New York Six Liberal Arts Consortium
Upstate New York Undergraduate
Research Conference
Saturday, September 21, 2013
New York Six Liberal Arts Consortium
Upstate New York Undergraduate
Research Conference
Saturday, September 21st

~ SCHEDULE ~

9:00am – 9:30am  Registration and Morning Refreshments

9:30am – 9:40am  Welcome

9:45am – 11:05am Oral Presentations, Sessions 1 and 2
Session 1: Eben North
Session 2: Eben South

11:15am – 12:15pm Poster Session 1
Eben Main (Center)

12:15pm – 1:15pm  Lunch
Dana Dining Center

1:15pm – 1:30pm  Break and Set up for Poster Session 2

1:30pm – 2:50pm  Oral Presentations, Sessions 3 and 4
Session 3: Eben North
Session 4: Eben South

3:00pm – 4:00pm  Poster Session 2
Eben Main (Center)
Oral Presentations Session I
9:45am – 11:05am
Eben North

Sufia Bakshi and Scotlynne Rieder
Clarkson University
The Effects of Estrogen in Cervical Epithelial Cells
Mentor: Craig D. Woodworth

The major risk factor associated with cervical cancer is infection with high-risk human papillomaviruses (HPV). HPV16 and 18 alone cause 70% of cancers attributable to HPV. However, HPV resolves spontaneously in 80 – 90% of cases; the low frequency of persisting infections suggests that HPV alone does not lead to cervical cancer. Scientists believe that non-viral cofactors, such as estrogen, must also contribute to the onset of cancer. The uterine cervix is highly responsive to estrogen and recent studies suggest that estrogen and its receptor, ERα, in combination with HPV oncogenes, contribute to carcinogenesis by inducing cell proliferation. We are measuring and comparing the estrogen responsiveness of cultured HPV16-immortalized, tumor, and normal cervical epithelial cell lines. Cells are transfected with a reporter gene containing the estrogen response element (ERE) attached to the firefly luciferase gene. The cells are treated with varying dosages of estradiol and the estrogen activity is determined using the dual luciferase assay. Overall, our findings support high estrogen sensitivity in normal cells and low responsiveness in tumor lines. We will use this data to determine the optimal dosage and duration of exposure to fulvestrant, an estrogen receptor inhibitor, as a treatment of HPV-infected cells.

I’d like to acknowledge and thank the National Institutes of Health (NIH) for their support and funding, and for the resources and knowledge provided by our mentor, Dr. Craig Woodworth.

Shelby Casas
Clarkson University
Breeding Habitat Differences in St. Lawrence County for Golden-winged and “Brewster’s” Warblers
Mentor: Tom Langen

In recent years, the golden-winged warbler (Vermivora chrysoptera) has suffered a severe population decline in North America, and is thus a candidate for federal listing as a threatened species. This decline is associated with decreased shrubland habitat for breeding, and hybridization with the blue-winged warbler (Vermivora pinus). The Upper and Lower Lakes and the Fish Creek State Wildlife Management Areas (SWMA) are New York State-owned and managed regions where there is documented golden-winged warbler populations. However there is no data on population size or whether blue-winged warbler or blue-winged/golden-winged warbler hybrids like the “Brewster’s” warblers are present. The purpose of this survey was to examine whether golden-winged warblers and hybrids occur in different habitat. Thus golden-winged warblers and hybrids were located using playbacks in appropriate habitat at each SWMA, and these points were mapped using ArcGIS 10.1. A total of 24 phenotypic golden-
winged warblers and 9 Brewster’s warblers were detected. A random selection of the golden-winged and Brewster’s warbler points were then analyzed for their habitat differences based on vegetation type and size, canopy cover, and distance to forest edge. With this information, land management can specialize in habitat preferences of each bird species and assist in habitat improvement of sites favored by golden-winged warblers.

Paulina Piotrowski
Union College
Characterization, Identification, and Synthesis of Drosophila athabasca Cuticular Hydrocarbons
Mentor: Joanne Kehlbeck

Discrimination in mate selection is a crucial step leading to speciation. Selection in insects is guided by hydrocarbon pheromones located on their exterior cuticle, which is coated with a complex mixture of straight-chain saturated, unsaturated, and branched hydrocarbons. In Drosophila, cuticular hydrocarbons are among factors known to act as sexual signals. Unique species-specific profiles enable recognition among individuals of the same species. Drosophila athabasca, found widely throughout Northern America, is in the process of speciation, with three distinct behavioral races; WestNorthern found primarily in Canada and Alaska and two Eastern races, A and B. These races are morphologically similar; however, an overall pattern of sexual isolation exists among them. This discrimination in mate selection makes D. athabasca an excellent model for nascent speciation. We hypothesize that cuticular hydrocarbon profiles of the D. athabasca races are critical to sexual discrimination and thus speciation.

Investigating the unique cuticular hydrocarbon profiles of the D. athabasca races provides insight to the biochemical factors influencing sexual isolation. We have characterized D. athabasca cuticular hydrocarbons using GC-MS analysis of several isofemale lines and individual flies. The cuticular hydrocarbons were identified using mass spectrometry analysis and confirmed by comparison with commercially available analytical standards or synthesized compounds. Dimethyl disulfide (DMDS) derivatizations were used to unambiguously identify sites of unsaturation. The most abundant cuticular hydrocarbons of WestNorthern and Eastern A races were synthesized. Synthesis of monounsaturated cuticular hydrocarbons was achieved by cis-directed Wittig reactions. Dienes were synthesized by coupled substitution reactions of deprotonated acetylenes followed by P-2 reduction.

Gili Rusak
Siena College
Codester: An Android App for Teaching Computer Science
Mentor: Darren Lim

Learning to program is like learning a language. Studies have shown that it is important to start learning at an early age to build up depth and understanding in both subjects. Mastery in computer programming may be achieved, especially if started at an early age.

Accordingly, we have developed an Android™ game app called Codester that will teach the users, kids or adults, the basic principles of coding. The goal of the game is to transport Codey, the game’s
protagonist, to the designated target. Throughout the levels, the player is guided in learning programming concepts of sequencing, decision making, iteration, and code reuse to make solutions more efficient, clean, and robust. Codester relies on arrows and symbols instead of words, a system with many advantages. It can globally reach many users, ranging from young children who haven’t learned to read to adults who are interested in learning basics of programming, including people who don’t know English. We also maintained space efficiency using this system.

This project is two-fold: first, we designed and created the app, and second, we will use the app to create outreach programs, in order to teach programming to all levels of the community. This app teaches programming through the use of logic, procedural thinking, and problem solving, something that is never too early to teach. It can help the users with more than just coding; it may help with math, the sciences, and even writing where individuals must organize their thoughts into a logical order.

Oral Presentations Session 2
9:45am – 11:05am
Eben South

Hoa Dieu Bui
Colgate University
Vietnamese Teachers’ Agency in Responding to Gendered Messages in the National Textbook and Classroom
Mentor: Kay Johnston

This is a case study examining the way in which ninth-grade Vietnamese teachers reconcile and respond to gender inequality in the national ninth-grade literature textbook and their classrooms. Data was collected through observation, interviews of two participants, and printed documents. Using the concept of teacher’s agency as the center of the framework, this research showed Vietnamese teachers’ commitment to their students despite obstacles. Not formally or professionally trained to do gender work, my two participants, through different ways and emphases, expressed a commitment toward gender equality. Their concerns called for more gender conscious policies, more professional support, and more self-empowerment.

Matthew Dudley
St. Lawrence University
Agent 13 in Los Archivos de Indias
Mentor: Melissane Schrems

A story overlooked by generations of mainstream historical accounts can become the blind spot of millions. This seems to be exactly the case when it comes to the duplicitous career of General James Wilkinson. While serving the United States military, Wilkinson passed along a variety of intelligence to Spanish officials stationed in Natchez, New Orleans, and Pensacola. His briefings regularly focused on US intrusion on Spanish territory, England and France’s undying efforts to strengthen their foothold in the
New World, and the allegiances/movements of various indigenous tribes on either side of the Mississippi River. Wilkinson's twenty plus years of ciphered correspondence, under the codename "Numero 13", accompanied his service as second in command of the US Army from 1792-1796, as Commanding General of the United States Army from 1786-88 and 1800-12, and as Governor of the Louisiana Territory from 1805 to 1807. After a period of almost fifteen years in command of the US Army and two decades of simultaneous correspondence with the Spanish Crown, James Wilkinson is among the most high profile double agents you have never heard of. My research on Wilkinson began the fall semester of 2011, as a part of a primary source assignment on the War of 1812. I had the good fortune of finding three of his letters during our class' visit to the university archives. The following semester, this discovery led me to construct an exhibit about Agent 13. More recently, my investigation has led me to archives in both Spain and Chicago.

Kevin Gibson
Clarkson University
Social Network Consensus: It's Not Who You Know, It's What You Are A Part Of
Mentor: Joseph Skufca

A relatively new area of study in sociology tries to understand how social behaviors can be viewed within the context of social networks. This study focuses on modeling the spread of an idea through social networks, in order to observe the rate in which consensus of the idea is reached. We model these social networks using a representation known as an Affiliation Network, which captures interactions between individuals based on their memberships in various groups (called a two-mode graph). This structure is compared to a standard social network, where individuals interact directly with acquaintances (called a one-mode graph). The method by which the nodes in these graphs are updated, or “change their idea,” is known as a voter model. Our research seeks to understand how the size and connectivity structure of the network affects the time to reach consensus in both the one and two mode graphs.

Jessica Diana Muttitt
Colgate University
Museum Methods in Indigenous Art and Artifacts and Public Education
Mentor: Carol Ann Lorenz

Museums serve as an important outlet for general public education at all levels. Not only can students of all ages attend museums to supplement and reinforce what they are learning in their classes, but adults can also use museums to continue a life-long journey of learning in an informal setting. My research this summer took the broad theme of public education through the art and artifacts found in museums and applied it to a single case: the Longyear Museum of Anthropology at Colgate University. Through work with social media, web design, artifact inventory and organization, upcoming exhibitions and festivals, and other office tasks, I identified and discovered the most effective ways to synthesize the museum’s mission and vision to project it to the public. My work was more concrete than hypothetical: I did not identify broad ideas about museum organization, but rather sought to identify
and apply the best methods of public outreach in the specific case of the Longyear Museum. My efforts have benefited the museum through the creation of an engaging Facebook page to promote the museum to the campus community and general public, new webpages on Colgate University’s website featuring exhibitions and collections, and publicity and educational materials for upcoming museum events. This research also aided the museum’s ongoing goal of continued organization and clarity to help the museum in sustaining its role as a source of education for the general public within Colgate and the community.

**Poster Session 1**

11:15am – 12:15pm

Eben Main (Center)

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**Salina F. Ali**

**Union College**

**Proton-Induced X-Ray Emission Analysis of Crematorium Emissions**

Additional Authors: Benjamin J. Nadarski, Alexandrea D. Safiq, Jeremy W. Smith, Josh T. Yoskowitz, Scott M. LaBrake

Mentor: Michael F. Vineyard

There has been considerable concern in recent years about possible mercury emissions from crematoria. We have performed a particle-induced X-ray emission (PIXE) analysis of atmospheric aerosol samples collected on the roof of the crematorium at Vale Cemetery in Schenectady, NY, to address this concern. The samples were collected with a nine-stage cascade impactor that separates the particulate matter according to particle size. The aerosol samples were bombarded with 2.2-MeV protons from the Union College 1.1-MV Pelletron Accelerator. The emitted X-rays were detected with a silicon drift detector and the X-ray energy spectra were analyzed using GUPIX software to determine the elemental concentrations. We measured significant concentrations of sulfur, phosphorus, potassium, calcium, and iron, but essentially no mercury. The lower limit of detection for mercury in this experiment was approximately 0.2 ng/m³. We will describe the experimental procedure, discuss the PIXE analysis, and present preliminary results.

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**Katelyn Almon**

**St. Lawrence University**

**Pets and Well-being in Undergraduate College Students**

Mentor: Serge Onyper

College-aged adults are especially affected by stress, substance abuse, and social pressures, which places them at high risk for psychiatric disorders (e.g., Blanco et al., 2008). Animal Assisted Therapy, the use of pets to treat mental and physical health problems, has been studied in several human populations including the elderly, children, and hospital patients. Research on the potential benefits of
pet ownership and interaction in the college-aged population is lacking (Wells, 2009). The present project examined the relationship between pet interaction and undergraduate college student well-being. A large, diverse sample of over 480 participants were recruited using Amazon’s Mechanical Turk, an established rapid-data collection tool that allows researchers to build experiments and recruit human participants online (Johnson & Borden, 2012). Participants completed questionnaires about the extent of their interaction with pets, their physical and mental health, emotional well-being, and adjustment to college. Analysis of Variance and multiple regression models suggested results generally inconsistent with findings of related research (McConnell et al., 2011). Students who interacted with others’ pets often were more socially adjusted to college and felt more socially supported by friends and family, but were less mentally and physically well than those who interacted with others’ pets less often. Student pet ownership significantly predicted positive self-esteem, but dog ownership significantly predicted poor social adjustment to college. These findings suggest that confounding variables may be involved with the relationship between pet interaction or ownership and several aspects of well-being. Further studies should investigate such potential confounds.

Ariel Alperstein  
Skidmore College  
Dual Pathway for Bdellovibrio bacteriovorus Asparaginyl-tRNA Formation  
Mentor: Kelly Sheppard

Two routes have evolved for attaching the amino acid asparagine (Asn) to its correct transfer RNA (tRNAAsn), an essential step in protein synthesis. The one-step pathway involves a discriminating asparaginyl-tRNA synthetase (D-AspRS) directly attaching Asn to tRNAAsn. In the two-step pathway, used by organisms that do not produce free Asn, a non-discriminating aspartyl-tRNA synthetase (ND-AspRS) attaches the amino acid aspartate (Asp) to tRNAAsn. Then, the tRNA-dependent amidotransferase GatCAB converts the Asp to Asn. The predatory bacterium Bdellovibrio bacteriovorus, used in water treatment and agriculture, may employ both pathways. To determine if both routes are encoded in B. bacteriovorus, the relevant proteins are being investigated through both in vivo and in vitro assays.

Jackson Ang’ong’a  
Colgate University  
Parametric Analysis of the Josephson Junction Neuron Model  
Mentor: Patrick Crotty

We consider the Josephson Junction neuron model which is an analog simulation model that is based on superconducting circuits which consist of two Josephson Junctions per neuron. The JJ neuron model has proven able to simulate various neuron features including the action potential, refractory period, the firing threshold bifurcation and synchronization; while exhibiting simulation speeds that are orders of magnitude faster than both traditional computer simulations and biological neural networks. We analyze the functional relationships between the parameters governing a JJ point neuron and an
Izhikevich integrate-and-fire neuron. We use Matlab’s extension called Matcont which uses numerical continuation to analyze the bifurcation diagrams and face portraits relating to continuously changing parameters in both systems. This enables us to clearly determine the correlations and functional relationships between the parameters in both the Izhikevich and JJ neuron systems. From this analysis we will be able to effectively "tune" the parameters of the JJ neuron model to simulate different kinds of biological neurons.

Hillary Baynham  
St. Lawrence University  
**Effects of Endocrine Disrupting Chemicals on The Development of the Thymus Gland in Xenopus laevis Tadpoles during Embryogenesis**  
Mentor: Marsha Sawyer

Estrogenic chemical compounds such as the plasticizer Bisphenol A (BPA) disrupt function of the hormone estrogen. Exposing 7 day-old tadpoles to these estrogenic compounds shrinks fully-developed thymus glands, suppressing the immune system and increasing susceptibility to disease. This study investigates the effects of these compounds on the embryogenesis of the thymus gland by measuring thymus size following treatments from days 3-7 of embryogenesis. Thymus images are captured with a camera-mounted stereomicroscope, and surface area measurements derived using ImageJ imaging software. This research has shown thymus gland surface area to be significantly smaller in tadpoles treated with estradiol (7µM). Conversely, estrogen mimic BPA (15µM) had no significant difference on the development of the thymus gland.

Mark Benhaim and Israel Da Silva  
Skidmore College  
**Expanding the Genetic Code With Pyroglutamate**  
Mentor: Kelly Sheppard

Pyroglutamate forms via the cyclization of glutamine residues in proteins including amyloid β-peptides associated with Alzheimer’s disease and oconase, an anti-cancer agent. To study the role pyroglutamate plays in these proteins, we propose expanding the E. coli genetic code to include pyroglutamate by reassigning the amber stop codon to pyroglutamate. To include amino acid, we are modifying the archaeal RNA- dependent Gln biosynthetic pathway to synthesize pyroglutamate on an amber suppressor tRNA. The relevant genes were cloned into a vector for expression in E. coli. To determine if the system can incorporate pyroglutamate into proteins, we are developing an enhanced yellow fluorescence protein reporter system. Once established, we will use the system to test the role of the pyroglutamate in proteins.
Spencer S. Berstler  
Skidmore College  
Synthetic Strategies in the Organic Chemistry Laboratory  
Mentor: Kara Cetto Bales

Many students perceive organic chemistry as challenging because they often attempt to memorize details rather than grasp the underlying concepts. To improve student comprehension and retention, we are developing a project-based lab curriculum where students will design a method to synthesize a novel molecule using fundamental organic reactions. Following this design process, students will carry out their proposed synthesis. The focus of this research is to determine the viability of one possible multi-step synthetic pathway in the undergraduate organic chemistry laboratory. In this presentation, we discuss one example lab module and the challenges of its implementation.

Adam C. Biggs  
Siena College  
Taking Socio-Economic Status out of the Student Success Equation  
Mentor: Cheryl Gowie

Socio-economic status has long been the best predictor of American students’ academic success. Over the decades researchers have investigated numerous approaches to minimize this effect, largely to no avail. Politicians and policy makers have legislated demands for improvement, resulting in extensive standardized testing, demoralization of the teaching force, and schools being labeled as “failing.” A few nations have made progress in de-coupling SES from student performance, and have achieved high student performance and high inclusion, meaning that a high percentage of school-age children and adolescents are actually in school. In this research, we will investigate interventions that have transformed globally improving schools from mediocre to very good or excellent according to standards of the Organization for Economic Cooperation and Development. We will then offer ideas that could be implemented in US schools.

Danielle Bynoe  
Colgate University  
Examining the Roles of the WNT and FGF Pathways in Zebra Fish Neuromast Development and Regeneration  
Mentor: Jason Meyers

The posterior Lateral Line (pLL) in zebrafish serves as a sensory system that allows for the detection of water movements. Within the pLL are a complex of cells called neuromasts which include hair cells, support cells, and mantle cells. Lateral line hair cells are homologous to those in the inner ear and play a similar sensory role in other animals. These sensory cells in fish and amphibians have the ability to regenerate upon ototoxic damage. The Wnt pathway plays a pivotal role in the proliferative aspects of development and has been shown to be involved in hair cell regeneration. HYPOTHESIS: Wnt and FGF
work both collaboratively and antagonistically to coordinate the development and regeneration of hair cells, support cells and mantle cells. In this study we aim to highlight the roles of FGF in the context of the Wnt/FGF pathway in the both the aforementioned processes of zebrafish hair cells. METHODS: BRN-GFP and CLDN- GFP zebrafish lines were used for hair cell and neuromast specific tagging respectively. To explore the roles of Wnt and FGF, we used small molecule drugs to activate or inhibit these pathways alone or in combination, and analyzed hair cell counts as well as areas and widths of neuromasts. RESULTS: During the developmental period neuromasts treated with the combination drug treatment appeared to have abnormal elongated shapes. Exposure to a Wnt agonist increased hair cell count; although FGFRTKI led to a decrease in hair cell count, the size of these neuromast were larger as compared to the control. After neomycin-induced hair cell ablation, the Wnt antagonist led to more hair cell proliferation as compared to the FGFRKTI and the combination treatment which yielded results similar to the control. CONCLUSION: The data suggests that Wnt and FGF may indeed antagonize each other during hair cell development.

Emily Carbone
Skidmore College
Mitochondrial Dysfunction in Spinocerebellar Ataxia Type 1
Mentor: Sarita Lagalwar

The neurodegenerative disease Spinocerebellar Ataxia Type 1 (SCA1) is characterized by the progressive degradation of cerebellar neurons known as Purkinje cells. This results in a loss of motor abilities and, ultimately, death. Purkinje cells are among the most energy-demanding cells in the body and rely on large quantities of mitochondria for chemical energy in the form of ATP. Recent research indicates that mitochondrial dysfunction may contribute to neuronal death in other neurodegenerative diseases such as Alzheimer’s, Parkinson’s, and Huntington’s diseases. However, the role of mitochondria in SCA1 has not been previously examined.

In order to investigate mitochondrial function in SCA1, transgenic SCA1 mice were treated with succinate – a compound that promotes mitochondrial production of ATP by acting as an electron donor. After 4 weeks of treatment, subjects were evaluated for rescue of motor ability, Purkinje cell death, and mitochondrial activity. Purkinje cells of succinate-treated subjects were found to have longer dendritic lengths than those of water-treated controls, suggesting that mitochondria may be impaired in SCA1 and implicating mitochondria as a potential therapeutic target.

Zach Cardell, Hailey Elder, Eric Moore, and Nga Nguyen
Colgate University
Earthworm Communities of the Northern Forest and their Effect on Biodiversity at the Forest Floor
Mentor: Timothy McCay

Evidence suggests that earthworms are colonizing portions of the northern United States, a process that may have been active since the last glaciation. Soil structure, plant regeneration, and invertebrate
biodiversity all may be affected by earthworm colonization. To better understand earthworm dispersal and its impact on surrounding environments, 65 sites within Madison County, NY, and 15 sites in the remote Adirondacks were investigated. Earthworms were collected using mustard extraction and were identified to species, and invertebrate biota were extracted from leaf litter via Tullgren funnels and identified to order. Other data collected included leaf litter weight, pH, and organic content, and soil pH and organic content. The majority of individuals collected were of species believed native to Europe. However, we also collected members of the Asian genus Amyntas and a native earthworm inhabiting a highly acidic peat bog. Initial analyses suggest that earthworms are able to inhabit areas with a wide pH range, but may be excluded from the most acidic areas of the state. Leaf litter mass was high and invertebrate biodiversity and abundance were high at sites where earthworms were found in low abundance. Conversely, areas with high earthworm abundance tended to have fewer and less diverse invertebrates. Both environmental and biogeographic factors were associated with earthworm presence and abundance, suggesting roles for both environmental tolerances and invasion processes in controlling earthworm distributions in New York State.

Michael Coffel and Renee Schapiro
Skidmore College
Hemispheric Specialization and Self-Relevant Stimuli Mediate Emotional Stroop Effects
Mentor: Denise Evert

The present study explored the effects of hemispheric lateralization for emotional processing using both experimenter- and participant-generated (self-relevant) positive, negative and neutral words in an Emotional Stroop task. In this divided attention task, words in red, green or blue ink were presented vertically to the left visual field (LVF) or right visual field (RVF). Response times for color identification were recorded to test the valence hypothesis that the left hemisphere of the brain is specialized for processing positive emotions and the right hemisphere for negative emotions. Significantly faster reaction times to negative stimuli presented in the LVF than the RVF were observed, implicating the right hemisphere in the processing of negative emotional information. Furthermore, significantly faster reaction times to positive stimuli presented in the RVF than the LVF were observed for males only. These results help support a valenced- based hypothesis for emotional processing and highlight greater patterns of hemispheric lateralization in males than females.

Terry Lawrence Cox
St. Lawrence University
Geology and Weather-Related Controls on Tree Fall Of White Pine (Pinus Strobus), Lampson Falls, Adirondacks, NY: A Key To Forest Management and Tourism
Mentor: Dr. Alexander K. Stewart

Dendrochronology can help determine the environmental effects of geology and weather on felled Pinus strobus (White Pine) in the Adirondack Mountains. Using dendrochronological tools and techniques, along with geological and weather-related analyses we analyzed 28 living trees and 14 felled trees. A
master chronology of the living trees dated from 1920-2013 with 1956-57, 1961 and 1996-99 identified as marker years. Felled trees were felled to the northeast, approximately perpendicular to slope, determined by growth variations in the trees. These dead trees were crossdated and determined to have been felled in 1983, 1994, 1995 (2x), 2003, 2005, 2006, 2007(3x), 2008, 2009 and 2010(2x). Felled trees had a mean fall direction of 039° and probably succumbed to wind gusts of >11m/s coming from the southwest. The combination of slope-induced growth, perpendicular gusts and a lack of tap root growth in thin soils (<50cm) on non-fractured meta-igneous rocks leads to a ~7% chance/annum that white pines (>25m) may be naturally felled due to wind gusts >11m/s. These data was then used to develop a model explaining environmental interactions. Confirmation of this idea will be of interest to Adirondack hikers, because geologically complex landscapes are visually appealing (e.g., waterfalls); however, it’s this complexity that leads to natural felling of large white pines. Although inevitable in current white pine stands, a better understanding of the relationship between windthrow and aesthetics may present opportunities for modifying forest management methods.

Robert I. Curtis
SUNY Potsdam
Can a Robotic Whirligig Lead a Real Swarm?
Mentor: William L. Romey

The role of individual behavior on the emergent properties of a group is not well understood in the biological literature. For example, can one individual, moving in a different direction than the rest, influence the group’s overall trajectory? We studied the influence of individuality on group direction by developing a robotic individual that can move in a realistic way within a live group. Our study system are whirligig beetle swarms (Coleoptera: Gyrinidae), which have the advantages of being laboratory friendly and swimming in two dimensions, yet possessing similar properties of fish schools and bird flocks. Replicate groups of live whirligig beetles were tested with four different movements of the whirligig mimicking robot: short and long linear trajectories at two speeds. We developed a method of automatically tracking the individuals. The coordinate data for 60 video segments is currently being analyzed to understand the group’s: polarization; speed; and whether the group followed, avoided, or was alarmed by the robot. Our findings will help to understand the proximate mechanisms for how individual behaviors translate to group movements in other species of animals.

Brian David, Keri Cody, Thomas S. Hughes
Siena College
Synthesis of Shape-Persistant Phenylene Ethynylene Macrocycles as Precursors of Single-Walled Carbon Nanotubes
Mentor: Thomas S. Hughes

Shape-persistent phenylene ethynylene macrocycles contain alkyne moieties which could allow conversion via Diels-Alder cycloaddition of the nominally planar ethynylene macrocycle into compounds with a dimensionality along the axis of the macrocycle. The result is a structural precursor of a single-wall carbon nanotube segment. The monomers contain an aryl iodide and an alkyne terminus, through
which a Sonogashira cross-coupling will be used to link them to form a macrocycle. The monomers also contain three phenylenes, which are assembled by a series of Suzuki couplings. Functional group transformations, including the conversion of a diethyltriazene to an iodide, an alkynylation of an aldehyde, and the bromination of an aryl ring have been used in the synthesis of the monomer.

Michael Duffy
Siena College
A Statistical Approach to Gun Control in the United States
Mentor: Douglas Lonnstrom

The objective of my summer research was to collect and analyze data to create a non-biased report on gun violence and gun control in the United States. Using data from past reports collected by the FBI, CDC, and other various research groups I was able to combine this data to shed new light on the top of Gun control in America. This report contains facts and only facts as well as a list of the current laws regarding firearms purchases and use in the United States.

Christopher Esposito
Colgate University
Burgess and Hoyt in L.A.: Testing the Chicago Models in the Automobile-Age American City
William Meyer

For much of the twentieth century, cities in the United States were thought to follow the Chicago models of urban form, those of E. W. Burgess, Homer Hoyt, and Chauncy Harris and Edward Ullman. In recent years, a “Los Angeles School” in geography and urban studies has dismissed the Chicago models as outdated. Using Los Angeles as their prime example, they have argued that technological innovation and new forms of capitalism and culture have destroyed the regular residential patterns of American cities and the validity of any predictive model of urban form. But the Los Angeles School is short on empirical evidence in support of their claims. Identifying exogenous amenities—those of distance from the city center, terrain, and waterfronts—as the basis of the Chicago models, we mapped these factors against the patterns of income in three automobile-age cities (Los Angeles, San Diego, and Miami) and in one modern city with pre-automobile origins (present-day Chicago) using spatial statistical regression. The three automobile-age cities closely follow, while the older city of Chicago often deviates from, the patterns predicted in the Chicago models. Our results indicate that the Chicago models best describe the most recently built American cities and may be more relevant than ever today in explaining urban form. Key words: Burgess, E. W.; Chicago models; environmental amenities; Los Angeles School; urban form
Jody-Ann Facey  
Skidmore College  
Modulation of a Bacterial Proton-gated Ion Channel by 18-methoxycoronaridine  
Mentor: Rebecca Howard

The hallucinogen ibogaine reduces drug seeking by inhibiting brain proteins such as nicotinic acetylcholine receptors (nAChR), which are also modulated by alcohol and other drugs. A synthetic congener, 18-methocycoronaridine (18-MC), is a promising non-hallucinogenic alternative to ibogaine. However, it has been difficult to characterize binding of ibogaine or its derivatives due to a lack of high-resolution structures of nicotinic receptors. The prokaryotic ion channel GLIC is a homolog of nAChR, it is modulated by alcohol and other drugs, and its structure is known at atomic resolution, making it a relevant model. We tested the effect of 18-MC on GLIC by two-electrode voltage clamp electrophysiology in Xenopus laevis oocytes. GLIC was inhibited by 18-MC at slightly higher concentrations than nicotinic receptors, supporting GLIC as a model system for future structure/function studies.

Melanie Feen  
Skidmore College  
Additional Authors: Denise Garofalo and Mohammed Islam  
Discriminating Nature of the Aspartyl-tRNA Synthetases from Three Human Pathogens  
Mentors: Kelly Sheppard

Protein synthesis is essential for all known life. Accurate translation during protein synthesis is primarily achieved by pairing an amino acid with its cognate tRNA. For the amino acid asparagine, two routes for asparaginyl-tRNAAsn synthesis have evolved. Asparagine can be directly attached to tRNA by an asparaginyl-tRNA synthetase or can be formed on the tRNA by the concerted actions of a non-discriminating aspartyl-tRNA synthetase and an amidotransferase. The human pathogens Borrelia burgdorferi, Legionella pneumophila, and Mycoplasma pneumonia may synthesize Asn on the tRNA in addition to using the direct route. We are thus determining whether these three bacterial aspartyl-tRNA synthetases can be used to synthesize asparagine on the tRNA. The work will provide insight into new drug targets for these human pathogens.

Brett M. Ford  
St. Lawrence University  
Population Genetic Structure of the North American Porcupine (Erethizon dorsatum)  
Mentor: Erika Barthelmes

Determining the level of genetic variation in a population is necessary in order to better understand population viability, the ability of a population to thrive. A decrease in genetic variation can be caused by genetic drift, random fluctuations in allele frequency (Lacy 1997). Reduced genetic variation often leads to individuals mating with relatives, also called inbreeding, which can decrease longevity,
resistance to disease, and fecundity (Lacy 1997). The North American porcupine (Erethizon dorsatum) may be a species facing low levels of genetic variation in Northern New York. Porcupines face the highest vehicle-induced mortality rates in the north country (Barthelmess and Brooks 2010). Motorways may have caused habitat fragmentation and isolation of groups, thereby causing a subdivision within the population and increased inbreeding. Because porcupines, on average, produce less than one offspring a year (Isle and Hellgren 2001), recovery from threats to the population would take a considerable amount of time. In order to determine the genetic structure of the population I screened and genotyped 75 to 100 porcupines at eight microsatellite loci. Preliminary results display an appropriate amount of genetic variation, but this degree of variation is on a very large scale and does not consider variation on a more local scale and does not consider the possibility of population subdivision. Determining population genetic structure of porcupines will lay the groundwork for more important questions relating to behavioral ecology, road ecology, and evolutionary history of this species.

Olivia Frank
Skidmore College
Understanding UPK: A Case Study in New York
Mentor: Hope Casto

Early education is an essential aspect of the life experience of a young child and has become an increasingly common part of the conversation about the role of the public school system. New York State has been providing state funding to early education for decades and since 2006 has offered Universal Pre-Kindergarten (UPK). This project is the beginning of a five-year follow-up study of five case studies completed in 2008 by the Rural Early Education Project (REEP). These case studies were conducted to better understand the adoption and implementation of the New York State Universal Pre-Kindergarten policy in rural school districts. The work contributes to the national conversation through its longitudinal investigations of the adoption and implementation of a state early education policy.

Zach French
St. Lawrence University
Characterization of Novel Treatment Strategies in the Murine Model of Multiple Sclerosis
Mentor: Karin Heckman

Multiple sclerosis (MS) is an autoimmune disorder affecting over two million people worldwide and approximately 350,000 people in the United States. A lack of treatment options makes drug development a top priority in current MS research. Past studies have demonstrated the efficacy of cerium oxide nanoparticles (CeNPs) in treating MS. Mice induced with experimental autoimmune encephalomyelitis (EAE), the mouse model of MS, displayed significantly improved symptoms when treated with the CeNPs. As MS is characterized by the loss of muscle function resulting from the demyelination of neurons, the CeNPs serve to reduce demyelination by scavenging reactive oxygen species (ROS) released by macrophages activated by T helper (TH) cells. Fingolimod, the currently prescribed drug for MS, reduces disease severity by preventing TH cells from entering the brain to
activate the macrophages. Thus, the nanoparticles and fingolimod function via different mechanisms, and this study successfully illustrated the synergistic effect of combining these treatments using suboptimal doses of each. Additionally, the potential to treat MS using a green tea component, epigallocatechin-3-gallate (EGCG), was investigated. Previous studies have shown the effectiveness of EGCG delivered by two different oral methods in EAE models, but EGCG delivery by an injectable route has not been reported. In this study, EAE induced mice also received daily intraperitoneal (IP) injections of EGCG, which effectively reduced disease severity, especially with regard to the day of onset. Ultimately, these results describe the applicability of new treatment options in a mouse model of MS, with the goal of eventual use in patients.

Sergio Gallucci  
Clarkson University  
Optimizing Ducted Wind Turbine Design  
Mentor: Kenneth Visser

A study is being conducted to improve the design methodology of ducted wind turbines by utilizing the flow field present within the duct. The practice of ducting, widely used in ship propulsion, has not been adopted by the wind energy industry despite the benefits of augmented flow. Consequently, no optimization methods exist specifically for ducted wind turbines, which have been shown to have increased power output compared to open-air turbines. Recent research at Clarkson University indicates that open-air rotor designs in ducts would actually see a reduced efficiency, despite their increased energy output. A turbine designed specifically for a duct would be able to extract an even higher amount of energy from a given flow-field. This research aims to implement a variable radial velocity design method into the Clarkson rotor geometry design code mROTOR, based on the flow characteristics of any given duct. Duct flow properties calculated in Computational Fluid Dynamics solvers were used to determine a more effective ducted rotor blade geometry using mROTOR.

Valerie Garcia  
Colgate University  
Nup57 and Nup100 Are Important for the Nuclear Import of the Karyopherin Nmd5 in Yeast  
Mentor: Ken Belanger

The Nuclear Pore Complex (NPC) is a large protein complex in the nuclear envelope of eukaryotic cells. The NPC consists of about 30 different proteins called nucleoporins (nups). Many large molecules (i.e. proteins) transport into and out of the cell nucleus through the NPC. In order for nuclear transport to occur, carrier proteins called karyopherins (Kaps) shuttle cargo by binding to certain nucleoporins within the NPC. We studied a specific Kap, Nmd5, and one of its protein cargos, Crz1. Crz1, a transcription factor, is imported into the nucleus when calcium is added to yeast cells. We want to determine which nucleoporins are important for the import of Nmd5. First, we transformed several yeast strains with a plasmid containing Crz1 tagged with a genetic marker that fluoresces green under UV light; the yeast strains contain mutations in different nups. We then conducted import assays, in which we would use a
fluorescence microscope to count the number of cells containing Crz1 in the cytoplasm (whole cell fluoresces green) compared to the number of cells containing Crz1 in the nucleus (green fluorescence is localized in the nucleus). We counted about 100 cells every two minutes and plotted these results. Based on the data collected, the nup57 mutant had a very low import rate compared to wild-type, suggesting that Nup57 is important for the import of the Nmd5 Kap. We also observed that the nup100 mutant had an increased rate of import compared to wild-type, suggesting that Nup100 may regulate the import of Nmd5 in yeast.

Keith Goode Jr.
St. Lawrence University
What it takes to Win: A Linear Regression Analysis of Variables in the NFL and their Contribution to Points Scored and Wins/Losses
Mentor: Ed Harcourt

Every professional team sport has statistics that determine points scored, as well as wins and losses. In professional football, these variables include, for example, yards per game, passing yards, and rushing yards. This project seeks to understand which variables in a professional football game are the greatest predictors of points scored and wins/losses. National Football League (NFL) game data from the years 2009-2012 will be extracted from the ESPN website with website extraction software developed in Python. This will be followed by running a linear regression analysis and ANOVA analysis to determine which variable is the greatest predictor of points scored and wins/losses. It is anticipated that the findings of this project will have the potential to influence NFL teams’ play-making decisions.

Katie Greene
St. Lawrence University
Vigilantism or Marginalized Citizenship: Youth and Generational Conflict in Kenya
Mentor: Matthew Carotenuto

In late 2007 the world trembled as a deeply contested election sparked widespread violence leaving over 1000 dead and another 600,000 internally displaced. The youthful Kenyans of the “Uhuru (freedom) Generation” were both the perpetrators and victims of postelection violence. This raises questions about the role of youth in Kenya’s political system and the wider history of generational tensions in the region. Issues associated with unequal land distribution, class and ethnic tensions, and the lack of youth representation in the Kenyan government resonated with the youth generation and galvanized youth support for a political system that would address the historic issues of inequality rooted in the nation’s colonial history. However, because of the horrifying violence after the 2007 election many used the killings to take the attention away from historical issues and paint the Kenyan youth simply as a destructive force unfit to engage in politics.

The purpose of my project is to reflect on the 2013 elections through the prism of generational politics and their colonial roots. I have explored the colonial roots of youth politics and generational conflict and
begun to assess how issues like land, ethnic and class divisions have historically been at the heart of generational politics in Kenya. I have begun to identify the changes and continuities of youth activism and its pertinence in Kenya politics and identify key trends stemming from colonial issues and have examined how this fits into the historiography of the definition of youth in Africa more broadly to engage in preliminary research for my honors thesis.

Jacqueline Ashley Grey
St. Lawrence University
Climate Change Effects on Coral Reef Communities in Southern Palau
Mentor: Marsha Sawyer

Increased levels of pCO2, predicted to reach ~700 ppm by the end of the century, will severely inhibit coral reefs’ ability to build aragonitic skeletons with respect to changes in pH levels and sea surface temperatures. Yet, the effects of corals’ resistance to climate change vary geographically and on species-specific levels. Studies demonstrate that some coral species can calcify in low pH conditions (~7.8 – 7.9) without revealing signs of skeletal stress. In this two part study, coral drill cores were collected from Southern Palau, a relatively warm geographic locale where corals calcify at pH levels predicted at the end of the century. Skeletal growth parameters of three species of corals including Diploastrea Heliopora, Porites Lobata, and Favia Pallida, with a focus on the latter species, were quantified using CT scanned images of drill cores in MATLAB. Secondary Ion Mass Spectrometer analysis was used to measure isotopic ratios (Sr/Ca, Ba/Ca, Mg/Ca, and U/Ca) in a coral stress band, an unusually dense growth band. This study reveals that across a heterogeneous pH gradient, calcification rates are relatively homogenous despite geographic and species differences. Coral stress bands display little geochemical variation in relation to normal growth bands, suggesting that calcification during thermal stress is unperturbed. Similar growth rates in low pH conditions and thermal resiliency indicate that coral communities in Southern Palau acclimatize to climate change by tinkering with calcification mechanisms. As a possible analog to future reefs, these corals’ ability to adapt to climate change provides hope for future reef systems.

Aaron Hebert and Jesus Vijay
Siena College
Cell Signaling and Regulation of the Alpha 2A Adrenergic Receptor
Mentor: Rachel Sterne-Marr

Cells relay information, such as the fight or flight response, via chemicals, such as adrenalin, and one of two classes of adrenergic receptors, α and β. The α2A-adrenergic receptor (α2AAR), has been shown to play a key role in vasoconstriction in some parts of the cardiovascular system, and is the target of pharmaceuticals. Proper regulation of cellular signals by desensitization of the receptor is essential to maintaining the organismal status quo or homeostasis. Phosphorylation, or the addition of a highly charged phosphate group, is carried out by kinases and is a common
mechanism of receptor desensitization. We study a kinase, called GRK2, that phosphorylates adrenergic receptors after they are treated with adrenaline. One way to study the phosphorylation of the $\alpha_{2A}$AR in intact cells is to use antibodies that specifically recognize the phosphorylated receptor. Because no commercially available $\alpha_{2A}$AR phosphosite antibodies currently exist, we set out to generate such a reagent. A functional phosphosite antibody that detects $\alpha_{2A}$AR phosphorylation was isolated and characterized. This antibody that we call Rb617 was used to test whether the phosphorylation of $\alpha_{2A}$AR in intact cells was adrenaline-induced and GRK2-dependent in primate cells in culture. We found that the $\alpha_{2A}$AR was phosphorylated in the absence of adrenaline and exogenous GRK2 suggesting that, in addition to GRK2, other cellular kinases modify the $\alpha_{2A}$AR. Further intact cell phosphorylation assays will likely include the use of inhibitors to minimize the effect of phosphorylation due to these other kinases so that we might study phosphorylation by GRK2.

Jessica Helfter
SUNY Potsdam
Native American Health
Mentor: Kelly Bonnar

Native Americans, including those at Akwesasne, face health disparities in most areas of health including lower life expectancy, higher rates of alcoholism, and depression (Centers for Disease Control and Prevention, 2013). The Office of the General Counsel (2004) reported that Native Americans are 770% more likely to die from alcoholism, 420% more likely to die from diabetes, and 52% more likely to die in accidents. Between 2009 and 2010, Native Americans over the age of 18 were almost twice as likely to suffer from serious psychological distress as their white counterparts, and found to be at higher risk for mental disorders (USDHH, 2012). Additionally, according to the U.S. Department of Health and Human Services Office of Minority Health, Native American adolescent females are four times as likely to commit suicide as their white counterparts.

One major determinant that plays a role in the health disparities experienced by Native Americans is lack of access to quality health care. Currently, the United States federally funds the Indian Health Service (IHS), with the purpose to provide health services to Native Americans and Alaskan Natives. However, many Native Americans are not within close proximity to IHS, and due to the current state of the economy, the IHS budget has been reduced by 8.2%, causing some health programs and services to be cut (NPAIHB, 2012). Some factors that also play a role in the lack of quality health care received by Native Americans include poor access to health insurance and over 30% of the Native American population are considered to be below the poverty line (The Office of the General Counsel, 2004). The need for health care to become more accessible and affordable is severe in order for Native American’s health to suffer less disproportionately.
Yue Hu  
Colgate University  
Economic Development and Dental Health Care in China  
Mentor: Jyoti Khanna  

In China, dentists are highly concentrated in economically developed and urban areas and the inequality in dentist density across the country is staggering. Only 34.6% of adults age 35-44 brush their teeth at least twice a day and over 99% of the population rarely or have never used dental floss. In China, GDP per capita has almost no effect on the amount of unfilled decayed teeth because as people get richer, they consume more sweet food and get more tooth decays but a higher percentage of their tooth decays are filled. The two effects cancel each other out almost perfectly. As people in less developed parts of China get richer, they will consume sweet food in greater frequency and a surge in tooth decays will be observed in these areas as their economies grow. Dental caries are more prevalent in China among adults in 2005 than in 1995. During the same period, GDP per capita, average years of education, and frequency of tooth brushing increased. People pay more attention to dental health in 2005 than in 1995 and have more money to spend on dental care. However, their dental health worsened during the period. After ruling out all the possible factors, the significant decreased in insurance coverage and subsequently decrease in the frequency of dental visits are most likely to be the cause. Insurance coverage correlates highly to care index and people’s dental health and thus the government should increase insurance coverage.

Mohammed Tarek Islam  
Skidmore College  
Discriminating Nature of the Aspartyl-tRNA Synthetases from Three Human Pathogens  
Mentor: Kelly Sheppard  

Protein synthesis is essential for all known life. Accurate translation during protein synthesis is primarily achieved by pairing an amino acid with its cognate tRNA. For the amino acid asparagine, two routes for asparaginyl-tRNAAsn synthesis have evolved. Asparagine can be directly attached to tRNA by an asparaginyl-tRNA synthetase or can be formed on the tRNA by the concerted actions of a non-discriminating aspartyl-tRNA synthetase and an amidotransferase. The human pathogens Borrelia burgdorferi, Legionella pneumophila, and Mycoplasma pneumonia may synthesize Asn on the tRNA in addition to using the direct route. We are thus determining whether these three bacterial aspartyl-tRNA synthetases can be used to synthesize asparagine on the tRNA. The work will provide insight into new drug targets for these human pathogens.

Bryn Keenhold  
St. Lawrence University  
Deglacial History of the Fox Fen, Adirondacks, NY  
Mentor: Alexander Stewart
The relative desolation of the northwestern Adirondacks has limited studies in glacial and deglacial reconstructions of the region. Straining of advancing glacial ice from the lowlands to the Adirondack highlands caused kame-and-kettle terrain to be predominant; affording excellent terrain for “bog” coring. Fox fen, located in Colton Township, was selected because it is the largest peatland in the Adirondack Park visible from a major roadway (NY 56). The deepest point (17.2m), located by tile probing, was cored using a modified Livingstone piston corer, which recovered approximately 16m of sediment. In addition to core stratigraphy analysis, magnetic susceptibility readings were taken at 1-cm intervals and loss on ignition was performed every 10cm through the upper 15.7m and every 2cm through the basal silts. As a result, four distinguishable units were interpreted; from the base of the core upsection: 1) inorganic glacial silts, 2) fine-detrital gyttja, 3) coarse-detrital gyttja and 4) peat. Data suggest that this fen started as a proglacial lake basin, which transitioned into an organic-rich post-glacial lake. Subsequent to lacustrine infilling, the site developed into an oligotrophic fen, which has paludified two smaller basins to the north and south. Regional records of post-glacial lacustrine sedimentation suggest this transition occurred during the early Holocene synchronous with the development of a spruce-rich boreal forest. In addition, variations in carbonate content imply subregional changes in drainage patterns penecontemporaneous to glacial retreat. Data collected from this fen begin to improve our understanding of glacial and deglacial events in this poorly studied region.

Elise Taverna and Sara Brandt
Skidmore College
Non-Medical Use of Prescription Drugs among College Students
Mentor: Robert M. Hallock

This study examined trends in nonmedical prescription drug use among college students at Skidmore College, a liberal arts college in the Northeast. We observed the motives, frequency of use, and perceived emotional/physical risks of nonmedical prescription drugs. Specifically, we examined the nonmedical use of prescription pain relievers, stimulants, and anti-anxiety medication. We sent an internet-based survey to 1/3 of the students from each class year and 303 students completed the survey. We found that 36.8% of the sample reported using prescription drugs for non-medical purposes. First-year students were less likely to have used the drugs than other students. Of those reporting use, 48% reported non-medical use of pain relievers, 73% reported using stimulants, and 40% reported using anti-anxiety medication. The most commonly used pain relievers were Vicodin (hydrocodone/acetaminophen), Oxycontin (oxycodone), and Codeine (acetaminophen/codeine), the most commonly used stimulants were Adderall (amphetamine/dextroamphetamine) and Ritalin (methylphenidate), and the most commonly used anti-anxiety medication was Xanax (Alrazolam). When nonusers were asked what factors influenced their choice not to use prescription drugs as prescribed by a doctor, 82% cited a lack of interest, 61% indicated a fear of damaging their physical health, and 60% indicated a fear of damaging their mental health. This study supports recent findings that show widespread non-medical use of prescription drugs among college students. Our report brings a more detailed understanding of the patterns of drug usage, including the factors that influence drug use in drug users and abstinence in those who choose not to use the drugs.
Eben North

Jayesh Bokhiria
Clarkson University
A Longitudinal Analysis for Berry Farmers Using Trade-Off Curves
Mentor: Kathleen Fowler

Everyone loves berries but we do not like to see the price increased every time we go to grocery store. Why have the berry prices increased every year? In the previous years, California’s agricultural practices have stressed the groundwater basin significantly. Hence, the government had also increased water prices dramatically to promote less water usage and stop the overdraft. In this paper, we use predicted water prices and crop parameters in an optimization model that analyzes farming practices over 10 years. The three objectives are to maximize the profit, minimize water usage, and minimize deviation from the current demand. We pose this problem as a multi-objective constrained linear optimization model. We present trade-off curves to help guide decision makers.

Jennifer Brodsky
Union College
Towards a More Complete Characterization of Spatial Suppression using Psychophysical Methods
Mentor: Pascal Wallisch

Spatial suppression is a perceptual phenomenon, representing the poor perception of larger stimuli. As a visual scene falls beyond the center receptive field, into the surround, the surround receptive field suppresses the visual scene information – as reflected by the worsened perception of the visual scene. The phenomenon of spatial suppression is counterintuitive, as naïve observers think that a larger visual scene should be better perceived. As it goes, Tadin, Lappin, Gilroy, and Blake (2003) provided evidence in support of the phenomenon spatial suppression, but with an unconventional assessment of duration thresholds. They asked observers to judge the motion direction of single moving gratings of varied size and contrast. In the current study, we revised the approach pioneered by Tadin et al. (2003), untangling the effect of spatial suppression from that of spatial summation. Our observers judged the orientation, from vertical, of a small center grating, ignoring the uninformative surround grating that varied in size. We found that observers were less accurate in discriminating the larger stimuli. Thus, we managed to characterize spatial suppression as a psychophysically sound phenomenon. The approach by Tadin et al. (2003) has been used in various populations, such as Depression, Schizophrenia, Autism, and others. This makes it crucial that spatial suppression be placed on a sound psychophysical basis.
Andrew Chan  
St. Lawrence University  
Untraditional Monetary Policy and Financial Markets  
Mentor: Keith Evans

This study examines the unintended effects of Quantitative Easing and its impact on the macro-economy. Furthermore, utilizing the Random Walk Model, this study suggests that Quantitative Easing has not influenced Blue Chip stock prices in early 2013. In contrast, fundamental valuation techniques suggest that market performance has been driven by relative value, cost-cutting margin expansion, and institutional/commercial portfolio rebalancing.

Despite the double-digit returns of the market year-to-date, we hypothesize that company profitability and market momentum will see price level resistance if the greater economy continues along its trajectory of subdued growth. Additionally, we highlight that the Federal Reserve must steer future monetary policy through a precarious interest-rate environment by reconciling the unprecedented levels of excess reserves, rising interest rates, and inflation.

Jared Mondschein  
Union College  
The Nanomorphologies of Polyaniline as a Result of Different Synthetic Pathways  
Mentor: Michael E. Hagerman

Polyaniline (PANI) is a highly conductive polymer that offers promise for use in sensors, light emitting diodes and solar cells. Many of these targeted applications require the efficient synthesis of 1D (nanorods), 2D (nanosheets), and 3D (nanoparticles) nanoarchitectures. We are currently exploring how varying synthetic techniques and parameters affect the nanomorphology and physical properties of emeraldine polyaniline nanomaterials. Our goal is to develop a biocompatible, economical and environmentally friendly method to tune dimensionality and nanomorphology of polyaniline nanomaterials. To date, we have synthesized polyaniline via mechanochemical and solution based techniques, and have investigated varying concentrations of reactants, reaction time, temperature, as well as including inorganic templates. We have studied the resulting PANI nanomorphologies using atomic force microscopy, scanning electron microscopy, infrared spectroscopy and X-ray diffraction. Our results indicate successful synthesis of nanorods, nanosheets, and nanoparticles that exhibit morphological differences that stem from variations in the synthetic pathways.

Oral Presentations Session 4  
1:30pm – 2:50pm  
Eben South

Angelo González  
Skidmore College  
Comida Latina: Spanning Cultures, Building Bridges  
Mentor: Viviana Rangil
Food bridges cultures and at the same time is integral to cultural identity. Through the study of food, we propose an explanation of the “Latinization” of the US as a reciprocal and transformative trend for both the Latino and the US cultures. Comida Latina starts by highlighting that women are at the center of food-related activities and emphasizes the fact that the realm of the kitchen is a gendered space. Comida Latina is a database of images, texts, maps and more related to food, women, culture and identity. Comida Latina is the beginning of a conversation about food and cultural identity, and as such, it is a visible way of showcasing the transformative power of food to bridge culture.

Sarah Loy  
Colgate University  
Holocaust Imagery in the Work of Gabriella Nikolic  
Mentor: Carol Ann Lorenz

The Longyear Museum of Anthropology at Colgate University owns twenty monoprints from Serbian-Canadian artist Gabriella Nikolic’s series One Day, One Child. These artworks focus on telling the story of the children of the Holocaust, including members of Nikolic’s own family. In her work, Nikolic repeatedly uses a number of archival Holocaust images and texts; however, without knowledge of the context and meaning of these images and texts, it would be very difficult for viewers to grasp the deeper messages that Nikolic is trying to convey. Therefore, my goal was to identify and research the archival Holocaust images and texts used in this series, utilizing many different Holocaust databases, archives, and books to locate the images, learn about their background, and translate the texts. Using my research, I created an exhibition of Nikolic’s prints aimed at expressing her messages of the Holocaust while providing the historical context the public needs to understand these works. In the process of writing exhibition labels and an essay for a museum brochure, I was able to look at the ways in which art can be an effective way to teach about the Holocaust. As a Peace and Conflict Studies major and Religion minor, I feel it is important to understand and familiarize myself with these different methods of teaching about the Holocaust.

Caitlin Sackrison  
Colgate University  
The Fall of the Second Empire as Seen Through Contemporary Political Cartoons  
Mentor: Jill Harsin

The Second Empire in France was formed after Louis Napoléon Bonaparte led a coup in the National Assembly in 1851, dismantling the Second Republic of France, and appointing himself Emperor of France. The Second Empire was thus formed on instability with a shifting government in France. The fall of the Second Empire was predicted as early as 1851 by the media. Of all sources of media, political cartoons played a vital role in public opinion of the Second Empire by creating provocative images that would challenge authority, provoke disillusionment, and overall, provide a dramatic review of current events. Through an analysis of fifty-eight political cartoons created during the Second Empire, I will analyze how the cartoons depicted the fall of the Second Empire with a focus on those cartoons pertaining to Napoléon III, Empress Eugénie, and women living in Paris during the Second Empire. These cartoons will
serve as the main foundation for the narration of the fall of the Second Empire in France and will be supplemented with other works pertaining to the Second Empire.

**Poster Session 2**
3:00pm – 4:00pm
Eben Main (Center)

**Colleen Cook**
Union College
**The Effects of Soil pH on the Molting Success of Blacklegged Ticks: Background and Tick Density**
**Results**
Additional Authors: Natasha Scott and Daniel Rice
Mentor: Kathleen LoGiudice

Ixodes scapularis, or the blacklegged tick, is a prominent vector for many infectious diseases such as Lyme disease, caused by the bacteria Borrelia burgdorferi. Ticks spend the majority of their lives, when they are not questing or feeding on a host, in the soil. Abiotic factors within the soil have been shown to affect the survival and development of ticks at the various life stages. However, the impact that soil pH may have on tick survival has not been well investigated. A pilot project conducted by Ahern in 2012 explored the effects of pH on tick molting success with the results suggesting that sandy, acidic soils were most suitable for tick molting. In this follow up field and laboratory study, sites at the Albany Pine Bush in Albany, NY and Wolf Hollow in Schenectady, NY were chosen due to their differing soil texture and pH. Four plots were placed at each site, each plot containing three treatments: undisturbed soil/unaltered pH, disturbed soil/unaltered pH, and disturbed soil/altered pH. Engorged, chipmunk-fed nymphs were randomized and placed within the cores. The experiment was mirrored in the lab to better control temperature and humidity. In fall 2013, the cores will be removed and inspected for molted ticks. Here we report preliminary results including tick density estimates from dragging methods performed in July 2013. This poster is part one of a three part series with Natasha Scott and Daniel Rice.

**Abby Korn**
St. Lawrence University
**The Effects of Manure on Soil Bacteria’s Resistance to Antibiotics**
**Mentor:** Lorraine Olendzenski

Recent studies regarding changes in the soil microbial community after manure application have shown an increase in antibiotic resistant soil bacteria isolates. The implications of these results suggest that manure contains antibiotic resistant bacteria that transfer their resistance to antibiotics to soil bacteria. The results of these studies are very important as humans are in contact with soil on a daily basis. Possible ingestion of antibiotic resistant soil bacteria could occur when consuming raw root vegetables or when soil becomes wind borne. The purpose of this study was to obtain and compare antibiotic
resistant isolates from different farms. Each farm had a unique background and all had no history of antibiotic usage within their husbandry practices. In addition, a control at each site was obtained so that the microbial community of non-manured areas could be compared to the manured areas within each treatment. Soil dilutions from each farm were plated onto R2A agar that was enriched with tetracycline (30 µl/ mL) and sulfadiazine (100 µl/mL). Colony counts were obtained from the enriched agar plates and the number of colony forming units per gram was calculated. Overall, no significant difference (p > 0.05) in the average number of tetracycline resistant bacteria (CFU/g) was found between the nonmanured and manured samples for all farms. In addition, all farms were found to have very low levels of the percent of tetracycline resistant bacteria. The highest percent of tetracycline resistant bacteria recorded was 17.5% in a nonmanured sample replicate.

Maura LaBrecque
Skidmore College
Are All Artificial Sweeteners Created Equal?
Mentor: Robert M. Hallock

The present study investigated individuals’ perceptions of various artificial sweeteners. Most common sugar alternatives claim to replicate the intensity and taste of sugar, and the current study examined the validity of these claims. Participants were presented with 15 different solutions that comprised three concentrations (low, medium and high) of five natural and artificial sweeteners (Equal, Sweet’n Low, Truvia, Xylitol and sugar). Participants swished the solutions in their mouths and rated their perceived intensity of the sweetness and bitterness of each solution after 3 and 20 seconds of exposure. ANOVAs revealed significant differences and suggest artificial sweeteners do not replicate the taste components of sugar. While claiming to be interchangeable, post hoc tests showed that sugar was less sweet than both Sweet’n Low and Truvia (p < 0.05). Additionally, Sweet’n Low was more bitter than all other solutions. p < 0.05 for each comparison.

Veronica Lavia
SUNY Potsdam
Teresa e Gianfaldoni, A Chamber Opera: Resurrecting a Forgotten Composition of Gaetano Donizetti for the 21st Century
Additional Author: Daniel Mertzlufft
Mentor: Donald George

Gaetano Donizetti (1797-1848) was one of the most important 19th-century composers of Bel Canto opera. His most popular operas such as The Elixir of Love and Lucia di Lammermoor are performed worldwide and remain in the standard repertoire. Little known and seldom performed, however, is Donizetti’s fascinating short chamber opera Teresa e Gianfaldoni which is the subject of our presentation. We have researched the story, translated the text, and are creating a modern transcription of the score for performance. The story was inspired by an historical incident on May 30, 1770 when two lovers, Teresa and Gianfaldoni committed suicide at the altar of the chapel of Nimes,
because her father did not accept their relationship. This tragedy was noted above all by the writer Nicolas-Germain Léonard in his novel *Letters of two lovers living in Lyon*. Scored for two singers and piano, this short chamber opera was probably performed in Mantua in 1821 and then forgotten. For our project, we had researched the background of the piece in addition to making an intelligible modern Italian text from the handwritten libretto and also the first singable English translation of the text. We are also creating a modern notation score from the only available 19th-century manuscript. What’s more, we are orchestrating the piano accompaniment for a chamber group in the style of Donizetti’s orchestral writing. A performance of this piece is planned for The Crane School of Music, SUNY Potsdam, and the score will be made accessible for the public.

**Kathryn Lawson**
**Clarkson University**
**Golden-winged and Hybrid Warbler Breeding Populations in the North Country**
**Mentor: Tom Langen**

The golden-winged warbler (*Vermivora chrysoptera*) is suffering one of the most rapid population declines of any bird in North America, and is a candidate for federal listing as a threatened species. This decline is associated with decreased shrub-covered breeding habitat and hybridization with the blue-winged warbler (*Vermivora pinus*), as well as the loss of winter habitat in Central America. Upper & Lower Lakes and Fish Creek State Wildlife Management Areas are regions in St. Lawrence County that are owned and managed by New York State. These locations had documented golden-winged warbler breeding populations, but there was no data on their sizes and distribution, or if blue-winged or hybrid (“Brewster’s” and “Lawrence’s”) warblers were present. It was difficult to plan effective habitat management strategies without this information, and later assessment of their success in increasing local golden-winged warbler populations would be even harder. In this study, warblers were located by birdsong playback in appropriate habitat at each management area. No blue-winged or “Lawrence’s” warblers were found, but populations of golden-winged and “Brewster’s” warblers were identified. ArcGIS 10.1 was used to map bird locations and identify potential habitat. Breeding populations were estimated using the total number of birds found per total habitat area surveyed. Despite having much more potential habitat, Upper & Lower Lakes has many fewer golden-winged warblers than Fish Creek. It is suggested that current habitat areas be maintained, and since Fish Creek appears to be preferable, more areas be managed there to increase appropriate habitat for the golden-winged warbler.

**Charles Lichtenauer**
**Colgate University**
**Pollution Impacts on Canopy Ecosystem Processes and Epiphyte Community Structure**
**Mentor: Catherine Cardelús**

Pollution is predicted to increase by 50% over the next 30 year in tropical areas. This is a direct threat to tropical forests that are highly nutrient limited. The canopy, in particular, is at risk because it is disconnected from forest floor soil resources and is dependent on atmospheric nutrients and scant
canopy soil resources. The canopy hosts 25% of vascular plant flora (Cardel’s and Chazdon, 2005), which obtain nutrients and water through elaborate functional mechanisms such as: aerial roots, impoundments for water collection, and specialized foliar surfaces (see pictures below). Atmospheric nutrient sources are poor compared to canopy soil. Canopy soil is acidic, highly organic, and dominated by microbial fungi. Forest floor soils are highly mineralized, more basic, and contain more microbial bacteria than canopy soils. As such, we expect to see a shift toward decreased fungal abundance in the canopy soil with greater pollution. Most of all epiphyte species are found in tropical habitats, occupy a niche that is little occupied elsewhere in the world, and are severely nutrient-limited, making them an important group to study as climate change via anthropogenic disturbances has the potential to dramatically alter biotic community structure in the tropics and elsewhere (Bassirirad, 2000; Vitousek, 2010). We are studying the implications of a changing environment on the canopy community structure of vascular epiphytes, and canopy ecosystem properties.

**Greg McDonald**  
St. Lawrence University  
The Electrochemical Peroxidation of Hydraulic Fracturing Wastewaters Using Fenton’s Chemistry  
Mentor: Matthew Skeels

Hydraulic Fracturing, as a method to extract petroleum products, has always been a topic of much discussion due to the amount of water needed, as well as the amount of contaminated water produced. This project investigates an electrochemical peroxidation process (ECP) using Fenton’s Chemistry, ferrous ions and hydroxyl radicals, with regards to its potential as a hydraulic fracturing wastewater treatment. Thus far the optimal methods for sampling, treating, and quantifying volumes of a controlled fracturing waste solution, containing seven common contaminants in a brine pseudo flowback water, have been determined. Solutions were sampled and quantified using headspace solid phase microextraction sampling, and gas chromatography analysis. The optimal concentrations of ferrous ions (10 mM) and hydrogen peroxide (500 mM) were also determined in order to achieve greater than 90% degradation of the contaminants in the first hour. This treatment was then run with the addition of different chelating ligands to determine its effect on the rate of degradation. Preliminary results show the addition of EDTA (15 mM) leads to total degradation, below detection limits, within the first hour of treatment. Moving forward from here, multiple chelating ligands will be tested to determine their effect on the rate of degradation, as well as beginning the construction of a flow through bench scale reactor to treat wastewater. The reactor will introduce electrodes as a catalytic source of ferrous ions to solution, as well as have the potential to treat larger volumes of wastewater due to its flow through capabilities.

**Magenta Miller**  
SUNY Potsdam  
Vision and Vibrational Cues Influence Flash Expansion in Swarms  
Mentor: William Romey
Flash expansions are a tactic used by grouping animals as a way to confuse a predator. As a predator nears the group, individuals instantaneously move in all directions. The predator becomes confused and does not know which individual to attack. This method of predator evasion is seen in many animals including fish, birds, and insects. Our study looked at the flash expansion behaviors in whirligig beetles and what sense was used to initiate and maintain it. We predicted that either the eye or antennae (responsible for detecting water surface vibrations) would be responsible for the flash expansion. Beetles were collected from the Raquette River and their senses were obstructed in one of the following ways: eyes were painted over on one side or antennae were removed from one side. Removing the antennae significantly delayed the flash expansion compared to either the control or those with their eyes covered. De-antennated insects were significantly more likely to turn towards the side that was removed when faced with a collision. This tells us that the antennae are more important than eyes in avoiding collisions during a flash expansion in whirligig beetles. Understanding the mechanisms of emergent group properties, such as a flash expansion, is an important step in making general simulation models and controlling the group dynamics of flocks and schools.

William P. Miller  
Skidmore College  
Synthesis of 3-Penten-2-One: Use in the Undergraduate Organic Chemistry Laboratory  
Additional Author: Brian E. Geraghty  
Mentor: Kara Cetto Bales

Typical experiments in the organic chemistry laboratory involve following a preset protocol where students are told exactly what to do to achieve their desired end result. Our goal is to diverge from the traditional "recipe" style laboratory experience to a research based project where students will become active participants in the experimental process. The focus of this research is to develop a discovery based project for students to design a synthesis of a novel complex molecule and then carry out their proposed sequence utilizing a number of fundamental organic reactions. In order to determine the viability of this project in the undergraduate organic laboratory, one synthetic pathway was investigated. Due to the limited availability of the precursor 3-penten-2-one alternate routes for its synthesis were investigated, the results of which will be discussed in detail.

Joshua Mills  
Colgate University  
Measuring Housing Insulation  
Mentor: Beth Parks

My research project was centered on housing insulation. The goal of this research is to provide a low-cost method of measuring the R-Value of homeowners housing insulation. At present there is no way to measure the R-Value of house walls, instead it is standard practice to estimate the value based on knowledge of construction materials, typically performed by a professional. My study revolved around
using a thermocouple connected to an epoxy mold to take many measurements temperature difference across a wall, over a long period of time, to determine the wall and its wall’s R-Value.

Stefani Mladenova  
Skidmore College  
**Dual Routes for S. Aureus Asparaginyl-Trna Formation**  
Mentor: Kelly Sheppard

Two routes have evolved for attaching the amino acid asparagine to the correct transfer RNA (tRNAAsn), an essential step in protein synthesis. The direct pathway includes the aminoacylation of tRNAAsn by AsnRS, when free Asn is available. In the indirect pathway, a non-discriminating AspRS attaches Asp to tRNAAsn. Asp-tRNAAsn then undergoes amidation to Asn, through the action of the amidotransferase GatCAB. The human pathogen Staphylococcus aureus possesses AsnRS but may also employ the indirect route. To determine if the latter is possible, we testing in vitro and in vivo whether the S. aureus AspRS can attach Asp to tRNAAsn. If S. aureus encodes both Asn-tRNAAsn biosynthetic routes, we will study how both routes fit into the life cycle of the organism.

Kimberly Morante  
St. Lawrence University  
**Endocrine Disrupting Effects of Atrazine and Bisphenol-A on Immune Development in a Model Amphibian Species Xenopus laevis**  
Mentor: Alexander Schreiber

Endocrine disrupting compounds have been found to mimic, block or disrupt the effects of hormones and potentially cause adverse physiologic effects, such as the inhibition of growth and development of an organism. Atrazine, a potent herbicide, has endocrine disrupting effects resulting in the increase of estrogen levels in vertebrates, while BPA, a chemical found in plastics is thought to mimic the estrogen hormone by binding to its receptor. We have previously showed that exposure to either of these endocrine disrupting agents result in a decrease of thymus gland size. Seven day old tadpoles were treated and exposed for one week with atrazine and BPA, respectively. Using stereomicroscope imaging, tadpole thymuses (N=64) treated with atrazine (25, 50, 100 μg/L), and (N=60) thymuses treated with BPA (15μM) were measured. The thymus size index for the atrazine study showed that the100μg/L (1.45 ±0.42 SD) group was significantly smaller by 15.4% compared to controls (1.72 ±0.42 SD) (p=0.0007, ANOVA); no other treatments were different. This suggests that the estrogenic effects of atrazine are responsible for the reduced thymus sizes. Statistical analysis (t-test) showed that BPA-treated thymuses (2.01 ± 0.07 SEM relative units) were 10.27% smaller compared with controls (2.24 ± 0.08 SEM), suggesting that BPA reduces thymus size in a manner similar to estrogen.
Nilendra Nair  
Skidmore College  
Dual Routes for B. Halodurans Asparaginyl-Trna Synthesis  
Mentor: Kelly Sheppard

Two evolutionary distinct routes for attaching asparagine (Asn) to its cognate transfer RNA (tRNAsn), an essential step in protein synthesis, are found in nature. In the first, asparaginyl-tRNA synthetase directly ligates Asn to tRNAsn. In the second pathway, a non-discriminating aspartyl-tRNA synthetase first ligates Asp to tRNAsn and GatCAB then modifies the tRNA-bound Asp to Asn. Our bioinformatics analysis of the Gram- positive Bacillus halodurans suggests it may encode the indirect pathway in addition to the direct one. We are using in vivo and in vitro assays to determine whether the B. halodurans AspRS is non-discriminating. If B. halodurans encodes both Asn-tRNAsn biosynthetic routes, we will investigate how the pathways fit into the life cycles of the bacteria.

Iyi Okunlola  
St. Lawrence University  
Konurim (Drinking Water) > Moi le kom (Dugout Water): Understanding the Importance of Safe Water Consumption and Hygiene for a Developing Country  
Mentor: Lorraine Olendzenski

An estimated 1.8 million people die each year from preventable waterborne disease, of which 90% are children under the age of 5 (CWS handbook). This statistic is considerably more compounding because half of the world’s population is less than 28 years old. Of the estimated 7.066 billion people of Earth, 783 million people lack access to safe water supplies; this staggering statistic equates to approximately one in eight people (CWS Handbook). Clean drinking water can decrease the infant mortality rate, which should help a country develop economically (Reidpath et al 2003). The NGO, Community Water Solutions alleviates the global water crisis by implementing sustainable water purification businesses in rural villages in the greater Tamale, Ghana region. To date, CWS has made clean water accessible to 31,820 people including 6,400 children. This study will assist in understanding the efficacy of the Community Water Solutions model, which uses the flocculant Aluminum Sulfate and Aquatabs® cost effectively treat contaminated water. Further water quality experiments, using the membrane filtration technique, will be conducted to examine the efficacy of the CWS model on a water source, known as the Beaver Pond in Canton, NY. The results showed that the CWs model of water purification was efficient while being cost-effective. Total Coliforms and Fecal Coliforms decreased in all replicates (37°C & 44°C) post treatment (Figure 1-6). All the treatments incubated at 37°C had a significant difference (p<0.05)(Figure 1, 3, 5). The model of the CWS model also was sustainable as revenue generated went into purchasing more supplies.
Reversible chemical modification of residues on histone proteins is a key factor in the regulation of chromatin structure and gene expression. One such modification is the methylation of lysine residues, which is catalyzed by histone lysine methyltransferases (HKMTs). PR domain-containing (PRDM) proteins, a large sub-class of HKMTs, are important in cell division and differentiation and have been linked to human cancers; yet, the methyltransferase activity of these proposed enzymes remains largely uncharacterized. We have begun an enzymatic investigation of the enzyme PRDM2 in order to determine the catalytic and kinetic mechanisms of this family of HKMTs.

Why do some local governments perform well and others poorly? Drawing on Robert Putnam’s theory of social capital, we show that village governments in upstate New York perform better when residents are civically engaged and trusting of their neighbors. This effect holds after controlling for wealth, income inequality and other community features. The validity of our conclusions is improved by the use of multiple data sources, including social surveys, census data and village government reports.

Endocrine disrupting compounds have been found to mimic, block or disrupt the effects of hormones and potentially cause adverse physiologic effects, such as the inhibition of growth and development of an organism. Atrazine, a potent herbicide, has endocrine disrupting effects resulting in the increase of estrogen levels in vertebrates, while BPA, a chemical found in plastics is thought to mimic the estrogen hormone by binding to its receptor. We have previously showed that exposure to either of these endocrine disrupting agents result in a decrease of thymus gland size. Seven day old tadpoles were treated and exposed for one week with atrazine and BPA, respectively. Using stereomicroscope imaging, tadpole thymuses (N=64) treated with atrazine (25, 50, 100 μg/L), and (N=60) thymuses treated with BPA (15µM) were measured. The thymus size index for the atrazine study showed that the 100μg/L (1.45 ±0.42 SD) group was significantly smaller by 15.4% compared to controls (1.72 ±0.42 SD) (p=0.0007, ANOVA); no other treatments were different. This suggests that the estrogenic effects of atrazine are
responsible for the reduced thymus sizes. Statistical analysis (t-test) showed that BPA-treated thymuses (2.01 ± 0.07 SEM relative units) were 10.27% smaller compared with controls (2.24 ± 0.08 SEM), suggesting that BPA reduces thymus size in a manner similar to estrogen.

Samantha Ribeiro
St. Lawrence University
The Additive Therapeutic Effect of Fingolimod and Cerium-Oxide Nanoparticles on EAE Development and Progression in Mice
Mentor: Karin Heckman

Multiple sclerosis (MS) is an autoimmune disorder that affects the central nervous system (CNS) which is made up of the brain, spinal cord, and optic nerves. Autoimmune disorders are characterized by immune cells attacking tissues of the body. In the case of MS, T cells attack the myelin surrounding neurons, and macrophages release damaging chemicals. The most common animal model used to study MS is experimental autoimmune encephalomyelitis (EAE). Previous studies at St. Lawrence University have shown that cerium oxide nanoparticles (CeNPs) significantly decrease EAE symptom severity in induced mice by reducing reactive oxygen species (ROS) levels in the CNS. Fingolimod functions by blocking T cells from entering the brain, thus reducing MS symptoms. Since CeNPs and Fingolimod utilize different therapeutic mechanisms, I hypothesized that a combination of both the CeNPs and Fingolimod would decrease the severity of clinical symptoms. I also tested whether subcutaneous CeNP treatment would be as effective as intravenous CeNPs. Finally, Epigallocatechin-3-gallate (EGCG) was studied to observe the effects of an intraperitoneal treatment dose in EAE mice. In this study I found that the Fingolimod + CeNP treatment was more effective than either treatment alone, and I observed that subcutaneous doses of CeNPs reduced clinical scores as effectively (if not more) than intravenous CeNP dosages. Furthermore, intraperitoneal EGCG was effective in alleviating EAE severity even when delivered in a therapeutic regimen. Together, these results suggest that these reagents could be further developed as treatments for multiple sclerosis.

Daniel S. Rice
Union College
The Effects of Soil pH on the Molting Success of Blacklegged Ticks: Interim Data Analysis
Mentor: Kathleen LoGiudice

Ixodes scapularis, or the black-legged tick, is the major vector of Lyme disease in the U.S. I. scapularis has expanded its range in recent years, making the study of factors affecting its distribution a priority in containing the spread of Lyme disease. Studying the effects of various conditions in the soil and leaf litter could help in understanding range expansion, because ticks spend the majority of their lives in contact with the soil. Soil order, defined by organic matter, pH and texture, appears to influence tick survival although the importance of each variable remains unclear. We are investigating the effects of soil pH on the molting success of engorged I. scapularis nymphs collected from eastern chipmunks (Tamias striatus). The factorial experiment was conducted in two sites in upstate NY, the Albany Pine
Bush Preserve and Wolf Hollow, incorporating soil pH (native and adjusted pH), and soil texture as main
effects. We duplicated this experiment with minor variations in the field and the lab to control for
covariates such as temperature, relative humidity and soil moisture. We hypothesize that low pH
increases molting success based on the results of a pilot project. Here we present an analysis of tick
body burden patterns on chipmunks and variables to be monitored until the molting period is complete.
The findings of this experiment could help identify suitable habitats for I. scapularis and consequently
areas where people could be at risk of Lyme disease. This poster is part of a three part series with
Colleen Cook and Natasha Scott.

Erika Riederer
Skidmore College
Alcohol Modulation of a Eukaryotic Ligand-Gated Ion Channel of Known Structure
Mentor: Rebecca Howard

Alcohol was recently shown to bind and modulate bacterial ligand-gated ion channels related to
neurologically important cys-loop receptors. These findings provide useful models for alcohol
modulation of brain receptors, but remain to be confirmed in eukaryotic proteins at equivalent
resolution. The recent determination of an X-ray structure of GluCl, a Caenorhabditis elegans receptor
substantially closer to human proteins than existing bacterial structures, provides a valuable opportunity
to investigate alcohol modulation in a more relevant model system. To test the utility of GluCl as a
model for alcohol modulation, we expressed the crystallized form of this receptor (GluClαx) in Xenopus
laevis oocytes and characterized its function and modulation properties by two-electrode voltage clamp
electrophysiology. The modified homomeric receptor exhibited limited glutamate sensitivity in the
absence of ivermectin, consistent with partial agonism. Preliminary data indicate glutamate activation is
inhibited by anesthetic concentrations of ethanol. Comparative modeling of prokaryotic and eukaryotic
receptors supports alcohol binding to transmembrane cavities conserved throughout this family of
proteins. In the long term, our results will test the validity of GluCl as a model system to bridge the gap
between receptors of known structure and those of neurological importance, posing opportunities for
characterizing alcohol modulation of eukaryotic receptors in structural detail. This work was supported
by NIH/NIAAA grant R01 AA06399, Swedish Research Council grant VR 2010-491, European Research
Council grant ERC 209825, and by individual and collaborative research support from Skidmore College.

Kara Rode
Skidmore College
The Role of Mediator in Transcription of Inducible Genes in Saccharomyces cerevisiae
Mentor: Randy Morse

Eukaryotic transcription of mRNA by RNA Polymerase II is facilitated by the Mediator complex, a multi-
protein entity that bridges gene activator proteins with the general Pol II machinery. In Saccharomyces
cerevisiae, Mediator is believed to be required for transcription of all Pol II genes with little exception;
however, the role of Mediator at various inducible genes has not been fully explored. Expression of
three inducible genes/gene families—SUC2, MET, and GAL—was assessed in induced and uninduced conditions in yeast strains with a non-functional Mediator caused by a conditional mutation at essential Mediator subunits as compared to their wild type counterparts. Expression at SUC2 was found to be highly Mediator-dependent, as indicated by the decreased levels of expression and absence of induction in the mutant Mediator strain. Conversely, expression at the MET and GAL genes are likely Mediator-independent, because induction and continuous transcription were observed regardless of the presence of Mediator. This suggests that not all inducible genes are transcriptionally regulated in the same manner and that other mechanisms may be influencing the regulation of transcription in genes that are not Mediator-dependent.

Madison Schoeberlein
St. Lawrence University
Street Art in the Twenty-First Century
Mentor: Catherine Tedford

Some consider street art as the art movement of the twenty-first century. Though it has been evolving worldwide since its manifestation over fifty years ago, recent developments have caused a street art revolution. The importance of studying and preserving it is increasingly essential. Street art allows us to gain a deeper perspective on the culture in which it exists. It reflects the creative, political, and cultural aspects of its context, and provides insight on what the masses think about contemporary issues rather than just an elite few. Keeping this in mind, the purpose of my project is to create a street art exhibition in the Richard F. Brush Art Gallery for the spring semester of 2014. To this end, I will research street artists, collect street art, and document the process. I will collaborate with my mentor, gallery director Catherine Tedford, drawing from her knowledge of street art as well as her experience arranging exhibitions. Gallery resources will supplement my research. This project will involve travel to New York City and Baltimore to view street art in context. My own (legal) street art will be included in the show. I will use resources available in the Fine Arts Department and the gallery, as well as my personal materials, to experiment with designs and techniques. This project will highlight the importance of preserving street art. It aims to foster in the St. Lawrence community an awareness, interest in, and understanding of, street art.

Natasha Scott
Union College
The Effects of Soil pH on the Molting Success of Blacklegged Ticks: Methods Development
Mentor: Kathleen LoGiudice

Lyme disease, an infectious worldwide disease caused by the bacterium *Borrelia burgdorferi*, is one of the most prevalent tick-borne diseases today. As the incidence of Lyme disease is on the rise, it is important to understand the life cycle of the black-legged tick (*Ixodes scapularis*) and any environmental factors that affect its survival. Following-up on an experiment conducted in 2012 by Kaleigh Ahern, we are investigating the effects of soil pH and composition on the molting success of the blacklegged tick. Since ticks spend most of their time in the soil, investigating pH is vital to understanding tick survival and
molting success. The Eastern Chipmunk (*Tamias striatus*), a common reservoir of the black-legged tick was captured at the Albany Pine Bush Preserve in Albany New York. The chipmunks were held for 72 hours to collect engorged nymphal ticks that fell off of them. These ticks were placed in soil cores at the Albany Pine Bush Preserve and Wolf Hollow, in Schenectady County, New York. The soil pH and the composition at these sites differ. This experiment was also replicated in the lab to better control temperature, humidity and soil moisture. Results on the molting success of the black-legged tick will be available later in the fall. Here we report methods used to adjust soil pH, measure soil texture and monitor soil moisture. This poster is part of a three part series with Colleen Cook and Daniel Rice.

Casey Sherman  
Colgate University  
**Does Less Familiar Mean Less Restricted? Experimental Support for the Principle of Minimal Departure**  
Mentor: Jeffrey Foy

Readers make use of prior knowledge when reading stories, but little research has been conducted on how readers deal with two potentially conflicting sources of information: real-world knowledge and knowledge about a specific narrative world. The principle of minimal departure states that readers will assume a narrative world resembles the real world and make adjustments away from the real world only when required. However, we theorized that this principle would operate differentially depending on character familiarity, such that readers would have narrow expectations about what familiar fantastic characters can do based on prior knowledge, but will find it easy to comprehend unfamiliar fantastic characters carrying out a range of fantastic actions. Participants read brief stories one sentence at a time which featured either a familiar character (e.g. Superman) or a made-up, unfamiliar character (e.g. Dr. Mobius). In the sixth sentence, the character performed a fantastic action that fit with the familiar character (e.g., shooting lasers from his eyes’). In the ninth sentence, the character performed a realistic action or a fantastic action that was inconsistent with the familiar character (e.g., turning somebody to stone). Participants were faster to read the realistic sentences than the fantastic sentences, regardless of character familiarity. Participants were non-significantly faster to read the last fantastic action for the unfamiliar character than the familiar character. Our results provide support for the predictions derived from the principle of minimal departure: participants found it no easier to comprehend unfamiliar characters performing fantastic actions.

Mark Sieling  
SUNY Potsdam  
**Breaking Bold: Personality Type Influences Emergent Behavior in Frightened Whirligig Beetles**  
Mentor: William Romey

Predator-evasion tactics in large groups of prey are known to hinge upon characteristics of individuals. In this study, anti-predation behaviors in whirligig beetles were analyzed with respect to the shy-bold personality continuum. Beetles were caught from the Raquette River and separated and marked based on personality. Groups of shy and bold individuals were videotaped from above while displaying an anti-
predation tactic known as a flash expansion. Analysis showed that bold beetles were significantly further from the center of the group during a flash expansion. Furthermore, shy and bold beetles began to separate directly after the initiation of a flash expansion. The data shows that in a flash expansion, bold individuals move towards the outside of the group, and diverge from the pack. This behavior could represent a difference in innate speeds, age, or predator defenses of the beetles or a behavioral willingness to group.

Chelsey Smith
SUNY Potsdam
Teaching Abroad: Mexico's Lessons
Mentor: Lora Lunt

As a Spanish Education major, I’ve always been well aware that schooling systems are different throughout the world. What I had never thought much about however, was how different teachers might be throughout the world, and the impact that this would have on the citizens of their countries, and the lives that they would in turn lead. Teaching in Puebla, Mexico opened my eyes to an entire different realm of education and with it, transformed me into an entirely different teacher.

Adriana Sperlea
Colgate University
Modeling and Computational Analysis of Zebrafish Somitogenesis
Additional Authors: Jack Holland and Sebastian Sangervasi
Mentor: Ahmet Ay

Oscillations are prevalent in biological systems, controlling the proliferation of cells, daily rhythm of organisms, predator-prey population dynamics, metabolic cycles, and developmental pattern formation. The axis of the vertebrate species is patterned as spatially repetitive structures called vertebrae, which are derived from corresponding embryonic somite segments. A gene expression oscillator, the segmentation clock (involving genes her 1, her 7, hes6 and delta), dictates the period of somite segmentation. Breakdown of the oscillations disrupts somite boundaries and results in vertebral defects 1-3. Although the complete set of the oscillating genes are identified in several model organisms, a mechanistic understanding of this developmental clock remains elusive 1. In this study we developed a comprehensive tissue level model of segmentation clock and used this model to elucidate how the dynamics, i.e. period and amplitude, of the segmentation oscillator is set up by mathematical modeling, stochastic simulations and computational analysis 4. Our model matched the current experimental findings, expanded our understanding of this fascinating developmental clock and has been able to predict potential causes for vertebral defects in mutant organisms.
Nicholas Stark  
Siena College  
Preparatory Inspection of Consumer Self-Handicapping in Purchase Decisions  
Mentor: Dr. Raj Devasagayam

Psychology literature defines self-handicapping as the choosing of impediments and obstacles to put blame on if things do not go well. The goal is to maintain a higher self-image and self-worth (Cantor and Norem, 1986). Studies on whether self-handicapping is a positive or negative process are mixed (Debus, Marsh, & Martin, 2001). Two components have been identified in psychology literature: the “thinking through” process of deliberation, and defensive pessimism. Deliberation is a means of thinking through a situation, whether optimistically or pessimistically, to view all possible outcomes. Defensive pessimism is the setting of unrealistically low expectations and thinking through many different outcomes to avoid an increased let down amidst a negative outcome (Debus et al, 2001). In order to further understand how to provide their customers with satisfaction and delight, marketers must first examine these main psychological components of consumer decisions, however, they have received no formal attention in marketing literature.

Our research will investigate the possibilities created by these new constructs. Of particular interest will be the difference in amount of satisfaction experienced when using different types of self-handicapping strategies in purchase decisions (deliberation and defensive pessimism). Currently, there are no theoretical models that directly link these important psychological concepts to consumer decision making. We propose to create a theoretical framework that makes the investigation of such constructs possible. How do self-handicapping strategies assist or hinder the purchasing process for consumers? Many interesting insights can be drawn from an investigation of this subject. We perform an exploratory research study to build and develop a consumer decision model that accounts for the role of deliberation and defensive pessimism in pre-purchase, purchase, and post-purchase consumer decisions.

Berke Tinaz and Camille Yongue  
Skidmore College  
Experimental Manipulation of Primary Cell Wall and Morphological Plasticity in the Unicellular Green Alga, *Penium margaritaceum*.  
Additional Authors: Julie Ochs, and David S. Domozych  
Mentor: David Domozych

*Penium margaritaceum* is a unicellular green alga found in the Zygnematales; the taxon considered the closest to modern land plants. *Penium* provides unique opportunities for analyzing the structure, adhesion, dynamics of wall polymers, their synthesis and secretion. A pectin “lattice” positioned directly on the outside of the cell wall along with arabinogalactoproteins (AGPs). *Penium* can be easily manipulated in culture for rapid screening of alterations to wall components and assayed for adhesive properties under carefully controlled experimental conditions. Cell wall elasticity in *Penium* is easily visualized using both electron microscopic protocols and *live-cell*, immunofluorescence imaging. Confocal laser imaging results indicated chemical treatments causing morphological changes are reversible.
Sibin Wang
Skidmore College
Urine-based Diagnostic Assay for Malaria
Mentor: Kimberley Frederick

The malaria parasite is most commonly detected by a blood-based test that requires expensive, modern equipment and cannot provide a diagnosis until the late stages of infection. In developing countries, sanitary conditions are less than ideal and proper equipment is scarce. Therefore, faster and easily accessible methods to detect malaria at earlier stages are needed. Our assay focuses on the target analyte D-lactate, that is produced in excess by the malaria parasite during glycolysis and is detectable in urine. Through a coupled chemical reaction D-lactate reacts with a dye called resazurin that results in a distinct color range from blue to pink. Our efforts have focused on reaction optimization to produce accurate and precise readings of D-lactate levels in urine using accessible equipment on microfluidic chips.

Michael Warrener
Union College
Star Formation in the NGC 5846 Group of Galaxies
Mentor: Rebecca Koopmann

Star formation distributions of galaxies in the western portion of the NGC 5846 group are determined using broadband R and narrowband Hα images obtained at the KPNO WIYN 0.9m telescope with OSIAC. Of 28 galaxies in the field, six have Hα emission. Several of these galaxies display star formation that is truncated compared to the stellar extent. The truncation of star formation and the low detection rate, suggest that environmental effects are important in this group.

Peter Weatherill
St. Lawrence University
Investigation of Verbal Overshadowing in Olfactory Memory
Mentor: David Hornung

The primary purpose of this ongoing study is to quantify the impact of verbal overshadowing on olfactory memory. Verbal overshadowing is a phenomenon that occurs when an individual is unable to accurately recall a memory due to a verbalization of the sensory perceptions that comprise the memory (Melcher and Schooler, 1996). Specifically, this study aims to quantify the impact that verbal overshadowing has on subjects by measuring their ability to recall an olfactory memory with and without the presence of verbal overshadowing. This study consists of five testing groups. Four of which exhibit different situations where the subjects are exposed to verbal overshadowing and one of which serves as a control group, where the subjects are not exposed to verbal overshadowing. The data obtained from each of the groups that exposed subjects to verbal overshadowing will be compared to the data obtained from the subjects in the control group. A statistical analysis will be done in order to
identify any trends that persist throughout the data.

The results obtained from this ongoing study will serve to greatly expand the current understanding of verbal overshadowing, as well as the present knowledge base about how olfactory memories are constructed, stored and retrieved. This study also has the potential to lead to an early indicator of problems in executive functioning, which may be helpful in identifying early stage dementia.

Amy Yao
St. Lawrence University
Changes in Lung Morphology During Spontaneous and Induced Metamorphosis of Xenopus laevis Tadpoles
Mentors: Mike Temkin and Alex Schreiber

The development of air breathing during amphibian metamorphosis is characterized by dramatic physiological changes in the organism, most notably significant morphological remodeling in the lungs that is mediated by thyroid hormone and corticosterone. However, despite its gross biological significance, especially in regards to the study of human fetal lung development, relatively few studies have been conducted on the development of the amphibian respiratory system. The development of the lung is characterized by two distinct trajectories of proliferation and differentiation of the various cell types comprising the lung tissue. We were able to determine a key set of tools with which we can analyze and quantify the changes in cell type, focusing primarily on actin, epithelial cells, and connective tissue. When metamorphosis is induced with thyroid hormone (T3) and dexamethasone, a synthetic glucocorticoid, immunohistochemistry staining of lung cross-sections suggests that T3 is responsible for cell differentiation, while dexamethasone mediates cell proliferation. Here we describe our methodology for studying and detailing the changes in cell type, and propose a model for the interplay of T3 and dexamethasone in mediating lung development.

Josh Yoskowitz
Union College
PIXE Analysis of Atmospheric Aerosol Samples in the Adirondack Mountains
Additional Authors: Josh T. Yoskowitz, Salina F. Ali, Benjamin J. Nadareski, Alexandrea D. Safiq, Jeremy W. Smith, Scott M. Labrake
Mentor: Michael F. Vineyard

We have performed an elemental analysis of atmospheric aerosol samples collected at Piseco Lake in Upstate New York using proton induced x-ray emission spectroscopy (PIXE). This work is part of a systematic study of airborne pollution in the Adirondack Mountains. Of particular interest is the sulfur content that can contribute to acid rain, a well-documented problem in the Adirondacks. We used a nine-stage cascade impactor to collect the samples and distribute the particulate matter onto Kapton foils by particle size. The PIXE experiments were performed with 2.2-MeV proton beams from the 1.1-MV pelletron accelerator in the Union College Ion-Beam Analysis Laboratory. X-Ray energy spectra were
measured with a silicon drift detector and analyzed with GUPIX software to determine the elemental concentrations of the aerosols. A broad range of elements from silicon to zinc were detected with significant sulfur concentrations measured for particulate matter between 0.25 and 0.5 μm in size. The PIXE analysis will be described and preliminary results will be presented.