

2007-2008 MAYS Awards

Student (Major) **Mentor** (Department): *Title of Project*
Abstract

Garrick Klabyor, Biology with Molecular Emphasis, **Stephanie Dellis**, Biology, *Analysis of the protein factors contributing to bcl-2 mRNA stabilization in the acute myelocytic leukemia cell line MV 4-11*

The B cell lymphoma-2 (Bcl-2) protein functions to inhibit programmed cell death (apoptosis). Thus abnormal cells are not destroyed when they should be. A high concentration of the Bcl-2 protein in cells is commonly associated with different types of cancer, including B cell lymphomas and certain leukemias. High concentrations of the Bcl-2 protein can occur when the *bcl-2* message is present for an increased time in the cell before it is degraded. This extended life provides additional opportunity for Bcl-2 protein production. Several cellular proteins are known to bind to a specific area on some messages, the AU-rich element (ARE), and affect the stability of the message. Some proteins can stabilize the message while others make it more susceptible to degradation. We will determine the set of proteins from the leukemia cell line MV 4-11 that bind to the AU-rich element of the *bcl-2* mRNA, and how these proteins affect the message stability. This research will further our knowledge on the mechanisms that keep certain cancer cells alive and proliferating, and ultimately help clinicians design more effective treatments.

Robert Goodrich, Computer Science, **Isaac Green**, Computer Science, *Multiple Robot Autonomous Mapping and Navigation*

The goal of this project is to develop a method of using multiple, inexpensive robots to map an unknown environment. Research using single robots to map an area has been done in the past, with varying environments, testbeds, and results [1][3][5]. This project will build upon work single robot mapping work already done and in progress at the College of Charleston by Alex Ender and Dr. Green. However, we will address the issue of multiple robots collaborating to map the environment more efficiently. We aim to create a flexible, robust map that utilizes landmarks for localization.

Alexander Endert, Computer Science, **Jerry Boetje**, Computer Science, *ClforJava Advance Compiler*

The CLforJava project is a long-term effort by students to create a completely new implementation of the Common Lisp computer language. It remains the core effort of the CSCI 462 Software Engineering Practicum course. Common Lisp is a standard language used by many researchers in Artificial Intelligence and increasingly a language for creating very complex commercial products. CLforJava runs in the standard Java environment, automatically making it capable of running on multiple operating systems. A key feature differentiating it from other Lisp/Java implementations is its ability to “intertwine” with the Java language (see references).

The current CLforJava implementation has a compiler for translating Lisp code into Java runtime code (called “bytecode”). While it works correctly, it is missing most of the advanced features that many modern compilers provide. It is also written only in the Java language, making it increasingly difficult to deal with the intricate constructs in the Lisp language. The goal of the project is to build an entirely new compiler written in CLforJava itself. This new compiler will be capable of implementing some of the features of modern compilers while increasing the ability to “intertwine” with the Java language.

Alexandra Eichler, Arts Management & Business Administration, **Lori Kornegay**, Arts Management, *Fundraising Research for Non-Profit Organizations*

Alex Eichler, a junior Arts Management major, will research and present funding opportunities for a new contemporary arts center (CAC) located in Columbia, SC. The ultimate goal of the research will be the creation and subsequent implementation of a fundraising plan for the arts center. Alex will deliver a summary of the project to the CAC advisory board at the center no less than two (2) times throughout the spring semester. She will make recommendations to the board regarding plausible funding sources, and will be charged, with the board’s direction, with completing grant applications on behalf of the CAC. Alex will attend a five-day Grantseeker Training Institute in New York City with the Foundation Center in January 2008 to workshop grants and gain precious knowledge about grant writing and philanthropic foundations as a whole. The goal of no less than one (1) grant application will be completed by May 2008. Alex will be guided by CAC advisory board member and Arts Management professor, Lori Kornegay.

Meghan Protasi, Psychology, Katherine White, Psychology, *Semantic Influences on Homophone Substitution Errors*

The goal of this research is to examine young and older adults' written production of homophone substitution errors. Homophones share phonology (sound) but differ in orthography (spelling) and semantics (meaning). The production of a homophone substitution error occurs when a contextually inappropriate word (*beach*) is written in place of its contextually appropriate homophone (*beech*), e.g., "The yard was full of trash so the *beach* tree could not grow." This research will specify whether semantics (i.e., meaning) can influence homophone substitutions, and whether young and older adults are differentially susceptible to semantic influences on spelling. Specifically, will a word (e.g., sand) that is related in meaning to a contextually inappropriate homophone (beach) influence whether the inappropriate homophone will substitute for the contextually appropriate homophone (beech)? Previous research suggests that older adults have more intricate and developed semantic knowledge for words and their meanings. The proposed research will determine whether this age-related semantic advantage can actually be a disadvantage when retrieving homophone spellings.

Erin Wooten, English, Tim Carens, English, *Archival Research on the Late-Victorian Discourse of Anglo-Irish Relations*

There are certain aspects of George Meredith's *Diana of the Crossways* (1885) that, like other late-19th-century "New Woman" novels, imagine and justify female independence. The Irish heroine, Diana Merion, chafes at the social restraints endured by women in Victorian England. She makes a luckless first marriage to a bully whom she eventually abandons. She then supports herself for much of the plot by writing novels and political essays. This progressive trajectory is subverted, however, by a conservative counterplot; the novel ends with a marriage between Diana, whose first husband conveniently dies, and Thomas Redworth, who counterbalances his bride's wit and imagination with level-headed English pragmatism. The marriage between Irish heroine and English politician with which the novel concludes reflects Meredith's persistent tendency to forge a metaphoric link between colonial and sexual hierarchies of power. Published in 1885, on the eve of Prime Minister Gladstone's first attempt to pass the Irish Home Rule bill, *Diana of the Crossways* brings into full view the extent to which Meredith found it possible to support the progressive causes of female and colonial independence and, just as important, the extent to which he sought to restrict that independence by subordinating women as well as colonies to English patriarchal government.

Our faculty-student research team will recapture the historical and political context of *Diana of the Crossways*. Conducting archival research in the British Library, we will comb through books and journal articles to recapture the liberal

perspective on the Irish Home Rule crisis from which Meredith constructed the metaphoric basis of the novel's marriage plot.

Michael Passarello, Geology, Timothy Callahan, Geology and Environmental Geosciences, *Testing a Groundwater Recharge Model Using Water Level and Geochemistry Data*

Increased intensity of rainfall, interrupted by longer periods of drought conditions are expected for the Southeast U.S. in the coming decades due to climate change. To understand the impacts of such changes in the hydrological cycle, we will inspect a forested watershed near Charleston, South Carolina. Local climate and hydrology (surface water and shallow groundwater) data have been collected over the past two years in an ongoing effort to understand the role of soils to take up excess storm water from rain events and allow infiltration, and thus recharging the shallow groundwater system. We will use short time scale water level data collected from wells in tandem with climate and groundwater chemistry data to test a groundwater recharge model. Many residents and small communities rely on shallow groundwater as the main water resource, and the results from this study will be used to ascertain the sustainability of these groundwater systems into the future.

Andrew Walker, Music theory and composition, Julia Harlow, Music, *"Fitter, Happier": A Concert of the Music of Radiohead in Support of Breast Cancer Awareness*

Musically I intend to expand my knowledge through arranging more complex pieces for larger ensembles, including instruments for which I have not written before. This program is going to be longer and more focused on the melodic, harmonic, rhythmic and timbral qualities of the songs. I am interested in pursuing a career through the art of arranging and performing modern music with instrumental ensembles. I hope this project will provide the opportunity for me to absorb as much knowledge about this process as possible. I intend to turn around and fuel my professional career as a musician with the knowledge I take away from this project.

As the producer I am looking forward to collaborating with different groups, departments and organizations in our community. I will be working with the School of the Arts music, arts management, and visual arts departments at the College of Charleston as well as the media production company Production Design Associates. This will give me the opportunity to increase my skills in cooperating with others.

As a performer, the opportunity to play at the Sottile Theatre will be great in of itself. I have never performed at a venue that sat 800 people.

Lastly, I want to pave the way for students to produce events that collaborate all of the departments in the School of the Arts, the College of Charleston, and charitable organizations in the Charleston area. *I would like to see this project inspire younger students to get involved.* Most students do not realize what they are capable of achieving. I would consider this project a personal success if one student told me this had inspired them to get involved and start working on their dreams.

Gregory Smith, Physics & Astronomy, Ana Oprisan, Physics & Astronomy, *Critical fluctuations and phase separation in pure fluids*

Image analysis techniques implemented in the Matlab will be used to develop new approaches to study the density fluctuations and phase separation for sulfurhexafluoride (SF₆) near critical temperature. The critical temperature is the point at which there is no fundamental difference in the liquid and gaseous phases in a fluid [1]. With such a close approach to the critical point, new and basic quantities can be derived by analyzing the resulting optical images of the fluctuations and phase separating domains. First we will manipulate the images using different denoising methods such as N-point filter, Fast Fourier Transform and Wavelets in the Matlab program [2, 3]. We will use these methods to compare the results obtained for the characteristic length of fluctuations in each case and the fluctuation relaxation time.

Based on denoised images illustrating fluctuations and phase separating domains, we will determine new quantities such as fractal dimension, the critical exponents, and the size of gas and liquid clusters. These results will provide valuable information regarding the parameters of the mathematical model describing the fluid under investigation [4].

Lindsay Funderburk, Political Science, Ashley Stock, Theatre, *American College Dance Festival: A Study of the Creation and Adjudication of Student Choreography*

On March 8, Lindsay Funderburk will leave with her dance partner, also a College of Charleston student, and mentor Ashley Stock, to attend the American College Dance Festival in Gainesville, Florida. She and her partner will spend March 8 through the 11 refining their dance technique in multiple workshops and classes each day. In addition, she will present her choreography to a panel of adjudicators at a public performance. Following the performance the adjudicators will offer a critique of Lindsay's work and the work of other choreographers.

Natasha New, Physics, **Sorinel Oprisan**, Physics, *Computational Model of CA1 Hippocampal Neurons from In Vitro Electrophysiological Recordings of Mus Musculus*

Computational modeling will be used to demonstrate the electrophysiological abnormalities in CA1 pyramidal neurons in the hippocampus of the schizophrenic-model mutant mouse, *Mus Musculus*. This schizophrenic model of neuronal behavior will then be compared to that of the wild type mouse. The abnormality associated with the schizophrenic model is believed to be dependent on a lack of the neurotransmitter glutamate receptors, namely the NMDA receptor. The computational model will be used to simulate the administration of glutamate to the schizophrenic model, and the expected result is more normalized neuronal electrophysiological behavior similar to that of the wild type model. We expect that the model will be able to reproduce essential features of the biological neuron and offer the basis for a large scale study of networks involving pyramidal cells. We are interested in pairing the electrophysiological findings at the cellular level with those at the network level through mean field recordings.

Luca Pellicoro, Psychology, **Mark Hurd**, Psychology, *Real-time cursor control using EEG activity*

Electroencephalographs (EEG) are used to measure brain electrical activity with small surface electrodes on the scalp. These electrodes amplify and record tiny changes in brain electrical activity. A number of studies have used EEG activity for both clinical and research purposes. Historically, this EEG activity has been used as a passive recording technique for determining what the brain is doing during specific mental activities (e.g. sleep, memory tasks, attention, and perception). More recently, researchers have begun to use the EEG activity in the development of brain-machine interfaces (BMI) that attempt to use EEGs in a bidirectional fashion. Thus, changes in the EEG waveform are associated with and reflected as an output for producing movement in both virtual (computer environments) as well as the physical environment. One application for the development of such interfaces is for the individuals that have been completely paralyzed. However, the BMIs that are currently available are cumbersome and complicated to use. Here, we propose to develop custom designed software that uses a widely available system for recording biological signals to control a mouse cursor through EEG feedback. This software uses the interaction between the user and the system to facilitate an adaption to one another and produce the desire result – movement of a mouse cursor on the computer screen.