

*Utica College
Student Research
Conference*

April 25, 2012



**UTICA
COLLEGE**

Student Research Day

Wednesday, April 25, 2012

Gordon Science Center

Schedule of Events

Welcoming remarks – Dr. Judith Kirkpatrick, Provost, Vice President for Academic Affairs, Utica College - *Donahue Auditorium (Gordon 167)*

- 2:30 - 2:50 **Opening Speaker: Dr. Linda Zee, Associate Professor of Spanish: *Where do you want to go today? Traveling through time and space with zombies, hippos and Johnny Depp.***
- 2:50 - 3:00 **Presentation set-up**
- 3:00 - 4:00 **Concurrent Oral Presentations, Sessions A, B, C, and D**
- 4:00 - 4:30 **Poster Presentations – Gordon 261**

SESSION A: Gordon 261

Moderator: Dr. Daniel Barr, Assistant Professor of Chemistry

- 3:00 - 3:15: **Milk-Induced Sliding of *Bacillus cereus* Is Not Due to Nutrient Starvation**
- **Jeanette McCorry**
- 3:15 - 3:30: **Analysis of the Effects of the Major Components of Bovine Milk on Induction of Sliding Motility in *Bacillus cereus***
- **Kate E. Zeigler and Lyndsay E. Avery**
- 3:30 - 3:45: **Sequence-Specific Protein-DNA Interaction**
- **Suliman Salman**
- 3:45 - 4:00: **Light Effects on Pyomelanin Production in a Novel *Pseudomonas* Species**
- **Stephanie Benzing and Catie Cotrupe**

SESSION B: Gordon 262

Moderator: Dr. Joseph Ribaldo, Assistant Professor of Physics

3:00 - 3:15: Temperature Dependence of the Coefficient of Static Friction

- **William Darman & Armin Rosic**

3:15 - 3:30: Absorbance of Quantum Dots: To Be or Not To Be Aqueous?

- **Zakiya Skeete**

3:30 - 3:45: The Death of the Physid Snails

- **Courtney Healy and Stephanie Calenzo**

3:45 - 4:00: Synthesis and Characterization of Biologically-Active Peptides

- **Nan Thuzar Myint**

SESSION C: Gordon 271

Moderator: Dr. Jennifer Yanowitz, Assistant Professor of Psychology

3:00 - 3:15: Cross Cultural Differences and Expatriate Training Between Canada, France, and the United States

- **Stephen S. Karboski Jr.**

3:15 - 3:30: Adaptation of a Prototype Behavior Conditioning Model in a Research Study of Stakeholder Perceptions of Organization Value in a Residential Nonprofit Organization

- **Tracy Balduzzi and Theresa Staring**

3:30 - 3:45: Moral Condemnation and Dystopian Society in Ursula K. Le Guin's "The Ones Who Walk Away from Omelas"

- **Brandy Miller**

3:45 - 4:00: It's Playtime! : Archaeological Interpretations of Human Behavior at a Hypothetical and Historic Playground

- **ANT 267 Group – Kayla Thurston, Kristy Allen, Haley Butler, Ashley Cappadonia, Kris Mahar, and Meg Willett**

SESSION D: Gordon 272

**Moderators: Dr. Mary Ann Janda, Professor of English and Dr. Linnéa Franits,
Associate Professor of Occupational Therapy**

3:00-4:00: Narratives of Disability – Poster Session and Round Table Discussion

***Please note: The posters from this session will remain available during the general
poster session from 4:00 – 4:30.**

ORAL PRESENTATIONS

SESSION A: Gordon 261

Moderator: Dr. Daniel Barr, Associate Professor of Chemistry

Milk-Induced Sliding of *Bacillus cereus* Is Not Due to Nutrient Starvation

Jeanette McCorry

Dr. Lawrence Aaronson, Faculty Advisor

Bacillus cereus is a gram-positive rod-shaped bacterium found in soil, and is often a contaminant of unpasteurized milk. *B. cereus* is a motile bacterium with several forms of motility: swimming in liquid media; swarming and sliding on moist surfaces. Swarming is due to hyperflagellation on nutrient-rich media while sliding is an aflagellar mode of motility. We observe *B. cereus* sliding only on agar media containing cow's milk where the bacteria exhibit distinctive dendritic growth. The transcriptional regulator, PlcR is known to regulate motility in *B. cereus* by controlling expression of flagellar proteins; Δ PlcR strains exhibit sliding. On milk, *B. cereus* peptonizes casein for nutrition, due to lack of sugar availability. Therefore, we hypothesize that the addition of glucose to milk agar will suppress sliding as PlcR induces swarming motility. *B. cereus* was inoculated onto agar plates with varying combinations of milk, tryptone, sheep's blood and glucose, and incubated at 30°C for 48 hrs. Cells from the edges of colonies were collected for mRNA extraction. RT-PCR was performed using primers for EP, hblA, fliC and plcR. Results show that sliding occurs on whole or diluted milk, on milk + 1% glucose and milk + 3% sheep blood. No sliding was observed on tryptone, TSA+blood agar. RT-PCR studies indicate no expression of plcR in sliding cells, while hblA and EP RNA was evident, suggesting that one or more components of milk induce sliding in *B. cereus* through undetermined signaling pathways, and that sliding is not a carbon starvation response in this organism.

Analysis of the Effects of the Major Components of Bovine Milk on Induction of Sliding Motility in *Bacillus cereus*

Kate E. Zeigler and Lyndsay E. Avery

Dr. Lawrence Aaronson, Faculty Advisor

Bacillus cereus is a motile Gram-positive bacterium. When the bacteria are introduced into a nutrient-deprived environment, they fail to produce flagella in an effort to conserve energy. On bovine milk agar, *B. cereus* exhibits distinctive sliding, characterized by dendritic outgrowths. Recent data in our lab showed that the addition of 1% glucose to milk agar does

not suppress sliding behavior, contradicting the idea that sliding is the result of a starvation effect. This suggests that one or more components of milk stimulate sliding in *B. cereus*. To test this, *B. cereus* 14579 was grown on tryptone agar supplemented with the major components of milk including calcium, potassium, lactose, vitamin D, and lactoferrin with concentrations equivalent to that in whole milk. Plates were inoculated with *B. cereus*, incubated at 30°C, and examined after 24 hr and 48 hr incubation. *B. cereus* did not exhibit sliding when grown on any of these single constituents of milk. These results show that individual major components of milk do not induce sliding motility in *B. cereus*. However, recent data in our lab showed that the addition of the detergent NP-40 to tryptone agar induces sliding. Future studies will explore how the physical properties of the agar affect the surface tension of the media and sliding in *B. cereus*.

Sequence-Specific Protein-DNA Interaction

Suliman Salman
Dr. Daniel Barr, Faculty Advisor

Most biological processes start at the molecular level of protein-DNA interaction, triggering more complex processes. Sequence specificity plays an important role in the protein-DNA interaction. However, little data are available in the literature concerning exactly how sequence specificity mediates the protein-DNA interaction or how changes in the sequence affect that interaction. To answer such questions, we simulated two peptides interacting with both specific DNA and mutated DNA using VMD and NAMD. We simulated gal protein with gal DNA, and lac repressor protein with lac DNA. Then we simulated gal protein with lac DNA, and lac protein with gal DNA. The simulations ran for approximately 50 nanoseconds in real time. We measured the sequence preference of the peptides by analyzing RMSF, hydrogen bonding patterns, and interaction energies in the protein-DNA systems. As expected, the protein showed lower fluctuations and greater stability when complexed with the sequence specific for the protein. The protein interacting with a mutant DNA however, spent less time. We conclude that changing as little as two amino acids or one nucleotide of the system can cause dramatic differences in sequence-specific protein-DNA interaction.

Light Effects on Pyomelanin Production in a Novel Pseudomonas Species

Stephanie Benzing and Catie Cotrupe
Dr. Lawrence Aaronson, Faculty Advisor

Novel *Pseudomonas* sp. UC17F4 produces a pigment identified as pyomelanin on nutrient-rich media. Recent work in our lab has focused on quantifying the effects of light intensity, the length of exposure to light, and the density of cells on pyomelanin production. In this study, several conditions were tested – time and intensity on the production of pyomelanin and light intensity on pyomelanin after production. UC17F4 was cultured on TSYE agar at several dilutions. The first study was conducted by placing bacterial cultures

under constant light for varying amounts of time. In the second study, the cultures remained under varying light intensities for a constant amount of time. Lastly, UC17F4 was allowed to grow and produce pyomelanin under room light, and were then subjected to high-intensity light for varying time periods. To extract the melanin from the cells, harvested cultures were centrifuged and the resulting cells were lysed by boiling in 1% SDS. The lysates were analyzed for absorbance by UV spectrometry at 335 nm. It was found that pyomelanin production was dependent on the density of cells, with the most diluted cultures exhibiting a lower amount of pyomelanin. A two-fold increase of pyomelanin was exhibited in time exposures up to 35 min. The concentration of pyomelanin increased up to 250 lux, though the decline in pyomelanin production above 250 lux suggests that photobleaching may occur. Also, time- and intensity-dependent changes in pyomelanin concentrations were of lesser magnitude suggesting that quorum sensing may induce pyomelanin production.

SESSION B: Gordon 262

Moderator: Dr. Joseph Ribaud, Assistant Professor of Physics

Temperature Dependence of the Coefficient of Static Friction

**William Darman and Armin Rosic
Dr. Lawrence Day, Faculty Advisor**

The coefficient of static friction is the ratio of the friction force need to keep an object in equilibrium and the normal force exerted on that object by the surface. This coefficient is thought to be a constant in most circumstances but the theoretical basis for the coefficient of static friction is not well understood. The current theory about static friction is that there is slight bonding between the two surfaces. If this theory is correct then there should be circumstances that result in the coefficient of static friction changing value. In other words, there should be ways to disrupt or increase the bonding process. We will heat different materials and measure the coefficients of static friction. To collect this data we will use a metal plate on an incline and place different materials on this metal surface. By heating the metal plate we will heat the object placed on it. If the object starts to slip down the incline we have decreased the coefficient of static friction. From this data we will create a graph of the coefficient of static friction as a function of temperature. In this way we should be able to gain insight into both the force and the coefficient of static friction and how they behave in various materials.

Absorbance of Quantum Dots: To Be or Not To Be Aqueous?

Zakiya Skeete

Dr. Alyssa Thomas, Faculty Advisor

Quantum dots (QDs) are nanometer-sized semiconducting crystals. Since their size is on the nanometer scale (10^{-9} m), changes in their diameter can alter their optical properties, such as the solution color in ambient light and under ultraviolet (UV) light. Under UV light, the QDs glow due to the excitation of the electrons to a higher energy level. Based on the size of the QDs, they emit different wavelengths as the electrons return to their ground state after excitation. Changes in size can also affect the absorbance spectra. The objective of this experiment was to determine if different media play a role in the absorptivity of a variety of QDs (CdS, CdSe, etc). Analyzing the optical properties of the QDs, show how the properties are affected by solvent changes; therefore the solvent can change accordingly when the QDs are used for biomedical applications. This experiment compares how CdS, prepared in aqueous phase, and CdSe, prepared in organic phase, behave in different media. Previous experiments explored the stability of CdSe QDs in various solutions in terms of solubility, but were not analyzed for absorbance changes. This project analyzed the absorbance changes of both CdSe and CdS QDs in various solutions (aqueous and non-aqueous) and found that CdS QDs were soluble in the same solvents that CdSe were, as well as others. UV-visible spectroscopy was used to look at the absorbance and analyzed to predict possible changes in the emission of the QDs. The results of the CdS absorbance were found inconclusive.

The Death of the Physid Snails

Courtney Healy and Stephanie Calenzo

Dr. Terri Provost, Faculty Advisor

Chlorpyrifos is an organophosphate pesticide that is found in farm run off. Research has shown that Chlorpyrifos causes effects on the nervous system, and growth rates in prenatally exposed mammals. Physid are aquatic snails that live in areas where run off from farm land occurs. The current study was conducted to investigate cellular changes, which may lead to reproductive inhibition in these snails. Twenty snails were separated into 4 treatment groups. Our vehicle control group was treated with 200 μ l of methanol. The third group was treated with Chlorpyrifos in methanol diluted in aged water to a final concentration of 0.09%, the maximum acceptable concentration found in drinking water. The fourth treatment group was treated with Chlorpyrifos in methanol diluted in aged water to a final concentration of 0.025%, the average concentration found in drinking water. Within 4hrs, the snails in the Chlorpyrifos treatment groups were no longer moving and were pronounced dead. The methanol treatment snails appeared healthy and motility remained the same when compared to the control group. Therefore, the methanol did not have an effect on the snails in the Chlorpyrifos treatment. Further research will take place to determine the exact effects of this chemical on snails, and on prenatally exposed mice.

Synthesis and Characterization of Biologically-Active Peptides

Nany Thuzar Myint

Dr. Daniel Barr, Faculty Advisor

Sequence specific DNA binding to proteins has a vital role in the regulation of the cellular activities in various environments. Proteins use varieties of methods to communicate with specific DNA sequences such as identifying the DNA structure using geometry and flexibility and recognizing the hydrogen bond between proteins and DNA bases. A slight change in amino acid residues of protein may result the significant differences in recognition of the preferred DNA from mutation experiment. Although the specific framework between the proteins and DNA have been proposed³, the biochemists are interested in explaining and predicting the direct recognition code of proteins and DNA interactions. In this research, a small peptide chain (PFVKL) was synthesized characterized using NMR and GC-MS spectroscopy. Additionally, a tripeptide (CSL) is being synthesized and investigated for coupling to nanoparticles and applications in therapeutics.

SESSION C: Gordon 271

Moderator: Dr. Jennifer Yanowitz, Assistant Professor of Psychology

Cross Cultural Differences and Expatriate Training Between Canada, France, and the United States

Stephen S. Karboski Jr.

Dr. Marie-Noëlle Little, Faculty Advisor

The world is no longer as big as it once was, and businesses are sending their top employees or expatriates abroad and to neighboring countries to do business and live. The only difference is that there are variances in culture, society and basic life. The majority of people from the United States do not understand much about other countries. Without proper knowledge of these countries' culture differences (in this case Canada, France and the United States), expatriates have a high rate of failure and so does the business in that country. Expatriate training is a substantial part of a company's success in neighboring and foreign countries. Properly trained expatriates have a higher success rate when the average failure rate is around 50%. It is shown that expatriates who know the culture they are immersed into assimilate into the culture better. They will not only do well, but also flourish and become an integral part of the company abroad.

Adaptation of a Prototype Behavior Conditioning Model in a Research Study of Stakeholder Perceptions of Organization Value in a Residential Nonprofit Organization

**Tracy Balduzzi and Theresa Staring
Dr. Dana B. Hart, Faculty Advisor**

The behavior conditioning model emerged from a two year research study conducted in 2010-2011 entitled, “*Mapping Behavioral Conditioning Theories: A Literature Meta-Analysis.*” Through the review of 130 articles in 27 psychological journals, a framework emerged integrating the cognitive domains deemed by authors as critical dimensions of behavior change. In the Fall 2011 the “Behavior Conditioning Model” was presented at several health care conferences with positive audience feedback regarding relevance and applicability to explore behavior perceptions.

In an effort to further apply the behavior conditioning model in an organizational setting, the authors will engage the Pathfinder Village community. The Pathfinder Village is a residential facility serving over 80 Down syndrome and related disability residents in Edmeston, NY. The organization has contracted the Leadership Institute of Utica College to conduct an assessment of residential life at the facility. The graduate student researchers will present the behavior conditioning model and research proposal to be conducted during the summer of 2012.

This presentation will demonstrate how the “*Behavior Conditioning Model*” can be used as an applied research process in a developmental research study of the stakeholder perceptions of service value in the Pathfinder Village organization.

Moral Condemnation and Dystopian Society in Ursula K. Le Guin's "The Ones Who Walk Away from Omelas"

**Brandy Miller
Dr. Frank Bergmann, Faculty Advisor**

For this research paper, I was required to analyze a short story by Ursula K. Le Guin in light of literary criticisms published on the author in general and more specifically, on my chosen piece. The purpose of this assignment was to demonstrate the worth in using outside, educational viewpoints as tools in formulating personal, analytical interpretations of any given piece of literature. The story I chose to study was “The Ones Who Walk Away from Omelas”, an illustration of a dystopian society founded and maintained on the suffering of one innocent child. For my research, I explored four different essays. In regards to the literature published by Shoshana Knapp, I analyzed how the style of narration evident throughout the piece deliberately incriminates the reader and puts them, along with the people of Omelas, on trial for the injustices done to the child. Additionally, I delved deeper into the notion of a scapegoat, or a pharmakos, as defined by Northrop Frye. Next, I researched a paper written by Jeree Collins during which she spoke specifically of Omelas as

a critique of our contemporary American lifestyle. Closely related to this notion was the criticism set forth by Donald Theall whom, widening the scope, argued that all of Le Guin's fictional settings are reflections of the societies in which we ourselves live. I ultimately came to the conclusion that through her writing, Le Guin hopes to make readers cognizant of their own moral codes, and in doing so, open the door for true utopias to form.

**It's Playtime! : Archaeological Interpretations of Human Behavior
at a Hypothetical and Historic Playground**

**Kayla Thurston, Kristy Allen, Haley Butler, Ashley Cappadonia, Kris Mahar, and
Meg Willett
Dr. Helen Blouet, Faculty Advisor**

This presentation documents research conducted by the current ANT 267: Introduction to Archaeology class. Class members excavated a portion of a mock-archaeological site designed by Professor Helen Blouet of the Sociology and Anthropology department. The purpose of this presentation is to explain how the students performed excavation, site analysis, and artifact identification in order to draw preliminary conclusions about a hypothetical archaeological site that was once a playground where boys and girls amused themselves with many toys and spent time with family members. Overall, this project presents the utility of a variety of archaeological and analytical methods in the reconstruction and interpretation of human behaviors at a hypothetical and historic playground site.

SESSION D: Gordon 272

***Moderator: Dr. Mary Ann Janda, Professor of English and Dr.
Linnéa Franits, Associate Professor of Occupational Therapy***

Narratives of Disability

**Eyslin Bekoe, Kirt Broedel, Jenna Curtis, Sal DeAngelo, Tiffany Gilberti, Krystal
Gonzalez, Jaime Hillman, Brian Marcantonio, Matthew Mariani, Michael Miner,
Katelin Murphy, Joseph Panford, and Elysa Vogt
Dr. Mary Ann Janda and Dr. Linnéa Franits, Faculty Advisors**

The aim of this project is to describe how a variety of analytical models can be applied to narratives where disability is present. Thirteen different narratives have been chosen and each one analyzed using a selection of theoretical lenses, demonstrating how disability is

understood, exemplified, and framed within story. After the audience has had an opportunity to view the posters describing these analyses, students will conduct a roundtable discussion about their ongoing research.

POSTERS

Located in Gordon 261

The impact of artificial light at night on the development and growth of the cricket *Acheta domesticus*.

Sarah E. Crill,

Dr. Bryant Buchanan, Dr. Tom McCarthy, and Dr. Sharon Wise, Faculty Advisors

The impact of artificial light at night (light pollution) has been shown to affect the physiology and behavior of many species of vertebrates but little research has examined the effect of light at night on invertebrates. We are examining the impact of artificial light at night on growth and development of the nocturnal domestic cricket (*Acheta domesticus*). We hypothesized that artificial light at night would alter development and growth (increasing or decreasing rate of growth) compared to normal dark-night controls. To test this hypothesis, we are collecting 12 eggs from each of 24 females and exposing 3 eggs each (determined randomly) to a 12L: 12D photoperiod with nocturnal light levels of 0.0001 lx (starlight), 0.01 lx (moonlight), 1 lx (dawn/dusk lighting), and 100 lx (overcast day/room lighting). All treatment groups are exposed to 100 lx illumination during the day. We will compare the number of days to hatching and number of days to each instar (averaged for each of the three eggs in each treatment) in each of the lighting levels. Preliminary results will be presented.

Perceived pleasantness of androstenone in adult humans based on sexual orientation and sex

Janelle Crouch and Liz Lopez

Dr. Daniel Kurtz, Faculty Advisor

Human communication through pheromones has been a matter of debate; studies of the human olfactory system and the vomeronasal organ (VNO) provide evidence that humans can communicate via pheromones. Androstenone, a compound that acts as a pheromone in boars, is also found in some human bodily fluids and may act as a pheromone for sexual attraction in humans. We hypothesized that participants' sexual orientation, sex, and the interaction of these two factors would influence their detection and perception of

androstenone. To test this hypothesis, participants were presented with samples of diluted androstenone and asked to report the perceived pleasantness of the substance using a 9-point hedonic scale.

Synthesis and Characterization of Enantiomerically Pure Amino Acids

Karolina Kirilko

Dr. Daniel Barr and Dr. Michelle Boucher, Faculty Advisors

Impure enantiomers can cause dangerous physiological consequences, so it is important to determine chiral properties, particularly purity. This can be done using spectroscopy. In this research project I am making a MTPA functionalized phenylalanine with the purpose to make a product for NMR analysis. A well-organized plan for the synthesis has been developed using both D- and L- phenylalanine, which are isomers (enantiomers) of each other. Resulting compounds will be tested for purity using ^{19}F - NMR as the analytical technique. Due to the use of ^{19}F - instead of ^1H - or C-NMR, some work will be required to adjust the NMR spectrometer to identify ^{19}F . Work done in this research will continue to benefit the biochemistry program as ^{19}F -NMR can be used for determination of protein structure and conformational changes.

Synthesis, Purification, and Characterization of Ligand 1 Precursors

Lindsay Grenier

Dr. Bryant Buchanan and Dr. Sharon Wise, Faculty Advisors

Light pollution, which is caused by the overuse of artificial light at night, is a growing problem in many ecological habitats. It has been shown to have negative effects on the behavior of animals, including foraging, and physiological function such as metabolism and hormone regulation. We investigated the effects of light pollution on the development and reproductive output of the fruit fly, *Drosophila virilis*. We hypothesized that increases in exposure to artificial night lighting would cause changes in development and reproductive output relative to normal, dark night lighting. We tested this hypothesis by exposing virgin male/female pairs to four different light intensities at night (0.0001 lx-dark; 0.01 lx-bright moonlight; 1 lx-dawn/dusk; and 100 lx-room lighting) while keeping daylight constant in all treatments (100 lx). We allowed females ($n = 32$) to lay eggs in separate vials with moistened media and measured time to pupation (days), time to eclosion (days), and the number of offspring produced in a one-week period following the first eclosion. Preliminary results suggest that night lighting affects developmental rate and total number of offspring produced, although a larger sample size (in progress) is needed to have confidence in these results.

Study of Foreign Language Teachers

Luke Manolescu

Dr. Linda Zee, Faculty Advisor

The main objective of this study was formulated to observe and research local educators who have studied abroad (specifically to Hispanic countries) in the content area of Adolescent Spanish education. Further research was conducted on the differences between ethnic and non-ethnic teachers of foreign languages, and the direct impact it has on the learning development of students. These topics are relevant to my field of study primarily because it is vital to know that as a future educator of Spanish, studying abroad can greatly influence improvements in language abilities and broaden cultural viewpoints. Research entailed using multiple approaches such as: exploring differentiated classroom instruction/observation (in each teacher's classroom throughout the semester), conducted personal interviews with each individual teacher, discussed opinions on ethnic vs. non ethnic with teachers, and researched facts on language immersion in Hispanic countries for teachers of foreign language. The outcomes of this investigation of teachers supported my case that total language immersion through a study abroad program was beneficial for teachers learning the Spanish language. Further results from interviews concluded that non-ethnic teachers by most part are better qualified language teachers than ethnic teachers (research/opinion based). The implications to this project can potentially influence others and me to find the opportunity to study abroad and experience total cultural and language immersion.

Effects of *Bradyrhizobium japonicum* hosted by soybeans (*Glycine max*) on tomato plants (*Lycopersicon esculentum*)

Alexander J. Moyer

Dr. Sara Scanga, Faculty Advisor

Bradyrhizobium japonicum are symbiotic bacteria found on the root nodules of soybean plants. Legumes are used in crop farming to fixate nitrogen from the atmosphere to the soil after being tilled in. Previous research has shown that crop rotation is effective as well as its ability to supply the soil with an excess amount of nitrogen for the next year's crop. The objective of this study is to determine the effects that *bradyrhizobium japonicum* have on the growth of neighboring tomato plants. We are growing soybean plants alongside tomato plants in the same pots to test whether the symbiotic bacteria promote a prosperous soil environment. We will observe the tomato plants as they grow and look at plant characteristics such as height, color, leaf size, dry weight, and stalk girth. Plants will be compared between a control group without soybeans and an experimental group used to mimic the crop rotating process. Our results will help with further studies in eliminating harmful persistent fertilizers.

Characterization of noble metal nanoparticles: Study of pH effects

Sai Han Myo Tun

Dr. Alyssa Thomas, Faculty Advisor

A nanometer is one billionth of a meter (10^{-9} m) 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 compared to the bulk state. The physical and optical properties have very unique features due to electron confinement and high surface to volume ratios. Among these are noble metal (copper - Cu, gold - Au and silver - Ag) nanoparticles (NPs) that to the naked eye will appear colored in solution from pale red to black, depending on the NPs size and distribution. These colors are due to surface plasmon resonances, which are sensitive to small changes in the particle size. This research will analyze the relationship between size and size distribution of synthesized Au NPs and initial concentration of reagents as well as the stability of the synthesized Au NPs in various pH environments.

Second Step of a Model System for Photochrome Attachment to an Apophyllite Base

Karisa Rawlins

Dr. Michelle Boucher, Faculty Advisor

People who wear prescription glasses, and are dependent on them to improve their vision, often find it irritating having to wear their glasses, instead of sunglasses, on very sunny days. However, photochromic compounds have been incorporated with prescription glasses to create transition lenses, which darken in sunlight and recover transparency in diffused light. Photochromic compounds are compounds that have the ability to transition between two states of reversible color when they are exposed to different wavelengths of light.

Apophyllite is a naturally occurring silicate mineral that is composed of a siloxane lattice with pendent oxygens sticking out from the surface. These oxygens offer fixed bonding sites on a silicate template where many different functional groups, such as photochromic compounds, can be attached. The modified silicate/functional group hybrid has properties from the organized silicate lattice and from the incoming functional group.

The focus of this project has been to attempt to synthesis a series of organosilicon hybrid materials with functional groups that can be reacted further through chemical routes such as hydrosilylation. A series of alkene substituted organosilicon hybrid materials has been synthesized including a vinyl dimethylsiloxy silicate and a hexenyl dimethylsiloxy silicate. These functional groups have been further reacted by attaching small model molecules, such as pentamethyl disiloxane, to the alkene group using hydrosilylation. The attachment conditions were studied to maximize linkage. Then, using the previously worked out conditions, larger molecules that resemble photochromic molecules were introduced to the silicate surface. The goal for this project is to synthesize photochromic molecules modified

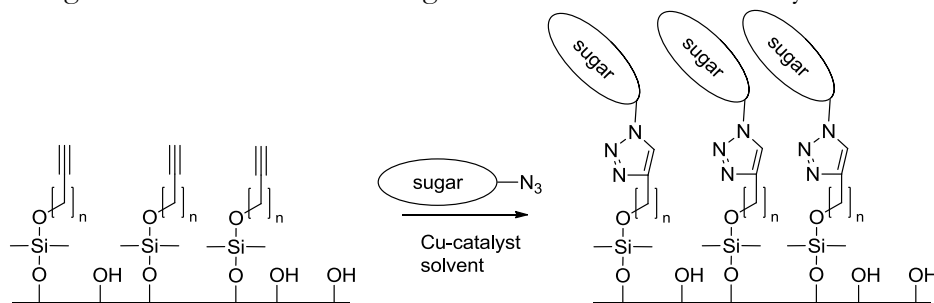
with a Si-H functionality that then can be attached through hydrosilylation to the alkene functionality on the silicate surface.

Synthesis of Glycosylated Organosilicates

Amanda Sulicz

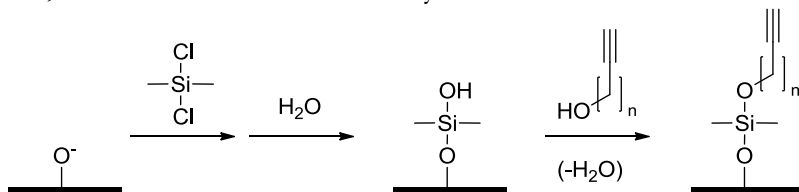
Dr. Michelle Boucher, Faculty Advisor

In this research we aim to generate a series of materials that present sugars covalently bound to a planar organosilicon framework through the use of “click” chemistry.



The overall goal is to synthesize a new class of materials in order to study the effect of the introduction of strongly hydrophilic groups onto the hydrophobic backbone. Creating a library of silicates where the 2nd generation and 3rd generation appended groups are varied should allow for tuning of the gel-forming properties in these materials. These systems should offer the potential to form gels in aqueous solvents and fundamentally change the hydrophobic nature of the system. This will allow for the use of these gels in the study of immobilized organic and biomolecules. Importantly, the layered nature of these materials should lead to diffusion properties that allow for more flexibility and mobility of molecules trapped in the gel. This layered nature also shows potential for mixed hydrophobic/hydrophilic regions that more closely mimic those of cell membranes compared to current sol-gel derived materials, and therefore have potential for the immobilization and stabilization of membrane-associated proteins. This system has potential in other arenas as well. Silicon carbohydrates are of interest for biotechnology applications, as chiral scaffolds for catalysis and as nanocomposite materials.

Work on this project has focused on the synthesis of an alkyne-substituted sheet polymer through silylation, and condensation with an alkyne alcohol.



The first step of this reaction has been successful and product has been obtained in good yield. The condensation reaction has shown some reactivity, but reaction conditions continue to be optimized.

Ethical Guidelines

Institutional Review Board (IRB)

The research projects presented at this forum that involve human subject participation were reviewed and approved by Utica College's Institutional Review Board. The IRB's purpose is to assure that appropriate steps are taken to protect the rights and welfare of humans participating as subjects in a research study. IRB works to ensure that student research projects with human participants maintain ethical standards, use appropriate research methods, fully promote informed and voluntary participation, and create protocols to protect the safety of its participants.

Institutional Animal Care and Use Committee (IACUC)

If research presented by students at this forum involved the use of non-human vertebrates (and octopuses), the proposals were reviewed and approved by the Institutional Animal Care and Use Committee (IACUC). The function of the IACUC is to assure that procedures used to test these animals are appropriate and that the well-being of these animals are considered in the design and implementation of experiments.

ACKNOWLEDGMENTS

The UCSRC would like to thank both the students and the faculty advisors for their interest and support. This conference is sponsored by the Office of the Provost and we would like to thank Provost Judith Kirkpatrick for her support. We would also like to thank Dr. Linda Zee, Dr. Daniel Barr, and Dr. Joseph Ribaud.

The UCSRC 2012 Committee: Jennifer Yanowitz and Alyssa Thomas