UTICA

COLLEGE

Student Research Day

April 29, 2015

Student Research Day

Wednesday, April 29, 2015

Carbone Auditorium/Gordon Science Center

Schedule of Events

Welcoming remarks – Dr. Judith Kirkpatrick, Provost, Vice President for Academic Affairs, Utica College - *Carbone Auditorium*

2:30 - 2:50 **The Rats and the Arts: Common Strategies and Transdisciplinary Inquires**
Steven Specht, Professor of Psychology

2:50 - 3:00 **Presentation set-up**

3:00 - 4:30 **Concurrent Oral Presentations, Sessions A, B, C, and D**

4:45 - 5:30 **Poster Presentations & Refreshments – Carbone Auditorium**

SESSION A: Carbone Auditorium

Moderator: Alyssa Thomas, Assistant Professor of Chemistry

3:00 - 3:15: **Pharmacophore Development and Drug Design Based on DNMT1**
- **Gabrielle Abbott**

3:15 - 3:30: **Computational analysis of morphine analogs**
- **Kelsey Ross, Andrenna Sykes, and Tasha Davis**

3:30 - 3:45: **The Effects of Wrapping NGM Culture Plates with Parafilm M® on the Growth and Development of Caenorhabditis elegans**
- **Patrick Spica**

3:45 - 4:00: **A Novel Dihydrofolate Reductase Inhibitor Obtained Through Field-Based Computational Modeling and SAR**
- **Anna Piasecki, Katherine Pearce, and Omer Hajder**

4:00 - 4:15: **Pharmacophore Model and Drug Design Targeting MepA**
- **Trieu Le, Cassandra McNitt, and Phu Do**

SESSION B: Gordon 262

Moderator: Aaron Mallace, Assistant Professor of Health Studies

3:00 - 3:15: **The Future of US-German Relations**
- **Adam Brooks**

3:15 - 3:30: **Responsible Museum Representations of Indigenous Cultures: A Case Study from Utica College's Barrett Art Gallery**
- **An Hoang and Joseph Coniguliaro**

3:30 - 3:45: **The Progression of Worker Inequality Between the Erie Canal and New York Central Railroad**
- **Andrew Walters**

3:45 - 4:00: **The Iroquois Trade Impact On The Mohawk Valley**
- **Kennedy Jennings**

4:00 - 4:15: **Pelts and Prosperity: The Fur Trade along New York's Mohawk Valley, 1730-1776**
- **Nolan Cool**

SESSION C: Gordon 271

Moderator: Luke Perry, Associate Professor of Government and Politics

3:00 - 3:15: **Ultrasonography an evolving tool for the diagnosis of plantar fasciitis: systematic review of diagnostic trials.**

- **Matthew Wyland, Lee Applequist, Heather Klingensmith, Erin Bolowsky, and Isaac Virag**

3:15 - 3:30: **Effectiveness of Ultrasonography in Diagnosing Chronic Lateral Ankle Instability: A Systematic Review**

- **Nicole Webber, Jordan Bakowski, Bridget Greenwald, Eryn Hyde, and Stephanie Dew**

3:30 - 3:45: **Effect of TENS on Ischemic Pain: A Systematic Review**

- **Taylor Lennon, J. Alexander Sheridan, Jacob Templar, and Joshua Torrey**

3:45 - 4:00: **Title IX – Sexual Harassment**

- **Melisa Segura**

4:00 - 4:15: **New York State Court Data Analysis**

- **Rachael Payne**

SESSION D: Gordon 272

Moderator: Sara Scanga, Associate Professor of Biology

3:00 - 3:15: **Prey Detection by the Red-backed Salamander Under Low Illuminations**
- **Jon Treen and Mark Nelson**

3:15 - 3:30: **Effects of sound waves on *Zea mays***
- **Bajro Nuhanovic, Tiffany Cabrera, Michael Jones, and Ryan Skowron**

3:30 - 3:45: **Long-term changes in nitrogen export in two neighboring watersheds in the Adirondack Mountains.**
- **Gabriel Zabala and Alexandria A. Alinea**

3:45 - 4:00: **The Effect of Artificial Night Lightning on the Activity of *Drosophila virilis***
- **Tiffany Cabrera, Jasmina Samardzic, and Abigail Schaible**

4:00 - 4:15: **The Effect of the Antifungal Secretions of a Novel *Pseudomonas* Species on Cell Hydrophobicity, Growth Viability and Ion Permeability of *Candida albicans***
- **Daniele Casper and Danielle McHarris**

4:15 - 4:30: **Virulence of a Novel Melanin Producing Pseudomonas Species UC17F4 on *C.elegans***
- **Mary Brockett**

POSTER SESSION: 4:45 PM – Carbone Auditorium

How bad is it doc? The varying predictions of ODE cancer growth models.

- **Hope Murphy**

Skidaway Institute of Oceanography Internship

- **Ashley Ward**

What Do Students Want in a Syllabus: An Exploratory Study

- **Katharine Shove**

Synthesis and Stability of Cysteine- and Cystine-capped Gold Nanoparticles

- **Phu Do**

Synthesis of a series of methyl-1-indanone derivatives for biomimetic studies

- **Tasha Davis**

Heavy Metal or Light Metal:
A Closer Look at the Bimodal Metallicity Distribution of the CGM

- **Brittany Vanderhoof**

Synthesis and Characterization of Novel Organosilicate Systems

- **Shamaris Perez**

SESSION A: Carbone Auditorium

Moderator: Alyssa Thomas, Assistant Professor of Chemistry

Pharmacophore Development and Drug Design Based on DNMT1

Gabrielle Abbott
Dr. Daniel Barr, Faculty Advisor

Rational drug design is used on the forefront of medication development and pharmaceutical design. Thousands of lead drugs and analogs can be determined through the use of computer modeling and drug design. Implications in anti-cancer drug therapy concerning DNMT1 (DNA (cytosine-5)-Methyltransferase 1) have been made through rational drug design processes. Existing DNMT1 nucleoside analogs bind in the active site of the protein, where this paper focuses on new drug candidates that will bind and interact at the DNA binding site. Prevention of methylation to the daughter strand of hemimethylated DNA because abnormal and distinct methylation patters have been observed in come cancers. DNA methylation can directly inhibit the expression of genes or increase the probability that affected genes undergo a mutational event so, in this case, there is documentation showing that methylation in the promoter region of certain tumor suppressor genes will result in failure to express functional proteins. Discovering both a pharmacophore and a drug candidate to bind at the DNA binding site of DNMT1 could change the way drug companies may view pharmaceutical techniques for DNMT1 inhibition. This article aims to present both the process and outcome of DNMT1 DNA binding mimetics for the treatment of cancer.

Computational analysis of morphine analogs

Kelsey Ross, Andrenna Sykes, and Tasha Davis
Dr. Daniel Barr, Faculty Advisor

Since the first drugs had been discovered, drug production has become increasingly effective for the treatment of known diseases. More specifically, many psychological disorders have been treated using drugs that bind to hormonal-based receptors in the body. In this research, we will use computational studies to modify and develop a pharmacophore that is more selective in decreasing the side effects resulting from the binding of drugs to the μ-opioid receptor. There are three opioid receptors in the body, all of which the drug has a possibility of binding to. In order to minimize addictive properties, the drug must act as an agonist to the μ-opioid receptor and an antagonist to the δ-opioid receptor. Computational analyses shows the ligand, βfunal trexamine, is surrounded by a region of hydrophobic amino acids when bound to the active site. The structure of the ligand indicates the pharmacophore should contain a complex nitrogenized ring structure. It is observed that the presence of methyl groups, as well as cyclic rings increase the drug's overall activity.

The Effects of Wrapping NGM Culture Plates with Parafilm M® on the Growth and Development of Caenorhabditis elegans

Patrick Spica
Drs. Jessica Thomas and Sara Scanga, Faculty Advisors

Parafilm M® is a thin thermoplastic used to seal a variety of containers in scientific laboratories. It is commonly used to seal Nematode Growth Media (NGM) culture plates to prevent microbial contamination and media dehydration. However, the effects on *C. elegans* of wrapping culture plates with Parafilm M® during experiments are unknown. Parafilm M® may limit gas exchange between the external and culture environment, potentially affecting the biology and life history of *C. elegans*, including its larval growth rate, viability, fecundity, lifespan, and behavior. In particular, wrapping culture plates with Parafilm M® may produce a hypoxic (low oxygen) environment compared to plates with no Parafilm M® (normoxic). Anoxic (no oxygen) and hypoxic conditions have been shown to change the metabolism, development, and longevity of *C. elegans*.

Our research aims to determine the effects of wrapping NGM culture plates with Parafilm M® on *C. elegans.* We hypothesized that worms cultured on plates wrapped in Parafilm M® would exhibit a slower rate of larval growth and increased mortality compared to worms grown in normoxic conditions. Synchronized L1 worms were individually transferred to culture plates and incubated within an anoxic environment, hypoxic environment, normoxic environment, or wrapped one time with Parafilm M®. BD GasPaks™ were used to create anoxic and hypoxic environments, and normoxic culture conditions consisted of unsealed plates. Larval growth rate and mortality were measured 5 times over 48 hours. We found no significant difference in the growth rate between worms cultured in normoxic conditions and on plates wrapped with Parafilm M®. However, the growth rate between worms cultured on plates wrapped with Parafilm M® and worms in anoxic and hypoxic conditions was significantly higher. Mortality was significantly higher in worms cultured in anoxic conditions, but was not significantly different among the other three environmental conditions. Our data suggest that wrapping *C. elegans* culture plates one time with Parafilm M® does not affect the larval growth rate or viability. Future studies will focus on additional biological and life history metrics, such as fecundity and lifespan, to verify that wrapping with Parafilm M® has no unexpected effects on the outcomes of *C. elegans* studies.

A Novel Dihydrofolate Reductase Inhibitor Obtained Through Field-Based Computational Modeling and SAR

Anna Piasecki, Katherine Pearce, and Omer Hajder
Dr. Daniel Barr, Faculty Advisor

Dihydrofolate reductase (DHFR) catalyzes the reduction of dihydrofolate to tetrahydrofolate, which is essential for the synthesis of both purines and pyrimidines for DNA and RNA. A DHFR inhibitor would stop the production of tetrahydrofolate which in turn, would stop DNA synthesis, allowing for possible cancer treatment. We have studied a variety of existing DHFR inhibitors to develop a field-based pharmacophore and build a structure-activity model that we have correlated with specific protein-ligand contacts from available crystal structures. On the basis of our analyses, we propose several novel candidates for investigation as DHFR inhibitors in cancer treatment.

Pharmacophore Model and Drug Design Targeting MepA

Trieu Le, Cassandra McNitt, and Phu Do
Dr. Daniel Barr, Faculty Advisor

MepA is a multidrug export protein belonging to multidrug and toxin extrusion (MATE) family found from Staphylococcus aureus. Structural data with high-resolution of MepA and MepA-ligand binding are limited, which makes the study about drugs inhibiting MepA more difficult. The purpose of this study is to find the pharmacophore for MepA inhibitor based on the reported MepA binding data using biocides and dyes. We used the Forge program to examine structure activity relationship (SAR), activity miner, and field differences of the various known substrates to find out the pharmacophore. Substrate moxifloxacin has the best activity, and showed that the potential MepA inhibitor should include clear charge separation, in which the protein binding site should be positive, while the solvent interacting site prefers exposed oxygen rather than methylated nitrogen. Furthermore, the pharmacophore also indicated planar was preferred over other types of geometry. Double bonds or rings were included in the pharmacophore to stabilize the protein-binding site. After modifying the structure of moxifloxacin to increase the activity, we linked that new substrate to the long linear carbon tail of centrimonium bromide. The tail was designed to embed in the lipid membrane of the vesicles to enhance the drug delivery across the cell membrane.

SESSION B: Gordon 262

Moderator: Aaron Mallace, Assistant Professor of Health Studies

The Future of US-German Relations

Adam Brooks
Dr. Nate Richmond, Faculty Advisor

The essence of relations between the US and Germany have thus far been determined by the structure of the international system in Europe. Analyzing the impact of this structure on the US-German relationship is imperative if one wishes to make predictions about the future of this relationship. This program will attempt to use an offensive realist analysis of past and present US-German relations in order to make predictions about the future of US-German relations.

Responsible Museum Representations of Indigenous Cultures: A Case Study from Utica College's Barrett Art Gallery

An Hoang and Joseph Coniguliaro
Dr. Helen Blouet, Faculty Advisor

Museology has been a major public institution in America since the eighteenth century. Museums provide society with many benefits including public knowledge advancement, entertainment, and tourist attractions. Playing such an important role in society, anthropological museums are responsible for providing the public with accurate and interesting information about different cultures. Nonetheless, without careful procedure in designing and presenting, exhibit contents may suffer from the issue of misrepresentation. The topic of this presentation revolves around good museum practices that will ensure responsible representations of indigenous cultures. This research is a combination of information gathered from literature review and intensive interviewing with museum directors and curators. Good practices in museums that will prevent the issue of misrepresentations include holistic research, involvement of indigenous members, and the biographical approach. Putting all such theories and methods into real-life practice, we present our internship working experience at the Barrett Art Gallery, Utica College to further demonstrate the employment of these good practices.

The Progression of Worker Inequality Between the Erie Canal and New York Central Railroad

Andrew Walters
Dr. Peter DeSimone, Faculty Advisor

An inequality between workers of the Erie Canal and New York Central Railroad established diverse social perceptions from a comparable labor pool. Obvious disparities between Erie Canal and New York Central Railroad workers from the nature of the work, unwavering nativism, and personal investment transformed the societal atmosphere of the Mohawk Valley.

The Iroquois Trade Impact On The Mohawk Valley

Kennedy Jennings
Dr. Peter DeSimone, Faculty Advisor

My presentation is going to be about the Iroquois trade impact on the Mohawk Valley. From their trading pathways and turnpikes and why was that important. Also from a cultural perspective on what the Iroquois traded during that time period why was it important.

Pelts and Prosperity:
The Fur Trade along New York's Mohawk Valley, 1730-1776

Nolan Cool
Dr. Peter DeSimone, Faculty Advisor

Facing a declining and unstable market, only a few Mohawk Valley merchants attained economic prosperity through strategic geographic utilization and a favorable position in the colony's fur trading network during the eighteenth-century. This handful of merchants operated in both Schenectady and in settlements along New York's western frontier. They obtained a profitable position in the high-risk, high-reward fur trading environment and successfully took advantage of a palate of business connections and a favorable geographic position between the fur-bearing settlements further west and England's peltry market. Mohawk Valley fur merchants acted as the commercial conduit between their widespread business connections and Great Lakes peltry suppliers. A supply of British trade commodities provided this small group with the means to keep the pelts flowing from further west. Businessmen in the valley involved in the fur trade encouraged neighboring farmers, settlers, and traders along the colony's frontier to supplement their personal economies through bartering in furs as well. Mohawk Valley merchants and their neighbors contributed to one another's economic stability, while the most prosperous merchants optimized their economically and geographically advantageous position between western peltry suppliers, New York City shipping agents, and dealers in English entrepôts. The finer details of colonial entrepreneurship on the Mohawk Valley frontier prove invaluable for a fuller understanding of how geography, business relationships, and economic expansion converged to create economic opportunities both large and small.

SESSION C: Gordon 271

Moderator: Luke Perry, Associate Professor of Government and Politics

Ultrasonography an evolving tool for the diagnosis of plantar fasciitis: systematic review of diagnostic trials.

Matthew Wyland, Lee Applequist, Heather Klingensmith, Erin Bolowsky, and Isaac Virag
Dr. Ahmed Radwan, Faculty Advisor

Background: Plantar Fasciitis (PF) is the most common cause of heel pain that affects 10% of the general population, including individuals between the ages of 40-60 that live an athletic and sedentary lifestyle. The most frequent mechanism of injury is an inflammatory response that is caused by repetitive microtrauma. Many techniques are available to diagnose PF, including the use of the evolving diagnostic tool of ultrasonography (US).

Purpose: The purpose of this study is to systematically review and appraise previously published articles between the years 2000 and 2015 that evaluate the effectiveness of using US in the process of diagnosing PF, compared to alternative diagnostic methods.

Methods: A total of eight databases were searched to systematically review scholarly (peer reviewed) diagnostic and intervention articles pertaining to the ability of US to diagnose PF. Two raters independently scored each article using the 15 point modified QUADS scale.

Results: Using specific key words the preliminary search yielded 264 articles, 10 of which were deemed relevant for inclusion in the study. Each article was summarized, and given a QUADS score which was organized into table format.

Discussion: Six studies compared US to another diagnostic technique to diagnose PF, and four studies focused on comparing baseline assessment of plantar fascia before treatment. The most notable outcomes measured were plantar fascia thickness, enthesopathy, hypoechogenicity, bioconvexity, and perifascial fluid.

Conclusion: US was found to be accurate and reliable compared to alternative reference standards like MRI in the diagnosis of PF. The general advantages of US (eg, cost efficient, ease of administration, non-invasive, limited contraindications) make it a superior diagnostic modality in the diagnosis of PF.

Clinical implications: US should be considered in physical therapy clinics to effectively diagnose PF.

Effectiveness of Ultrasonography in Diagnosing Chronic Lateral Ankle Instability: A Systematic Review

Nicole Webber, Jordan Bakowski, Bridget Greenwald, Eryn Hyde, and Stephanie Dew
Dr. Ahmed Radwan, Faculty Advisor

Background: Chronic ankle instability (CAI) is a condition that often develops after repeated ankle sprains, allowing the ankle to move into excessive inversion when walking on unsteady surfaces. Treatment for CAI costs approximately 3 billion health care dollars annually. Currently, common diagnostic tools used to identify ankle instability are arthroscopy, imaging, manual testing, and self-reported questionnaires.

Purpose: The purpose of this systematic review was to investigate the effectiveness of ultrasonography in diagnosing CAI, in comparison with other diagnostic tools.

Methods: Search limits: articles published between the years 2000-2015, and articles that are peer reviewed and published in the English language. Databases searched: CINAHL, PubMed, Medline, Medline Plus, Science Direct, OVID, Cochrane, and EBSCO. Titles and abstracts of the 1,420 articles were screened for the inclusion criteria by two independent raters, with discrepancies solved by a third rater. The modified 14-point Quality Assessment of Diagnostic Accuracy Studies (QUADAS) scale was used to assess article quality, and a summary table was used.

Results: High quality articles were included in this systematic review, as indicated by high scores on the QUADAS scale, ranging from 10 to 13. Sensitivity of US range: 84.6 %-100%, specificity of US range: 90.9%- 100% and accuracy range: 87%- 90.9%.

Discussion: The studies included proved that US is able to accurately differentiate between the grades of ankle sprains and between a lax ligament, torn ligament, thick ligament, absorbed ligament and a non-union avulsion fracture. These findings indicate that US is a reliable method for diagnosing CAI, and that US is able to classify the degree of instability.

Conclusion: Researchers found that US is effective, reliable, and accurate in the diagnosis of CAI. However, more research still needs to be done on the subject of training; there is little evidence on the amount of training needed to efficiently perform and interpret an US image.

Clinical Implications: US would allow for earlier diagnosis, which will increase the quality of care as well as decrease the number of outpatient visits. Physical therapists will be able to choose more appropriate treatments and begin the plan of care sooner, in turn reducing the number of treatments needed. This will lead to better treatment plans, goals and outcomes.

Effect of TENS on Ischemic Pain: A Systematic Review

Taylor Lennon, J. Alexander Sheridan, Jacob Templar, and Joshua Torrey
Dr. Jim Smith, Faculty Advisor

Introduction: Ischemic pain occurs when blood flow in tissues is reduced or absent. The treatment of choice involves 30-60 minutes walking, with progression of the distance and duration of the walking over time, and optimal effectiveness requires walking with near-maximal pain. To engage patients in exercise the reduction of perceived pain is critical. Transcutaneous electrical nerve stimulation (TENS) is a non-invasive electrotherapy intervention for reducing the perception of pain. The purpose of this research was to evaluate published evidence to determine the effect of TENS on ischemic pain.

Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) process was followed using selected search terms and appropriate databases. 735 articles were identified and screened with defined inclusion and exclusion criteria, resulting in the identification of 10 relevant articles. A tool designed for data extraction was modified for this project, relevant data was collected, and validation of the data was confirmed by the team. Critical appraisal of the quality of the research design for each article was performed by 2 members of the project who were blinded to the results. Disagreement about critical appraisal scores was resolved by consensus among the paired reviewers.

Results: TENS was found to be effective at reducing the perception of pain among subjects with ischemic pain in the legs, and critical appraisal revealed moderate to low strength of the evidence. TENS applied for angina appeared to reduce cardiac workload due to a vasodilation response, the effect on pain was not clearly reported, and those conclusions were based on moderate to low strength evidence. TENS applied for pain from Raynaud's phenomenon was not effective at reducing perceived pain based on low strength evidence.

Conclusion: TENS may be effective at reducing perception of pain among people with ischemic pain in the lower extremities, however that conclusion is based on evidence of moderate to low strength. We propose that exercise intervention for patients with ischemic pain may benefit from the addition of TENS. The clinical benefits of TENS for people with angina and Raynaud's phenomena are not well established. Weakness of the evidence indicates further research is needed to inform clinical practices.

Title IX – Sexual Harassment

Melisa Segura
Dr. Jessica Singer Brown, Faculty Advisor

Title IX of the 1972 Education Amendment is a powerful tool for combating college campus violence. This law requires colleges and universities receiving federal funding to combat gender-based violence and harassment, and to respond to survivors' needs in order to ensure that all students have equal access to education. My research explores how various campuses respond to Title IX requirements, and how this influences the campus community. My goal is to continue a meaningful change and exhibit the importance of this legislation not just for women, but for men as well.

New York State Court Data Analysis

Rachael Payne
Dr. Shanna Van Slyke, Faculty Advisor

Over 60 counties in New York collect money from convicted misdemeanants and felons. The present study explores how the funds are allocated among federal, state, and local court systems and what these variations mean. Additionally, this study investigates the relationship between funds collected and variables suggested by major criminological theories and interviews with subject matter experts. Publicly available data on the New York Local Government and School Accountability website were used for the collections data, while the United States Census Bureau (also publicly available) was used for the independent variables of travel time to work, homeownership rate, percent White, percent Black, and retail sales per capita. Analyses examine trends in collections over time as well as the relationship between collections and variable suggested by criminological theories. Conclusions suggest explanations for fund collection patterns beyond the level of criminal activity in the area, while the discussion outlines directions for future research and policy implications in this line of research.

SESSION D: Gordon 272

Moderator: Sara Scanga, Associate Professor of Biology

Prey Detection by the Red-backed Salamander Under Low Illuminations

Jon Treen and Mark Nelson
Drs. Sharon Wise and Bryant Buchanan, Faculty Advisors

Red-backed salamanders (Plethodon cinereus) forage and communicate with each other at night under very low illuminations presumably using both vision and olfaction. However, the minimum illumination necessary for visual prey detection is unknown; so, it is unclear under what conditions visual prey detection and communication is possible. We determined the amount of light necessary for salamanders to visually detect and identify artificial prey stimuli in two experiments. In the first experiment, we observed salamander responses to moving prey stimuli in a step-wise trial of progressively increasing illumination simulating transition from complete darkness to bright moonlight (dark, 1 x 10-5, 5 x 10-5, 1 x 10-4, 5 x 10-4, 1 x 10-3, 5 x 10-3, 1 x 10-2, and 5 x 10-2 lx). The minimum illumination at which multiple salamanders responded was 5 x 10-5 lx. In a second experiment, where light treatments were presented in a randomized order on different occasions, salamanders oriented toward and attempted to capture prey stimuli significantly sooner at all light levels (5 x 10-5, 1 x 10-4, 5 x 10-4, 1 x 10-3, 5 x 10-3 lx) compared to the dark treatment (where none responded), suggesting that sufficient light existed above 5 x 10-5 lx for some salamanders to detect movement of the prey stimulus. Salamanders responded significantly sooner and more often at higher light levels suggesting that salamanders are better able to detect and identify prey under brighter nocturnal light levels.

Effects of sound waves on *Zea mays*

Bajro Nuhanovic, Tiffany Cabrera, Michael Jones, and Ryan Skowron
Dr. Sara Scanga, Faculty Advisor

There is an ongoing interest in plant responses to environmental stimuli, particularly in agricultural settings where it is crucial to develop and implement the most efficient technology and techniques. Sound waves are environmental stimuli that have been shown to affect plant growth through several biochemical processes within the plant. Although previous studies show that sound waves can have both positive and negative effects on the growth of certain plant species, none of these studies have focused on corn (*Zea mays*). Given that corn is one of the most widely-planted agricultural crops worldwide, it is important to provide a greater understanding of how sound waves produced by agricultural machinery (for planting, fertilizing, watering, and harvesting) affect corn plant growth. We hypothesized that exposing corn plants to sound waves of 200 Hz at 85 dB would increase the growth of the plants. We tested this hypothesis by exposing 20 corn plants to sound waves with a frequency of 200 Hz at 85 dB for 2 hours per day over 22 days, and comparing their growth (plant height, leaf length and width, fresh and dry mass of the plant, and average number of chloroplasts) to a control group of 20 plants that were not exposed to sound waves. We found greater plant growth in the control than in the treatment group, suggesting that sound waves from agricultural machinery may reduce corn productivity in a field setting.

Long-term changes in nitrogen export in two neighboring watersheds in the Adirondack Mountains.

Gabriel Zabala and Alexandria A. Alinea
Dr. Sara Scanga, Faculty Advisor

This project seeks to identify the controls of N retention in forests by highlighting the long-term changes in forest composition, atmospheric nitrogen (N) deposition, stream nitrate export, and soil N availability in two neighboring USGS-gaged watersheds (the North and South Tributaries) of Buck Creek in the Adirondack Mountains. Shifts in tree species composition and basal area were assessed in 15 permanent observation plots in each watershed in 2000, 2005, and 2010. The N input-output budget was constructed using atmospheric N deposition data from NADP and statistically modeling annual stream N yields. Long-term changes in N availability were assessed through δ15N analysis of 40 tree cores (20 trees per watershed). We found pronounced differences in forest composition between watersheds; the South was dominated by American beech trees, and the North by both American beech and red spruce. Both of these dominant species, however, are in decline due to beech bark disease and unexplained spruce decline. Atmospheric N deposition has decreased by 40% since 1986, yet the two streams are showing divergent trends in stream nitrate export. Even though both catchments are experiencing forest decline, δ15N analysis of annual tree rings suggests that N availability has also decreased over time in both catchments since 1980. These results emphasize the complexity of N biogeochemistry, and the need to integrate regional (N deposition and climate) and site-specific (forest composition and health) drivers of N retention in forests.

The Effect of Artificial Night Lightning on the Activity of *Drosophila virilis*

Tiffany Cabrera, Jasmina Samardzic, and Abigail Schaible
Drs. Sharon Wise and Bryant Buchanan, Faculty Advisors

Artificial light at night (light pollution) is an ecological problem that has increased with human development. The impact on the behavior of animals in an ecological context may vary among animals based on their life history. For example, the activity of nocturnal animals may be suppressed at night, while the behavior of diurnal animals may be stimulated at night. In order to study the effect of light pollution at varying levels of intensity on a diurnal animal, we monitored (via IR cameras) the locomotor activity of a large species of fruit fly, *Drosophila virilis*, at night when exposed to illuminations of 0.0001 lx (control, normal dark starlight) and increasing light intensities from low to high levels of light pollution (0.01 lx, 1 lx, and 100 lx), during one night 1800-0600 h (all flies were exposed to 100 lx during the day). We used 16 light chambers with 4 at each illumination. Adults were tested randomly and individually in Petri dishes placed in a chamber beginning at 1300 h. Behavior was monitored from 1700-1800 h (1 h before lights off), 1800-0600 h (nighttime), and 0600-0700 h (1 h after lights on). We predicted that fruit flies would be more active (distance moved per h in cm) with increasing levels of light pollution. Our data supported this prediction: flies exposed to brighter illuminations at night moved significantly more than those in control treatment. Activity was greatest in the brighter treatments in the early hours of the morning (0300-0600 h). These data suggest that light pollution impacts the behavior of a diurnal animal, increasing behavior at night when they would normally be inactive.

The Effect of the Antifungal Secretions of a Novel *Pseudomonas* Species on Cell Hydrophobicity, Growth Viability and Ion Permeability of *Candida albicans*

Daniele Casper and Danielle McHarris
Dr. Lawrence Aaronson, Faculty Advisor

A novel *Pseudomonas* species, designated as *P. uticensis*, was isolated from the cutaneous flora of red-backed salamanders due to its ability to produce antifungal secretions. We hypothesize that at least one antifungal secretion produced by *P. uticensis* is a Ca^{2+} ionophore. *Candida albicans* is a polymorphic fungus that can grow as a budding yeast, as pseudohyphae, or as true hyphae. Its ability to shift between the yeast-to-hyphal state is essential for its virulence. The purpose of this research was to determine if the antifungal secretions from *P. uticensis* effect cell hydrophobicity, growth and viability in *C. albicans*, as well as ion permeability. A sterile supernatant was prepared from TSYE broth cultures of *P. uticensis* and was added in increasing concentrations to *C. albicans*, in media with either NCS or NAG. Both NCS and NAG cultures showed at least a 50% decrease in cell hydrophobicity as increasing concentrations of *P. uticensis* supernatant were added, indicating the inhibition of hyphal formation. Furthermore, a dose-dependent inhibition of *C. albicans* growth was observed with increasing concentrations of supernatant, with a biomass reduction up to 60%. A 50% decline in cell viability was apparent with 10% concentration of supernatant; no further decline was observed with higher concentrations. At least one of the *P. uticensis* antifungal secretions is a Ca^{2+} ionophore, as a direct correlation between increased supernatant concentrations and change in cytoplasmic Ca^{2+} levels was observed. We suspect that this effect is Ca^{2+} specific because no change in cytoplasmic pH was detected under the same culture conditions.

Virulence of a Novel Melanin Producing Pseudomonas Species UC17F4 on *C. elegans*

Mary Brockett
Drs. Lawrence Aaronson and Jessica Thomas, Faculty Advisors

Pseudomonas sp. UC17F4 is a novel species of Pseudomonas isolated in our lab from the cutaneous microbial flora of the red-backed salamander, Plethodon cinereus. UC17F4 produces intracellular melanin, a brown pigment, in the presence of tyrosine-rich media. Melanin has been shown to serve as a virulence factor for several organisms, including bacteria and fungi. Our lab generated several mutant strains of UC17F4: UC17F4 (MM1) produces less melanin than the wild-type strain, UC17F4 (MM7, 8, and 9) hypersecrete extracellular melanin, and UC17F4 (PV 21 and 22) produce no melanin. We demonstrated that UC17F4 exhibits virulence by using C. elegans as a model host. Worms were transferred to lawns of UC17F4 bacteria on Nematode Growth Media (NGM) supplemented with tyrosine and lethality was assessed over time using touch assays. Our studies show that C. elegans exposed to the wild-type strain (UC17F4) have the highest mortality rate and worms exposed to UC17F4 (PV21) have the lowest mortality. Worms do not die after exposure to the hypersecreting strains or the strains without melanin. We investigated the effect of UC17F4 exposure on the different larval stages of C. elegans (L1, L2, L3, L4, and adult worms). Our results show that L1 and L2 worms are most vulnerable to the virulence of UC17F4 compared to later developmental stages. L1 and L2 worms die in less than 24 hours of exposure, whereas later developmental stages are viable and reproduce. Our current studies include determining the kinetics of L1 and L2 lethality and the mode of pathogenesis.

POSTER SESSION: Carbone Auditorium

How bad is it doc? The varying predictions of ODE cancer growth models.

Hope Murphy
Dr. Joseph Ribaudo, Faculty Advisor

Cancer is the second most common cause of death in the US. While mathematical models are often used to predict pro- gression of the disease and treatment outcomes, we don't yet know how to accurately model tumor growth. Several ODE models (exponential, logistic, linear, surface, Bertalanffy, and Gompertz) have been proposed to model tumor growth. We examined the predictions of the models both for untreated growth and growth during treatment with chemotherapy. We compared the predicted maximum volume of the tumor, the doubling time, and the amount of chemotherapy needed to end tumor growth for each of the models and found that the predictions vary dramatically. This work highlights the need for detailed experiments to aid in choosing appropriate cancer growth models.

Skidaway Institute of Oceanography Internship

Ashley Ward
Dr. Sharon Kanfoush, Faculty Advisor

Skidaway Institute of Oceanography is a multidisciplinary research institution, located in Savannah, Georgia, with a focus in marine and coastal sciences. While participating as a summer intern I had the opportunity to work on a variety of different projects related to coastal geology. This poster will discuss three of those projects.

The coastlines are a continuously developing area, however, it is not clear to what extent they are affected by this development. Sieve analysis was performed to differentiate grain sizes in areas of varying densities of development in order to determine how bulkheads are affecting the coastlines. From the data collected thus far in the project it appears that the sediment grain size in more heavily armored areas is smaller than in more undeveloped areas, which could increase erosion rates. In addition to this research, salinity data along one of Georgia's major rivers was obtained in order to track how far up river the salt wedge extends as well as the extent of mixing between fresh and saline water up river. This information is important because it is used as parameters within a coastline model known as Sea-Level Affecting Marsh Model. Lastly, side scan sonar equipment was tested on the continental shelf in order to acquire a better understanding of the different wave regime conditions the sonar could handle while still producing usable data and images.

What Do Students Want in a Syllabus: An Exploratory Study

Katharine Shove
Dr. Shanna Van Slyke, Faculty Advisor

In a generation where college education is so highly valued, students' ability to understand what is expected of them is an essential component of their success in school. A course's syllabus defines the expectations of the professor, course requirements, and assignments given throughout the semester. Students seek various elements of a course's syllabus based on their class status and ambition as a student. Those who possess high expectations for themselves academically may look to the syllabus as a guide throughout the course, while those with lower expectations and organizational skills may not see the importance of a syllabus. Additionally, through experience from freshman to senior year of college, students may obtain a new understanding and appreciation for a course's syllabus, as they learn the value of the professor's expectations and requirements. The purpose of this study is to examine if college students use the information provided to them in the syllabus, as well as how they apply it to their own study habits and course goals.

Synthesis and Stability of Cysteine- and Cystine-capped Gold Nanoparticles

Phu Do
Dr. Alyssa Thomas, Faculty Advisor

Gold nanoparticles (GNPs) have been extensively studied and showed a broad range of biological and nano-technological applications. GNPs are not only promising targeted delivery drug carriers but also potential biospecific markers due to their high electron density. GNPs bind strongly to substances possessing thiol groups such as cysteine and its dimer, cystine. These amino acids can be later polymerized on GNPs' surfaces as well as interact with other molecules of interest. The aim of our study is to synthesize stable cysteine and cystine-capped GNPs. Sixteen GNPs were prepared and characterized by UV-Vis spectroscopy, from which six processes (three with cysteine; three with cystine; half were prepared by sodium borohydride NaBH4) were chosen for further investigations. Their UV-Vis spectra have absorptions between 400-600nm, indicating the formation of amino acid-capped gold nanoparticles. Ratios of amino acid to HAuCl4 will be varied for example 1:2 or 1:1 to determine optimal conditions for GNP synthesis. The capping ability of cysteine and cysteine will also be compared based on the results of reactions prepared in the same ratios. The necessity of adding sodium borohydride will also be discussed.

Synthesis of a series of methyl-1-indanone derivatives for biomimetic studies

Tasha Davis
Drs. Michelle Boucher, Daniel Barr, and Curtis Pulliam, Faculty Advisors

The use of peptide drugs is increasingly popular; they offer advantages such as limited side effects and high specificity. However, stability of these drugs is an issue due to protein inactivation by enzymes. Conditions to improve the efficacy of peptide drugs are studied through the use of mimetic compounds. These compounds structurally resemble peptide drugs and allow for a greater understanding of how to regulate the protein drug's function within the body.

Methyl-1-indanone is a compound identified through computational studies to have a backbone that would make it useful as a mimetic if functionalized with a polar group on the aromatic methyl. The goal of this research is to brominate a commercially available cyclic ketone, methyl-1-indanone, at the methyl carbon and then synthesize from the bromo-derivative a library of compounds.

Successful conditions for the bromination of the aromatic methyl group have been developed using hydrobromic acid, hydrogen peroxide, and photochemical initiation. The reaction progress was monitored through TLC, and reaction conditions including time and concentration optimized. The product was separated through extraction, purified through column chromatography, and characterized through NMR and GC-MS. Further reactions of the brominated derivative with strong nucleophiles have been studied, and initial results from those syntheses will also be presented. Future work will focus on optimizing reaction conditions for the substitution reactions with the bromo-derivative. The eventual goal of the library of cyclic ketone compounds is for it to be used in experimentation as a peptide mimetic.

Heavy Metal or Light Metal:
A Closer Look at the Bimodal Metallicity Distribution of the CGM

Brittany Vanderhoof
Dr. Joseph Ribaudo, Faculty Advisor

We present a study of the circumgalactic medium (CGM) of galaxies, to better understand the evolution of the galaxies over cosmic time. In particular we are examining the physical and chemical composition of the CGM through an analysis of the absorption features present in the spectra of background QSOs. Recent studies have identified a bimodal metallicity distribution in the population of CGM environments, suggesting the composition of the CGM is roughly equal amounts of metal poor and metal enriched gas. In an attempt to confirm the existence of the bimodal nature of the CGM or identify evidence for mixing between metal poor and metal rich gas, our project examines, in detail, the multi-component nature of previously identified circumgalactic gas.

Synthesis and Characterization of Novel Organosilicate Systems

Shamaris Perez
Dr. Michelle Boucher, Faculty Advisor

Formation of interactive layered materials from naturally occurring sheet silicates is well known, and the potential of these systems as reinforcement agents is of fundamental interest in materials chemistry. These modified organosilicate hybrids have properties from the organized silicate lattice and from the incoming functional group. Currently the preparation of organosilicate hybrid materials is limited to direct silylation of the silicate and then subsequent hydrosilyation of functional groups from the silylation reactions; functionalities such as alkynes or alcohols are not possible with the current route.

Our goal is a route for third generation organosilicates in which there would be a larger variety of functional groups available for the hybrid system, allowing for expanded functions such as water solubility and better processing, making sheet silicates more efficient for use. The proposed route to a third generation system is to synthesize an organosilicate with a silanol functionality, react the silanol with 1-butyne-4-ol, and then use the alkyne functionality to create third generation systems.

An organosilicate with a silanol functional group was made through direct silylation of the sheet silicate Apophylite with dimethyldichlorosilane, and the product was characterized through FT-IR and powder XRD spectroscopy. Conditions to optimize the reaction were studied. Initial work describing the condensation reaction between the dimethylsilanol and the 1-butyne-4-ol will also be presented. Future work will focus on reacting the alkyne through “click” chemistry with compounds such as functionalized sugars to form a series of third generation organosilyl sheet silicates characterizable through FT-IR and powder XRD.

ACKNOWLEDGEMENTS

The UC SRD Committee would like to thank both the students and the faculty advisors for their interest and support. Student Research Day is sponsored by the Office of the Provost and we thank Provost Judith Kirkpatrick and her staff for their continued support. We would also like to thank Professor Steven Specht and the moderators for volunteering their time and expertise, making the 2015 Student Research Day a success. A special thank you to the Campus Theme Committee for sponsoring awards for the oral and poster presentations that best fit the Drivers of Change theme and to the faculty judges who helped determine this year's award recipients.

The UC SRD 2015 Committee: Joseph Ribaudo, Alyssa Thomas, Aaron Mallace, and Luke Perry