

# WIU Graduate Research Conference

Friday February 7, 2014.

## *Posters*

1. **Title: A study of soil yeast diversity in two ecosystems**

*Principal presenter:* Maryam A ALmatruk

*Major:* Biology\Biological Sciences

*Other presenters or co-authors:* Maryam Al Matruk, Cheryl Kuske, Andrea Porras-Alfaro

*Faculty mentor:* Andrea Parras-Alfaro

*Abstract:* Yeasts are eukaryotic organisms that have a major impact on human, plants, animal health and industry. However, little is known about the diversity and distribution of yeasts in natural ecosystems. The objective of this research was to explore yeast diversity and distribution in two ecosystems. Soils samples were collected in Utah at a semiarid grassland and the Duke temperate forest in North Carolina. Different seasons, treatments, horizons, and microenvironments were compared. Soils samples were diluted and yeast colonies were isolated in peptone-yeast-glucose (PYG) medium at 35°C. A total of 114 yeast cultures were obtained. Fifty one percent of the isolates were from the Utah semiarid grassland and forty-nine percent of the isolates were obtained from the hardwood forest in North Carolina. Soil samples at Duke were collected from a long-term nitrogen fertilization experiment, similar number of yeasts were isolated from both treatments. The largest number of isolates (47%) were in the control plots and were isolated from the C horizon (9.8 to 15mm depth) in comparison with the other soil horizons A (2.4 mm) (12%), B (2.4-5.4 mm) (12%), and X (5.4-9.7mm) (29%). In the nitrogen treatment, C and X horizon had equal number of yeast isolates (36%) in comparison to the other horizons A (21%) and B (7%). For the semiarid grasslands, we isolated a total of 57 yeast cultures. The largest number of cultures (82%) was isolated from the samples collected in September 2013. Pure cultures were obtained and DNA will be extracted and sequenced using fungal specific primers for yeast identification.

## 2. **Title: Exploration of Chemistry in Macrocyclic compounds**

*Principal presenter:* Chandra kireeti Ailneni

*Major:* Chemistry

*Faculty mentor:* Dr.Jin jin

*Abstract:* Background: Macrocycles, as important and powerful ligands, are applied in many areas such as ion and molecular sensing, metal ion protection in biomedical imaging, treatment of heavy metal waste streams, drug delivery and increase of drug efficacy, etc. Considerable effort has been directed towards the design and synthesis of sulfur and selenium containing macrocyclic ligands. The objective of this research is to synthesize novel macrocycles containing mixed atoms such as O, S, Se and Si atoms and study their coordination chemistry with metal ions. The incorporation of the Si atom is to increase the coordination ability of the ligand due to the beta-silicon effect. Four macrocycles containing mixed Si/S/O or Si/Se/O are designed. The designed macrocycles contain mixed-donor functionalities with both hard and soft donor atoms. Therefore they can potentially bind two metals of differing character and oxidation state within the same cavity. These macrocycles can be used for complexation with heavy metals due to (1) higher stability constant of the complexes over their open chain analogs due to macrocyclic effect and (2) selectivity of the metal ion binding can be achieved by varying macrocyclic ring sizes and donor atom set combinations. Also, sulfur and selenocrown ethers should bind strongly to precious metals like Cu, Ag, Au, Pd and Pt since these metals prefer soft donor atoms. The synthesis of these macrocycles will be described. Objectives: The objective of this research is to synthesize novel macrocycles containing mixed atoms such as N, O, S, Se and Si atoms and study their coordination chemistry with metal ions. The incorporation of the Si atom is to increase the coordination ability of the ligand due to the beta-silicon effect. Methods: (1) Design of the novel macrocycles The designed macrocycles contain mixed-donor functionalities with both hard and soft donor atoms. Therefore they can potentially bind two metals of differing character and oxidation state within the same cavity. These macrocycles can be used for complexation with heavy metals due to (1) higher stability constant of the complexes over their open chain analogs due to macrocyclic effect and (2) selectivity of the metal ion binding can be achieved by varying macrocyclic ring sizes and donor atom set combinations. Also, sulfur and selenocrown ethers should bind strongly to precious metals like Cu, Ag, Au, Pd and Pt since these metals prefer soft donor atoms. (2) Synthesis of the macrocycles The synthesis of the macrocycles will start from smaller, linear molecule bis(chloromethyl)dimethyl silane which is commercially available. By running multi-step organic synthesis as shown in the following scheme, various intermediates will be obtained leading to the final products macrocycles. All

intermediates and products should be purified by column chromatography and characterized by nuclear magnetic resonance (NMR) spectroscopy and mass spec. (3) Coordination chemistry study of the macrocycles. The obtained macrocycles will further react with various metal ions since all of them are tetra-dentate ligands with mixed soft and hard donors. We expect them to be able to bind two metals of differing character and oxidation state within the same cavity.

3. **Title: Compositional dependence of Refractive Index and Energy Band Gap in Lead Borate and Samarium doped Lead Borate Glasses**

*Principal presenter:* Ashish Adhikari

*Major:* Physics

*Other presenters or co-authors:* P. K. Babu, Saisudha B. Mallur

*Faculty mentor:* Dr. Saisudha B. Mallur

*Abstract:* We studied the effect of glass composition in the refractive index and energy band gap. Glasses with varying PbO content were prepared by the quenching method. Refractive index is measured experimentally by the Brewster's Angle method and calculated theoretically by using Lorentz-Lorenz equation and Effective Medium Theory method. Energy band gap is obtained from the optical absorption spectra by using the David and Mott Relation. The refractive index is found to increase with the increase in concentration of the PbO whereas the energy band gap was found to decrease with the increase in the concentration of heavy metal oxide in the composition. The increase in the refractive index was due to the addition of highly polarizable ions to the glass network and the decrease in optical band gap is believed to be due to the increase in the covalency of PbO bonds.

4. **Title: Identifying the Effects of Maximum and Preferred Audibility In First Time Hearing Aid Users**

*Principal presenter:* Ashley Schwingle

*Major:* Communication Sciences and Disorder

*Faculty mentor:* Amanda B. Silberer

*Abstract:*

Introduction

Hearing loss affects more than 30 million Americans and is expected to exceed 53 million by 2050 (Kochkin, 2005). Hearing aids are the most common intervention for addressing hearing loss; however, only approximately 24% of individuals with hearing loss report using them. Audiologists who are fitting

the hearing aids are reluctant to adjust the hearing aids from the fitting target to "satisfy" the hearing aid user, especially first time users. At the initial fitting, these listeners typically want fine-tuning sound quality adjustments before leaving the office to begin their trial with hearing aids. This investigation attempts to compare speech recognition performance and satisfaction outcomes between two groups of first time hearing aid users.

#### Methods/Procedures

The purpose of this pilot study aimed to identify the relationship between audibility, speech recognition performance, and patient satisfaction in a group of first time adult hearing aid users who received two different methods of fitting and follow-up. Participants were randomly assigned to a control group (target) or an experimental group (preferred). Subjective and objective measures were performed at: initial fitting, 1-week follow-up, 1-month follow-up, 3-month follow-up, and 5-6 month follow-up. Both groups were fitted according to the manufacturer's software and then adjusted to reach acoustic targets using the speech mapping function of the AudioScan Verifit. The target group did not receive adjustments to their hearing aids and only received aural rehabilitation services (i.e., counseling, education, and communication). The preferred group received fine-tuning adjustments based on complaints and comments. Starkey Inspire 2013 Software using the NAL-NL2 prescription method was used to fit and adjust the hearing aids. The unaided speech intelligibility index (SII) was obtained by entering pure tone thresholds into the AudioScan Verifit. The speech mapping function of the AudioScan Verifit was used to obtain aided SII at 65 dB SPL. Hearing aids were adjusted to maximize the SII while maintaining listening comfort. A series of subjective and objective measures were completed at each of the four follow-up sessions. Participants were also contacted at 6-months to perform a satisfaction survey. The preferred group was allowed fine-tuning adjustments and when these occurred, the SII at 65 dB SPL was redetermined using the speech mapping function of the AudioScan Verifit. Speech perception tests were presented in a sound treated room in sound field at 60 dB SPL. Hearing aids were set in omnidirectional mode with target volume. Participants were seated 1-meter and 0 degrees azimuth in front of the sound field speaker and computer monitor and asked to repeat back what they heard.

#### Results/Conclusion

The results revealed that providing or withholding fine-tuning adjustments made no significant difference for first time hearing aid users. This is important clinically because this may aid audiologists in the fitting and follow-up with first time hearing aid users who may not adjust to hearing aids as readily. If the audiologist can be confident that these fine tune adjustments are not

significantly changing the overall outcome, they may be more confident in allowing the changes.

5. **Title: A Study of Stress Hormone Variation in the Island**

*Principal presenter:* Katie Briney Atwater

*Major:* Biology

*Faculty mentor:* Dr. Jeanette Thomas

*Abstract:* Island fox (*Urocyon littoralis*) populations on the northern Channel Islands underwent a severe population decline in the 1990s, prompting four subspecies to be listed under the Endangered Species Act. In response to the declines, the National Park Service took immediate recovery actions, including a captive breeding program. The island fox was studied to determine whether stress hormone levels and aggression were associated with failure to produce offspring and to determine how stress hormone levels in free-ranging foxes compare to that of captive foxes. Fecal samples and video data were obtained from foxes in the captive breeding program, while the wild caught fecal samples were collected during a 4 year time period that began after the captive breeding program ended. A fecal glucocorticoid analysis was performed on the fecal samples to determine stress hormone levels. The video data was analyzed to correlate instances of aggression with stress hormone levels. The results from this study will help researchers have a better understanding of how stress hormone levels affect aggression and reproductive success, as well as understanding stress hormone variation trends in both captive and free-ranging island foxes.

6. **Title: Computational Studies on the Electronic Properties of Organic Functional Groups Contained in Pharmacological Compounds: A Density Functional Investigation**

*Principal presenter:* Lisa L. Johnson

*Major:* Chemistry

*Faculty mentor:* Dr. Ronald Terry

*Abstract:* When considering drug design, the term pharmacophore generally refers to the functional groups (group of atoms in the molecule) that are responsible for the pharmacological activity of the drug. A term that is closely related to pharmacophore is bioisostere, which can be either an atom, functional group or even a molecule which have physicochemical similarities that produce broadly similar biological effects. In this study we will concentrate on some of the common bioisosteric functional groups and their electronic

structure. Functional group electronic structure is important because it gives information about the influence it is expected to have within a molecule such as acid-base properties, partition coefficient, hydrogen- bond donors and acceptors, solubility, charges, hydrophobicity and so on. Computations on the functional groups will be carried out using Density Function Theory (DFT) with suitable combinations of functionals and basis sets. For example, a small functional group containing first row elements might use the EDF2 functional along with a correlation consistent basis set such as cc-pVTZ. However for larger functional groups with heavier elements, one might use the B3LYP hybrid functional along with a medium sized polarized basis set such as 6-31G\*. The calculations will give results such as net atomic charges, bond orders, molecular volumes and surface areas. HOMO and LUMO energies, total molecular energy, thermodynamic parameters, ionization energies, electron affinities as well as orbital energies and orbital populations can also be calculated. Visualization can be done through surface and orbital plots which will also be included in the presentation. Moreover, it would be interesting if it is found that there is a simple quantitative relationship between various electronic properties and the bulk properties of the functional groups. Ultimately, we would like to compile a list of compounds for which the experimentally determined biological activity is known. This list can then be used to establish the quantitative structure activity relationship (QSAR) between molecular structure and biological activity or environmental toxicology. Once a QSAR has been established, it can be used in the design of new drugs with a targeted biological activity.

7. **Title: Analysis of Vanishing L Polarization of Quasar 2148+6107**

*Principal presenter:* Natalia Andreev

*Major:* Physics

*Other presenters or co-authors:* E. Araya

*Faculty mentor:* E. Araya

*Abstract:* This project is a part of monitoring program which purpose is analysis of the variability of the intensity of formaldehyde (H<sub>2</sub>CO) masers towards massive star forming region NGC 7538 with Green Bank Telescope (GBT) of the National Radio Observatory in West Virginia. During the period 2008-2011 we have seven runs of observations. We used quasar 2148+6107 to derive pointing and focus corrections during three runs of observations. In analyzing and reducing the data of the second run of our monitoring program we found interesting phenomenon of decreasing and disappearing L polarization of quasar 2148+6107. This phenomenon wasn't observed in runs a

year before and a year after that using GBT, or using the VLA telescope in 2000. We flagged these observations as corrupted data, however, the reason for this phenomenon is still unclear.

8. **Title: Use of Head-Mounted Displays to Increase Presence**

*Principal presenter:* James Munger

*Major:* Computer Science

*Other presenters or co-authors:* Dr. Justin Ehrlich is my thesis advisor.

*Faculty mentor:* Justin Ehrlich

*Abstract:* The purpose of my research is to test if using a head-mounted display to present a virtual environment will increase a subject's presence in the environment as opposed to a traditional monitor display. Presence is defined as the psychological sense of being in a virtual environment. A virtual environment is a recreation of reality inside of a computer that uses graphics to represent objects. You would commonly see a virtual environment used in modern computer-animated films or video games. In particular, I want to test whether individuals with autism and learning disabilities will accept the use of head-mounted displays to interact with a virtual environment. A head-mounted display is a device which rests on the head and provides a viewport for the user to see graphical information, or a virtual environment. In the past head-mounted displays were large, heavy, and expensive to produce. This limited their availability and use for consumers. There were other problems with head-mounted displays, which reduce a subject's presence, including poor viewing angle which limits what the user can see, latency which affects how accurately the device follows head movement, and eye strain which is caused by staring at a screen which does not have true depth. Autism is a psychological disorder which is often characterized by impairment in social interaction and communication skills. There is currently no cure for autism but it can be treated to help individuals learn skills and social rules. Current treatments include positive reinforcement for desired behavior and therapy. Therapy can include role-playing, discussions, and games. I have created a simple virtual environment for use with a head-mounted display with some interactive features which I will use to determine whether a head-mounted display is effective for use with individuals with autism and learning disabilities. I have constructed a virtual environment in which subjects will be required to perform simple tasks such as recognizing various objects and maneuvering an avatar through an environment. I will record their ability to complete the tasks within the virtual environment successfully as well as their acceptance of the head-mounted display itself. The test consists of placing the head mounted display

on the subject and observing whether the device is accepted by recording how successfully the subject completes each task. This is a practical application of virtual reality at a potentially consumer level. Now that technology has progressed far enough to make affordable, and comfortable, head-mounted displays available to consumers, it is possible for various applications to be explored. This research also combines the fields of computer science and psychology which may further research in both fields.

9. **Title: A Survey of Entomopathogenic and Keratinophilic Fu**

*Principal presenter:* Noland Ryan Deaver

*Major:* Biology

*Other presenters or co-authors:* Kenneth McCravy, Cheryl Kuske, and Andrea Porrás-Alfaro

*Faculty mentor:* Andrea Porrás-Alfaro

*Abstract:* The goal of this study is to explore the diversity of entomopathogenic and keratinophilic fungi found in soils from a temperate hardwood forest. Entomopathogenic fungi are fungi that parasitize insect hosts, while keratinophilic fungi are those that can degrade keratin, a main component of many insect structures. Past research on these fungi has focused largely on agricultural applications of the genera *Metarhizium*, *Beauveria*, and *Cordyceps* as biological control agents of insect pests, and as such, the diversity of entomopathogenic and keratinophilic fungi outside of agroecosystems is poorly explored. This study seeks to address two goals: 1. Establish culture collections of entomopathogenic and keratinophilic fungi. 2. Compare different soil horizons collected from a temperate hardwood forest to determine potential differences in the diversity of entomopathogenic and keratinophilic fungi. In addition, fungi found in the soils will be compared with common mycoflora isolated from other invertebrate hosts. Soil samples were collected from the Duke Forest in North Carolina. Sterilized insect parts were placed in moist soil chambers; these sterile insect parts were used as baits to isolate fungi from soil. Fungi were isolated from insect segments in Sabouraud's dextrose agar and will be identified by sequencing of the ITS rDNA region. To date, 36 experimental treatments have been started and 26 pure cultures have been isolated. Both filamentous and yeast morphotypes have been isolated from insect parts, which were visibly colonized after approximately 5 days of exposure to soil. This study will generate data that could, in the future, be used to make inferences about the distribution, relative abundance, and ecology of potentially valuable fungal taxa.

## 10. Title: **Synthesis Diaryl selenides (ArSeAr)**

*Principal presenter:* Adam M Koe

*Major:* Chemistry

*Faculty mentor:* Jin Jin

*Abstract:* Diaryl selenides (ArSeAr) have proven to be valuable building blocks in organic synthesis and also exhibit interesting biological activities, such as antioxidant, anticancer, enzyme inhibiting. Previous methods to synthesize unsymmetrical diaryl selenides usually take multi-step reactions, long reaction time and poor yields. For example, usually three steps are required to synthesize the unsymmetrical diaryl selenides (Ar<sub>1</sub>SeAr<sub>2</sub>). The first two steps are to prepare the necessary starting materials and the third step is to couple the two starting materials together to form the final product (Ar<sub>1</sub>SeAr<sub>2</sub>). Multi-step synthesis increases the lab cost and the reaction time; it also lowers the overall yield of the synthesis. Scheme 1: Previous methods to synthesize unsymmetrical diaryl selenides

The objective of this project is to look for a new methodology to synthesize unsymmetrical diaryl selenides (Ar<sub>1</sub>SeAr<sub>2</sub>) in one-pot reaction. The following scheme shows the proposed reaction to synthesize unsymmetrical diaryl selenides in one-pot reaction. In chemistry a one-pot synthesis is a strategy to improve the efficiency of a chemical reaction whereby a reactant is subjected to successive chemical reactions in just one reactor. This is much desired by chemists because avoiding a lengthy separation process and purification of the intermediate chemical compounds would save time and resources while increasing chemical yield. The reaction involves the formation of an intermediate Ar<sub>1</sub>SeSeAr<sub>1</sub>, which will be directly used in the following reaction without any separation needed. So overall it is a one-pot reaction involving two steps. The new method one-pot synthesis will greatly save the cost, increase the yield and reduce the reaction time.

Methods: 1. Screen the reaction conditions. In order to optimize the protocol and to understand the influence of different variables in this reaction, several components were studied. By changing the reaction conditions with various catalysts, bases and solvents; at different temperatures and reaction time, we would be able to find out the optimized condition for the synthesis of the final product. Currently we have found the optimized reaction condition for the synthesis of (p-MePh)Se(p-OMePh) where Ar<sub>1</sub> is p-MePh and Ar<sub>2</sub> is p-OMePh. The optimized condition was carried out at 90 oC for the first step and 110 oC for the second step. 2. Apply the optimized reaction condition to the synthesis of more diaryl selenides. To explore the scope of substrates for the synthesis of diaryl selenides, various aryl selenides will be investigated under the optimized conditions. For example, by changing the substitution group on benzene ring of the starting material, various diaryl selenides products will be obtained. 3. Analyze the structures of the products. If the methodology to synthesize

unsymmetrical diaryl selenides is successful, it would benefit the pharmaceutical research. Since diaryl selenides and their derivatives are important molecules frequently found in the biological and pharmaceutical fields. Many compounds containing these systems are drugs with potential applications in the treatment of inflammation, cancer, human immunodeficiency virus (HIV), asthma, and Alzheimer's and Parkinson's diseases.

11. **Title: Generation Of Assymmetric Dicke States**

*Principal presenter:* Daniel DeYoung

*Major:* Physics

*Faculty mentor:* Kishor Kapale

*Abstract:* Dicke class states are maximally entangled states of atoms or atom-like two-state entities involving a small number of excitations (much less than the total number of atoms). It has been shown in the literature [Z.H. Peng, J. Zou, X.J. Liu, Eur. Phys. J. D 58, 403-407 (2010)] that the so-called asymmetric Dicke states, which carry different relative phases for different permutations corresponding to different atomic entity being in the excited state, are more useful for quantum information processing tasks than the symmetric Dicke states. We have devised a practical conceptual proposal for generation of asymmetric Dicke states based on a proposal to generate symmetric Dicke states [Thiel et al. Phys. Rev. Lett. 99, 193602 (2007)]. We show that the asymmetric Dicke-class states can be used for perfect teleportation [Agrawal and Pati, Phys. Rev. A 74 062320 (2006)] and dense coding.

12. **Title: Comparative Study on Road Traffic Injuries in Myanmar and Thailand**

*Principal presenter:* Bawk Mai Aung

*Major:* Health Sciences

*Other presenters or co-authors:* Mei Wen

*Faculty mentor:* Mei Wen

*Abstract:* Road traffic injury took 1.2 million lives away every year all over the world. Besides, 20 million to 50 million more are injured or disabled in these crashes. Road traffic injuries account for 2.1% of global mortality and 23% of all injury deaths worldwide. As a growing public health and development problem, it cast tremendous impact on people's social, economic and health status. This study aims to compare road traffic injury in two neighboring Southeast Asian countries (Myanmar and Thailand) to help better understand

the magnitude, the time trend, existing policy issues and their implications. The study includes three stages. At first, road traffic injury data from the two countries were collected from published reports and related websites, and analyzed with statistical tools to explore the differences and/or similarities. Secondly, the study describes the time trend of this issue to illustrate the change and pattern of the epidemic over a period of time in relation to socioeconomic development. One major predication by the World Health Organization is the position of road traffic injuries as a contributor to the global burden of disease is to rise from tenth place in 2002 to eighth place by 2030. The study will discuss the existing policies on road traffic injury in Myanmar and Thailand, and provides recommendations and suggestions to reduce the fatalities and harm associated with road traffic injury.

**13. Title: The Impact of Beaver Herbivory on Floodplain Forest Communities**

*Principal presenter:* Victoria Green

*Major:* Biology

*Faculty mentor:* Dr. Susan P. Romano

*Abstract:* Herbivory by beavers (*Castor canadensis*) has historically had a profound effect on streams and wetlands in the United States. Beavers build large dams and lodges which not only use large amounts of resources (trees) in their construction, but also change the course of water features. Beavers select trees for food as well as to build their lodges and dams, and this removal of trees can have a great impact on the tree composition of a forest. It is well established that a size-distance relationship assists beavers in selecting trees in accordance with the optimal foraging theory. It has also been established that the tannin and sugar content of trees can affect beaver preference, and that herbivory by beavers can be a major control of certain plant species in particular habitats. However, there is still much to learn regarding the selection process beavers use when harvesting trees. Few studies have investigated what species and size of trees beavers select and how this may impact the species composition and diversity of a forest. Even fewer studies have been conducted seeking to elucidate the effect of beavers on the Mississippi River floodplain forest composition. This information may be crucial in an ecosystem which is currently experiencing drastic changes in species composition due to human development and invasive species.

Studies will be conducted at Nahant Marsh Education Center outside Davenport, Iowa. There are two main beaver lodges on the property, which will be the areas of interest to this study. The main goals of this study are to 1) elucidate the effects of herbivory by beavers on wetland forest ecosystem

species diversity and composition and 2) make recommendations regarding the management of beaver populations at Nahant Marsh. In the past, land managers have removed beaver lodges which block the water control structure in order to maintain favorable hydrology in the marsh. However, possible benefits to overall biodiversity may be compromised in doing so. The hypothesis of this study is that areas impacted by herbivory by beavers will have higher overall diversity of tree species and size, and that beavers will preferentially select smaller trees and *Salix spp.* (willow) trees. The beaver population of Nahant Marsh will be estimated using wildlife cameras and night surveys to confirm beaver activity in the area. A total inventory of tree species and size in the area with active beavers will be performed. The circular area this encompasses, dam or lodge size, and any changes in number of lodges or activity will also be noted. Species, diameter at base height, GPS location, and whether or not the tree has been selected by beavers will be recorded. Tree species, size, and location relationships relative to a lodge or dam will be analyzed using nearest neighbor analysis in *ArcGIS* software. Shannon-Weiner and Simpson diversity indices as well as species richness and evenness will be computed and compared between sites varying in the level of beaver activity.

#### 14. **Title: Synthesis of Novel Macrocyclic compounds**

*Principal presenter:* Uday bhanu veera

*Major:* Chemistry

*Faculty mentor:* Dr. Jin jin

*Abstract:* Background: In the chemical literature, organic chemists may consider any molecule containing a ring of nine or more atoms to be a macrocycle. Coordination chemists generally define a macrocycle more narrowly as a cyclic molecule with three or more potential donor atoms that can coordinate to a metal center. There are many macrocycles present in nature such as chlorophyll and vitamin B12. Macrocycles, as important and powerful ligands, are applied in many areas such as ion and molecular sensing, metal ion protection in biomedical imaging, treatment of heavy metal waste streams, drug delivery and increase of drug efficacy, etc. Considerable effort has been directed towards the design and synthesis of sulfur and selenium containing macrocyclic ligands. Objectives: The objective of this research is to synthesize novel macrocycles containing mixed atoms such as N, O, S, Se and Si atoms and study their coordination chemistry with metal ions. The incorporation of the Si atom is to increase the coordination ability of the ligand due to the beta-silicon effect. Methods: (1) Design of the novel macrocycles Four macrocycles containing mixed Si/S/N, Si/S/O, Si/Se/N or Si/Se/O are designed as shown in

the following figure. The designed macrocycles contain mixed-donor functionalities with both hard and soft donor atoms. Therefore they can potentially bind two metals of differing character and oxidation state within the same cavity. These macrocycles can be used for complexation with heavy metals due to (1) higher stability constant of the complexes over their open chain analogs due to macrocyclic effect and (2) selectivity of the metal ion binding can be achieved by varying macrocyclic ring sizes and donor atom set combinations. Also, sulfur and selenocrown ethers should bind strongly to precious metals like Cu, Ag, Au, Pd and Pt since these metals prefer soft donor atoms. (2) Synthesis of the macrocycles The synthesis of the macrocycles will start from smaller, linear molecule bis(chloromethyl)dimethyl silane which is commercially available. By running multi-step organic synthesis as shown in the following scheme, various intermediates will be obtained leading to the final products macrocycles. All intermediates and products should be purified by column chromatography and characterized by nuclear magnetic resonance (NMR) spectroscopy and mass spec. (3) Coordination chemistry study of the macrocycles. The obtained macrocycles will further react with various metal ions since all of them are tetra-dentate ligands with mixed soft and hard donors. We expect them to be able to bind two metals of differing character and oxidation state within the same cavity.

#### 15. **Title: Optical Band Gap Variation in Lead Boro Tellurite Glasses**

*Principal presenter:* Aisha Farag

*Major:* physics

*Other presenters or co-authors:* Saisudha Mallur P K Babu

*Faculty mentor:* Saisudha Mallur

*Abstract:* Study of Optical absorption near the fundamental absorption edge is a useful method for the investigation of optically-induced transitions, band structure and the optical band gap in glasses. For the present work, specimens of the glass system  $(x-y)$  PbO -  $20$ TeO<sub>2</sub> -  $(80-x-y)$  B<sub>2</sub>O<sub>3</sub> -  $y$  Nd<sub>2</sub>O<sub>3</sub> where  $y=0.5$ ,  $x=20,30,40,50,60,70$  mol%, have been prepared by melt quenching technique. Glass samples were annealed to remove thermal strains and then polished for absorption experiments. Optical absorption spectra obtained for these glasses show that the fundamental absorption edge lies in the wavelength range 350 to 500 nm. The fundamental absorption edge shows a shift towards longer wavelengths (lower energy) with increasing PbO content. The absorption spectra were analyzed using the Mott-Davis model to determine optical energy gaps of these glasses. Our analysis shows that the band gap is associated with direct forbidden transitions. The optical band gap of these

glasses decreases from 2.98 to 2.69 eV with increasing PbO content from 19.5 to 69.5 mol%. Variation in the band gap with composition is due to the structural modifications and alterations in the covalence of the Pb-O bond.

**16. Title: Analyzing the effects of density-dependent dispersal on population dynamics**

*Principal presenter:* Hassan Rafique

*Major:* Mathematics

*Faculty mentor:* Dr. Amy Ekanayake, Dr. Dinesh Ekana

*Abstract:* An epidemic model is proposed to describe the effects of density dependent migration rates on the spread of disease within patchy habitats. Changing land usage has resulted in increasingly fragmented (patchy) habitat and some species live within habitat that is naturally patchily distributed. Examples include amphibians, butterflies, prairie dogs, and some marine species such as reef fish. Since the migration from one patch to another can lead to the spread of communicable diseases, it is important to consider the effect of population dispersal on spread of a disease. Many epidemic models have been proposed and the dynamics of disease transmission have been studied for population dispersal among patchy or fragmented environments. Hethcote [1976] proposed an epidemic model with population dispersal between two patches. Brauer and van den Driessche [2001] presented a model with immigration of infectious individuals. Wang and Zhao [2004] analyzed a susceptible-infectious-susceptible (SIS) disease transmission model with population dispersal among  $n$  patches. Fulford [2002] devised a susceptible-asymptomatic-symptomatic SEI metapopulation model to study the spread of an infectious agent by migration and the model is applied to the problem of the spatial spread of bovine tuberculosis in a possum population. Li and Jou [2009] applied a susceptible-infectious SIR model to a patchy environment for a disease with latency. Many patch epidemic models assume constant per-capita migration rates [Wang and Zhao, 2004; Brauer and van den Driessche, 2001; Hethcote, 1976]. These models are well suited for studying many disease dynamics and general trends of the spread of the disease. However, there are only few [Fulford, 2002] that extend these models to include density dependent migration rates. Analyzing density dependent migration is important in optimizing disease control strategies, as one can control the disease by controlling the density of the population properly. There are many species with density dependent migration. Examples include the northern vole and lemmings [Rofl, 2005]. In this project, we use a susceptible-infectious-immune (SIR) model to analyze (both analytically and numerically) the effect of various

density-dependent migration rates on the spread of disease within patchy habitats. The analysis includes establishing a threshold quantity that determines persistence or extinction of a disease, determining stability of disease-free and endemic equilibria and investigating the control of disease dynamics through an optimal control strategy. We further compare the results with models that employ constant per-capita migration rates.

**17. Title: The Effect of Light and Soil Saturation on the Health of the Pink Turtlehead Flower**

*Principal presenter:* Anthony Kloppenborg

*Major:* Biology

*Faculty mentor:* Susan Romano

*Abstract:* The Pink Turtlehead (*Chelone obliqua*) is a perennial wildflower that is native to western and southern Illinois. Recently a population of this plant was found along the Mississippi River in Bettendorf, Iowa. The plants in this population seemed to prefer areas of open canopy which were close to sources of water. The purpose of this study is to examine how factors such as the level of canopy cover and the level of water saturation of the soil affect the health and abundance of this plant. This study intends to grow a population of this plant from seed under different variations of artificial cover to determine the conditions this plant grows best in. This study will also grow a population of this plant from seed in soil preparations of different water saturation levels to determine its tolerances to the level of water saturation of the soil. The plants for both treatments will be measured for height every 4 days. The plant heights for each treatment will be input into an Anova to determine if there is a statistical difference between the treatments. A Tukey test will be used to determine which treatments are different. The plant heights will also be input into a regression created by comparing the height of the plants to level of light penetration through the artificial cover. The height will also be compared to the level of water saturation of the soil in the same manner. The number of seedlings that sprouted under each condition will also be counted. This data would be input into an Anova, and a Tukey test would be used to determine which treatments were statistically significantly different.

**18. Title: Exploring a New Way to Synthesize Unsymmetrical Biaryl Compounds**

*Principal presenter:* Mahati Lolla

*Major:* Chemistry

*Faculty mentor:* Dr. Jin Jin

*Abstract:* Exploring a new way to synthesize unsymmetrical biaryl compounds. The biaryl scaffold has received increased attention as a privileged structure by the pharmaceutical industry. This motif has shown activity across a wide range of therapeutic classes, which include antifungal, anti-inflammatory, antirheumatic, antitumor, and antihypertensive agents. It also has shown the potential to treat infertility as a follicle-stimulating hormone (FSH) receptor agonist. When drugs that contain the biaryl moiety attach to proteins, they are dominated by interactions with aromatic and hydrophobic residues. Furthermore, it has been shown that the biaryls interact favorably with polar groups such as amides and hydroxyl groups. They have also combined with positively charged moieties. Since the biaryl is able to interact with these numerous binding sites, it is prevalent in pharmaceuticals. Recent literature has highlighted the use of the biaryl scaffold as a selective Histamine H3 receptor antagonist. The H3 receptors are presynaptic receptors and are mainly found in the central nervous system. These receptors control the production and release of histamine. Because the majority of the receptors are located in the central nervous system, it has been proposed that controlling this receptor could be a drug development target for neurological disorders such as Alzheimer's disease, Parkinson's disease, and epilepsy. Besides their potential use as H3 receptor antagonists, biaryls have exhibited antibacterial activity against Gram-positive bacteria. In my research project, first I will develop a novel method for the synthesis of unsymmetrical diaryltellurides in one-pot reaction. The reaction involves the formation of an intermediate diarylditelluride  $Ar_1TeTeAr_1$ , which will be directly used in the following coupling reaction leading to the final product unsymmetrical diaryl telluride  $Ar_1TeAr_2$ . Next, the method to remove tellurium in  $Ar_1TeAr_2$  leading to the unsymmetrical biaryl product  $Ar_1Ar_2$  will be explored. The reagents to remove tellurium will be palladium acetate and triethylamine which are both commercially available. The new method to make unsymmetrical biaryls will lead to a more benign alternative to the synthesis of biaryl containing drug molecules.

19. **Title: Fluorescence of Sm<sup>3+</sup> Doped Lead-Borate Glasses with CdSe and ZnSe Nano-Particles**

*Principal presenter:* Stephen O. Fatokun

*Major:* Physics

*Other presenters or co-authors:* Co-authors: Dr. Saisudha Mallur and Dr. P.K. Babu

*Faculty mentor:* Dr. Saisudha Mallur

*Abstract:* We studied the fluorescence emission spectra of Sm<sup>3+</sup>-doped lead borate glasses containing zinc selenide (ZnSe) and cadmium selenide (CdSe) nanoparticles with the following compositions (x PbO - 60 B<sub>2</sub>O<sub>3</sub> - 0.5 Sm<sub>2</sub>O<sub>3</sub> - 3 ZnSe/CdSe, x=36.5 and 56.5 mol%). These glass samples are prepared using the melt-quenching method. Each sample is annealed just below the glass transition temperature at 400°C for 3 hours and 6 hours, making 8 samples in all. We have chosen these heavy metal oxide glasses PbO-B<sub>2</sub>O<sub>3</sub> to incorporate Sm<sup>3+</sup> ions because they have a large glass forming region, high refractive index, and good physical and thermal stability. Fluorescence spectra of these samples are obtained with the excitation wavelength at 477 nm. Three fluorescence transitions are observed at 563 nm, 598 nm and 646 nm. The transition at 646 nm is found to be a hypersensitive transition that strongly depends on the covalency of the RE-O bond and the asymmetry of the crystal field at the rare earth site. The 646 nm/598 nm fluorescence intensity ratio has been studied for different annealing times and PbO concentration for both ZnSe and CdSe samples. The presence of CdSe nanoparticles is seen to produce the greatest influence on the fluorescence intensity ratio. This could be due to the size of the CdSe nanoparticles and covalency of the RE-O bond.

20. **Title: Public vs. Private: Does the Method Chosen for Development and Administration of Standardized Testing Matter?**

*Principal presenter:* Oleksandr Iakymenko

*Major:* Political Science

*Faculty mentor:* Vincent Auger

*Abstract:* Standardized testing has become a mainstay in modern education systems throughout the world; however, standardized testing is not homogenous within these systems and has dissimilar purposes. Different ways of establishing and maintaining the standardized testing are implemented; in some countries government maintains the process while in others, it is privatized. Standardized testing is affected by a number of factors, some of which are not directly related to education. The main concern is that, as a result, testing functions may be distorted and that will lead to disruptions in the education system at all its levels. This research investigates how the creation and administration of the standardized testing influences its functions by comparing the establishing standardized testing in the U.S. and Ukraine. Findings indicate that despite differences in management and structures of testing in particular, and the systems of education in general, both tests (SAT in the U.S. and EIT in Ukraine, respectively) have similar functions. The approaches used by both countries, despite their core differences, can be

equally effective, although improvements are possible. Effectiveness of the systems of standardized testing does not rely heavily on the method chosen for development and administration, but rather whether the test itself and the administering procedures are unbiased and impartial. This study will help policymakers and scholars who work on improvement of the educational structures in general, specifically systems of standardized testing in particular. In the era of globalization it is impossible to compete among the nations having poorly advanced educational system, which includes effective mechanisms for testing gained skills and knowledge.

21. **Title: Genetic Transformation of Leuconostoc**

*Principal presenter:* Joseph Lucas

*Major:* Microbiology

*Faculty mentor:* Scott Holt

*Abstract:* Species of the bacteria Leuconostoc synthesize a variety of unique complex carbohydrate polymers called alpha-glucans. The alpha-glucans are characterized by a backbone of alpha-linked glucose molecules, often containing branches at 1-3, 1-4, or 1-6. An example of an alpha-glucan made by Leuconostoc is called alternan, which has a backbone of alternating 1-6 and 1-3 linked glucose molecules. The unique linkage properties of alternan and other alpha-glucans grant the polymers physical properties that make them useful for certain applications. Development of an efficient gene-transfer system for Leuconostoc is important for understanding glucan synthesis and to enhance their biotechnology potential. Electroporation is a widely used gene-transfer system for certain bacteria. Electroporation utilizes brief exposure to an electrical discharge to create transient pores within the cell wall of bacteria. DNA or genes can then enter the bacterial cell through the transient pores. Leuconostoc has been resistant to gene-transfer systems such as electroporation probably due to its thick gram positive cell wall composed of peptidoglycan. The goal of this project is to improve the efficiency of electroporation methods in Leuconostoc by developing treatments that temporarily weaken the bacterial gram-positive cell wall to allow for efficient transfer of genetic material into the cell. Cell wall treatments may include cellular exposure to glycine, lysozyme, and penicillin. Leuconostoc strains that lack indigenous plasmids will be used as host species for the research to reduce gene transfer resistance due to plasmid incompatibilities. The effectiveness of each electroporation treatment will be quantified by measuring Leuconostoc transformants per microgram of DNA transferred (transformation efficiency). Transformation efficiencies will be compared by ANOVA and TUKEY tests to determine

which treatment, if any, is a statistical improvement compared to the control method (no cell wall treatment). Major findings include potentially large improvements of transformation efficiency, allowing easier study of the genes behind alternan synthesis. Funding is largely covered, as the majority of the necessary supplies for this project are present in the lab.

**22. Title: Synthesis of potential new cathepsin K inhibitors**

*Principal presenter:* Hema latha Sarepalla

*Major:* Chemistry

*Other presenters or co-authors:* Co-authors: Karthika Yarlagadda, Durga Yeramala, Bharat Guda, Prashanth Akula, Karthik Malayala, Lisa Wen, and Rose M. McConnell

*Faculty mentor:* Dr. Rose McConnell

*Abstract:* Cathepsin K has recently been identified as the major cysteine protease expressed in osteoclasts. The abundance and selective location of cathepsin K in cells responsible for bone resorption has led to a new interest in design of cathepsin K inhibitors for the treatment of osteoporosis. Increased bone resorption may release factors from the extracellular matrix that contribute to tumor growth. In fact, recent reports indicate that interactions between prostate cancer cells, osteoblasts, osteoclasts, and bone matrix are essential in the formation of bone metastases. The design and synthesis of substituted thiosemicarbazones as potential new cathepsin K inhibitors is reported.

**23. Title: Detection of an Extreme Blue-Shifted Molecular Flo**

*Principal presenter:* Hyung Kwan Kim

*Major:* Physics

*Other presenters or co-authors:* co-authors: Esteban D. Araya

*Faculty mentor:* Esteban D. Araya

*Abstract:* We report detection of extremely broad hydroxyl absorption lines in the massive star forming region G34.26+0.15. The observations were conducted with the 305m Arecibo Telescope in Puerto Rico in 2012. The absorption line is asymmetric, with a broad ( $> 20$  km/s) line wing blue-shifted with respect to the systemic velocity of the region. We detected the absorption line in two different transitions of hydroxyl, at 6035 and 6030 MHz. The velocity range of the absorption line matches that of a small cluster of water masers, thus, the hydroxyl line may serve as a link between extended gas traced by absorption and the compact maser regions traced by water.

24. **Title: Prenatal Oxytocin Exposure and ADHD**

*Principal presenter:* Ashley Simmons

*Major:* General Experimental Psychology

*Other presenters or co-authors:* Matt Jefferson (Iowa State), Sarah Adams, Seth Yockey

*Faculty mentor:* Russell Morgan

*Abstract:* Attention deficit hyperactivity disorder (ADHD) is one of the most common childhood disorders and is believed to affect nearly 5.4 million children in the U.S. alone. The prevalence rate of ADHD continues to rise, suggesting an important need for determining the etiology of the disorder. Oxytocin (OT), a naturally-occurring hormone which serves numerous roles within the body, but most notably facilitates contractions during childbirth and social interactions/bonding, has also been implicated as a possible factor contributing to neurodevelopmental deficits in children. Although administration of OT to facilitate childbirth/labor is common in hospital settings, the process can cause excessive uterine hyperstimulation, creating an oxygen deficient environment (hypoxia) for the fetus. A recent correlational study has suggested an association between the use of OT to induce or augment labor and diagnosis of ADHD (Kurth and Haussman, 2011). However, cause and effect conclusions cannot be drawn between OT administration and ADHD development because of the clinical/correlational nature of this study. Therefore, our laboratory set out to investigate this relationship using an experimental animal model in which cause and effect could be delineated. Twenty pregnant Long-Evans rats were administered 5 IU/kg OT subcutaneously or an equal volume of saline (SAL) on gestation day 22 in order to induce labor. To assess ADHD-like behaviors, the litters of those dams were tested as adults in a 3-Choice Serial Reaction Time Task (3CSRTT). This task was designed to evaluate attention-related behaviors, including performance accuracy, premature responses (commission errors), reaction time (response latency) and omission errors. In order to measure these, the task involved the use of an automated operant chamber in which food pellets were given as a reward for correct nose-poke responses into three funnel-shaped response ports based on visual and olfactory cues. The results indicated that female offspring of the OT dams had a higher percentage of nontrials and longer alcove latencies than female offspring of SAL dams. Additionally, male offspring of OT dams had a lower percentage of nontrials and shorter alcove latencies than male offspring of SAL dams. OT female offspring performed better than SAL female offspring under long cue Delay conditions but made more omission errors at the 3 second cue Delay. In summary, the results

indicated that exposure to OT during labor produces deficits in attention and motivation. These behavioral deficits are possibly caused by hypoxic-induced hyperactivation of striatal dopamine (Brake, Sullivan, & Gratton, 2000) and should be investigated further. Future attempts to explore the relationship between OT and ADHD should consider variations in drug dose and exposure models, different animal strains, and behavioral task options.

**25. Title: Thermophilic fungal diversity in corn.**

*Principal presenter:* Katrina Sandona

*Major:* Biology

*Faculty mentor:* Andrea Porras-Alfaro

*Abstract:* High temperatures and low humidity conditions may be favoring the colonization of grain by thermophilic fungi in corn storage facilities.

Thermophilic fungi are fungi that thrive at temperatures between 45 and 50°C with a drastic decrease in growth at 60°C. The corn bins can reach an average temperature of 45- 52°C in the summer which can stimulate the growth of thermophiles. The objective of this project was to isolate and identify thermophilic and thermotolerant fungi from corn grain in bins and determine potential interactions between thermophiles and known mycotoxin producing fungi. Corn samples were collected from local farmers during the summer and winter. The corn had been dried to 15 percent moisture. Corn was plated and incubated at 50°C and the fungi were isolated in Emerson medium and identified by sequencing the ITS rDNA region. The number of spores in the corn silos was very high, more than 90% of grains show colonization by thermophilic fungi. Multiple species of thermophilic fungi were isolated and identified including: *Thermomyces lanuginosus*, *Aspergillus fumigatus*, *Thermoascus crustaceus*, and *Rhizomucor pusillus*. Many of the species isolated were true thermophiles with optimal growth temperature at 50°C. 454 pyrosequencing was performed in order to determine other fungi present in corn grain. For the 2011 454 data the most common genera were *Aspergillus*, *Ophiocordyceps*. The most common genera for the 2012 crop were *Gibberella* and *Stenocarpella*. This study raises new concerns on the high abundance of previously undocumented actively growing fungi in corn that could represent a food safety risk.

**26. Title: Development of a new methodology to the synthesis**

*Principal presenter:* keerthi vedula

*Major:* Chemistry

*Faculty mentor:* Dr. Jin Jin

*Abstract:* Abstract Development of a new methodology to the synthesis of symmetrical biaryls Biaryls, compounds containing two directly connected benzene rings, frequently feature in pharmaceuticals and agrochemicals as well as forming the core of many functional materials (for example LEDs, liquid crystals, conducting polymers). Over the last two decades, methods for preparing biaryls have relied predominantly on cross-coupling - a method in which two differentially pre-functionalized benzene rings are connected together in the presence of a catalyst, most often based on the precious metal palladium. The power of this method was recognized in the 2010 Nobel Prize in Chemistry. However, concerns regarding the environmental impact of such processes, arising from use of toxic metals and the requirement for pre-functionalization of the coupling partners, have led to a search for more benign alternatives. As a consequence, much recent interest has focused on replacing one of the pre-functionalized benzene rings with the desired benzene ring itself, a process known as direct coupling. Despite major advances in this area, most direct couplings still only operate under undesirable conditions, for example strongly acidic solvents, high temperatures, high concentrations of toxic metal catalysts, large excess of one reactant, and so on. The appeal of the new direct coupling process is increased still further by the ease with which it can be performed: unlike more traditional procedures, the chemistry is insensitive to the presence of air or moisture, allowing reactions to be assembled on the bench-top without prior purification of reactants and solvents. A highly efficient new protocol for C-Te bond formation leading to symmetrical diaryl tellurides has been developed. The synthesis employed aryl iodides and elemental tellurium as starting materials in the presence of KOH. It is a one-pot reaction without using any catalyst. Utilizing this new protocol, a variety of aryl and heteroaryl iodides are reacted with elemental tellurium to afford the corresponding diaryl tellurides in good to excellent yields. These synthetic diaryl tellurides will be used as the starting materials to generate biaryls under exceptionally mild conditions. The biaryls will be produced by the detelluration reaction on the diaryl tellurides using palladium (0) which is generated from commercially available and low cost palladium acetate and trimethylamine. The new method to generate biaryls will lead to a more benign alternatives to the field of pharmaceuticals in the synthesis of biaryl containing drugs.

**27. Title: TUNNEL DIODE RESONATOR STUDIES OF SUPERCONDUCTING**

*Principal presenter:* AYSH MADKHLI

*Major:* physics

*Other presenters or co-authors:* Author List: Saleh Altarifi, Andrew Onaghise

*Faculty mentor:* Dr. Ryan Gordon

*Abstract:* The tunnel diode resonator (TDR) circuit is a radio frequency oscillating circuit that has been optimized for measuring changes in material properties at low temperatures. The TDR has been used to study materials in the field of condensed matter physics due to its sensitivity and its very fast response time. This device has been designed for measuring changes in its resonance frequency with part-per-billion sensitivity. The essential components of the TDR are an LC tank circuit, where the radio frequency oscillations take place, and a properly biased tunnel diode that supplies energy for these oscillations. In this presentation, I will give an overview of the operation of the TDR and I will explain how this device can be used to measure the ac magnetic and electric susceptibilities of materials as functions of temperature, frequency and magnetic field. In addition, I will show how examples of TDR data taken on various types of superconducting and magnetic materials to illustrate how useful this device can be as a materials research tool. Finally, I will give an update on the progress of constructing a TDR measurement lab in the WIU Physics Department.

**28. Title: Are all seed endophytes beneficial for plant growth**

*Principal presenter:* Terri Tobias

*Major:* Biology

*Other presenters or co-authors:* Terri Tobias, Sarah Hicks (University of New Mexico), Robert Sinsabaug (University of New Mexico), Katherine Suding (University of California-Berkeley), Andrea Porrás-Alfaro

*Faculty mentor:* Andrea Porrás-Alfaro

*Abstract:* Plant seeds can harbor different types of endophytic fungi. These symbionts can provide the hosts with nutrients, while also giving the plants an advantage at germination and protect the plant against pathogens while others can be pathogenic. We isolated seed-associated fungi from dominant plants in the alpine tundra and determined their pathogenicity levels in germination assays. Samples were collected from a moist meadow in the alpine tundra at the Long Term Ecological Research Site (LTER) in Niwot, Colorado. Seeds were collected from six plant species: *Geum rossii*, *Erigeron simplex*, *Artemisia scopulorum*, *Deschampsia caespitosa*, *Bistorta bistortoides*, *Trisetum spicatum*. Fungal cultures were sequenced using the Internal Transcribed Spacer rDNA and identified using BLASTN and phylogenetic analysis. A total of 54 fungal cultures were isolated from seeds. All fungal isolates belong to the phylum

Ascomycota. The majority of the isolates were closely related to taxa commonly found in soils and/or described as fungal endophytes. Dominant orders in seeds included Capnodiales (23% of the isolates), Pleosporales (23%), and Eurotiales (16%). We isolated 12 unique genera from the seeds and 53% of these genera were also found in the roots of two of the plants. Germination experiments using commercial corn seeds were conducted for each species to determine potential roles in symbioses. Sixty-six percent of the total endophytes tested were closely related to seed pathogens and had pathogenic activity. Seed pathogens negatively affected germination and caused root necrosis. The most common genus isolated was *Alternaria* accounting for 26% of the isolates. There were 3 unique *Cladosporium* that showed positive effects on seed germination and plant growth. Microbial interactions with plants are known to play an important role in maintaining the biodiversity in ecosystems. The high number of pathogenic fungi found in the seeds could have a major role shaping the structure of plant communities in the alpine tundra.

**29. Title: Exploration of multi-component reactions leading to an important structure in antitumor drugs**

*Principal presenter:* kamala keerthy.kola

*Major:* chemistry

*Faculty mentor:* Dr.Jin Jin

*Abstract:* Multicomponent Reactions (MCRs) are convergent reactions, in which three or more starting materials react to form a product, where basically all or most of the atoms contribute to the newly formed product. Compared to the usual multi-step synthesis, MCRs generate structural complexity in a single step and therefore are usually highly efficient, selective, convergent, and atom-economical. As illustrated in the following figure, a four-component reaction leads to the final product in a single step in a yield of 85%, whereas the traditional 3-step reaction leads to the same product in an overall yield of 61% and of course it takes longer reaction time.

Multi-component reactions have played a central role in the development of modern synthetic methodology for pharmaceutical and drug discovery research. MCRs provide a new approach towards the efficient synthesis of diverse compounds and compound libraries.

In this research project, we are going to explore a multi-component reaction leading to 2-amino-3,5-dicyanopyridines, which are very important basic structures for many antitumor drug molecules. The reaction is a four-component reaction involving benzaldehyde, 2 equiv. of malononitrile and thiol or selenol. My plan for the research is shown as follows. Learn the reaction

mechanisms of this multi-component reaction. Run the multi-component reaction using benzaldehyde and substituted benzaldehyde such as para- nitro and para-chloro groups. Examine the products using various analytical techniques such as infrared spectroscopy (IR) and nuclear magnetic resonance (NMR).

The final product of the reaction 3,5-dicyanopyridines are an important privileged heterocyclic scaffold and have produced a great number of compound libraries with diverse biological activities such as antibacterial, antitumor, and anti-infective properties.

**30. Title: Error Correcting Codes: Classical to Quantum**

*Principal presenter:* Timothy Woodworth

*Major:* Physics

*Faculty mentor:* Kishor T. Kapale

*Abstract:* In 1981 Feynman spoke at MIT about how to simulate physical systems with computers. He conjectured that the binary nature of computers make them unsuitable to show real life situations in an efficient manner. He suggested that the continuous nature of superposition offered by quantum mechanical systems could lead to very powerful computers. There has been a significant hurdle in making this quantum computer a reality, mainly decoherence. Decoherence results when there exists an unwanted interaction between the quantum system of interest interacts and its environment causing errors in the results of the computation. Quantum Error Correction (QEC) is the field that involves search for specific encoding of the quantum information that will allows for detection and corrections of computational errors. In my talk I will discuss some of these codes and analyze the process of designing the codes and how they function to eliminate some common errors.

**31. Title: Effects of Prescribed Burning and White-Tailed Deer**

*Principal presenter:* Jeff Woodyatt

*Major:* Biology

*Faculty mentor:* Dr. Sean Jenkins

*Abstract:* Oak woodlands are recognized as disturbance driven ecosystems, whose composition and structure, prior to European settlement, were in a large part determined by the frequency, severity and seasonality of anthropogenic driven fires. More recently these woodlands have been fragmented due to timber harvesting, agriculture and urban development. The overstory composition and structure of remaining remnants are shifting from being

dominated by oaks (*Quercus* spp.), to being dominated by fire intolerant and shade tolerant species such as sugar maples (*Acer saccharum*) as a result of a decrease in the frequency of fire disturbances and closed canopy conditions. Recent research indicates that this shift in overstory composition and structure has led, and will continue to lead, to the disappearance of native shade intolerant and fire dependent woody species, as well as a loss in diversity of forest flora species. Aside from fire suppression altering woodland plant communities, the impact of browsing behaviors seen by high densities of white-tailed deer (*Odocoileus virginianus*) is a subject of question. Just in the past thirty years, white-tailed deer densities have reached record highs in the Midwest, as well as in other areas of the United States. According to research, white-tailed deer are known to be semi-selective browsers, meaning that they will feed more heavily on better tasting or palatable vegetation varieties. Due to this behavior, populations of particular plant species can be severely diminished in numbers or even extirpated in some instances. This study examined how both of these factors affect the relative abundances and diversity of oak woodlands and their associated woody and herbaceous plant communities. Using a stratified random sampling method, forty 300m<sup>2</sup> circular plots were established into an oak-hickory dominated woodland complex of Prairie Glen at the Alice L. Kibbe Life Science Station. Each 300m<sup>2</sup> plots housed a nested 100m<sup>2</sup> plot and five 1m<sup>2</sup> quadrates, which were used for data collection for all overstory/understory woody and herbaceous species. White-tailed deer browsing behaviors were assessed by the instillation of animal exclosures to prevent the browsing of the enclosed vegetation. In addition, this study addressed the effects of prescribed burning on resident plant communities by administering one spring prescribed burn. Initial data collection for the first sampling year has been completed; however the project is not expected to be finished until 2015. Expected results for this study include: 1) Prescribed burning will decrease the relative abundance and diversity of fire intolerant, invasive species while promoting an increase in native and fire adapted species. 2) White-tailed deer browsing will significantly decrease the relative abundance and diversity of palatable vegetation. Information obtained for this study may serve to promote a further understanding of woodland plant community dynamics in respect to the reintroduction of landscape level fire disturbances, as well as the impact of high white-tailed deer populations and their browsing behaviors. This project is unique in that both of these factors have not yet been compared together to see the compounding effects of two dominate forces driving the structure and diversity of woodland plant communities.

**32. Title: Evaluating cause-specific mortality, nest site cha**

*Principal presenter:* James S Zweep

*Major:* Biology

*Faculty mentor:* Dr. Christopher Jacques

*Abstract:* In the state of Illinois, smooth softshell turtles (*Apalone mutica*) have been on the decline due to the effects of river channelization, habitat fragmentation, and other anthropogenic activities in areas that they occupy. Conservation efforts for this species depend on understanding the characteristics for reproductive success of nesting females, as well as survival rates of the hatchlings. My proposed research project will investigate the nest-site characteristics of the species, estimate the survival rate of *A. mutica* hatchlings in subsequent years, and measure the growth rate of the hatchlings. The study site is located on Pool 19 of the Mississippi River, which contains many potential nest sites for nesting *A. mutica* females. I will first locate the nests by looking for distinctive tracks and signs of digging, and place trail cameras around the area to record any activity around the nest (e.g. predation, hatchling emergence, etc.). When the hatchlings begin to emerge, I will place drift fences and gill nets near the shoreline to collect 1,500 smooth softshell hatchlings that will be fitted with passive-integrated transponder (PIT) tags to be used for population estimates in the following years. Thirty individual hatchlings will be fitted with a radio transmitter in order to learn where smooth softshell hatchlings disperse to after emerging from the nest. Three hundred *A. mutica* hatchlings will be selected for a growth rate study which will allow us to understand how growth rate affects the survival rate of the species. This study should provide valuable knowledge about the reproduction and development of smooth softshell turtles, as well as population estimates that would be imperative in evaluating the species conservation status in the state.

## ***Performances***

**33. Title: The Pebble Project: The Process to Product Journey**

*Principal presenter:* Emily Terrell

*Major:* Theatre: Acting

*Other presenters or co-authors:* Dallas Milholland

*Faculty mentor:* Bill Kincaid

*Abstract:* During the summer of 2013, Dallas Milholland and I travelled to Bristol Bay, Alaska and conducted research about the people of Bristol Bay and

the Pebble Mine (a large open pit copper and gold mine that poses ecological hazards to the region). We conducted interviews with our co-workers at Leader Creek Fisheries, members of the Bristol Bay community and the fleet's fishermen. We collated photographs that we took and our fishermen took. We gathered evidence from news sources, websites, magazines, press releases and social media as supplementary evidence. We will be using this research as a basis for creating a devised piece during the spring of 2014, with the purpose of using the medium of theatre to support the Save Bristol Bay Movement. This presentation traces the research we have already conducted including successes and setbacks, including methodology and theoretical underpinnings, as well as our goals for the creation of a devised piece and excerpts of performance material.

## ***Podium Presentations***

### **34. *Title: Student Achievement in Mathematics: Where Are We Now and Where are We Going?***

*Principal presenter:* Amanda Meiners

*Major:* Mathematics

*Faculty mentor:* Robert Mann

*Abstract:* The purpose of this project is to statistically analyze student mathematics scores on Standardized Tests, (ISAT, PSAE, and ACT) since mandated testing began in Illinois in 2000 as a result of the implementation of No Child Left Behind (NCLB). In Illinois over the past 25 years we have made consistent efforts to improve the structure of the education in the mathematics classroom. Have the efforts and expectations associated with NCLB resulted in gains in mathematics achievement? These results are particularly important now as new standards and new standardized tests (PARCC and Common Core Mathematics Standards) are becoming the norm in Illinois. Using the online Illinois Report Card System, along with posted information from the National Assessment of Education Progress and other resources, scores will be compared with the expectations from the standards under the Illinois Learning Standards for Mathematics (ILSM) as adapted and adopted from the original Illinois State Goals brought about in 1985. Scores indicate that student achievement in the lower grade levels (3-8) rose steadily but have recently taken several large reductions, due primarily to changes in the testing and cut scores at these levels. Mathematics achievement for 11th graders meanwhile

has remained basically stagnant with very small changes up and down depending on the year of testing. Analysis of this data and trends will try to establish notable outcomes as well as possible areas and strategies for improvement. The expectations under NCLB were more advanced than what the previous standards (ILSM) were calling for. What was perceived as a simple way to help students who were behind catch up to grade level, has made the progressive problems students face in mathematics come into the dramatic spot light. Thus knowing how we have progressed over the last 13 years may help us better measure our progress as new standards and efforts are implemented in the coming years. This study will also use mathematics scores from international tests to examine how students in the United States compare to those from other countries and how those comparisons have changed over the last several years in relation to the new standards and assessments.

**35. Title: Acoustic Startle Response of Individuals with Comorbid Anxiety and Depression**

*Principal presenter:* Sarah L Adams

*Major:* Experimental Psychology

*Other presenters or co-authors:* Dr. Sandra McFadden, Elizabeth Kiebel, Naoyuki Sunami, Desire Barker, Kayla Belcher, Sze Jin Ooi, Shiloh Lueschow, Brooke Randazzo

*Faculty mentor:* Sandra McFadden

*Abstract:* Problem/Rationale: Psychophysiological responses such as the acoustic startle response (ASR) and ASR-related measures may serve as a means of distinguishing between anxiety and depression. Evidence exists for increased ASR (Ludewig et al., 2005) and decreased habituation and prepulse inhibition (PPI) of the ASR (Ludewig, Ludewig, Geyer, Hell, & Vollenweider, 2002) in persons with anxiety-related disorders but no such effects in persons with non-psychotic depression (Taiminen et al., 2000). The current study examines ASR, PPI, habituation and dishabituation in persons high on both the anxiety and depression scales of the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995), as part of a larger study that aims to establish psychophysiological profiles of depression, anxiety, and comorbid disorders. Procedure: Participants (N=22, 13 female) completed the DASS, then Ag/AgCl electrodes were placed beneath the right eye to record eyeblink startle. Participants relaxed while 42 sound stimuli were delivered via headphones at long interstimulus intervals (35 s on average) in pseudorandom order. Background noise at 65 dB(A) SPL was present throughout the procedure. The first 40 trials were in four blocks of 10 trials each consisting of five startle

stimuli (50 ms 95 dB(A) SPL bursts of white noise) and five startle stimuli preceded (80 ms prior) by a 40 ms 70 dB(A) SPL prepulse. The last two trials were a 50 ms 1000 Hz dishabituation tone at 95 dB(A) SPL and another startle stimulus. Results: Data analyses focused on ASR amplitude, PPI (percent reduction of ASR by prepulse), habituation (percent reduction of ASR between Blocks 1 and 4), and amplitude of ASR to the dishabituation tone for participants low on both anxiety and depression (Control) or high on both (Comorbid). Independent samples t-tests showed that Comorbid participants had more habituation ( $M=95.88\%$ ,  $SD=5.82$ ) than Controls ( $M=62.32\%$ ,  $SD=27.47$ ),  $t(8.56)=4.46$ ,  $p<.01$ . Comorbid participants also had lower startle to the dishabituation tone ( $M=65.94$ ,  $SD=35.81$ ) than Controls ( $M=322.14$ ,  $SD=392.69$ ),  $t(18.84)=2.74$ ,  $p=.01$ . There were trends for Comorbid participants to have lower startle overall and in response to the last stimulus compared to Controls. Implications: Results suggest that comorbid participants startle less and show more habituation to acoustic stimuli than controls. Comorbid depression may dampen the increased startle expected in association with anxiety. Future analyses will include responses in persons high on only depression or only anxiety to examine this.

**36. Title: Analysis of the Causes and Consequences of Girls' School Dropouts: The Case of Girls of Diguengue in Togo (West Africa)**

*Principal presenter:* Komi Tadjere

*Major:* Political Science

*Other presenters or co-authors:* Dr. Jonathan Day

*Faculty mentor:* Dr. Jonathan Day

*Abstract:* This research paper is a case study that identifies and analyses the different causes of girls' school dropouts in Togo. It focuses especially on the case of the village of Diguengue which has the highest rate of girls' school dropouts and this affects the development of this village. Some past studies have been done to explain this phenomenon and many actions have been initiated by the government authorities to solve this issue but the problem is still remaining unsolved due to its numerous causes. The girls' school dropouts according to my research are due to socioeconomic factors, sociocultural factors, and some other factors related to the Togolese educational system. By analyzing these factors, this paper makes some suggestions and recommendations that take into account may decrease girls' school dropouts' rate in Togo.

**37. Title: Determination of Aflatoxin B<sub>1</sub> and Its metabolite in Body Fluids Using Solid Phase Extraction Followed by HPLC Analysis**

*Principal presenter:* Donna Herrera

*Major:* Chemistry

*Faculty mentor:* Hongxia Guan

*Abstract:* Aflatoxins are mycotoxins that are produced by certain molds such as *Aspergillus parasiticus* and *Aspergillus flavus*. They are seen to grow on peanuts, soy sauce, maize and fermented soybeans. Human exposures to Aflatoxins from the diet have been linked to the development of liver cancer. The research topic focuses on the detection and quantification of Aflatoxin AFB<sub>1</sub> and metabolite AFM<sub>1</sub> in bodily fluids. The experimental methods involve extracting AFB<sub>1</sub> and AFM<sub>1</sub> through a Solid Phase Extraction (SPE), followed by High-Performance Liquid Chromatography (HPLC) in order to detect and measure the amounts of each Aflatoxin in the bodily fluids. Some traditional methods to extract Aflatoxins are based on immune-affinity sample cleanup followed by (LC) liquid chromatography or (CE) capillary electrophoresis analysis. However, these sample preparation methods are expensive, many steps are required, and there is an increase in analysis time. Disposable pipette extraction (DPX) is a type of newly developed SPE method that is easy, quick, and reliable. DPX eliminates the use of large volumes of organic solvents and sample volume needed for extraction process. Thus, evaluating the presence and amount of AFB<sub>1</sub> and AFM<sub>1</sub> in bodily fluids will provide information on improved accuracy and precision of solid phase extraction and chromatographic analysis. The DPX methodology presented here incorporates styrene divinyl benzene (SDVB) for reversed phase mechanisms, which provided satisfying accuracy (recoveries > 80%) and precision (%RSDs < 10%) for extraction of aflatoxins in body fluids

**38. Title: Extraction of Humic Acid and Fulvic Acid from**

*Principal presenter:* Kirthi Pallemati

*Major:* Chemistry

*Other presenters or co-authors:* Deepa Rekulapally, Steve A Wailand

*Faculty mentor:* Dr. J. Scott McConnell

*Abstract:* Soil is an essential part of the lithosphere which interacts with the atmosphere, hydrosphere and biosphere. Plants are a major sink for atmospheric CO<sub>2</sub>. The carbon cycle illustrates movement of carbon with soil as major sink for carbon pool. Sequestration of carbon increases the soil carbon pool by 'fixing' the atmospheric CO<sub>2</sub>. Soil organic matter consists of C, H, S, O, N and P. Humus is classified as humic and non-humic substances. Humic

substances consist of humin, humic acid and fulvic acid. Humic acid and fulvic acid are complex high molecular weight materials with many functional groups including aromatic, aliphatic, carboxylic and alcoholic groups. Using International Humic Substances Society method (IHSS), humic acid and fulvic acid were extracted by their solubility differences. In aqueous solutions, fulvic acid is both acid and base soluble while humic acid is base soluble only. The primary objective of this research is to extract humic acid and fulvic acid from five prairie restorations and five conventionally tilled sites; five native prairies and five conventionally tilled sites. The humic acid and fulvic acid contents indicate the chemical character of soil organic carbon. Humification index and percent of soil carbon were determined with the extracted humic acid and fulvic acid. Future work will study humic and fulvic acids with various spectroscopic techniques. References: • Katkar, R. N., B.A. Sonune, and P.R. Kadu. 2011. Long-term effect of fertilization on soil chemical and biological characteristics and productivity under sorghum (*Sorghum bicolor*)-wheat (*Triticum aestivum*) system in Vertisol. Indian journal of agricultural sciences. 81: 734-9. • Havel. J. and Fetsch. D. 2000. Humic substances. Encyclopedia of separation science. 3018-3025. • Cambardella. C. A. 2005. Carbon cycle in soils/Formation and decomposition. Encyclopedia in soils in the environment. 170-175. • Gondar. D., Lopez. R., Fiol. S., Antelo. J. M. and Arce. F. 2005. Characterization and acid-base properties of fulvic and humic acids isolated from two horizons of an ombrotrophic peat bog. Geoderma. 126: 367-374. • Qin. X., Liu. F. and Wang. G. 2012. Fractionation of kinetic processes of humic acid upon adsorption on colloidal hematite in aqueous solution with phosphate. 209: 458-463. • Schaumann. G. E. and Theile Bruhn. S. 2011. Molecular modeling of soil organic matter: Squaring the circle. Geoderma. 166: 1-14.

**39. Title: Inner Castle Stories for Improved Reading Comprehe**

*Principal presenter:* Susan Grant

*Major:* Instructional Design and Technology

*Faculty mentor:* Dr. Hoyet Hemphill

*Abstract:* Using mental imaging during reading is a critical component for reading comprehension. Being engaged with a story means to see, feel, taste, hear and even smell the experience. Currently, teaching mental imaging is a struggle for teachers. Even though research supports the teaching of it, teachers are reluctant to teach mental imaging, visualizing (Stahl, 2004). The U.S. Department of Education recommends three ways to teach students to visualize (Shanahan, 2010): 1) informing students that visualizing when they read will help them recall what they read; 2) have students study an object. Awhile later,

show them a picture of a setting. Then remove both, have the students visualize what they saw, and tell you about it; 3) read a sentence and describe what you see to students. Then have them practice and discuss what they saw. All three of these processes are not engaging for the students, and can be complicated to explain. This fact prompted me to create Inner Castle Stories: A Journey of Sensory and Emotional Imaging (ICS). ICS are nine short stories written in the second person. Textural features of the five senses are woven into the experience. The stories are designed to be a read aloud only a couple of times a month. This instructional material teaches visualization in a way that is both easy and engaging for the students and teacher. A study on ICS is currently being conducted in the 2013-2014 school year in the Community School District #4 (CUSD#4) in Mendon, Illinois. Research Questions: 1) Will using the instructional material, Inner Castle Stories, improve sensory and emotional imaging (a comprehension strategy) for reading? 2) After using ICS, how can it be improved to be more effective? The stories are to be read one story per-month, but read two times in the month. The process of reading the stories has three main steps: 1) to preview the story, 2) read the story aloud, and 3) group discussion time. All three steps can be done in less than thirty minutes. The classroom teacher will read all stories. The study involves four classrooms, consisting of approximately fifteen students each at CUDS#4. The four classrooms, two for each of the two grade-levels, were placed into two groups: a) treatment group- Inner Castle Stories, b) alternate treatment group- the current practice of reading strategies education group. The study will be using existing data (Developmental Reading Assessment) collected by the school with student's names removed. The research study is a pretest-posttest design. Also, I will be collecting data from the teachers on the use of my material in the form of hand written notes on extra paper copies of the introduction and nine stories. Inner Castle Stories is designed to makes teaching mental imaging skill simple and engaging. I will present preliminary findings in the form of teacher's comments on its application in the classroom up to this point.

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40. **Title: Investing in High Technologies for a sustainable and efficient growth in the Sub-Saharan African countries**

*Principal presenter:* Elhadji Massata DIAKHATE

*Major:* Economics

*Faculty mentor:* Bhavneet Walia

*Abstract:* This paper discusses the benefits for the Sub-Saharan African countries to invest in High Technologies as a more efficient long-term growth strategy. This type of investment can produce much more effective results than investing in the traditional sectors like agriculture. Therefore, the paper is organized in four main parts. The first describes the Sub-Saharan African economic situation and its future perspectives. The second part presents the potential benefits of investing in high-technology for any given economy. In the third part, it presents the cases of South Korea and Singapore which applied high-technology policies. The last part provides a framework of required changes to make in education system, governments' priorities, regulation, and corporate facilitation for a success of this policy.

41. **Title: Modeling the Effect of Temperature on Reproduction**

*Principal presenter:* Shufang Liu

*Major:* Mathematics

*Other presenters or co-authors:* Dr. Amy Ekanayake

*Faculty mentor:* Dr. Amy Ekanayake

*Abstract:* Modeling the Effect of Temperature on Reproduction Modeling of insect population dynamics is an essential part of research and management of both agricultural and forest pest insects. Population dynamics are affected by environment factors such as resources abundance, climate or temperature, plant diversity, predations, and demography of competitor species, among others. Such factors may directly influence the rates of reproduction, death, and dispersal. However, a population model that combines all such dynamics may be too complex to analyze. We seek to understand the consequence of seasonal variations and climate changes on various insects whose birth and dispersal behavior depend on temperature. For example, the eight-spined spruce bark beetle has several temperature-dependent phases, including oviposition, which influences birth rates [Wermelinger and Seifert, 1999]. Other species with temperature-dependent birth processes include the whitefly species [Wang and Tsai, 1996], the Colorado potato beetle [Ferro, Logan, Voss, and Elkinton, 1985], and the mealworm, *Tenebrio molitor* [Tuda and Midori, 2011]. Examples of species exhibiting temperature-dependent dispersal are the dark

beetle and the Karner blue butterfly. Karner blue butterflies travel between open habitats in warm temperatures [Meyer, 2006]. The dark beetles recolonize certain tree species based, in part, on temperature [Bentz, Régnière, Hansen, Hayes, and Hicke, 2010]. In this research, we modify a metapopulation model, based on the logistic model, to include temperature-dependent reproduction and migration rates. Per capita birth and migration rates are often assumed to be constant. Instead, we use per-capita birth and migration rates that are functions of temperature, where temperature is assumed to be varying seasonally. Such a model is simple enough to efficiently simulate population dynamics and complex enough to analyze the dynamics for both seasonal fluctuations and climate change. We may use the resulting temperature-time dependency of population growth and persistence for effective control of pests with minimum environmental damage (such as controlled pesticide use), as well as for conservative efforts for some species.

**42. Title: Motherhood's Effect on Wages**

*Principal presenter:* Sarah Blaase

*Major:* Economics

*Faculty mentor:* Dr. Bhavneet Walia

*Abstract:* Women have been discriminated against in the labor market by glass ceilings and wage gaps. This meta-analysis looks to address the effect of motherhood on women's wages. The six different studies surveyed all support the notion that the effect is negative, but the magnitudes of these declines are varying. Motherhood affects wages since raising children leads to decreases in human capital, job opportunities, and hours spent at work. This meta-analysis will also look at the wage benefits of delaying motherhood. Some, like Sheryl Sandberg and her "Lean In" movement, believe that women are judged more harshly in the workplace and are less likely to receive promotions-arguing that employer discrimination is to blame for lower wages. Others, like economist John List, find that women are less competitive and more willing to take a guaranteed wage that is usually lower. I will test these two theories and provide results using an original data set. JEL Classification: J13, J16 Keywords: wage determinants, motherhood, fertility timing

**43. Title: Open Access to Desire: Queering Classrooms to Build Connections**

*Principal presenter:* Jessica Mason McFadden

*Major:* English

*Faculty mentor:* Alisha White and Bradley Dilger

*Abstract:* Queer pedagogy draws on similar pedagogies, such as social justice, feminist, eco, critical, anti-oppressive, and performance, but has yet to emerge as a distinct and interdisciplinary area of applied theory. My presentation will allow me to present an ongoing project that aims to mine the weaknesses of current manifestations of queer pedagogy and develop new manifestations of queer pedagogy using queer and critical theories. I will discuss the way in which conscious and unconscious queer practices affect the classroom and can be studied qualitatively. In addition, I will offer examples of ways that queer theory can be translated into pedagogy. My examples are based on my own and others' classroom practices, addressing the fact that many original queer assignments are presented but not always contextualized or rooted in a particular literature of queer pedagogy or theory. Queer pedagogical practices would be stronger if they were built using both queer theory and interdisciplinary contributions as well as tested with an educational research methodology. I will propose a method for the close interaction of queer theory and pedagogy by incorporating the works of queer educational theorists, such as Kevin Kumashiro and Susanne Luhmann. This presentation will be practical and theoretical. My hope is that it will be useful to other pedagogues who are practicing "the queer arts" without a theoretical foundation for, or even an awareness of, their practices. I will speak about my own goals to improve my "unconscious" classroom methodologies, particularly the development of my gender-and-language assignments, by developing and incorporating theory that speaks to the assignments themselves. While I will focus on my composition classrooms and Queer Studies classrooms, I will argue for the universal relevance and application of queer pedagogy- that it can and should be used in classrooms across the disciplines. As part of my presentation, I will show how queer desire can be a pedagogical technique and location with practical implications. Further, I will suggest that it can and should be applied to classroom practices, and is relevant to issues of access, imagined in several ways: intellectual access, emotional access, and erotic access. To do this I will use Tim Dean's *Beyond Sexuality* as a framework for defining desire. Dean's work, like the works of queer theorists such as Judith Butler and Eve Kosovsky Sedgwick, can be used as a springboard for queer pedagogues who wish to envision, invent and apply theoretical concepts (of desire and so forth) to their classroom practices. For me and those whose work I value, "Queer" is an umbrella term, one that encompasses a variety of non-normative phenomena. In this way, inclusion is important to queer pedagogy- and access is necessary for inclusion. During this portion of my presentation, I will use Dean's work to argue that queer desire goes beyond sexuality and that it can, when considered this way, create access and build connections in a variety of classrooms, particularly in the composition classroom.

44. **Title: The issue of Humanitarian intervention: Libya and Syria**

*Principal presenter:* Ghashia Kiyani

*Major:* Political Science

*Faculty mentor:* Vincent augur

*Abstract:* The UN resolution 1973 on Libya authorized the necessary measures to protect civilians as it was the violation of human rights by Qaddafi regime under the responsibility to protect doctrine. The justification of military intervention with the idea of international responsibility to protect and enforcement of human rights led the world in a new era. On the other side, in 2011 the protests in Syria which took the lives of more than eight thousand people an example of non-intervention by international community. The non-intervention in the case of Syria is an example that shows the limits to humanitarian concerns in world politics. The purpose of the paper is to look for the rationale of humanitarian intervention in Libya in comparison to the Syrian ongoing conflict. In order to evaluate, the research will find answers for three questions. First, it will find the reasons for intervention in Libya and non-intervention in Syria and how they fit in broader geo-strategic context. Secondly, paper will find why the UN, NATO and other participant nations were so quick in decision making in case of Libya whereas reluctant in Syrian case Finally, in order to examine the importance of humanitarian intervention in comparison to national geo-strategic interest, it will examine the role of USA. It is significant to find answers for these questions as it is highly debated in international politics that whether the intervention and non intervention falls in the interest based approach or in the normative context,

45. **Title: Political Economy of Yuan- Dollar Exchange rates**

*Principal presenter:* Md. Deen Islam

*Major:* Mathematics

*Faculty mentor:* Dr. Dinesh B. Ekanayake

*Abstract:* The Chinese exchange rate policy has attracted a great deal of attention in academics and among policymakers due to the slower pace of economic growth, slower than expected creation of manufacturing jobs during the 21st century, and the recent financial crisis in the United States. China has been accused of pursuing a new mercantilist policy; that is, encouraging export and impeding import mainly through the manipulation of exchange rates between the Chinese currency, known as Renminbi, and the US dollar. Since 1994, China has kept its currency strongly pegged to US dollar. Some prominent economists and policy makers repeatedly blame the Chinese

exchange rate policy for the prolonged financial crisis and sluggish recovery, whereas other prominent economists provide different opinions.

The debate on the Chinese exchange rate policy began during the East Asian crisis in 1997. But it has been intensified only after the publication of several articles in an economics newspaper in the western world (Financial Times) and in Japan (Nihon Keizai Shinbun). On several occasions afterwards (such as in the G7 meetings 2002, 2005), USA and Japanese government officials urged and pressured the Chinese authority to allow more flexibility in the exchange rate. Thus, the debate initiated several research studies to justify or nullify the claims of the policymakers. Some of these studies validate the arguments of policymakers, such as Morrison and Labonte (2009), Lafrance (2008), Goldstein (2004), Frankel (2005), Preeg (2003), Eichengreen (2003), Hausmann, Lim, and Spence (2006), and others. On the contrary, economists such as Nobel Laureate Robert Mundell (2003), Paul Krugman (2003), Ronald Mackinnon (2003), and others strongly argue in favor of Chinese currency pegging.

My objective is to find possible impacts of the Chinese controlled exchange rate policy on production and investment in the USA, and to assess the claims on both sides by employing econometric techniques on historical time series. I will create a vector auto-regressive model using a monthly time series of the total production in the USA and the Yuan-Dollar exchange rates. By checking the Granger causality of the coefficients of the estimated vector auto-regressive model, we can infer whether there is any relationship between the variation in USA total production and the Yuan-Dollar exchange rates. Thus, using results of the econometric analysis, we can make a more grounded statement regarding the so-called manipulation of exchange rates by the Chinese authorities.

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46. **Title: Population Structure of *Euglossa imperialis* in a Disturbed and Fragmented Honduran Cloud Forest**

*Principal presenter:* Joseph Van Dyke

*Major:* Biology

*Other presenters or co-authors:* Ruth Doherty (Queen's University), Sue Hum-Musser, Kenneth McCravy

*Faculty mentor:* Kenneth McCravy

*Abstract:* Habitat destruction is an important and increasing problem worldwide. Resulting fragmentation of critical habitat can have negative impacts on population size as well as overall biodiversity. These impacts include the loss of genetic diversity as well as the decline of total species richness within an affected area. The loss of a species' genetic diversity affects its viability due to inbreeding depression and a reduced ability to adapt to environmental change. Orchid bees (Hymenoptera: Apidae: Euglossini) are native to the Neotropical Ecozone and encompass a vast array of morphological, behavioral, and ecological diversity among 5 genera. They are significant pollinators of tropical forests as well as many plant species important in agriculture and horticulture. *Euglossa imperialis* is a widely distributed orchid bee species of Central American cloud forests and an important pollinator of many species of orchids as well as other flowering plant groups. The decline of these bees would have significant negative consequences on cloud forest ecology. Using microsatellite markers across 5 loci we investigated if habitat fragmentation has an effect on genetic diversity and gene flow in *E. imperialis* populations of cloud forest habitats in Cusuco National Park, Honduras.

47. **Title: Prevalence and Risk Factors Associated with Diabetes**

*Principal presenter:* Henry Onyia

*Major:* Public Health

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

*Faculty mentor:* Mei Wen

*Abstract:* Diabetes is a chronic condition which arises when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin produced. Diabetes is a debilitating and often deadly disease associated with tremendous public health burdens. The prevalence of type 2 diabetes is rising at an alarming rate throughout the world, with its global prevalence estimated at about 366 million today, and 552 million by 2030. The African continent counts approximately 13.6 million people with diabetes, whereas Nigeria has the highest number of people with diabetes, with approximately 1,218,000

people affected. In Africa and in Nigeria, there are sparse and inadequate information on the prevalence of diabetes and the associated factors. This study aims to explore the prevalence, time trend of the epidemic; to identify gender, age and geographical differences; and to summarize and describe the associated factors and the existing interventions. Secondary data and publications are collected, entered with Excel tables, and analyzed with SPSS, a systematic review will be conducted. This study is meant to provide recommendations and suggestions to tackle this issue in order to reduce the burden of the disease. The study concluded the steady rising trend of diabetes in Nigeria, assessed a list of associated factors, such as age, gender, social-economic status, geographical location and life styles. Given diabetes is a preventable disease, public health recommendations are provided from increasing screening services to modifying life styles.

48. **Title: RIVER OTTER HABITAT ALONG THE UPPER MISSISSIPPI RIVER NEAR SAVANNA, IL**

*Principal presenter:* Alissa Shaner

*Major:* Biology

*Faculty mentor:* Dr. Susan Romano

*Abstract:* The North American River Otter (*Lontra canadensis*) is currently found throughout the state of Illinois. River otter populations in the state were near extirpation by 1940 and listed as state threatened in 1977. Through the reintroduction of river otters into Illinois, their numbers have risen. It is still important to continue to monitor their population, as well as, habitat in order to maintain the current numbers living in Illinois. This study looks at river otter habitat in the area of Spring Lake in the Savanna District of the Upper Mississippi National Wildlife and Fish Refuge. The objective of this research was to determine if specific habitat types including forest, grass, and water, as well as areas of aquatic vegetation are important to river otter presence. The presence of river otter in the area was determined by signs such as tracks and scat in areas near river otter trails during the winter of 2012. Once a trail was determined to have been used by river otter the location was marked with a Garmin GPS device. On a map of Spring Lake a polygon layer was made for each habitat type in ArcMap 10, and the distance from each river otter trail location to each habitat type polygon was measured. Distance data between trail locations and habitat types will be analyzed using principal components analysis. It is expected that backwater sloughs off of the main channel of the Mississippi will be positively related to river otter trails because they may be using the sloughs as a means of travel between den sites and the lake where

they forage. It is also expected that the river otter will favor areas of the lake with aquatic vegetative cover which would provide protection from predators. The main food source of river otter is fish and it is possible that the areas within the lake that they prefer are areas with the most prey. Forest and grass areas will not likely be a determining factor of otter trail location because these habitats are found around the entire edge of Spring Lake and are therefore near all of the otter trails so these areas must be used out of necessity to get to the lake to forage. It is also expected that river otter will avoid the main channel of the Mississippi because they prefer the backwater areas for den sites and foraging purposes. This study may provide some insight on ways to improve riparian habitat for management of river otter populations.

49. **Title: Science and Spaces of (False) Knowledge: Potions in *Romeo and Juliet***

*Principal presenter:* Nicole Hagstrom-Schmidt

*Major:* English

*Faculty mentor:* Dr. Christopher Morrow

*Abstract:* Recent years have seen a considerable re-surgence in the popularity of the connections between early modern imaginative literature and science. In the past decade alone, we have witnessed a critical book series, Ashgate's *Literary and Scientific Cultures of Early Modernity*, special issues of journals like the *South Central Review's* "Shakespeare and Science," edited by Carla Mazzio, and "Literature and Science" research clusters across various universities. Given the renewed interest in Science Studies in early modern literature, I find it surprising that so little work has been done on the area of chemistry and its connection with the developing of science as a mode of inquiry in the English Renaissance. While not necessarily called "chemistry," examples of potions and experimental practice abound within early modern drama, in plays both popular and obscure. When constellating science and literature within a broader cultural framework, we must be cognizant that what we understand to be the distinct disciplines of literature and science is the result of years of practice and tradition. Understandably, science for the early modern is (by necessity) different than science for the postmodern, in regards to its actual practices and the places which those practices occur. As Howard Marchitello states, we must "not only... consider...the multiple sites across the early modern period in which scientific practices are indeed underway, but rather to consider sites -or practices-where what doesn't immediately look like science is underway" (45). More simply put, we must look towards alternative spaces for examples of science developing into a practice. These sites may

include spaces such as the alchemist's laboratory, the brewer's shop, and or even literary spaces like poetry and drama. In this essay, I focus upon these spaces of knowledge and their relationship with a specific object of chemistry: the potion within Shakespeare's *Romeo and Juliet*. Drawing from Marchitello and Elizabeth Spiller's work on knowledge practices within imaginative literature and science, I examine how both Friar Laurence's sleeping death potion and to the apothecary's poison, function as conduits of science, even within their literary form. The locations of the apothecary's shop and Juliet's consuming body are proffered as readable spaces, created by means of the potions in order to be understood by the observing audience and cast. In engaging with potions and their production of meaning, Shakespeare is actually engaging with ongoing practices of disciplinary formation of science, though within a form not previously expected or explored.

**50. Title: Seed Bank Composition in Drawdown Areas of Pool 18, Upper Mississippi River**

*Principal presenter:* Amber Schorg

*Major:* Biology

*Faculty mentor:* Dr. Susan Romano

*Abstract:* Prior to impoundment and associated anthropogenic modifications, the Upper Mississippi River (UMR) meandered through its substantial floodplain and supported a rich ecosystem created by the dynamics of the river and its tributaries. Following the 9-foot channel project and the construction of the lock and dam systems in the 1930's, the river and its water level have been regulated for the primary purpose of navigation. The U.S. Army Corps of Engineers is currently considering a pool-scale water level drawdown on Navigation Pool 18 of the UMR, which would occur during the growing season and would be intended to mimic pre-impoundment flows in order to restore many of the natural processes and diverse habitats that rely on seasonal water level fluctuations. In order to determine the plant community available for germination during a drawdown, a seedling emergence study was conducted from samples collected in 2009 from the drawdown zones. Samples were grown in four hydrologic treatments: dry, moist soil, shallowly submerged, and deeply submerged. Fifty-five species of plants were observed in the seed bank study, and forty-eight species developed sufficient characteristics to be identified to the genus or species level. The species assemblage consisted of 21 obligate wetland, 10 facultative wetland, 3 facultative, and 7 facultative upland species. Dominant taxa within the seedbank included *Gratiola neglecta*, *Eragrostis hypnoides*, *Amaranthus tuberculatus*, and *Leersia oryzoides*. Of the

four hydrologic treatments, the moist soil treatment was the most diverse and productive. Submersed aquatics and emergent species were not well represented in the study, but moist soil species and annuals associated with disturbed/agricultural areas were common. The wildlife food and habitat value of all species documented in the study is reported within, and these results will assist the Corps and other land management agencies in Pool 18 management decisions.

**51. Title: Selecting Micro CHP Technology for Cold US Regions**

*Principal presenter:* Nazar Emirov

*Major:* Mathematics

*Faculty mentor:* Dr.Dinesh B Ekanayake

*Abstract:* Micro combined heat and power (micro CHP) units simultaneously generate heat and electricity at the location of the end user. Their total efficiency as high as 90%, compares to 30-40% for conventional electricity generation from fossil fuels (Energy Efficiency Indicators for Public Electricity Production from Fossil Fuels, IEA, 2008). Benefits of improving efficiency include reducing carbon dioxide emissions, compensating for the rapid growth in the global energy demand, and significant cost savings for end users. Many micro CHP units are already in European and Japanese markets. However, micro cogeneration is at an early stage of development in the US due to the very low cost of a furnace (compared to micro CHPs) and due to the fragmented electricity market in North America, often with different interconnection requirements that add more cost to the end users (M. Pehnt, et al. Micro Cogeneration: Towards Decentralized Energy Systems, 2006). Also, the micro CHP technologies used in the current market are characterized by relatively low electrical efficiencies, and high heat-to-power ratios. These features, combined with low electricity prices, make it harder for micro CHP systems to deliver significant energy cost savings to end users. However, several micro CHP systems that are currently in development stages have lower heat-to-power ratios and some have a supplementary heating unit, which provide the possibility of implementing cost optimization strategies. In this project, we investigate the feasibility of incorporating such micro CHP units in rural northern towns in the US where heat demand is high in winter months. Emerging micro-CHP systems are based on Stirling engine, Organic Rankine Cycle, internal combustion engine (ICE) technology, or fuel cells (J.F. Oudkerk, et al, 2013). For example, the Baxi Ecogen Stirling engine is capable of producing 7.7kW heating with 1kW electricity capacity; however, it is also equipped with a supplementary heating unit with heat capacity 17.7kW (The

Baxi Ecogen Dual Energy System guide). The ICE based 1kW Honda EcoPower unit produces only 2.5kW of heat (Vaillant EcoPOWER 1.0, Case study factsheet, 2013). Micro CHP units based on fuel cell technology are still in development stages and are expected to have power-to-heat ratio close to 1:1 (Sytze Dijkstra, 2009). In this research, we formulate cost optimization problems based on different micro CHP technologies, with the provision for the end user to sell excess electricity. We also assume that residential micro CHP unit alone is not sufficient to satisfy the heat demand. (See heat demands for different working hour pattern in (M. Chaudry, 2008).) Therefore, micro CHP units are assumed to be installed with a supplementary heat supply. The cost optimization problem is solved in terms of the ratio between heat produced by the micro-CHP and by the supplementary heating unit and the selling price (assuming selling price is below the current market price for the electricity). The monthly cost savings is obtained for different technologies and compared to obtain the best possible technology for cold rural towns in the US.

**52. Title: Sexism and Gender Conformity: Differences Across Cultures**

*Principal presenter:* Naoyuki Sunami

*Major:* General Experimental Psychology

*Other presenters or co-authors:* Co-authors: Zachary Roth, Ryan Kopatich, Hannah Bradshaw, Zeinab Hosseini; Panel Title: "Aspects of the Self: Personality, Conformity, and Success"; Co-panelists: Zachary Roth, Alexander Stinnett

*Faculty mentor:* Dr. Kristine M. Kelly

*Abstract:* Problem or Major Purpose: Stoica, Miller, and Ardelea (2011) found cultural differences between Romania, Japan, and Sweden on gender portrayals in television advertisements. Specifically, Japanese advertisements were rated higher on masculinity than Romanian advertisements while Swedish advertisements were rated the lowest on masculinity. We hypothesized that these gender stereotypes as seen in TV advertisements reflect various types of sexism across cultures. Thus, the purpose of this study was to investigate gender norms and sexism across greater variety of cultures. Procedure: Participants were recruited from North America, South America, Europe, Africa, Asia, and Australia via social networking avenues. Participants completed a short online survey that contained either the Conformity to Masculine Norms Inventory or the Conformity to Feminine Norms Inventory (Parent & Moradi, 2010), depending on the sex of the participant. They also completed benevolent and hostile sexism measures (Glick et al., 2000). Results: Analysis of variance was conducted with country of origin as an independent

variable and conformity to gender norms, benevolent sexism, and hostile sexism as dependent variables. Results indicated significant differences between countries on hostile sexism ( $F(2,98) = 18.02, p < .001$ ) and benevolent sexism ( $F(2,101) = 19.62, p < .001$ ). For example, participants in Iran and the Philippines scored higher on both hostile and benevolent sexism than participants in the United States. Also, female Iranian participants endorsed feminine gender role norms to a greater extent than those in the Philippines and the United States. Furthermore, female American participants scored lower on conformity to feminine norms than female Iranian and Filipino participants ( $F(2,48) = 3.09, p < .05$ ). However, there was no significant difference on conformity to masculine norms across cultures ( $p = .36$ ). Conclusions and Implications: Relatively little research has been done on gender norms and sexism cross-culturally; thus, this study will provide a more broad understanding of psychological processes in contexts other than the United States or Western Europe. These results will be discussed in terms of attitudes as a function of cultural contexts.

**53. Title: Spain in the Holocaust: Victims, Perpetrators And the Myth of Spanish Neutrality**

*Principal presenter:* Frank S. Shaw

*Major:* History

*Faculty mentor:* Dr. Ute Chamberlin

*Abstract:* Although Spain was officially a non-belligerent country during the Second World War, Spain was closely involved with Nazi Germany. The historical record clearly shows that Franco and Spain were allied with Hitler and Germany economically and even militarily; what has not yet been clearly assessed is Spain's role in the Holocaust. This research paper challenges the assumption of Spanish neutrality and the perception of Franco as a protector of Spanish Jews in the Nazi genocide. Though some scholars have written about the Spanish victims of the Holocaust, most notably David Wingate Pike in his book *Spaniards in the Holocaust: Mauthausen, the Horror on the Danube* (2000), existing research is limited, especially in English. Taking both a bottom up and a top down view of the events that took place during the early 1940s, this presentation investigates the roles played by the Spanish Government and Spanish citizens, men and women, Jews and non-Jews, victims and perpetrators. This research utilizes a broad range of primary and secondary sources, written in Spanish, French, English and German, including trial testimonies, victim memoirs, official government documentation and relevant historiography, to arrive at a better understanding of Spain's role in the

Holocaust. Spain and her citizens were intimately involved in the Holocaust; in fact, the sources point to a high level of participation. Spaniards were both victims and perpetrators, on large and small scales. My analysis of the evidence casts considerable doubt on the idea of Spanish neutrality in the Holocaust.

54. **Title: SPECTROSCOPIC STUDIES OF LEAD BORO TELLURITE GLASSES DOPED WITH Nd<sup>3+</sup> IONS**

*Principal presenter:* Kinnary Patel

*Major:* Physics

*Other presenters or co-authors:* P.K.Babu, S.B.Mallur

*Faculty mentor:* Dr. Saisudha. B. Mallur

*Abstract:* Lead boro-tellurite glasses with composition (x-y) PbO - 20 TeO<sub>2</sub> - (80-x) B<sub>2</sub>O<sub>3</sub> - y Nd<sub>2</sub>O<sub>3</sub>, y=0.5, x=20, 30, 40, 50, 60, 70 mol% were prepared by melt-quench technique. Optical absorption experiments were carried out as a function of glass composition. The optical absorption spectra were analyzed using the Judd-Ofelt theory and the intensity parameters  $\Omega_t$  (t=2,4,6) were determined. Using the intensity parameters, we calculated the radiative transition probability ( $A_{\text{Rad}}$ ), radiative lifetime ( $\tau_R$ ), and branching ratios ( $\beta_R$ ) for different states.  $\Omega_t$ ,  $A_{\text{Rad}}$ ,  $\beta_R$  and  $\beta_R$  are found to vary with PbO content. The compositional dependence of these parameters has been attributed to the changes in the asymmetry of the ligand field at the rare-earth (R) site (due to the structural changes) and to changes in R-O covalency. The variation of  $A_{\text{Rad}}$  with PbO content indicates an increasing order around the R ion at ~25-30 mol % PbO. Large radiative transition probability observed for these glasses arises from the large refractive index of the host glass (1.6 - 2.2).

55. **Title: STUDYING THE SUPERCONDUCTING STATE OF Ba(Fe<sub>1-x</sub>Co)**

*Principal presenter:* Saleh Altarifi

*Major:* Physics

*Other presenters or co-authors:* Awwad Alotaibi, Andrew Onaghise

*Faculty mentor:* Dr.Ryan Gordon

*Abstract:* Below a critical temperature, the electrical resistivity of many metals suddenly vanishes and applied magnetic fields are expelled from their interior. This phenomenon is called superconductivity and during my presentation, I will focus on magnetic measurements in Ba(Fe<sub>1-x</sub>Co)<sub>2</sub>As<sub>2</sub>, a member of the newly discovered iron-based superconductors. The London penetration depth has been measured in this material to characterize the rate at which applied magnetic fields are expelled. This rate is fundamentally related to the symmetry

of the superconducting order parameter, which results from electron-electron interactions. These measurements were made using an extremely sensitive oscillating circuit, known as a tunnel diode resonator (TDR). The TDR consists of a radio frequency LC tank circuit and energy is supplied to it by a properly biased tunnel diode. The details of the measurement process will be discussed during my presentation. These studies suggest that the iron-based superconductors display a power law temperature dependence in the penetration depth and understanding the role of impurity scattering remains a future goal for this work. Also during my presentation, I will outline the progress made in building a TDR lab in the WIU Physics Department under the direction of Dr. Ryan Gordon to further contribute to these measurements.

**56. Title: The Nature of French Policy in Francophone Africa before the Mali Intervention**

*Principal presenter:* Messan D. LAWSON

*Major:* Political Science

*Other presenters or co-authors:* Vincent AUGER

*Faculty mentor:* Vincent AUGER

*Abstract:* Sub-Saharan Africa and religious terrorism: the example of French Sudan (now Mali) As part of a research program focused on the conflict in northern Mali with sporadic attacks by various armed Islamic groups (AQIM\*, MUJAO\*, Ansar Dine\* and MNLA\*) on the one hand, and against the state fragility unable to have total control of its northern border on the other hand. The purpose of this research is to analyze the perspective of the realist theory of international relations and foreign policy of France, in order to understand the debate between regional and international news today. The research aims to analyze the general situation, and to dwell specifically on the crisis and the reasons for the rapid intervention of France in Mali. While there is in the region, member countries of ECOWAS\* organize themselves militarily to fight Al Qaida6 Groups in the North. From the data, and review of the literature, this paper will examine the strategies and measures put in place for the operation in West Africa called Serval. Finally, this study will consider the possibilities of crisis, in order to restore order, security and social peace in Azawad\*.

**57. Title: Success as a Product of Self-Regulation**

*Principal presenter:* Alexander J Stinnett

*Major:* Psychology

*Other presenters or co-authors:* Co-author: Seth D. Yockey; Panel title:

Aspects of the Self: Personality, Conformity, and Success; Panel members:  
Naoyuki Sunami, Zachary Roth

*Faculty mentor:* Dr. Kristine Kelly

*Abstract:* **Problem/Purpose:** The purpose of the current study was to determine the level of importance of self-regulation in American culture. Self-regulation is an executive function of the brain whereby an individual inhibits an automatic behavior in favor of a desired behavior. Specifically, we sought to explore whether or not a relationship exists between an individual's ability to self-regulate and success, the strength of the relationship, and the areas of success that a strong self-regulatory capacity is important to. **Procedure:** Participants were primarily college students recruited through a human subject pool and Facebook. Participants completed a variety of online surveys. First, participants filled out a demographic questionnaire, then the Success Measure that assessed success in a variety of areas (academic, health, occupational, etc.), and finally the Self-Control Scale developed by Tangney et al. (2004). The Self-Control Scale has been used as a self-regulation measuring stick in a variety of studies. **Results:** We conducted a number of correlations to determine the existence and strength of a relationship between participant scores on the Success Measure and the Self-Control scale. Participants who did not complete the surveys in their entirety were removed from the analysis. There was a significant, positive relationship between Success Measure scores and Self-Control Scale scores. Moreover, our analyses revealed a significant positive correlation of Self-Control Scale scores with each dimension (academic, health, occupational, etc.) of the Success Measure. Finally, a significant relationship was found when Self-Control scores were compared to current GPA. **Conclusions/Implications:** The results of the current study indicate that a greater ability to self-regulate is significantly associated with overall success (by American culture standards) and success in a number of domains (academic, health, occupational, etc.). Moreover, self-regulation appears to be strongly related with current GPA. The implications of these findings are that a greater ability to self-regulate is positively and strongly linked with overall success. These strong relationships persist when self-regulatory abilities are compared to specific areas of success. Thus, whether self-regulation is the cause of success, or success increases an individual's ability to self-regulate, self-regulation and success appear intimately entwined with one another.

58. **Title: Tentative Detection of New Astrophysical Maser Transitions**

*Principal presenter:* Li E Lee

*Major:* Applied Physics

*Other presenters or co-authors:* Esteban D. Araya (co-author)

*Faculty mentor:* Esteban D. Araya

*Abstract:* The study of different molecular species helps us to understand the characteristics of massive star forming regions. In this work, we report a survey for uncommon molecular transitions toward 12 massive stars forming regions. The observations were conducted with the 305m Arecibo Telescope in Puerto Rico in the ~6 GHz range. We detected three tentative emission lines and one uncommon molecular absorption transition. The absorption was detected toward G34.26+0.15 in a transition of H<sub>2</sub>CS - this is only the second time that this transition has been detected in the interstellar medium. The tentative detections are of CH<sub>3</sub>OH at 6.85 and 7.28 GHz and CH at 7.35GHz toward the star forming region IRAS18566+0408. The lines are weak, but their peak velocities are in the range of other molecular transitions in the same star forming region. Based on the different velocity of the lines with respect to systemic velocity, and the high energy state of the transitions, the emission must be due to a maser mechanism. A follow-up Arecibo proposal has been approved to re-observe and confirm the new masers.

**59. Title: The Clash: Huntington, Civilizations, and Identity**

*Principal presenter:* Zee Al- Mutairi

*Major:* Political Science

*Faculty mentor:* Vincent Auger

*Abstract:* In Samuel Huntington's *The Clash of Civilizations and the Remaking of World Order*, the author develops his Clash-of-Civilizations thesis and explains its geopolitical significance after the demise of the Soviet Union. Huntington argues that differences between civilizations will be responsible for future conflicts and that these conflicts will occur along the fault lines of the author's designated civilizations. Huntington's thesis is aimed at world's numerous cultures and societies, however; it is his writing on his perceived Islamic civilization that has sparked intense debate among scholars and laypeople alike and captured popular imagination since his article first debuted in 1993. In some ways, Huntington's argument found greater resonance after September 11th and the subsequent military conflict between the United States and various predominately Muslim states. Though some might say that Huntington's characterization of the world and prediction about conflict has been confirmed by the relationship between the West and certain countries that are predominately Muslim since the early 2000s, parts of his thesis have also been seriously challenged and, in some cases, contradicted. This paper will re-examine and critique Huntington's Clash-of-Civilizations thesis argument as it

applies to his Islamic Civilization by exploring sectarian identity within Islam and examining how these identities manifest in political institution and conflict. Specifically, this paper will address notions of Shia identity and Sunni identity. This paper will do so by detailing the historical split between the two sects and how these early events reflected the political struggle between diverging interpretations of leadership in the early Muslim community. Following, I will look at Arab nationalism's failure to address Shia concerns, and the ramifications of the Iranian Revolution in the region's political climate as well as role in deepening sectarian identity. Finally, I will explore the turbulence of post-Saddam Hussein Iraq and the struggle between both domestic and regional actors to secure one sect's hold on power over the other. My argument here is that identity culture, values, and identity matter, and have bearing on conflict and relations amongst states. This is true of states in the Middle East as it is with other states across the world. In this way, Huntington's assessment that culture matters is correct. However, Huntington's monolithic "Islamic Civilization" ignores distinctive Sunni and Shia identities and in doing so, fails to account for sectarian violence and the battle between elites in both sects to dominate regional politics. Huntington's argument does appear to capture how Sunnis and Shias living in predominately Muslim states self-identify. The question of sectarian identity in Middle East regional politics is becoming increasingly salient as the conflict in Syria continues. Perhaps by understanding, or at least recognizing, the differences in Sunni and Shia identity we can understand the region's politics better.

**60. Title: The Degradation of Women and Regression of Feminism in the Adaptation of True Blood.**

*Principal presenter:* Brittany Barrie

*Major:* English Literary Studies

*Faculty mentor:* Christopher Morrow

*Abstract:* For my graduate research project, I will be exploring an abstract of my thesis on the Degradation of Women and Regression of Feminism in the Adaptation of True Blood. For this particular presentation, I will be focusing on chapter two of my thesis. In this chapter, I argue the regression of postfeminist society from the liberation of the women's movement into a raunch culture of sexiness using theorist Laura Mulvey and her model of the male gaze, Julie Sanders and Laura Hutcheon's ideology of adaptation, and Ariel Levy's philosophy of the "Female Chauvinist Pig." I then demonstrate the contradictory nature surrounding active female sexuality as it is experienced today to be pleasurable and liberating yet still reproduces an image that appears

objectifying (Evans et al. 116). Arguing that a 'technology of sexiness' has thus replaced 'innocence or virtue' for young women in postfeminist cultures, as the display of sexual knowledge, practice, and agency has increasingly become more prevalent and normative in television (Evans et al. 118). To illustrate this, I have analyzed two mediums, Charlaine Harris's, *Southern Vampire Mysteries*, and HBO's television series *True Blood*, and its adaptation from a traditional female romance novel written by women for women to a overtly pornographic and racially, religiously, and sexually controversial show supporting postfeminist theories of gender and sexuality, most specifically raunch culture. I will argue that such a presence of female sexuality in television has corrupted the minds of female spectators of shows, such as *True Blood*, who feminist film theorist Laura Mulvey argues project their repressed desires onto the cinematic performers. As thus, these spectators are forced to endure and then mimic the degradation of women through the overt sexual acts of violent sexual intercourse, male dominance, and female submission. I make the argument that young spectators watching these depictions of women view them as socially acceptable and in turn hold themselves, as women, to the same demeaning standards under the mask of customary. I propose that the overt sexualization of women is not empowering or liberating but rather degrading and forcibly setting back decades of feminist acts of protest and revolution. My intention is to inform the public, especially the young female public, about the negative consequences of allowing the this kind of degradation of women to persist.

61. **Title: The Influence of Agreeableness on Prejudice and the Moderating Role of Self-Monitoring**

*Principal presenter:* Zachary C. Roth

*Major:* General Experimental Psychology

*Area:* Social Psychology

*Other presenters or co-authors:* Co-author: Breanne Helmers; Pre-formed Panel: "Aspects of the Self: Personality, Conformity, and Success."; Naoyuki Sunami, Alec Stinnett

*Faculty mentor:* Julie C. Herbstrith, Ph. D.

*Abstract:* Major purpose: There has been longstanding interest in the relationship between prejudice and personality (Graziano, Bruce, Sheese, & Tobin, 2007). Previous research demonstrated relations between prejudice and the Big Five Model of personality (Ekehammar & Akrami, 2003). In particular, higher levels of the Big Five factor Agreeableness, or the tendency to seek smooth social interactions, have been linked with lower prejudice (Ekehammar & Akrami, 2003). Another personality trait dealing with social interaction is

Self-Monitoring, or the extent to which one uses the situation to guide self-presentation (Snyder, 1974). High self-monitors shape their self-presentation to situational cues to appear socially acceptable, while low self-monitors do not. This study evaluated the effect of this presentation management on Agreeableness and prejudice. Specifically, we examined whether self-monitoring moderated the relationship between Agreeableness and homonegativity. Procedure: Five hundred fifty-nine college students were recruited from a university in the Midwest. Participants were administered the Big Five Inventory (John & Srivastava, 1999), Self-Monitoring Scale (Snyder, 1974), and Homonegativity Scale (Morrison, Parriag, & Morrison, 1999). Results: A moderation analysis was conducted. Self-monitoring was a significant moderator of the relationship between Agreeableness and homonegativity,  $\beta = -.1727, t(558) = -2.21, p = .05$ . Simple slopes analyses revealed that when participants had high self-monitoring, low Agreeableness was a better predictor of prejudice towards homosexuals,  $\beta = -.22, t(550) = -3.22, p < .01$ , than high Agreeableness. There was no significant effect for low self-monitoring,  $\beta = .07, t(550) = .24, ns$ . Conclusions: Agreeableness, or the tendency to seek smooth social interactions, predicts lower prejudice, presumably because prejudiced attitudes are counter to that goal. Results indicate that Agreeableness predicts levels of prejudice toward sexual minorities, but only when accounting for self-monitoring. Higher Agreeableness predicted lower levels of prejudice, but only for high self-monitors; low self-monitors expressed similar levels of prejudice across levels of Agreeableness. One interpretation of these findings is that High-Agreeable people must also be able to read social cues and monitor their own behavior in order to suppress prejudice. That is, Agreeableness may provide the motivation to withhold prejudice, but high self-monitoring may provide the ability to read the situation and manage the appropriate self-presentation in an environment that warrants prejudice suppression. References Ekehammar, B., & Akrami, N. (2003). The relation between personality and prejudice: A variable and a person centred approach. *European Journal of Personality*, 17, 449-464. Graziano, W. G., Bruce, J. W., Sheese, B. E. & Tobin, R. M. (2007). Attraction, personality and prejudice: Liking none of the people most of the time. *Journal of Personality and Social Psychology*, 95, 65-582. John, O.P., & Srivastava, S. (1999). The Big Five trait taxonomy: history, measurement, and theoretical perspectives. In L.A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and Research* (2nd ed., pp. 102-138). New York: Guilford. Morrison, T. G., Parriag, A., & Morrison, M. A. (1999). The psychometric properties of the Homonegativity Scale. *Journal of Homosexuality*, 37, 107-122. Snyder, M. (1974). Self-monitoring of expressive behavior. *Journal of Personality and Social Psychology*, 30(4), 526-537.

62. **Title: The Ironic Persona in Popular Music: Finding Empowerment Through Irony in the Music and of Ke\$ha**

*Principal presenter:* Alyssa Yealy

*Major:* Musicology and Clarinet Performance

*Faculty mentor:* Dr. Anita Hardeman

*Abstract:* Can musical content be so ridiculously irrational that its ironic value becomes didactic? That is to say, can irony, when imposed upon or interpreted in music that might otherwise be considered offensive, be a source of empowerment or even activism? I extend these questions in regard to the music of pop singer-songwriter and rapper Ke\$ha. Through the theoretical lens of Wayne C. Booth's "A Rhetoric of Irony", I examine various performative aspects of the artist in order to discern an answer to Booth's focal question "Is it ironic?" I will consider Ke\$ha's performance of persona, as well as musical performances, as an indication of irony and the implications held therein. I discuss the paradoxes present in the dual authorship of Ke\$ha and her producers, and the claims of creative ownership laid by both. There also exists a paradox in the contradiction between the values expressed in Ke\$ha's music and her actual lifestyle; she sings about drinking all night and "making out with random dudes," but in reality, she maintains a relatively low and positive profile. Through multimedia including interviews, song lyrics, and analysis of her portrayal in the media, I aim to show that Ke\$ha may be "in on the joke." Ke\$ha's music rejoices in vapidty and basks in its own absurdity. As a result of this irony, I argue that Ke\$ha's over-the-top sexualization and even perceived anti-feminism actually represent feminine and youth empowerment, delivered via the artist's own self-parodying ironic pop persona.

63. **Title: The Making of Knowledge in Art: Case Studies of Fiber Artists**

*Principal presenter:* Kristyne Gilbert Bradford

*Major:* English

*Faculty mentor:* Dr. Bradley Dilger

*Abstract:* The Making of Knowledge in Art: Case Studies of Fiber Artists. The word "art" suggests cultures that are acting imaginatively or creatively through a variety of mediums. As artwork is produced for private and public consumption, both artistic and non-artistic exchanges occur between fiber artists, their work, and the public. My research explores the relationship between creation processes and the discourses that surround the manipulation of textiles, following similar work by Jason Swarts (2010) and Kathryn Northcut (2011). During creative processes, artists' textiles and conversations

intersect. These intersections are one of the subjects of my research. I am examining the types of conversations taking place, how associated texts function in the communities and professional contexts in which they are embedded, how texts and textiles effect one another, and what documents are produced as the end results of these interactions. Like writing processes, artists' processes for creating artwork are not always transparent. Artists involved in the creative process may not be readily aware of their connections to texts-that is, their knowledge of art, text, and related discourses may be tacit. Technical communication, obvious and implied, is an integral part of the artistic process, though artists may believe that technical writing comes after the completion of the artwork and is not formally connected to it. Some examples of such technical communication are demonstrated through gallery catalogs, pattern and instructional templates, grant writing, and artists' statements. Because I see technical communication as a tool that operates during the entire process of creation, I am working directly with five fiber artists, interviewing and observing them to understand its role in artistic processes. As Flower & Hayes (1981) and other scholars have repeatedly shown for tacit knowledge (Smagorinsky 1989, 2003), artists may not be aware of the textual connection between artists and their artistic processes. As artists work, they must adhere to written and unwritten guidelines of genres they are working with in order to complete their projects-whether in text or textile. My research is helping to understand the relationships between artistic work and related technical communication practices. After framing the problem with relevant literature, I will describe my methods and present preliminary findings from the interviews that are the most important part of my data collection. My presentation will include preliminary findings on: the influence of tacit knowledge on writing processes, the frequency of writing processes, and the acknowledgment of a connection or disconnection between artistic processes and writing processes.

**64. Title: Arts Advocacy: A Dance**

*Principal presenter:* Kristin Katsu

*Major:* Theatre Directing

*Other presenters or co-authors:* Kristin Katsu

*Faculty mentor:* Carolyn Blackinton

*Abstract:* This performance draws conclusions about arts advocacy through the content and the format. I will outline the history of arts advocacy programs across the world and identify the most successful tactics to ensure a growth in creativity and outreach. Theaters need a live audience in order to thrive, and a few individuals take the stand as arts advocates to ensure the audiences

continue to arrive at plays, musicals, and fringe festivals. These few advocates represent the many artists who need funding and participants to entertain, educate, and inspire communities. We can learn from the advocates who unite theatre companies and university theatre programs across the world to fight together against cuts in funding. The form of this presentation follows the function: I present my conclusions through the dialogue and movement of theatre artists. Not only do these dancers and actors present the ideas I draw from my research, but through the rehearsal process, we formulate conclusions as a team. We dig deeper than we could as individuals, just as the history of arts advocacy presents the idea that the arts must work together to grow in skill and impact.