “gating mechanism” for attentional processing. Higher alpha activity—known as event related synchronization (ERS)—inhibits neural communication, whereas lower alpha activity—event related desynchronization (ERD)—allows for neural communication. ERS can be useful for suppressing unnecessary brain activity during top-down selective attention processing. However, research on sustained attention vigilance tasks (searching for small changes in the environment over a long stretch of time) found undesirable parietal ERS occurring more frequently over time-on-task, and this was related to a decrease in behavioral performance reflected by increases in reaction time (RT) and missed targets (a phenomenon known as "vigilance decrement"). One study found that vigilance decrement effects were attenuated in participants who performed a memory recall task intermittently throughout the vigilance paradigm. Additional research has shown that alpha ERS is associated with switching from one task to another. However, it is unclear whether alpha ERS is related to task switching during vigilance trials. Nor is it clear if alpha ERS will be attenuated along with vigilance decrement in participants who experience task switching. The current project addressed these two questions by measuring alpha activity from parietal and occipital electrodes while participants performed a 40-minute vigilance task where they responded to a target line that was 40% shorter than a non-target line and that appeared randomly in only 10% of 1200 trials. In addition to performing the vigilance task, a task-switching group also periodically recalled whether a presented number came from an initial set of 4 numbers they were asked to memorize at the start of the task. A break group saw a fixation cross in lieu of a number. Lastly, a control group conducted the regular vigilance task with an extra line task presented in replacement of a number or fixation cross. Results are being analyzed, but are expected to show that (a) parietal alpha ERS occurs during task switching trials and less so during later portions of the study, and (b) ERS increases as a function of time-on-task. Results from the break group will show if a break, rather than a recall task, is sufficient to attenuate vigilance decrement. This study could provide insight into the neural mechanisms of sustained attention and provide evidence that brief breaks and/or task switching during vigil could enhance task performance. A potential application might include using neurofeedback training for patients with attention related disorders.

22. **Title:** Students’ Achievement Goal Orientation and Interest in Social Comparison

**Principal presenter:** Rachel Najdek

**Major:** General/Experimental Psychology

**Faculty mentor:** Dr. David Lane
Abstract: In school settings, it is natural for students to engage in social comparison because of the reward system based on academic performance. When a student identifies as a particular goal orientation (mastery, performance-avoidance, or performance-approach) their motivation for engaging in social comparison may vary. Harackiewicz and Hulleman (2010) define mastery goals as the desire to gain knowledge and improve skills. Performance-approach goals were defined as the desire to outperform others and performance-avoidance goals as the desire to minimize the negative impact of failure by trying to avoid looking incompetent. It is important to understand the relationship between achievement goal orientation and social comparison because social comparison has been found to have varying effects on academic achievement (Butler, 1992). The present study attempted to address a gap in the literature. Previous research (Butler, 1992) has used ability as a moderator to help determine an individual's interest in social comparison. The present study used Reynolds's (1988) definition of academic self-concept as a moderator instead of ability. We hypothesized that individuals with performance-approach goals and a positive academic self-concept would be more interested in social comparison than individuals with a mastery or performance-avoidance goal orientation. Method Participants were college students completing an online survey (n = 85). They completed an achievement goal orientation (Elliot & Church, 1997) and an academic self-concept questionnaire (Reynolds, 1988). They also answered questions about their interest in engaging in social comparison. Results To analyze the data, we ran multiple regressions using the technique recommended by Hayes (2013) to test for moderation. For each analysis, achievement goal orientation, academic self-concept, and their product were entered as predictors, with interest in academic comparison as the outcome. The interaction of performance-approach and academic self-concept was significant, p = .03. Among people with good academic self-concept there is not a relationship between performance-approach and interest in social comparison. Among people with poor academic self-concept there is a positive relationship between performance-approach and interest in social comparison. The interaction of performance-avoidance and academic self-concept was significant, p < .001. Among people with a good academic self-concept, greater interest in performance-avoidance was related to less interest in social comparison. The interaction of mastery and academic self-concept was not significant, p = .07 Discussion Though unexpected, the results for the performance-approach analysis theoretically make sense. If a student has performance-approach goals, but is unsure of their academic abilities, they may choose to compare to reassure themselves. The findings for the performance-avoidance goals were contrary to previous research. When a student has performance-avoidance goals, they wish to avoid looking incompetent (Harackiewicz & Hulleman, 2010) so it was expected that they would not wish to engage in social comparison. Future research should look at which direction (upward or downward) of social comparison students would engage in.

23. **Title:** Cinematic Representations of the Bataan Death March  
**Principal presenter:** Harrison Schulte  
**Major:** History  
**Faculty mentor:** Dr. Febe Pamonag  

Abstract: In April 1942, an estimated 76,000 prisoners of war (66,000 Filipinos and 10,000 Americans) were forced by the Japanese military to march for sixty-six miles from the Bataan Peninsula to Camp O'Donnell. Earlier scholarship on the Bataan Death March tended to focus on the atrocities committed during the march and at the POW camps, whereas recent works, most notably by Theresa Kaminski and Vina Alzona, have paid more attention to those who fought and resisted the
Japanese. Despite the presence of several films on the Bataan Death March, cinematic representation of this event is an understudied theme in the scholarship. Examining such representations of this historic event, this paper demonstrates the importance of unpacking representations of history in film. Based on my analysis of Bataan! (1943), The Great Raid (2005), and Death March of Bataan, (2008), I would argue that filmic representations of the Death March were shaped by such factors as when the film was produced and by whom, the purpose, and intended audience. Produced during the war by Metro-Goldwyn-Mayer, Bataan! is a black and white sensationalist propaganda film that employs racial sensationalism to promote a pro-war message against Japan. Meanwhile, Death March of Bataan (produced in the Philippines and directed by Rainer Loeser), while shot in a documentary-like fashion, utilizes shock and exploitation to elicit emotional responses from its audience. Both the Death March and The Great Raid were produced more than sixty years after the war. Although The Great Raid (Miramax), is an action/war movie intended, first and foremost, to entertain, it provides a nuanced portrayal of the Manila underground movement and the Filipino guerilla units. The Great Raid does embellish on a love triangle involving Margaret Utinsky, a member of the Manila underground movement, and a POW at Camp O'Donnell; in reality, Utinsky's husband died at the Cabanatuan prison, before the events portrayed in the film had taken place. Thus, each film's approach varies in terms of the intended effect.

24. **Title:** Orderly Packing of Rings  
**Principal presenter:** Manjula Mahesh K. Ranpati Dewage  
**Major:** Mathematics  
**Faculty mentor:** Dr. Dinesh Ekanayake  
**Abstract:** A general circle packing is an optimized arrangement of circles on a given surface such that no two circles overlap. In this study, we discuss the optimal arrangement of circles on concentric annuli. We present the properties of the general solution, the exact solution for some special cases, a heuristic algorithm to find the general solution, and some industrial applications, including packing of cylindrical strands in high voltage power cables.

25. **Title:** Optical properties of Samarium (Sm) and Europium (Eu) co-doped Bismuth Telluro-borate glasses  
**Principal presenter:** Michael Mayowa Adetunji  
**Major:** Physics  
**Faculty mentor:** Dr. Saisudha Mallur  
**Abstract:** Bismuth Telluro-borate glasses doped with rare earth (RE) ions are important materials for optical devices. We prepared a series of bismuth telluro-borate glasses with the composition 30Bi2O3: 10TeO2: (60-x-y) B2O3: xSm2O3: yEu2O3 (x=0.5, y= 0.5 to 2.0) and studied the refractive index and fluorescence of these samples. These glasses are synthesized using the melt quenching method. The glass samples obtained are annealed at 3500C for 3hrs to remove the thermal strains. Annealed glass samples are flattened and polished using a lapping machine to obtain well reflecting surface. In the two sets of samples prepared, first set we fixed the concentration of Sm as 0.5 mol% and varied the composition of Eu (0.5,1.0,1.5 and 2.0 mol%) and the second set we fixed the concentration of Sm as 1.0 mol% and the Eu content is varied as before. The refractive index of the glasses is measured by the Brewster angle method using a PASCO set up (OS-8170) with a diode laser operating at 650 nm as the source. The fluorescence
of each sample is measured by exciting at 405nm and the light emitted by the sample is collected using a LEOI-101 Modular Multifunctional Grating Spectrometer. The fluorescence spectrum of Sm3+ exhibits four emission peaks at 565nm (4G5/2 → 6H5/2), 598nm (4G5/2 → 6H7/2), 646nm (4G5/2 → 6H9/2), 707nm (4G5/2 → 6H11/2) and five emission peaks for Eu3+ which are 580nm (5D0 → 7F0), 585nm (5D0 → 7F1), 615nm (5D0 → 7F2), 650nm (5D0 → 7F3) and 695nm (5D0 → 7F4). Among the observed bands, the 598nm (4G5/2 → 6H7/2) and 615nm (5D0 → 7F2) are more intense for Sm3+ and Eu3+ ion respectively. From the fluorescence spectra, it is observed that samples with 1.0 mol% of Eu3+ show higher intensity for both sets.

26. **Title:** Formation of Abortion Legislation in America: Colonial America Through the Early 20th Century

**Principal presenter:** Katrina Vandeven

**Major:** Political Science

**Faculty mentor:** Dr. Julia Albarracin

**Abstract:** This presentation will discuss the causes surrounding abortion policy output from 1821, the first legislative action regulating abortion, through the 1910s. This period was chosen as the abortion laws that lasted until Roe v. Wade were almost entirely created during this period. By beginning in the Colonial Era and ending in the 1910s, the scope allows a fully formed historical context of the attitudes towards abortion and the ways in which anti-abortion legislation came into existence. Given the complex and socio-political nature of abortion, this presentation will utilize interdisciplinary theory and methodology. The scope of this study is limited to the abortion rights of free women, as the reproductive policies surrounding enslaved women had highly different intentions and socio-political status. The presenter will begin by contextualizing abortion during the Colonial Era and the Revolutionary Period, and systematically analyze the creation of abortion legislation, and the social, cultural, political, and economic trends in which they were shaped. She will then present the following conclusions: 1. Anti-abortion views took shape during an intense shift in attitudes towards race, gender, and nationalism. They coincided with the beginnings of both Anglo-Saxonism and radical feminism, in addition to a wave of immigration to America. 2. The demographic of married Protestant women becoming the primary seekers of abortion created a public need to regulate abortion. 3. The visibility and commercialization of abortionists and abortifacient remedies made it a highly public, even popular, practice and created the impetus behind anti-abortion campaigns. 4. Abortion legislation was primarily created and propelled by a new type of professionalized physicians, in which fully accredited physicians attempted to control how medicine was practiced and viewed.

27. **Title:** Life History Mediates Effects of Childhood Intervention on Risk-taking/Mental Health

**Principal presenter:** Amy Walen

**Major:** Psychology-Clinical Community Mental Health

**Other presenters or co-authors:** Curtis Dunkel, Jonathan J Hammersley, Amy Walen, Michael Waters, Ben Kolaczkowski, Lauren Watson, An Le, Dimitri van der Linden Western Illinois University, Erasmus University Rotterdam

**Faculty mentor:** Dr. Jonathan Hammersley

**Abstract:** A. Problem or purpose Data from the Carolina Abecedarian Project (N = 104) was used to test the hypothesis that infants who received the intervention (ABC) would develop a slower life
history strategy as measured in young adulthood. It was predicted this effect on life history (LH) strategy would mediate several effects of the intervention. This possibility was tested in the areas of risk-taking, mental health, and cognitive ability. Deducing from Brunswik-Symmetry, it was predicted that any effects would be strongest at the most molar level of measurement. 

B. Procedure
The ABC included random assignment of infants to an intervention that, because it reduced harshness and unpredictability, was expected to slow LH strategy. This hypothesis was tested using ratings of participants' LH strategy at age 21. LH strategy was measured using the LH rating form (Dunkel, Brown, Mathes, Summerville, Kesselring & Colclasure, 2016). Judges based LH ratings on transcribed interviews. Risk-taking was measured using a set of items from the Risk Behavior Survey. Mental health was measured using the Brief Symptom Inventory (Derogatis & Melisaratos, 1983). The Wechsler Adult Intelligence Scale was used to measure participant cognitive ability. A unit-weighted composite trait was also computed by standardizing (transforming to z-scores) the risk-taking factor, global severity index, and full IQ scores. 

C. Results supported the hypothesis that the intervention caused a slowing of LH strategy and that LH strategy mediated the effect of the intervention on risk-taking, mental health, and cognitive ability. Using Brunswik-Symmetry, effects were found to be strongest at the most molar level of measurement for a composite trait and cognitive ability, but not for risk-taking and mental health. 

D. Conclusions and implications
The results have several significant implications, but given the small sample size, replication is especially important. Given the accumulating evidence for the impact of early developmental exposure to environmental harshness and unpredictability on developing LH strategy, it may be useful to consider the policy implications. As emphatically stated by Ellis et al. (2012), there is nothing inheritably superior to a slow or a fast LH strategy yet understanding of the different strategies and their vicissitudes may still help inform and improve policy. Looking at the effects of the ABC through the lens of Evolutionary Psychology may provide new insights allowing for more effective interventions. One particular implication of the current results is that successful interventions have a holistic effect.

28. **Title:** Food for Thought: The Beef about Plant-Based Diets and Lowering Meat Consumption  

*Principal presenter:* Caitlin Merritt  

*Major:* Public Health  

*Faculty mentor:* Dr. Maureen Bezold  

*Abstract:* Research has found that the prevalence of obesity has reached epidemic proportions in the United States, this health crisis can be traced back to the American diet. Increased risks of health implications can be associated with a diet lacking in nutritional balance. The following research will introduce the concept of plant-based diet practices and lowering the consumption of meat for improved health. Additionally, this research will focus on the plausibility of food behavior modifications towards adopting a plant-based diet in accordance with educational interventions. There is limited research on the perceptions of plant-based diets and the apprehensions correlated to transitioning to a vegan or vegetarian diet. Coincidentally, vegetarianism and veganism are becoming prominent areas of interest in American society and federal and public health organization are recognizing plant-based diets as an optimal choice to reduce the risk of heart disease, obesity and other health comorbidities. The purpose of this study is to conduct a thorough literature review of the current beliefs of plant- based diets, apprehensions and general knowledge of what a plant-based diets entail. The research will also include discussion of the health benefits of a vegetable-focused nutrition. The method for the investigation is a quantitative approach and will include a survey
instrument with the target audience being individuals 18 years and older. The objective from this study is to determine the likelihood of behavior change in reducing meat consumption if education regarding plant-based diets is provided to participants and in general, shift individuals towards plant-based eating. Interpretations from the findings of the survey results have not yet been established. However, the exploration into plant-based diets and lowering the intake of meat has illuminated the causal factors fostering the hesitation of lowering meat consumption and adopting a plant-based diet in American society. The perceived barriers include negative social stigmas, challenges in gender roles and identity and lack of information about plant-based diets. Information from this study aims to identify population and cultural challenges behind food behavior change in America and assist health professionals in implementing public health campaigns as well as aid health promotion initiatives directed towards improving nutritional health and decreasing diet-related chronic disease in the population.

29. **Title:** Sexual Abuse and the Health Implications on Women in Western Illinois University

*Principal presenter*: Uyios Chukwuka

*Major*: Public Health

*Faculty mentor*: Dr. Jamie Johnson

**Abstract: Purpose of the study** The purpose of the study was to assess the level of awareness of sexual abuse, and the health implications of sexual abuse among college women in Western Illinois University (WIU). The objective of this study was to ascertain how knowledgeable the WIU students are of the topic sexual abuse, determine if the effects of sexual abuse in women are known, establish who is more knowledgeable amongst the males and females, and raise awareness in the WIU community about the adverse effect of sexual abuse on women. **Significance of the study** Sexual abuse, despite the campaign and various interventions carried out to stop it, still exists. Many people are of the opinion that sexual abuse happens only when a woman is attacked by a stranger using force. Following this definition, no one can be raped by someone they know or with whom they are intimate with. Thus, the various attempts made to enlighten people on the topic are often met with setbacks. This is because people define the word sexual abuse differently (Bourque, 1989; Estrich, 1987; Koss, 1993; Jeffrey & Barata, 2017).

**Steps taken** An approval was gotten from Western Illinois University Institutional Review Board (IRB). This study was electronically carried out with the use of a self-administered assessment tool. The study was conducted amongst the undergraduate and graduate students of the fall semester of 2018 in both campuses (Macomb and Quad cities). Statistical Package for the Social Science (SPSS) version 25 was used for data analysis. **Major findings** Majority of the students could identify behaviors that are regarded as sexual abuse. Although, students didn’t know if the following behavior implied sexual abuse. Exchanging sexual favor for money (49.5%), telling of obscene joke (46.5%), incest (16.5%), receiving and sending nude pictures (33.2%), and stalking (47.0%). Also, majority of the students could identify the effects of sexual abuse on its victims. Though, some of the students didn't know that it has the following health effects on the victims. Chronic pelvic pain (22.7%), Pelvic inflammatory disease (31.4%), eating disorder (23.0%), urinary tract infection (21.9%), and cervical cancer (44.9%). In general, females (84.9%) were found to be more aware of the behaviors and side effects of sexual abuse than the males (75.7%). An average of 70.8% of the males and 79.2% of the females responded yes to the questions asked on what behavior constitutes sexual abuse. While for health implication, an average of 80.6% (n =91) of the males and 90.6% (n =233) of the females replied yes. **Conclusions** According to this study, it is important to keep up with educating the public through interventions and sexual abuse
prevention programs. Also, an in-depth education targeted to the males on the effects of sexual abuse on its victims will be helpful. Students should be taught acceptable and non-acceptable sexual behaviors since according to the study, the students had more knowledge on the health implication it has on the victims than the sexual behavior that constitute sexual abuse.

**Podium with Performance Presentations**

1. **Title:** Dishonorable Tyrant: Honor and Natural Law Justice in Fuenteovejuna
   
   **Principal presenter:** Austin James Roach
   
   **Major:** MFA Acting
   
   **Faculty mentor:** Hadley Kamminga-Peck
   
   **Abstract:** William Blue's article "The Politics of Lope's Fuenteovejuna" states, "Most of the interpretations of Lope de Vega's drama, in one way or another, speak to its politics" (295). Blue continues: The play has been seen as a fervent cry for monarchy, for democracy, for socialism, even for communism. It is a paean to the people, to altruistic love, to harmony, as well as a call to the oppressed to throw off the social, economic, and political chains that bind them to servitude. (295-296) Blue's argument hinges on the fact that audiences' worldviews change throughout history. As with any historical drama, a modern audience living outside of the original time period will attach their personal views and politics, assuming that the piece speaks to greater human truths about themselves. However, when an audience does this, there is a great loss of historical context of the art object. What is the importance of that context? What can modern audiences learn from historical aspects of Fuenteovejuna that tend to be overshadowed by modern interpretations? And finally, how does the original context enrich the experience of viewing a historical drama like Fuenteovejuna? This performative research presentation hopes to answer the above questions by re-contextualizing the play within its own time by applying historical research to a performative analysis and interpretation of the character Fernán Goméz de Guzmán. Using Aristotle as the basis of analysis, the presentation will investigate the Commander's objectives and characterization throughout several key moments of the play. These moments will focus on two major aspects of my research: the importance of honor within the play and within Spanish Golden Age society, according to William Blue, J.B. Hall, and Marcelin Defournex; and the role of Natural Law Justice, a motivating force in medieval Europe as both Robert Fiore and Michael Ruggerio demonstrate. These perspectives will be referenced among moments of performance, where, with the aid of several acting graduate students, scenes from the play will be used to highlight, illuminate, and reinforce the research. Using the above techniques, I hope to construct an image of the Commander character that demonstrates Lope de Vega's original intention.