MESSAGE FROM THE PRESIDENT

I am delighted that the College of Staten Island, in its tradition of providing academic excellence and opportunity, is hosting its first Undergraduate Research Conference. It is yet another important addition to the many opportunities we provide our students for learning. I take this opportunity to congratulate all student authors and their faculty mentors who are presenting their research and scholarly work at this conference. I appreciate our students’ and faculty’s hard work, dedication, careful insight, and collaboration needed to complete major projects while meeting their respective learning and teaching responsibilities in the classroom.

The conference theme “Your Passport to Knowledge” is very befitting: doing research and engaging in creative projects allow our students to test their ideas and hypotheses, and to apply and acquire new knowledge. Even more significant is the possibility that their new knowledge may some day make useful and worthwhile contributions to their fields. I am equally confident that the students’ research experience will increase their potential for future opportunities. We should all appreciate the real excitement and pride that they can derive in the ownership of what they have accomplished.

I am encouraged by the level and diversity of participation in the conference and I certainly hope to see that grow in the future. The conference participants represent a broad cross section of the disciplines at the College of Staten Island. Indeed, it is quite remarkable that we have 37 presentations in the conference that range from music and drama to research in sciences, social sciences, and humanities.

I want to express my sincere gratitude to our very hard working faculty and students who have contributed to make this college-wide conference a success. I thank also the members of the conference committee who solicited proposals and organized the conference. Finally, I want to acknowledge the financial support provided by the CSI Student Government Academic & Curricular Affairs Commission.

In closing, let me reiterate that the College of Staten Island is committed to supporting and facilitating faculty-mentored undergraduate research and creative activities in all disciplines. Once again I want to thank all of the student presenters and their mentors for sharing their intellectual work with the College community and wish them success in their future endeavors.
### Dramatic Presentations
Center for the Arts, 1P-Atrium, 2:00 - 3:30 p.m.

1. Michael Hartnett and John Melone  
   Mentor: Maurya Wickstrom  
   Department of Performing and Creative Arts  
   *Angels in America*

2. Elizabeth McNellis  
   Mentor: Maurya Wickstrom  
   Department of Performing and Creative Arts  
   *Leonie - A One-Woman Play*

3. Mariah Pizzano  
   Mentor: Maurya Wickstrom  
   Department of Performing and Creative Arts  
   *An Excerpt from Rebecca Gilman’s Play, Blue Serge*

### Dramatic Readings
Center for the Arts, 1P-110B, Black Box Theater, 2:00 - 3:30 p.m.

4. Michelle Mayo  
   Mentor: Herb Liebman  
   Department of English, Speech, and World Literature  
   *The Loser*

5. Alexander Kraus  
   Mentor: Herb Liebman  
   Department of English  
   *In Your Own Words*

6. Brian Richards  
   Mentor: Herb Liebman  
   Department of English, Speech, and World Literature  
   *William and Elizabeth’s Invisible Marriage*

### Musical Performances
Center for the Arts, Recital Hall, 1:45 - 4:35 p.m.

7. The CSI Guitar Ensemble, 1:30-2:15 p.m  
   Directed by Ed Brown  
   Mentor: Sylvia Kahan  
   Department of Performing and Creative Arts  
   *Works Ranging from Bach to the Beatles*

8. CSI Jazz Ensemble, 2:30-3:15 p.m.  
   Directed by Michael Morreale  
   Mentor: Sylvia Kahan  
   Department of Performing and Creative Arts  
   *Classics by Ellington and Basie; New Works by Morreale*

9. Outstanding Student Soloists from CSI’s Vocal, Piano, Flute, and Strings Studios  
   Mentor: Sylvia Kahan  
   Department of Performing and Creative Arts  
   *Beethoven Serenade for Flute, Violin, and Viola; Arias by Mozart, and Piano Works by Brahms and Chopin*

10. The CSI Chorus  
    Directed by Marina Alexander  
    Mentor: Sylvia Kahan  
    Department of Performing and Creative Arts  
    *An Exuberant Selection of Music for a Cappella Chorus*
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The Role of Helping Behavior in a Mentoring Course in Raising Empathy

32. Mario Perez  
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Department of Biology  
Site-specific Disparity in Prey Capture of Environmentally Impacted Populations of Grass Shrimp

33. Norbert Phillipps and John Tanios  
Mentor: Sos Agaian  
Department of Engineering Science and Physics  
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34. William Smilowitz  
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Department of History  
Christian Magic in the Late Antique Mediterranean World

35. Rochna Sondhi  
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Department of Chemistry  
Investigation of the Role of the Serotonin1A Receptor (5-HT1A-R) in the Inhibition Process of Caspase-3 During Anoxic Conditions

36. Dmitry Volfson  
Mentor: Ruth Stark  
Department of Chemistry  
Madison Square Garden: Not a Building but a State of Mind

37. Dmitry Volfson  
Mentor: Ruth Stark  
Department of Chemistry  
Structure Determination and Prediction of LFABP
DRAMATIC PRESENTATIONS

#1. Angels in America

Michael Hartnett and John Melone  
Mentor: Maurya Wickstrom  
Department of Performing and Creative Arts

shall perform a scene from Angels in America which deals with the homosexuality of Attorney Roy Cohn and the health effects of his promiscuity. This scene was previously performed by us at the “Straight from the Arts” benefit for the victims of the September 11 tragedy.

#2. Leonie - A One-Woman Play

Elizabeth McNellis  
Mentor: Maurya Wickstrom  
Department of Performing and Creative Arts

My performance piece is a one woman play titled ‘Leonie’.

This is an original play which I wrote. This play is sectioned into several different monologues. Each monologue represents the different personalities of this one woman. Each one of these personalities stands as an individual character herself. The section of this play, which I chose to perform for this event, is performed partially with puppetry. The beginning of the piece will be performed with a puppet and voice over. The second half of the piece consists of the actress, who is now the puppet made flesh. The character will perform a poem which I wrote for the play.

#3. An Excerpt from Rebecca Gilman’s Play, Blue Serge

Mariah Pizzano  
Mentor: Maurya Wickstrom  
Department of Performing and Creative Arts

I am directing two scenes from Rebecca Gilman’s Blue Serge. The play is about a cop named Curt who risks both his job and his relationship with his fiance, Beth, to help a nineteen-year-old prostitute named Sandy. Initially, Curt tries to arrest Sandy but quickly forms an attachment to her. My directing project attempts to answer the question: Why does Curt risk everything to help this girl? I selected two scenes which I feel best get at the heart of this question. Curt and Sandy both grew up poor and somewhat neglected. In relating to Sandy, Curt is quite honest and at ease with himself. This is a contrast to the way he relates to Beth, who grew up wealthy. In Beth’s company, Curt feels awkward and “dirty” as though he bears the “mark” of a poor person which, he feels, can never truly be erased. Through juxtaposing two of Curt’s scenes, one with Sandy and one with Beth, I hope to show how class struggle helps shape our identities and how it functions to both unite and divide people.
#4. The Loser

Michelle Mayo  
Mentor: Herb Liebman  
Department of English, Speech, and World Literature

A comedy in which a blind date confronts an overly inquisitive and formidable family. This script is a work-in-progress. At the conclusion of the reading members of the audience will be invited to participate in the development of the script through comments and questions.

#5. In Your Own Words

Alexander Kraus  
Mentor: Herb Liebman  
Department of English, Speech, and World Literature

A reading on the question and practice of academic plagiarism. This script is a work-in-progress. At the conclusion of the reading members of the audience will be invited to participate in the development of the script through comments and questions.

#6. William and Elizabeth’s Invisible Marriage

Brian Richards  
Mentor: Herb Liebman  
Department of English, Speech, and World Literature

The script, “A Contemporary Twist on Droit du Seigneur,” is a work-in-progress. At the conclusion of the reading members of the audience will be invited to participate in the development of the script through comments and questions.
MUSICAL PERFORMANCES

A diverse sampling of performances by the young artists of the CSI Music Program will be presented, representing different historical and stylistic musicals genres, played by a variety of ensembles. The afternoon’s offerings will include:

#7. The CSI Guitar Ensemble

Directed by Ed Brown
Mentor: Sylvia Kahan
Department of Performing and Creative Arts

Works ranging from Bach to the Beatles.

#8. CSI Jazz Ensemble

Directed by Michael Morreale
Mentor: Sylvia Kahan
Department of Performing and Creative Arts

Jazz classics by Duke Ellington and Count Basie, and new works by Michael Morreale. The Shunsuke Nagamine Trio, a student group, will be among the featured young artists.

#9. Outstanding Student Soloists from CSI’s Vocal, Piano, Flute, and Strings Studios

Mentor: Sylvia Kahan
Department of Performing and Creative Arts

The offerings will include the Beethoven Serenade for flute, violin, and viola; arias by Mozart, and piano works by Brahms and Chopin.

#10. The CSI Chorus

Directed by Marina Alexander
Mentor: Sylvia Kahan
Department of Performing and Creative Arts

An exuberant selection of music for a cappella chorus.

(Program subject to change, works to be announced)
Digital design is the application of a set of numbers and techniques for developing digital circuits and subsystems to create a solution for some problem. Digital circuits, processing discrete information, are found in an astonishingly wide range of electronic systems. Consumer microwave ovens and television, space communication, traffic control and many others. Advances in digital circuit manufacturing have provided system designers with more functions contained in less space. Digital systems operate on numbers that represent some real logical or arithmetic functions.

The digital system is based on binary representation of numbers. There are other representations of numbers such as the Fibonacci numbers. Fibonacci numbers form one of the most fascinating sequences of numbers. The sequence originally came up as the answer to a problem posed by Leonardo of Pisa, also known as Fibonacci. Fibonacci numbers and the Fibonacci sequence are prime examples of “how mathematics is connected to seemingly unrelated things.” The system \{r_n\} is called Fibonacci system. It has a very simple law of formation for every \(n>2\) given by the following recursive equation

\[ r_n = r_{n-1} + r_{n-2} \]

The case when \(r_1=r_2=1\) is the important special case of the Fibonacci system. In that case the system \(\{r_n\}\) forms the sequence of numbers

1,1,2,3,5,8,13,21,34,55,89,144,

which is called Fibonacci series and its terms are called Fibonacci numbers. We’ll denote such Fibonacci system by \(\{r_n\}\).

It is natural to ask, how to use Fibonacci numbers to representation for the construction or the design of digital circuits. If we can, how efficient can this be compared to classical circuits?

In this article, we present Fibonacci code based Boolean function minimization algorithms, fast efficient calculation, and derivatives of Boolean functions, investigation nonlinearity.

* This work is supported in part by the Discovery Institute through the C-STEP and AMP programs
Finite Topological Nearrings*

Emmanuel Adepo

Mentor: Prabudh Misra
Department of Mathematics

A nearring is a, not necessarily abelian, group with another operation which satisfies only one sided distributive law with respect to the group operation. Such nearrings arise naturally when we compose functions or polynomials and they have been studied extensively in the last seventy years. These algebraic structures have found applications in combinatorics, the design of statistical experiments, coding theory and cryptography in the recent past.

In this project we propose to identify finite nearrings that are topological. Nearrings of low orders have been listed with the use of a popular and powerful computer program GAP (Groups, Algorithms and Programming) and nearringer have developed the SONATA system for their calculation needs. Topologists in listing all possible topologies on a finite set have made similar efforts. In order to proceed with the problem at hand, we first need to learn the available relevant mathematical systems on computer and then use that knowledge to create program(s) that will identify topological nearrings and similar structures.

We expect that the examples of topological nearrings obtained by a computer will help us recognize some patterns, which will facilitate proofs of some general theorems.

References:


* This work is supported in part by the Discovery Institute through the C-STEP and AMP programs
Controlled Nucleation and Growth of Nano-sized Metal Crystallites in Presence of Silicon Polymers*

Abeer Al-Hmouz, Cole Oluwaseun, Alexandra Krawicz, Tariq Bandoo, and Rajesh Sardar
Christian Toussaint (Queensborough Community College)

Department of Chemistry

Stabilized clusters and colloids of noble metals such as Pd with nanometer-scale dimensions are of particular interest as catalysts for organic and inorganic reactions. It is well known that the per-atom catalytic efficiency of metal clusters and colloids often increases as the cluster size decreases. However, the probability of cluster aggregation also increases as particle size is reduced. To prevent agglomeration (formation of large particles or powders) nano structured particles usually need to be protected by stabilizers such as polymers or surfactants. Much recent efforts have been devoted towards the fabrication of polymers containing nanometer-sized clusters, which are usually prepared by reduction of metal ions within the polymer matrix.

A key problem in the preparation of such type materials is the ability to control not only the size but also the size distribution. Great effort has, therefore, been made to optimize the preparation conditions for such type of materials.

In this presentation, we will disclose our preliminary results on the grafting of the silicon polymers and their application as host agents for precisely controlled nucleation and growth of nano sized metal particles. Our strategy not only permits the quantitative generation of porous silicon materials but also allows a chemical control over the size of the pores under very mild reaction conditions. Preliminary results indicate that these materials are stable under atmospheric conditions and agglomeration of nano-structured particles can successfully be prevented.

* This work is supported in part by the Discovery Institute through the C-STEP and AMP programs
A self-consistent calculation will be developed to compute the geometry and spin density of magnetic materials with applications in spin electronics devices. Spintronics is a new concept in which uncompensated electron spins are introduced into devices. The electron particles possess two distinct spin states (up or down), as the binary digit in a computer data unit. Meanwhile, one can utilize the transport properties of different spin states or the magnetism arising from uncompensated electrons for device design. Such devices have shown the advantage to shrink the present devices to molecular levels. In this project, we first would investigate magnetic iron (III) oxide nanoparticles, typical compounds for magnetic materials, coated with long chain acid surfactants. Experiments have shown that the magnetism of iron oxide is highly sensitive to the surrounding surfactants. To better understand the effect of surfactants, investigation of the spin density profile of magnetic nanoparticles is needed. In the model, we need to define several parameters, including total uncompensated electrons in a nanoparticle, structure of an iron oxide particle, and geometry of surfactants near an iron oxide particle. Here we will devise a self-consistent calculation to compute the geometry and spin density simultaneously. We will employ the commercially available force fields, such as MM+, to predict the structure of iron oxide nanoparticles. For a given number of uncompensated electrons, the surfactants will then be introduced into the system, and a geometry optimization method will be used to compute the optimal structure for the system containing nanoparticles and surfactants. The quantum chemistry calculation, such as ZINDO parameterized for iron atoms, will be resumed to calculate the charge and spin density of the iron oxide particle. The procedure will be repeated until the convergence of geometry and spin density is achieved. This scheme allows us to conduct a systematic study for different types of surfactants, the optimal number of surfactants to bind with the iron oxide particle, and the number of uncompensated spins in a nanoparticle.
We spend a great deal of our lives interacting with our siblings, and these interactions provide us with important ways to establish and practice social and interpersonal skills. The purpose of this research is to examine the differences in behaviors, cognitions, and emotions about the sibling relationship of middle aged adults and their recollections of their childhood sibling relations. Although a few comparisons of childhood and elderly adults have been conducted, our study sampled a middle aged adult population (between the ages of 35-60). The possible variations of gender, contact and geographic proximity were also examined to observe their effects on the sibling relationship during middle age. Our first hypothesis states that the sibling relationship will be more positive in childhood and will decline during adulthood due to the changes that affect this life stage. A second hypothesis states that sibling pairs containing a female member will be closer than those dyads that contain only males. The third hypothesis predicts that the smaller the geographical distance and the greater the contact between the siblings in adulthood, the closer the relationship. Participants were solicited via an e-mail message sent to all faculty and staff at The College of Staten Island of the City University of New York, as well as individuals outside of the college. Those meeting the criteria of age (35 to 60) and sibling status (at least one living sibling) completed the Lifespan Sibling Relationship Scale. This psychometric scale assesses attitudes toward the sibling relationship in two time periods: retrospectively to childhood and currently in middle adulthood. Results indicated that female participants became emotionally closer with their sibling as adults, yet showed no change in behavior. Male participants showed no change in their feelings towards their sibling, despite having significantly fewer interactions in adulthood.

* This work is supported in part by the CSI Foundation
The subject of my research project is a clay tablet inscribed with Mesopotamian cuneiform writing, located here on campus in our museum. I have chosen to undertake this project because of my interest in ancient culture, particularly life in Ancient Egypt and Mesopotamia. I spent about two months researching cuneiform tablets, and the culture of ancient Mesopotamian Society. As my research progressed, I asked myself the following questions: 1) Why was clay used for the tablets? 2) When was this particular tablet made? 3) What is inscribed upon the tablet? 4) Who was it made for/by? 5) What purpose did this tablet serve? 6) What is the historical significance to this tablet and 7) What can this tablet tell about life in Ancient Mesopotamia?

Through my research, I was able to determine that this artifact was created around 2100 BCE for documentation of proof of a sale or trade. Since, in Ancient Mesopotamia scribes were the only people who could read and write in cuneiform, I inferred that this tablet was created and inscribed on by a scribe. Although a record of sale may appear to be historically insignificant, I believe this to be far from the case. Once a tablet is deciphered, it can tell us a great deal about life during this period. The exact translation of this artifact is not yet available, however I have found many examples of other tablets with striking similarities to the one I have researched. After translations, the majority of these tablets have shown records of sale and trade of animal or grain. From this evidence, I have concluded that ancient Mesopotamia is an agrarian society, relying heavily on farming and the goods that farmers can produce.

In order to prove my thesis and find the answers to my questions, I studied my artifact as close as possible and compared the tablet I have studied with others from the same geological period. I consulted resources including the Internet, and various secondary works.
An American Family: True Relevance Programming?

Natalie Baginski

Mentor: Edward Miller
Department of Media Culture

In early 1971, WNET Producers Craig Gilbert and Curtis Davis collaborated with renowned filmmakers Susan and Allen Raymond on an idea to document on film the daily life and events of the William C. Loud family of Santa Barbara, California. Changing social and political climates in the early 1970s (anti-war protests, civil rights movements, women's liberation, increasing political tension, homosexuality and so on) called for new genres of programming. This twelve-hour miniseries was an innovative attempt to grasp a hint of American bourgeois reality, “to illuminate a distinctively American condition” (Family relations expert Fredelle Maynard, Image Magazine, January 1973).

The 1970s spawned dramatic changes in programming format and content. Producers and writers began experiment and take on issues of controversy, as they had never done before. New technological refinement and innovations allowed for the documentary form as well as the miniseries to act as an effective media weapon, allowing for a more serious and in-depth examination of important issues. Racial and ethnic diversity as well as social conflict and feminism became central themes of discussion, changing previous media paradigms. Pioneering writer/producer Norman Lear changed the face of prime time comedy as well, with such revolutionary, yet extremely successful sitcoms like All in the Family, Maude and The Jeffersons. Enjoying almost immediate popularity, these shows gave television new relevance as a social mirror. Or did they really?

Despite the changes in content and style (language, characters, setting, socio-economic status and so on), these shows still maintained a very formulaic structure. Serious issues were dealt with humorously, often drowning in the absurd. Conflicts were resolved within the thirty minute timeframe, rationally and without much struggle. Naturally, this is not the case in reality. Often enough, life does not result in happy endings.

For the Louds, lack of communication, denial, hidden resent, hurt pride and mind games create tension and conflict that remains unresolved throughout the duration of the series and even beyond. Torn apart by divorce and the family’s inability to deal with the oldest son’s choice of lifestyle, the family polarized and to this day has never entirely reunited.

A detailed analysis of the Loud family miniseries, using evidence (both historical and contemporary) from works by renowned media experts (e.g. Erik Barnouw, Douglas Kellner et. al.), a critical analysis of the show and its characters, by author Anne Roiphe; excerpts by famed anthropologist Margaret Mead and others, should prove that An American Family, as a first real version of “reality TV”, was truly a key example of relevance programming.

* This work is supported in part by the CSI Foundation
Angiogenesis is the proliferation of new blood vessels from existing vessels. It occurs during normal homeostatic events (embryonic development and endometrial remodeling) example includes vessel growth to accommodate reduced blood flow in cardiac vessels, growth of new vessels to supply blood to growing tumors and vessels in the retina and kidney accompanying diabetes, pathological and repair processes which is best characterized by the process of wound healing. In each case, growth factors released from endogenous tissue stimulate the proliferation and migration of vascular endothelial cell. Binding of the growth factor stimulates the endothelial cells to increases mitotic processes and the release of matrix metalloproteinases to accompany cell migration. These enzymes, the matrix metalloproteinases, degrade extracellular matrix proteins, thereby allowing cell migration. Recently, the angiostatic proteins angiostatin and endostatin have been described. These proteins decrease endothelial cell proliferation. I wish to determine if angiostatin inhibits the release of matrix metalloproteinases, thereby facilitating the anti-angiogenic properties. I will treat microvascular endothelial cells with angiostatin, angiostatin plus VEGF, or untreated controls and determine the amount of matrix metalloproteinases released by these treatments.

* This work is supported in part by the Discovery Institute through the C-STEP and AMP programs
The subject of my research project is Ancient Roman Perfume Bottles and Ancient Roman Women's Perfume and Cosmetics. The reason I chose to research these ancient artifacts was not only to fulfill a requirement of an ancient culture class, but also because the topic greatly intrigued me. I chose these artifacts from a list of many other choices because it was something that I could relate to, as well as the overwhelming curiosity it struck in me. Being a young woman in the 21st century, fashion and beauty play a large role in daily life. The possibility of linking present ideals and practices with a Roman past was an opportunity I could not miss.

These artifacts from ancient Rome date from the middle of the first century B.C. The method used to manufacture these bottles is in the art of blowing glass. The shape and style of these bottles are similar, and are generally small in size. These bottles have a thin neck, and usually gain size as you descend from the top to the bottom.

The questions I raised throughout my research are as follows: What actually was put into these bottles? Who owned perfume bottles and cosmetics in ancient Rome? Did all women wear cosmetics and perfume, or was it strictly an upper class luxury? What were the ingredients used to make perfume and cosmetics? How did this shape the culture of women, and what can the artifacts tell us about the importance of appearance to women in ancient Rome?

My research will demonstrate that these artifacts were indeed used in ancient Rome to hold women's cosmetics and perfumes. These bottles held a great importance in the daily life of women due to their status of inferiority to men, their concern for proper hygiene, and the importance placed on appearance. My research will show the historical significance of these bottles was to allow each woman create her own style and uniqueness. Appearance was a value held very highly for both women and men in ancient Rome, due to the standards society placed on dress and hygiene. These bottles played a large role in the routine daily life of these women.

The methods used to research these artifacts were numerous. I began with the artifact itself, studying and identifying what I could by inference. I then looked for any primary or secondary books on this subject area that could be useful. A majority of my information was found on academic or historical websites, which were very useful. I researched any information that was comparable to my artifacts to help me get a feeling of the cultural and historical influence they held. In support of my thesis, this research will refer to images and texts on the cosmetic and perfume bottles used during this time to show the importance appearance held in ancient Rome.
Amid the zeal to create, improve, and modernize the world, engineers too often forget the most important foundation they must first build upon. Each engineer has a responsibility to follow certain ethical guidelines as they work toward the advancement of technology, science, and society. In most colleges and universities, a course on basic ethics and proper moral procedure is not even offered, much less required, for engineers-in-training. Because the duty of every engineer is to be aware of, practice, and make others aware of proper ethical procedure, every learning institution should offer and require future engineers to take a course that will give students a firm foundation and confidence to make the right decisions when faced with moral dilemmas.

According to the North American Free Trade Agreement (NAFTA) and the American Society of Civil Engineers (ASCE), there are several specific laws of ethical conduct in engineering practice. In this presentation, the following code of engineering ethics will be explored:

1. Engineers shall keep the safety, health and welfare of the public above all else while carrying out his or her work.
2. Engineers shall work only in his or her area of experience and capability.
3. Engineers shall make public statements in a way that is unbiased and factual.
4. Engineers shall perform in a faithful and trustworthy manner for each employer, avoiding any conflicts of interest that may arise.
5. Engineers shall create a professional reputation based on what he or she has earned through their work and shall not deal unfairly with competitors.
6. Engineers shall act in a way that will maintain and increase the honor, integrity, and dignity of the engineering profession.
7. Engineers shall continue to learn and develop professionally throughout his or her career, and shall provide opportunities for those under his or her supervision to do likewise.

Perhaps the most important directive of this presentation is that everyone must be made aware of his or her own ethical responsibilities. Students, doctors, construction workers, artists, and business owners, to name a few, have a duty to follow moral rules for the safety of those with whom they share this planet. Nothing beneficial can be built in the world we live in if we do not first build on the firm foundation of our morals.
The Role of Endophytic Fungi and Storage in the Regrowth Ability of Perennial Ryegrass Genotypes Following Defoliation*

Roy Cho

Mentor: Gregory Cheplick
Department of Biology

Endophyte is a general term that refers to any organism that lives inside of a plant, including an organism such as Neotyphodium lolii, which are found in perennial ryegrass (Lolium perenne L.). Globally, this ryegrass is noted as an important forage crop. Since carbohydrate levels are imperative for regrowth rate in plants, it is hypothesized that the general carbohydrate levels and regrowth ability of these genotype-specific plants will be lower in Neotyphodium lolii presence than compared to its absence. This hypothesis states that the lower availability of carbohydrates will decrease the hosts' ability to regrow after defoliation in comparison to non-infected plants. In this experiment, 10 different host genotypes were used to replicate 20 clones each. One half of each host genotype (10 clones) was infected and the other half free of endophytes resulting in a total of 100 infected and 100 non-infected clones for this research. Defoliation followed after 8 weeks of growth. After a period of 10-12 weeks, tiller number, root mass, leaf area, and stem mass data were collected. Dr. D. Belesky (from the Agricultural Research Service, USDA) performed a carbohydrate analysis for this research. The advantage was to have quantitative data to correlate carbohydrate levels with endophytic presence. The analysis showed statistically significant variation among genotypes for all growth traits. The variations due to endophyte associations depicted that each genotypic relationship is specific. For example, Genotype E illustrated inhibition of growth under endophyte presence, while other genotypes did not. There was reduced growth in tiller number, root mass, stem mass, and carbohydrate % as compared with the non-infected clones. The endophyte may have been competing with its host for nutrients in some genotypes. In 4 weeks following defoliation, the infected E genotype showed decreased regrowth ability due to its endophytic association. Carbohydrate storage was not significantly affected by endophyte infection.

* This work is supported in part by the CSI Foundation
Logic circuits are the basis for modern digital computer systems. To appreciate how computers operate one needs to understand digital logic and Boolean algebra. Boolean algebra is a deductive mathematical system that uses the base two binary system, which is closed over the values zero and one (false and true). Boolean logic forms the basis for computation in modern digital computer systems. You can represent any algorithm, or any electronic computer circuit, using a system of Boolean equations.

This program will help new engineers understand visually how to design digital circuits. By feeding the program Boolean expressions, and input values for each variable it will construct a graphical demonstration of digital circuits. This will help engineers grasp the concept of drawing simple circuits step by step with multiple stages. They will see the actual gates and witness the flow of binary data, allowing the user to see how and why the output has certain values depending on their input values.

The objectives of this program will be:
Implementation of Boolean functions with gates.
Simplifying a Boolean expression.
Given a function of two to four variables, the program will be able to plot the function in a Karnaugh map.

The project will be presented with graphical representations that provide the visual aspect of the program. It will be coded in Java, because of its efficiency in linking core programming and graphical interfaces.

Our approach for this project is:
Expression of Aminophospholipid Translocase in Brain-derived Cell Lines*

Ruth Duchatellier, Tomasz Sobocki, and Farah Jayman

Mentor: Probal Banerjee
Department of Chemistry

An important aspect of the production of immortalized and rapidly dividing cancer cells is their ability to evade apoptosis and phagocytosis. In our experience, typical conditions causing apoptosis, such as anoxia-reoxygenation or hydrogen peroxide treatment have little effect on rapidly dividing neuroblastoma cells. Apoptosis and externalization can be effected only when the cells are simultaneously serum-starved or differentiated prior to insult. Our preliminary experiments have also shown that in the HN2-5 cells, apoptosis is accompanied by an inhibition of aminophospholipid translocase (APTL) activity, which is responsible for the localization of phosphatidylserine (PS) to the inner leaflet of the plasma membrane. This could be due to transcriptional regulation. In addition, APTL mRNA levels are highly tissue-specific. For such reasons, we are interested to study the APTL gene promoter and its activity in a wide range of transformed cells, and whenever possible, we will measure the activity of APTL and expression of the gene in undifferentiated and differentiated hybrid neuroblastoma and glioblastoma cell lines. Currently, we have obtained from the human genome a 1.5-kb sequence upstream of the reported APTL open reading frame. This sequence harbors many characteristics of TATA-less promoter and is being studied using the luciferase expression system for promoter activity. Further analysis by 5’-RACE and serial deletion and will yield additional information on the transcription start site and the types of regulatory elements that we could expect to find on the APTL promoter. This will help us delineate a reason for the tissue-specific expression of APTL and then assign a role for this P-type ATPase in cell division and survival.

* This work is supported in part by the Discovery Institute through the C-STEP and AMP programs
D. Melanogaster’s Genotypes and their Adaptation to Different Temperatures*

Ramia Elghandour

Mentor: Valerie Pierce
Department of Biology

Drosophila melanogaster’s different alleles have been genotyped and characterized using the method of cellulose acetate electrophoresis. Some of their enzymes were dimorphic, while others were monomorphic. Of the 10 glycolytic enzymes, glyceraldehydes-3-phosphate DH (GAPDH) was dimorphic having two different alleles, and phosphoglucose kinase (PFK) was monomorphic having only one allele. Previous researchers have genotyped other enzymes, such as phosphoglyceromutase (PGM) and phosphoglucose isomerase (PGI), and results showed that they were monomorphic. In addition, these enzymes were ready to be assayed for activity. The different acclimation temperatures affected the two enzymes. Assaying these enzymes at a greater temperature than the incubation temperature increases the amount of enzyme at lower temperature to compensate for the activity that was lowered. In addition to acclimation temperature, these enzymes were assayed at different temperatures other than their living temperature, which was at (25C). Their maximal initial velocities (Vmax) were recorded as a measure of enzyme concentrations. Findings indicate that for both enzymes, activity becomes greater when measuring at a higher temperature.

The Vmax is expressed by the Kcat and the enzyme concentration: Vmax = Kcat [enzyme]. So, when the Vmax of these enzymes were obtained, it became obvious that the Vmax reflected the effect of temperature on Kcat, which is the catalytic constant. The opposite also became obvious after doing the acclimation responses. In this case, the Vmax reflected the effect of temperature on the enzyme concentration. Our hypotheses that were proposed prior experiment for activity assays and acclimation assays are thus been approved.

* This work is supported in part by the CSI Foundation
Heavy metal pollution is a major environmental concern. Metals can accumulate in organisms and perhaps exert toxicity. Metals can be transferred from prey to predator. Therefore, metal toxicity in one organism can have an impact on the entire ecosystem. Metals exert toxicity by binding to high molecular weight proteins and altering their function. Animals can detoxify metal by producing metallothioneins (proteins that bind to metals) or making metal-rich granules. The objective of this study is to investigate the effects of Cadmium exposure on the swimming behavior of amphipods. Laboratory cultured amphipods were exposed to 0, 0.06, 0.125, 0.25 and 0.5ppm Cd. Then they were observed in plastic rings to record the amount of time they spend swimming out of 10min. They were also observed in boxes to record the number of times they go up to the surface in 30min. Swimming activity decreased as the concentration of the exposure increased. But swimming activity decreased in big jumps and not gradually. Also, there seems to be a point between the 0.25 and 0.5ppm Cd exposure were the swimming activity of the amphipods drops to almost nothing. This is possibly because the amount of metal in the cytosol exceeded the amount of metallothioneins. The results obtained from this experiment will be used in future projects to correlate the changes in behavior to the binding of the heavy metals to the metal sensitive fractions.

* This work is supported in part by the Discovery Institute through the C-STEP and AMP programs
Enteric pathogenic such as Escherichia coli and Salmonella typhimurium have the capacity to colonize and infect susceptible hosts. However, environmental stresses such as high osmolarity and low pH are encountered when these bacteria undergo the transition to a pathogenic existence. Both high osmolarity and low pH contribute to the secretion of organic signaling molecules (autoinducers) by these organisms grown in the presence of glucose or preferred carbohydrates. The autoinducer molecules communicate information regarding both cell density and the metabolic potential of the environment and are believed to signal the bacteria that they should undergo transition from the free-living to the parasitic existence. It has been proposed by Dr. Surette and Dr. Bassler that alteration in gene expression in response to cell density or “Quorum Sensing” may have a role in the regulation of virulence in enteric pathogens such as Salmonella typhimurium. Genes associated with Salmonella pathogenesis include those regulated by regulatory system. Regulatory system- activated genes have recently been show to be affected by DNA adenine methylation (Dam methylation) at specific genomic sites. Dam- mutants of S. typhimurium are avirulent and it believed that Dam and regulatory system constitute an overlapping network controlling virulence in Salmonella species. In this investigation we are using the Vibrio harveyi quorum-sensing reporter system to evaluate autoinducer production in Escherichia coli 0157:H7 and E. coli derivative strains with deficiencies in the Dam and the mutS gene involved in methyl- directed mismatch repair (MDMR).

* This work is supported in part by the CSI Foundation
Many people think that Fred Rogers was just the host of a long running children's television program. This research found that Fred Rogers was one of the central pioneers in educational television. Rogers helped establish the nation's first community supported public television station. He incorporated the knowledge he gained working in the early days of commercial television with a commitment to developmental psychology in creating programming that both educated and entertained. One of Rogers’ key contributions was to produce programs that treated children as real people. His programs spoke to children, not at, above, or below. Rogers’ influence continues far beyond his “Neighborhood.” His work has served as a model for other educational broadcasters and he has been a force for education, children and parents in American society.
We carry out Monte Carlo simulations to investigate a greatly simplified model composed of polymers, precursors and solvents on a two-dimensional lattice. Our aim is to explore the rod-like cavity (to accommodate precursors) formed in such a blend system, which can facilitate the synthesis of non-spherical nanoparticles. In the simulations, we elucidate the effects of the attractive and repulsive short-ranged interaction between the monomer and precursor. For repulsive interactions, the chain tends to contract, and the rod-like cavities display a wide range of sizes. In contrast, the attractive short-ranged interactions increase the mean chain dimension, and screen out the larger cavity sizes. In other words, the attractive interaction enhances the selectivity of cavity sizes (like filters). This can be partially attributed to the role of attractive precursors as linkers to bridge different chain molecules together. As a result, the large aggregates arising from precursors are suppressed. These results provide rationales to devise more effective synthetic schemes for non-spherical nanoparticles.

* This work is supported in part by the Discovery Institute through the C-STEP and AMP programs
Poster #29

**Pd(OAC)₂- Catalyzed Silaestrification to Generate Biodegradable Polymers and Evidence for the Colloidal Pd as “real” Catalyst**

Alexandra Krawicz, Abeer Al-Hmouz, Tariq Bandoo, Rajesh Sardar, and Cole Oluwaseun and Christian Toussaint, and Moni Chauhan (Queensborough Comm. College)

*Mentor: Bhanu P. S. Chauhan*  
Department of Chemistry

Simple methods for the quantitative conversion of a variety of organic compounds into stable, easily isolable and identifiable silyl derivatives are required in organic synthesis. The silylating agents generally used in the conversion of the important carboxy function into the silyl ester group are hexamethyldisilazane or aminosilane which requires prolonged heating and continuous removal of ammonia or amine. Other important methods known to synthesize silylesters are by heating chlorosilane or alkoxysilanes with acetates or acetic anhydrides. However, all these processes are applicable under extreme reaction conditions and are accompanied by other side products.

The utility of introducing functional group on the polysiloxane backbone is well recognized, and modifying the existing ones is a continuous challenge. Organofunctional siloxanes are a relatively new class of siloxane copolymers that couple the unique properties of polysiloxanes with the wide range of reactivities of carbon functional organic groups. They form the basis of a rapidly developing and diverse field of applied science. A few among the many applications of polysilylesters are in the cotton textile industry to impact water repellency. These materials are also used as liquid cross linkers, adhesion promoters for silicone RTV's and as source of silicon dioxide.

We report herein a very simple, efficient, catalytic route for quantitative conversion of siloxanes to siloxyesters. The reactions in most cases are very rapid and the catalyst precipitates out after the completion of the reaction. We will also present the results of our preliminary investigations to establish following guiding principles.

(i) What types of catalysts are suitable to effect polysilylester formation reactions?  
(ii) Can we develop a catalytic system, which can effect the sylester formation in monomeric, oligomeric and polymeric siloxane?  
(iii) Can we provide the evidence for the participation of colloidal solutions in present catalytic transformation?  
(iv) Can we stabilize polysilyl esters in order to investigate their physicochemical properties, which will define the applications of these polymers in diverse fields?  
(v) Can we predict the degradation behavior poly(silylester)s as a new class of degradable polymers?

*This work is supported in part by the Discovery Institute through the C-STEP and AMP program*
Within the past ten years tourism has been the fastest growing industry in the United States and actually around the world. Heritage tourism in turn has been the fastest growing branch in this category. Heritage museums are sprouting up all over the world, everything from old tenements of the Lower East Side, to the Gulags of Russia and the slave ships of Africa. History trails of former battle grounds and pioneer migrations are being retraced all through out the United States. Developments of historic towns like Williamsburg and Salem are now being undertaken all over the world. This research is a look at the reasons why a movement like this one, to recreate our sometimes not so appealing past, has emerged. Is it because the human race is thirsting for knowledge about its past and would like to experience the reality of its ancestors on a more personal level? Or is this simply a carefully designated advertising campaign that is trying to cash in on the public’s current fascination with recreated reality? Through my research I came to the conclusion that both of these reasons can apply.

Some heritage museums have emerged with specific missions to bring about tolerance and understanding of others through the understanding of history. Other museums found the tactic of adding realistic historical detail to their exhibitions to be helpful in renewing the interest in history of the younger audiences. Although I found the movement to recreate history to be a positive one, there are a number of historic rejuvenations that seem to emerge specifically in order to make money. They often are encouraged by governors whose first priority is boosting tourism in their states and that sometimes can distort the history.
The Role of Helping Behavior in a Mentoring Course in Raising Empathy

Nitsana Moyal

Mentor: Rima Blair
Department of Psychology, Sociology, Anthropology, and Social Work

Literature shows that empathy has a role in helping behavior (Batson, 1991). This study’s first objective was to examine the effect on empathy of taking on the role of a mentor as an undergraduate in a college based mentoring course. The second objective was to ascertain mentors’ beliefs and attitudes associated with the helping experience during the course. Both a quazi-experimental study and an interview were conducted. Participants were 9 female undergraduate students who mentored and tutored incarcerated adolescent girls. A comparison group of 13 participants (11 females and 2 males) was used for control. Both groups completed The Balanced Emotional Empathy Scale (Mehrabian, 2000) as a pre and post test measure, and also answered a set of four open-ended questions at the end of the course. Results were inconclusive since participants demonstrated no growth in empathy in the quazi-experimental study, albeit perceiving themselves as significantly more empathic as a result of taking the course. Moreover, participants were significantly more willing to help others after completing the course, associating it with numerous psychological benefits to themselves.

References:

Mehrabian, A. (2000), Manual for the Balanced Emotional Empathy Scale (BEES); (Available from Albert Mehrabian, 1130 Alta Mesa Road, Monterey, CA 93940).
The grass shrimp, *Palaemonetes pugio*, inhabits the waters surrounding Staten Island, NY and is potentially at risk of exposure to metal, as well as organic pollutants. The focus of this study was to determine if grass shrimp inhabiting these waters exhibit sublethal toxicity as evidenced by impaired prey capture, and if exposure to ‘polluted’ sediment is responsible for any toxicity. Metal body burdens and subcellular distributions were investigated to explain toxic responses. Shrimp for this study were collected along a suspected ‘pollution gradient’ which included three Staten Island, NY sites and one Southern New Jersey site. Prey capture studies were conducted by monitoring the number of live prey (*Artimia salinas*) consumed by shrimp in one hour. Shrimp originating from the least impacted site [Tuckerton, NJ (TK)] captured approximately twice as many prey (~8 prey/hour) as compared with shrimp from the most impacted site [Richmond Creek, Staten Island (RC)] (~4 prey/hour). Additionally, following an 8 week exposure to RC sediment in the laboratory, prey capture in TK shrimp became impaired (TKrc); the prey capture of TK shrimp maintained in TK sediment (TKtk) remained high. Analysis of metal burdens and subcellular distributions suggests that Cu and Zn may not to be relevant to impaired prey capture; Cu burdens are the same between TKrc and TKtk, and increased burdens of Zn in TKrc are stored as biologically-detoxified metal. Ag toxicity, however, cannot be ruled out, as a low, though detectable level was found associated with the organelles (a metal-sensitive fraction) of TKrc shrimp; no Ag was detected in the same fraction of TKtk shrimp. It would be premature however to suggest that Ag exposure results in the impaired prey capture of RC shrimp. Future studies will specifically investigate mechanisms of Ag toxicity in grass shrimp as well as the possibility that exposure to organic pollutants results in behavioral toxicity.

* This work is supported in part by the CSI Foundation
From the computers on our desks, to the microprocessor in control of our car’s engine, computers are an integral part of our daily lives. And yet, we rarely stop to think about just how they run, and how they are designed.

Digital systems operate on numbers that represent a real, logical, or arithmetic function. It is the designer’s test to establish the relationship between the numbers and the task being performed. Boolean algebra is the basic mathematical tool for the solution of this type of logical design problem.

However, we must look at Boolean algebra and wonder if the binary system is the most efficient way to represent the functions mentioned above. With that goal in mind we examine the Fibonacci series of numbers—first developed to calculate the breeding rate of rabbits under ideal circumstances—which can be defined as \( p(n) = p(n-1) + p(n+2) \). This yields the sequence 1,1,2,3,5,8,...

This sequence is found not only in the rabbits it was originally designed for, but also in many other seemingly random places. Pinecones, nautilus shells, cactus spines, and even cauliflower all show patterns that are based upon this sequence.

Taking these values as radix numbers we can base binary numbers in Fibonacci. This Fibonacci representation of binary numbers can be used to perform the same arithmetic operations as with other radix values.

If we use only 1’s and 0’s in our base Fibonacci we can represent any number with the simple rule that two 1’s should never appear next to each other. This is because two 1’s can always be represented by the next number in the sequence. For instance, the number 3 is 1000. It could be represented as 110, however if we apply the no consecutive 1’s rule we have a unique representation for every number. We can easily use this to add two or more numbers. 5+2 = 10000+100 = 10100 which using our Fibonacci radix values gives us 7. Multiplication is even easier, it is based on the Egyptian system of doubling. With base Fibonacci rather than double we add to the previous number. Thus 6 * 6 =

\[
\begin{align*}
16 \\
16 \\
212 \\
318 \\
530 \\
8 \\
5 + 1 = 6, \text{ and } 30 + 6 = 5 * 6
\end{align*}
\]

With this method for addition and multiplication it is natural to attempt the application of Boolean laws to this system. In this presentation we will introduce digital concepts based upon this so-called Boolean-Fibonacci Algebra. Knowing that we define...
combinational logic, and the generation of switching equations from the values in truth tables, we are planning to present the simplification of switching equations using a so-called Kaighaugh-Fibonacci map.

In addition we will explain the difference between binary and Fibonacci systems, and why Fibonacci systems are capable of accuracy.
Christian Magic in the Late Antique Mediterranean World

William Smilowitz

Mentor: Eric Ivison
Department of History

This Conference proposal will study the ampullae or pilgrim flasks of Saint Menas currently on display in the S.I.A.S@CSI Archaelogical Study Collection at the College of Staten Island. The three sixth-seventh century A.C.E. terracotta ampullae of Saint Menas orginally from Byzantine Egypt, were used as reliquaries for pilgrims who visited the saint's pilgrimage center in Abu Mena, Egypt. These ampullae were used as containers for the oils, water, and earth associated with the saint's tomb. This Conference proposal will study how these ampullae indicate the evolution of popular devotions contrasted with the ambiguity of magical practices and pious reverence.

The ampullae of Saint Menas are examples of Mediterranean Christian material culture. These ampullae provide insight into the iconography of Saint Menas, as well as the development of the cult of the saint. The dissemination of the ampullae of Saint Menas throughout the Christian world has indicated the extent of the popularity of the saint, and indeed, the popularity of the ampulla as a devotional object. Ampullae of Saint Menas can be found in numerous museum collections throughout the world, including the Louvre and the Metropolitan Museum of New York, thus indicating the widespread usage of the ampullae of Saint Menas as popular religious practice. Additionally, the preserved ampullae of Saint Menas found in museum collections also shows the uniformity of the typology employed by Christian craftsmen, as well as the similar iconographic motifs found upon the ampullae.

The ampullae of Saint Menas also demonstrates the popularity of the cult of the saint, and the saint's intercessory power. The primary use of the ampullae was to invoke the saint's protection over evil and disease via the holy material contained within the ampulla which was worn as a pendant by the pilgrim to the saint's tomb in Abu Mena, Egypt. The textual tradition associated with Saint Menas' miracles is found in the Greek Passion of Saint Menas and the Coptic Miracles of Apa Mena. These texts illustrate the power of the saint and provide the context for the use of the ampullae as objects of power.

Finally, these ampullae belonged to a broader class of Christian material objects used as apotropaic or protective devices. The ampullae of other saints and holy places, as well as enkolpia, eulogias, and amulets were used as apotropaic devices which enfringed upon traditional Church rites. Indeed, the ambiguity of “magic” versus devotion is encountered by the use of these Christian objects by the Christian laity in opposition to the elite standards imposed by the Church. Thus, ampullae and similar conceptualized objects demonstrate the rift between popular religious devotion and institutional conservatism practiced by the Church during Late Antiquity, as well as underlying traditions associated with the cult of saints and their associated objects.
Investigation of the Role of the Serotonin\textsubscript{1A} Receptor (5-HT\textsubscript{1A}-R) in the Inhibition Process of Caspase-3 during Anoxic Conditions

Rochna Sondhi

In our laboratory, we have shown that by stimulating the serotonin\textsubscript{1A} receptor (5-HT\textsubscript{1A}-R) in the derived hippocampal cell line, HN2-5, the extracellular signal-regulated (ERK), or mitogen-activated protein kinase (MAP-K) pathway is activated. The purpose of this study is to investigate the role of the serotonin\textsubscript{1A} receptor (5-HT\textsubscript{1A}-R) in the inhibition process of caspase-3 during anoxic conditions. The 5-HT\textsubscript{1A}-R signaling cells lack Ca\textsuperscript{2+} channels. Therefore, the experiment is being performed through a Ca\textsuperscript{2+} channel-independent pathway. We have shown that the protein kinase-C (PKC) inhibitor, GFX, reverses 8-OH-DPAT-mediated suppression of caspase-3 activity. Furthermore, a selective Ca\textsuperscript{2+} isozyme, PKCa, reverses the role of reverses 8-OH-DPAT-mediated suppression of caspase-3 activity. Current efforts are being made to locate the role of the epidermal growth factor receptor and Src in the serotonin\textsubscript{1A}-signaling.
The words Madison Square Garden (MSG) have come to symbolize the best in sports and entertainment for millions of people around the world. Although today most people are aware of the importance of MSG to entertainment and sporting events, many underestimate its remarkable history. In fact, most people do not realize how close MSG came to being destroyed. Over the last century, the Garden has changed in appearance and location a number of times. There were four different Gardens to be exact and many more owners of each one, ranging from Phineas Taylor Barnum to Chuck Dolan and Cablevision. The arena experienced its share of ups and downs, but managed to survive and has become one of the most recognizable stages in the world.

Recently, the Garden has opened its behind the scenes door to the public. It offers a tour of the arena and its facilities every day of the week. Now, each person can be more captivated by this magnificent structure than ever before. Attending this tour has made me appreciate the history of the Garden even more.
Structure Determination and Prediction of LFABP*

Dmitry Volfson

Mentor: Ruth Stark
Department of Chemistry

Liver Fatty Acid Binding Protein (LFABP) is a member of the Fatty Acid Binding Protein (FABP) family. Its key function is the intracellular transport of fatty acids and other ligands, controlling their concentration levels in organelles such as mitochondria, microsomes and peroxisomes. Our studies of LFABP have concentrated on the apo form (no bound ligand) and the holo form, where the ligands are two oleate chains. Using NMR experiments, an acceptable structure of holo-LFABP has been obtained and the structure of apo-LFABP is being refined.

We have used an experiment known as CLEANEX-PM to measure solvent accessibility by monitoring hydrogen exchange in the holo-LFABP. Another experiment used on the holo form was the HNHA experiment. Here we correlated the alpha and the amide protons to obtain information on the dihedral angle, $\phi$, which is used to define protein conformation. These pieces of information are used as constraints in structure calculations. Over the last month, we have applied this technique to the apo form of the protein and are in the process of evaluating these results.

Homology modeling is a technique used to generate structures based on comparisons of primary structures of proteins of the same family. We have been able to generate a homology model of LFABP that seems to correspond to an NMR based structure of holo-LFABP. Currently we are observing the effects on structure accuracy, when identity percentage of the amino acid sequence is varied. Also, we want to see how the model differs when both apo and holo forms of proteins are used as templates.

One of our main goals is to apply the techniques used in structure calculations of holo-LFABP to calculating the structure of apo-LFABP. Our sample supply of apo-LFABP has been very low, because of the protein’s instability and high solubility in this form. Therefore, we have been very limited in our experiments on apo-LFABP. Over the last several months we have applied a newly described method of protein expression to maximize our yield. During this time I have learned how to express and purify the protein. We have been able to obtain a new apo sample and are currently in the process of setting up the desired experiments.

* This work is supported in part by the CSI Foundation
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<td>Nan Sussman</td>
<td>Psychology</td>
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<td>Mario Perez</td>
<td>William Wallace</td>
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<td>Dmitry Volfson</td>
<td>Ruth Stark</td>
<td>Chemistry</td>
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