

# UTICA



# COLLEGE

## Student Research Day

**April 19, 2017**



# **Student Research Day**

Wednesday, April 19, 2017

*Carbone Auditorium/Gordon Science Center*

## **Schedule of Events**

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

2:30 - 2:55     **Then You Move On**  
**Jim Smith, Professor of Physical Therapy**

2:55 - 3:15     **Presentation set-up**

3:15 - 4:30     **Concurrent Oral Presentations: Sessions A, B, C, D, and E**

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



## **SESSION A: Carbone Auditorium**

**Moderator: Alyssa Thomas, Assistant Professor of Chemistry**

**3:15 - 3:30: Silver/Gold Core/Shell Nanoparticles**

- **Brad Long**

**3:30 - 3:45: Effects of Different Reducing Agents on the Size of Gold Nanoparticles**

- **Michael Bird**

**3:45 - 4:00: Synthesis of Gold Nanoparticle in the 1-10nm Range by the Application of Thiol Capping Agents**

- **Derek R. Case**

**4:00 - 4:15: The Synthesis of Silver Nanoparticles Using Tea**

- **Jenna Dy**

**4:15 - 4:30: Synthesis Methods for Monodispersed Gold Nanoparticle Solutions**

- **Kollin Schultz**

## **SESSION B: Gordon 261**

**Moderator: Jessica Redmond, Assistant Professor of Biology**

**3:15 - 3:30: An Investigation of Nontarget Insecticide Effects of Erythritol on *C. elegans* and Two Common Agricultural Crop Plants**

- **Bilal Hasanspahic and Edin Zvornicanin**

**3:30 - 3:45: Investigating the Effects of Artificial Light at Night on *C. elegans* Offspring Production and Lifespan**

- **Hardik Nariya**

**3:45 - 4:00: Helicobacter DNA Is Not Present in the Urine of Interstitial Cystitis Patients**

- **Summer Carbone**

**4:00 - 4:15: The Influence of Artificial Light at Night on Nocturnal Activity of Eastern Red-Backed Salamanders (*Plethodon cinereus*)**

- **Steffon Williams**

**4:15 - 4:30: Genomic and Biochemical Analysis of Melanin Biosynthesis in *Pseudomonas uticensis***

- **Celia Nicolette DeJohn**

## **SESSION C: Gordon 262**

**Moderator: Jim Smith, Professor of Physical Therapy**

**3:15 - 3:30: Virtual Reality Treadmill Training for Improving Balance and Gait in Individuals with Chronic Stroke: A Systematic Review**

- **Ava Morabito, Cara Kernoschak, Mary Miceli, and Courtney Wheeler**

**3:30 - 3:45: Does Smart Home Technology Prevent Falls in Community-Dwelling Older Adults? A Systematic Review.**

- **Cassandra L. Plows, Amanda M. Drake, Taylor A. Ellis, and Sara C. Silverman**

**3:45 - 4:00: The effectiveness of alternative and standard computer mice designs in decreasing physical and mental stress in workers. A systematic review of controlled trials.**

- **Tyler Kallasy, Orrin Carpenter, Emily Chrisman, and Abigail Monroe**

**4:00 - 4:15: Body-Worn Cameras in the Utica Police Department**

- **Caitlin Hopkins**

**4:15 - 4:30: The Stuffer**

- **Sean Drzewiecki and Aaron Gudrian**

## **SESSION D: Gordon 271**

**Moderator: Luke Perry, Associate Professor of Government & Politics**

**3:15 - 3:30: Communist Regime Resiliency: Cuba and North Korea**

- **Tanner FitzPatrick**

**3:30 - 3:45: International Security Negotiations: the Comparison between the DPRK and Iran**

- **Sung Jang**

**3:45 - 4:00: The Sea Voyage and The Starving Time**

- **Alison Brown**

**4:00 - 4:15: Creative Writing Story in Progress**

- **Danielle Harvey**

**4:15 - 4:30: Open Discussion/Questions**

## **SESSION E: Gordon 272**

**Moderator: Michelle Boucher, Associate Professor of Chemistry**

**3:15 - 3:30: The relationship between grief and nostalgia in college students**

- **Abigail Schaible and Amanda Taurisano**

**3:30 - 3:45: The Role of Teacher Collaboration in Promoting Equity in United States Schools**

- **Anna Anggaputra**

**3:45 - 4:00: First Results of the Arecibo Pisces-Perseus Supercluster Survey**

- **Taylor Koivuluoma, Nathaniel Flower, and Liam Patterson**

**4:00 - 4:15: Synthesis of peptide auxillaries**

- **Kyle Podolak**

**4:15 - 4:30: Effects of Temperature on Gold Nanoparticle Size**

- **Joseph Antonacci**





## **POSTER SESSION: 4:45 PM – Carbone Auditorium**

**Aquatic Hermaphrodite Snails Exposed to Combinations of Environmental Chemicals Experience Increased Mortality Yet Sustained Reproductive Ability**

- Jasmina Samardzic

**Greenhouse Sensing & Automation**

- Santina Luce and Kaitlin Trumbull

**Optimization of a Route to 2nd Generation Organosilicate Systems**

- Dakota Monk

**Gold Nanoparticle Synthesis and Optical Characterization**

- Sabina Kendic



***SESSION A: Carbone Auditorium***  
***Moderator: Alyssa Thomas, Assistant Professor of Chemistry***

**Silver/Gold Core/Shell Nanoparticles**

**Brad Long**  
**Prof. Alyssa Thomas, Faculty Advisor**

The experiment was to synthesize silver/gold core/shell nanoparticles at different ratios of silver:gold concentrations. The turkevich method was used to begin forming both sets of nanoparticles before being combined. The silver nanoparticles were started first to let them form before adding the gold nanoparticles so that the gold will be able to form around the silver. The gold nanoparticles were also allowed to start forming before mixing them together so that the gold nanoparticles would be able to finish forming around the silver nanoparticles. More trials need to be ran to fully test the concentration dependence, but with the UV-vis spectra, the size of the nanoparticles and how the different ratios effect can be determined. Comparison of spectra for the core-shell nanoparticles to a previous study involving gold/silver alloy nanoparticles was performed in order to determine the success of the experiment. Alloy nanoparticles mix the gold and silver solutions before adding the sodium citrate so they form all at once.

**Effects of Different Reducing Agents on the Size of Gold Nanoparticles**

**Michael Bird**  
**Prof. Alyssa Thomas, Faculty Advisor**

Unlike bulk gold, the physical and optical properties of gold nanoparticles (1-100 nm size range) are dependent on the size of the particles. This size dependence has led to great interest in how to control the size of synthesized gold nanoparticles. Gold nanoparticles are easily synthesized by the reduction of  $\text{Au}^{3+}$  to  $\text{Au}^0$ . This experiment will look at the effect of different reducing agents on the size of resultant nanoparticles. Sodium citrate, aspartic acid, hydrazine hydrate, sodium borohydride, and hydroxylamine will all be used to reduce chloroauric acid. The resulting gold nanoparticles will all be analyzed using UV-visible spectroscopy to determine the surface plasmon resonance peak, which is then used to determine the size. It is expected that the nanoparticles synthesized with stronger reducing agents should be smaller since the reaction proceeds faster, and they have less time to grow around the nucleation site.

## **Synthesis of Gold Nanoparticle in the 1-10nm Range by the Application of Thiol Capping Agents**

**Derek R. Case**

**Prof. Alyssa Thomas, Faculty Advisor**

Gold nanoparticles have many applications in the field of science, and are easily synthesized, in a way that typically involves a gold salt reduction when in the presence of appropriate stabilizing agents that prevent particle agglomeration. According to Hostetler et al., being able to synthesize gold nanoparticles of a specific size is invaluable due to the breadth of chemical application. As later found by Ghosh et al., the application of gold nanoparticles, which are inert and non-toxic in nature, within the range of 1.5 – 5nm provides an enhanced in vivo targeting ability due to gold nanoparticles of this size taking advantage of the enhanced permeation and retention (EPR) effect. This increased targeting allows for maximized drug efficacy and minimal side effects. For this reason, the synthesis of gold nanoparticles within the range of 1 – 10 nm is essential to further pursue testing of gold nanoparticles as effective targeting agents, and to utilize gold nanoparticles in the future as a method of in vivo treatment. Size-specific gold nanoparticle synthesis can be done by way of regulating the ratio of gold ion concentration to stabilizing agent.<sup>5</sup> Size may also be regulated by way of thiol capping agents. This project probes gold nanoparticle synthesis from a sodium borohydride reduction process with varying gold ion amounts, in terms of volume, in the presence of thiol capping agents as a means of producing gold nanoparticles within the range of 1 – 10nm for the purpose of bio-targeting. Analysis of nanoparticles within this range was done via UV-Vis spectroscopy.

## **The Synthesis of Silver Nanoparticles Using Tea**

**Jenna Dy**

**Prof. Alyssa Thomas, Faculty Advisor**

Nanoparticles are microscopic particles between 1 and 100 nm. Silver nanoparticles have antibacterial properties which can be applied to clothing, bandages, ointments, and coatings. The Turkevich method uses sodium citrate as a reducing agent to produce silver nanoparticles. Due to the interest of green chemistry, tea extract is used as a reducing agent in place of sodium citrate. Black tea, green tea, and chamomile tea are used to make the silver nanoparticles. The silver nanoparticles are compared for size to see which type of tea will be a stronger reducing agent compared to sodium citrate analyzed through UV-Vis spectroscopy.

## **Synthesis Methods for Monodispersed Gold Nanoparticle Solutions**

**Kollin Schultz**

**Prof. Alyssa Thomas, Faculty Advisor**

Nanoparticles are innovating modern technology because of their unique size dependent properties. Methods for synthesizing gold nanoparticles (AuNPs) of a specific monodispersed size are needed for research and manufacturing applications. For this project, synthesis methods for 5, 20, and 50 nm AuNPs were tested. A reverse Turkevich method was used to synthesize the 5 nm AuNPs, and a pH controlled Turkevich method was used to synthesize the 20 and 50 nm AuNPs. The size of the AuNPs was determined using UV-Vis spectroscopy and mathematical equations.



## ***SESSION B: Gordon 261***

**Moderator: Jessica Redmond, Assistant Professor of Biology**

### **An Investigation of Nontarget Insecticide Effects of Erythritol on *C. elegans* and Two Common Agricultural Crop Plants**

**Bilal Hasanspahic and Edin Zvornicanin**

**Profs. Jessica Thomas and Sara Scanga, Faculty Advisors**

Sugar substitutes, such as Truvia®, are increasingly gaining popularity in cooking and processed foods. Erythritol, a non-nutritive polyol, is the main component of Truvia. Previous studies showed that erythritol consumption does not affect plasma and urine osmolarity and electrolyte levels and it is not toxic or carcinogenic to rats. In contrast, erythritol was shown to significantly decrease longevity in *Drosophila melanogaster* compared to sucrose and other polyols with the exception of D-mannitol. Researchers have suggested that erythritol has potential use as an insecticide given its apparent safety for mammals but harmful effects on arthropods such as *Drosophila*. However, for erythritol to have practical use as an environmentally-friendly insecticide in agricultural settings, it must have neutral to positive effects on crop plants and other nontarget organisms, including soil and compost-dwelling animals such as *C. elegans*. The purpose of our research is to examine the dose-dependent, nontarget effects of erythritol on *C. elegans* lifespan and larval survival, and tomato (*Solanum lycopersicum*) and corn (*Zea mays*) germination and growth.



# **Investigating the Effects of Artificial Light at Night on *C. elegans* Offspring Production and Lifespan**

**Hardik Nariya**

**Profs. Sharon Wise, Bryant Buchanan, and Jessica Thomas, Faculty Advisors**

Artificial light at night (ALAN) has many broad-scale and global implications for ecosystems and wildlife that have evolved under a 24-h circadian cycle. With increased urbanization, artificial light at night has directly altered natural photoperiods and nocturnal light intensity. Artificial light at night can disrupt behavioral patterns such as foraging activity and mating in animals. Disturbances in natural light and dark cycles also affect melatonin-regulated circadian and seasonal rhythms in *Drosophila*. We investigated the impact of ecologically relevant levels of light pollution on an important invertebrate model, *Caenorhabditis elegans*, as the impact of night lighting at these light levels is currently unknown. In this study, we exposed worms to artificial light at four intensities: 10<sup>-4</sup> lx (control, comparable to natural nocturnal darkness), 10<sup>-2</sup> lx (comparable to full-moon lighting and a low level of light pollution), 1 lx (comparable to dawn/dusk or intense light pollution), and 100 lx (dim daylight level comparable to extreme light pollution) on a 12L:12D photoperiod (100 lx treatments experienced constant light). We measured the impact of these light treatments on offspring production in hermaphroditic *C. elegans*. We grew worms for 2 generations in each light treatment, and then recorded the lifespan and counted the number of hatched offspring produced in the F3 generation. Our data show no significant differences among light levels for lifespan or offspring production suggesting that at least for these life history traits, ALAN does not affect these soil nematodes. Future directions include measuring additional life history traits and circadian gene expression for worms exposed to ALAN.

## **Helicobacter DNA Is Not Present in the Urine of Interstitial Cystitis Patients**

**Summer Carbone**

**Prof. Lawrence Aaronson, Faculty Advisor**

Interstitial cystitis or painful bladder syndrome (IC/PBS) is a disease of the urinary bladder that is characterized by painful urination, hematuria, and sometimes lesions in the endothelium called Hunner's ulcers. The underlying cause of IC/PBS is still unknown. A species of bacteria called *Helicobacter pylori* is commonly found in the gastric mucosa of individuals with peptic ulcers. *H. pylori* utilizes its helical shape and flagella to burrow into the stomach lining where it can successfully colonize, despite the low pH of the surrounding environment. Because of the similarities between peptic ulcers and Hunner's ulcers, previous studies sought evidence that *H. pylori* might be involved in IC, but showed that *H. pylori* is not present in the bladder tissue of patients with this disease. In this study, I hypothesize that *Helicobacter* bacteria are present in the urine of individuals diagnosed with IC/PBS. I hypothesize that other species of *Helicobacter* may have evolved to survive in the urothelium of the urinary bladder. To test this hypothesis, a total of 25 clean-catch urine samples were obtained from individuals with IC/PBS and individuals with other urological disorders to use as a control. The samples were filtered and bacteria were isolated. Taking advantage of the characteristic fused *ropB/rpoC* gene that is specific to only the *Helicobacter* and *Wolinella* genera, PCR was employed along with gel electrophoresis to identify the presence of the fused *rpoB/rpoC* gene in the urine samples. The 16S rRNA gene was also targeted in each sample to determine a baseline level of all bacteria present in the bladder for comparison. No *Helicobacter* DNA was detected in any of the 25 urine samples as evident by the absence of the expected 535 bp PCR amplicon band resolved on the agarose gel. It appears that bacteria of the genus *Helicobacter* are not present in the urine from IC/PBS patients. Future experiments using PCR and primers designed to target the fused *rpoB/rpoC* gene in tissue from bladder biopsies from IC/PBS patients are recommended to further support these findings.

## **The Influence of Artificial Light at Night on Nocturnal Activity of Eastern Red-Backed Salamanders (*Plethodon cinereus*)**

**Steffon Williams**

**Profs. Sharon Wise and Bryant Buchanan, Faculty Advisors**

Most organisms have circadian rhythms that regulate many physiological processes. These rhythms are often controlled by environmental light stimuli such as day-night photoperiodic cycles. Disruption of these delicate circadian rhythms with light pollution (artificial light at night) has been shown to have adverse effects on many species. Amphibians are primarily nocturnal and have evolved under low light conditions; so, they are at especially high risk to increases in artificial light at night. The eastern red-backed salamander (*Plethodon cinereus*) is a nocturnal amphibian that lives under rocks and logs in eastern forests. These salamanders emerge from these refugia at dusk and forage until dawn. If darkness is used as a cue for emergence from refugia, then artificial light at night should delay emergence time and impact nocturnal activity. To test this prediction, we randomly exposed 16 salamanders to 4 lighting treatment groups with day light levels of 100 lx and different intensities of light at night, including 0.0001 lx (dark, control), 0.01 lx (low levels of light pollution), 1 lx (higher level of light pollution), and 100 lx (daylight, control). We used infrared video cameras to record salamander movement continuously for 4 days, and then analyzed these recordings using Ethovision XT7 to determine when animals emerged from and the amount of time they were active outside their refugia. We will present the results comparing the results of the behavior of salamanders under each lighting treatment from 1,536 h of recordings that tracked the movements of these salamanders.

## **Genomic and Biochemical Analysis of Melanin Biosynthesis in *Pseudomonas uticensis***

**Celia Nicolette DeJohn**

**Prof. Lawrence Aaronson, Faculty Advisor**

*Pseudomonas uticensis*, a novel bacterial species originally isolated in our laboratory, was discovered in the cutaneous microbial flora of the redbacked salamander, and was isolated on the basis of its antifungal properties. One of the distinguishing characteristics of *P. uticensis* is its rich, chocolate-brown intracellular pigmentation when grown on nutrient-enriched media. This pigment appears to be a high MW form of melanin, and is enhanced by the addition of tyrosine to growth media. Pyomelanin (PM) is also produced and secreted in the abundance of tyrosine (TYR). The complete sequence of *P. uticensis* genomic DNA was recently obtained and through whole genome analysis, it is apparent that the intracellular melanin in this organism is not eumelanin, since there is no evidence of genes encoding tyrosinase or any enzymes with tyrosinase-dependent pathways of melanin synthesis. *Pseudomonas putida* strain F6 has been shown to utilize p-hydroxyphenylacetate (POHPA) as a substrate for melanin synthesis, so we explored the possibility that this was also occurring in *P. uticensis*, a related species. Cultures were grown on Lawrence Minimal Media (LMM) agar with different concentrations of POHPA and minimal citrate to determine whether POHPA could solely promote growth and stimulate melanin production. The optimal threshold of concentration of POHPA that was not toxic to *P. uticensis* was found to be 0.1% (w/v), which is the same limit of solubility of TYR in aqueous media. Evidence suggested that limiting POHPA and citrate alone do not support growth or melanization. A PM-overproducing mutant strain (MM9) and wild type cells were inoculated on nitrocellulose filters on LMM agar plates to observe extracellular and intracellular pigment production when supplemented with POHPA. Pigment production was quantified using digital imaging methods and the results indicated that POHPA enhances intracellular melanin production, but is not a precursor to pyomelanin synthesis. According to the genome metabolic pathway, this confirms that the enzyme 4-hydroxyphenylacetate 1-hydroxylase, which converts POHPA to homogentisate (HGA), is not present, as predicted by the genome sequence. Furthermore, none of the intermediates of the *P. putida* F6 pathway (3,4-dihydroxyphenylacetate, 3,4-dihydroxymandelic acid, 3,4-dihydroxybenzaldehyde, or 3,4-dihydroxybenzoic acid) enhance melanin synthesis in *P. uticensis*, suggesting that the intracellular pigment is coming from an as yet unidentified alternate pathway.



**SESSION C: Gordon 262**  
*Moderator: Jim Smith, Professor of Physical Therapy*

**Virtual Reality Treadmill Training for Improving Balance and Gait in  
Individuals with Chronic Stroke: A Systematic Review**

**Ava Morabito, Cara Kernoschak, Mary Miceli, and Courtney Wheeler**  
**Profs. Gabriele Moriello and Brittany Wolanin, Faculty Advisors**

Study Design: Systematic Review

Objective: To synthesize the evidence for the use of virtual reality treadmill training (VRTT) on balance and gait in adults with chronic stroke.

Methods: Six reviewers searched six databases (PEDro, PubMed, ScienceDirect, Proquest, Cochrane, and CINAHL), selecting all articles that met the selection criteria. Article quality was appraised through the use of the PEDro Scale by random assignment to four reviewers. Effect sizes were calculated using Cohen's D in order to determine treatment effects. Data pertaining to each study's methodology, participation information, outcome measures, and results were extracted.

Results: A total of 11 articles met the selection criteria. The studies consisted of seven randomized control trials, three pilot randomized control trials, and one within group pretest-posttest design. Eight out of the eleven articles scored a five or higher on the PEDro Scale. For balance outcome measures, dynamic balance (4/6 articles) and balance confidence (2/4 articles) were significantly improved, but results of static balance were inconsistent (1/2 articles). In regards to gait outcome measures, spatiotemporal parameters (4/5 articles), gait speed (5/8 articles), ambulation distance (0/3 articles), and functional gait ability (1/2 articles) were found to be significantly improved.

Conclusion: There is strong evidence this systematic review showed effectiveness of VRTT with improvements in balance and gait impairments in comparison to conventional rehabilitation in individuals following a stroke. VRTT can be used in addition to conventional physical therapy in order to maximize an individual's recovery post-stroke.

Key Words: Virtual Reality Treadmill Training, Stroke, Gait, Balance

## **Does Smart Home Technology Prevent Falls in Community-Dwelling Older Adults? A Systematic Review.**

**Cassandra L. Plows, Amanda M. Drake, Taylor A. Ellis, and Sara C. Silverman  
Prof. Jim Smith, Faculty Advisor**

**Background:** As individuals age they experience age-related changes such as decreases in strength, aerobic capacity, and functioning. Age-related changes have the capacity to lead to falls. A fall can lead to hospitalization or even the need to switch their living environment. Smart home technology may benefit this population for improving safety and preventing falls.

**Objective:** The aim of this study was to gain insight into the evidence about smart home technology and its ability to prevent falls in community-dwelling older adults.

**Methods:** Seven databases: Medline (PubMed), CINAHL, Science Direct, Cochrane Central Register of Controlled Trials, Ageline, and PROSPERO were searched until 09 February 2017. Studies evaluated whether smart home technology would prevent falls in older adults living in the community. Eligibility was assessed by two groups of two reviewers with disagreements resolved by consensus of an independent reviewer. Methodological quality was assessed using the PEDro and Newcastle-Ottawa scales.

**Results:** The search strategy retrieved 173 references. After examination of titles and abstracts, we retrieved the full text of 15 potentially relevant studies. None of these studies met the inclusion criteria for our review.

**Conclusion:** Based on a well-designed and rigorously implemented systematic review, we found no evidence that smart home technology has an effect on fall prevention. While smart home technology has been promoted as a tool for fall prevention we cannot recommend its implementation in the homes of older adults.

**Keywords:** aging in place, smart home technology, smart home, falls, fall prevention

**The effectiveness of alternative and standard computer mice designs in decreasing physical and mental stress in workers.  
A systematic review of controlled trials.**

**Tyler Kallasy, Orrin Carpenter, Emily Chrisman, and Abigail Monroe  
Prof. Ahmed Radwan, Faculty Advisor**

**BACKGROUND:** Previous research has shown that the prolonged use of a standard computer mouse is associated with increased risk of musculoskeletal complaints. Many alternative designs may reduce this risk by optimizing posture, decreasing undesirable muscle activity and improving subjective response. However, evidence behind such alternative mice designs and their efficacy is not fully understood.

**OBJECTIVE:** This systematic review will provide in-depth analysis of the literature regarding the effects of alternative mouse use on the reduction of musculoskeletal symptoms, and improvement of performance in the workplace.

**METHODS:** A systematic review of controlled trials was performed. Four independent researchers searched several databases like PubMed, Sciencedirect, CINAHL, google scholar and specific ergonomics journals. Studies were included if they evaluated physical and psychological symptoms associated with the use of alternative and standard computer mouse designs. Methodological quality of included articles were assessed by two independent researchers through utilizing the physical therapy evidence database (PEDro) and the Cochrane risk of bias questionnaires.

**RESULTS AND DISCUSSION:** This search identified 17 studies within the last decade that met the inclusion criteria for data extraction and analysis. Quality of included studies were deemed to be fair to moderate showing some support for the use of alternative mouse designs such as biofeedback, roller-bar, slanted and vertical mice to reduce upper extremity muscle activity and discomfort of users in comparison with the standard mouse. However, the standard mouse was still the preferred choice of participants in terms of psychological comfort and user preference.

**CONCLUSION:** Currently the evidence behind the use of certain alternative mouse designs is moderate and more research involving long-term analysis of standard and alternative computer mouse use is necessary to determine the overall optimal pointing device is needed.

**CLINICAL IMPLICATIONS:** Computer mouse selection should be an individualized process that is preceded by careful analysis of each individual's needs and work demands. Similarly, ergonomic education on posture and appropriate mouse use is strongly encouraged to complement the effect of alternative or standard mouse use.

Keywords: Computer mouse, pain, fatigue, discomfort, and repetitive stress injuries (RSI).



## **Body-Worn Cameras in the Utica Police Department**

**Caitlin Hopkins**

**Prof. Kyung-Seok Choo, Faculty Advisor**

On August 21 st of 2015, the Utica Police Department (UPD) was equipped with cameras in the VieVu LE3 body-worn video system. This research surveys UPD officer attitudes pertaining to body-worn cameras (BWCs) to measure the UPD BWC operation and impact. In particular, the study will collect information as follows.

- Whether UPD officers support for the cameras,
- Whether cameras help in resolving complaints against officers,
- Whether cameras protect the UPD and its officers from liability,
- Whether UPD and Oneida County DA's Office utilize BWC evidence in court,
- Whether UPD officers believe BWCs reduce use-of- force incidents.

Programs that utilize BWCs can raise many different policy questions, so policy and officer compliance with those policies should be monitored intermittently to determine their effectiveness.

## **The Stuffer**

**Sean Drzewiecki and Aaron Gudrian**

**Prof. Ronny Bull, Faculty Advisor**

STUFFER... is a utility which exploits the reserved bits and padding space of multiple layers of the TCP/IP protocol stack for covert data transfer. Implemented using a custom Python library, Stuffer is easily integrated into existing or future Python applications. Stuffer is currently implemented as a proof of concept in Python, and could be easily ported to other programming languages. This concept can be utilized in command and control systems for botnets, as a method of covert data exfiltration, as well as a pseudo-private line of communication. Current firewall and intrusion detection/prevention technologies are ill-equipped to protect against this technique.

## ***SESSION D: Gordon 271***

*Moderator: Luke Perry, Associate Professor of Government & Politics*

### **Communist Regime Resiliency: Cuba and North Korea**

**Tanner FitzPatrick**

**Prof. Jun T. Kwon, Faculty Advisor**

Since the dissolution of the Soviet Empire in 1991, various communist states outside of Europe, in particular the Castro regime of Cuba and the Kim dynasty of North Korea, face increasing pressure to democratize. Employing most similar systems design to understand how the leadership of both states maintain power, it is vital to understand how these two states compare and differ, analyzing the various aspects of how economic, social, and foreign policies and their impact on regime resilience. Utilizing academic articles on economic and social policies, reports from the Nuclear Threat Initiative, and current events to study foreign policy developments, this study asserts that these communist regimes are able to generate legitimacy through coercive policies. The deviating methods of control between the Cuban and North Korean states have resulted in two very political institutions; in Cuba, economic liberalization has resulted in the growth of the middle class, debate over the efficiency of socialism, and increasing ties with the West, whereas in North Korea, a repressive caste system, manipulation of outside aid, and the deterrence of a nuclear program has created a totalitarian state rule. This paper concludes that while both communist states retain power, North Korea's use of fear and violence has created a negative international stigma of the inefficient leadership, differing greatly from the Cuban regime's progressive transition towards democracy.

### **International Security Negotiations: the Comparison between the DPRK and Iran**

**Sung Jang**

**Prof. Jun T. Kwon, Faculty Advisor**

One of the most enigmatic countries in the world is the Democratic People's Republic of Korea. In a world where countries that were once belligerent to the West like Libya (2003), and Iran (2015) have decided to give up their programs developing weapons of mass destruction (WMD), the DPRK remains defiant. Many both inside and outside of government and academia has asked why that is so yet remain puzzled and lost in their comparisons between both situations. Through this research in comparing the success in coming to an agreeable negotiated conclusion with Iran, against the failed negotiations between the United States and its allies with North Korea there are few things that come to light. Despite the fact that there is a common conception a hawkish foreign policy would serve to pacify adversarial but smaller powers like North Korea and Iran, what is ultimately interesting is that diplomacy is necessary, almost inversely to the successes of threats.

## **The Sea Voyage and The Starving Time**

**Alison Brown**

**Prof. Jason Denman, Faculty Advisor**

Overshadowed by Shakespeare's *Tempest*, Fletcher and Massinger's *The Sea Voyage* is a provocative critique of English colonialism. My presentation argues for the play's engagement with colonial Jamestown, especially the 1609-1610 crisis known as *The Starving Time*.

## **Creative Writing Story in Progress**

**Danielle Harvey**

**Prof. Lisa Orr, Faculty Advisor**

Throughout the semester I have been working on a fantasy fiction story about a fairy and a witch. In my presentation I will discuss what the writing process was like, as well as the factors involved in making a story work.

## ***SESSION E: Gordon 272***

***Moderator: Michelle Boucher, Associate Professor of Chemistry***

### **The relationship between grief and nostalgia in college students**

**Abigail Schaible and Amanda Taurisano**  
**Prof. Steven Specht, Faculty Advisor**

This research is a followup to the research previously conducted by Specht and Roberts (2017) which found a positive correlation between levels of grief and levels of nostalgia in adults currently in grief counseling. We were in whether similar results would be found in a population of college students using the same grief and nostalgia survey. The survey consisted of the Hogan Grief Reaction Checklist, the Southampton Nostalgia Scale, and the Specht Nostalgia Behaviors Scale. The students responded to the surveys which were counterbalanced so that some students would receive the grief items first and others would receive the nostalgia items first. Our results were similar to those of Specht and Roberts, as a positive correlation between levels of grief and levels of nostalgia was found. However, unlike Specht and Roberts, this correlation was only found for the Specht Nostalgia Behaviors Scale, not the Southampton Nostalgia Scale.

### **The Role of Teacher Collaboration in Promoting Equity in United States Schools**

**Anna Anggaputra**  
**Prof. Thomas Diana, Faculty Advisor**

In the United States, students from low socioeconomic backgrounds are 2.5 times more likely to perform poorly on international assessments than their peers from high socioeconomic backgrounds. This persistent achievement gap is particularly troubling given that the United States ranks near the top in terms of how much is spent per student on education. This literature review addresses one factor in the continuing inequity in United States schools: the quality of teaching. Disadvantaged schools are more likely to have less experienced, less qualified teachers, and teachers at these schools are more likely to leave. Higher salaries and bonuses can serve as motivators to improve retention and attract qualified, experienced teachers to the neediest schools. However, this literature review finds that an even more powerful tool in promoting quality teaching across United States schools is teacher collaboration. Teacher collaboration promotes increased teacher well-being, self-efficacy, and professional growth, all of which both encourage teacher retention and promote student achievement. This literature review argues that teacher collaboration is a powerful tool in helping equip teachers to build better teaching and learning environments that encourage student resilience.

## **First Results of the Arecibo Pisces-Perseus Supercluster Survey**

**Taylor Koivuluoma, Nathaniel Flower, and Liam Patterson**  
**Prof. Joseph Ribaldo, Faculty Advisor**

We report the data reduction pipeline and the initial results of the Arecibo Pisces-Perseus Supercluster Survey (APPSS). The survey targets the 21-cm emission signature produced by the neutral hydrogen gas within the galaxies. The galaxies are detected using L-Band Wide (1.15-1.73 GHz) and the 305 meter dish at the Arecibo Observatory. We will describe the data collection and reduction processes, as well as the analysis techniques that will allow us to quantify the rate at which the largest structures in the universe acquire mass over cosmic time.

## **Synthesis of peptide auxiliaries**

**Kyle Podolak**  
**Prof. Benjamin Williamson, Faculty Advisor**

In peptide synthesis, it is useful to have an auxiliary molecule that resides in the region in which the two peptide chains will be linked together in order to ensure chemospecificity and enantiomeric purity. A common issue in peptide synthesis is the epimerization of peptide side chains, which leads to loss of enantiomeric purity and in turn loss of specific function of the peptide. The process of linking two peptide chains, or ligation, is susceptible to epimerization. In an effort to combat this, ligation is done by an imine-induced acyl-transfer approach using serine and threonine residues. The amine group of N-terminal serine or threonine reversibly reacts with the aldehyde of the C-terminus salicylaldehyde auxiliary to form an imine. This is followed by the cyclization of the hydroxyl group of the N-terminal threonine or serine. After cyclization, an O $\rightarrow$ N acyl transfer takes place which gives rise to a stable acetal intermediate. This acetal intermediate is then removed, affording a natural peptide bond. In light of this proposed mechanism, it is necessary for these auxiliaries to be present to ensure correct and specific function of the peptide. A synthetic precursor to one such auxiliary molecule, ethyl-2-hydroxy-6-methyl benzoate, was synthesized through a Michael Addition followed by cyclization in 21.05% yield. Two intermediates in this synthetic pathway to an auxiliary, ethyl-2-acetyl-6-methyl benzoate and ethyl-2-acetyl-6-dibromomethyl benzoate were synthesized in 70.01% and 10.74% yield, respectively. These reactions were monitored by Thin Layer Chromatography (TLC) and analyzed with <sup>1</sup>H NMR to determine identity and purity of each compound. The purpose of this research is to develop an effective and easily reproducible method of synthetically generating peptide auxiliaries.

## Effects of Temperature on Gold Nanoparticle Size

**Joseph Antonacci**

**Prof. Alyssa Thomas, Faculty Advisor**

The ability to create nanoparticles for use in modern products has existed for some time. In the lab was reconstructed a synthesis of gold nanoparticles from Reddy et al's "Gold and silver metal nanoparticle-modified AgCl photocatalyst for water oxidation to O<sub>2</sub>". The common synthetic method is a basic citrate reduction method, which adds sodium citrate to boiling tetrachloroauric acid. As a result of the initial trial of this synthesis, gold nanoparticles were synthesized that were dark red in solution. Analysis with UV-Vis spectroscopy showed that these particles were of larger size than another sample with a less intense reddish or pink color. As both syntheses were run from the same starting material and utilizing the same methodology, it was hypothesized that the size difference must have arisen through some difference in methodological execution. It was further hypothesized that the likeliest point of methodological difference involved the heating of the solution. This issue was further researched to examine whether or not the heating method might play a role in the size of the gold NP products. Specifically, to test whether or not the amount of time the solution was boiled after adding the sodium citrate had an effect on the size of the nanoparticles produced. An analysis via UV-Vis spectroscopy was conducted, and preliminary results appear to indicate that the measured variable, boiling time, has no effect on the size of gold NP products. Further research would have to be conducted, however, to determine fully whether or not boiling time can affect the size of particles produced from this method.



## **POSTER SESSION: Carbone Auditorium**

### **Aquatic Hermaphrodite Snails Exposed to Combinations of Environmental Chemicals Experience Increased Mortality Yet Sustained Reproductive Ability**

**Jasmina Samardzic**

**Profs. Terri Provost and Tom McCarthy, Faculty Advisors**

Hermaphroditic, pulmonate snails are widespread and important members of aquatic ecosystems, and may serve as indicator-species when assessing levels of environmental stress. As benthic organisms living in shallow waters, pulmonate snails risk exposure to anthropogenic pollutants in a variety of combinations, including chemicals in bottom sediments or dissolved in the water. As simultaneous hermaphrodites, individuals may act in the female role and/or the male role during reproduction. This suggests that an overall regulation of the endocrine system is essential for successful reproduction, and that both estrogen and testosterone concentrations may be especially important for an individual. We examined whether exposure to individual and combinations of anthropogenic stressors such as polychlorinated biphenyls (PCBs), PCBs and chlopyrifos, PCBs and estrogen, PCBs and atrazine, and PCBs and Melamine for 4 weeks induced disruptions to the endocrine system by ELISA and affected mortality and reproduction rates in adult planorbid snails (*Helisoma trivolvis*).

### **Greenhouse Sensing & Automation**

**Santina Luce and Kaitlin Trumbull**

**Prof. Ronny Bull, Faculty Advisor**

The purpose of the Greenhouse Sensing and Automation project is to incorporate Internet of Things (IoT) technologies to modernize the Utica College greenhouse. This facilitates automation of day to day redundant tasks such as monitoring temperature, humidity, and turning on and off lights and heaters. This was accomplished by implementing a cost effective wireless sensor network, and using a Raspberry Pi as a customized controller that also provides a web interface to view greenhouse environmental parameters as well as alerting via email and text messaging.



## **Optimization of a Route to 2nd Generation Organosilicate Systems**

**Dakota Monk**

**Prof. Michelle Boucher and Linda Dake, Faculty Advisors**

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. Established routes for introduction of functional groups include silylation of the silicate surface (1st generation systems) and hydrosilylation of a functionality of the 1st generation system (2nd generation systems). Our eventual 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. The work described in this project focused on optimization of the attachment of the 1-butyne-4-ol to the silanol surface. An organosilicate with a silanol functional group was made through direct silylation of the sheet silicate Apophyllite with dimethyldichlorosilane, and the product was characterized through FT-IR spectroscopy. This 1st generation product was reacted with the butyne-ol varying conditions such as time, temperature, and addition of drying agents to optimize the condensation reaction and 2nd generation system product.

## **Gold Nanoparticle Synthesis and Optical Characterization**

**Sabina Kendic**

**Prof. Alyssa Thomas, Faculty Advisor**

A nanometer (nm) is one billionth of a meter ( $10^{-9}$ ) and represents the collection of few molecules or atoms. At this scale (1-100 nm), the properties of materials become dependent on their size and shape and differ from their bulk or individual states. These deviations in behavior observed at the nanoscale are due to electron or quantum confinement, surface to volume ratios, and unique interfaces not present as size increases for a given material. The properties can be tuned by the size of a given structure and not the nature of the material itself. This allows for the possibilities of designing and building structures at the nanometer scale for a variety of applications.

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. This project synthesized a variety of GNPs using the Turkevich method using sodium citrate as the reducing agent as well as the reverse Turkevich method. The ratio of sodium citrate to gold salt was varied to determine the effects on the resulting GNPs. All solutions were characterized using UV-Vis spectroscopy.

## **ACKNOWLEDGEMENTS**

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**The 2017 Utica College Student Research Day Organizing Committee: Joseph Ribaud, Alyssa Thomas, Aaron Mallace, and Luke Perry**



## NOTES

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