

**7th Annual  
TAS /SSHS  
Student Research Symposium**

# PROGRAM

9:00 am - 10:00 am

Poster session I

10:00 am - 12:00 pm

Oral Presentation Session I

12:00 pm - 12:30 pm

Lunch Break

12:30 pm - 2:30pm

Oral Presentation Session II

2:30 pm - 2:45 pm

Break for Refreshments

2:45 pm -3:45 pm

Poster Session II

3:45pm-5:00pm

Oral Presentation Session III

5:00 pm - 5:15 pm

TAS Research Honors Awards

5:15-5:30pm

Presentation of SRS Awards

**Wednesday, April 23th, 2008  
Trustees Pavilion  
Ramapo College of New Jersey**

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

**Poster Session I 9:00 AM - 10:00 AM**

All Presenters are required to be present at both poster sessions.

The Use of Transition Metal Hydrogen-Transfer Catalysts in Organic Synthesis Adam R. Toth	Pg. 8
G-Quadruplexes are Conserved Near RNA Processing Sites of Proto-oncogenes Melissa Hee Chung and Gadareth Higgs	Pg. 9
Alternatively Processed Sites in Apoptotic Genes are Associated with Special G-Quadruplex Motifs Viktor Vasilev	Pg. 10
QGRS Mapper2: A suite of Computational tools for Comprehensive analysis of G-Quadruplexes in mRNAs and pre-mRNAs Zachary Zappala	Pg. 11
Gravity Induced Motion Aftereffects in Crickets ( <i>Acheta Domesticus</i> ) Kathleen Walsh	Pg. 13
The Window-Mountain Illusion and the Role of Accommodation Traps Amanda Wichnick	Pg. 14
Study the Possibility of High Molecular Weight Polyphenols in Non-Fermented (Green) Tea Extracts David Fleischmann	Pg. 16
Pegylation of Small Molecules in Aqueous Solution Ashley Cornett	Pg. 17
Pegylation of Thymosin alpha one Sandralynn Veech	Pg. 18
Microsatellite analysis of a Hawaiian population of the peat-moss <i>Sphagnum palustre</i> Falon B. Cartwright	Pg. 19

# R A M

Linear Algebra Cracks Codes! Corinne Bronder and Michele Jastrzembski	Pg. 20
Is There a Link between Body Mass Index and Locus of Control Kristen Tandberg	Pg. 21
Limiting Areas of Poly (methyl methacrylate) and Poly (ethyl methacrylate) Michal Vascak	Pg. 23
The use of vital stains to investigate the histological changes which occur during tail regeneration in Lum- briculus variegatus [Mudworm] Jamie M. Banks	Pg. 24
The effect of ibuprofen on Lumbriculus variegatus [mudworm] tail regeneration Leann M. Lydon	Pg. 25
Temperature affects tail segment regeneration in Lum- briculus variegatus [mudworm] at the anatomical and molecular levels Felix I. Medrano	Pg. 26
The effect of gibberellic acid and salicylic acid on the release of ecodormancy in buds of Forsythia Adeyinka Owoyele	Pg. 27
The effect of salicylic acid on Lumbriculus variegatus [mudworm] tail regeneration Jonathan Rosenthal	Pg. 28
Anatomical and molecular events which occur during regeneration of tail segments in Lumbriculus variega- tus [Mudworm] Sonal P. Shah	Pg. 29
The effect of caffeine on Lumbriculus variegatus [mudworm] tail regeneration Peter D. Tsakkos	Pg. 30
Could Dinosaurs Swim? Evidence from Dinosaur State Park, Connecticut Matthew R. Howard	Pg. 31

Biomechanics of Avian Cervical Vertebra Pg. 32  
Kyle Mastropole, Kathleen Dwyer, Pauline Joshua

Studies of Organic Synthesis Reactions using Green Metrics Pg. 33  
Gurpreet Kaur

Herbivory on Witch Hazel Trees in a Northeastern Hard- Pg. 34  
wood Forest  
Dena Gitto

Trends in Trunk Diameter Growth of Four Tree Species in a Pg. 35  
Hardwood Forest  
Rebecca Lake

### **Oral Presentations 10:00 AM - 12:00 PM**

The Use of Transition Metal Hydrogen-Transfer Catalysts in Pg. 8  
Organic Synthesis  
Adam R. Toth

Study the Possibility of High Molecular Weight Polyphenols Pg.16  
in Non-Fermented (Green) Tea Extracts  
David Fleischmann

The Synthesis of Manganese Complexes Containing Tripod Pg. 7  
Ligands  
Samantha Gribben

G-Quadruplexes are Conserved Near RNA Processing Sites Pg. 9  
of Proto-oncogenes  
Melissa Hee Chung and Gadareth Higgs

Alternatively Processed Sites in Apoptotic Genes are Associ- Pg. 10  
ated with Special G-Quadruplex Motifs  
Viktor Vasilev

Promiscuity and Chastity Pg. 15  
Jonathan Marose

Is There a Link between Body Mass Index and Locus of Control Pg. 21  
Kirsten Tandberg, Pauline Joshua and Adam Toth

Could Dinosaurs Swim? Evidence from Dinosaur State Park, Connecticut Pg. 31  
Matthew R. Howard

### **Oral Presentations 12:30 PM - 2:30 PM**

Biomechanics of Avian Cervical Vertebra Pg. 32  
Kyle Mastropole, Kathleen Dwyer, and Pauline Joshua

Pegylation of Small Molecules in Aqueous Solution Pg. 17  
Ashley Cornett

Pegylation of Thymosin alpha one Pg. 18  
Sandralynn Veech

Adsorption of methacrylate polymers onto silica Pg. 12  
Courtney Cunningham

Heterogeneous Extraction of Fibrinogen from Aqueous Solutions Using Acrylic Polymers Pg. 22  
Carla A. Pallay

Limiting Areas of Poly (methyl methacrylate) and Poly (ethyl methacrylate) Pg. 23  
Michal Vascak

Studies of Organic Synthesis Reactions using Green Metrics Pg. 33  
Gurpreet Kaur

### **Poster Session II 2:45-3:45 PM**

All Presenters are required to be present at both poster sessions.

### **Oral Presentations 3:45 PM - 5:00 PM**

Anatomical and molecular events which occur during regeneration of tail segments in *Lumbriculus variegatus* Pg. 29  
[Mudworm]  
Sonal P. Shah

The effect of salicylic acid on *Lumbriculus variegatus* Pg. 28  
[mudworm] tail regeneration  
Jonathan Rosenthal

The effect of ibuprofen on *Lumbriculus variegatus* Pg. 25  
[mudworm] tail regeneration  
Leann M. Lydon

The effect of gibberellic acid and salicylic acid on the release of ecodormancy in buds of *Forsythia* Pg. 27  
Adeyinka Owoyele

The effect of caffeine on *Lumbriculus variegatus* Pg. 30  
[mudworm] tail regeneration  
Peter D. Tsakkos

Temperature affects tail segment regeneration in *Lumbriculus variegatus* [mudworm] at the anatomical and molecular levels Pg. 26  
Felix I. Medrano

### **TAS Research Honors Awards**

### **Presentation of SRS Awards**

**Student Name** : Samantha F. Gribben  
**Major** : Chemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Stephen Anderson

**Title of Project** :

The Synthesis of Manganese Complexes Containing Tripod Ligands  
*Samantha Gribben and Stephen Anderson*

**ABSTRACT**

The goal of this project is to synthesize manganese complexes that contain tripod ligands such as hydrotris(3,5 dimethylpyrazolyl) borate(tp\*). These are tridentate ligands that bind to a metal center at three different sites. They sit over the metal like an umbrella and add steric influence to other parts of the complex. They are also referred to as scorpionate ligands as they also contain potential free arms which can influence catalytic reactions such as the hydroformylation of alkenes.

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

**Title of Project** :

The Use of Transition Metal Hydrogen-Transfer Catalysts in Organic Synthesis

*Adam R. Toth and Stephen Anderson*

### **ABSTRACT**

Traditionally, the hydrogenation of unsaturated organic compounds, such as alkenes, is performed using 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 molecular hydrogen from one reagent, such as isopropanol or cyclohexene, and transfer it to an organic substrate. Using this method, ketones and alkenes were successfully reduced to secondary alcohols and alkenes, respectively. The end result of the transfer hydrogenation reaction is recorded in an IR spectrometer and products are analyzed via gas chromatography.



**Student Name** : Melissa Hee Chung & Gadareth Higgs  
**Major** : Bioinformatics  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Paramjeet Bagga & Dr. Lawrence D Antonio

**Title of Project** :

G-Quadruplexes are Conserved Near RNA Processing Sites of Proto-oncogenes

*Melissa Hee Chung, Gadareth Higgs, Aileen Tolentino, Lawrence D Antonio\* and Paramjeet Bagga*

#### **ABSTRACT**

The quadruplex structures formed by guanine rich nucleic acid sequences have received significant attention recently because of increasing evidence for their role in important biological processes and as therapeutic targets. We have used a computational approach (1) to map putative Quadruplex forming G Rich Sequences (QGRS) within the transcribed regions of a large number of mammalian genes. Our computational suite consists of a QGRS Mapper program (2) that can analyze genomic nucleotide sequences and the GRSDDB database (3) for curation and further analysis of the QGRS Mapper generated data. At present, our database contains information obtained from ~30,000 eukaryotic genes that include large sets of alternatively processed pre-mRNAs and the genes involved in oncogenesis. The goal of the current project has been to study conservation of G-quadruplex structure motifs near RNA processing site of proto-oncogenes and to explore their role in the human disease. These studies involve detailed comparisons of homologous genomic sequences and mapped G-quadruplexes near RNA processing sites. Our data indicate an evolutionary bias in the favor of G-quadruplex conservation near splice sites across the species and suggest an important role of G-quadruplex motifs in RNA splicing.

**Student Name** : Viktor N. Vasilev  
**Major** : Computer Science  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Paramjeet Bagga & Dr. Lawrence D'Antonio  
**Title of Project** :

Alternatively Processed Sites in Apoptotic Genes are Associated with Special G-Quadruplex Motifs

*Viktor Vasilev, Oleg Kikin, Lawrence D Antonio and Paramjeet Bagga*

#### **ABSTRACT**

G-quadruplexes have come into the limelight in recent years, especially because of increasing indication for their diverse roles in key cellular processes, human disease, and as targets for therapy. Although prevalence of G-quadruplexes in the human genome has been established, there is a paucity of systematic studies focusing on the analysis of G-quadruplex motifs near RNA processing sites. Our group has been interested in studying the role of G-quadruplexes in regulation of gene expression at post-transcriptional level. We have adopted a bioinformatics approach to study composition and patterns of G-quadruplexes in pre-mRNA sequences (1). Our computational suite consists of a QGRS Mapper program (2) that can analyze genomic nucleotide sequences and the GRSDb database (3) for curation and further analysis of the QGRS Mapper generated data.

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

QGRS Mapper2: A suite of Computational tools for Comprehensive analysis of G-Quadruplexes in mRNAs and pre-mRNAs  
*Zachary Zappala, Oleg Kikin, Lawrence D'Antonio and Paramjeet Bagga*

#### **ABSTRACT**

G-quadruplex motifs in the RNA play significant roles in key cellular processes and human disease. Studies performed in our lab suggest that sequences capable of forming G-quadruplexes in the pre-mRNA are involved in regulation of polyadenylation and splicing events in mammalian transcripts. The G-quadruplex motifs in the UTRs may also help regulate mRNA expression. QGRS Mapper 2 is an improved version of the original QGRS Mapper that analyzes data from the NCBI Entrez Gene database on demand to mine information pertaining to the composition and distribution of putative Quadruplex-forming G-Rich Sequences (QGRS) in both pre-mRNA and mRNA sequences. The data is displayed in a variety of formats with several additional computational capabilities. The main upgrade to QGRS Mapper 2 is the ability to determine the composition and distribution patterns of putative QGRS in the 5'- and 3'-UTRs of eukaryotic mRNA sequences. It is also possible to analyze a large number of mRNA or sequences in the FASTA format. Analysis of pre-mRNA processing has also been improved to show data relating to Exon-Splicing Enhancer (ESE) sequences that overlap with QGRS. The goal of these experiments has been to build freely accessible resources for exploring the role of G-quadruplex structures in gene expression regulation at post-transcriptional level. The tool can be accessed at: <http://bioinformatics.ramapo.edu/QGRS2/>.

**Student Name** : Courtney A. Cunningham  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Anita Brandolini

**Title of Project** :

Adsorption of methacrylate polymers onto silica  
*Courtney Cunningham and Anita Brandolini*

**ABSTRACT**

When poly(methyl methacrylate) and other carbonyl-containing polymers are adsorbed on certain surfaces, the carbonyl groups can hydrogen-bond with any hydroxyl groups present. Determination of the fraction of hydrogen-bonded segments has been the focus of several studies including this one. We have studied the adsorption of poly(alkyl methacrylate)s onto silica (SiO<sub>2</sub>). Our primary focus has been on polymethacrylates with molecular weights of 15,000, 75,000 and 540,000. The amount of polymer adsorbed is less for higher molecular weights because of the larger coil size in solution. Studies have also been conducted on other polymers including poly(butyl methacrylate)s. Curve fitting of the carbonyl stretching region of the infrared spectrum allows the estimation of the relative amounts of free and bound carbonyls.

**Student Name** : Kathleen Walsh  
**Major** : Computer Science  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Joseph F. Cataliotti

**Title of Project** :

Gravity Induced Motion Aftereffects in Crickets (*Acheta Domestica*)

*Kathleen Walsh and Joseph Cataliotti*

**ABSTRACT**

A considerable number of studies center on perceptual motion aftereffects in humans, however, the visual and gravitational systems of crickets have not received much attention in the scientific literature. Here we begin to describe methods to study two broad but related questions; Do crickets experience visual motion aftereffects, and do they experience body movement aftereffects, such as dizziness, after repeated rotation? The role of the gravity sensitive cerci and the discovery of a temporary locomotor ataxia after controlled horizontal rotation, are two such issues we explored.

**Student Name** : Amanda Wichnick  
**Major** : Psychology  
**School** : Social Science and Human Services  
**Faculty Supervisor** : Dr. Joseph F. Cataliotti

**Title of Project** :

The Window-Mountain Illusion and the Role of Accommodation Traps  
*Amanda Wichnick and Joseph Cataliotti*

**ABSTRACT**

The window-mountain illusion is a robust perceptual illusion that occurs when an observer backs away from a window while looking out at a distant mountain scene. The perceived size of the mountain scene greatly increases while perceived distance of the scene decreases. Our previous work shows that the systematic removal of ocular depth cues decreases the magnitude of the illusion. In the current set of studies we systematically manipulate the role of ocular accommodation by providing an accommodation trap and measure its effect on the illusion. We think this close cousin of the moon illusion is best explained using Rock and Kaufman's theoretical framework and Hans Wallach's notion of separation of systems."

**Student Name** : Jonathan J. Marose  
**Major** : Psychology  
**School** : Social Science and Human Services  
**Faculty Supervisor** : Dr. Gordon Bear

**Title of Project** :

Promiscuity and Chastity  
*Jonathan Marose and Dr. Gordon Bear*

**ABSTRACT**

According to evolutionary psychology, men are motivated to seek committed long-term relationships and short-term affairs at the same time. Theory holds that underlying this motivation is the belief that women are either chaste or promiscuous, known as the Madonna-whore complex. I am proposing to present at the Student Research Symposium a study on the Madonna-whore complex in relation to a person's tendency to overestimate the number of people who share his or hers attitudes and values and the tendency to underestimate the number of people who share their most prized characteristics. This study will use a questionnaire to collect data from subjects to compare men and women, and within each sex, compare the more promiscuous with the more chaste to see if a Madonna-whore complex exists and whether it is stronger in men and in those more inclined to promiscuity. The questionnaire will measure subjects' opinions toward sex, relationships and their perceptions of other people's attitudes towards this subject matter.

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

**Title of Project** :

Study the Possibility of High Molecular Weight Polyphenols in  
Non-Fermented (Green) Tea Extracts

*David Fleischmann and Frank Farrell*

#### **ABSTRACT**

Polyphenols have been studied because of their antioxidant activity. They eliminate dangerous free radicals, which may be responsible for disease processes for some cancers, heart disease, and neurological problems. Many polyphenols have been identified and analysis methods developed. This is not true for high molecular weight species. In tea, some researchers think these larger species are a major fraction of the brew from highly fermented teas (Black Tea). This study intends to develop a method to quantify these larger species (Thearubigins) and show that they are similar to the smaller molecules and have as much antioxidant capacity. The fact that tea polyphenols can be degraded by Tannase enzyme to form Gallic acid is proposed as a way to detect the larger molecules. Gallic Acid can be measured by HPLC so an HPLC analysis, before and after reaction with Tannase, was run of tea extracts from a single bush at different fermentation stages. Earlier work in this lab showed that Gallic acid does increase for Black Tea. It also seemed to increase in less fermented teas. The current study looked more closely at these earlier findings, including the possibility of Thearubigins being present in fresh leaf. The extracts used are from tea leaf, dried after fermentation times, ranging from 0 (Green Tea) to 120 minutes (past normal fermentation for Black Tea). The HPLC results were evaluated along with Folin-Ciocalteu analyses, which can quantify species containing Gallic acid.



**Student Name** : Ashley L. Cornett  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Arthur Felix

**Title of Project** :

Pegylation of Small Molecules in Aqueous Solution

*Ashley Cornett and Arthur M. Felix*

### **ABSTRACT**

Pegylation, a procedure used to modify various therapeutics, involves the attachment of a long chain of poly(ethylene)glycol (PEG) to the target therapeutic which may include large molecules e.g. peptides and proteins. Previous work from our laboratory reported on the pegylation at the NH<sub>2</sub>-position of small molecules using PEG-COOH forming stable amide bonds. These reactions are usually carried out in organic solvents (e.g. dichloromethane, CH<sub>2</sub>Cl<sub>2</sub>) using dicyclohexylcarbodiimide (DCC) as the coupling reagent. However, many small molecules have limited solubility in the required organic solvent and pegylation reactions are often compromised. Research is being carried out in our laboratory to develop more general methods for the coupling of PEG-COOH with small molecules in aqueous solution thereby overcoming the problem of their poor solubility in organic solvent. To achieve this goal, we developed novel reaction conditions using N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide (WSC1), a water soluble carbodiimide for the coupling reaction with ampicillin and amoxicillin. In addition, the inclusion of N-hydroxybenzotriazole (to form the intermediate active PEG-benzotriazole ester) enabled the pegylation of other small molecules that possess additional functionalities including the phenolic OH group (e.g. 4-aminosalicylic acid, L-DOPA and dopamine) that are known to interfere with the coupling reaction. The reaction conditions for the pegylation of small molecules in aqueous solution and structure confirmation will be described.

**Student Name** : Sandralynn Veech  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Arthur Felix

**Title of Project** :

Pegylation of Thymosin alpha one  
*Sandralynn Veech and Arthur M. Felix*

### **ABSTRACT**

In recent years, several biologically active peptides and proteins have been pegylated to improve their metabolic stability and increase their biological half-lives. The goal of our work was to develop conditions for the pegylation of thymosin alpha one, a naturally occurring thymic peptide consisting of 28-amino acids that possesses immunomodulatory activity. Thymosin alpha one is being used for the treatment of hepatitis B and is being evaluated as a combination therapy with interferon alpha for the treatment of other immunomodulatory diseases. In our pegylation experiments, conditions were developed for the aminoalkylation of a model pentapeptide [H-Leu-Lys(Boc)-Lys(Boc)-Gly-Thr(tBu)-NH<sub>2</sub>] with PEG2000-aldehyde and NaCNBH<sub>3</sub> (in methanol). The pegylated product was purified by dialysis/lyophilization and gave the expected negative ninhydrin test. Deprotection of the Boc-protecting groups on the Lys residues resulted in the expected positive ninhydrin test thereby providing confirmation of successful pegylation. Thymosin alpha one was then pegylated by the same aminoalkylation procedure using a novel H<sub>2</sub>O-trifluoroethanol solvent (1:3) in place of methanol. Confirmation of structure was provided by hydrolysis of the PEG-thymosin alpha one followed by TLC, which revealed the presence of amino acids that are present in thymosin alpha one. The procedure was also successfully carried out with PEG5000-aldehyde. Plans to undertake biological studies of PEG-thymosin alpha one are in progress.

**Student Name** : Falon B. Cartwright  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Eric Karlin

**Title of Project** :

Microsatellite analysis of a Hawaiian population of the peatmoss  
*Sphagnum palustre*  
*Falon B. Cartwright and Dr. Eric Karlin*

**ABSTRACT**

*Sphagnum palustre* is a widespread polyploid species that occurs naturally in Hawaii. This study is the first to perform a genetic study on a Hawaiian population of this species. Microsatellite analyses of 14 individuals of *S. palustre* from the Island of Oahu were performed. Of the 16 loci analyzed, eight loci expressed fixed heterozygosity for all samples and eight were homozygous for all samples. This pattern of microsatellite alleles indicates that these plants have diploid gametophytes, as has been reported for other populations of *S. palustre*.

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

**Title of Project** :

Linear Algebra Cracks Codes!

*Corinne Bronder, Michele Jastrzembski, and Sara Kuplinsky*

### **ABSTRACT**

Cryptography, which in Greek translates to "hidden writing", is the study of coding systems. Though commonly associated with the military or secret agents, cryptography is now widely used in everyday life. For example, to protect their customers' personal information, companies now use cryptography to encode the information on their computers. In cryptography, the uncoded messages are known as the plaintext and the coded messages as the ciphertext. The encoding method is called the cipher. Many different cipher methods exist; in this project, we will use matrices and modular arithmetic to illustrate the so-called Hill cipher method.

**Student Name** : Kirsten Tandberg, Pauline Joshua, & Adam Toth  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Richard Lowell

**Title of Project** :

Is There a Link between Body Mass Index and Locus of Control  
*Class project for Nutrition and Human Metabolism*

**ABSTRACT**

Obesity in America is a major health problem in terms of the extent of the disease (currently 53% of the adult population) and seriousness of the disease. Obesity is linked to heart disease, cancer and diabetes as well as numerous other health problems. For members of the population who are obese or close to obese normal medical has almost nothing to offer in treatment or cure. This project uses The Body Mass Index to measure the weight status of a mixed population of Ramapo students and to compare that status to a dimension of personality called the locus of control. This personality dimension attempts to determine the extent to which a person feels in control of the events in their lives as opposed to feeling that they are at the mercy of external forces.

**Student Name** : Carla A. Pally  
**Major** : Chemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Robert Mentore

**Title of Project** :

Heterogeneous Extraction of Fibrinogen from Aqueous Solutions  
Using Acrylic Polymers  
*Carla A. Pally and Robert Mentore*

**ABSTRACT**

Fibrinogen was extracted from pH 7.4 buffered solutions using chloroform solutions of a series of poly(n-alkyl acrylates). The acrylic polymers differed in the length of the side-chain which influenced the flexibility of the polymers and this affected their ability to encapsulate fibrinogen. The five polymers that were chosen were poly(methyl acrylate), poly(ethyl acrylate), poly(n-hexyl acrylate), poly(n-decyl acrylate), and poly(n-octadecyl acrylate). UV-visible and FTIR spectroscopy were used to measure the concentrations of fibrinogen in aqueous solutions before and after extraction. The results of these studies will be presented.

**Student Name** : Michal Vascak  
**Major** : Biochemistry  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Robert Mentore

**Title of Project** :

Limiting Areas of Poly (methyl methacrylate) and Poly (ethyl methacrylate)

*Michal Vascak and Robert Mentore*

**ABSTRACT**

The limiting areas of poly (methyl methacrylate) and poly (ethyl methacrylate) were determined from surface pressure versus area curves. A Langmuir trough was used to hold a water subphase. The polymers were delivered onto the water subphase in solution form. After evaporating the solvent, the system was compressed, and surface tension was recorded as a function of time. Surface pressure was derived from surface tension measurements, and the repeat unit area was determined from the amount of polymer delivered. PC Spartan Pro was used to determine the repeat unit area of isolated polymers. It was determined that isolated poly (methyl methacrylate) and poly (ethyl methacrylate) repeat unit areas were  $0.14 \pm 0.03$  and  $0.24 \pm 0.03$  nm, respectively, and the limiting areas were  $0.174 \pm 0.008$  and  $0.203 \pm 0.005$  nm, respectively.

**Student Name** : Jamie M. Banks  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

The use of vital stains to investigate the histological changes which occur during tail regeneration in *Lumbriculus variegatus* [Mudworm]

*Jamie M. Banks and William C. Mitchell*

#### **ABSTRACT**

We are studying the use of different vital stains on *Lumbriculus variegatus*, more commonly referred to as mudworm or California blackworm. Vital stains were used because of their ability to stain living tissues. Our worms can regenerate body segments and we want to find appropriate vital stains for observing this process in detail. The different vital stains used included Methylene blue, Typan blue, and Neutral red. The concentrations of stain used ranged from 0.100 mg/mL (w/v) to 0.001 mg/mL (w/v). Worms were left in the stains until they developed dark pigmentation. Dissecting microscopes and digital photography were used to collect data. The stains used had differing abilities to stain the various tissues and organs. Stains also showed different requirements for staining duration and stain concentration. Some stains were more toxic than others. In other experiments we stained entire worms, placed them in spring water without stain and removed the tails. When methylene blue was used, the regenerating tail grew back unstained, but when neutral red was used the tail grew back stained. We will discuss this interesting phenomenon in detail.



**Student Name** : Leann M. Lydon  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

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

*Leann M. Lydon and William C. Mitchell*

### **ABSTRACT**

We are examining the effects of ibuprofen [ $\alpha$ -Methyl-4-(isobutyl)phenylacetic acid), an over-the-counter anti-inflammatory medication, on the regeneration of *Lumbriculus variegatus*, a freshwater oligochaete which is commonly known as the mudworm or California blackworm. Initial experimentation focused upon finding a concentration of ibuprofen which our worms could tolerate but which would affect the regeneration process. This led to the experimental use of 0.1 mM ibuprofen in spring water.

The rate of regeneration of worms in plain spring water was compared to the regeneration rate of worms in the 0.1 mM ibuprofen solution. This was accomplished by measuring the length of the regenerating tail segments using a dissecting microscope and digital photography. Comparison of treatments shows that ibuprofen decreases the rate of worm tail segment regeneration.

RNA extracted from the posterior ends of both ibuprofen treated and untreated worms will be analyzed via RT-PCR in order to look for mRNA changes associated with ibuprofen inhibition of regeneration.

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

**Title of Project** :

Temperature affects tail segment regeneration in *Lumbriculus variegatus* [mudworm] at the anatomical and molecular levels  
*Felix I. Medrano and William C. Mitchell*

### **ABSTRACT**

Previous work in our laboratory had shown the effects of high and low temperatures on the viability of the fresh water segmented worm *Lumbriculus variegatus*. Heating *L. variegatus* to 35C for 1 hour or 37C for 30 minutes had no lethal effect while heating this worm at 37C for 1 hour was lethal. Chilling the worms at 8C for two hours induced considerable variability in their regenerative abilities for no net effect, but we did change mRNA expression with chilling. More recently we have examined the regeneration process in *L. variegatus* after a non lethal 35C heat treatment for one hour. Heat treatments do reduce the rate of regeneration in worm tail segments when measured using a dissecting microscope and digital photography. Heating also changes the profile of mRNAs expressed during regeneration when compared to worms which regenerate tail segments at room temperature (18-24C). Here we will discuss the organismal, physiological and molecular methods of our study as well as our results.

**Student Name** : Adeyinka Owoyele  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

The effect of gibberellic acid and salicylic acid on the release of ecodormancy in buds of Forsythia  
*Adeyinka Owoyele and William C. Mitchell*

**ABSTRACT**

We are interested in investigating the release of ecodormancy in the buds of the common landscape plant Forsythia. Ecodormancy is the environmental imposition of dormancy on buds due to suboptimal growing conditions alone [in this instance cold temperatures]. Ecodormant branches were removed from Forsythia plants and brought into a room temperature laboratory. The branches were re-cut to approximately 26 cm and placed in one of three test solutions [50 mM sodium phosphate (pH 6.0), 50 mM sodium phosphate (pH 6.0) containing 10 mg/mL Potassium Gibberellin, and 50 mM sodium phosphate (pH 6.0) containing 10 mg/mL Sodium Salicylate]. Measurements were made of bud mass and the number of flowering buds when branches were initially forced (day 0) as well as 3 and 7 days after forcing. The average bud mass and percent flowering buds increased from day 0 to 7 for all treatments. To our great surprise Gibberellic acid (GA3), a growth regulator which typically increases plant growth, had little effect on bud mass or flowering when compared to controls, while the growth regulator salicylic acid, typically considered a stress hormone in plants, stimulated the growth of buds and stimulated flowering.

**Student Name** : Jonathan Rosenthal  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. William C. Mitchell

**Title of Project** :

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

*Jonathan Rosenthal and William C. Mitchell*

### **ABSTRACT**

The goal of this work is to affect the regenerative process of *Lumbriculus variegatus* using the bioactive molecule salicylic acid [2-Hydroxybenzoic acid]. Salicylic acid, the active metabolite of aspirin [Acetylsalicylic acid], has multiple roles in animal metabolism and is a growth regulator associated with stress responses in plants. In previous work, our laboratory found low concentrations of salicylic acid treatments in *L. variegatus* to be harmful and/or deadly, however by lowering the exposure time we are now able to use it to inhibit tail segment regeneration. Worm tails were regenerated with or without 0.1 mM sodium salicylate for time periods from 1 to 2 days. Higher dosages or exposures of 3 days were found to be lethal. Recording regenerative abilities was accomplished by measuring the length of the tail segments using a dissecting microscope and digital photography. RNA extracted from the posterior ends of both salicylic acid treated and untreated worms will be analyzed via RT-PCR in order to look for mRNA changes associated with salicylic acid inhibition of regeneration.

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

**Title of Project** :

Anatomical and molecular events which occur during regeneration of tail segments in *Lumbriculus variegatus* [Mudworm]  
*Sonal P. Shah and William C. Mitchell*

**ABSTRACT**

Tissue regeneration occurs in a wide variety of animal species. Many invertebrates and some vertebrates can regenerate limbs or larger body structures. The mudworm, *Lumbriculus variegatus* [California Blackworm] 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. We have performed a time course of tail segment regeneration in these worms at both the molecular and anatomical levels. We look at events before tail segment removal (day 0) as well as 1 day, 3 days and 5 days after the removal of tail segments and their subsequent regeneration. We measured the length of the regenerating tail segments using a dissecting microscope and digital photography. RNA extracted from the posterior ends of regenerating worms will be analyzed via RT-PCR in order to look for mRNA changes during regeneration.

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

**Title of Project** :

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

*Peter D. Tsakkos and William C. Mitchell*

#### **ABSTRACT**

We had investigated the affects of salicylic acid and glucose treatments on *Lumbriculus variegatus* [mudworm, California blackworm] viability and tail segment regeneration with mixed results. We are now turning our attention to the psychoactive stimulant compound caffeine [1,3,7-Trimethylxanthine]. *L. variegatus* were kept in spring water. After treating the worms at various caffeine concentrations, we found that 1.0 mM caffeine was a useful experimental concentration. Comparisons between treated and untreated worms were made based on regeneration of tail segments. Using dissecting microscopes and digital photography we found the addition of caffeine at 1.0 mM concentration inhibited tail regeneration. We decided to look for effects of caffeine on the profile of mRNAs when compared to worms which were untreated. This was done by extracting RNA from the posterior half of worms and conducting RT-PCR on the purified mRNA. During the presentation we will discuss the organismal and molecular methods of our study, our results and the potential of our model of regeneration.

**Student Name** : Matthew R. Howard  
**Major** : Environmental Science  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Emma C. Rainforth

**Title of Project** :

Could Dinosaurs Swim? Evidence from Dinosaur State Park, Connecticut

*Matthew R. Howard and Emma C. Rainforth*

### **ABSTRACT**

Thousands of *Eubrontes* (footprints made by large theropod dinosaurs) are preserved on a single surface at Dinosaur State Park (Rocky Hill, CT). This surface also contains several unusual prints previously attributed to swimming dinosaurs, the tips of their toes touching the substrate and then claws dragging over the surface as they push off. Each swim-track consists of three parallel grooves that are wider at each end and pinch in the middle. Some also have full or partial pad impressions behind the groove, indicating the underside of the animal's foot was at least partially in contact with the substrate. One track is intermediate in morphology between the swim-track and regular *Eubrontes*. Several swim-tracks are overprinted by *Eubrontes*, and one is clearly cross-cut, showing that these swim-tracks are not undertracks but were made on the current surface. Based on morphology alone, these swim-tracks must have been made by walking not swimming dinosaurs. Experiments with a domestic turkey walking over a similar substrate with varying moisture contents showed that a compressed, slightly wet substrate results in a similar morphology to the swim-tracks. It is likely that the exact morphology depends on microbial content in the substrate.

**Student Name** : Kyle Mastropole, Kathleen Dwyer, & Pauline Joshua  
**Major** : Biology  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Edward Saiff

**Title of Project** :

Biomechanics of Avian Cervical Vertebra

*Kyle Mastropole, Kathleen Dwyer, Pauline Joshua and Edward Saiff*

### **ABSTRACT**

The evolution of the degree of cervical rotation in birds has been a topic of interest amount some Ornithologists. Analyzing previous research, performing tissue dissections of avian necks, and studying current literature has helped generate several conclusions about neck size, structure, length, degree of rotation, eye location, and flexibility. Two main species of birds, namely raptor and preyed birds were studied independently and compared with one another in effort to understand why raptor birds have 270 ° neck rotations, whereas preyed birds have restricted neck rotations. Though anatomical evidences were not found, our research concluded that the feeding habits and eye positioning of birds are directly related to the degree of cervical rotation.



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

**Title of Project** :

Studies of Organic Synthesis Reactions using Green Metrics  
*Gurpreet Kaur and Robert J. Shine*

### **ABSTRACT**

In Organic Chemistry, yield is the accepted metric for measuring the efficiency of a synthesis reaction. Yield fails to consider consumed reagents, catalysts, and solvents that will not be fully recovered. It also fails to consider the costs involved in handling the byproducts and waste. It is important to incorporate a maximum number of atoms used in the process into the final desired product. Green Chemistry has been mainly focused on the development of new, cleaner chemical processes using various technologies. As legislation puts an increasing emphasis on chemical processes, it is important that chemicals be used adhering to green chemistry methods. It is important to prove the reliability of data for the purpose of Green Chemistry and to ensure that the advantages be quantified. Chemistry must become greener because of increasing cost pressures, controls and restrictions. At Ramapo College, Green Metrics were applied in the Organic Chemistry Laboratory in the Hydrolysis of Methyl Benzoate reaction. The metrics that were studied were E-factor, Atom Economy, Atom Efficiency, Effective Mass Yield, Reaction Mass Efficiency, and Percent Yield. The goal is to analyze the efficiency of an organic synthetic reaction and make it more environmentally friendly.

**Student Name** : Dena Gitto  
**Major** : Environmental Science  
**School** : Theoretical and Applied Science  
**Faculty Supervisor** : Dr. Eric Wiener

**Title of Project** :

Herbivory on Witch Hazel Trees in a Northeastern Hardwood Forest  
*Dena Gitto, Melanie Klein, Nicole Bermudez and Eric Wiener*

**ABSTRACT**

Witch hazel (*Hamamelis virginiana* Linnaeus), a common understory tree found in dry to mesic hardwood forests of Eastern North America, is fed on by a variety of insect species. We examined the herbivory suffered by 13 witch hazel trees along a forested ridge at the Ramapo County Valley Reservation, Mahwah, NJ. Herbivore damage was categorized into the following guilds: chewers, rollers, folders, skeletonizers, miners, scrapers and galls. Regression analyses were used to determine whether ecological variables (canopy area, tree height, understory light environment, neighboring canopy tree species and total canopy area of conspecifics near the study trees) predict percent leaf area damage by each guild, and by all guilds combined. Particular interest was given to total canopy area of neighboring conspecifics, given its wide range of variation among the study trees and its value as a predictor variable in similar studies on other plant species. Leaf area damage per tree ranged from 1.8 % to 16.2 %. However, results revealed no significant relationships between the predictor and response variables. We concluded, therefore, that more in-depth examination of the causes of variation in herbivory both within and among trees is warranted. Future studies should focus on leaf chemistry and individual insect species.

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

**Title of Project** :

Trends in Trunk Diameter Growth of Four Tree Species in a Hardwood Forest

*Rebecca Lake, James O Brien, Greg Szczupak and Eric Wiener*

**ABSTRACT**

The purpose of this study was to compare growth trends among four common tree species in one hardwood forest. Growth rings from the past 30 years were measured from increment cores that were collected from multiple red oak (*Quercus rubra*), black oak (*Q. velutina*), pignut hickory (*Carya glabra*) and white ash (*Fraxinus americana*) trees on one forest ridge at the Ramapo Valley County Reservation, Mahwah, NJ. Growth rings of white ash trees in floodplain habitat were also evaluated. Results revealed that white ash growth has been in decline since 1986, which presumably is when the fungal pathogens that are known to cause white ash decline became problematic. Decline was more precipitous for white ash trees on the ridge than for those in the floodplain. Growth trends of the other study species were less consistent. No overall pattern was evident for pignut hickory. The only trend among the oaks was a decline and subsequent recovery during and after a gypsy moth outbreak. In general, trends varied greatly among conspecific trees of oaks and hickories. Given that oaks and hickories are mast seed producers, it is likely that their reproductive biology makes it difficult to identify fine-scaled trends within or among populations.