

**6th Annual  
TAS/SSHS  
Student Research Symposium**

# PROGRAM

9:00 am - 10:30 am

Poster session I

10:30 am - 12:30 pm

Oral Presentation Session I

12:30 pm - 1:00 pm

Lunch Break

1:00 pm - 2:30pm

Oral Presentation Session II

2:30 pm - 2:45 pm

Break for Refreshments

2:45 pm - 4:30 pm

Oral Presentation Session III

4:30 pm - 4:45 pm

Research Honors Awards

4:45-5:00pm

Presentation of SRS Awards

**Wednesday, April 18th, 2007**

**Friends Hall**

**Ramapo College of New Jersey**

<http://phobos.ramapo.edu/~pbagga/SMS/sms.html>

**9:00 AM - 10:30 AM      Poster session**

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A Bioinformatics Tool for Analyzing G-quadruplexes in the mRNA Untranslated Regions Zachary Zappala	Pg. 11
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Lumbriculus variegatus [mudworm] is more than a system to study regeneration in animals Peter D. Tsakkos	Pg. 27
The Effects of Child Abuse on Self Esteem, Trust, and Sexual Behavior Aleksandra Nastoska	Pg. 28
An Investigation Into Alternate Methods of Neutralizing Lakes Subjected to the Detrimental Effects of Acid Rain Glen P. Liszczak	Pg. 30
Green Chemistry Studies using Microwave Assisted Synthesis Gurpreet Kaur	Pg. 31
CFTR Protein Structure and its Evolutionary Relationship to other Members of the ABC Transporter Superfamily Caitlin J. Byrne	Pg. 32

Database of Ligand - Protein Binding Sites Pg. 33  
Matthew M. Croken

Tree Health in Rock Outcrops of a Mixed Hardwood Forest Pg. 35  
Danielle Erasles

Patterns of White-tailed Deer Browsing in a Northeastern Pg. 37  
Hardwood Forest  
Ilana Workman

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Darya Chedzhemova

Use of Organolithium Reagents in Organic/Organometallic Pg. 8  
Synthesis  
Mark D. Fallcon

Reduction of Organic Compounds Using Transfer Pg. 9  
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Adam R. Toth

Evaluation of Alcoholic Extraction Techniques for Use in Pg.13  
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Pegylation Via Aminoalkylation: Development of Reaction Pg. 16  
Conditions Using PEG-Aldehyde with Amino Compounds  
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Sonal P. Shah

The effect of high temperatures on Lumbriculus variegatus [mudworm] tail regeneration Pg. 24  
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### **Oral Presentations 2:45 PM - 4:30 PM**

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### **Research Honors Awards**

### **Presentation of SRS Awards**

**Student Name** : Darya Chedzhemova  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Stephen Anderson

**Title of Project** :

The Use of Oxyclean in Organic Oxidation Reactions  
*Darya Chedzhemova and Stephen Anderson*

**ABSTRACT**

The conversion of primary alcohols to aldehydes to carboxylic acids via an oxidation reaction is usually performed using reagents such as potassium permanganate and chromic acid. These reagents are hazardous, difficult to use and are not environmentally friendly. In this project, the uses of the detergent Oxyclean, as well as its active component sodium percarbonate were investigated as potential oxidizing reagents. These reagents are safe to use and are not harmful to the environment. Using Oxyclean and sodium percarbonate, benzaldehyde was successfully oxidized to benzoic acid.

**Student Name** : Mark D. Falcon  
**Major** : Chemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Stephen Anderson

**Title of Project** :

Use of Organolithium Reagents in Organic/Organometallic  
Synthesis

*Mark D. Falcon and Stephen Anderson*

### **ABSTRACT**

Organolithium compounds, such as methyl lithium, are prepared by the reaction of organic halides with lithium metal. The purpose behind making these reagents is to generate a nucleophilic alkyl group. In organic chemistry this reagent can be employed in attacking the carbonyl group of aldehydes and ketones. In organometallic chemistry, this reagent can attack carbon monoxide ligands that are bound to transition metals.

It was shown that treating tungsten hexacarbonyl with methyl lithium leads to the formation of tungsten acyl and di-acyl anionic species. These products were further investigated as potential nucleophiles. All reactions were monitored by infrared spectroscopy.



**Student Name** : Adam R. Toth  
**Major** : Enviromental Studies  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Stephen Anderson

**Title of Project** :

Reduction of Organic Compounds Using Transfer Hydrogenation Catalysts

*Adam R. Toth and Stephen Anderson*

**ABSTRACT**

Traditionally, the hydrogenation of unsaturated organic compounds, such as alkenes, is performed via molecular hydrogen in the presence of a transition metal catalyst. The reaction can also be performed using no external source of hydrogen via hydrogen transfer catalysts. These catalysts remove hydrogen from a reagent such as isopropanol or cyclohexene, and transfer it to the organic substrate. Using this method, ketones and alkenes were successfully reduced to secondary alcohols and alkanes, respectively.

**Student Name** : Aileen Tolentino & Melissa Chung  
**Major** : Bioinformatics  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Paramjeet Bagga & Dr. Lawrence D'Antonio

**Title of Project** :  
Phylogenetics of G-quadruplexes mapped near RNA Processing sites of Mammalian Genes  
*Aileen Tolentino, Melissa Hee Chung, Oleg Kikin, Lawrence D'Antonio and Paramjeet Bagga*

### **ABSTRACT**

The quadruplex structure formed by guanine rich nucleic acid sequences has received significant attention recently because of increasing evidence for their role in important biological processes and as therapeutic targets. G-quadruplex DNA has been suggested to regulate DNA replication and may control cellular proliferation. Although initially most of the studies focused on G-quadruplexes in the DNA, lately there have been many efforts to study G-quadruplex forming RNA. In fact, G- rich sequences capable of forming G-quadruplexes in the RNA have been implicated in a variety of important biological activities, such as mRNA turnover, Fragile X Mental Retardation Protein (FMRP) binding, translation initiation as well as repression.

We have used a computational approach to map putative Quadruplex forming G Rich Sequences (QGRS) within the transcribed regions of a large number of alternatively processed human and mouse genes. Our computational suite consists of a "QGRS Mapper" program that can analyze fully annotated genomic nucleotide sequences from NCBI-based databases, and the "GRSDB" database for curation and further analysis of QGRS Mapper data on alternatively spliced and alternatively polyadenylated mammalian genes. We have been using these servers to perform a large scale analysis of alternatively processed mammalian transcripts. At present, our database contains information obtained from >30,000 eukaryotic genes. The goal of current project is to investigate phylogenetic relationships among homologous G-quadruplex structures in mammalian genes. These studies involve detailed comparisons of homologous genomic sequences and mapped G-quadruplexes near RNA processing sites. Our findings suggest a high degree conservation of G-quadruplex motif and position across mammalian species.

**Student Name** : Zachary Zappala  
**Major** : N/A  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Paramjeet Bagga & Dr. Lawrence D'Antonio  
**Title of Project** :

A Bioinformatics Tool for Analyzing G-quadruplexes in the mRNA Untranslated Regions

*Zachary Zappala, Paramjeet Bagga, and Lawrence D'Antonio*

#### **ABSTRACT**

Untranslated regions of eukaryotic mRNAs contain motifs that are vital for regulation of gene expression at posttranscriptional level. Specific interactions between RNA binding proteins and cis- acting elements in 5' - and 3' -UTRs are responsible for regulating essential biological activities, such as mRNA localization, mRNA turnover, and translation efficiency. Much attention has been paid to study the composition of regulatory RNA motifs and mechanism of their interactions with the cellular machinery. Guanine rich nucleic acids have been shown to form a G-quadruplex structure which is implicated in a variety of regulatory processes in the cytoplasm, including mRNA turnover via exoribonuclease action, interaction with FMRP, cap independent translation initiation, and translation repression. We have developed a software program for analyzing G-quadruplexes in the untranslated regions of mRNAs. The UTR specific module is an extension of the existing Quadruplex forming G-Rich Sequences (QGRS) Mapper program in our suite of computational tools that search mammalian genes for occurrences of the G-quadruplex motif, and analyze their distribution patterns near biologically important sites on the precursor and mature mRNAs. The QGRS-UTR Mapper is being used to study a very large number of eukaryotic mRNAs for identifying cis- regulatory G-quadruplex motifs in their 5' - and 3' - UTRs. The goal of these experiments is to explore the role of G-quadruplex structure in regulation of gene expression at posttranscriptional level.

**Student Name** : Rebecca Strang  
**Major** : Psychology  
**School** : Social Sciences and Human Services  
**Faculty Supervisor** : Dr. Joseph Cataliotti

**Title of Project** :

Inter-Individual Variation in Perceiving Classic Contrast Illusions  
*Rebecca Strang and Joseph Cataliotti*

**ABSTRACT**

Color perception illusions and contrast effects have been systematically studied for nearly a century but little work has focused on individual differences (Bressan, 2006; Ross & Logvinenko, 2002; Schirillo & Shevell, 1996). In the current study we report on a distinct group of observers who we are classifying as superseers and who are within the normal population and unlike most others perceive no difference between physically equal gray targets of the classic simultaneous lightness contrast illusion. These same observers made matches for gray targets in a number of other contrast and assimilation illusions including White's effect (1979). Interestingly, the same observers who reported seeing no difference in the shade of gray of targets within the simultaneous lightness contrast display reported significant differences between gray targets in the White display. We have yet to find observers with normal vision who do experience the classic simultaneous lightness contrast effect and who do not experience White's effect. This single dissociation suggests that models which explain both the classic simultaneous lightness contrast effect and White's effect with the same underlying mechanism or organizational rule would benefit from a reevaluation.

**Student Name** : David Fleischmann  
**Major** : Chemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Frank Farrell

**Title of Project** :

Evaluation of Alcoholic Extraction Techniques for Use in Analysis of High Molecular Weight Polyphenols  
*David Fleischmann and Francis Farrell*

### **ABSTRACT**

Polyphenols have been the subject of extensive study during the past 20 years due to their antioxidant properties in the body that can reduce the formation of destructive free radicals. These free radicals may be partially responsible for the mechanism of illness in some kinds of cancer, heart disease, and neurological diseases. Although great progress has been made in the structural identification and analysis of many of these polyphenols, much remains to be done with regard to the high-molecular-weight components. It is thought that many of the high molecular weight polyphenols form a major fraction of the solids of the tea brew and have at least the same antioxidant properties as the smaller molecular weight polyphenols. The goal of this research is to determine if the use of methanol is better as a solvent for extracting the polyphenols, especially the larger variety. The methanol extract is then analyzed by methods preciously used (Folin-Ciocalteu and HPLC) before and after treatment with Tannase enzyme. The catechins, found in green tea, are converted to higher molecular weight polyphenols during the fermentation process. These high-molecular-weight polyphenols are not separated by HPLC, although, we propose that they are detected by the Folin analysis. Folin and HPLC data for a single, already fermented tea blend, was analyzed during this study and evaluated to determine if the evidence substantiates the contention that this procedure has value as an analysis. It was found that the catechin data was representative of black teas. It was also determined during the course of this research that methanol may be more effective and achieve a better extraction.

**Student Name** : Susana Molina  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Francis Farrell

**Title of Project** :

An HPLC Study for Analyzing Polyphenols in Tea Extracts  
*Susana Molina and Francis Farrell*

### **ABSTRACT**

Polyphenol compounds have been studied extensively during the past two decades because of their activity as antioxidants in the body. As such, they help reduce the formation of dangerous free radicals. These free radicals are believed to be partly responsible for the disease processes involved with some types of cancer, heart disease, and event neurological problems. Many of these polyphenol molecules have been structurally identified and analysis methods developed. This is not true, however, for the higher molecular weight species, which do not appear in HPLC chromatograms. In Tea, it is thought by some researchers that these larger species account for a major fraction of the tea brewed from teas that are at a higher state of fermentation (Black Tea). There is some controversy about how useful these high molecular weight species (called Thearubigins) are for health. This study is intended to develop a method of analysis and show that they have structures that are similar to the low molecular weight species. As such, they should have at least as much antioxidant capacity as the smaller molecules. This research utilizes the fact that polyphenols in tea can be degraded by Tannase enzyme to form Gallic acid. Unlike the Thearubigins, Gallic Acid can be measured by HPLC. HPLC analyses, before and after reaction with Tannase, has been made of tea extracts from a single bush at different stages of fermentation. The formation of Gallic Acid combined with increases in some of the smaller polyphenols will be shown to relate to the Thearubigins. The extracts used are of the Tea after specific times of fermentation, ranging from 0 time (Green Tea) to 150 minutes (past normal fermentation time).

Previous work in this lab has indicated that such an approach may help characterize the Thearubigins. This approach is proposed to be an acceptable one for performing analyses of all types of polyphenols in Tea.

**Student Name** : Daniel Rimoldi  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Francis Farrell

**Title of Project** :

Development of a Method for Analyzing Polyphenols in Tea  
Extracts from a Single Bush  
*Daniel Rimoldi and Francis Farrell*

### **ABSTRACT**

There is an abundance of polyphenols found in tea that are partially responsible for the flavor of the beverage. More importantly, polyphenols are known antioxidants that are being studied for their ability to limit the amount of free radicals that are produced in the body. It is believed that free radicals are the cause of the processes involved in certain diseases such as heart disease and cancer. There are analysis methods that currently exist that can identify the structures of most polyphenol molecules. However these methods are unable to determine the structures of the high molecular weight polyphenols that are found in black tea. These high molecular weight species, called Thearubigins, are of great interest and considered important because they are a thought to be a major component of the tea brew. Prior studies have compared Green Tea to Black Tea and concluded that the total extractable solids and polyphenol content is lower in Black Tea. It is proposed that this is not true and that the Thearubigins have at least as much antioxidant activity (thus providing health benefits) as the smaller polyphenols. The low molecular weight polyphenols are regularly analyzed by using HPLC and the Folin-Ciocalteu procedures. It is proposed that the Folin-Ciocalteu method can also accurately determine the Thearubigens. This study uses samples from a single clone (bush) of tea rather than randomly chosen samples. The tea, which starts as Green Tea is allowed to ferment and samples analyzed at time intervals during this fermentation. Each sample is treated with tannase, which degrades tea polyphenols to produce gallic acid (also detectable by the Folin method). Then each sample is analyzed using this technique. The results obtained show that there is no loss of phenolic species when Thearubigens are formed, and later split by the tannase enzyme. The final results are expected to show that the Folin-Ciocalteu method is an appropriate and accurate approach for analyzing both the small and large polyphenols found in green tea and black tea extracts.

**Student Name** : Angela A. Aggrey  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Arthur Felix

**Title of Project** :

Pegylation Via Aminoalkylation: Development of Reaction Conditions Using PEG-Aldehyde with Amino Compounds

*Angela A Aggrey and Arthur M Felix*

#### **ABSTRACT**

Previous work reported from our laboratory focused on the successful pegylation of salicylic acid and acetylsalicylic acid at their phenolic OH and COOH sites, respectively. A follow-up study investigating the pegylation of 5-aminosalicylic acid prompted us to develop general conditions for site specific pegylation of amino-compounds. We have successfully attached PEG-aldehyde, synthesized in our laboratory, to a model compound; aminoethanol. It was determined that an acidic environment of approximately pH 5 in the presence of sodium cyanoborohydride (NaCNBH<sub>3</sub>) was needed for a successful site-specific pegylation of this compound. The reaction was monitored using a kinetic study for optimal reaction time. Structure confirmation was determined by infrared spectroscopy. Reaction conditions for the aminoalkylation as well as results from the kinetic study will be discussed.



**Student Name** : Catherine P. Post  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Arthur Felix

**Title of Project** :

Development of Novel Reaction Conditions for the Synthesis of PEG-Aldehyde

*Catherine P. Post and Arthur M. Felix*

#### **ABSTRACT**

Pegylation of proteins, at either the amino terminus or at the  $\epsilon$ -amino position of specific lysine residues, have become important targets since the resulting products have been reported to have advantageous therapeutic properties. The use of PEG-active esters for conjugation has been reported to result in non-specific attachment to proteins. Recent reports on the use of PEG-aldehyde, for site-specific conjugation to proteins, have prompted us to develop an alternate synthesis of these aldehyde pegylating reagents. To this end we developed a one-step synthesis of PEG-aldehyde from poly(ethylene) glycol using pyridinium chlorochromate, an oxidizing agent that is used routinely in organic chemistry for the conversion of primary alcohols to aldehydes. Reaction conditions were developed for the synthesis of PEG2000- and PEG6000-aldehyde. Structure confirmation was determined by infrared spectroscopy. Reaction conditions for the preparation of PEG-aldehyde as well as results from the kinetic study will be discussed.

**Student Name** : Tihomir Piskuliyski  
**Major** : Computer Science  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Scott Frees

**Title of Project** :

Virtual Reality Building Modeler  
*Tihomir Piskuliyski and Scott Frees*

### **ABSTRACT**

The VR Building Modeler is a software application designed specifically to allow users to create digital blueprints of buildings. These models can then be exported, automatically, into a 3D Virtual Environment. It differs from other more general 3D modelers in that it is specifically designed for the architectural domain, thus providing the user a more streamlined and simplified interface.

The VR building Modeler consists of two modules. The first one is a Java module using the 2D swing java library to let the user create a blueprint of a building. The 2D blueprint allows the user to create and manipulate multiple floors. The system automatically detects the dimensions of the building and creates the floors and ceilings. The information for all the objects is saved as a text file.

The second module is the SVE library. It uses the text file created from the java module and renders all the objects in a three dimensional environment. The user can then walk into the building previously designed in the Java application and get a very realistic notion of what the inside of the building would look like if it were to be built.

**Student Name** : Michele Jastrzembski  
**Major** : Mathematics  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Professor Sara Kuplinsky

**Title of Project** :

Scheduling Traffic Lights

*Michele Jastrzembski and Sara Kuplinsky*

**ABSTRACT**

This talk develops a model to schedule traffic lights at a street intersection. A "green-time" interval is assigned to each user of the intersection so that two of them do not get overlapping green time if they should not go through simultaneously. The assignment should not only avoid collisions but also respect restrictions, such as required minimum green times for each traffic stream. A linear program will be set up whose solution provides, among all feasible schedulings, one that maximizes the total amount of green per cycle.

**Student Name** : Detelina Stoyanovva  
**Major** : Mathematics  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Professor Sara Kuplinsky

**Title of Project** :

Green, Red, Green, Red, .... at a Crossroads, But How Long Each?  
*Detelina Stoyanova and Sara Kuplinsky*

**ABSTRACT**

To model the scheduling of traffic lights at a crossroads a linear program has to be solved. This talk presents three examples of traffic intersections. For the first one the linear program is easily defined, and its solution yields an optimal schedule. The second example shows how carefully the linear program has to be set up in order to produce the desired result. The third intersection could be handled with techniques more advanced than those presented here.

**Student Name** : Taofik O. Atolagbe  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Robert Mentore

**Title of Project** :

Surface Packing of Polymer Monomers at The Air-Water Interface.  
*Taofik O. Atolagbe, and Robert Mentore*

### **ABSTRACT**

The surface pressure-area isotherm of poly(methyl methacrylate) (PMMA) and poly(ethyl methacrylate)(PEMA) were measured at  $23\pm 1^\circ\text{C}$ . Limiting areas were compared to determine surface arrangement of polymer chains. The results indicate that the polymer repeat units are not significantly different despite the extra methylene group in the side chain of PEMA. The limiting area of PMMA and PEMA were  $4.6 \times 10^{16} \pm 1.4 \times 10^{16} \text{ nm}^2$  and  $4.31 \times 10^{16} \pm 1.7 \times 10^{16} \text{ nm}^2$  respectively. These results will be compared to theoretical results from computer simulations. The results indicate that the arrangement of polymers at the air-water interface involves an irregular sequence of loops, trains and tails rather than a linear arrangement where all segments exist along the polymers backbone in the plane of the surface.

**Student Name** : Ravneet K. Nagi  
**Major** : Chemistry and Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Robert Mentore

**Title of Project** :

Fibrinogen Extraction studies using Poly(N-Hexyl Methacrylate)  
*Ravneet Nagi and Robert Mentore*

**ABSTRACT**

Buffered fibrinogen solutions and varying concentrations of poly(n-hexyl methacrylate) in chloroform were combined and shaken vigorously in order to determine the efficiency of the polymer in extracting fibrinogen from the aqueous phase. Results indicate that molecular interactions between the polymer and the protein led to encapsulation of fibrinogen, altering the density of the protein and ultimately allowing it to be removed from the aqueous phase and transported into the organic phase. Ultraviolet-Visible absorbance spectroscopy and fluorescence spectroscopy were used to characterize the efficiency of the extraction process. FTIR spectroscopy was used to confirm the formation of complexes of fibrinogen and poly (n-hexyl methacrylate). Preliminary results indicate that the extraction process is dependent upon the concentration of the polymer.

**Student Name** : Sonal P. Shah  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

Lumbriculus variegatus [mudworm] is a model of animal regeneration

*Sonal P. Shah and William C. Mitchell*

**ABSTRACT**

Animals, including humans, can regenerate some body tissues, however only a small number of animals can regenerate limbs or larger body structures. Some incredible invertebrate animals can regenerate huge portions of their body. An example of an animal capable of massive bodily regeneration is the miniscule segmented worm Lumbriculus variegatus (Mudworm, California Blackworm, Blackworm). L. Variegatus a fresh water species of the phylum Annelida, Class Oligochaeta, is capable of regenerating both tail and head segments from central body segments. Adult stem cells migrate to the truncated portion(s) of the worm and grow into fully functional body segments. During the presentation we will discuss the organismal and molecular methods of our study as well as our results. We will discuss the regeneration process as demonstrated in our laboratory and show related changes in the profile of mRNAs which are expressed during the regeneration process.

**Student Name** : Matthew J. Brennan  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

The Effect of high temperatures on Lumbriculus Variegatus  
[mudworm] tail regeneration  
*Matthew J. Brennan and William C. Mitchell*

**ABSTRACT**

Previous work in our laboratory had shown the effects of high temperatures on the viability of the fresh water segmented worm Lumbriculus variegatus. Heating L. variegatus to 25C for 1 hour or 27C for 30 minutes had no lethal effect while heating this worm at 27C for 1 hour was lethal. We decided to look at the regeneration process in L. variegatus after a non lethal 25C heat treatment for one hour. The heat treatment did reduce the rate of regeneration in the worms and changed the profile of mRNAs which are expressed during the regeneration process when compared to worms which were kept at room temperature (18-24C). During the presentation we will discuss the organismal and molecular methods of our study as well as our results.



**Student Name** : Felix I. Medrano  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

The effect of low temperatures on Lumbriculus Variegatus  
[mudworm] tail regeneration  
*Felix I. Medrano and William C. Mitchell*

**ABSTRACT**

Previous and current work in our laboratory had shown the deleterious effects of high temperatures on the viability and regenerative ability of the fresh water segmented worm Lumbriculus variegatus. We decided to look at the regeneration process in L. variegatus after an 8C chilling treatment for two hours. We were surprised to find that our clonally propagated worms showed considerable variability in their regenerative abilities when chilled. It appears that chilling could stimulate or inhibit the regeneration process for a net negligible effect. Chilling treatments did have an effect on the profile of mRNAs which are expressed during the regeneration process when compared to worms which were kept at room temperature (18-24C). During the presentation we will discuss the organismal and molecular methods of our study as well as our results.

**Student Name** : Nitika Paudel  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

The effect of acetaminophen on *Lumbriculus variegatus* [mudworm] tail regeneration

*Nitika Paudel and William C. Mitchell*

#### **ABSTRACT**

The analgesic acetaminophen [N-(4-hydroxyphenyl)ethanamide] has been used in our lab as a chemical way to reduce the rate of regeneration in the fresh water segmented worm *Lumbriculus variegatus*. *L. variegatus* treated in 1 mM acetaminophen had a slower rate of regeneration compared to control untreated worms. This treatment has a greater effect on regeneration than other treatments we have tried. Acetaminophen treatments did have an effect on the profile of mRNAs which are expressed during the regeneration process when compared to worms which were untreated. During the presentation we will discuss the organismal and molecular methods of our study as well as our results.

**Student Name** : Peter D. Tsakkos  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

Lumbriculus variegatus [mudworm] is more than a system to study regeneration in animals:

*Peter D. Tsakkos and William C. Mitchell*

**ABSTRACT**

We have had great success in our lab inhibiting regeneration in the fresh water segmented worm *Lumbriculus variegatus* with acetaminophen treatment and we decided to try the analgesic and plant growth regulator salicylic acid. Use of salicylic acid at low concentrations had variable effects from inhibiting regeneration to being lethal. We turned our attention to the biologically important compound glucose (blood sugar). Addition of glucose to regenerating *L. variegatus* did not effect the regeneration rate. We decided to look for effects of glucose on the profile of mRNAs when compared to worms which were untreated. During the presentation we will discuss the organismal and molecular methods of our study, our results and the potential of our model for other purposes.

**Student Name** : Aleksandra Nastoska  
**Major** : Psychology  
**School** : Social Science and Human Services  
**Faculty Supervisor** : Dr. Lysandra Perez-Strumolo

**Title of Project** :

The Effects of Child Abuse on Self Esteem, Trust, and Sexual Behavior

*Aleksandra Nastoska and Lysandra Perez-Strumolo*

### **ABSTRACT**

The study was designed to examine the possible relationship between the experience of child abuse and a series of variables, including self-esteem, interpersonal trust, and sexual behavior and attitudes. Ninety-one volunteers between the ages of 18 and 24 participated in this study. Participants completed four measures: Self-esteem levels were measured using the Rosenberg Self-Esteem Scale (1965); The Rempel, Holmes, and Zanna Trust Scale (1985) was used to measure trust in close interpersonal relationships; the experimenters also used an originally produced survey designed to gather information about sexual behavior and attitudes regarding sexual intimacy. A demographic questionnaire provided general background information including abuse history. The experimenter predicted that participants who reported any kind of abuse would be more likely to report promiscuous sexual behaviors and attitudes, lower self esteem, and less trust in others. Of those who participated, 25.3% reported having experienced some sort of abuse history. Self-esteem was found to be related to the experiences of emotional abuse and neglect. Participants with a history of abuse reported less comfort with casual sex, but a higher rate of pregnancies.

**Student Name** : Melissa A. Manzella  
**Major** : Environmental Science  
**School** : Social Science and Human Services  
**Faculty Supervisor** : Dr. Emma C. Rainforth

**Title of Project** :

Estimating speeds of dinosaurs: a re-evaluation of assumptions  
*Melissa A. Manzella and Emma C. Rainforth*

#### **ABSTRACT**

For 30 years, paleontologists have estimated speeds of dinosaurs from their trackways, with the underlying assumption that the leg length is approximately 4-5 times the foot length, with slight variation between different groups of dinosaurs and overall size of the dinosaur. The purpose of this study is to examine the relationship between foot and leg length in a variety of dinosaurs. We used measurements from 24 dinosaur specimens including bipedal ornithischians and theropods. Leg length is defined as femur + tibia + metatarsal III; foot length is defined as that part of the foot preserved in footprints (digit III phalanges + metatarsal III + metatarsal IV) but excluding the claw. We compared leg and foot lengths and found that in bipedal ornithischians the foot:leg length ratio is ~6-7, and in theropods, ~3.5-6. Contrary to previous studies, we found that (1) there is no correlation between dinosaur size and foot:leg length ratio, (2) the foot:leg length ratio is greater than previously estimated, and (3) the foot:leg length ratio is far more variable for each group of dinosaurs. We conclude that estimating dinosaur speed from trackways should not be undertaken lightly, and the results be interpreted with caution.

**Student Name** : Glenn P. Liszczak  
**Major** : Chemistry/Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Roberta Rosty

**Title of Project** :

An Investigation Into Alternate Methods of Neutralizing Lakes  
Subjected to the Detrimental Effects of Acid Rain

*Glenn P. Liszczak and Roberta Rosty*

#### **ABSTRACT**

In regions of the country subjected to the detrimental effects of acid rain, liming is the current accepted method for neutralizing lakes that are too acidic to support fish and other aquatic life. Lime is economical and is available in large quantities, but the practice of liming a lake is only a temporary method for bringing the lakes' pH to an acceptable level for aquatic life, as the lime must be continually reapplied, and if not done at the proper dosage, can also prove to be toxic or lethal to a lake.

In this study, we examined alternate methods of neutralizing acidic lakes through the use of natural materials and we especially focused on nature's ability to neutralize acid rain in Lake Mohonk which is located in New Paltz, New York.

It is believed that the phytoplankton (*Botryococcus Braunii*) that populate Lake Mohonk, which are the variety of phytoplankton currently being studied for their ability to form long-chained hydrocarbons (or lipids, are largely responsible for buffering the lake. These plankton are aided in their survival by the presence of trace metals in the rockbed of the lake (which are needed for enzymatic activity).

**Student Name** : Gurpreet Kaur  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Robert Shine

**Title of Project** :

Green Chemistry Studies using Microwave Assisted Synthesis  
*Gurpreet Kaur and Robert Shine*

### **ABSTRACT**

There is a new technique that is set to revolutionize and enhance synthesis in chemical research. It is called microwave-assisted organic synthesis (MAOS). Since the late 1970s, microwave technology has been used in chemistry as an alternative method of heating. However, it has only been implemented in synthesizing organic reactions since the mid-1980s. A leader in this field has been Ajay K. Bose at Stevens Institute of Technology. The number of publications related to MAOS has dramatically increased since the late 1990s. It is safe to assume that most chemists will probably use microwave energy to heat and drive reactions in the future. At Ramapo College, microwave heating technology versus traditional heating (i.e. hot plate) was studied for use in the undergraduate organic chemistry laboratory. Methods for applying Green Chemistry concepts via microwave synthesis were also examined. Experiments that were studied and modified include a hydrolysis of methyl benzoate in dilute sodium hydroxide solution, a Diels Alder reaction using maleic anhydride and anthracene, and a synthesis of aspirin. Some oxidation reactions were also performed using calcium hypochlorite, bleach, potassium permanganate, and hydrogen peroxide. The primary goal of this work is to make the undergraduate laboratory environmentally friendly, safe, and efficient.

**Student Name** : Caitlin J. Byrne  
**Major** : Bioinformatics  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Ash Stuart

**Title of Project** :

CFTR Protein Structure and its Evolutionary Relationship to other Members of the ABC Transporter Superfamily  
*Caitlin J. Byrne and Ash Stuart*

### **ABSTRACT**

The Cystic Fibrosis Transmembrane Conductance Regulator (CFTR) is a member of the ABC transporter superfamily and is comprised of five domains. Its two membrane-spanning domains and its two nucleotide-binding domains are characteristic of any ABC transporter, but it also contains a regulatory domain between the first MSD and the second NBD. Together these domains fold to form a chloride ion channel, which transports chloride ions through the membranes of epithelial cells. The purpose of this study is to examine and illustrate the structure of CFTR and its evolutionary relationship to other members of the ABC Transporter superfamily. Several sequence and structure alignment tools were used to compare CFTR to members within and outside of the CFTR/MRP subclass. Sequence and structure alignments of the nucleotide-binding domains indicate a strong relationship between CFTR and the sulfonyleurea receptor (SUR) which regulates a potassium channel. This particular relationship, in addition to the presence of the regulatory domain in CFTR, suggests that CFTR might also be involved in the regulation of other channels. Together, statistical and graphical results provide clear evidence of the CFTR protein's place in the evolution of ABC transporters.



**Student Name** : Matthew M. Croken  
**Major** : Bioinformatics  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Ash Stuart

**Title of Project** :  
Database of Ligand - Protein Binding Sites  
*Matthew M. Croken and Ash Stuart*

### **ABSTRACT**

Database of Ligand Protein Binding Sites We have developed a new, public database of proteins and small chemical compounds with which they are known to interact. Starting with information from the Protein Databank, Perl scripts were used to identify PDB files of proteins in complex with their ligands and to create tables displaying the protein's amino acids that are close in three dimensional space (within 5 Å) to the ligand. The tables contain over 107,000 protein-ligand interactions, each with a corresponding residue list. MySQL is to manage this data. The database is accessed through a PHP website that enables the user to search the database remotely and identify which proteins are known to interact with a specific ligand or which compounds have been observed interacting with a particular protein. In either case, the database will also provide information on what specific residues form the binding site. Additional tables provide in depth information on the ligand compounds and the protein structures respectively, as well as links to the relevant PDB web pages. Due to inconsistencies found in PDB files, complete protein profiles are difficult to obtain, however the algorithm always establishes the correct name of the protein, all associated ligands, interacting amino acids, sequence information and the source organism. This new tool will improve general understanding of protein-ligand interactions. In particular, this database is designed to identify important active site residues in homology models built for the Plasmodium falciparum proteome through the Tropical Disease Initiative. The central objective of this project is to provide a freely available tool for researchers to study active sites in protein structures and homology models, identify chemical compounds and their interactions and finally to help identify targets for drug development, especially for malaria.

**Student Name** : Zulma Y. Valcarcel  
**Major** : Mathematics  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Pangyen Weng

**Title of Project** :

On the Josephus Problem  
*Zulma Y. Valcarcel and Pangyen Weng*

### **ABSTRACT**

Legend has it that Josephus, a Jewish historian in the 1st century, survived the Jewish-Roman war thanks to his mathematical talent. Josephus was one of 41 Jewish rebels trapped in a cave by the Romans. Preferring suicide to capture, they decided to form a circle and every third person would commit suicide. They would proceed around the circle until no one was left. Not too fond of the idea, Josephus calculated quickly where in the circle to stand, and hence saved his life. This is the well-known Josephus problem. We consider two situations: 1) the J-2 problem, where every second remaining person is executed, and 2) the J-3 problem, where every third remaining person is executed. We first discuss the method by Knuth-Graham-Patashnik on the J-2 problem, and the difficulty to generalize it to J-3. We then approach the J-3 problem using another set of recursive relations. Based on these recursive relations, we generate algorithms and analyze the numerical outcomes. We then discuss the closed-form solution of the J-3 problem.

**Student Name** : Danielle Ersalesi  
**Major** : Environmental Science  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Eric Weiner

**Title of Project** :

Tree Health in Rock Outcrops of a Mixed Hardwood Forest  
*Danielle Ersalesi, Melissa Manzella, Phil Allegro and  
Eric M. Wiener*

**ABSTRACT**

This study used rock outcrops to examine how naturally elevated temperature and drought conditions affect tree health. A health index was determined for 771 trees within 10 rock outcrop habitats in a mixed hardwood forest in northern New Jersey. Health of the most common species were compared to data from plots along the mid-slope just below the rock outcrop sites. Tree health was also compared among the outcrops and among the mid-slope plots.

Results revealed significantly lower tree health in rock outcrops for 6 of the 7 study species for which sample sizes were sufficient. Significant differences in health among the outcrops existed for 4 of the 5 study species, and among the mid-slope plots for 4 of the 6 study species for which there were sufficient data. Results indicate, therefore, that health of most of the study species is affected by the environmental stresses that typify rock outcrop habitats, and that tree health often even varies among different locales of the same habitat type.

This study suggests that shifts in climate could negatively affect the health of many tree species. Habitat effects in this study were subtle, however, suggesting that other factors may have greater impacts on forest dynamics.

**Student Name** : Meghan Farrell  
**Major** : Environmental Science/ Biology-  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Eric Weiner

**Title of Project** :

Patterns of White-tailed Deer Browsing Across Tree Seedling Assemblages in Five Forests in the New Jersey and New York Highlands

*Meghan Farrell and Eric Weiner*

#### **ABSTRACT**

White-tailed deer browsing on different tree seedling species often impacts forest regeneration dynamics. However, surprisingly little information exists about spatial patterns of the impact of deer browsing. The objectives of this study were to: a) compare browsing levels among common tree seedling species in New Jersey / New York Highlands forests; b) determine whether patterns of browsing among different tree seedling species vary among forest tracts, and among different locations within forest tracts.

Five hardwood forests that span a range of browsing intensities were surveyed. In 20 plots within each forest, the proportion of twigs browsed was determined for one seedling of each species present. Although browsing on individual seedlings varied from 0 % to 100 %, browsing patterns among tree seedling species were strikingly similar across, and within, different forests. Sassafras consistently exhibited the highest browsing levels, while red oak, black oak, white oak, chestnut oak and pignut hickory also exhibited high levels of browsing. In contrast, sugar maple, musclewood and black cherry seedlings exhibited much lower levels of browsing.

The patterns observed in this study may have important implications for future tree species composition in regional forests. In particular, relatively low levels of deer browsing is likely one of the reasons that sugar maple is rapidly increasing in dominance in many forests. In contrast, higher browsing pressure may be a principle cause of the decline of other species. This is especially problematic for the oak species, which are already suffering gradual population declines due to periodic defoliation by gypsy moths.

**Student Name** : Ilana Workman  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Eric Wiener

**Title of Project** :

Patterns of White-tailed Deer Browsing in a Northeastern Hardwood Forest

*Ilana Workman, Eric Wiener and Meghan Farrell*

**ABSTRACT**

To determine if browsing by white-tailed deer differentially impacts seedlings of different tree species, this study compared browsing levels among sixteen common tree species in a mixed hardwood forest in the New Jersey Highlands.

One seedling of each species present in each of forty-seven 154 m<sup>2</sup> circular plots were surveyed for proportion of twigs that have been browsed by deer, and results were compared among tree seedling species. Sassafras seedlings exhibited significantly higher proportions of browsed twigs than any other species. Red oak, black oak, white oak, chestnut oak, mockernut hickory and pignut hickory seedlings all exhibited significantly higher levels of browsing than sugar maple and black birch seedlings, the two species with the lowest proportions of browsed twigs. No correlations were found between browsing and seedling or adult tree densities.

Relatively low levels of deer browsing of sugar maple seedlings may be one of the contributing factors to the increasing dominance of sugar maple in many forest tracts in the region. Conversely, species that are suffering from higher browsing levels are less likely to compete successfully with sugar maple seedlings. This is especially problematic for tree species that are also suffering from insect herbivore or disease outbreaks.