
The Effects Stress, Emotional Support and Tangible Support Have on Life Satisfaction Among Midlife Women and Men

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The period of midlife is often overlooked in developmental research. Spanning from roughly 35 to 65 years of age, midlife brings a variety of physical and contextual changes into the lives of those who are passing through it. Women, in particular, are further affected by the onset of menopause, with its own specific physical and emotional issues. Psychological research on this period focuses mainly on its connection to and influence on a person's well-being and confidence. The research being conducted focuses on life satisfaction, stress, emotional support, and tangible support. Previous research has found that older women with poorer functional ability experienced greater chronic daily stress and that perceived social support and internal health locus of control significantly contributed to the prediction of life satisfaction after demographic, illness-related, and stress-related variables were controlled (Tak, S. & Laffrey, S. 2003). The relationship between stress, emotional support, and tangible support and its effect on life satisfaction is the focus of the study. It is hypothesized that for midlife women, stress levels will be a significant predictor of life satisfaction and emotional support in contrast to tangible support will be significant in the life satisfaction ratings of midlife men. Analyses support these hypotheses and suggestions for future research are provided.

Electromechanical Impedance Sensor for In Vivo Monitoring of Body Reactions to an Implant

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The cellular wound healing response to a foreign substance into soft tissues has been characterized histologically. During wound healing, collagen encapsulates the foreign body and then contracts in an effort to attack the unknown substance. In the case of implants (breast implant, chin implant, pacemaker, etc.), capsule contracture can cause the implant to harden, deform, or migrate within the body. Capsule contracture is a concern of manufacturers of implants and prosthetic devices, but the solution to minimizing it has yet to be found. The first step is to learn more about the actual contracture from an engineering standpoint. Using piezoelectric biosensors combined with electromechanical impedance methods, the in vivo body reaction to an implant was monitored. The theory was that as the wound healing process and capsule formation advanced, the amplitude of the impedance peaks would decrease and the overall received signal would dampen. The bio-PWAS, modified Piezoelectric Wafer Active Sensors, were surgically implanted into medium-sized rats. Their impedance spectra were recorded regularly for two months. It was concluded that the amplitude of the impedance peaks decreased over time. Overall, it seemed that the impedance results correlated with the histological timeline of events during the wound healing process.

Saliency of the Term 'Vegetable': How Common Experiences Shape a Common Definition

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My poster will be a presentation of my work with the South Carolina Home Garden Project conducted in ANTH 213H Ethnobotany: Plants & Peoples. This project began in 1996 as a research project on the home gardens of South Carolinians, but recently it has been redirected to answer the question “What is a vegetable?” based on a study of cultural perception of vegetables. I proposed that people create definitions of concepts based on personal experiences with them, and that cultural saliency in the idea of “vegetable” is a result of common experience, the most universal of which is the consumption of vegetables. As a student in the Ethnobotany course, I conducted original research in the form of scientific interviews. Using the results of my interviews and the interviews that my classmates conducted, I studied the correlation between experience and definition and how this relates to the cultural saliency of the term “vegetable”. Analysis proved that in the case of vegetables, personal experiences do in fact shape personal definitions and therefore common experiences lead to a salient definition.

Developing Software Tools for Modeling Cognitive Development of Undergraduate Researchers in the Research Communications Studio

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The Research Communications Studio (RCS), an NSF funded research project, is studying how communications support cognitive and meta-cognitive development of undergraduate researchers within group environments. Communications within the research groups have been videotaped, and a method is being developed to encode the communication events recorded on the videos into discrete chronological data sets. Each session lasts for 75 minutes and contains hundreds of discrete events. It is time-consuming and difficult to code the sessions on paper. I am developing software tools to model cognitive development in the RCS, beginning with a tool to ease the coding and management of the data. I researched tools and technologies to ensure that the software would be compatible with the hardware on which it would be implemented. Additionally, the software must be intuitive and user friendly, which was ensured by conducting iterative user acceptance testing. So far I have developed the coding and management software. The software outputs data to a spreadsheet, allowing it to be analyzed using pre-existing tools. From this data we can identify peak periods of interaction that can be used to aid modeling and future studies of the undergraduate researchers' cognitive development.

Sterilization with Dense Phase CO₂

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The reason for studying sterilization with dense phase CO₂ is to eliminate toxic residues and high temperatures in current sterilization techniques. This will enable new materials to be used in sterile environments that would otherwise melt under high temperature or be susceptible to toxic residuals affecting their range of use. The sterilization is concerned with achieving a high log reduction kill of 6 or 7 to complete sterilization of the bacillus pumilus spore, varying pressure cycling, temperature and additives. The poster covers the plan of action of our study as well as the procedure, equipment and results. We were able to achieve a 6-log reduction of the bacterial spores Bacillus pumilus using the right combination of additive, temperature and pressure cycling.

Strategic Use and Morphology in Vocabulary Acquisition

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When reading, individuals are constantly confronted with unfamiliar words. These may, or may not, appear in a context with specific information about their meaning. When context is unavailable (inadequate information from the sentence or inability to get to a dictionary), one may use a morphological strategy, which entails breaking a word apart and using the smaller parts to determine the overall meaning. In this experiment subjects were given one of two lists of words in which they were asked to write as much information as they could about each word's meaning. In each list half the words could appropriately be broken down into component parts to create a definition. In condition one the word list was presented with two examples, one of which defined the word in its component parts. Condition two contained no examples. Both conditions were scored for the strategies used, morphological, associative and phonological, as well as the accuracy of the definition. This experiment attempts to learn whether subjects use a morphological strategy more frequently when the strategy is modeled for them and how it affects their accuracy. Preliminary data suggests that the examples increased the frequency with which the strategy was employed, even when not appropriate.

Colorectal Cancer Prevention using Traditional West African Plants

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Colorectal cancer (CRC) is the second most prevalent cause of cancer deaths in the world, and the third most common cancer in the US. The lack of consistent efficacy coupled with devastating side effects of chemotherapy and radiation have lead medical providers to seek alternative means of cancer management, namely chemoprevention. The use of nonsteroidal anti-inflammatory drugs (NSAIDs), which inhibit the cyclooxygenase (COX) enzymes, is known to decrease the risk of CRC by 50%. Unfortunately it is associated with negative side effects. This experiment studied the potential chemopreventative effects of traditional medicinal West African plants, Azadirachia indica (AZI-B) and Senegal mahogany (SEM-C), which are used for

similar treatments as synthetic NSAIDs, without the side effects. HCT-15 (COX-negative) and HT-29 (COX-positive) CRC cells were treated with various concentrations of the extracts, and cell viability was measured to determine chemopreventative effects. Each cell line markedly demonstrated inhibition of CRC proliferation when treated with both compounds. The pathway of inhibition has not yet been studied, but it is presumably a COX-independent pathway, because the compounds did not selectively inhibit the HT-29 cells. The toxicity of the compounds has not yet been determined, but these compounds have potential as safe chemopreventative colon cancer agents.

Computing with Atoms

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The trend of miniaturization makes atomistic computation of great interest. Current transistor channels expect downsizing below ~45 nm within the next 10 years reaching molecular size, i.e. ~1-2 nm. Shrinking enables integration of more transistors into a single chip thereby driving research for atomistic types of computation. In addition, present digital circuits show speedup and downsize physics limits at nanometer scales whereas quantum circuits bring more room for improvement. My research aims to develop software tools that cope with several aspects of molecular scale electronics research. In particular it focuses on (a) technologies: molecular devices as fundamental building blocks, and (b) methodologies: circuits, architectures, and signal processing schemes. As part of my research I wrote a program to solve for all the solutions of a molecular circuit. The program helps to determine which molecular nets or devices will yield efficient n-ary logic families and programmable architectures. At a lower level, other tools were developed to study electron transport and signal processing in molecules based on ab initio and molecular dynamics techniques; these tools help to explore the possibilities for atomistic computation.

The re-invasion of a Southeastern estuary by postlarval fiddler crabs: the distribution of swimming megalopae of *Uca pugnator*, *Uca pugnax* and *Uca minax* along a tidal creek in North Inlet Estuary, South Carolina

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Estuarine fiddler crabs of the Southeastern United States undergo larval development in the coastal ocean, and thereby avoid the unstable physical conditions and abundant predators of estuarine ecosystems during their most vulnerable life-stages. Returning postlarval (megalopal) crabs leave the relatively stable environment of the sea and re-invade estuaries where they locate settlement sites along tidal creeks that experience great fluctuations in temperature and salinity. In this study, we used light traps to capture returning megalopae of three fiddler species. Three sampling stations were established along the length of Oyster creek, North Inlet Estuary, SC and swimming megalopae were captured on evenings during July 2003. All postlarval specimens were identified using a RFLP molecular analysis and the species frequencies found along the salinity gradient

answered the following questions: Where do these species leave the water column? Do *U. pugnator* and *U. pugnax* megalopae preferentially leave in higher salinity areas, and does *U. minax* delay settlement until it reaches sites along tidal creeks where salinity is low? Or do species proportions remain the same along the length of the tidal creek, indicating that settlement is random with respect to the salinity gradient? After analyzing our results we found that *Uca pugnax* was the most common crab in the water column and on the sediment surface following settlement at North Inlet Estuary, SC. From the species distribution found at the different sampling sites we concluded that *U. pugnax* left the water column faster in higher salinity areas compared to the other two species, while *Uca minax* delays settlement until it reaches lower salinity habitats.

Crossed Meander-Line Dipole Elements for GPS Application in Enhanced 911 Enabled Wireless Terminals

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Lately the Federal Communications Commission has made it mandatory that all mobile phone systems in the US must have enhanced 911 functionalities in their phones to identify and locate a person when he or she dials 911. Many phone carriers are focusing on GPS systems to be integrated within the mobile transceiver so that such functionality can be supported. However, since GPS operates at a distinctly different frequency band with communication in between the portable receiver and the satellite transmitter a different antenna is required than the mobile phone antenna. Given the size of mobile phones it is easy to understand that a very compact low profile antenna will be greatly desirable for GPS application. In this research, we study and analyze the properties of a self-resonant printed meander-line antenna for possible GPS application. Full-wave three dimensional electromagnetic models are being developed to investigate the properties of such antennas such as impedance, bandwidth, gain, radiation pattern, and polarization. As this research progresses, models and possibly an experimental prototype will be developed for crossed meander-line dipole radiators operating at 1575 MHz. Such antennas will be developed on both sides of an FR4 dielectric substrate and fed using the necessary circuitry to generate circular polarization.

UV-Vis and Fluorescence Microspectroscopy for the Forensic Analysis of Fluorescent Brighteners on White Textile Fibers

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Fibers are ubiquitously found as trace evidence in crimes of personal contact, such as homicide, assault, and sexual offenses. Ultraviolet-visible (UV-Vis), and UV-fluorescence microspectroscopy offer direct, relatively inexpensive, and informative means of characterizing fibers based on the dyes present and the fiber type (e.g. acrylic, cotton, nylon, and polyester). Textile fibers are typically mounted for examination in a mounting medium such as Permout®[®], which is the mountant of choice in forensic laboratories. However, Permout®[®] absorbs strongly below 330 nm and fluoresces between 400 and 600 nm. This project evaluated whether fluorescent brighteners, which

absorb in the UV region around 360 nm and fluoresce in the blue-green region around 400 nm to 560 nm, could be detected and differentiated with Permout® as the mountant. This problem is important to forensic analysts because dyes are usually the most discriminating factors and fluorescent brighteners are typically the only dyes present on white fibers. Fluorescent brighteners from six chemical classes were detected and differentiated using UV-Vis and UV-fluorescence microspectroscopy. These results establish that UV-Vis and UV-fluorescence microspectroscopy is a viable approach for forensic discrimination of white fibers in Permout®.

Interfacing Computer Simulations in Virtual Test Bed with Real Power Hardware [referred to as Power Hardware in the Loop]

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The purpose of my research group is to design a system that can use a computer simulation to drive real electrical or mechanical hardware. Real components use real power (in the form of voltage and current), while simulations only pass numbers that are equivalent to power. The problem that occurs with interfacing the real with the virtual world is resolving the numbers that are equivalent to “virtual power” into real power that can drive physical hardware. My focus in this project will be to make a resizing and filter circuit that will be part of the interface circuit between the output of the analog hardware and the computer input. The computer input must be precisely digitized so it can correctly pass the output signal information, and since the output signal is 3 times larger than what the analog-to-digital converter input of the computer can effectively use, the output signal must be resized. The filtering aspect of this circuit is built in to insure the input will be free of noise and distortion. Once this circuit is constructed, the system will be tested for speed, accuracy, and amount of distortion and the results will be shown.

A COARSE Receiver Function Survey of the Southern Arizona Lithosphere

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The Consortium for Arizona Reconnaissance Seismic Experiment (COARSE) operates a temporary network of eight broadband seismic stations in an approximate SW-NE swath across southeastern Arizona. It seeks to constrain lithosphere structure across the transition from the southern Basin and Range to the Colorado Plateau, a region of notable seismic undersampling. When augmented with the two permanent broadband stations (TUC and WUAZ), the array will provide the requisite data to delineate the first-order structure of the lithosphere in this region. One key issue is the nature of extension in the southern Basin and Range, and how this extension is accommodated at greater depths. The current study therefore focuses on data collected at stations located on mountain summits geologically associated with the regional extension. From SW to NE the seismic stations are located at Kitt Peak (KITT), Mt. Lemmon (LEMN1) and Mt. Graham (SQRL). Analyses of receiver functions generated from teleseismic earthquakes at each station indicate a gradual SW to NE increase in crustal thickness related to elevation. Receiver functions from stations KITT and SQRL also show prominent arrivals from the

top of a crustal low-velocity zone. Overall, we hope to characterize the nature of crustal structure in southern Arizona.

Multiplicative Structures on Finite Free Resolutions

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The purpose of our research is to attempt to classify finite free resolutions by examining their properties. These include their tor-algebras, higher-order products, and other tools and techniques that were developed and implemented for the above purpose. The issue is that as of yet no such categorization of resolutions exists. To start the process of categorizing, we developed and tested many different computer scripts and several different programs. Specifically, the undergraduates have assisted the graduates and professors by running many examples and searching for similarities. Also, the undergraduates were responsible for preparing and leading several class discussions including the topics of Pfaffians, tight double linkage, and constructing a resolution from maps of other resolutions. So far, we have been successful in finding several categories of resolutions grouped by their Tor12 through the examples we have run. These examples and categories have lead to several conjectures, some of which have been proven by the professors, others of which are in the process of being proven and supported by more examples that the undergraduates are collecting.

Anonymity and Accountability in Computer Systems

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Privacy preservation in today's computer systems is a major concern. While full anonymity has been studied recently, it does not provide the accountability needed for applications like e-commerce or online editorial board. The focus of the proposed research is to investigate and improve on protocols providing anonymity and accountability in virtual communities. Current technologies use a trusted third party (usually a secured computer system) to hide the real identity of the users while ensuring that this identity can be retrieved if a legitimate need arise (i.e., criminal investigation). However, this centralized approach is infeasible in dynamically changing, ad-hoc computer systems. In my research I will analyze the anonymity and accountability needs in ad-hoc computer systems, and develop methods to support these needs using modified communication protocols, timed-release cryptography, and encapsulated key escrow.

Menopausal Status and Related Factors Influencing Self-Esteem and Life Satisfaction

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Previous research has indicated that there is a negative relationship between life satisfaction and menopausal classification, and it is hypothesized that this is due to the psychological effects of the uncomfortable symptoms (Alarape 2001). This relationship may be bidirectional, since psychological state could also affect perceived number of symptoms. Our research seeks the correlation between number of menopausal symptoms and life satisfaction as well as between number of symptoms and self-esteem. Various health problems relating to issues other than menopause also develop during middle age. For example, this is the time of the start of Type II diabetes and arthritis for many women. These health issues also have an effect on psychological well-being. Health problems can be classified in many ways. One classification involves the degree to which a problem threatens a person's life. Common life threatening illnesses include heart problems such as high blood pressure, angina pectoris, etc. as well as diabetes; life hampering illnesses, on the other hand, include chronic headaches, depression, pain, arthritis, and allergies. Research on individual life hampering illnesses has demonstrated a clear negative relationship between the incidence of illness and both self-esteem and life satisfaction (Celiker 2001, Wilkins 2000, Ireys 1995, DeVellis 1990). Bi-directionality is an issue here as well. Our research focused on the relationship between general type of illness – as defined by life threatening and life hampering – and life satisfaction and self-esteem in the population of middle aged women. Lastly, our research looks into the relationship between number of medications taken regularly and measures of life satisfaction and self-esteem. Although the influence of this relationship has often been indicated in research on specific illnesses (Hendricks 1992), the relationship among a more general population of middle aged women has not been investigated in-depth.

Creation, Translation, and Contradiction: A Study of Bilinguality in the work of Vladimir Nabokov

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The name Vladimir Nabokov is famously associated with controversy; after all, he authored *Lolita*, a novel which, due to its content, remains one of the most provocative works ever written. Yet Nabokov's opinions as a translator present no less a controversy in the eyes of many. Especially following his intensely "unreadable" English rendering of Aleksandr Pushkin's *Eugene Onegin*, Nabokov has been known for taking an extreme position with regards to translation theory. It is this position, and its relationship to Nabokov's own practice as a translator, that interests me as a student of Russian and English language and literature. Indeed, the creative liberties taken – or, alternatively, eschewed – by Nabokov in his translations seem to indicate certain values and artistic aims not explicitly embraced by the author in theory; it is these beliefs and goals which I explore in my research, especially as they are manifest in Nabokov's translations of Lewis Carroll's *Alice in Wonderland*, Aleksandr Pushkin's *Eugene Onegin*, and his own *Lolita*. I argue that the tension between creativity and mimicry in the process of translation leads to Nabokov's idiosyncratic theoretical position and explains the contradictions that arise between that position and Nabokov's actual practice as a translator.

Landscape Design for the Courtyard between Hamilton and Barnwell Colleges

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For my senior project, I developed a landscape design for the narrow rectangular space or 'courtyard' between Barnwell and Hamilton colleges. After conducting a survey in the Anthropology department to determine the nature and content of the design, I prepared design documents. Perennials suited for a partial shade environment, a rock garden, and a built-in earth bench are included. These designs also feature areas for sitting and relaxing, eating and socializing and taking walks. As a landscape designer, my inspiration for the design comes from observing the vertical layers of vegetation in woodland environments. The benefit of this project is to provide a place for meetings and other such interactions (cookouts, study, etc.) within the Anthropology Department and amongst adjacent social science departments that will ultimately foster a sense of ownership and community. This project serves as a model to inspire other similar projects at the university.

Memory for Spatial Location

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Remembering where things are is a fundamental human cognitive ability. One theory of this ability is place learning or cognitive mapping theory. Support for this theory has been found using an apparatus called the Morris Water Maze, in which rats discover and remember the location of a hidden platform in a small round swimming pool. Our research involves a human version of this task in which participants are shown and then remember locations of hidden coins in an indoor testing arena. We tested the hypotheses that unlike non-spatial memory, memory for spatial location would (a) show sex-related differences in accuracy, with men's accuracy being greater than women's accuracy, (b) show little evidence of decay over time, and (c) show little consequence of memory load. To test these hypotheses, we tested men and women with either one or three hidden objects for their immediate memory, memory one week after learning, and memory two weeks after learning. Results showed no sex-related differences and no effect of retention time. However, memory load made a difference. We conclude that spatial memory may be unique in some ways but also shares some things in common with non-spatial memory.

Modeling a Four Tank Pressure System Using Differential Algebraic Equations

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Chemical processes are modeled with systems of ordinary differential equations (ODEs) to account for dynamic changes in mass, momentum, and energy. However, many chemical processes cannot be adequately modeled by ODEs because they have properties that contain independent algebraic equations. These algebraic equations arise from conditions such as physical correlations and quasi-steady state dynamics. Systems of ODEs coupled with algebraic constraints are called differential algebraic equations (DAEs). With the use of DAEs, a model of a four-tank pressure system is being developed. Dynamic mass balances of the four tanks are modeled by ODEs. Each of the flows is proportional to the square root of the pressure gradient. The algebraic equations model the dynamics occurring at the two split points within the system. An optimization problem is being set to figure out the constants in the system to minimize the offset between the model and the physical tank system. This model can be used to create a control scheme that can track set points for certain outputs and track disturbances to the system. The application of DAEs goes beyond the tank system because they can be used to model more complicated systems such as various reactors with complicated reaction rates.

Dynamic Modeling and Simulation of a Methanol Reformer

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Because of the search for alternative energy carriers, a great deal of research is focused on fuel cells. Fuel cells are electricity producers that convert energy from natural gases. One of the most common gaseous fuels used to power the fuel cells is hydrogen. Unfortunately, pure hydrogen is very difficult to store thus refueling the system is problematic. However, if methanol, a hydrogen-rich hydrocarbon fuel, was used instead of hydrogen, refueling would be made simple. With methanol as the fuel, a reformer would need to be implemented into the process. Fuel cell powered electric cars utilize on-board reformers to produce the necessary hydrogen from the hydrocarbon fuel to power the fuel cell. The objective of this research is to create and optimize a dynamic model of a methanol reformer for vehicle application. Using kinetic information associated with the steam reforming reactions of methanol and the general material balance, the reformer was modeled as a plugged flow reactor (PFR). Based on the open loop test results of the model, the reformer produces hydrogen from the methanol and steam fed to the reformer. Further testing is to be performed on the model to determine the conditions that would yield the best results.

Microstructure of Friction Stir Welding

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Friction Stir Welding (FSW) is a state of the art process of welding metal together. Conventional welding melts the metal together and adds filler material, which adversely affects the original material properties. Friction stir welding maintains more of its original properties, which creates a stronger bond. FSW is the process of butting two pieces of metal together then driving a tool that is rotating at high rpm, between the metals. There is still research that needs to be done about how welding inputs affect the

micro structural outputs. My job is to study the microstructure of a weld, specifically the nugget, or the area of where the stirring took place. The samples studied were all 7050 Aluminum alloy welded with the same tool at differing speeds. Cross-sectioned samples are prepared then studied under the Orientation Imaging Microscope (OIM). The results show larger grain sizes at increasing welding speeds and further trends are being investigated. The information collected in this study will be added to a formal paper in progress.

MARSci Undergraduate Journal Goes Global: The New Wave

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MARSci, the premier online journal for undergraduate research in Marine and Aquatic Sciences is the first inter-institutional setting for undergraduate marine and aquatic science research articles and is peer-reviewed and managed entirely by undergraduates. In addition, the journal operates entirely online, from submission to review to publication, allowing for efficiency as well as worldwide contribution. The first three issues can be found at <http://marsci.schc.sc.edu>, featuring articles from students throughout the United States. The new wave of the MARSci staff wants to take the online publication to the next level of progression. The present goal is to implement an inter-institutional Peer Review Board, by creating MARSci Hubs at six different institutions across the nation. This will require going to the institutions to train and help them to start their own branch, with USC being the main hub for the start.

Efficiency and Weight Improvement of Power Sources

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The objective of this research is to improve the efficiency and weight of power sources used for military applications. The research uses two simultaneous approaches. The first approach adds high energy density components with high power density components to create a high energy density-high power density source. This is accomplished by putting a super capacitor in parallel with a Lithium Ion battery. The battery and capacitor are sized respectively to meet the energy and power demands of the load. The hypothesis is that the battery-capacitor hybrid system will be lighter than a battery that must meet both energy and power demands of the load. In one case study the hybrid system lasted an hour longer that the battery alone but the overall weight of the source was not improved. The second approach schedules a battery such that it will power equipment demanding high energy first and equipment demanding low energy afterwards. The hypothesis is that scheduling the battery in this way, will improve battery efficiency thus requiring fewer batteries to power the same load. This research promises to make batteries, such as in cell phones and laptops, so efficient that they can last weeks or months without being recharged.

Development of a Total Organic Carbon Sensor using a Photocatalytic Polyoxometalate

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The measurement of total organic carbon (TOC) in environmental samples is necessary for many studies. Current techniques are time-consuming and often lack high accuracy. A novel approach to this type of measurement is the use of the polyoxometalate (POM) Eu(W₅O₁₈)₂₉ as a reporter for organic compounds. When excited by UV light, the POM can either luminesce or act as a photocatalyst to oxidize organic molecules. Luminescence quenching of the POM by benzoic acid, ascorbic acid, and phenol was studied. The target organic molecules 2,4-dichlorophenol (DCP) and 2,4-dichlorobenzene were oxidized in the presence of the POM excited at 270 nm at an aqueous solution pH of 9. GC-ECD analysis confirms that the concentration of the organics decreases as illumination time increases, thus supporting the hypothesis that photochemistry competes with the luminescence pathway of the excited POM. These characteristics of the POM can be utilized in developing a novel TOC sensor.

Nanotechnology: A Dream Deferred The Influence of Nanotechnology in Third World Countries

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Grandiose steps in the development of science have their beginnings in the dreams of scientists. These dreams have been transformed into the reality of today's science. In our highly technologically evolved society we are faced with the culmination of dreams encapsulated in the most minute of Pandora's Boxes, Nanotechnology. Nanotechnology, defined as any technology related to features of nanometer scale, is no longer an abstract concept in the realm of science fiction but a daily reality. With these new discoveries come new problems. These problems don't only affect developed countries as the United States, but also third world countries. For these countries Nanotechnology could be a way that they can ameliorate their economic development, a sweet raisin dried by the sun and a panacea for their problems, or it could be a Pandora's box. Since these underdeveloped countries don't have many laws restricting research in fields as nanotechnology they could become the testing grounds for the western world. My research explores the effects that nanotechnologies are expected to have in a third world country, specifically Albania. These predictions were made in collaboration with scientists of the Academy of Sciences in Tirana Albania.

Discrimination of Nylon Subclasses using FTIR Microscopy and Multivariate Statistical Techniques

Jennifer Kennedy

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Fibers are important trace evidence in incidents involving personal contact, such as homicide, assault, and sexual offenses, as well as hit-and-run accidents and other crimes. Fibers can also be found in, or on, objects peripherally associated with crimes, such as weapons or cars involved in armed robberies. The generic class of a fiber (e.g. cotton, polyester, nylon, or wool) can be determined by visual and polarized light microscopy. However, an additional technique, such as Fourier transform infrared (FT-IR) spectroscopy, is necessary to determine its subclass (e.g. nylon 6; nylon 6,6; nylon 6,11). Normal library searching using absolute difference and absolute derivative difference searching algorithms gives inconsistent results for nylon subclasses. The purpose of this project is to evaluate the usefulness of multivariate and peak ratio analysis for the identification of nylon subclasses using attenuated total reflectance FTIR (ATR-FTIR) spectroscopy. Results indicate that determining the subclass of nylon fibers using the peak ratio of the N-H vibrational stretch to the sp³ C-H vibrational stretch intensities, suggested by Cho, was only useful for a limited number of nylons subclasses. Multivariate statistical analysis, however, was able to graphically visualize differences among subclasses and differentiate between all 14 subclasses tested.

Discrimination of Nylon Subclasses using FTIR Microscopy and Multivariate Statistical Techniques

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Fibers are important trace evidence in incidents involving personal contact, such as homicide and sexual assaults, as well as hit-and-run accidents and other crimes. Fibers can also be found on objects peripherally associated with crimes, such as weapons or cars involved in armed robberies. The generic class of a fiber (e.g., cotton, polyester, nylon, or wool) can be determined by visual and polarized light microscopy. However, an additional technique, such as Fourier transform infrared (FT-IR) spectroscopy, is necessary to determine the fiber subclasses (e.g., nylon 6, nylon 6,6, and nylon 6,11). Library searching using absolute difference and absolute derivative difference searching algorithms gives inconsistent results for nylon subclasses. The purpose of this project was to evaluate the usefulness of peak ratio analysis and multivariate statistics for the identification of nylon subclasses using attenuated total reflectance FTIR (ATR-FTIR) spectroscopy. Results indicated that use of the peak ratio of the N-H vibrational stretch to the sp³ C-H vibrational stretch intensities to determine the subclass of nylon fibers, as suggested by Cho, was only useful for a limited number of nylons subclasses. Multivariate statistical analysis, however, was able to discriminate and provide a graphical visualization of differences between all 14 subclasses tested.

Metacognitive Strategy Use During Vocabulary Acquisition

Vaso Kutelis

Anderson, SC

Mentored by:

Dr. Robin Morris

USC Department of Psychology

Sixty-five percent of eighth grade students in South Carolina read below a “Proficient” reading level (NAEP Reading State Report, 2003). At a proficient level readers can make inferences and acquire new information from text. Previous research studies indicate that metacognitive strategies aid proficient readers in acquiring new information (Pressley &

Afflerbach, 1995). The present study examined the types of metacognitive strategies that college students use to determine the meaning of unfamiliar words during silent reading. Participants were given a questionnaire concerning the strategies that they had used after participating in a silent reading study that included many unfamiliar words. It was expected that participants would use word-based and text-based strategies to determine the meanings of unfamiliar words. Results demonstrated that participants reported using the following strategies: (1) phonologically mediated (sound), (2) orthographically mediated (word form), (3) morphologically mediated (prefix/roots), and (4) context-based (reading study sentences). However, only certain strategies led participants to acquire the correct meaning of the unfamiliar words. The results of this study can assist educators in identifying the best ways for students to acquire the meaning of unfamiliar words.

The Use of Direct Methanol Fuel Cells in Hybrid Power Systems

Joseph W. Lambert

Mentored by:

USC Department of Chemical Engineering

Hybrid Advanced Power Systems (HAPS) is a program designed to overcome the shortcomings of an individual power system by combining it with another power system. By choosing the appropriate components, areas of poor interface matching can be buffered. In this study, areas of interest specific relating to direct methanol fuel cells; including methanol crossover, CO poisoning, and flow-field design, are studied by using the integration of DMFCs and batteries. Initially, each individual issue pertaining to the DMFC is characterized based on performance measurements. Then, the effect of battery integration is studied. For example, methanol crossover may be limited by relying on batteries to buffer the load from the management-oriented operating strategy of the DMFC. Simulations based on fundamental cell data as well as physical tests are used to characterize the hybrid systems.

The Truth About Children's Books Concerning Blindness

Reba Landry

Mentored by:

Dr. Gail Wagner

USC Department of Anthropology

In the world of children's literature today, authors are trying harder than ever to make sure that every population of children is accurately and respectfully represented. However, as a visually impaired person myself, I can honestly say that concerning children's books about blindness, there is one population not always considered: children who are themselves blind or visually impaired. In my paper, I discuss how most books for children concerning blindness are intended for a sighted audience, and how these books may not only give an incomplete representation of the lives of those with such a disability, but also fail to provide a positive role model for such children as well. Also, I will evaluate 12 picture books on the topic of blindness and visual impairment found in the Richland County Public Library, and offer my own conclusions as to their usefulness to both the sighted and the blind or visually impaired.

Detection of Fibroblast Adhesion through the use of a Quartz Crystal Microbalance

Stephanie Lareau

Charlotte, NC

Mentored by:
Dr. Jonathan Bender

USC Department of Chemical Engineering

When a foreign object enters the human body it elicits a specific immune response. In order to more fully understand the contracture aspect of the immune response a quartz crystal microbalance was used to measure frequency and resistance changes associated with cell adhesion. Interestingly, the high frequency oscillations used to determine quantify the adhesion transmitted a mechanical signal to the cells, which they likely communicate through chemical signals to surrounding cells causing the cells to aggregate and adhere preferentially to the oscillating region of the crystal rather than to the non-oscillating surface, when in solution. When cells were evenly adhered and the crystal was then oscillated cells attached to the bare crystal with no substrate migrated toward the center oscillating area. In more dilute solutions migration to the center oscillating region were less pronounced, supporting the idea of the intercellular chemical signaling.

Looking for Sex Differences in Spatial Memory

Liza Malone
J. Brooke Munn
Katie Groux

Mentored by:
Dr. Gary L. Allen & Dr. Sylvia Fitting

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Mention of superior spatial abilities in men is common in textbooks and the popular press. However, sex differences in spatial abilities may not be as large or as widespread as these references might lead us to believe. In fact, superior performance by men in spatial tasks may be limited to specific tasks such as mental rotation of objects. In this project, we looked for sex differences in several spatial tasks, including place learning within a pedestrian arena, the Money Road Map Test of Direction Sense, a pencil-and-paper Maze Learning Task, and the Building Memory Test of visual-spatial memory. Results thus far indicate no significant differences between the performance of men and women. This suggests that sex differences in spatial cognition are not as widespread as might be expected, especially in spatial memory.

Calculating Probability

Eric J. Martin

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Mentored by:
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USC Department of Computer Science and Engineering

Probability is a measure of how often a particular event will occur. This measure can be used to determine a reaction to certain events. These events can be represented in a Bayesian Network. A Bayesian Network is created to estimate the state of certain variables given some evidence. These variables represent the events being studied. The basis of my research is to design and create an application that can calculate the probability value of certain events given by a Bayesian Network. The application should read an XML file that contains the network information to evaluate. The research consists of evaluating the best way to design an application to calculate probability using the C# programming language and Visual Studios .Net. Various book and internet resources are used to gain an understanding of how probability is calculated and what it is

used for. The probability of events can be evaluated by a computer application. This application makes calculating probability faster and more efficient than doing it by hand. The final result consists of a well rounded application that could be used for many important reasons. This research could be used in the computer industry to help create artificial intelligence for example. This application is another tool to make life easier and more productive.

Tales of the Tidewater: Oral History in a 21st Century Forum

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Murrells Inlet, SC

Mentored by:

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USC Department of History

This project is designed to display the research results of an oral history project in an online forum. Because humanistic projects have often been slow to adapt to an online format, the Tales of the Tidewater website is an initial attempt to incorporate undergraduate humanistic research into a forum for online presentation and future discussion. Tales of the Tidewater began as a three-week Maymester class in the Spring of 2004, whose goal was to develop a better understanding of the environmental history of Georgetown County through research and oral history interviews. The course will be offered again in Fall 2004. The central initiative of the first website design is to serve as a recruitment tool for the class, informing potential students about the opportunity for original and exciting undergraduate research. The website also serves as an exhibit of student research and conclusions to date, in order to establish a basic understanding of the history of Georgetown County and the environmental perspectives of its residents. The website discusses the various aspects of Georgetown's environmental history, including historic tidal culture, the development of elite hunting preserves, and the recent advance of industry and tourism. When this knowledge is compared with oral history interviews of local residents, students are able to develop a complex understanding of the effect of landscape and the environment on local ideas, perceptions and values.

Dining in the Pleistocene--who's on the menu?

Moriah McKay

Lugoff, SC

Mentored by:

Dr. Matthew J. Kohn

USC Department of Geological Sciences

A new fossil locality near coastal South Carolina has yielded a spectacularly abundant and well-preserved assemblage of ~425,000 yrs BP megafauna, including sabertooth cat (*Smilodon fatalis*), wolf (*Canis arbrusteri*), cheetah (*Miracinonyx inexpectatus*), camels (*Hemiauchenia* sp. and *Paleolama* sp.), tapir (*Tapirus* sp.), deer (*Odocoileus virginianus*), and horse (*Equus* sp.). Of particular interest is the ability to decipher paleoecologies and paleodiets, especially for carnivores, by using carbon isotope compositions ($\delta^{13}C$) of well-preserved fossil teeth. *Paleolama* and *Tapirus* have the lowest $\delta^{13}C$ values (-16 to -13‰, PDB); *Canis*, *Smilodon*, and *Hemiauchenia* have intermediate values (-13 to -9‰); and *Equus* has the highest values (-6 to -1‰). High (>-5‰) vs. low (\leq -9‰) $\delta^{13}C$ values indicate ecosystems dominated by warm-climate grasses vs. trees and shrubs. The high $\delta^{13}C$ values for *Equus* indicate grassland occupancy, whereas the low $\delta^{13}C$ values for the other herbivores indicate forest occupancy. Because both high and low $\delta^{13}C$ values are represented in the herbivores, both grassland and forest ecosystems must have been present. The low $\delta^{13}C$ values for carnivores indicate that *Canis* and *Smilodon*

preferred hunting in forests, e.g. preying upon camel and tapir, and not in grasslands. Instead, the top grassland predator was likely cheetah.

Reconstructing Eunice: A Novel's Journey From the Nineteenth Century to the Twenty-first Century

Tara Courtney McKinney

Fountain In, SC

Mentored by:

Dr. Thomas J. Brown

USC Department of History

William J. Rivers, a longtime professor at South Carolina College, composed *Eunice: A Tale of Reconstruction Times in South Carolina* in the mid-1870s after resigning his position to protest the school's racial integration during Reconstruction. Later revised extensively by Rivers, the unpublished manuscript is in the collections of the South Caroliniana Library. This project provides the first typescript of the work. One version shows Rivers's editorial changes, and the presents the final "clear text" after incorporation of his revisions. An introduction describes Rivers's place in nineteenth-century South Carolina as an intellectual whose politically engaged scholarship gained him a place in prominent state circles, although he never forgot that he had been born an outsider. It also places the novel in the literature of the post-Civil War era, tracing Rivers's efforts to express his political views through fictional characters representing social types. Though he looked forward to sectional reconciliation, he expected a new group of white southerners to displace the antebellum elite and triumph over Reconstruction. This edition makes *Eunice* accessible for the first time to scholars and other interested readers.

Characterization of a Direct Methanol Fuel Cell

Patrick McKinney

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Mentored by:

Dr. John Weidner

USC Department of Chemical Engineering

The motivation of this research is directed towards applications in hybrid power systems. These systems involve both a high power and high energy device. The direct methanol fuel cell (DMFC) is considered as the high energy device, which is characterized in this research. The performance of the DMFC will be measured based on running experiments at different operating conditions such as temperature, methanol concentration, and methanol flow rate. This performance is determined from the relationships between voltage and current measured using the DMFC. Methanol crossover is determined by collecting cathode gas stream samples at these same operating conditions. The samples are injected into a GC (gas chromatography) to determine each sample's carbon dioxide concentration. The carbon dioxide concentration measured in a given sample explains how much methanol reacted at the cathode layer. Therefore, the carbon dioxide is produced as a function of the amount of methanol that crosses over the membrane. The effects of this crossover are also determined by analyzing the voltage and current relationships of each experiment. After data are collected from the experiments running on the DMFC, they will be fit to a previously developed mathematical model. From this fit, kinetic and transport parameters will be extracted.

The Correlation Between Stress and Emotional Support on Life Satisfaction in Middle Age

Haylea Mims
L. Daniell Andrews
A. Aikman
Brian Bedenbaugh

Mentored by:

Dr. K. C. Kirasic
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The period of middle age is often one overlooked in developmental research. Spanning from roughly 35 to 65 years of age, middle age brings a variety of physical and contextual changes into the lives of those who are experiencing its unique physical and emotional issues. Psychological research on this period focuses mainly on its connection to and influence on a person's well-being and confidence. Our research focuses on stress, emotional support from one's spouse and other sources and their relationship to middle age levels of life satisfaction. Additional correlates between stress and emotional support were also considered. It was hypothesized that stress and spousal emotional support, but not total emotional support from others, will significantly predict satisfaction at midlife. In addition, the hypothesis includes that spousal emotional support and stress will predict life satisfaction more so for midlife men.

Image Processing with EIPA

Brian Murphy

Aiken, SC

Mentored by:

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USC Department of Computer Science and Engineering

My research involves the modification of the EIPA image processing program, originally developed by Greg Croft. EIPA stand for "Extending Image Processing Application". I created several plug-ins during the course of my research. Several were of negligible scientific importance. Some of these were a color overlay plug-in, a photo negative plug-in, an embossing plug-in, and others. However creating these plug-ins was not the main point of my research. The focus of my research was to produce a scientifically useful plug-ins, so that people can use EIPA for scientific applications. The first plug-in I made was one that found the standard deviation of RGB values of a section of the image. Then all pixels less than the standard deviation are then marked and several statistics are displayed. The other plug-in is a segmentation plug-in. Segmentation is used for picking out objects within an image. This can be hard since the color of an object can change fairly gradually, especially in different lighting conditions. Using local maximums of hue, saturation and intensity, we are able to distinguish objects. Both of these plug-ins are easily modifiable, so they may be quickly adapted to perform many different operations.

Examining the Role of ZAT Family Members in Stress Responses Using Arabidopsis

Kristin Oates

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The purpose of my experiment was to test the responses of three transgenic Arabidopsis lines to different stresses. These transgenic lines had decreased expression of ZAT 7 and ZAT 8 (ZAT 7/8) or increased expression of ZAT 12 (35S::ZAT12). The Arabidopsis ZAT 7,

Zat 8 and Zat 12 genes are thought to play roles in plant stress response pathways, thus; these transgenic Arabidopsis lines may have a response that is different that wild type Ler after exposure to different stresses. Plants were exposed to water stress (salt and drought), oxidative stress (paraquat), and heavy metal stress (zinc and nickel). Root length was measured for approximately 5 days on 7 day old seedling grown on B5 (no stress), paraquat, zinc or nickel. Results from the experiment conclude that there were no significant differences in the root growth between wild type and the transgenic lines altered in Zat gene expression. In addition, the transgenic plants had similar responses as wild type plants to drought and salt stress.

Study Of Gaba Mechanisms In Audiogenic Seizures Using Herpes Virus And Lentivirus Mediated Gene Transfer

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E. Jo Mason

S. Alisha Epps

Virginia Mason

Erica Dole

Brandy Ludlam

Kathryn Hawkins

Mentored by:

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The goal of this research is to use viral vectors to alter GABA levels and GABAA receptor configurations to systematically study excitability related to epilepsy. Herpes viral vectors were used to increase (sense) or decrease (antisense) GAD65 (synthesizes GABA) or block the GABAA1 receptor subunit in the inferior colliculus (IC) of audiogenic seizure (AGS) prone or seizure-resistant (SR) Long-Evans rats. Lentiviral vectors capable of long-term expression synthesizing GABAA1 were injected in AGS animals. AGS rats were acoustically primed at postnatal day 18 and AGS-tested at day 32. Subjects were tested 2 and 3 days before surgery, and 2, 3, and 4 days after with testing to 30 days in lentivirus Ss. Incidences and latencies of wild running (WR) and clonus were recorded. The IC was bilaterally injected with replication-defective herpes virus or lentivirus, including 10% lacZ-encoding virus and 100% lacZ-encoding virus for controls. For herpes subjects, AGS behavioral testing after surgery revealed a significant decrease in clonus incidence following GAD65 sense injections in AGS rats and a significant increase in clonus incidence following GAD65 antisense injections in SR animals. AGS-related WR incidence increased significantly following GAD 65 or GABAA1 antisense injections in SR rats. For lentivirus subjects, AGS behavioral testing after surgery revealed significance in WR latencies. These results point to the critical role of GABA mechanisms in AGS and the potential role of gene therapy for epilepsy.

A Fiber Optic Probe for Analytical Chemistry in Ionic Liquids

Jonathan Pressley

Mentored by:

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USC Department of Chemical Engineering

A PC-based ultraviolet (UV) fiber optic dip probe spectrometer detection technique is being developed for use in measuring the concentration of chlorinated aromatics and

superoxide ion dissolved in ionic liquids. The spectrometer has been calibrated using 1, 2, 4-trichlorobenzene (TCB) in ethanol within the concentration range of 75 ppm to 650 ppm. The spectrometer will support a kinetic investigation of the rate of destruction of chlorinated aromatics using electrochemical oxidation in ionic liquids. The electrochemical oxidation method is being studied as an environmentally-friendly, low-temperature route for oxidation of chlorinated aromatic wastes. The fiber optic spectrometer permits real-time, in-situ measurement of concentration of chlorinated species. Such measurements are critical for kinetic investigations, and the technique could also have application as a process monitor should the new oxidation process be commercialized.

How We Learn New Words From Reading: Morphological and Phonological Associations

Nicole Rush

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Mentored by:

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USC Department of Psychology

As adults, our primary source of new vocabulary is reading. This experiment investigated the extent to which readers use morphological and phonological information to infer the meaning of new words that appear in print. A morphological strategy entails breaking the word down to coherent roots and stems. This strategy is likely to provide accurate information about word meaning, but this information is not transparent in all words. The phonological association strategy involves relating the new word to a more familiar word that has a similar sound. This could be done for any word, but is unlikely to yield an accurate interpretation. Participants were given a list of words that varied in familiarity and morphological composition and asked to write as much information as they could about the meaning of each word. Half of the words had transparent morphological components and the other half did not. The responses were scored by three individuals according to the strategy the participant used to define the word: morphological, phonological, or other. There was evidence that readers use both phonological association and morphological decomposition strategies and that participants use the morphological strategy more often than any other strategy.

Epidemiology & Phylogeny of Togaviruses

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Mentored by:

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USC Department of Biological Sciences

Arthropod-borne viruses are responsible for responsible for a variety of tropical infections worldwide, including viral encephalitis and epidemic polyarthritis. Togaviruses (Togaviridae, especially the genus Alphavirus) are among the most important arboviral families with regard to veterinary and human health, mainly responsible for viral encephalitis, meningo-encephalitis and epidemic polyarthritis. Three important viruses cause viral disease in the United States: Eastern Equine Encephalitis, Western Equine Encephalitis and Venezuelan Equine Encephalitis. The purpose of this study is to examine the epidemiology and evolutionary relationships of fifteen Togaviruses in comparison to the antigenic complexes reported in the literature. Fifteen complete viral sequences were obtained from the NCBI Genbank and aligned with the Clustal W program. Phylogenetic analyses were performed using the MEGA2 software package.

The structural and non-structural proteins showed different phylogenies, supporting the hypothesis that an ancient recombination event played a role in the evolution of this viral family. Further research based on these results could help better understand the epidemiology and control of arthropod-borne viral encephalitis.

Codifying the Ethics of Nanoscience and Technology

Ashley Shew

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Mentored by:
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USC Department of Philosophy
USC NanoCenter

Professional codes of ethics provide outlines of the values held by various disciplines. The multidisciplinary nature of nanoscience and technology makes the understanding of professional ethics difficult. Collaborating researchers have been trained with different professional values and ethical norms. Scientists focus on knowledge creation, and engineers focus on application and commercialization. Nanotechnology challenges this neat division. Nanotechnology's aim is that of engineering the nanoscale, and nanoscience is viewed as preliminary work that will be useful to production, a significant shift from the normal understanding of science. Because of the hype surrounding nanotechnology, having some sort of "list of areas of concern" – one potential contribution of a Code of Ethics – would be useful in helping to resolve the conceptual clash between disciplines. Such a code might highlight truth, safety, and fairness in practice to help scientists and engineers find a common set of values.

Modeling Mechanical Systems using Virtual Test Bed

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Mentored by:
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USC Department of Mechanical Engineering

Using Virtual Test Bed (VTB) and User Defined Device (UDD), both designed by the Electrical Engineering Department, it is possible to build mathematical simulation models of mechanical systems. These models yield displacement, velocity, and acceleration of mechanical parts and are very useful to modern design. To develop a model, first mathematical differential equations must be written that "govern" the mechanical system. These equations must be written in "Resistive Companion Modeling" format that UDD understands. The models can then be viewed in VTB. Through self study, I have learned to use UDD and VTB for mechanical systems. To demonstrate the usefulness of the program, I have developed several mechanical models. In the poster I will show the "governing" equations, the format they must be written in, and the models that I have developed with results.

The Performance of a Proton Exchange Membrane Fuel Cell Subjected to Blockages in the Electrode Channels

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Batavia, OH

Mentored by:
Dr. John W. Van Zee

USC Department of Chemical Engineering

The performance of a proton exchange membrane fuel cell (PEMFC) was studied under conditions in which part of its electrode flow channels were impeded by rubber blockages. These blockages may be a result of water accumulation in a PEMFC and they are part of a hypothesis for decreased performance. These obstructions were moved between the anode and cathode as well as the start and end of the channels. Although counterintuitive, it was discovered that these blockages actually improved the cell's performance in all cases without any noticeable decay over time. Impeding the cathode had more effect than impeding the anode because flow rates are higher in this section of the fuel cell, and this is where the majority of the voltage losses occur. There was also a greater effect from blocking the start of the flow channels rather than the end because this allows the obstructing phenomenon to occur where there is a higher concentration of reactant. Although the limiting current did increase in all cases, the current versus time data show that the introduction of a blockage induces unstable fluctuations in the steady state performance, most likely due to excess condensation. The severity of these fluctuations follows the same trend with blocking location as the improvement in performance. It is hypothesized that the obstructions improved the performance because their presence in the flow channels begins to approximate interdigitated flow in which the dominant mass transport method switches from diffusion to forced convection.

Monitoring Collagen Capsule Formation and Contraction with In Vivo QCM Sensor

Chris Stewart

Columbia, SC

Mentored by:

Dr. Jonathan Bender

USC Department of Chemical Engineering

Placing an implant in the body leads to an immune response entailing encapsulation of the implant by collagen. Contraction of this capsule can cause deformation, migration, and firmness of implants such as pacemakers, chin implants, or breast implants. The purpose of this study was to design an in vivo sensor that would monitor cellular and fibrotic responses to the implantation of the sensor. A quartz crystal microbalance (QCM) was used as the basic sensor, and modifications were made to allow for in vivo functioning. Sensors were implanted into eight rats and measurements of resistance and frequency of oscillation were taken. A ninety percent success rate of crystal oscillation in vivo was achieved, and changes in frequency and resistance due to physiological disturbances were observed.

Processing Biomaterials with Dense Phase CO₂

Gary Lee Thompson

North Charleston, SC

Mentored by:

Dr. Michael A. Matthews

USC Department of Chemical Engineering

Development of a sterilization-and-cleaning process utilizing dense phase CO₂ requires knowledge of both the effects of dense CO₂ on the materials and on the infectious agents. Compatibility of several polymers and adhesives with liquid CO₂ at about 65 bar and ambient temperature was evaluated via tensile strength, modulus of elasticity, area reduction, mass change, and qualitative observations. Hydrogen peroxide (~70 mg H₂O₂/L) was evaluated as an additive for this process. The "rubbery" materials, latex, silicone, and EPDM, each exhibited noticeable qualitative changes. In comparison to unprocessed controls, polycarbonate and PVC showed statistically significant changes in

tensile strength both with and without H₂O₂. There were other statistically significant changes in mechanical properties of polymers. Preliminary results on the solubility of the pro-inflammatory biomolecule, endotoxin, in dense CO₂ are also presented.

Microbially-mediated O₂ consumption in the Winyah Bay Estuary.

Steven Traynum

Mentored by:

Dr. Douglas F. Williams

South Carolina Honors College
USC Department of Geological Sciences

A study of the rates of microbially-mediated O₂ consumption was conducted in the Winyah Bay estuary, SC during five research trips beginning 9/7/02 and concluding 2/21/04. The goal of this study was to obtain an understanding of the biological uptake of oxygen in the estuary with changes in salinity and temperature. Winyah Bay is a partially mixed estuary, draining the second largest watershed on the east coast. Measurements were principally collected traveling the length of the estuary, as well as one 20-hour time series data set. Standard 300ml biological oxygen demand (BOD) bottles were incubated for 6 hours to determine the amount of O₂ consumed. Our results show a general decrease in the rate of O₂ consumption with increasing temperature and a no significant change with salinity. The r² value for temperature versus the rate of O₂ consumption was 0.21. On 10/11/03, a 20-hour time series was conducted in the Western Channel portion of Winyah Bay. The results of this data set suggest no strong correlation between tidal stage and respiration rate. Continuing research is planned to repeat the time series analysis and acquire more data to better understand seasonal variation in respiration rates.

The Preservation of Phosphorus in Marine Sediment Trap Samples

Kelly Truesdale

Lexington, SC

Mentored by:

Dr. Claudia Benitez-Nelson

USC Department of Geological Sciences

Phosphorus is a crucial nutrient for marine organisms as they require phosphorus for the synthesis of nucleic acids, proteins, and ATP. In the open ocean, the major source of P to surface waters is from the breakdown (i.e. remineralization) of detritus, such as fecal pellets and marine snow, which are formed during marine plant production and grazing by larger organisms and bacteria. To analyze the composition and magnitude of sinking particles, sediment traps are often utilized. In order to reduce any post depositional reprocessing (i.e. due to bacterial growth) poisons or preservatives are added. However, these poisons may also affect sample integrity. The purpose of this experiment was to examine the effects of three preservatives (mercuric chloride, formalin, and sodium azide) on inorganic and organic P levels in marine samples of various P composition collected from a range of coastal in open ocean environments. Samples were exposed to preservative solutions, and the loss of P to the supernatant was monitored over time. Our results indicate that the most commonly used preservative, formalin, is the least effective in preserving P sample integrity. In contrast, sodium azide, appears to be the most effective trap solution and should be used whenever possible.

Forensic Raman microspectroscopy of fibers and fiber dyes

Bryan J. Vasser

Aiken, SC

Mentored by:

Dr. Stephen L. Morgan

USC Department of Chemistry and Biochemistry

Fibers are commonly encountered as trace evidence in crimes involving personal contact, such as homicide, assault, or sexual offenses. In comparison to other spectroscopic methods (e.g., UV-Vis, IR), Raman microspectroscopy offers advantages for fiber analysis. In addition to determining the fiber type, Raman spectroscopy also yields information on the structures of dyes present. The disadvantage of Raman spectroscopy is that only a small fraction of the incident light (approximately 1 in 10⁷ photons) undergoes Raman scattering. Spectra are therefore easily overwhelmed by background effects caused by fluorescence and/or thermal degradation. This project evaluates the potential of Raman microspectroscopy for discrimination of common fiber classes, subclasses and fiber dyes. All components of the sample (base fiber, dyes, mounting adhesive, cover slip, and slide) have been found to contribute to the spectrum. This sensitivity makes Raman spectroscopy extremely discriminating for different fiber classes and dye formulations. Use of a longer wavelength (785 nm) laser reduces fluorescence and baseline artifacts and yields higher signal-to-noise ratios. Careful control of laser power is also important to minimize fiber damage and photo-bleaching. The long-term objective of the project is to decrease background effects and develop improved protocols for forensic analysis of single fibers using Raman microspectroscopy

Modern South Carolina Quilters As Artists

Elizabeth Voris

Winston-Salem, NC

Mentored by:

Dr. Alexander Ogden

USC Department of Languages, Literatures, and Cultures

This poster analyzes quilting as an aspect of South Carolina folk life. In an age when it costs less to purchase a mass-produced bed covering than to make a quilt at home, why do South Carolinians quilt? Can a practice that started hundreds of years ago as a purely utilitarian action now be considered art? The issue of what distinguishes an art from a craft currently evokes lively debate both in academic disciplines (art, history, ethnography, cultural studies) and among practitioners of folk art themselves. This project addresses the art/craft debate by documenting the views of twelve South Carolina quilters, who were interviewed by phone and e-mail to discern their reasons for quilting and if they considered their quilting an art or a craft and why. The majority reported their quilting was an art because they added their own creativity to quilting patterns, or didn't use patterns at all. They stated quilting brought them peace, direction, and a creative outlet for thoughts and feelings. Quilting in South Carolina today is characterized by a love for manipulating color and fabric, not only a need for warmth or function. The project also draws on the resources of McKissick Folk Life Resource Center.

Porting EDIF Netlists for Congruential Sieves to the Viva Environment

Heather A. Wake

Gambrills, MD

Mentored by:

Dr. Duncan A. Buell

USC Department of Computer Science and Engineering

Computationally dense applications take a long time to run on conventional computers. Such applications perform better when run on custom processors whose hardware has

been specifically designed for the application than when run on conventional machines. As an alternative to dedicated hardware for a particular computation, reconfigurable hardware can be designed for the application without the cost of design and fabrication of a special purpose device, and then the hardware can later be redesigned to solve another problem. A congruential sieve is the ideal example of an application that is better suited for hardware than software. This poster describes an implementation of a sieve, starting with its VHDL model and continuing through the port of its EDIF to the Star Bridge Systems HC 36m reconfigurable computer. We believe this implementation, with comparable running speed, uses significantly less area of the chip than a version already implemented using the design environment native to the HC 36m. This reconfigurable system was used to implement a very fast sieve without the cost of dedicated hardware, and this project shows that the VHDL to EDIF process is effective as a programming process and avoids the complications of the native software tool.

The Reproductive Ecology of the Alien Invasive Love Bug, *Plecia nearctica*

Christina White

Columbia, SC

Mentored by:

Dr. Timothy Mousseau

USC Department of Biological Sciences

The love bug, *Plecia nearctica*, is characterized by a prolonged period of copulation whereby males and females are locked in tandem for 56 hrs on average. In previous experiments we found that the males transfer approximately twenty-two percent of their body mass to females during copulation. We hypothesize that this is a predatory act on behalf of the female, and that there is a lock-and-key mechanism associated with genital coupling, in which the female has certain machinery that allows her to grasp the male and hold him inside of her. We observed the flies' genitalia under a wild dissecting microscope. We found that the female has a pair of unidentified tooth-like structures on the inside margin of her vaginal opening. This pair of sclerotized processes extend from the median portion of the vagina, and surrounds the vaginal opening. The absence of these processes in male love bugs indicates that the female is holding the male inside of her. The fact that the female locks the male inside of her is a good indicator that the transfer of extragametic materials is a predatory act on behalf of the female.

Children's Fear Response to News Media

Loran Casey White

Spartanburg, SC

Mentored by:

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Previous studies have noted developmental differences in the ways children respond to potentially fear-producing news stories. In this study, a survey distributed to approximately 450 parents of children in kindergarten, 2nd, 4th, and 6th grade gathered information on which categories produced the most fear responses from children at different grade levels. Parents were requested to fill out the short survey and return it via postal mail to the researcher, and a total of 105 were returned. It is expected that the number of children frightened by developmentally abstract concepts in news stories, such as foreign issues, national crimes, and economic distress will increase with grade level, while the number of children frightened by visually stimulating coverage, as with natural disasters, will decrease with grade level. A disproportionately high number of responses citing fear after viewing a war story are expected across all grade levels considering the

current war in Iraq. Proposed explanations for reported differences are based on developmental differences in processing, such as dependence on visual stimuli for interpretation in younger children and conceptual understanding of abstract ideas as the brain continues to develop in older children. It is hoped that research on this topic will help to educate parents and teachers on potentially disturbing media stories for children at different developmental levels.

The Incorporation of Doulas into Local Child Birthing Practices in South Carolina

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The incorporation of doulas into U.S. hospitals can be traced to research on maternal-infant bonding conducted by Klaus and Kennell in the 1960s. Studying Guatemalan women in childbirth, these researchers recognized a correlation between the presence of a doula (defined as a person who provided labor support) and a decrease in obstetrical interventions such as epidurals, episiotomies, and cesarean sections. My research explored the process of incorporating doulas within local child birthing practices in South Carolina. This was a descriptive, qualitative study involving in-depth, individual interviews with ten participants recruited through a local hospital doula program, personal community contacts, and snowball referrals. Of the participants, 3 were doulas themselves, 4 were women who had doulas assist them during birth or post-partum, and 3 were medical personnel who have worked with doulas. The semi-structured interviews were between 30-60 minutes. The audio-taped interviews were transcribed and analyzed using qualitative data analysis techniques. In response to the research question about the incorporation of doulas into local birthing practices, four main themes were identified: a) filling a perceived need, b) the roles of the doula, c) the experience and practices of doulas, and d) challenges and issues related to incorporating doulas into local birthing practices. Sub-themes, dimensions, and properties were also identified within each main theme. In summary, the participants in this study embraced the incorporation of doulas as positive. However, there are still many questions that need to be researched and analyzed. Previous research has focused primarily on outcomes related to obstetrical interventions. Further research should focus on both the benefits and costs of incorporating a labor support person into hospital birthing practice. Future research could examine how the role and practices of doulas may vary with culture, class, geography, or educational level.

Binary Formulations In The Enhancement Of Transdermal Drug Delivery

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The world of chemical enhancers in transdermal drug delivery contains hundreds of individual enhancers that allow up to a certain size molecule to penetrate the stratum corneum (top layer of skin) and pass into the patient's blood stream. Each single enhancer is given a value of enhancement and skin irritation. The theory involved leads us to believe that a binary combination of these enhancers should result in an ideal formulation with very high enhancement and low skin irritation value. Many of the

underlying molecular mechanisms of these chemicals remain a mystery, which hinders the progression of any rational design of such mixtures. However, through the development of a new high throughput screening tool, several binary formulas can be tested per day in order to analyze any patterns that may arise among the numerous different types of enhancers used. Such categories include fatty acids, fatty esters, fatty alcohols, ionic and nonionic surfacants, and terpenes that offer different intermolecular interactions affecting the enhancement of each unique combination. Enhancement is measured through conductivity since it shows a strong linear relationship with permeability. Several compositions already display positive synergistic transport enhancement, in addition to negative and neutral synergy that can also aid in the further understanding of these various enhancers.