Research, Community Engagement and Creative Work
Brooks, Meaghan, David Lavoie, Brian Pleskowicz  
*Chemical Engineering*  
**METAL ELECTROSPINNING OF METAL NANO FIBERS**  
(Advisor: Nese Orbey)  

Metal electrospinning is the process of drawing nanoscale fibers from a metallic liquid solution by using an electric field. Due to the fibers’ high surface area to volume ratio, these materials have the potential of being used in a variety of applications including rapid heating/cooling and artificial muscles. Little work has been done to date regarding the production of fibers with consistent properties controlled by electrospinning parameters. In the current study, solutions of copper acetate, nickel acetate and zinc acetate in polyvinyl alcohol (PVA) were prepared and then electrospun. The electrospun fibers were then pyrolyzed at 800°C in inert atmosphere to burn-off the polymer and reduce to pure metals. The effect of the voltage, polarity, flow rate, and solution composition on fiber diameter, mechanical tensile strength, and piezoelectric properties was studied. A Scanning Electron Microscope was utilized to characterize the physical properties of the electrospun fibers. The experimental work done and the results obtained will be presented.

Clay, Molly, Qingzhou Cui  
*Chemical Engineering*  
**ELECTROCHEMICAL BIOSENSORS BASED ON NOVEL POROUS METAL NANOSTRUCTURES**  
(Advisor: Zhiyong Gu)  

Sensing is vital to the healthcare industry in order to diagnose patients with accuracy and in a timely manner. Among many sensing platforms, electrochemical sensing is a fast, reliable, sensitive, and low cost method to improve conventional biosensing techniques. Herein we show the electrochemical detection of serotonin, a neurotransmitter linked to depression, using novel porous metal nanostructures, including nickel, cobalt, copper, silver, and gold. These porous nanostructures are synthesized by a galvanic replacement reaction between an aluminum nanoparticle template and respective metal ions. Growth kinetics play an important role in the galvanic replacement to form two distinct structures: discrete porous nanoparticles and continuous porous nanostructures. The sensor set-up consists of a 3-electrode cell with working, reference (Ag/AgCl), and counter (Pt) electrodes. A glassy carbon electrode modified with porous metal nanostructures functions as the working electrode. Due to the increase in surface area, these porous nanostructures have promise as electrocatalysts. It was found that nickel hollow nanoparticles enhance the sensitivity of the electrode towards the oxidation of serotonin with a detection limit of 25nM.

Gao, Fan  
*Chemical Engineering*  
**DEVELOPING LEAD-FREE NANOSOLDERS FOR NANOELECTRONICS ASSEMBLY AND PACKAGING**  
(Advisor: Zhiyong Gu)  

The current demand for high-performance interconnects in advanced packaging is resulting in dramatic scaling down of the electronics packaging feature size from microscale to nanoscale. Novel and/or enhanced interconnection and packaging techniques have to be developed to meet a variety of needs for device or system level integration. Nanosolder-based joining and interconnection techniques provide an
opportunity to form robust joints between nanostructures and to integrate nanocomponents into a functional device or complex system. The approach of nanosoldering has shown effectiveness in the construction of functional and interconnected nanostructures from nanocomponents by utilizing a nanosolder reflow process, where the surface oxidation and wettability are critical factors. Herein we show that the usage of a vapor phase-based fluxing process is an effective way of cleaning nanosolder surface oxides and ensuring good nanosolder reflow. A multi-segmented nanowire system, as model one-dimensional nanostructure, provides a good structure to study the intermetallic diffusion and wetting properties of nanosolder systems. In addition, we will show the interaction of nanosolders with different metallic surfaces, such as gold, copper and nickel, as well as the effect of using several industrially relevant fluxes. These studies will provide the needed information for developing the nanosoldering techniques and their potential applications in nanomaterial assembly and nanodevice fabrication. These nanosoldering techniques, in combination with one or more assembly techniques that have been developed, will have the great potential not only in nanoscale assembly and nanoscale ball grid array (BGA) formation, but also in the integration of sophisticated sensor arrays and the enabling of nanoscale integrated circuits.

Oljey, Jonathan  
Chemical Engineering  
PILL MAKER  
(Advisor: Byungki Kim)  
The project that I worked on for the symposium is a manually operated pill making machine. For this project, I was tasked with building the prototype. During the construction of the prototype, I kept track of the changes I made and the times it took for the individual components. After completion of the prototype, we had a meeting to discuss the changes and the viability of the project. In the end, it was decided that the blueprint would be revised to reflect the necessary changes.

Shu, Yang, Karunaharan Rajathurai, Fan Gao, Qingzhou Cui  
Chemical Engineering  
LOW MELTING POINT TIN/INDIUM (SN/IN) NANOSOLDER PARTICLES: SYNTHESIS AND APPLICATIONS  
(Advisor: Zhiyong Gu)  
Many electronics manufacturing processes require low temperature processing, for example, flexible electronics. To meet the requirement of low temperature processing and also satisfy the need for energy saving, low melting point solder particles are necessary for electronics assembly and joining of certain products. Herein we report the synthesis of tin and indium alloy particles as a new nanosolder material for low temperature applications. The nanosolder particles are synthesized by a surfactant-assisted chemical reduction method. The parameters that affect the synthesis process such as stirring speed, solution pH and surfactant concentration are studied to control the size and shape of the Sn/In nanosolder particles. It is found that oxidation plays a significant role in nanosolder formation. SEM, TEM, and EDS are used to determine the structure and composition of the nanosolders. DSC test has been done to determine the melting points of the nanosolders and confirm the alloy formation. Our results show that the nanosolder particle size can be well controlled under optimum conditions. These low melting point nanosolders have potential for such applications as micro- or nanojoining techniques, bonding and interconnection on flexible electronics.
Bagheri, Sina, Pola Arsanious  
Civil and Environmental Engineering  
A STUDY ON THE ENVIRONMENTAL IMPACTS FROM RUBBER TIRES  
(Advisor: Kenneth Lee)

This work studies the pathways of automobile tire particles in the environment. According to a 2007 United States Department of Transportation study, there are over 250 million registered passenger vehicles in the United States. As the tires on these vehicles wear off, tire particles enter the air we breathe and the water we drink. The main ingredient in a rubber tire is a synthetic polymer called styrene-butadiene, which is a stable chemical that doesn't break down easily. The black color of tires comes from a chemical called carbon black, which is basically soot. And soot contains some chemical by-products that are known environmental pollutants. Rubber tires also contain hazardous sulfur and zinc compounds that are used to speed up the rubber-making process. In this poster, we present calculations on the amount of various chemical compounds entering the environment as a result of tire wear and describe the hazardous nature of each compound to our health.

Deschamp, Barbara, Jung Hwan Cho  
Civil and Environmental Engineering  
A PROGRAMMABLE POTENTIOSTAT FOR DETECTION OF CADMIUM IN WATER  
(Advisor: Pradeep Kurup)

This work aims to develop a potentiostat for detecting heavy metal contaminants in ground water. The measurement system utilizes a potentiostat with an MSP430 microcontroller to input cyclic and anodic stripping waveforms. Detection of heavy metal in ground water is performed by voltammetry techniques. Linear regression is employed to analyze the output current of the system in order to identify cadmium at different concentrations levels.

Howard, Zachary, JungHwan Cho  
Civil and Environmental Engineering  
ELECTRONIC NOSE COMBINED WITH MEMBRANE INTERFACE PROBE FOR DETECTION OF VOCS IN WATER  
(Advisor: Pradeep Kurup)

Described is the training of a novel electronic nose (EN) integrated with a membrane interface probe (MIP) for detecting volatile organic compounds (VOCs) in water. The MIP is an in-situ tool with a heated semi-permeable membrane that allows the detection of certain VOCs in soil and groundwater. The MIP was combined with an EN sensor array consisting of four different tin-oxide gas sensors. The EN system was calibrated in aqueous media spiked with benzene, toluene, ethylbenzene, and p-xylene (BTEX) at different concentrations. The experiment was conducted utilizing five repetitions for each analyte. The data was analyzed using intelligent models such as statistical methods and artificial neural networks. The trained models showed excellent prediction capabilities. Principle component analysis was found to contain 99% of the sample variance within two principal components while providing accurate and separable results. The two artificial neural networks utilized were the multi-layer perceptron and general regression neural network yielding accuracies of 91.7%, and 100%, respectively.
Mardani, Shirin  
*Civil and Environmental Engineering*  
**THE EFFECTIVENESS OF A NEWLY FORMULATED ENVIRONMENTALLY-FRIENDLIER SURFACTANT FOR REMOVING TRICHLOROETHYLENE IN A ONE-DIMENSIONAL SATURATED COLUMN**  
(Advisor: Kenneth Lee)  

The use of surfactants is a popular method for remediation of groundwater contaminated with nonaqueous phase liquids (NAPLs). Typically, surfactants would be injected into an injection well and a recovery well would be used to recover the contaminants as well as the injected surfactant. Most surfactants contain nonylphenol ethoxylate (NPE), and NPE is a weak endocrine disruptor and may persist in aquatic environments. Thus numerous states as well as the European Union have raised concerns over the usage of surfactants containing NPE. In this work, we conducted one-dimensional saturated column flow-through experiments to test the effectiveness of a newly formulated non-NPE surfactant (Obtained from The Biosolve® Company) for removing Trichloroethylene (TCE), which is a common groundwater contaminant. Numerous one-dimensional column flow-through experiments were conducted using 6% concentrations of the surfactant. For this study, we used both glass beads and sand as the porous media. Results show that this new non-NPE surfactant is very effective in raising the solubility of TCE, thus significantly increases the removal efficiency of TCE from the columns.

Vidal, Maria, Seth Robertson  
*Civil and Environmental Engineering*  
**DETECTION AND ANALYSIS OF ZINC IN GROUNDWATER**  
(Advisor: Pradeep Kurup)  

Due to the current limitations of in situ contaminant monitoring, the need of a rapid, real-time detection technique arises. Therefore, an Electronic Tongue is being currently developed to detect several harmful heavy metals that can be present in contaminated groundwater and complex soil matrices. Zinc is one of the electro-active species being analyzed, as zinc nitrate in solution, using an electrochemical cell with a variety of working electrodes at different concentrations, and performing Square Wave Stripping Voltammetry to record the current responses under an applied potential. The goal is to generate a distinguishable “taste” of this metal based on its unique current responses at each electrode accounting as well for the influences of several factors such as the electrical conductivity and the presence of dissolved oxygen.

Alshawabkeh, Ibrahim  
*Electrical and Computer Engineering*  
**SOLID STATE COOLER FOR CARS**  
(Advisor: Kavitha Chandra)  

The purpose of this research is to design, fabricate and evaluate a portable solid-sate cooler (SSC) using thermoelectric cells for cooling the passenger compartment of a regular car. The thermoelectric cell is a solid-state semiconductor-based electronic component (with no moving parts) that converts electrical energy into a temperature gradient; in other words, it functions as a heat pump, known as the “Peltier effect,” or converts temperature to power, known as the “Seebeck effect.” By applying DC power to the cell, one surface gets cold and the other gets hot; by reversing the polarity of the DC power, the heat moves to the other direction. Since the car is parked in the sun for eight hours or more, it is reasonable to use a PV module placed in the car on the windshield to provide the DC power needed to power the SSC. To maximize the power output of the PV module, a maximum power point tracker (MPPT) was designed. This research was presented to students in 9th grade Physics class at Lowell High School, in Lowell MA.
Students conducted interactive experiments to better understand how transducers work, the process of energy conversion and the principle of energy conversion.

**Attoui, Fouad, Mahdi Haghzadeh**  
*Electrical and Computer Engineering*  
**BLACK SILICON**  
(Advisor: Joel Therrien)

With the current technologically advanced state of photovoltaics (PV), advances in efficiency come in small increments; silicon solar cells are developed well enough that we are the point of squeezing out improvements of fractions of a percent in efficiency. Such small changes however play an important role in bringing PV closer to the breakeven point where it can compete with fossil fuel derived electricity. Antireflection (AR) coatings play an important role in efficiency of solar cells. Silicon, being naturally very reflective, needs a coating of material that will enable more of the incoming light to enter the cell. Standard AR coatings are thin films that enable high absorption of a range of wavelengths, but not all (this is why solar cells have the familiar blue color). We have developed a simple coating process on top of textured silicon that results in a uniformly dark coating. Reflectivity tests at various angles of incidence were performed on uncoated textured silicon, coated, as well as a standard antireflection film. The results indicate that the coated textured silicon has the lowest reflectivity and maintains this even at low angles of incidence.

**Bhatta, Ambika**  
*Electrical and Computer Engineering*  
**SCATTERING OF SPHERICAL WAVE FROM A RIGID WEDGE**  
(Advisors: Kavitha Chandra and Charles Thompson)

A new representation of the scattered pressure of a point source due to infinite rigid wedge is derived by simplifying the Bessel functions in the modal solution and by implementing the image based representation of the source. The solution comprises of six impulses contributing to the reflected and transmitted pressure and an integral for the diffracted pressure. The inverse Fourier transform of the solution yields the time domain pressure and the asymptotic solution for higher frequency is evaluated and compared with solution obtained by steepest descent method. The analytical approach based on wedge diffraction is extended to evaluate the scattered pressure from finite rigid wedge. To validate the solution the computational results for the scattered pressure is also presented.

**Currier, Blake, Zachary Howard**  
*Electrical and Computer Engineering*  
**COMPUTER DESIGN AND TESTING OF A LIGHT WEIGHT AIRCRAFT WING**  
(Advisor: Kavitha Chandra)

In this project students from Lowell High School (LHS) collaborated with GK-12 Vibes and Waves in Action fellows from UMass Lowell (UML) to design a computer generated efficient, low-carbon-emission, and environmentally friendly Light Sport Aircraft (LSA) wing using Mathcad and Creo. The team of LHS students performed aerodynamic, propulsion, sizing and weight estimation calculations that were used to obtain optimum lift and drag characteristics to minimize fuel economy. Simulations performed in FlowEFD determined that the computer generated wing the students created was capable of flying for 2 hours, at a speed of 100 miles per hour and a cruising altitude of 1,000 ft as required. UML GK-12 fellows worked with the LHS students by providing both theoretical explanations of engineering concepts and software technical guidance throughout the design process. The GK-12 Vibes and Waves project supports the teaching of graduate level research to high schools students in Lowell and Lawrence
to increase interest in the fields of science, math, engineering, and technology while providing fellows the opportunity to gain experience in presenting their research.

Dai, Lian, Abiche Dewilde, Gang Wang, Jianping Zhang, Kenneth Marx  
*Electrical and Computer Engineering*  
**POLYMER COATED SURFACE ACOUSTIC WAVE BIOSENSOR FOR LIVING CELLS**  
(Advisors: Joel Therrien and Susan Braunhut)

A shear horizontal surface acoustic wave (SH-SAW) biosensor is fabricated on quartz wafer for measurement of mechanical properties of living cells. The SAW device was fabricated with a top film of polymer (PMMA, SU-8) to avoid immense attenuation in aqueous media. Several models were designed to operate under different frequencies such as 20MHz, 40MHz and 80MHz and higher in order to identify how frequency affect the sensitivity. A network analyzer was used to capture the resonant frequency of inter-digitated transducers (IDT) of SAW, and it is found that resonant frequency shift is closely correlated to the cell deposition on the sensing area of SAW.

El Aoud, Yassine Ait, Mark Hickey, Gary Adil Kussow  
*Electrical and Computer Engineering*  
**NOVEL TECHNIQUE FOR CONTROLLING FERROMAGNETISM IN DC-RF SPUTTERED CR DOPED IN2O3 THIN FILMS**  
(Advisor: Alkim Akyurtlu)

This study presents a novel technique for fabrication of ferromagnetic thin samples of the bulk material In2-xCrxCrO3-d , which is a magnetic semiconductor under certain conditions of Cr doping and oxygen content. This material is interesting from the point of view of optics because the bulk plasmonic and magnonic properties can be modified by the material composition. Cr-doped indium oxide thin films were deposited on p-Si(100) substrates at room temperature using the DC-RF sputtering deposition technique. These samples were post annealed. With this method, we were able to precisely control the oxygen deficiency, and obtain Cr-doped IO with the desirable stable ferromagnetic properties with magnetic saturation up to 0.6µB/Cr-atom. The results of this study can be further exploited to inspect the negative refractive index in these materials by extracting the optical constants from the spectroscopic transmittance and reflectance data.

Gandhi, Pratik, Steven MacDonald  
*Electrical and Computer Engineering*  
**SPECTRUM SENSING FOR COGNITIVE RADIO**  
(Advisors: Kavitha Chandra and Charles Thompson)

Wireless networks supported by cognitive and software-defined radios rely on the performance of spectrum sensing algorithms for opportunistic access to shared radio spectrum. In 2004, the Federal Communication Commission (FCC) allowed frequency bands in the 54-862 MHz frequency range that were assigned to analog TV transmission to be utilized by cognitive radios. The licensed users of these bands referred as primary users share the spectrum with secondary users who are allowed access to the bands by the cognitive radio. The standards specify strict constraints on the interference that primary users experience during spectrum sharing. This work examines the spectrum sensing performance in indoor wireless channels, and determines achievable gains against the limiting effects of multipath interference, frequency-selective and correlated fading using commercial software radio transceivers. Through the NSF Vibes and Waves in Action GK-12 fellowship, students in the Probability and Statistics (11th and 12th grade) class at Lawrence High School for Mathematics, Science and Technology were introduced to various statistical metrics such as the mean, variance, z-score and correlation. Students were exposed to real world application of analyzing weather related variables such as temperature, relative
humidity and dew point temperature. Using the knowledge of these physical parameters students were asked to find the dependence of these variables on each other using MATLAB software, and compare them with the theoretical model.

Gandhi, Pratik, Steven MacDonald  

*Electrical and Computer Engineering*  

**WEATHER BUG: ANALYSIS OF WEATHER DATA**  
(Advisors: Kavitha Chandra and Charles Thompson)

This research addresses the statistical analysis of recorded weather data obtained from the weather station mounted on the roof of Lawrence High School in Lawrence, MA. Students in the Advanced Placement Probability and Statistics (11th and 12th grade) class in the Mathematics, Science and Technology High School conducted the research with the guidance of NSF GK-12 Vibes and Waves in Action fellow. The students were introduced to various statistical metrics such as the mean, variance, z-score, correlation coefficient and linear regression. Using the knowledge of statistical metrics, students found the dependence of weather related variables using MATLAB software, and compared results with the theoretical models available on the National Oceanic and Atmospheric Administration (NOAA) website. A first and second order regression analysis was carried out to model the observed dependence.

Jaradat, Hamzeh  

*Electrical and Computer Engineering*  

**BROADBAND ABSORBERS BASED ON METAMATERIALS**  
(Advisor: Alkim Akyurtlu)

Metamaterials (MTMs) are artificial materials that possess special characteristics like negative refractive index, negative phase velocity etc. This field has been a fertile area of research especially in the Infrared (IR) and visible regimes. Recently, Engheta has reported a type of MTMs where the impinging EM wave exhibits a minimum reflection and transmission simultaneously leading to a maximum absorption. In this work we report two types of IR absorbers that may find applications in thermal detectors and terahertz stealth technology. The first type is a two layered IR MTM absorber that utilizes minimum amount of conductor. The other type is a broadband IR absorber that offers more than 80% absorption over a very wide range of wavelengths. All results are obtained using the commercial software Microwave Studio CST.

Kalkan-Savoy, Ayse  

*Electrical and Computer Engineering*  

**B-SCAN SIMULATION USING A MULTISCATTERING MODEL WITH PADE APPROXIMANTS**  
(Advisor: Charles Thompson)

This work investigates applicability of certain numerical and correlation techniques in generation and tracking of ultrasound B-scan images. A pulse-echo ultrasound B-scan for an inhomogeneous tissue medium in periodic motion was developed. Our goal is to develop computation techniques for modeling multi-scattering and an accurate methodology to measure the displacement of tissues in motion. Our simulation implements multi-scattering by solving pressure equation with higher order terms using Pade approximants. Majority of B-scan simulations and scattering models are implemented using Born approximation and exclude multi-scattering. Pade approximant expansion enables us to work with wide range of input parameter values. Because simulation is based on acoustic scattering model, our approach naturally includes attenuation. B-scan images were generated using real-life dimensions for ultrasound. The transducer voltage is formulated as summation of the received echoes on the surface of the transducer, and solved using Bessel functions. This work is the first step for us in investigation speckle tracking technique to quantify heart strain.
Breast CT (BCT) using a photon counting detector (PCD) has a number of advantages that can potentially improve clinical performance. Previous computer simulation studies showed that the signal to noise ratio (SNR) for microcalcifications is higher with energy weighted photon counting BCT as compared to cesium iodide energy integrating detector (CsI-EID) based BCT. CsI-EID inherently weighs the incident x-ray photons in direct proportion to the energy (contradicting the information content) which is not an optimal approach. PCD do not inherently weigh the incident photons. By choosing optimal energy weights, higher SNR can be achieved for microcalcifications and hence better detectability. In this simulation study, forward projection data of a numerical breast phantom with microcalcifications inserted were acquired using CsI-EID and PCD. The PCD projections were optimally weighed, and reconstructed using filtered back-projection. We compared observer performance in identifying microcalcifications in the reconstructed images using ROC analysis. ROC based results show that the average area(s) under curve(s) (AUC) for AUCPCD based methods are higher than the average AUCCsI-EID method.

A fusion of asymmetric multicore processor, accelerators and reconfigurable logics provides opportunities for matching computing tasks with the best suitable processing elements in terms of performance or energy consumption or both. Various programmable accelerators have been incorporated with general purpose cores to speedup particular workloads. In this paper we explore the design space of memory hierarchy for such heterogeneous architectures with general purpose cores and programmable accelerators. We evaluate the impact of different memory organizations (on-chip versus off-chip, local versus shared) on the performance of embedded applications. Through extensive simulation experiments, we make several observations: (1) in a single core case, an on-chip accelerator generally outperforms an off-chip one, but it is possible that an on-chip accelerator pollutes a shared cache and degrades the performance; (2) an accelerator's ideal speedup factor largely affects the cache behavior on general purpose cores; (3) in a multicore case, a 15x speedup factor is necessary for an on-chip accelerator to outperform an additional core by offsetting the overheads.

This research addresses the spectrum sharing paradigm of cognitive radio networks from a queueing model perspective. The arrival patterns of primary and secondary users to a radio channel bank are modeled using random distributions and queueing disciplines to better understand how spectrum utilization can be improved. In particular, this work examines the blocking probabilities of primary and secondary users considering exponential, Erlang and long-tailed inter-arrival time distributions of secondary users in the presence of Poisson distributed primary user spectrum access. Through the NSF
GK-12 fellowship, this research has been brought to 10-12\textsuperscript{th} grade students in an honors pre-calculus class at Lawrence High School for Performing and Fine Arts in Lawrence, Massachusetts. The students have been engaged in activities centered around exploring probability distributions. This includes activities involving a live video of traffic on the highway and counting cars and mapping inter-arrival times to histograms. The students also conducted a simulation that introduced them to sensitivity of system parameters and how real world processes can be simulated via functions and models and applied for prediction.

Morasse, Patrick, Meghan Sunny  

Electrical and Computer Engineering  

ANALYSIS OF REYNOLDS NUMBER AND THE VELOCITY OF AN OBJECT THROUGH VARIOUS FLUIDS  

(Advisor: Kavitha Chandra)

An important quantitative measure to determine fluid motion around an object is the Reynolds number (Re). It represents the relationship between inertial force and viscous force in fluid flow. In this work, a group of 9th grade students in algebra class at Lowell High School designed a graphical user interface (GUI) in MATLAB. The GUI is used to analyze and display the dependence of an object’s velocity in the fluid as a function of the object’s length and the kinematic viscosity of the fluid. The program determines the Reynolds number and displays the change in velocity as a function of Re. The GUI is designed to compare the relative change in velocity as the length and viscosity parameters are changed. The graphical analysis provides students an intuitive understanding of how an object’s dimensions can be scaled to understand its behavior at a particular Re of interest.

Pakalapati, Shiva Subhashini, Syed Hasan, Garth Hall  

Electrical and Computer Engineering  

MOSAIC 545  

(Advisor: Alan F. Rux)

Typical process of pathogen identification in blood takes at least 24 hours. In spite of tremendous technological advancement that humans have achieved the timeline for pathogen identification has remained fairly constant over the past hundred years. The big share of these processes is ever more elongated over a week. Delayed diagnostic procedure not only raises the cost per patient to $500 per essay but also increases the risk of danger to the patient. Immunotrex Biologics is addressing this well-known issue by developing a novel multi-sensor based point of care medical device called MOSAIC 545TM that automates blood culture to identify viruses, bacteria or fungi in the blood within an hour of testing. It utilizes Oligomer hybridization of a small RNA sequences that are both highly conserved; and are species specific to identify infectious agents. Multiple testing of samples at a given time increases the speed of action thus decreasing patient time in the hospital and reducing the overall cost of hospital care. Mosaic 545TM specificity and sensitivity lowers the need for broad spectrum antibiotics. The all in one package of Mosaic 545TM sums together the capability of multiple test procedures within a closed sterile cartridge system.

Sunny, Megha, Taoufik Nabat  

Electrical and Computer Engineering  

STOKESLET BASED MODEL FOR OSCILLATORY FLOWS  

(Advisor: Charles Thompson)

In this work we investigate the applicability of Stokeslet based analysis to oscillatory flows. Stokeslets are classically used to model particle transport in fluid at low Reynolds number. For oscillatory flows linearity is the overarching restriction to its application. In this work the Stokeslet based approach will be
Particle Tracking Velocimetry (PTV) is a powerful tool for measuring and understanding fluid flow fields. The system involves seeding a fluid with particles, and tracking their motion across a series of images from multiple vantage points to discern the behavior of the fluid. Despite its extensive use in research, most undergraduate students are not exposed to PTV because high grade systems require complex software and hardware, and as such are ill-suited for undergraduate experiential education. In response to these shortcomings, this project was initiated with the goal of developing a basic particle tracking velocimetry (PTV) system that would be technically accessible for an undergraduate student, but still able to illustrate a basic flow field. To achieve this goal, the system was constructed using MATLAB, and tailored for use in a low turbulence water channel. Exposing students to Particle Tracking Velocimetry would increase their understanding of the tool’s principles, and how more complex PTV systems are applied in research. Given the developed system’s inexpensive computing and hardware requirements, and the relative ease with which it can be applied to a low turbulence water channel, it has the potential to be an effective educational tool.

NCFs (Non-Crimp Fabrics) are commonly used in the design of wind turbine blades and other complex systems due to their ability to conform to complex shapes without the wrinkling that is typically experienced with woven fabrics or prepreg tapes. In the current research, a form of vacuum assisted resin transfer molding known as SCRIMP® is used to manufacture wind turbine blades. During the compacting of the fabric layers by the vacuum pressure, several plies may bunch together out-of-plane. When the resin is infused, the areas beneath the waves become resin rich and can compromise the structural integrity of the blade. A reliable simulation tool is valuable to help predict where waves and other defects may appear as a result of the manufacturing process, and to quantify the effect of these defects on the structural performance of the blade. This study incorporates experimentally determined in-plane shearing, tensile, bending stiffness, and friction information of NCFs into a finite element model (Abaqus/Explicit) of a 9-meter wind turbine blade to investigate the mechanical behaviors that can lead to the formation of waves as a result of the manufacturing process. Furthermore, the simulation provides a map of the final yarn orientations and can subsequently be used to predict the structural stiffness of the blade.
This research used a combination of static flexure tests and impact modal tests to obtain the material properties of the fibers and resin in a 0/90 biaxial non-crimp fabric laminate plate. The material properties were input into a finite element model of the plate and the model was analyzed in flexure and in a free-free modal configuration to compare to experimental results. Two different approaches were used in the commercially available software Abaqus to model the plate. One approach used a combination of beam and shell elements to represent the fibers and the resin, respectively. The other approach used orthotropic shell elements to capture the unbalanced behavior of the fiber/resin composite. The beam/shell modeling approach best represented the overall behavior of a single-layer plate but encountered problems when attempting to model multiple layers. The orthotropic shells led to an accurate representation of single and multi-layered plates in flexure and in modal models, but did not capture the tensile stiffness sufficiently. Future work will require combining both modeling approaches to simulate the mechanical behavior of cured composite materials.

Munroe, Brian  
Mechanical Engineering  
FINITE ELEMENT MODELING OF A BASEBALL  
(Advisor: James Sherwood)

A baseball consists of many different materials and layers. A spherical cork core is wrapped with two layers of rubber, three layers of wool, one layer of cemented cotton and one layer of cowhide to create a baseball. The varying material properties of these layers make it challenging to accurately capture the behavior of a baseball. Existing finite element models (FEMs) treat the baseball as a single viscoelastic material. These models do not necessarily possess the same hyperelastic and viscoelastic qualities as a real baseball, and these missing behaviors limit the ability of these baseball models to simulate a bat-ball collision over a very narrow range of impact speeds. A layer by layer approach will be used to create a more robust baseball FEM that characterizes the layer behaviors within the baseball. The pill, which is a cork core wrapped in two layers of rubber, will undergo bounce and compression testing at a wide range of impact speeds and compression rates. These data will be used to tune the pill properties and ensure close agreement between experimental and FEM results. The remaining layers will be added individually until the complete baseball is modeled and agrees closely with experimental results over a range of impact speeds. Possible applications for a new and improved baseball FEM include accurate simulations of baseball testing and bat-ball collisions. The improved ball model can also be used to predict performance of future bat designs not yet manufactured.

Petrov, Alexander  
Mechanical Engineering  
AUTOMOTIVE LIGHTWEIGHT COMPOSITE STRUCTURES WITH EMBEDDED COMMUNICATIONS  
(Advisor: James Sherwood)

The automotive industry is challenged by government mandated regulations to produce more and more fuel efficient ‘green’ vehicles. At the same time, increased telecommunications applications within a vehicle for control of safety features and health monitoring of the engine require fast and high-bandwidth data transmission. The strength-to-weight capabilities of continuous fiber composites can provide significant weight reductions in comparison to steel and aluminum through the application of multiple layers of woven and stitched fabrics as either resin-infused dry or pre-preg materials. Communication grids can be embedded between the plies of a composite part for simplicity and protection of the communication cable from the environment. The choice of materials and the associated manufacturing process has to be suitable to the high-volume low-cost manufacturing requirements of the automotive industry. The current research focuses on developing a reliable design-aid using the finite element code ABAQUS/Explicit to simulate the composite forming process of ply schedule and processing conditions.
to enable a part to be formed in a short cycle time without defects such as wrinkles or tearing. The embedded communication grids are included in the model to explore how their presence influences the overall mechanical behavior of the plies and the associated formability. Test coupons in flat panel, hemisphere, double dome, and surrogate formed part geometries manufactured by UMass Lowell and MAG in Cincinnati, OH will be used to validate the forming models. The fabrics used for this research are first mechanically characterized to define their shear, tensile, and friction behavior for implementation into user-supplied material subroutines and computer simulations of the forming process.

Ruggiero, Eric  
Mechanical Engineering  
AN INVESTIGATION OF BAT DURABILITY BY WOOD SPECIES  
(Advisor: James Sherwood)

Northern white ash had been the wood of choice for Major League Baseball (MLB) bats until the introduction of hard maple in the late 1990s. Since the introduction of maple to the game, there has been a perceived increase in the rate of bats to exhibit multi-piece failures (MPF)—both ash and maple. Lab and field data indicate that while a maple bat is as equally likely to crack as an ash bat, maple is three times more likely than ash to exhibit an MPF. In 2009 MLB implemented a number of additional regulations and inspection processes for the wood billets in an effort to reduce the MPF rate. In 2010, another regulation was added requiring that before any new wood species can be introduced to the game, it must it must obtain approval from MLB Baseball Operations. A proposed certification protocol to quantify the durability of a wood species relative to ash will be detailed, where ash is being taken as the acceptable baseline for durability. A demonstration of the protocol is conducted using yellow birch with white ash as the baseline. Finite element models of bats made of these two wood species are used to explore the relationship between wood density and bat durability.

Tye, Jordan, Amer Fadeelsaid  
Mechanical Engineering  
FLUID TRANSPORT WITHIN HONEYCOMB SANDWICH COMPOSITES  
(Advisor: Christopher Hansen)

Sandwich structural composites with a honeycomb core and composite skins are lightweight structures with outstanding flexural strength. For example, doubling the panel thickness with a honeycomb core yields a flexural stiffness seven times that of the composite skins for a mere three percent mass penalty. Despite these structural advantages, the cellular honeycomb core contains significant volume that is inaccessible and unable to be reassigned to other functions. The current research aims to access this underutilized structural volume for multifunctional composites with embedded storage and sensing capabilities. We process sandwich composite skins with interwoven sacrificial fibers which, subsequent to their evacuation, embed synthetic microvascular networks. The sacrificial fibers composition is polylactide (PLA) resin mixed with tin (II) oxalate catalyst that depolymerizes the PLA during an elevated temperature post curing cycle. Sacrificial fiber patterns woven into the fiberglass fabric skins will intersect specific honeycomb cells for targeted liquid and gas transport through the resulting microvascular network to achieve fluid storage and damage sensing functionality.

Wei, Siqi  
Mechanical Engineering  
NANO-TIO2 COATED FLY ASH PARTICLES  
(Advisor: Julie Chen)

Nano particles have numerical advantages then micro-size or larger particles, such as great specific surface area, and some unique physical or chemical properties. However, nano-particles easily aggregate
together and form into a micro-size particle. Besides, once scattered in solvent, it is difficult to recollect the nano-particles due to the small size. Our project is to coat the nano-particles onto the surface of micro-size particles; use the micro-size particles as a carrier of nano-particles to avoid the aggregation and help to collect the particles. At this stage, our work is focus on the coating of TiO2 onto the surface of fly ash particles; and hope that the composite-particles can have the similar catalysis effect of TiO2, while will not aggregate and easy to recycling.

Yee, Jennifer
Mechanical Engineering
CHARACTERIZING THE INTERACTIONS BETWEEN SOFTBALLS AND SOFTBALL BATS FOR DESIGN OF MAXIMIZE ALLOWED BATTED-BALL PERFORMANCE
(Advisor: James Sherwood)

This paper will explore the interaction between a softball bat and softball as a function of the respective bat and ball constructions. The overall objective of the research is to study and identify bat characteristics that result in maximum performance as quantified by batted-ball speed (BBS) for a given ball construction while complying with the standards sanctioned by the respective softball associations. This objective is being achieved through a combined experimental and finite element modeling approach and this paper will present some of those results. Four softballs are initially modeled in LS-DYNA as a viscoelastic material using the expression for the shear modulus G as a function of time: 

\[ G(t) = G_{\infty} + (G_0+G_{\infty})\exp(-\beta t) \]

Where \( G_{\infty} \) and \( G_0 \) represent the long term and instantaneous shear modulus respectively, and \( \beta \) is the decay constant. The model is then tuned to experimental COR, dynamic stiffness and quasi-static compression tests. This approach is not complete however, as this form of \( G(t) \) cannot express the softball’s behavior at all speeds. The ABAQUS Prony series 

\[ G(t) = G_0*(1-\sum g_i*(1-\exp(-t/\tau_i))) \]

is sought as an alternative method to model the ball. This paper will also present a methodology for investigating different combinations of bats and balls on the “feel” of the bats as perceived by the player at contact.
Adams, Elizabeth  

*Biological Sciences*  

**EFFECTS OF STUDENT-PRODUCED VIDEOS ON AN AUDIENCE’S INTEREST AND AWARENESS OF CLIMATE CHANGE**  
(Advisor: Juliette Rooney Varga)

The use of video production workshops to enhance learning that occurs in classrooms is becoming a unique method for instructors to engage students and, with the aid of a NASA “Global Climate Change Education” grant, has become a component of a course at UML (Climate Change: Science, Communication, and Solutions) and a summer program for high school students (Youth Educating the Public!). Although the goal of the projects was to engage students producing media, the videos continue to reach broader and broader audiences and it is unknown whether they have any impact on the individuals that view them. In order to determine if these videos affect an audience’s interest or understanding of climate change, UML students (mostly non-science majors) viewed a compilation of student-made videos online and completed surveys both before and after viewing. Results suggest that these student-made videos are successful in engaging audiences and making them both more aware and concerned about climate change.

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Correa, Sandra, Pamela Zobel-Thropp, Greta Binford, Robert Suter  

*Biological Sciences*  

**EVOLUTIONARY RELATIONSHIPS BETWEEN SPIDER SILKS AND THE SILK-LIKE VENOM FROM THE SPITTING SPIDER SCYTODES THORACICA**  
(Advisor: Jessica Garb)

The spider family Scytodidae has evolved a unique way to capture prey from a distance. Scytodids eject a wad of adhesive glue from their fangs onto prey. The ejected material contains long, fibrous strands with structural similarities to abdominal spider silk. We characterized the major protein products of the venom and silk glands of a spitting spider species, Scytodes thoracica, to determine its composition and possible evolutionary connections between the silk-like venom and their abdominal silk proteins (spidroins). We sequenced 241 silk gland cDNAs, which contained 24 putative spidroin sequences that clustered into two groups. Silk cDNA clones Spidroin 1 and Spidroin 2 showed the characteristics of all known spidroins, including repetitive sequences and conserved C-terminal domains. Amino acid repeats in the two spidroins contained iterations of GA motifs, which are associated with beta-sheets and the high-tensile strength of silk fibers. However, neither spidroin contained the amino acid motifs GGX, polyA, and GPGXX, which are usually associated with spider dragline silk. The silk sequence Spidroin 1 has an amino acid composition compatible with dragline fibers and glands we measured from S. thoracica, suggesting that this sequence could represent a major dragline silk protein. Tensile testing of S. thoracica dragline silk showed high toughness and exceptional extensibility. It was nearly as tough as silk from the closely related genus Plectreurys and other orb weavers such as Latodectus hesperus, and Caerostris darwini; it was also substantially tougher than the widely known silkworm silk (Bombyx) and it outperformed Kevlar and steel in toughness. A total of 457 transcripts were also sequenced from an S. thoracica venom cDNA library. About 10% of venom transcripts contain a glycine rich peptide, which may represent a component of the fibers in the silk-like venom, but is not homologous to spidroins.
Dewilde, Abiche, Gang Wang, Lian Dai, Jianping Zhang  
*Biological Sciences*  
**NANOCANARY™ TECHNOLOGIES: A CELL-BASED BIOSENSOR TO EVALUATE LIVE CELL RESPONSES TO DRUGS, MATERIALS AND TOXINS**  
(Advisors: Susan Braunhut, Joel Therrien and Kenneth Marx)

The Nanocanary is a platform technology, which has several distinct applications in nano-material/chemical toxicity testing, drug discovery and as a basic cell biology research tool. The nanocanary is a patented cell-based acoustic wave (AW) device, which uses live human cells as surrogates for tissues, organs or whole animals. The nanocanary can be used as a multiplex screen for monitoring and testing chemicals, materials and formulations for their biological effects and safety. The Nanocanary can simultaneously test different cells of a tissue in individual devices to represent all the distinct cells found in tissues or organs with the potential to reduce the number of animals needed to complete drug development or toxicology testing. This biosensor characterizes the mechanical as well as the viscoelastic properties of the cells. The technology is based on live cells attached to an oscillating crystal where frequency of oscillation and resistance along the surface are allowed to equilibrate with cells attached and then continuously measured in an automated fashion every minute. If cells are treated with chemicals, drugs or materials that perturb their physiology and health this can be detected as changes in frequency and resistance. Crystals can be driven to oscillate at resonant or higher harmonic frequencies, providing unique signature patterns reflecting changes in mass distribution and viscoelastic properties, within whole cells or subcellular organelles. The Nanocanary is the ultimate biological machine and a generic device, which can be used with any cells and applied to any human disease, general toxicology and systems biology.

Gross, Vladimir  
*Biological Sciences*  
**BEAR NECESSITIES: ADAPTATIONS TO SPECIFIC HABITATS ARE REFLECTIVE OF MORPHOLOGICAL VARIATION BETWEEN TARDIGRADE SPECIES**  
(Advisor: Rick Hochberg)

Tardigrades (aka water bears) are microscopic, barrel-shaped invertebrates that dwell in permanently or temporarily wet environments. Tardigrades have been studied for over two centuries, yet relatively little is known about their biology and evolutionary history. Past research has focused on the physiology of environmental resistance (cryptobiosis) and tardigrade relationships to other groups such as arthropods. However, studies designed to gain insight into the structure of organ systems and their role in understanding intra-phyletic relationships have been relatively rare. This study is an effort to gain insight into how the muscular system, a relatively conserved organ system, can vary with body form and habitat. Two species were examined: an intertidal marine tardigrade, Batillipes mirus (Arthrotardigrada, Heterotardigrada) and a freshwater moss-dwelling species Isohypsibius sp. (Parachaela, Eutardigrada). The study was performed using fluorescent-labeled phalloidin and confocal laser scanning microscopy (CLSM) to create a 3-dimensional reconstruction of the muscular system of each species. Scanning electron microscopy (SEM) was used to visualize external morphology. Comparative studies of relatively conserved organ systems such as the muscular system may help to further elucidate the evolutionary history and intra-phyletic relationships of the Tardigrada.
Hunt, Cecelia  
*Biological Sciences*  
**TRANSFORMING MENTAL MODELS OF CLIMATE CHANGE THROUGH “WORLD CLIMATE” SIMULATION GAME**  
(Advisor: Juliette Rooney Varga)

The scientific consensus is that climate change is a serious reality which requires urgent action, yet the American public has not reached a comparable consensus. Climate change communication literature highlights common confusion among the public that may prevent large-scale or sufficient action, and in particular mental model flaws. Common faulty mental models involve a misunderstanding of climate system dynamics, such as atmospheric greenhouse gas stock and flows, and biogeochemical feedbacks. Such misunderstandings lead to support of policies or behaviors that will not sufficiently mitigate dangerous climate change. These include stabilization of emissions above the net removal rate, which would lead to continued increase in atmospheric greenhouse gas concentrations, or taking a wait-and-see approach, encouraging action after climate change has caused dangerous extremes and potentially passing a climate tipping point. Traditional educational or information campaigns have not been effective in correcting these mental models. Past research on simulation gaming has demonstrated the capacity to yield a shift in mental models. My research examines the potential of simulation games, such as Climate Interactive’s “World Climate”, in overcoming inaccurate mental models. Participants’ mental model shifts are assessed from reflection papers written within two weeks of playing the game, and professional evaluation of a voluntary focus group with several participants. The responses demonstrate an appreciation of the economic challenges to mitigation, and the role that social and economic inequality plays in climate negotiations and worldwide emission mitigation. Overall, participants gained an understanding of tragedy of the commons, and the necessity of urgent global action.

Merhi, Heather, Elizabeth Sawin  
*Biological Sciences*  
"**FUTURE CLIMATE**: A SIMULATION ROLE-PLAYING GAME ABOUT CLIMATE CHANGE ACROSS GENERATIONS"  
(Advisor: Juliette Rooney Varga)

There is overwhelming scientific data concluding that current climatic change is caused predominantly by human activities and is already underway. Despite this strong scientific consensus, confusion and misconceptions about the causes, impacts, and need for action on climate change are predominant in current American public discourse. In fact, misconceptions about climate change are not only widespread, but are also often deeply entrenched, presenting significant barriers to learning. Here, we describe a newly developed simulation role-playing game, “Future Climate,” that seeks to overcome these barriers and enable learners to develop robust mental models that are critical for understanding the climate and human energy systems. Participants in the game take on the roles of three groups: policymakers of today, youth of today, and future youth. Unlike passive educational tools, “Future Climate” enables learners to actively explore how decisions made today may impact future generations, within the framework of both social constraints and the physical/biogeochemical constraints of the Earth system as we currently understand it, including feedbacks, the stock-and-flow systems of atmospheric carbon dioxide and other greenhouse gases, and delays in human energy and climate systems. Participants are tasked with trying to avoid ‘dangerous climate change’ as agreed to by the parties of the United Nations Framework Convention on Climate Change (no more than a 2°C rise in global temperature over preindustrial times). The anticipated result is that participants will gain a deeper understanding of the climate system, the negotiation process, and the potential burden on future generations of decisions made today.
Sambhare, Rasika, Paul Yan, Todd Blackledge
Biological Sciences
GENETIC RECIPE FOR EXTREMELY TOUGH SPIDER DRAGLINE SILK
(Advisor: Jessica Garb)

Spiders spin a variety of silks that have distinct functions, such as different silks for prey-capture webs, for egg-case construction, and for dispersal. There are several types of silk glands present in the abdomen of the spider, each of which produces different fibers according to their function. The dragline-silk, which is produced by the major ampullate gland, is known for its high tensile strength and elasticity. There is a strong correlation between the mechanoelastic properties of silk fibers and their function, which in turn reflect their chemical composition and molecular conformation. Despite spider silks having a wide range of material applications, the properties of many types of spider silks are largely unstudied. We examined dragline silk proteins expressed by the major ampullate glands of Darwin’s bark spider (Caerostris darwinii), a recently described species from Madagascar that spins enormous orb-webs (up to 2.8 m² in area). Dragline silk from C. darwinii is the toughest spider silk that has been measured to date. We constructed and screened a major ampullate cDNA library from C. darwinii in order to identify transcripts encoding its silk proteins (spidroins). Sequenced cDNAs were compared to the NCBI protein database using the BLAST program to find putative spidroins. We sequenced 454 silk gland cDNAs, out of which we identified 19 cDNA sequences containing putative spidroins. These 19 transcripts clustered into four distinct sequence types, out of which two blasted to major ampullate spidroin-1 (MaSp1), one to major ampullate spidroin-2 (MaSp2) and one to minor ampullate spidroin-like protein (Misp).

Sandland, April, Dipti Gupta
Biological Sciences
EX VIVO CULTURED MOUSE BONE MARROW PROVIDES A NEW MODEL TO IDENTIFY DIFFERENTIALLY EXPRESSED NUCLEAR PROTEINS DURING MYELOID CELL MATURATION
(Advisor: Peter Gaines)

Neutrophils and macrophages play similar roles in immune system responses and arise from a common hematopoietic stem cell ancestor, but each undergoes unique morphologic maturation. While neutrophil progenitors exhibit extensive nuclear lobulation, macrophage progenitors undergo only modest nuclear condensation. Despite this difference, both cells escape capillary beds, a process thought to be dependent on nuclear structural changes. We have previously shown that each lineage exhibits unique expression patterns of nuclear envelope proteins using in vitro studies of cell lines. Although interesting patterns were revealed, how these patterns compare to those in differentiating stem cells in vivo has not been studied. Using a multi-step process that employs lineage depletion via magnetic separation, we have isolated highly enriched populations of bone marrow stem cells. By culturing the cells in different combinations of growth factors that include stem cell factor and interleukin 3, we identified an ideal cytokine combination that produces lineage-specific populations of neutrophils and macrophages. Cell populations were then harvested at different intervals during the differentiation of each lineage. Data presented will include our assessment of multiple stages of differentiation and how patterns of lineage-specific traits change during myeloid cell maturation. Although being manipulated outside of their in vivo environment, we believe that the collected progenitors and mature cells will accurately reflect changes that occur within the bone marrow of live animals. We have therefore identified a unique model for studying the roles that nuclear envelope proteins play during the maturation of two critical mediators of innate immunity.
**Varun, Kanaka, Bhere Nadia Ayoub, Cheryl Hayashi**  
*Biological Sciences*  
**GENOMIC ORGANIZATION AND EVOLUTION OF THE VERTEBRATE-SPECIFIC VENOM NEUROTOXIN \( \alpha \)-LATROTOXIN FROM THE WESTERN BLACK WIDOW SPIDER *LATRODECTUS HESPERUS*  
(Advisor: Jessica Garb)**

Widow spiders (genus: *Latrodectus*) are known for their highly potent neurotoxic venom, which contains the 120kD protein \( \alpha \)-latrotoxin (ALTX). ALTX is a neurotoxin that elicits massive neurotransmitter release from vertebrate pre-synaptic nerve terminals, and is responsible for the extreme pain caused by black widow spider bites. The toxin is encoded by a 4200bp gene, and is one of four latrotoxin paralogs that are exclusively known from black widow venom. Although black widow spiders and the ALTX toxin have important medical significance, the genomic organization and evolution of the ALTX gene remains largely unstudied. We have sequenced a 21 kilobase fosmid clone positive for the ALTX gene in its entirety, which was obtained from a genomic library constructed from the Western black widow spider *Latrodectus hesperus*. This was accomplished by randomly sequencing overlapping fragments cloned from multiple restriction digest libraries of the fosmid, followed by primer walking. Our results show the presence of a previously undescribed latrotoxin paralog found in close proximity to the ALTX gene in the *L. Hesperus* genome, indicating a recent gene duplication event during the evolution of this gene family. Consistent with previous reports, both latrotoxin paralogs are single-exon genes. We characterized the genomic regions surrounding the adjacent paralogs to identify the transcriptional and repetitive elements associated with the two latrotoxin genes and to better understand their regulation and evolution. Phylogenetic analyses of our genomic latrotoxins, along with published members of this family, also confirm the newly discovered paralog is the result of a recent duplication of the ALTX gene.

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**Taddeo, Marta, Sangmook Lee**  
*Chemistry*  
**METAL-CATALYZED OXIDATIVE DAMAGE AND MEDIATION BY A NUTRICEUTICAL FORMULATION**  
(Advisor: Thomas Shea)

As advances in medicine and nutrition have led to increased human longevity, diseases of aging have thus become more prevalent and have attained increased research interest. These include neurodegenerative disorders such as Alzheimer Disease and Parkinson Disease. A better understanding of the pathophysiology underlying these disease states and factors mediating their progression is critical. One such factor is the aggregation of amyloid beta, a normal protein which misfolds in Alzheimer Disease and forms plaque deposits in the brain. A second factor is the activity of normal transition metals, which are toxic to neurons at high levels. Recently, the Center developed a Nutriceutical Formulation (NF) which has been shown to improve cognitive function in people with Alzheimer Disease as well as in normal individuals. The aim of our present study is to determine the impact of iron and copper on the effectiveness of NF in cell culture, as well as the interplay between these metals and amyloid beta. Thus far we have determined that these metals, particularly iron, increase oxidative damage to at least the same extent as amyloid beta. NF counteracts this damage. However, simultaneous exposure of cultured neurons to metals and amyloid beta produced a synergistic deleterious impact. In upcoming studies we will determine if NF can counteract this synergy. This work may provide insight into disorders such as Alzheimer Disease where transition metals play a contributory role to oxidative damage and disease progression. Future treatment of disease states may include strategies to eliminate these excess metals.
Dufilie, Andrew  
*Computer Science*  
**SUPPORTING LARGE DATA SETS IN A WEB-BASED VISUALIZATION SYSTEM**  
(Advisor: Georges Grinstein)  

Weave is a new open source web-based visualization platform designed to enable visualization of any available data by anyone for any purpose. Weave currently handles thousands of records, much more than the 100 to 200 maximum supported by other web-based visualization frameworks. Our users wish to visualize larger data sets of 300,000 records or more, and eventually millions of records. The main challenges to be faced in web-based visualization systems are that code running in the browser is single-threaded and resources are limited. To provide a responsive user interface, rendering and data processing must be performed in iterative, asynchronous tasks and the system must be able to handle the intermediate results of those tasks.

Fallon, John, Patrick Stickney  
*Computer Science*  
**COLLABORATION WITHIN WEAVE**  
(Advisor: Georges Grinstein)  

Weave is an open source visualization platform developed by UMass Lowell that is intended for use by the public. It is being used by a large number of neighborhoods, cities, states and government agencies, including for example Boston, Chicago, Connecticut, Rhode Island and South Florida (see http://metrobostondatacommon.org/). One of the issues tackled in the continuing development of Weave is collaboration. Collaboration in Weave can consist of anywhere from two to hundreds of user’s simultaneously visualizing and sharing data. Some of the concerns of collaboration within Weave include keeping some data private that a user may not wish to share and the coding involved in allowing multiple users to connect to each other and deal with changes being made on each user’s instance of Weave. A way to deal with having common data being shared with all collaborators and to hide personal data is to have private and public workspaces. This could involve dividing the screen into different parts, or allowing a way to mark what should be made public and private. Weave is written mainly in Actionscript which runs using Adobe Flash. A collaboration server is needed to foster communication between users over the internet. This server listens for collaboration requests and manages the messages going between each user’s instance of Weave. The XIFF protocol is used for sending and receiving messages within Weave. Video and voice chat are also supported in Weave with the use of a media server to handle live streaming data. RtmpLite, which is an open source project written in Python, is used to handle the streaming of video and voice chat. Collaboration in Weave will allow users to interact with each other simultaneously in real time to develop visualizations and share data.

Galkina, Ekaterina  
*Computer Science*  
**ANALYZING GENE-ENVIRONMENT INTERACTION IN ALZHEIMER’S DISEASE USING WEAVE**  
(Advisor: Georges Grinstein)  

Alzheimer’s Disease (AD) is the 6th leading cause of death in the United States. Although several genetic and environmental factors have been implicated in AD risks, no single factor is found solely responsible for disease manifestation in all Alzheimer’s cases. In cases when no single gene can explain causality, the scenario of a combination of factors with modest effect sizes has been suggested. Through means of visual analysis in Weave we uncovered and further strengthened evidence for the link between genetics, air pollution and an earlier onset of Alzheimer’s disease as exemplified in US cities with the highest reported levels of toxicity.
Kolman, Sebastin
Computer Science
INFOMAPS: A SESSION BASED DOCUMENT VISUALIZATION AND ANALYSIS TOOL
(Advisor: Georges Grinstein)

Visual analytical systems built for analyzing text corpora typically concentrate on techniques for exploring only the document collections. We have developed a system for visualizing and analyzing the document collections with structured data sets. We use a document visualization tool called InfoMaps which has been tightly coupled with Weave, an open source framework for data exploration and analysis. We use named entity recognition and relationship extraction for ontology based information extraction from the documents. The ontology is built using data and meta-data from the structured datasets. The extracted information is then filtered, queried and visualized through the interface of InfoMaps and Weave. The visual tools from Weave and InfoMaps allow users to perform linked visual analysis and exploration of a text corpus with other structured data sets.

Vardaro, Anthony
Computer Science
MODELING CASCADES ON ELECTRICAL POWER NETWORKS
(Advisor: Kavitha Chandra)

This work provides an overview of modeling cascading failures on electrical transmission networks. These models leverage the Bak-Tang-Wiesenfeld sandpile model as an analog to describe the apparent self-organized critical dynamics found in blackout time series data. Statistical methods are used to characterize the network cascade failures. Preliminary work has shown that these models are capable of generating dynamics similar to time series data collected by power utilities. The relationship between these high level self-organizing critical network models and physical power transmission system dynamics is examined.

Roller, Christopher, Julien Lamouroux
Environmental, Earth and Atmospheric Sciences
THE INFLUENCE OF DISSOCIATION ENERGY AND ANHAMRONIC CORRECTIONS ON TOTAL INTERNAL PARTITION SUMS
(Advisor: Robert Gamache)

The partition function allows scientists to understand the population of states of a molecule and is used to model clouds on Jupiter, in plume detection, Thermodynamic functions, and others. It is defined as a sum over all states of the molecule up to the dissociation limit; \( Q(T) = \sum_{\text{all states}} \exp(-E_s/kT) \). When states are degenerate the sum can be reduced to sums over terms multiplied by their degeneracy. Symmetry plays a role in determining degeneracies, which again can simplify the sum. A ratio of partition functions is used in the intensity equation to convert from one temperature to another. For many of the Hitran molecules, we have had to make the product approximation where \( Q_v(T) \) was determined using Herzberg’s Harmonic Approximation. For many of the molecules in the Hitran Database with low a dissociation energy the Harmonic Approximation will over estimate \( Q_v(T) \). Therefore, the Anharmonic corrections to the vibrational energies may also be important. These hypotheses help us in our twofold focus of extending our partition calculations to low temperatures, which requires the direct sum over rotational energy levels. The second part is to make calculations accurate at high temperature, which requires the dissociation limit. To make the calculations accurate at high temperature we need to calculate the vibrational partition function by the direct sum up to the to the dissociation limit of the molecule while incorporating anharmonic corrections to the vibrational energies. These are used with the rotational partition function to get the product approximation of the partition function, which is comprised of the rotational and vibrational energies.
DeCourcy, Brendan  
*Mathematical Sciences*  
**MATHEMATICAL ANALYSIS OF THE A-EFFECT IN GEO-DYNAMO THEORY**  
(Advisor: Victor Shubov)

It is well known that our Earth, as well as other celestial bodies, has a magnetic field. What is not known, however, is the process by which this field is created and sustained. Although not confirmed, Dynamo Theory is widely accepted as a possible mechanism by which our Earth sustains its magnetic field. This theory suggests that the motions of the electrically charged liquid core create the magnetic field our Earth possesses. Though a complete explanation of the dynamo mechanism is still an open problem, there exist a number of theoretical models of dynamos that explain the generation of a stationary magnetic field. All of these models are based on specific physical assumptions about the turbulent motion in the liquid iron core. It is a confirmed and accepted fact that the presence of a turbulent motion is necessary for the dynamo effect. A cylindrical region filled with a moving conducting fluid is considered. The average fluid flow is assumed to be a uniform rotation about the z-axis. This flow is perturbed by a turbulent motion satisfying the $\alpha$-effect hypothesis: the magnetic field changes in time proportionally to the curl of the field. Inside the region the magnetic field satisfies the advection-diffusion equation with the $\alpha$-effect term. Outside the region it is governed by Maxwell’s equations. The boundary condition for a magnetic field crossing a boundary between two media is satisfied. It is demonstrated that the above system of equations has a stationary solution that describes a magnetic field that does not vanish with time. An explicit expression for this solution in terms of Bessel functions is obtained. The resulting magnetic field is investigated numerically.

Currier, Blake  
*Physics and Applied Physics*  
**SELECTION OF AN APPROPRIATE AIR KERMA RATE CONSTANT FOR VOLUMETRIC SE-75 SOURCES**  
(Advisor: David Medich)

The Air Kerma rate constant and transmission factors through different materials were determined for a volumetric 75Selenium source using Monte Carlo simulation techniques with results compared against that obtained theoretically using the weightless source approximation. In this study, a 0.64mm diameter spherical source of 75Selenium ($\rho = 4.0\,\text{mg/mm}^3$), encapsulated in 0.1mm thick stainless steel was modeled in MCNP5 and transmission factors were calculated through iron, lead, tungsten, and uranium with thicknesses ranging from 0mm to 50mm. The source’s Air Kerma rate constant was calculated to be 17.7 Gy-cm²/hr-Ci (0.203 R-m²/hr-Ci) which was determined to be four time less than calculated theoretically values calculated in the 1992 edition of the Radiological Health Handbook and ORNL/RISC-45.6

Melaragni, Alyssa  
*Physics and Applied Physics*  
**STUDY OF BLACK HOLE BINARY SYSTEM IN A STARBUSRT GALAXY**  
(Advisor: Silas Laycock)

Young starburst galaxies provide a laboratory to explore the most extreme massive stars and their relics. A starburst galaxy is a galaxy which is in the process of a high rate of star formation in comparison to the typical star formation rate observed in most galaxies. These objects dominate galactic evolution, the processes of their lives and deaths create all the elements heavier than hydrogen, and yet they are extremely rare in our own galaxy at the present day. An X-Ray eclipse profile was constructed for the most massive black hole binary, the X-1 system, in the starburst galaxy IC 10. The companion star is a Wolf-Rayet type star, its diameter was determined, and models for the accretion X-Ray emission
mechanism (the process by which material collects and causes the emission of X-rays) were tested. Wolf-Rayet stars are hot, massive stars which rapidly lose mass by means of a strong stellar wind. The Chandra Observatory provided data, which included ten observations ranging from 2003 to 2010. Using this data and the radial velocity (velocity along the line of sight toward or away from an observer) curve, the hardness ratio, or spectral slope, was determined.

College of Fine Arts, Humanities and Social Sciences

Auld, Abby
Art
inFHLuence PROFESSIONAL FIELD HOCKEY LEAGUE
(Advisor: Karen Roehr)

As a kid, we all had someone to marvel over and idolize. What grinds my gears is that as a tom-boy growing up loving sports, all of my supposed idols and heroes were men – people I couldn’t associate myself with. I grew up in a world believing that I couldn’t be successful in the thing I loved most, unless I was a boy. I want to create a league where there can be female heroes and role models for kids like me who love sports. WE need more female athlete role models. This is more than just sports – This is life, and I want to be the inFHLuence.

Fiodorova, Olesea
Art
WEDDING TRADITIONS & RITUALS IN DIFFERENT CULTURES —WATERCOLOR ILLUSTRATIONS
(Faculty Advisor: Karen Roehr)
I’ve discovered for myself that we as human beings have amazing abilities to celebrate the occasions that we give so much importance in our life, something not many of us are aware of. For this reason I have illustrated common scenes from traditional (and ancient) weddings of 12 ethnic groups which demonstrate some of the most curious and unusual rituals and traditions many of us have ever heard of.

Lam, Na
Art
TASTY TALES—FAIRY TALES ILLUSTRATED IN FROSTING
(Faculty Advisor: Karen Roehr)

My favorite pastime was hearing my grandmother telling me folktales right before I went to sleep. My Senior Studio Project is a series of Illustrations based on 13 known fairytales. The fairytales are chosen from a book called “Best-Loved Folktales of the World” selected by Joanna Cole. I am using cake and frosting because I loved the idea of the vanishing just like how a story is told. A cake will never be made
the same way twice. Just like how a fairytale is told and retold differently each time. In the end the cakes will become a series of “Edible Illustrations.” There will be 13 Fairytale Illustrations as the end product.

Waegelein, Alicia  
_Art_  
**TAKE A STAND**  
(Faculty Advisor: Karen Roehr)

Bullying in school, out of school, work, relationships, and in families has become an epidemic in today’s society. I chose to do an advertising campaign about the physical and mental abuse of youth as a result of bullying. We need to continue to keep this issue in the media, while teaching our children that it is not ok to hurt another person in any way. We need to take a stand against bullying before it escalates and more lives are damaged and lost. “One life lost in this senseless way is tragic. Four lives lost is a crisis.”

Keefe, Katelyn  
_Criminal Justice_  
**INVESTIGATION OF BACTERIAL ANTIMICROBIAL RESISTANCES**  
(Advisor: Guixin He)

Antibiotic resistance is an issue of great importance, as infections with antibiotic-resistant bacteria generally result in longer hospital stays and increased mortality of infected patients. Antimicrobial agents are frequently used in hospital and household settings as a common means of decontamination, and are currently suspected to play a significant role in inducing bacterial antibiotic resistances. The aim of this study is to research the occurrence of antibiotic resistant bacteria in environment and to understand their antimicrobial resistance mechanisms. Our investigation began with the collection of 67 isolates from environment and a subsequent investigation into the various antimicrobial resistances these organisms possessed. All collected isolates were cultured on properly agar for pure isolates and identified via standard biochemical procedures. Our results showed varying levels of resistances to both synthetic antimicrobial agents and antibiotics, with some isolates exhibiting resistance to multiple antibiotics. While we feel that these results indicate a possible relationship between the widespread use of disinfectants and the rise of antibiotic resistances, as well as highlight the possible future need of novel disinfectant/antibiotic methods and therapies, more research is still needed to understand their resistance mechanisms.

Ouellet, Tyler  
_Economics_  
**TURBULENCE IN THE LABOR MARKET: DATA AND THEORY**  
(Advisor: Tommaso Tempesti)

In this presentation I will investigate changes in individual’s occupations and labor force participation over time. This will be looked at as investigating how individuals moved in, out and between occupations and industries and the importance of measuring this accurately. This paper will also develop a methodology based on past research on how to measure a “true change” in occupation. A main difference between this and past research in the area of occupational switching is the use of the Survey of Income and Program Participation can be a useful tool in measuring how individuals move between occupations. It will be described the advantages of using this data over past data sets and a “proof of concept” that this data set has the capability of tracking individuals occupational history over time accurately.
Sister Sisters
Economics
PASSION FOR FASHION BY S.I.S.T.E.R.S.
(Advisor: Constanza Cabello)

Official since Fall 2010, S.I.S.T.E.R.S. serves as a voice for women and men on campus. We are committed to helping members achieve success in multiple aspects of life. This includes: encouraging professional, academic and personal development, whilst providing members with the opportunities to achieve. We are also involved in community outreach, and provide regular volunteer opportunities. S.I.S.T.E.R.S. holds weekly meetings on various topics. These topics include, but are not limited to: academic and professional issues, dynamics affecting women on campus, relationships, and character-building. In addition, S.I.S.T.E.R.S. hosts professional workshops on topics such as resume building and public speaking. For the symposium we will be showcasing one of our signature events/community service project called passion for fashion. This event is a clothing, shoe and jewelry swap for faculty members and students featuring a business casual and business formal fashion show. The remaining clothes from the event which filled up about four large trash bags were donated to the Lowell Wish Project.

Anthony, Ashley
English
CAUTION: SLIPPERY WORDS AND LOOSE MORALS: THE EFFECT OF NARRATIVE IN TWAIN
(Advisor: Melissa Pennell)
A well written narrative is not simply a means for aesthetic pleasure. Rather, there are epistemological benefits within an engaging account. In other words, there is knowledge contained in the narrative beyond the value of aesthetics. Narratives allow the writer to use imagery and symbolism to portray a greater human experience. Such an experience helps to develop a coherent sense of identity. Thus, the reader is better able to empathize with the writer’s conflict. First published in England in 1884, Mark Twain’s Adventures of Huckleberry Finn is an embodiment of the search for freedom. Though written post-Civil War, the novel is set in the antebellum American South. This setting allows Twain to examine the customs of the Old South and thus highlight the ethical conflict between manners and morals. Very much in the tradition of the Bildungsroman, Huck Finn focuses on the psychological and moral growth of the protagonist. The structure of the narrative, which is centered on a journey, allows the reader to encounter myriad personalities who mirror American society as a whole. Through a close reading of Mark Twain’s novel Adventures of Huckleberry Finn; I argue that the reader’s engagement with a narrative ultimately increases the inherent meaning and structure. This paper examines Twain’s use of language to draw attention to the discrepancies between societal mores and practices of the American Old South. This paper further discusses Twain’s conflict with the notion of policing the morals of others in terms of who has the authority to create such policies and who has the authority to enforce such policies.

Boudreaux, Robert
English
FEMININITY IN WILLIAM FAULKNER'S AS I LAY DYING
(Advisor: Bridget Marshall)
The role of female power in literature has long been disputed. The feminist is quick to point out the subservient roles to which women in literature are assigned, how they enforce the patriarchy of society. William Faulkner's southern tale As I Lay Dying is both no exception and every exception to this rule. The main female protagonist, Addie Bundren, is dead for most of the novel, but her part in it is perhaps the most important of all the characters. By examining what I am calling “femininity,” I aim to decode the character of Addie within the patriarchal norms Faulkner seems to be portraying. This paper draws on
well-known feminists like Simone DeBeauvoir, as well as some smaller pieces on the feminism of the novel in an attempt to show just how Addie may well be the driving force behind the novel, while simultaneously submitting to every imaginable form of patriarchal pressure.

Estabrook, Michael
English
THE UNKNOWN GARDEN OF CONNECTION IN VIRGINIA WOOLF’S "MRS. DALLOWAY"
(Advisor: Todd Avery)

"The Unknown Garden of Connection in Virginia Woolf's Mrs. Dalloway investigates the theme of connection in relation to the characters' memories, spirits, and words. Spoken words in Woolf's novel fail to connect the characters. Connection in Mrs. Dalloway, instead, grows only through sense memories and spiritual bonds. I first discuss the divergence of conversation and connection in Mrs. Dalloway. The emptiness and sparsity of the novel's dialogue as well as the characters' weak recall of past conversations prove this divergence. Wordless sense memories, on the other hand, establish an elaborate foundation of meaningful connections in Woolf's novel. Woolf's characters connect to each other by remembering their shared sensory experiences, not the words spoken between them. The characters' reliance on connection through sense memories allows them to remain connected because memory transcends time and space. Additionally, the spiritual bonds in Mrs. Dalloway supplement the temporal and spatial transcendence of connection through memory. Unlike how memory connects characters to specific people and places within their lives, the spiritual connections throughout Woolf's novel connect the characters to everyone and everything in both life and death. Woolf navigates through her characters' memories and spirits to create a world of eternal, universal connection within Mrs. Dalloway.

McGilvray, Amanda
English
EQUALITY: SHAKESPEARE THE FEMINIST
(Advisor: Jeannie Judge)

Female characters in Shakespeare’s plays have long been overlooked as secondary to the more powerful, title-bearing male counterparts. However, I intend to look at several female Shakespearean characters in a new light of feminist positivity. I will attempt to show that their depth of character and realistic qualities and behavior are proof of Shakespeare’s own, if only mild, feminist beliefs for his time. I will use the plays of ‘Twelfth Night’, ‘Romeo and Juliet’, ‘Othello’, ‘Macbeth’, and ‘The Winter’s Tale.’ My research will show that Shakespeare created female characters that helped to dismiss the misogynistic outlooks of the male-driven culture of the English Renaissance and spoke in the true feminist voice: equality.

Relf, Brittni
English
MARY ANNING: A REMARKABLE WOMAN HIDDEN IN A WORLD OF MEN
(Advisor: Jeannie Judge)

Tracy Chavlier’s novel, Remarkable Creatures, introduces readers to the figure of Mary Anning. Struck by lightning as a baby, Mary continues to amaze as an adult. She has a great talent for discovering rare fossils. As the novel progresses Mary uncovers new amazing animals along the shore of Lyme Regis. The most remarkable part of the novel is that Mary Anning is not a fictional character. Born in 1799, the real Mary Anning made numerous discoveries and advances in geology and the new scientific field of paleontology. Some of the most notable geologists of the time (all men) depended on Mary’s knowledge of fossils and her discoveries in their own research. Her fossils provided evidence for the then developing
idea of extinction. And yet, history has largely forgotten her name. This research will look into just how significant Mary’s impact to the masculine world of science was and how her contributions were swept under the rug. In doing so I will also look at how the novel Remarkable Creatures looks at Mary’s relationship with another fossil collector, Elizabeth Philpot who voices the questions that Mary’s discoveries brought to the scientific and religious worlds.

Castano, Jennifer
History
THE PANAMA CANAL AS A U.S ENTERPRISE
(Advisor: Lisa Edwards)

In 1904, the United States embarked on the extensive project of building one of Latin America’s richest and grandest enterprises. Ten years, $327 million dollars and 5,600 lost lives later, the greatest engineering marvel that represented America’s world power was completed: the Panama Canal. [1]This icon of American imperialism had innumerable economic and political advantages for the United States by cutting the cost of ocean transport and permitting the U.S. to dominate both the Atlantic and Pacific Oceans. Less than a century later, however, the canal was fully returned to the republic of Panama. Militarily and strategically, Panama’s geographic location yielded to the United States ever-growing world power. Economically, however, was the Canal worth the investment? Despite costing twice its initial projections and representing the single most expensive construction project in United States history of that time, the American imperial influence on Panama represents an economic and strategic success as a U.S enterprise. [1] Noel Maurer and Carlos Yu, The Big Ditch: How America Took, Built, Ran, and Ultimately Gave Away the Panama Canal (Princeton, N.J.: Princeton University Press, 2011), 98.

Pike, Sarah, Rebecca Walsh, Deborah Paul, Kevin Copson
Liberal Arts
LOWELL IMMERSION 2012
(Advisor: Linda Barrington)

Lowell Immersion is a weeklong service experience facilitated through the Alternative Spring Break Service Club. Participants spend all of spring break serving the Lowell community and reflecting on their experiences to better understand the community and their role within it. This year our group assisted in signing people up for free home energy efficiency assessments, data collection for a community needs assessment, renovations at United Teen Equality Center and Pawtucket Congregational Church, and prepared meals for terminally ill individuals. We also explored Lowell by having a meeting with local neighborhood leaders, visiting the Lowell Textile History Museum, creating low budget meals while shopping at local grocers, taking a tour of green roof architecture downtown and tasting cultural cuisine throughout the week.

Piepiora, LeAnne
Music
MEISA’S COMMUNITY INVOLVEMENT
(Advisor: Alan Williams)

I would be presenting on behalf of the Music and Entertainment Industry Student Association (MEISA), of which I am President. On display would be information about the different events and activities the organization has put on throughout the community this year. These events include Mothers of Rock Benefit Concert for Girls, Inc. of Lowell, The Sound Gallery, Somalia Famine Relief Benefit, Manatee Conservation Benefit Dance party, booking at Lowell's Annual Winter Festival, teaching music to the girls at Girls, Inc. and several more.
Steere, Peter  
*Philosophy*  
**REFORMATION OF STUDENT'S ATTITUDES**  
(Advisor: John Kaag)  

This thesis discusses student’s attitudes towards education. Drawing upon philosophical ideas of Immanuel Kant, Plato, and Alfred North Whitehead my thesis proposes a reflection take place regarding the way students are educated. Educators in America often find themselves in a system full of hardships which overshadow the student body leading to a lack of attention, a hopeless outlook and debilitating stigmas for students and teachers alike. It has become a cliché, to most students, that school is no fun and a necessary evil. This idea has been so engrained in society that actions to fix it have lost their focus. My paper addresses the need to improve education. It can be done by tending to the most important part of any educational system: the student. Producing interested, engaged and excited students is the purpose of this thesis. My analysis begins with Kant’s notion of enlightenment and his acknowledgment of our disadvantageous immaturity. Plato’s ideas of living a reflective, moral life then help to guide the freedom we gain through enlightenment. Whitehead’s work helps to modernize the ideas and warns against a lackluster teaching style. Bringing these philosophical concepts together is the beginning. Modernization of the concepts needs to occur constantly in order to educate each unique group of students efficiently. My argument exposes the true problem in education systems today, brings up to date pertinent philosophical concepts, and suggests a common goal that together students and teacher can work towards.

Delice, Eunice  
*Political Science*  
**VOICES OF HAITIAN COLLEGE STUDENTS: STUDENT LEADERSHIP DEVELOPMENT AND THE PLIGHT OF CIVIC ENGAGEMENT**  
(Advisor: Paula Rayman)  

The need for educated Haitian college students is growing in the political arena in Haiti. Student leadership development both in the curriculum and extracurricular activities is necessary for this goal to be satisfied. This thesis addresses the relationship of student leadership development on the level of college student civic engagement and how this may contribute to the mission of a sustainable democracy in Haiti. The research undertaken as part of this thesis investigates the state of educational programs of college-aged youth with an emphasis on extracurricular activities as a catalyst for promoting the social responsibility of Haitian youth. The interest driving this study was to understand the value placed on leadership and civic engagement by student leaders and administrators. For the youth involved, in this study, leadership was an integral part of who they are and what they bring to the conversation. This research will hopefully play a policy role by identifying barriers to civic engagement by many college students and assisting University administrators and government officials alike to adequately address student leadership values. I am a graduate student in the Economic and Social Development of Regions Program.

Schaefer, Mikhaila  
*Political Science*  
**INTERNATIONAL RELATIONS AND THE IRON CORE: NEWSPAPERS, MEDIA FREEDOM AND CORRUPTION**  
(Advisor: Jenifer WhittenWoodring)  

International organizations and Western democracies advocate for media freedom in developing and nondemocratic countries. Likewise, efforts continue to extend and improve communications technology to facilitate the use of new media in these same states. The rationale is that both media freedom and new media will promote democracy and prevent corruption by making it easier for people to hold government
accountable. At the same time, in many Western democracies, the growth of new media is coming at the cost of traditional media. Some argue this is threatening the “iron core” of journalism, thereby making it difficult for news media in these countries to perform their watchdog role and provide citizens with the information they need to make decisions in a democratic society. Thus, Western democracies and organizations like the World Bank and the United Nations are seeking to nurture the iron core of journalism in developing countries at the same time that this iron core is threatened in many developed democracies. Indeed, while newspaper circulation has plummeted in the U.S. and Western Europe, it is on the rise in India and much of Africa. This study focuses on the effects that changes in the newspaper industry and media freedom have on perceptions of corruption in developing and developed countries. In this preliminary study we find that, contrary to previous studies, newspaper availability and media freedom are associated with increased perceived corruption.

**Cole, Danielle, Isabel Cano, Cory Cascalheira**

*Psychology*

**HOW IMMIGRANT CHILDREN MAKE SENSE OF THEIR EXPERIENCES**

(Advisor: Jana Sladkova)

This project attempts to understand the ways in which children of immigrants and refugees make sense of their personal experiences. Personal narrative is widely understood as the way in which individuals make sense of their experiences. The ability to tell a personal narrative grows considerably between the ages of four and ten. For this reason, we will be interviewing children between the ages of four and nine. Lowell, MA has long been a destination city of immigrants and refugees, with twice the national rate (25%) of its population being foreign-born. We are investigating the narratives of members of the second largest and fastest-growing immigrant group in Lowell: Latino. Hispanic populations grew the fastest of all ethnic/racial groups according to the recent census and have a growth rate between 2000 and 2010 at about 43%. This project focuses on the narratives of children of Spanish-speaking immigrants who face challenges that can include language barriers, racial discrimination, obstacles due to status and many others. This study poses four main questions. How are immigrant issues present in individual personal narratives of children of immigrants? How does the child understand his/her experiences? What are the structures of the children's narratives as they relate to their early literacy and language development? How does the child make sense of his/her position at home, in day care, and in their wider neighborhood?

**Diaz, Janelle**

*Psychology*

**STRESS AND COLLEGE STUDENTS**

(Advisor: Doreen Arcus)

College students are highly prone to stress related to academic achievement, interpersonal relationships, finances, and adjustment (Ross, Niebling, & Heckert, 1999). Sleep has also been found to be reduced in quality and quantity among college students and associated with stress levels and impaired physical health (Lund, Reider, Whiting, & Prichard, 2009). In order to cope with these stressors students often seek support from their parents (Kenny, 1986). For students who are young adults in, or recently emancipated from, foster care, these stressors are exacerbated and they must face them without that source of parental support (Courtney & Dworsky, 2005). Moreover, there is evidence that sleep disturbances persist into adulthood for individuals with childhood trauma histories (Babson & Feldner, 2010; Noll, Trickett, Susman, & Putnam, 2006. This may further compromise sleep in this group of students as well as their capacity to cope with stress. Students who are trying to obtain a college education with insufficient assets are prime candidates for stress and failure, which may contribute to the fact that only three percent of youth in foster care complete a bachelor’s degree program (Emerson 2007). Empirical research in this area, however, is sorely lacking. The current study examines stressors, sleep, and coping strategies in the lives of college students in foster care compared with peers not in care through quantitative and
Hansen, Sophie, Molly Caslin, Erin Keeney  
*Psychology*  
**UNDERGRADUATE MAJORS & ATTITUDES**  
(Advisor: Mary Duell)

As undergraduate students set out to choose their intended majors at the beginning of their academic careers, it seems that students have different goals. At the University of Massachusetts, Lowell, there is a clear segregation between academic majors, with majors from different colleges being housed on either North or South Campus. The primary aim of this study was to assess whether this kind of academic segregation might be related to lack of tolerance or acceptance of students whose majors are different from their own and housed on a different campus. We used a modified version of the Bogardus Social Distance Scale (1933) to determine the extent to which students whose majors are housed on North Campus are accepting of students whose majors are housed on South Campus and vice versa. North Campus is home to the so-called “hard sciences” while South Campus is home to arts, humanities and social sciences. A secondary goal of this research focused on whether students would rate their own campuses higher in terms of attractiveness, friendliness, course difficulty and teacher quality. While there were no data found to support students rating their own campuses higher, data did show that North campus major rated South campus majors lower on a social distance scale in terms of academic equality and leadership.

Hondros-McCarthy, Ianna  
*Psychology*  
**SENIORS COUNT**  
(Advisor: Andrew Hostetler)

Although the city of Lowell is home to over 14,000 seniors (defined as adults 60 and over), community organizations, including the Lowell Senior Center know surprisingly little about the strengths, resources, needs, and goals of this population. Accordingly, the Lowell Seniors Count was initiated to get a clearer picture of this population through a comprehensive needs and well-being assessment adapted from a similar study done in Boston approximately decade ago. Over the period of June 2008 to August 2011, over 300 volunteers, including UML service-learning students, were trained as community researchers. Then, based on registration rolls for voters 60 and over (over 13,000), they went door to door throughout the city, delivering approximately 8,000 resource bags and conducting approximately 1,900 structured interviews. Interview respondents answered questions related to their living and financial arrangements, health and well-being, and social and community activities. The proposed paper will report on some of the basic descriptive findings from these interviews, focusing on those findings related to social and community involvement, and will supplement this quantitative data with qualitative data from life-history interviews with mature adults from a related study. Although I was not involved with data collection for Seniors Count, I did participate in data entry and analysis, and I conducted several of the life-history interviews. Previous research suggests that social support and community involvement are strong predictors of overall health and well-being among seniors and findings from this study will hopefully add to the growing body of research on this topic, inform future research, and help Lowell-area community organizations to identify and build on the strengths of local seniors, while also providing needed resources.
Recently in Lowell a local Iraqi restaurant, Babylon, held an event to raise awareness about a hate crime that occurred earlier that month. Issue Campaigning involves events like this one that help to bring communities together in support of the issue at hand. How that process works is critical to understanding how to successfully reach the community. In an effort to better understand grass-roots organizing, this presentation explores two questions in an archival analyses of a local non-profit organization, One Lowell, to examine ways in which campaigning impacts community based organizations. Archival analysis included newspaper articles, organizational meeting minutes, maps of Lowell, and strategic plans. The first research question focused on the process of community organizing and attempted to develop a flowchart for other organizations to follow when working on issue campaigns. Results suggested that the process of community organizing consisted of five main steps: identifying a need, making a plan, involving allies/volunteers, taking action, and reviewing the strategy used. The second research question focused on ways that campaigns benefited from community participation. These benefits included support, skills, time, and access to more people and resources that the organizations did not already have. Generally, results of this archival analysis indicate that community members play a critical role in the process of issue campaigns. Based on these results the process of issue campaigning in regard to the participation of the community members should be examined further. To expand upon this study’s findings, future studies should continue to interview key members of the organization and more deeply examine archival data to better understand issue campaigning and community participation in such campaigning.

Interest in the effects and usefulness of music for those with autism spectrum disorders (ASD) is growing rapidly. This study aimed to examine musical preferences among adolescents and young adults with ASD. Twenty-five participants with ASD and 43 participants in a comparison group matched for age took part in the study. Participants initially reported how long they spent listening to music each day, and their favorite genre of music. Participants then listened to 8 song clips which had been selected from a pilot study to represent the different levels of arousal and valence (high or low arousal, positive or negative valence). Participants rated the songs on a 7-point Likert scale for how familiar each song was and how much they liked each song. The findings showed that those with ASD were remarkably similar to the control group in the amount of time they spent listening to music. They also showed similarities in musical preferences, although no participants with ASD endorsed “pop” music as their favorite genre. No significant differences were found between groups for how familiar they were with the songs played in the study. Those with ASD liked highly arousing negative songs significantly more than those in the control group. It is possible that those with ASD are more responsive to songs with greater arousal. Further, given the daily challenges faced by those with ASD perhaps they were more able to identify with the lyrics in the negative songs. These hypotheses will need to be examined in future work.
Lewis, Megan  
Psychology  
“THE EX-SMOKERS’ HALL OF FAME:” CELEBRATING THOSE WHO HAVE QUIT SMOKING AND EMPOWERING OTHERS TO QUIT  
(Advisor: Anne Mulvey)

Smoking is the number one cause of preventable death and disease in Massachusetts. More than 8,000 Massachusetts residents die each year from smoking. The nicotine in cigarettes makes it one of the most difficult addictions to beat. However, it IS possible to quit smoking and there are ways to make it easier. Using quit-smoking medicines or counseling support can help you quit. In fact, using support and medicines together can make you three times as likely to quit for good! Most smokers have to try a few times before they quit for good. UMass Lowell has collaborated with the Northeast Tobacco Free Community Partnership to bring the Ex-Smoker Hall of Fame, an initiative of the Massachusetts Department of Public Health to the university. The Hall of Fame celebrates the powerful stories of UMass Lowell faculty, staff and students who have successfully conquered their addiction to tobacco. Their personal quitting stories delve into why they quit, how they quit, and how quitting smoking has changed their lives. These powerful stories will inspire others to quit and encourage those trying to quit to not give up. Additionally, there will be information on the many resources available to help people quit smoking. The project came into effect when Megan Lewis, UMass Lowell graduate student in Community Social Psychology, began working with Diane Knight, Director of the Northeast Tobacco Free Community Partnership, as part of her practicum experience.

Long, Sokny  
Psychology  
REACH OUT RIVERHawks: COMMUNITY SERVICE WITH A PURPOSE  
(Advisor: Anne Mulvey)

Working with the Office of Student Activities and Leadership has provided me great opportunity to expand on the new university’s message “Learning with Purpose”. This message had the vision of having UMass Lowell student be “Work Ready, Life Ready, World Ready”. One goal of the practicum is to meet this new vision by creating a connection between the students, the university and the community. As part of my practicum work, my role was to create monthly volunteer service opportunities to UMass Lowell students through a program known as Reach Out Riverhawks. Reach Out Riverhawks is an outreach program that works with student clubs and local community organizations in understand the needs of the community. Community and civic engagement is an important part of building educational excellence, a sense of community, networking, hands-on learning as well as empowerment and leadership. Through this experience I have gained a better understanding of working in various diverse community organizations. Each community organizations have its own unique needs and participating in service activities will give me the opportunity to learn more about their mission, needs and how students at UMass Lowell can assist and be a resource. Throughout this fieldwork, I have gained experiences in leadership skills and professionalism.

Mason, Nicole  
Psychology  
EFFECTIVE COMMUNICATION BETWEEN SCHOOL PROFESSIONALS AND PARENTS OF CHILDREN WITH DISABILITIES  
(Advisor: Doreen Arcus)

Children with disabilities such as ADHD, learning disabilities, or autism, receive special education and related services as indicated by an individual plan that is developed by a multidisciplinary team. Typically teams include parents, regular and special education teachers, the school psychologist, and an
Cohesive teams in which parents feel confident and perceive partnership serves children’s best interests. Both parents and school staff agree that team cohesion and parent confidence are enhanced by effective channels of communication (Stoner, Angell, House, & Block, 2007; Spann, Kohler, & Soenksen, 2003; Williams, 2011). However, cohesion may suffer when communications from team members address children’s weaknesses or points of disagreement, and are perceived as negative by the parent. Not all parents may respond similarly. Perceptions may vary by personality dimensions that have been associated with communication preferences in other settings (Choi, Deek & Im, 2009; Clack, Allen, Cooper & Head, 2004; Duberstein, Meldrum, Fiscella, Shields & Epstein, 2007; Zake & Wendt, 1991).

The current study examines communication approaches for their perceived effectiveness and association with parental personality factors. Parents of children with disabilities rate the effectiveness of messages that vary the order in which student strengths and weaknesses are presented using hypothetical school psychologist reports. They also complete a brief personality survey. Data collection is ongoing; therefore, preliminary results will be presented. Implications and future directions will also be addressed.

McDonald, Michael
Psychology
PERCEPTION: ATTITUDES AND BELIEFS ABOUT THE LGBT COMMUNITY
(Advisor: Mary Duell)

One dimension along which students at college and university campuses vary is sexual orientation. The recent suicide of a gay student at Rutgers University, who was harassed because of his sexual orientation, underscores the need for research to better understand the extent to which anti-gay sentiment exists on college campuses. Our study, which involved an internet survey of over 500 UMass Lowell students, employed measures of social distance to explore the degree to which members of the heterosexual community at UMass Lowell accept their lesbian, gay, bisexual, and transgendered (LGBT) peers as well as the perceptions of the LGBT community regarding the way in which they perceive themselves to be viewed by heterosexuals on campus. Additionally, we included measures of self-esteem and anxiety to probe possible relationships with stated attitudes regarding acceptance of LGBT individuals for both groups. Results are considered in the context of identifying potential areas of concern with respect to Heterosexual/LGBT relations at the university.

McDuffie, Andria
Psychology
COMMITMENT AND ACCOUNTABILITY – HOW THESE “SUPER ORDINATE” VALUES OUTLINE SUCCESSFUL PRACTICUM SITES
(Advisor: Anne Mulvey)

When I first arrived at my practicum site at the International and Multicultural Center at Middlesex Community College, I was baffled by the pre-existing commitment of the students to individual club activities. Every culture was represented with huge numbers except for the African Cultural Club. Being of African descent, I did feel somewhat responsible to use my knowledge and skills to increase the membership and representation of African Students in the club. What compelled me were the principles of commitment and accountability when called to a cause of action (Nelson & Prilleltensky, 2010). I made the time before and in between my own school semester beginning as well as work to rally hard at club fairs, open houses, and orientations engaging students to participate in this revived African Cultural Club. I knew from my community psychology courses that I had this commitment and accountability to others, community, and the profession instilled. I was unsure, however, how to transfer these values onto the students I just recruited. One of the first tasks Nelson and Prilleltensky (2010) suggest is to “engage stakeholders in dialogue about ways to balance personal, relational and collective well-being” (Nelson & Prilleltensky, p. 136, 2010). Reviewing the steps, I followed the suggested tasks loosely at the beginning of the year by holding a meeting with all the students discussing where they would like to see the club go
in the next year, and how I could be a resource to get them to that point. From that meeting I discovered that a lot of students felt connected personally to the continent and we vowed to highlight that connection in every activity we did. Towards the end of the year, we have raised 500+ books for children and adults in refugee camps in Africa, designed and sewed pillow case dresses for girls in Haiti, celebrated Black Heritage through a drumming workshop, and much more fun, educational activities that helped us all learn and feel more connected to African culture.

McSheehy, Maria, Alyssa MacInnis, Amy Macdonald
Psychology
CROCHETING THE WAY TO MATH EQUALITY: THE EFFECTS OF TEACHING STYLE ON MATH PERFORMANCE
(Advisor: Nellie Tran)

The current study focuses on understanding the ways that women learn best within the mathematics field. Science, technology, engineering, and math fields (STEM) have always been dominated by men. In recent years, the number of women entering these fields has increased dramatically, yet the number of women receiving bachelor degrees in many of these fields is still as low as 20 percent (Hill, Corbett, & St. Rose, 2010). This problem may be due to traditional teaching styles that do not meet the needs of the women’s mind. Sanchez and Wiley (2010) showed that women have trouble learning without visuals. This study tested whether women showed higher math performance when taught visually as compared to women taught in a more traditional non-visual technique. Additionally, women are expected to show higher math performance when taught a visual and hands-on approach compared to women only taught visually. Study limitations and future directions will also be included in the presentation.

Power, Shauna
Psychology
EATING DISORDERS AND IDENTITY
(Advisor: Allyssa McCabe)

There is significant research on the subject of eating disorders, implementing multiple perspectives in approaching the topic, along with numerous studies and data reported to support these theories. Within this range, there are many topics covered, but one in particular that is often overlooked is the possible relationship eating disorders hold with identity; an aspect of eating disorders that I think is essential to understand. Such work would provide insight on the possible psychological implications that an eating disorder can have on an individual and their concept of who they are. For this reason, I have chosen to focus my honors thesis on this topic. My thesis is designed to examine the relationship between identity and eating disorders, and how this relationship can often be detrimental to the individual. In order to examine this relationship, I am conducting a qualitative analysis of narratives written by adolescent girls with eating disorders. Each narrative has been placed into a category of ‘identification style’ based on the way an individual views their eating disorder. There are a total of four categories: no ID, positive ID, negative ID, and torn ID. Based on these classifications, I am analyzing the way that these subjects talk about their eating disorder, in an attempt to draw connections between the identification styles of eating disorders, narrative style, and other psychological themes. It is my hypothesis that the potential connections between these variables could provide insight into how eating disorders operate as a form of identity.
Sanchez, Cassandra  
*Psychology*  
**WHAT DO WOMEN REALLY WANT? A STUDY ON THE EFFECTS OF AGE & INCOME ON ATTRACTION**  
(Advisor: Nellie Tran)  

On television we often see young, beautiful women on the arms of old, wealthy men. This vision makes many people wonder what these women are truly attracted to. This experimental study tests the relationship of age and income on interpersonal attraction. Prior research indicates that people are likely to choose partners who are similar in age to themselves (Singh, Ng, Ong, & Lin, 2008). Research has also shown that high income leads to greater levels of attraction. Specifically, this 2 (age 18-22 or 30-34) x 2 (income 150,000-155,000 or 30,000-35,000), between subjects experimental study tested whether the presence of wealth and age similarity increases women’s report of attraction. This study included 76 UMass Lowell women between the ages of 18-24. Participants viewed PowerPoint slides with pictures of men. Each slide included a photograph and short description with the man’s income, age, and a couple interests. Participants rated attraction to the man in the photo on a five-point Likert scale, 1 being very unlikely to 5 being very likely. Participants also indicated how likely they would be to set up a friend or relative with the man. An ANOVA revealed a significant effect of age on attractiveness ratings as the hypothesis suggested. Contrary to common knowledge and the study hypothesis, income level did not affect attractiveness ratings. Finally, no interaction between age and income level was found on attractiveness ratings. Improvement of the stimuli as well as the rating scale could yield stronger results. The presentation will include implications and future directions for this study.

Sellars, Althea May, Alice Frye  
*Psychology*  
**THE UMASS LOWELL HEALTH EDUCATION NEEDS AND RISK ASSESSMENT**  
(Advisor: Mary Duell)  

In order to found a Peer Health Advocacy program, exploratory research needed to be conducted to determine on which subject areas the program should focus. Adapted from the CDC Youth Risk Behavior Survey, a questionnaire was created to assess these needs. The UMass Lowell Health Education Needs and Risk Assessment examines incoming health education levels, smoking behaviors, sleep, mental health issues, disordered eating, drug perceptions, and sexual health behaviors. We examined frequencies of various problem behaviors and relationships of those behaviors to demographic variables such as age and ethnicity. The data collected from this study will then be applied to pilot a future peer-based health education program.

Shepherd, Justin, Theresa Nguyen, Alexa Queenan, Sokontheari Soun  
*Psychology*  
**THE WEIGHT OF COMPLIANCE: A TEST OF TWO THEORIES OF COMPLIANCE**  
(Advisor: Nellie Tran)  

This study compares and contrasts the effectiveness of Foot-in-the-Door (FITD) and Door-in-the-Face (DITF) techniques with regards to an embarrassing task (i.e., use of a Shake Weight). This study had three conditions: FITD, DITF, and a target request only condition (use of the shake weight for one minute). FITD suggests that compared to merely asking a target request, individuals are more likely to comply if the requester first makes a request of a smaller magnitude. The DITF technique suggests that as compared to merely making a target request, individuals are more likely to comply when the requester first makes a request that is substantially higher in magnitude. This study included a convenience sample recruited randomly in UMass Lowell public and open spaces. Preliminary data shows that the DITF technique is most effective in gaining compliance. While FITD was less effective than DITF, it succeeded
in gaining greater compliance than the target request only condition. Further advances and limitations of this study will also be presented.

Iversen, Analissa  
*Sociology*  
**AMERICAN IDOL AND AMERICAN INDIVIDUALISM**  
(Advisor: Mignon Duffy)

American individualism as a political and social ideal is often linked to notions of the American Dream, including narratives of the self-made man such as Horatio Alger. In this collaborative project, Dr. Mignon Duffy, Associate Professor of Sociology at the University of Massachusetts Lowell, and myself, Analissa Iversen, undergraduate sociology student also of UMass Lowell, explore the pop culture phenomenon “American Idol” as a modern day representation of the American Dream. “American Idol” is the most watched show on American television, and represents a major cultural artifact of our generation. Data is drawn primarily from contestant profiles on the “American Idol” website.

Kim, Cheryl  
*Sociology*  
**STUDENTS HELP UML BECOME CARBON NEUTRAL**  
(Advisor: Charlotte Ryan)

The University of Massachusetts Lowell joins 675 universities as a signatory of the American College & University Presidents' Climate Commitment. Each promises to be carbon neutral by a designated date and for UMass Lowell this is 2050. I reviewed the Climate Action Plan for UMass Lowell and compared it to the climate action plans of other universities. I provide that comparison highlighting what students can do to help the University achieve its commitment to become carbon neutral by 2050.

Kim, Cheryl  
*Sociology*  
**SUSTAINABLE ENERGY AND RECYCLING**  
(Advisor: Charlotte Ryan)

The University of Massachusetts Lowell joins 675 universities as a signatory of the American College & University Presidents' Climate Commitment. Each promises to be carbon neutral by a designated date and for UMass Lowell this is 2050. I reviewed the Climate Action Plan for UMass Lowell and compared it to the climate action plans of other universities. I provide that comparison highlighting what students can do to help the University achieve its commitment to become carbon neutral by 2050.
Campusano, Yahaira  
*Education*  
**AMERICORPS JUMPSTART**  
(Advisor: Leslie Randall)  
For nineteen years, Jumpstart has served approximately 100,000 children from low-income neighborhoods across the country. Through training 25,000 college students and volunteers, Jumpstart has thrived in the early education effort. Because of the education crisis in America, Jumpstart takes pride in early detection. Without this, nearly half of America's children begin school up to two years behind their peers. Early prevention helps keep dropout rates low and increases the quality of education. With the help of Jumpstart, early detection and prevention in the early education crisis not only helps our children succeed in all areas of life, but also enhances the quality of the generations to come.

Ford, Maryann, Lindsay Tucker  
*Education*  
**A QUALITATIVE LOOK AT TEEN SextING**  
(Advisor: Judith Davidson)

UMass Lowell is at the forefront of research on the current issue of teen sexting. In a team led by Dr. Andy Harris and Dr. Judy Davidson, a research group has spent the year examining this issue. Components of the research included background information, data coding, and interpretation of results. Researchers also conducted focus groups for local educators to add to the existing data. Lindsay Tucker and Maryann Ford, two Emerging Scholars in the Center for Women and Work, have spent the year as part of this team, and have learned much from the data and the process itself.

Judge, Karie  
*Accounting*  
**UNDERSTANDING RESEARCH CONCEPTS AND LITERATURE REVIEWS**  
(Advisor: George Joseph)

What is the goal for research? There are a wide range of disciplines that conduct research form different perspectives. Some can be classified as basic, whereas others are applied in nature. However, in general, research advances knowledge. There are therefore, some key aspects of research which are elaborated and illustrated in this project. First, the need to contribute to a body of knowledge and find research questions pertinent to the current field or environment, involves understanding the literature in the area, and investigating the issues that raise pertinent questions and lead to propositions that add to our understanding of the topic. This is then followed by developing methods that leads to conclusions on the research proposition and/or furthers our understanding of the issues highlighted. Pursuing this goal, we tackled two areas, one more closely linked to professions and the careers, and the other on segment reporting, which was of an academic nature. We first conducted literature reviews using databases.
including Proquest, ABI-INFORM, and Business Premier. The type of journals and the nature of articles differed significantly. The first consisted of practitioner articles, more easily readable and evidently more relevant for those entering the work place as professionals. The articles appeared important to keep updated on issues and knowledge about the profession from a variety of perspectives including content and ethical codes. The second category was primarily academic research articles of theoretical and empirical nature. The next item in the research flow was determining sources of data. Data for the first was available from online sources and from mailing the professional institutions for information and brochures. The second was more challenging. Fortunately, the Standard and Poors’ Capital IQ provides vast reservoirs of data on corporations, both local and global. This database contained financial, nonfinancial and other types of information on thousands of companies. Understanding how to access and use the databases itself involves a learning process. The database allows drill down access, which was used to collect segment information, both quantitative and qualitative. Being knowledgeable about this data, including the ability to download, and extract the data, is very important when conducting empirical research. Finally, another aspect of research considered was presenting the information using an accepted form, such as the Chicago Manual of Style or the American Psychology Association. The experience helped me appreciated how researchers needed to develop skills in multiple areas that made the research process interesting and challenging. These include understanding research concepts and literature reviews, being aware of the relevant journals in the field, using search engines effectively and identifying relevant articles in the area. Another skill is to be able to communicate the research through developing literature review and referencing sources. The research coop has helped me develop the basic ability to work with research databases in management and accounting and understand the need to adequately organize the vast research literature to support the research process.

Kakungulu, Isaac  
Accounting  
AUDITING FOR NONPROFIT ORGANIZATIONS IN MASSACHUSETTS  
(Advisor: Stefanie Tate)

Part of my research was to assist in the process of data collection, classification and analysis for a study that investigates which auditing firms are perceived to perform the highest quality audits by nonprofit organizations in Massachusetts. Based on a sample of 2000 nonprofit organizations, I collected data for 200 from this sample; the data was collected from the Massachusetts Attorney General's office, nonprofit organizations' websites and other online resources and input it into Predesigned Excel spreadsheets that were based on the different criteria considered suitable and relevant to this research by the authors of the study. The next stage of the research is to input the data into particular equations that would help perform a statistical analysis. The various ways in which Nonprofit organizations record and organize their financial statements presented a challenge as we had to properly classify each individual nonprofit so as to have uniformity of data.

Mitchell, Cynthia  
Accounting  
SAFE TRICK-OR-TREAT  
(Advisor: Mary Connelly)

This project was based on having all student leaders of the Office of Residence Life Omicron Delta Kappa, and Tau Sigma watch over the youths and infants that walked through the doors of the Sheehy and Concordia dorms. Specific tasks for these individuals were to take groups upon groups of children trick or treating around the dorms, lead the daring children through the haunted house, dress up appropriately for the holiday, provide candy, and provide games. Furthermore, we had fun little games that were easy for young children to win so that everyone could feel like a winner and leave with all the candy we could
give. Nevertheless, this project took an hour to decorate and cleanup to get everything prepared for the fun night.

**Mitchell, Cynthia, Kelly Walton**  
*Accounting*  
**MERRIMACK RIVER CLEAN UP**  
(Advisor: Mary Connelly)

Members of Omicron Delta Kappa, led by Rocky Morrison from the Clean River Project, spent the day cleaning up the Merrimack River. Teams boarded pontoon boats that were equipped with hand-made cranes and went to work. ODK members manned the cranes in order to pull large debris from the depths of the river. An astonishing amount of refuse was collected such as box springs, car parts, even parts to waste water treatment facilities, along with typical trash. What started as the intent to dedicate a couple hours to the littered river, turned into a couple hours cleaning just one fraction of the river bank and a day spent at the Merrimack. ODK diligently accumulated a remarkable three to four dozen trash bags of garbage that had once burdened the Merrimack River and its inhabitants.

**Mitchell, Cynthia, Abby Auld**  
*Accounting*  
**ODK'S HELPING HEARTS**  
(Advisor: Mary Connelly)

As the honors leadership society here at UMass Lowell, we had the pleasure of working with the ‘American Heart Association’ to give back to the community. On a cool October morning, dozens of students came together to help heart disease survivors unite and share their accomplishments. Our tasks involved setting up, distributing water/food, and most importantly cheering on the walkers! We were able to help the event considerably and let survivors enjoy and celebrate in a very proud moment.

**Borchers, Todd**  
*Management*  
**SPECIAL SPIRIT @ UML 2012**  
(Advisors: Joel McCarthy and James Kohl)

Special Spirit @ UML! is a project I created to give Special Olympic athletes the equality and equity of being able to play sports in a 'college-like' environment. The goal of this program is to have the teams have the main focus of the crowd and surrounding environment and be recognized for their efforts for the sport they put many hours of hard work in practice for. These athletes deserve the proper recognition for their efforts and should be able to perform for crowds as other athletic teams do. So, for the Special Spirit program, the athletes will have the full experience of a college or professional game. For example, the athletes will have colorful flyers advertising before the event, greeted with attractive posters and decorations for the game, announcer player introductions, special apparel to wear, cheerleaders, mascots, an exciting halftime show, and most importantly a packed gymnasium with fans just for them!
**School of Health and Environment**

**Aljohi, Hasan, Shawn Patterson, Elizabeth Kotyla**  
*Clinical Laboratory and Nutritional Sciences*  
**SIMULTANEOUS MEASUREMENT OF CAROTENOIDS, TOCOPHEROLS, AND RETINOL IN HUMAN SERUM USING C30 PRONTOSIL COLUMN BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY**  
(Advisor: Thomas Wilson)

High performance liquid chromatography (HPLC) utilizing a C18 300 x 4.6 mm column to separate and identify the various isomers of carotenoids from human serum (1). The HPLC method employed a new C30 ProntoSIL 250 x 4.6 mm column, at 22°C, a flow rate of 0.5 mL/min, and an injection volume of 30 µL with an 80 min running time was optimized for the determination of the various carotenoid isomers, tocopherols, and retinol simultaneously in human serum. A diode array, detector (DAD) was used to measure serum carotenoids at 450 nm and retinol at 325 nm while a fluorescent detector was used to measure tocol (internal standard) and various tocopherols at an excitation 290nm and emission 330nm. The mobile phase consisted of 100% methanol (A) and 100% methyl t-butyl ether (B) and was run as a gradient by the following method: 95% A and 5% B initially, maintained for 10 minutes, decreased to 83% A at 13 min, 70% A at 20 min, 65% A at 29 min, 45% A at 34 min, 38% A at 40 min, 30% A at 45 min and maintained for 20 min, then returned to 95% A at 77 minutes and maintained for 3 minutes. By using this procedure, we were able to separate and identify lutein, zeaxanthin, α-cryptoxanthin, β-cryptoxanthin, α-carotene, β-carotene, lycopene, α-tocopherol, δ-tocopherol, γ-tocopherol, and retinol with one injection.

**Bellerose, Kara, Kristen Slejzer, Elizabeth Kotyla**  
*Clinical Laboratory and Nutritional Sciences*  
**EFFECTS OF STATINS ON SERUM LIPIDS AND LIPOPROTEIN CHOLESTEROL AND GLUCOSE LEVELS IN INDIVIDUALS CONSUMING 12 EGGS PER WEEK FOR A YEAR**  
(Advisor: Thomas Wilson)

Patients with high blood cholesterol levels are prescribed statins and are recommended to reduce their consumption of dietary cholesterol and fat. Eggs currently contain 210 mg of cholesterol per yolk. However, since eggs are a valuable source of other nutrients, the recommendation not to consume eggs when prescribed statins may put older individuals at risk for developing other health-related problems. The purpose of this study was to examine the effects of consuming 12 eggs per week for a year on blood cholesterol levels in individuals currently using statins. Forty-six men and women over the age of 60 were divided into statin users or non-users and then randomized into either the intervention (eggs) or control (no eggs). A fasting blood sample was taken from all participants at baseline and after 12 months and serum lipids and lipoprotein cholesterol and glucose were measured. Results showed that people on statins had slightly lower serum total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), and triglyceride (TG) levels, and a slight increase in high density lipoprotein cholesterol (HDL-C) and glucose levels after consuming eggs, but not significantly. People not on statins had slightly higher serum TC, HDL-C, LDL-C, TG and glucose levels after consuming eggs, but not significantly. In conclusion consumption of 12 eggs per week for a year did not significantly alter serum lipids, lipoprotein cholesterol, or glucose levels in people on or not on statins, thus people prescribed statins do not have to omit eggs from their diet.
In the United States, there are approximately 265,000 quadriplegic and paraplegic people that require ongoing care. The estimated annual incidence of spinal cord injury (SCI) in the USA is approximately 40 cases per million population or approximately 12,000 per year. Preliminary studies indicate that the extent of damage from trauma is a result of not only the immediate care, but also related to the nutrient status of individuals at the time of injury. Key nutrients that might impact the extent of trauma include ascorbic acid, the carotenoids and vitamin D. Preliminary research suggests that many people with spinal cord injuries have poor diets that do not meet recommended servings of fruits and vegetables, and have low serum concentrations of vitamin D, E and C.; however, there have been few studies of nutrition with SCI. We investigated whether the ‘Americans with disabilities act (ADA)’ of 1991 had an impact on the number or the focus of studies in SCI. We searched Pub Med for publications during 2 decades: 1989-1999 and 2000-2010 using search terms such as ‘spinal cord injury’, ‘dietary metabolism’, ‘nutrition’. Of the 56 research articles that pertained to our investigation, approximately 30% of the research articles were published during 1989-1999 compared to 70% during 2000-2010. The mode (6) had occurred in 2005. Our results appear to suggest a positive impact of the ADA on nutrition research in SCI within the past decade.

DeMatteo, Robert, Daniel Warden, Erica Nou, Jason Marshall
Clinical Laboratory and Nutritional Sciences

Efficacy of the MondoVap 2400 in Real World Disinfection Situations
(Advisor: Nancy Goodyear)

The MondoVap 2400 (Advanced Vapor Technologies, Everett, WA) is a high temperature, low moisture steam vapor system designed for the cleaning and sanitation of a variety of surfaces using water only. In laboratory settings, this system has been shown to disinfect a variety of microorganisms at or above the industry standard of a 5 log reduction. These tests were performed using the recommended instructions which state that the nozzle tool of the cleaner should be fitted with a supplied filler pad and a cotton towel which has been washed without fabric softener. The goal of these experiments was to investigate the performance of the system when users deviate from these instructions. Cotton and microfiber towels were separately laundered in a home washer and dryer 10 times using detergent only for one group, including dryer sheets for a second group and including liquid fabric softener for a third group. Towels from each condition were used to clean aluminum coupons inoculated with either E. coli (ATCC 21214) or S. aureus (ATCC 6538). Cotton towels without a filler pad and filler pads without towels were also tested. The MondoVap 2400 was used on medium heat for 5 seconds with the triangular brush head. All tests resulted in a 100% reduction of growth which was greater than the minimum 5 log reduction. These results suggest that the use of fabric softener or dryer sheets, replacing cotton with microfiber, or excluding either the towel or the filler pad have no impact on disinfection.

Merlino, Emily
Clinical Laboratory and Nutritional Sciences

The Effect of Spinal Cord Injury on Leptin
(Advisor: Mindy Dopler Nelson)

Obesity in adolescents is a problem that carries on into adulthood in all demographics. This issue has been found to be more serious in spinal cord injured (SCI) adolescents due to immobility. Leptin, a protein secreted by the adipocytes, acts on the hypothalamus to affect satiety and metabolism. The
amount of leptin secreted is typically based on the amount of fat in the body. Furthermore, the nervous system is integral in the association of leptin with feeding and metabolism. Leptin signals the body to stop seeking food, it also increases energy metabolism. These actions aid in weight moderation in normal subjects. In previous SCI studies, increased levels of leptin (thought to indicate a resistance to leptin’s actions) and other risk factors related to obesity were reported based on using body mass index (BMI).

Since the sympathetic nervous system is disrupted in SCI, This leads to question whether SCI individuals have higher leptin levels due to inactivity and increased adipose tissue or a defect in the activity and regulation of leptin causing the increased adipose. BMI is not an accurate measurement of body composition in SCI due to underrepresentation of adiposity. Therefore total body fat and trunk body fat obtained by DXA more accurately determines adiposity levels in SCI. We hypothesize that SCI will have higher leptin levels compared to controls due to interruption of the sympathetic nervous system in SCI, thereby interrupting the inhibition of leptin, the expression of leptin, and its effect on energy expenditure, regardless of adiposity.

Nabanja, Sandra
Clinical Laboratory and Nutritional Sciences
Impact of Dietary Carbohydrate Intake on Glucose Tolerance in Individuals with Paraplegia and Tetraplegia
(Advisor: Mindy Dopler Nelson)

Spinal Cord Injury (SCI) is a serious lifelong impairment of the spinal cord due to trauma on the spine, which occurs in approximately 12,000 Americans each year. Numerous complications result from this injury, including impaired glucose metabolism from dietary carbohydrates. This may be associated with damaged insulin regulation leading to glucose intolerance. People with paraplegia (PARA) or tetraplegia (TETRA) may have varying levels of impaired glucose metabolism due to varying locations of injury, thereby having different neurological effects. The aim of our study is to investigate whether PARA have higher levels of impaired glucose metabolism compared to TETRA. We hypothesize that over time, PARA are most likely to consume more fats and carbohydrates than TETRA. We further hypothesize that although PARA are wheel-chair bound, they have upper body mobility, which allows them to prepare foods by themselves. Therefore, they are more susceptible to consume easy to prepare convenience foods. TETRA are more likely fed by a care-giver who will be compelled to provide healthier foods which are more nutrient dense, such as less processed carbohydrates. Consequently, PARA may have higher metabolic disorders in the long run as evidenced by higher fasting blood glucose, insulin or triglycerides even though they have less severe injury to the spine than TETRA simply because they consume a lower quality diet. This study aims to compare fasting blood glucose, insulin, and triglycerides in 23 PARA and 19 TETRA to determine if PARA have greater alterations in metabolism of dietary carbohydrate than TETRA.

Patterson, Shawn, Hasan Aljohi, Frances Adu Gyamfi
Clinical Laboratory and Nutritional Sciences
SERUM LEVELS OF LUTEIN AND ZEAXANTHIN AFTER CONSUMING 12 EGGS PER WEEK FOR ONE YEAR
(Advisor: Thomas Wilson)

Previous, studies have shown that two carotenoids, lutein and zeaxanthin, play a major role in the prevention of age-related macular degeneration (AMD). The best sources of these carotenoids are green leafy and yellow vegetable, such as spinach and corn. However, the bioavailability of these carotenoids from these sources is poor due to their high fiber content. Another good source is chicken eggs. Since the egg yolk contains a high amount of phospholipids, it provides greater bioavailability of these carotenoids compared to the vegetable sources. Unfortunately for many years people have refrained from eating eggs due to their high cholesterol content. The focus of this research was to determine blood levels of lutein
and zeaxanthin in individuals who consume 12 eggs/week for one year. Lutein and zeaxanthin levels were measured using a HPLC system with a C30 column at baseline and one year. The results showed that serum zeaxanthin levels significantly increased (67%) in the individuals consuming eggs but there was only slight increase (not statistically significant) in the group (17%) that didn’t consume eggs after one year compared to baseline. A non-significant increase in serum lutein levels was also observed in the group (56%) consuming eggs compared to no change in the group (6%) not consuming eggs after one year compared to baseline. In conclusion, this study showed that the consumption of 12 eggs per week for one year has benefits in raising the zeaxanthin levels and lutein levels and possibly reducing one’s risk of developing AMD.

Ruhm, Tanja, Hasan Aljohi, Halleh Mahini
Clinical Laboratory and Nutritional Sciences

EFFECT OF A SELF-ASSEMBLED NANOEMULSION (SANE) FORMULATION OF QUERCETIN VERSUS A DIMETHYL SULFOXIDE (DMSO) FORMULATION OF QUERCETIN ON CELL PROLIFERATION OF A HUMAN BREAST CANCER CELL LINE (MCF-7)
(Advisor: Thomas Wilson)

Quercetin is a lipid soluble phytochemical found mostly in red apples, red onions, red grapes, and cranberries that has antioxidant, anti-inflammatory and anti-carcinogenic properties. Nanoemulsions have the ability to encapsulate lipophilic drugs and nutrients and make them more amphiphilic, thereby allowing for their delivery in a polar matrix, potentially increasing compatibility. In addition, decreasing the particle size to < 100 nm results in greater and extended cellular penetration of encapsulates. As a result, the surface/volume ratios of the nanoemulsions are increased, thereby raising the bioavailability and efficacy of encapsulate. Self-assembled nanoemulsions (SANEs) are based on Phase Inversion Temperature (PIT). The PIT method is an organic, solvent-free and low energy required method for obtaining nanoemulsions. The purpose of this study was to examine a SANE formulation of quercetin for efficacy in reducing the cell proliferation of a breast cancer cell line in vitro. A cell proliferation assay was used to determine the rate of growth of the breast cancer cells, and three samples were assayed for each control and formulation. Cell proliferation was assessed by changes in cell number and viability over time. The results showed that the SANE quercetin formulation demonstrated 2.63 to 2.7 fold greater activity as an anti-proliferative agent then the DMSO formulation of quercetin at the same concentration.

Slejzer, Kristen, Kara Bellerose, Elizabeth Kotyla
Clinical Laboratory and Nutritional Sciences

INFLUENCE OF BODY WEIGHT ON BLOOD LIPID AND LIPOPROTEIN AND GLUCOSE LEVELS IN PEOPLE CONSUMING TWELVE EGGS A WEEK FOR ONE YEAR
(Advisor: Thomas Wilson)

Recent epidemiological data suggest that those people suffering from type II diabetes have an increase risk of death when consuming more than 1 egg per day. The purpose of this research project was to determine whether the consumption of 12 eggs per week for 1 year in overweight individuals alters their blood lipid and lipoprotein cholesterol and glucose levels. Forty-six men and women over the age of 60 were divided into normal weight (body mass index 19-24.9) or overweight (body mass index >25) and then each group randomized into either the intervention (eggs) or control (no eggs). A fasting blood sample was taken from all participants at baseline and 1 year later and serum lipids and lipoprotein cholesterol and glucose were measured. Results showed that serum total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), and triglycerides (TG) levels decreased slightly in the overweight group, while serum TC, LDL-C, and TG levels increased slightly in the normal weight group after consuming eggs, but not significantly. Serum high density lipoprotein cholesterol (HDL-C) levels increased slightly more in the normal weight group than the overweight group after consuming eggs, but not significantly.
Serum glucose levels in the overweight group increased slightly, but not significantly, however, serum glucose levels increased significantly in the normal weight group after consuming eggs. This study suggests that being overweight does not negatively impact blood lipids, lipoprotein cholesterol, or glucose levels when consuming 12 eggs a week for 1 year.

**Tasiopoulos, Stephanie**  
*Clinical Laboratory and Nutritional Sciences*  
**NUTRITIONAL EDUCATION EXPERIENCE**  
(Advisor: Mindy Dopler Nelson)

Obesity and obesity related factors are increasing rapidly within the younger population. As an effort to help reduce risks and increase knowledge and prevention strategies my research was focused on how already established nutritional educational programs work and how to make the information relevant to a specific population and age group. Information was obtained throughout the semester from websites for nutrition professionals, such as Eatright.org and Choosemyplate.gov to design a curriculum and assessment tests. As well as information from literary reviews from authors such as Isobel R. Contento, Ph.D., CDN. The main aim was to impact 4th grade students by presenting them with the basics about nutrition and healthy eating habits while providing opportunities for them to express their knowledge that they may already have, while learning new material. This will be achieved by administration of a pre and a post test, comparable to their test taking abilities. These tests will analyze what they might already know and what they learned, before and after the presentation. This data will inform future long-term intervention studies aimed at preventing weight gain in youth during this critical period in their lives.

**Vogel, Sommer, Mahima Tank, Jason Marshall**  
*Clinical Laboratory and Nutritional Sciences*  
**PRECISION AND SENSITIVITY OF AN ATP BIOLUMINESCENCE METER AS COMPARED TO CULTURE**  
(Advisor: Nancy Goodyear)

To evaluate the performance of safer (green) approaches to disinfection, rapid methods of detecting residual microorganisms on a surface are needed. Contact agar plates are sensitive and accurate, but time-consuming, costly, and require expertise. New devices based on bioluminescent detection of ATP have been marketed as rapid alternatives for detecting residual microorganisms. These devices have not been fully evaluated to ensure proper use and interpretation. We evaluated the Hygiena SystemSure Plus (Hygiena, Camarillo, CA) for sensitivity across the growth curve and precision in comparison to culture for *Escherichia coli* (ATCC 21214) and *Staphylococcus aureus* (ATCC 6538). Sensitivity was determined for *E. coli* and *S. aureus* during lag, log, stationary, and death phases of the growth curve. Between-run precision was determined with positive control, and within-run precision was determined with control, lag and log phase cultures. Sensitivity varied with the stages of the growth curve. Sensitivity for *E. coli* was 217,500, 24,000, 286,000, and 1,010,000 CFU/mL for lag, log, stationary, and death phases respectively. Sensitivity for *S. aureus* was 111,500, 1,710, 1,530,000, and 1,110,000 CFU/mL for the same phases. Between-run precision (CV) for the control was 16% Within-run precisions (CV) were: positive control 12%, lag phase *E. coli* 63%, log phase *E. coli* 19%, lag phase *S. aureus* 58%, and log phase *S. aureus* 18%. ATP meter sensitivity is dependent on bacterial growth stage; meter users need to take this into account. Precision of device is adequate with both organisms. Future work will include a field pilot study.
Yeth, Seyhak, Linda Tran, Sandra Nabanja  
*Clinical Laboratory and Nutritional Sciences*  
**VITAMIN C: MEASUREMENT AND STABILITY IN FOODS**  
(Advisors: Nancy Goodyear and Gary Handelman)

We evaluated vitamin C in a variety of fruits and vegetables, including commonly used foods, such as apples, oranges, peas and broccoli. Using an HPLC system with electrochemical detection, we injected juices or extracts from these foods, and compared the peak area to a standard of known concentration. The vitamin C has a retention time of 5 minutes, making it simple and fast to collect vitamin C data. The HPLC peak areas allowed us to determine vitamin C concentration in mgs/100 grams material. Our initial studies examined the use of metaphosphoric acid to maintain stability of vitamin C in food extracts. We then evaluated stability of vitamin C in commercial orange juice, which was bought fresh or analyzed after long storage in the refrigerator. Initially orange juice was very high in vitamin C, but it was mostly degraded after 3 months in the refrigerator. Surprisingly, chick peas and broccoli also had huge amounts although not as much as oranges. Apples, however, came in very last with the least amount of vitamin C. The analysis of some foods is made more complicated by the presence of other compounds (probably bioflavanoids) that also give a signal on the HPLC, and that leads to a complex HPLC trace. We believe consumers should pay more attention to vitamin C stability in foods, which cannot be assumed for lengthy periods of time.

Bobola, Krista, Kehle Osborne Trussel  
*Community Engagement*  
**LOWELL FOOD SECURITY COALITION FOOD ASSESSMENT**  
(Advisor: Leland Ackerson)

The goals and roles for us students was to create a tool (excel spreadsheet) with emergency food provider contact information that was used to send out a survey developed by Krista to these providers. Then the information was used to create a food pantry and meal schedule calendar displayed on the LFSC website. Other tasks included researching providers, creating a phone and e-mail prompt used when talking and e-mailing providers and contacting them for information. Kehle was responsible for researching and developing information for the federal assistance programs. An excel sheet with the programs addresses, phone numbers, email, and contact person that was used to facilitate the project. The School Lunch Programs, WIC, and SNAP were the main focus. An interview with WIC was conducted; interview questions for SNAP and School lunch were done by email. The final goal for the three programs was to create a narrative based on what the programs do, who they serve, how people are eligible, and the food they provide.

Brian, Amanda, John Corbacio, Nicole Giaquinto, Tracy Moore  
*Community Health and Sustainability*  
**ADD SOME ZZZZZS: PROMOTING THE IMPORTANCE OF SLEEP AMONG STUDENTS**  
(Advisor: Leland Ackerson)

As a group, we worked together to fulfill the responsibilities we were given, on different methods of promoting the importance of sleep among college students. Throughout the process, we kept in touch with our preceptor, Tracy Moore, by meeting once a week and emailing when needed. We had several service goals that we wanted to accomplish from this service-learning project. They were to research current data on sleep and college students, develop a PowerPoint presentation, conduct an informal focus group, create a door hanger, create a brochure, create a flyer, create a bulletin board outside of health services, and hold three educational resource tables that promoted healthy sleep habits and strategies for better sleep. At the resource tables, we talked to students and faculty members about the importance of
sleep. We handed out our door hangers, brochures, and ear plugs and had our PowerPoint presentation continuously playing.

**Brian, Amanda, Noelle Kaelblein, Kehle Osborne-Trussell, Jenna Ventura, Vanessa Elridge, Alice Harris, Susan Pulido**  
*Community Health and Sustainability*  
**STUDY MEASURING UNIVERSITY FRESHMEN STUDENT’S PERCEPTIONS OF ADHD MEDICATION**  
(Advisor: Leland Ackerson)

This project was part of a course called Introduction to Epidemiology, which had a Service Learning component. We worked with The University of Massachusetts Lowell Student Health Services and the health educator, Susan Pulido. The purpose of the study was to evaluate an intervention designed to influence attitudes and perceptions of the misuse of ADHD medication among freshmen students at the University of Massachusetts Lowell. First, we discussed the goals of the study with Susan and then decided on how we wanted to conduct the study. We decided on a one-group pretest/post-test quasi-experimental study, to investigate the impact of a brief educational intervention on the attitudes and perceived behaviors of freshman students towards ADHD medication misuse. Participants were first year students aged 18 years or older. We created one questionnaire for the pretest/posttest, which Susan used for the program. Susan conducted the program in five freshmen classrooms at the University of Massachusetts Lowell. The intervention was based on the Health Belief Model and designed to increase knowledge of likelihood of addiction, neurological changes, lack of improvement in school grades, and peer disapproval associated with ADHD misuse. A total of 83 eligible students participated in this study. All perceptions related to ADHD changed in a health-promoting direction between pretest and posttest. Our study proved to be successful and our results reinforce the importance of providing additional interventions toward other first year college students who have the potential to being exposed to ADHD medication misuse. The results indicate that the educational intervention was capable of influencing student’s thoughts and can be used as evidence to support other research.

**Crisci, Anna, Christine Soundara**  
*Community Health & Sustainability*  
**YOUTH VIOLENCE AWARENESS AND PREVENTION: ENGAGING YOUTH IN DISCUSSIONS**  
(Advisor: Craig Slatin)

The goal of this service learning project was for the students to work alongside the faculty at the Lowell Community Health Center Teen Coalition, in effort to help reduce teen violence. Our assignment was to facilitate and conduct discussion groups with the youths already involved in the program; this took place at the City Hall in Lowell. The purpose of the discussion groups was so that we the students could determine what information would be incorporated into the discussion guide we were assigned to create. In addition, we were given literature to read in regards to the history of teen violence in Lowell. Online sources enabled us to create this discussion guide which consisted of role playing scenarios, vocabulary related to violence and crime, discussion questions, icebreaker activities, exercises, newspaper clippings, and a list of movies all pertaining to violence. This discussion guide was created for faculty to make use of while conducting discussion groups in the future.
Delgado, Amy, Stefanie Wong  
*Community Health and Sustainability*  
**MERRIMACK VALLEY FOOD BANK**  
(Advisor: Leland Ackerson)

The goal of this service learning project, with the Merrimack Valley Food Bank, was to create a cookbook in which most of the ingredients were accessible at the food bank and food pantries. Our role was to work with the food bank to offer a source of food to those in need and those with a lack of access to other sources of food. This nonprofit organization offers the community a variety of foods to help keep the population from going hungry. They rely completely on the state and community to financially support this organization. Without the support from the food bank or the community there would be many starving people within the Merrimack Valley.

DiCiaccio, Michelle, Sarah Marquis  
*Community Health and Sustainability*  
**HEALTH COMMUNICATION IN ACTION**  
(Advisor: Craig Slatin)

As a part of this service learning experience, we developed our communication skills, and improved our ability to converse with professionals in the same career path. We learned how to create an interactive and health awareness exhibit that was engaging to the target population of the project. This service learning experience helped us to develop good organizational skills, and stay on top of deadlines. We learned how to take information from interviews that we conducted and communicate the information effectively to an audience through a written document in the form of a newsletter to be sent out to the Partnership members. We also had the chance to attend meetings and conferences in order to learn how to conduct ourselves professionally and build skills to be used in the future. This opportunity also helped us to generate an understanding of how organizations work and benefit the community. We were given the chance to interact with our organization throughout the executive committee meeting, the Ounce of Prevention Conference, and via email. The members guided us through explanations of what they wanted from us, but let us have creative freedom. Almost every week we met with Suzanne Nobrego, who is a member of the executive committee of the Partnership.

DiCiaccio, Michelle, Kristen Slejzer, Alyssa Williams, Tanya Behnan, Alicia Scalan, Michelle Ntori  
*Community Health and Sustainability*  
**LOWELL COMMUNITY FOOD ASSESSMENT IN THE ACRE**  
(Advisor: Leland Ackerson)

The purpose for the Lowell Community Food Assessment is to develop a better understanding of the communities’ access to healthy, culturally appropriate food and over time better the local food system. This assessment of the Acre was done as the first step in assessing the entire city. Our goal as students participating in the conduction of this study was to create and troubleshoot methods of data collection. By doing this first, we were able to improve the accuracy and efficiency of these methods for the remaining portions of Lowell to be surveyed. Once the study methods are perfected and the city is surveyed, the goal is to recognize and act on areas of improvement. By recognizing the troubled areas of the city’s food system, the Food Security Coalition can establish connections between stores and resources. Thus, helping better their business overall for themselves as well as the community. For example, stores that reported not being part of the WIC program may be assisted in involving their businesses in the program if they wish. Participating in this project gave us a firsthand experience to the factors that go into and affect a successful survey. We encountered barriers within our methods of data collection and were able to troubleshoot them to establish more efficient ways to collect data. We collectively learned how to find our niche in this project and come together to create an end product. After working with the Food
Security Coalition we were able to catch a glimpse of what the entire assessment will entail and learn how improvements can be made in a community we all are a part of. We look forward to the final outcome.

Evans, Andrea, Allison March  
*Community Health and Sustainability*  
**HEALTHY HABITS CURRICULUM**  
(Advisor: Leland Ackerson)

Our “Healthy Habits” curriculum project was a requirement for our senior level course, “Service Learning in Community Health”. This course requires all senior level students in the Department of Community Health and Sustainability to work with a community health organization to complete and help with projects that will be used to promote healthy behaviors in the Greater Lowell area. The main service goal for our project was to create a “Healthy Habits” curriculum in the form of a resource book. This program will be used by the Center for Community Health and Wellness at Lowell General Hospital to teach Girl Scout troop leaders using a “trainer to trainer” model. Our resource book is composed of many important health topics such as healthy eating, physical activity, stress, sleep, communication, personal hygiene, volunteering, and safety. For each topic area we defined the health topic, we outlined key informational points for the troop leaders to convey to their Girl Scouts, and multiple activities that are age appropriate and fun for the Girl Scouts to participate in. Also, we created an Appendix within our resource book which lists all of the Girl Scout badges that pertain to our program. This will help troop leaders decide which badges they would like to partake in, and have an easy time accessing the information and activities that coincide with accomplishing that badge. Throughout the process of creating this program, we have kept in close contact with Julie Patno, manager of the Center of Health and Wellness, to make sure we have achieved her needs as the faculty members of the department will be implementing the program in the spring of 2012. Although we did not teach the Girl Scout troop leaders ourselves, we plan to be present during the sessions when our program will be implemented in the upcoming spring months.

Hilbert, Heather, Jenna Ventura  
*Community Health and Sustainability*  
**ONE STEP TOWARD UNDERSTANDING HEALTH INSURANCE**  
(Advisor: Leland Ackerson)

As part of a collaborative effort, the Lowell Adult Education Center and the students of Service Learning in UMass Lowell’s Community Health program worked together to develop PowerPoint presentations about the importance of health insurance in Massachusetts and how to apply for and maintain such plans. The students worked directly with Betsy Chisholm of the LAEC researching and developing the presentations over a 14-week semester. The students planned and delivered three presentations—one for the GED students and two for the ESOL students. Upon completion, the adult students of LAEC developed a better understanding of Massachusetts health insurance and how to properly acquire the most beneficial health plan for their personal needs.

Marquis, Sarah, Andrea Evans, Allison Marsh, Heather Hilbert, Julie Moran, Alexandra Beauvais  
*Community Health and Sustainability*  
**UNIVERSITY OF MASSACHUSETTS: UTILIZATION OF STUDENT HEALTH SERVICES**  
(Advisor: Leland Ackerson)

As part of a collaborated effort, UMass Lowell’s Student Health Services and the members of the class of 2012’s Introduction to Epidemiology worked together to determine the uses, opinions, and needs of the Student Health Services. This was a service learning opportunity for us, and was a requirement for this course. An online survey was sent out to UMass Lowell students asking questions regarding students’ use of health services; if so, for what reason, if they would use student health services for STI treatment, if
they would use student health services for contraceptive use, and how much they would be willing to pay, etc. After the data was collected, we were able to use the analyzed results to improve the services provided for the students by the University of Massachusetts Lowell’s Student Health Services. Conducting an epidemiological study as a group involves a lot of hard work. We were required to manage the project with guidance and approval from Tracy Moore. We also needed to get approval from the IRB prior to submitting the survey. The project has been eye opening, and helped us gain a more influential educational experience. Working as a group, we had to split up the tasks evenly, and complete our work in a timely manner. We hope our work with Student Health Services will help the staff concentrate on what the students need and how to improve the services provided.

Moran, Julie, Christopher Mugford  
*Community Health and Sustainability*  
**LOWELL HEALTH DEPARTMENT'S INFLUENZA CAMPAIGN**  
(Advisor: Craig Slatin)

Part of the curriculum for Community Health majors at the University of Massachusetts Lowell is Service learning, which is taken our senior year. We had to work with the Lowell Health Department to come up with an influenza vaccination campaign for the community. Our goal was to reach out to the community and communicate the importance of herd immunity (the majority of people becoming vaccinated) and to let the elderly know of the fairly new high-dose vaccine (Fluzone), especially meant for the elderly who have compromised immune systems. We were able to deliver these messages with an informational video on herd immunity. We also made a thirty second audio public service announcement. We were granted autonomy throughout this creative and educational experience and it was up to us to make the information appropriate and to finish tasks on time.

Mugford, Christopher, Emily Merlino, Kara Bellerose, Natasha Frenzo, Stephanie Tasiopoulos, Tanja Ruhm  
*Community Health and Sustainability*  
**TOBACCO SURVEY REPORT**  
(Advisor: Leland Ackerson)

A group of undergraduate students at the University of Massachusetts Lowell, taking an Introduction to Epidemiology course investigated the attitudes and behaviors towards tobacco use of UMass Lowell employees through a service learning project. Overwhelming evidence indicates that smoking tobacco is hazardous to health. Smoke from tobacco products harms not only the smoker, but also others who inhale the environmental tobacco smoke. In response to the health risks of smoking, many colleges and universities have changed their smoking policies to ban smoking on campus. The purpose of this study is to assess the attitudes and behaviors of the University of Massachusetts Lowell's employees towards smoking. A descriptive cross sectional study was used to survey UML employee attitudes and behaviors. All UML employees were invited to take the survey via and electronic bulletin board posting. Of the survey participants, 67% were male and 33% were female. According to the results, 87% of respondents have not smoked a tobacco product in the last 30 days, and 98.6% have not used smokeless tobacco products in the last 30 days. A majority of the employees would like the university to implement a stricter smoking policy to reduce smoking on campus (76%). These findings indicate that the universities employees may support actions designed to modify the current smoking policy in order to reduce smoking on campus.
Ford, Maryann, Sergio Pernice
*Environmental Health*

**TICK SURVEILLANCE IN ANDOVER, MA**
(Advisor: Leland Ackerson)

The Andover health department is concerned about the number of Lyme disease cases there are in Andover. The city has come up with the plan to allow bow hunting in key areas in Andover. As part of a service learning project for our Service Learning class, it was our goal to collect data on the number of ticks we found in these key areas to determine whether or not the hunting of deer is necessary. We formulated an Excel sheet of data detailing the dates, locations, and tick counts from each trip. The data will be used as baseline data for the town of Andover as they assess the effectiveness of bow hunting on the deer tick population.

Patterson, Shawn, Antjie Brisbin, Krista Bobola, Kathleen McCabe, Nancy Sok, Christine Soundara
*Environmental Health*

**FOOD SECURITY AND CUSTOMER SATISFACTION AMONG FOOD PANTRY CLIENTS IN GREATER LOWELL, MASSACHUSETTS**
(Advisor: Leland Ackerson)

Background: The Mobile Pantry program (MP) of the Merrimack Valley Food Bank in Lowell, Massachusetts works to make sure that their clients have a sufficient amount of appropriate foods delivered for a nutritious diet. The purpose of this project was to assess the effectiveness of MP services and explore opportunities for providing more healthful foods. Methods: The project was a descriptive cross-sectional study surveying MP clients, who are homebound, low-income elderly and/or disabled individuals residing in Greater Lowell. The survey took place between October 10 and November 16, 2011. Participation was anonymous and voluntary. Results: The primary client from each of 77 households out of 309 responded to the questionnaire. Most of the respondents were white, female, and over age 65. Most respondents agreed strongly that with MP’s aid they ate more fruits, vegetables, and healthy foods; ate a balanced diet; were more physically and socially active; and generally felt healthier. Most respondents also stated that they would skip more meals and spend less on other necessities if they did not have help from MP. The majority of respondents felt able to perform all of the food preparation tasks and use all of the kitchen appliances/tools about which they were asked, with the exception of following a complicated recipe. Conclusion: MP may be essential for the health, nutritional well-being, and food security of the low-income elderly and/or disabled in the Greater Lowell community. Both respondents’ willingness to try new foods and their applicable meal preparation capabilities indicate an opportunity for MP to provide more healthful options. The results of this study may be utilized to improve MP services and food variety.

Abdalla, Barka, Chau Le, Megan paro, Phan Trieu, Marlena Ton, Stephanie Tremblay, Tia Warren
*Nursing*

**CARDIOVASCULAR HEALTH IN DRACUT, MASSACHUSETTS**
(Advisor: Alison Basmajian)

Purpose: The purpose of this project is to educate the residents of Dracut, MA about the high prevalence of cardiovascular disease and to educate them about the signs, symptoms, and preventative measures associated with this disease. Background: The percentage of cardiovascular events in Dracut is 2035.0 which represent a 22.5% higher than the state average. The percentage of adults who are obese based on BMI is 24.8% in Dracut compared to 21.7% in the state. Prevention of cardiovascular disease can be achieved by behavior changes that are enacted due to increase in knowledge about modifiable risk factors.
such as maintaining a healthy weight, getting adequate exercise and regular health screenings related to cardiovascular disease. Methods: As UMass Lowell senior nursing students we plan on increasing awareness and educating preventative measures about cardiovascular disease by hosting an informational event in front of two key locations in the town: Alexander’s Pharmacy and Dracut Center Convenience Store. Both primary (promoting health to prevent disease from starting) and secondary interventions (detecting disease in its early stage) will be used by educating the residents about the importance of screenings and what they need to be screened for in relation to cardiovascular disease. Informational brochures, free healthy food samples, red dress pins, heart health mints, mini heart health calendars, and visual posters will be available to educate and attract the residents to our table. Results: The program was evaluated by use of participant questionnaire after they have received educational material. 45 participants completed the questionnaire. All education was considered relevant with a 87% agreement or greater. 62% identified that the nutrition information was relevant. Discussion/Implications for Nursing: Use of primary prevention is an essential nursing function when working within a community. It is our goal that with improved education regarding risk factors the participants will be actively involved in self-motivated behavior changes that will reduce their risk of cardiovascular disease and thus decrease the incidence of cardiovascular disease in the Town of Dracut. Passive programming allowed us to give the residents pamphlets and educational calendars to share and refresh what we taught them.

Bongiorno, Alyssa, Julia Bernard, Natasha Cole, Sarah Connolly, Elise Miles, Stacy Tsiklis
Nursing
OBESITY IN CHELMSFORD
(Advisor: Valerie King)

Purpose: To address the potential risk of adult obesity by providing nutrition education to fifth grade students at Parker Middle School in Chelmsford, Massachusetts. Background: The adult obesity rate in Chelmsford is 21.5% compared to the state average of 22.5 %. The rate of diabetes is 7.8% compared to the state average of 8.1%. Adult obesity can be a result of improper nutritional habits that begin in childhood. Educating children on proper nutrition can be one method of creating healthy eating that will continue throughout adulthood. Methods: An educational program was developed based on the USDA “My Plate” and “Food Pyramid.” This program consisted of a 30 minute lesson with an interactive learning exercise for the students, followed by a question and answer session. A pre and posttest evaluation tool was utilized to assess knowledge acquisition. Results: The participants of this program (n=38) improved knowledge of general nutrition principles after the conclusion of the program. The post test results revealed that between 94-100% of the students correctly answered all of the questions related to nutritional knowledge. Discussion: Based on the marked improvement in correct responses from the pre-test to the post-test, it is clear that a nutrition education program can be highly successful at the fifth grade level. At the conclusion of the lesson the students asked thought-provoking questions that proved they are eager to learn more about nutrition. Implications/Conclusions: Educating school-age children about nutrition is an important health-promotion activity. Early intervention is important to helping children develop healthy eating habits and lifestyles that will last throughout adulthood. It is in childhood that new foods are introduced and it is important that children are trying healthy foods in this important developmental period. Establishing good habits in childhood and understanding the significance of a healthy lifestyle have long-term benefits. A nutrition education program for grade-school children can help decrease their risk of becoming overweight or obese in adulthood, which can lead to heart attack and stroke.
Purpose: To address the incidence of childhood obesity in Lawrence, Massachusetts by increasing the knowledge of school age children about healthy nutrition and exercise. Background: Lawrence is a large, diverse community with a population of roughly 76,000. 73.8% of the population is of Hispanic or Latino origin. 27.3% of the population is living in poverty. The obesity/overweight rate of students screened by Lawrence High School is 46.6% (2010). Methods: A health promotion program was implemented at the Young Women’s Christian Association (YWCA) of greater Lawrence. The program consisted of educational concepts based off the United States Department of Agriculture’s My Plate recommendations for healthy eating and exercise. Following the presentation, creative nutritional activities were implemented and the children were engaged in 60 minutes of exercise. At the conclusion of the program informational pamphlets and healthy snacks were given to the children to take home. Results: 65 school age children participated in a 4 hour program. Evaluation consisted of pre and posttest tool that measured the knowledge concerning nutrition and exercise. There was a significant increase in knowledge at the completion of the program. Discussion: Population was limited to the children that attend the afterschool program at the YWCA. All of the children were actively engaged. Implications/Conclusions: The program was economically feasible, practical, effective, and an excellent choice for future groups to implement. The YWCA was very receptive to our efforts. We hope the children will apply their new knowledge, ultimately reducing the incidence of childhood obesity in Lawrence.

Purpose: The purpose of this project is to educate second grade students about dental health and hygiene. At this age, children are receptive to learning and are developing an interest to perform tasks independently. Background: Oral health is one of the Healthy People 2020 topic areas and two of the objectives are to: Increase awareness of the importance of oral health to overall health and well-being and to increase acceptance and adoption of effective preventive interventions (Healthy People 2020). Oral health is one of the identified health education programs being implemented by the Westford Board of Health with a target population of second grade students. Methods: The program was implemented at Nabsnasset School in Westford Massachusetts to a second grade classroom (N= 20), which preceded Westford’s dental health initiative. The program consisted of a pre-test to assess dental knowledge followed by a short lecture and demonstration regarding oral hygiene. Activity books evaluated the program’s effectiveness. Results: Knowledge of proper dental hygiene improved from 75% correct response on pre-test to 100% response on posttest. Discussion/Implications for Nursing: Addressing proper dental hygiene habits in school-age children has the potential to create lifelong healthy habits that will reduce the risk of future health disorders and diseases that are related to poor dental health. Nurses are ideally suited to address health care needs in school settings in collaboration with other school or town based healthcare initiatives.
Researchers define reminiscence as the process by which an individual recalls past events in his or her life [1]. This therapeutic technique elicits numerous benefits and is therefore used by health care providers to improve the quality of life for their patients. Nurses use integrative reminiscence to assist patients to come to terms with unresolved conflicts, reaffirm their self-esteem and identity, and increase life satisfaction. The purpose of this study was to explore nurses' experiences of facilitating integrative reminiscence with HIV patients at end of life. A pilot qualitative study utilizing a phenomenological approach was employed. The purposive sample (N=4) included nurses caring for HIV patients in the hospital and/or community setting. Data were collected by a trained graduate student using structured interviews lasting approximately 60 minutes. Audio-taped interviews were transcribed and analyzed using the immersion/crystallization technique described by Borkan [2]. Preliminary results reflect that nurses' use of integrative reminiscence with their HIV patients created powerful relationships at end of life. Consequently, their patients' expressed increased levels of life satisfaction and the ability to accept death more peacefully. Recommendations including the need for formalized reminiscence and end of life care training at all levels of nursing education and practice are presented. [1] Webster, J., Bohlmeijer, E., & Westerhof, G. (2010). Mapping the future of reminiscence: a conceptual guide for research and practice. Research on Aging, 32(4), 527-564. doi:10.1177/0164027510364122 [2] Borkan, J. (1999). Immersion/crystallization. In B. Crabtree & W. Miller (Eds.), Doing qualitative research (2nd ed.) (pp. 179-194). Thousand Oaks, CA: Sage.

Purpose: The purpose of this project was to provide education to a segment of the population of Nashua, NH. The focus was how to incorporate more fruits and vegetables into the diet to address the problem that only 22% of Nashua residents eat 5 or more servings of fruits and vegetables daily. Background: Nashua is the 2nd largest city in NH. Its population is 89,000. 33% of Nashua residents are overweight and 26% are obese. Nashua city statistics identify that only 22% of Nashua residents eat 5 or more servings of fruits and vegetables daily. Obesity has been identified by leaders, medical providers, and by residents as one of the top 3 health issues in Nashua. The Pheasant Lane Mall in Nashua attracts over 7 million visitors annually and was an ideal setting to reach people of different ages, cultures and lifestyles. Methods: The design of the project included using a poster, brochures, a visual display to represent how to incorporate fruits and vegetables in daily diet. A post-test quantified the number of visitors able to identify one value of, and one method to, incorporate more fruits and vegetables into the diet. Results & Conclusions: The goal of educating visitors to the Pheasant Lane Mall was reached by meeting our objectives. 100% the learners were able to identify one value of, and one method to, incorporate these dietary changes. Possible limitations to the project are that visitors to the booth already include 5 fruits and vegetables in their daily diet.
DiNatale, Leah, Devin DiNatale, Nora Walsh, Jaclyn Sugrue, Erica Johnson, Inessa Gevorkian  
Nursing  
CARDIOVASCULAR DISEASE AWARENESS IN STONEHAM, MASSACHUSETTS  
(Advisor: Alison Basmajian)

Purpose: The purpose of this project was to address the incidence of cardiovascular disease in Stoneham, Massachusetts by increasing the knowledge of high school students on the signs of cardiovascular disease and prevention strategies.  
Background: Stoneham, Massachusetts is a suburban town consisting of approximately 21,500 residents. The overall circulatory disease rate for the Stoneham community is a staggering 8635.7, compared to Massachusetts’ specific rate of 7462.0. These circulatory diseases include stroke, myocardial infarction, and coronary artery disease.  
Methods: An educational awareness program was implemented on March 6, 2012 to a sophomore year health education class at Stoneham High School. Visual aides, informational pamphlets, and an interactive learning activity were available to further educate the students in the health education class.  
Results: Prior to our presentation, a pre-presentation quiz was administered to evaluate the student’s current knowledge on cardiovascular disease. Following the presentation, a post-presentation quiz was administered to evaluate the effectiveness of our teaching. Our program proved effective when the quiz average increased from 69.3% to 98.5% following the presentation.  
Discussion: Although our project was limited to one health education class, we were able to achieve our overall goal of bringing awareness and increasing the knowledge of cardiovascular disease to this population.  
Implication/Conclusion: We recommend for this project to be conducted again in the future as prevention is vital in cardiovascular disease. Our program proved to be a valuable tool in educating the sophomore year health education class at Stoneham High School.

Feroce, Lauren, Remy Garabieta, Samantha Gillis, Colleen Lynch, Marie Riley, Stephenie Sarault  
Nursing  
BACTERIAL PNEUMONIA IN SOMERVILLE, MA  
(Advisor: Alison Basmajian)

Purpose: The purpose of the project was to bring awareness to the staff of Somerville's two Senior Assisted Living facilities regarding bacterial pneumonia.  
Background: Somerville, MA is part of Middlesex County and has approximately 76,000 residents. Bacterial pneumonia is an important health issue as there were 205 cases reported in Somerville by August 2011, according to the Massachusetts Department of Public Health. Somerville’s crude rate is 311.9 while the Massachusetts crude rate is 298.3. In addition to the crude rate, the age specific rate for residents greater than 60 years of age is higher than the states age specific rate.  
Methods: We presented an educational program to the staff of Somerville’s two VNA Assisted Living Facilities. The program included information about bacterial pneumonia’s prevalence, signs and symptoms, when to contact the physician or emergency medical services, treatment, and prevention of bacterial pneumonia in the older adult population of Somerville. We also demonstrated proper hand washing and provided educational handouts. Lastly, we evaluated the effectiveness of our teaching.  
Results: Participants completed a pretest and post-test which evaluated the staff’s knowledge of bacterial pneumonia before and after our presentation. We found an increase of correct responses in the post-test compared to the pretest that they had completed. In the pretest only 54% of the staff had correct responses to our questions regarding bacterial pneumonia and after our presentation our post-test had a 32% percent increase. After our presentation 86% percent of the staff had the correct responses regarding signs and symptoms, hand washing, prevention and the target population bacterial pneumonia effects in Somerville.  
Discussion: Our population was limited to the staff at the VNA Assisted Living Facility. The staff varied from nurses to patient care aides. Because we were not able to educate the elderly population, we provided the staff with vital information to inform their patients on bacterial pneumonia and how to decrease the spread of bacteria themselves.  
Implications  
Conclusions: We accomplished our goal of educating the staff at the VNA Assisted Living Facility about the importance of prevention in treating bacterial pneumonia in the older adult population.
bacterial pneumonia. Our future goal would include presenting education directly to the elder population residing in Assisted Living facilities in Somerville.

Gomes, Vanessa, Ervia Arias, Meghan Fisk, Ann Galipeau, Carolyn Mortimer, Jenna Whiffen
Nursing
CARDIOVASCULAR HEALTH AND THE ELDERLY IN METHUEN MASSACHUSETTS
(Advisor: Alison Basmajian)

Purpose: To address the incidence of cardiovascular disease among the elderly population in Methuen, MA by increasing their knowledge. Background: Methuen has a population of about 44,000 with 13.8% being 65 years and older. There is a high incidence of cardiovascular related deaths in Methuen, totaling 141 in 2008. According to the CDC, cardiovascular disease is one of the leading causes of death among the elderly. Methods: A nutrition seminar and exercise program at the Senior Activity Center in Methuen, MA. After the program we will set up an information booth with posters, handouts and other visuals on nutrition and exercise. Those who attend the program will be awarded two free exercise classes and will be entered in a raffle for a $30 Market Basket gift card. Evaluation Method: A verbal survey was conducted to assess the participants understanding of the information presented. The goal was 75% increase of understanding; the goal was exceeded as the survey results indicated an 85% increase in understanding. Discussion: The education program was successful as the learners exceeded the expected goal, in addition the audience were active participants by asking questions and joining in the exercises. Implications /Conclusions: We feel that this project will be chosen in the future to be implemented at the Senior Activity Center because it will provide strategies that these individuals may take home and incorporate into their daily living.

Hand, Ashley, Jayme Bagtas, Kelly Ramos, Carolyn Miller, Nancy Curran, Mary Mosewick
Nursing
SEEDS OF CHANGE FOR A STRESS-LESS LIFE
(Advisor: Allison Basmajian)

Purpose: The purpose of this project is to address the higher incidence of suicide in Haverhill, MA. Our community project aims to educate residents with mental health issues, how to recognize stress and its negative impact; identify ways to reduce stress, avoid triggers; and learn to manage stressful situations by developing coping skills. Background: Haverhill was noted to have a 10% suicide rate which is higher than Massachusetts rate of 7.7 per every 100,000 people. This project is important because it subtly addresses Haverhill’s high suicide rate by providing education on stress management to the target population of people with mental illness who may be at increased risk for suicide. Design/Methods: We created an educational program for Haverhill Clubhouse members to identify personal stressors and improve coping mechanisms. These Clubhouse members include a population with various mental illnesses ranging from anxiety, bipolar disorder and schizophrenia. In response to member requests, the topics of nutrition, medication, blood pressure, and smoking cessation were included. Interactive discussion was the primary format used to engage willing participants. As an introduction, members were encouraged to write down a personal stressor and then throw it away. Participants were then asked to write down a unique personal strength on a wooden stick to be used in the gardening exercise. At the end of the program, members were encouraged to plant seeds using their wooden stick as a marker, for growing and watching that strength flourish. Specific stress reduction techniques such as visualization were discussed. Healthy blood pressure ranges were identified. Dietary Approaches to Stop Hypertension (DASH) diet was discussed for maintaining overall health, reducing stress, and improving blood pressure. Stress and coping comprised approximately 70% of the program, with 30% covering the subtopics. Results: During our two-day presentation, we interacted with 25 participants at the Haverhill Clubhouse. We identified members that were willing to participate were able to identify personal stressors as well as coping mechanisms. Members at the Clubhouse were also able to ask appropriate questions related to our
subtopics of nutrition, medication, blood pressure, and smoking cessation. Discussion: Our goals were achieved successfully because of the number of participants, and at least 7 out of 15 participants were very interested in the topic and asked appropriate questions and gave positive feedback. Our initial community health problem focused on a high suicide rate, but stress, nutrition, medication management, hypertension, and smoking cessation are important topics to discuss. As a result, the project will ultimately address suicide prevention in our target population. The major limitations in our project were the amount of time we spent with the participants, the timing of our presentation, and the constant flow of people at the Clubhouse. Implications/Conclusions: Our community project had two major educational implications. First, the need to teach coping skills to people with mental illness is paramount in order for these individuals to manage their illness and face life challenges. Second, we demonstrated that a clubhouse can be a great setting to provide education to this population. Nursing interventions are valuable as there are clubhouses across the state and country much like the one we worked at. Also, these clubhouses provide a safe accepting environment for people with mental illnesses to learn life skills.

Loaiza, Natalie, Kaitlyn Kavaleria, Hayley Coughlin, Mary Effer, Michelle Forti, Joshua Gonzalez
Nursing
COMBATING CHILDHOOD OBESITY
(Advisor: Valerie King)

Purpose: To address the incidence of childhood obesity in Lowell, MA by increasing the nutritional awareness of children ages 7-12. Background: Lowell is an ethnically diverse community with 16.8% of residents living below poverty level and 23.6% of the children under age 18 live in poverty. The incidence of obesity in low income preschool children is 18%. Lower socioeconomic status may be related to obesity and other nutritional disparities. Methods: An educational program was designed and implemented in collaboration with the Boys and Girls Club of Lowell. The program consisted of a lecture, demonstration, interactive exercises, craft activities and games to teach principles of healthy eating. Age appropriate activities were tailored to address two age groups. Additionally, parents were given packets with related informational material to reinforce the learned content. Results: Both groups demonstrated an increase in nutritional knowledge at the conclusion of the program. Post survey was 73% compared to 43% in the 7-9 year olds and 76% compared to 35% for the 10-12 year olds. Discussion: The 10-12 year olds may have done better due to the fact that they were our second group. Overall, both group had an increase in nutritional knowledge as evidenced by the increase in post-surveys. Conclusions: Although many children in the U.S are suffering from childhood obesity, through small teaching sessions and activities, we as health educators will be able to make a difference in the future by enabling families to make better food choices.

Rebello, Amy, Adaeze Onwuakor, Brenda Giddings, Jessica Bell
Nursing
BREAST AND LUNG CANCER AWARENESS IN BILLERICA, MA
(Advisor: Valerie King)

Purpose: The purpose of this project is to address the incidence of breast cancer and lung cancer in Billerica, MA through increasing resident’s knowledge of cancer prevention and early detection. Background: The purpose of this project is to address the incidence of breast cancer and lung cancer in Billerica, MA through increasing resident’s knowledge of cancer prevention and early detection. Design/Methods: We implemented an educational session at a booth at the Billerica Health and Wellness Fair on March 31, 2012. Information about breast and lung cancer was displayed on a poster board. We provided handouts about cancer in both men and women from the American Cancer Society as well as resources regarding early screening and detection for both lung and breast cancer. Evaluation consisted of a short, five question survey to evaluate the learning experience for the participants. Results: The results will be presented in the poster that will indicate the effectiveness of our education method works to
increase knowledge and awareness of the attendees at the Health Fair on the topics of lung and breast cancer. Implications/Conclusions: Educating people about prevention and early detection and screening of lung and breast cancer will help improve knowledge about these common diseases. A long-term goal is reduction in mortality caused by lung and breast cancer in Billerica due to improved detection and actual prevention. Our project also taught us as a group about the importance of community health nursing interventions to help address healthcare issues in the town of Billerica.

Shah, Ruchika, Lauren Natale, Kerrilyn O’Laughlin, Krystal Peirce, Marcia Schleier, Elizabeth Vantassell

Nursing

BREAST CANCER AWARENESS IN WILMINGTON, MA
(Advisor: Alison Basmajian)

Purpose: The purpose of our breast cancer project was to raise awareness and increase knowledge in the town of Wilmington about breast cancer prevention, early detection, and nutrition strategies. Background: Statistical data researched during the community assessment revealed total of 101 cases of breast cancer over 5 years, with 46 cases in females above the age of 65—indicating a high-risk group. There were 36 cases of breast cancer in adults between the ages 45-64, and 19 cases in females between ages 20-44. Therefore, our target population was mainly women 45+; however, it was open to the public to benefit women of all ages. Methods: “Think Pink” health fair was held on April 5th, 2012 at Wilmington Senior Center. We utilized visual, written, tactile, auditory, and discussion teaching methods and had three “booths” with information on breast cancer. Booth one had information on prevention, specifically related to proper nutrition such as food rich in antioxidants, which help prevent breast cancer. Booth two presented material on mammogram screening. Participants learned in detail about mammograms, including frequency, locations offering mammogram testing close to the area, and insurance coverage. The third booth provided health education information relating to self-breast exams. Proper ways to perform self-breast examination was demonstrated, practiced, and discussed. Results: The survey information was analyzed to evaluate our success. The presented information raised awareness regarding Breast Cancer prevention and detection measures in the community through 20 active participants. Discussion/Conclusion: Our project was limited to the number of residents who attended the health fair and chose to visit our booth. Even with this limitation, we were able to achieve our overall goal of increasing knowledge on breast cancer. To conclude our event provided the Wilmington residents with breast cancer awareness kit.

Sherman, Stephanie, Claire Snow, Meghan Esposito, Alcia Espinola, Margarita Wheeler, Lindsay Korn

Nursing

BREAST CANCER AWARENESS IN TYNGSBOROUGH, MASSACHUSETTS
(Advisor: Valerie King)

Purpose/aims/research question: The purpose of this study was to evaluate and educate Tyngsborough residents while promoting breast cancer awareness. Despite Tyngsborough, Massachusetts’s small town quality and welcoming community they still have major health risks. Tyngsborough’s breast cancer rate almost triples the state rate. Background: The importance of this study is to promote awareness and educate the community about the risks of breast cancer. The death rate of Tyngsborough residents with breast cancer, 96.9%, is four times the state death rate, 21.1% [1]. There may be a correlation between the community’s awareness and increasing rates of breast cancer in the community. Education and awareness was found to be needed for the residents of Tyngsborough. Methods: This study took place in the Pheasant Lane Mall, located in Tyngsborough, MA and Nashua, NH. The team was composed of six qualified senior nursing students from the University of Massachusetts Lowell. The target population of this study was female Tyngsborough residents, but all mall goers were welcomed to participate. A booth
was set up in the middle of the mall with informational flyers, posters, and at least two nursing students at a time. Participants were asked to take answer a brief questionnaire to evaluate how aware they were of the different signs and symptoms, risks, and screening methods of breast cancer. After filling out the questionnaire they were provided with a brief education session, along with a self-exam shower card, t-shirt, and flyer. Their participation also secured a spot in the free raffle for a breast cancer awareness basket. Results: There were 78 participants total, with approximately a quarter of the participants male and the rest female. Their ages ranged from 15-80. The average score on the questionnaire was 75%. Approximately 41% (32 people) of the participants were actually from the town of Tyngsborough, while the rest came from the surrounding towns of Chelmsford, MA, Lowell, MA, and Nashua, NH. Of this 41% from Tyngsborough many of them were shocked to see how high the breast cancer rate was and required education while filling out their questionnaire. It was challenging targeting just the community of Tyngsborough, but this study was successful in promoting awareness and educating the public on an issue many new little about. Discussion: Although only a small amount of Tyngsborough residents participated in this study, surrounding town residents were able to access the information provided as well. Education was provided and awareness was promoted. Although a definite correlation cannot be determined as to why Tyngsborough’s breast cancer rate is so high, the topic has been made aware to the public. It was expected that many would not know how to answer all three parts of the questionnaire and that education would need to be provide, which was our goal. We were limited in participants for this study. Free t-shirts and prizes were used to lure in participants, but not all came from Tyngsborough. The information provided and visuals on display allowed a simpler view of a complicated topic. Education on breast cancer should be provided to both women and men of all ages. This health care problem cannot be solved, but education should continue to be provided throughout the community of Tyngsborough. Early detection and frequent screening can decrease the breast cancer death rate. [1] Massachusetts Community Health Information Profile. (2011, January 1). MassCHIP. Retrieved January 20, 2011, from MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

Snediker, Celeste
Nursing
BLOODBORNE PATHOGENS IN CRITICAL CARE NURSING
(Advisor: Margaret Knight)

Blood-borne pathogens (BBP), present a safety obstacle which healthcare workers (HCW) in Massachusetts have been unable to overcome despite the progress that has been made since the increased awareness of their dangers in the late 1980’s. The BBP of most concern in regard to the safety of HCW are hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). The Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA) have put forth guidelines that provide a basis for healthcare environments and facilities to make policies to protect HCW. Patients’ rights regarding BBP are strongly protected by guidelines established by the Society for Healthcare Epidemiology of America (SHEA), however, in Massachusetts; there is no parallel way to protect HCW. The purpose of this paper is to look at the current trends in protecting HCW from BBP as well as eliciting the barriers to further protection. Critical care nurses are especially at risk for exposure to BBP due to the environment and acute situations in which they work on a daily basis. Advocating for nurses are the nursing organizations which seek to promote the safety and wellbeing of nurses. Massachusetts is one of two states that requires written consent for HIV testing, and although the CDC has urged states to make testing routine, Massachusetts has refrained from progressing. Nurses in the state need to advocate for their profession in order to promote health, safety, and quality of life for themselves as well as their patients.
Surprenant, David, Joshua Clark, Melanie Wilcox, Emily Welsh, Jon Harvey, Usman Mughal
Nursing
PROMOTING BRAIN HEALTH IN BEDFORD, MASSACHUSETTS
(Advisor: Valerie King)

Purpose: To address the problem of potential dysfunction in health perception-health management pattern: Knowledge deficit of risk factors of health issues related to lack of comprehensive educational programs in Bedford, Massachusetts. Background: Bedford, Massachusetts was founded in the mid 1600’s. It is located directly in Middlesex County, with nearly a third (over 3,300) of the town’s population is over the age of sixty. Due to this it is important to address the need of health teaching and promotion for healthy aging and the prevention of such diseases as dementia. The Bedford Council on Aging is the only senior center in the town that can offer the elderly population guidance when needed. Methods: In order to address the issue for the need of health promotion and teaching, we plan to host a “Brain Health Fair” on March 30, 2012 at the Bedford Council on Aging. It will include an introductory activity then three different learning stations; Brain Food, Fit for Life, and Exercising Your Brain. Results: Out of everyone who attended the fair, twenty-three people completed our survey. Out of the 23 people, the results were:
• 87% were female and 13% were male
• 91.3% said they learned something new
• 87% said they could see themselves exercising more on a regular basis
• 74% said they would change their diet after what they had learned
• Foods participants listed that would promote better brain function included: cranberries, almonds, fish oil, blueberries, raspberries, fish, salmon, nuts, green veggies, flax, soy, water, fresh fruit, omega-3's, whole grains, vitamins, and broccoli. Discussion – We feel we met our goal in promoting brain health to the elderly living in Bedford. The majority who participated already had some basic knowledge on brain health maintenance strategies. We were able to build upon exciting knowledge and reinforce current healthy practices. Implications /Conclusions: There is a future educational need for the promotion of brain health as evidenced by the turnout at the fair, and the responses from the survey.

Chenery, Tara, Christine DePerrio, Randy Jean
Physical Therapy
IMPACT OF TRADITIONAL AND WII-BASED EXERCISE PROGRAMMING ON ACTIVITY LEVELS OF COMMUNITY DWELLING ELDERS
(Advisor: Gerard Dybel)

Purpose: Determine the impact of exercise-based programming on improving physical fitness in community dwelling elders between two groups: Traditional and Wii-gaming exercise groups. The primary goal was to determine the optimal exercise intervention for improving physical fitness levels. Methods: Two groups of community dwelling elders participated in an 8 week training session. Intervention groups were females ranging from 63-90 y/o, average age of 75.6 years. Additionally, a control group consisting of 12 community dwelling elders: 3 male and 9 female ranging from 68-90, average age of 79 years was recruited for comparison. All participants in the intervention groups received medical clearance and self-selected themselves into an intervention group. Group 1 received Wii-gaming exercises including: bowling, golf, tennis, boxing, yoga and balance/flexibility activities. Group 2 received a traditional exercise program including endurance, strengthening, balance and flexibility. Interventions included 16 sessions over 8-12 weeks lasting 35-40 minutes. Outcome Measures: (1) 2-minute walk test (2) Rate of Perceived Exertion and (3) accelerometer counts to demonstrate energy expenditure. Results: Statistically significant improvement in both intervention groups for two-minute walk test (p<0.005) and RPE (p<0.012) values from pre to post testing. Total kilocaloric energy expenditure values comparing pre to post training were statistically significant for 2 subjects in each group. No statistically significant difference was found between Wii and Traditional groups for total
energy expenditure. Conclusion: Based on the results it can be concluded that either a Traditional or Wii based exercise intervention may demonstrate improvement in fitness levels of community dwelling elders. Due to the improvements seen in both groups it cannot be concluded that one form of exercise was more beneficial than the other.

Como, Kim  
*Physical Therapy*  
**BREATHING PATTERNS DURING INCREMENTAL EXERCISE: ASSOCIATION BETWEEN TIDAL VOLUME, RESPIRATORY RATE, AND VENTILATION**  
(Advisor: Sean Collins)

This study describes tidal volume (Vt), respiratory rate (RR) and ventilation (Ve) patterns during incremental maximal exercise testing (VO2 max) in a retrospective sample of college students. There are four different patterns that can occur during incremental exercise: linear, plateau, upsloping, or downsloping. Linearity implies a proportional increase in Vt while workload increases. A plateau, upward deflection, or downward deflection indicates that at some point during incremental exercise Vt, RR or Ve either stops increasing (plateau), increases more rapidly (upward deflection) or starts to decrease (downward deflection). Methods: Data was obtained from 20 healthy college undergraduate students (male=7, female=13). Linear and cubic models were compared using a partial F test to determine which was a better fit to each subject’s Vt, RR and Ve response. Of the subjects with a cubic fit, beta coefficients were utilized to determine breakpoints and response patterns. Results: It was found that Vt patterns were nearly split between two categories, with 45% in the plateau group and 55% in the linear group. Respiratory Rate (RR) appeared to be split with, 45% represented through a linear model, and 55% following an upward deflection after a breakpoint in the cubic model. Ventilation (Ve) data varied with 10% plateau, 20% linear, and 70% representing an upward deflection. Conclusion: It was concluded that there are various breathing patterns present during incremental exercise testing in healthy college aged subjects. Tidal volume was shown to either plateau or continue to increase linearly, affecting respiratory rate and therefore overall ventilation patterns.

DiChiara, Rachel, Jillian Cunningham, Alyson O’Connell  
*Physical Therapy*  
**THE EFFECTIVENESS OF YOGA AS TREATMENT FOR BALANCE DYSFUNCTION IN COMMUNITY-DWELLING ADULTS: A SYSTEMATIC REVIEW**  
(Advisor: Deirdra Murphy)

Background and Purpose: Falls are the most common cause of injury and death in the older adult population resulting in increased hospitalizations and rising healthcare costs. Physical Therapists encounter a variety of patients with balance impairments who have fallen or are at risk for falls. Physical activity is a treatment strategy that has been proven effective for this population. Recently, alternative forms of physical activity, such as dance and Tai Chi, are becoming popular for balance treatment. Due to the similar principles and benefits of yoga, it has the potential to significantly improve balance in the adult population; however the outcomes remain unknown. The purpose of this systematic review was to assess the effectiveness of yoga as a treatment option for balance dysfunction. Methods: A comprehensive search was completed using six major databases. Articles were included if they met the following criteria: originated from a peer-reviewed journal, publication within the last ten years, male and female participants, aged 18 and up, yoga was the primary experimental intervention, and at least one outcome measure assessed balance. Case study designs were excluded. Three reviewers performed the selection of studies, data extraction and validation independently. Eleven articles met the inclusion criteria and were included in the review. Results: Of the eleven articles, the methodological quality ranged between a 2 and 5 on the PEDro scale. Eight of the eleven studies demonstrated significant increases in balance outcome measures post yoga intervention. Discussion: The results suggest that yoga
is a treatment intervention that yields positive outcomes in regards to balance in the community-dwelling adult population. Overall improvements in all outcome measures, including balance assessments, were observed in the majority of studies. Major limitations of the review include the low to moderate quality of articles and high variability between the length, duration and type of yoga intervention performed.

Conclusion: Although the current review demonstrates that there are many positive effects of yoga on balance and quality of life in the community-dwelling adult population, the evidence is inconclusive. Future research on the effectiveness of yoga as a treatment intervention for this population is warranted.

Forsythe, Erin, Shannon McInnis
Physical Therapy
THE EFFECTS THAT EXERCISE AND RELAXATION HAVE ON HEART RATE VARIABILITY IN YOUNG ADULTS WITH AUTISM
(Advisor: Deirdra Murphy)

Background: Individuals with Autism Spectrum Disorder (ASD) tend to have an increase in overall stress levels which may limit their ability to interact within their social environment. The incidence of ASD is increasing, in boys more than girls. Exercise has been shown to improve overall health. Examining alternative non pharmacological interventions for stress management is critical for optimizing function and quality of life for individuals with ASD. Purpose: The aim of the study was to examine the effect of exercise and relaxation on stress in adolescents and young adults on the autism spectrum after a 9-week fitness program. Participants: Fourteen individuals with ASD participated in the exercise intervention program with ages ranging between 14 and 25 years. Methods: The fitness program included 7 weeks of exercise interventions and 2 weeks pre and post outcome measures. The exercise intervention program was comprised of low intensity exercise designed to improve balance, strength, coordination and overall fitness level. Relaxation techniques were administered at the beginning and end of each session which included deep breathing to ensure correct resting measurements of each individual’s heart rate. Data on heart rate variability (HRV) were taken 10 minutes prior and post exercise intervention each week using a Holter heart rate monitor, chest strap, and watch. Analysis: Pre and Post fitness measures over the nine week program were analyzed using a parametric t-test. Both time and frequency domain measures of HRV were calculated. Results: Pre and Post fitness screen scores were statistically significant positive changes at a p-value of 0.05 in bilateral Zipper tests for flexibility. RMSSD values were found to decrease over the 9-week exercise intervention. Conclusion: Data revealed improvements in strength and flexibility. Although overall fitness levels improved, HRV measurements yielded contradictory results. Implications: Further research utilizing exercise as a method for decreasing stress and anxiety in the ASD population is needed.

Iby, Christopher, Raymond Goddu, Sebastien Poirier
Physical Therapy
ESTABLISHMENT OF NORMATIVE DATA FOR RANGE OF MOTION OF THE GLENOHUMERAL JOINT WITH RESPECT TO AGE AND GENDER
(Advisor: Joyce White)

Objective: Determining normative glenohumeral range of motion (ROM) values for adults, and the effects of age and gender on these values. Background: Shoulder complex ROM occurs through movements of four joints: glenohumeral, acromioclavicular, sternoclavicular, and scapulothoracic. Often shoulder complex ROM is inadvertently measured when assessing glenohumeral joint pathology. Providing normative values for ROM of the glenohumeral joint in isolation will establish a standard that can be utilized in treating glenohumeral joint pathology. Methods: Ninety subjects, without shoulder pathology had their dominant arm glenohumeral ROM measured in flexion, abduction, internal rotation (IR), external rotation (ER), and extension. The scapula and clavicle were stabilized during measurements to isolate the glenohumeral joint. There were three age groups that each had 15 males and 15 females. Two-
way analysis of variance (ANOVA) was utilized to determine statistically significant differences between age groups and gender. Results: Mean glenohumeral ROM for all subjects was 117.7° (+ 14.1°) flexion, 123.3° (+ 10.6°) abduction, 50.4° (+12.7°) IR, 80.9° (+ 13.8°) ER, and 26.1° (+ 6.5°) extension. Mean ROM was significantly greater in the youngest group (18-39 years) compared to the oldest group (61-90 years) for glenohumeral flexion (10.3°, p=.015), abduction (6.9°, p=.036), and IR (9.9°; p =.008). Females had a greater mean flexion (8.1°, p=.004), abduction (8.3°, p=.000) and IR (8.4°, p=.001) ROM compared to males. Conclusions: Evidence of differences in normal ROM between genders, and a decreasing ROM with aging were noted. Findings indicate that glenohumeral flexion, abduction, and IR ROM values are greatest in younger and female populations.

Jarjoura, Nicholas, Michael Caeran, Ryan Burke  
*Physical Therapy*  
**IN VIVO ANALYSIS OF INTERSTITIAL FLUID POST INTRAMUSCULAR MANUAL THERAPY (DRY NEEDLING): PILOT STUDY**  
(Advisor: Danielle Day)

Introduction: Myofascial trigger points (MTrPs) cause persisting pain in patients presenting with myofascial pain syndrome. The underlying mechanisms responsible for the persistent nature of MTrPs are poorly understood. Local ischemia near the MTrPs may prevent aerobic metabolism and therefore relaxation of the contracted muscle. Intramuscular manual therapy (IMT), formerly “dry needling,” has been shown to alleviate MTrP-associated pain, potentially through reduction of concentrations of muscle metabolites known to alter aerobic metabolism. To date, no studies have directly measured biomarkers released after IMT to confirm or deny this hypothesis. AIM: To investigate the feasibility of using microdialysis to sample interstitial fluid within a MTrP, in vivo, immediately following IMT and to measure lactate and pyruvate concentrations within that interstitial fluid for comparison with a non-treated MTrP. Methods: Three males and one female met the inclusion criteria for presence of MTrPs in bilateral upper trapezius (assessed via physical exam) and were enrolled for participation after giving informed consent. Left and right upper trapezius were randomized to either an experimental (IMT) or control (no IMT) group. IMT was performed using the pistoning technique to the upper trapezius MTrP, followed by implantation of microdialysis catheters into bilateral upper trapezius MTrPs for a two-hour collection. Samples taken at 10-minute intervals were analyzed for concentrations of pyruvate and lactate. Results: We expect that, compared with baseline, interstitial lactate concentrations will be significantly lower at the end of a 120-minute sampling period only in the IMT-treated MTrP. Conclusion: Data currently under analysis.

Lee, Corinne, Erin Foley  
*Physical Therapy*  
**ASSESSMENT OF CONSTRUCT VALIDITY OF THE HEALTHY CAMPUS CAMPAIGN QUESTIONNAIRE**  
(Advisor: Cynthia Ferrara)

Purpose: To identify the underlying factor structure a priori using an exploratory factor analysis and to assess the construct validity of the Healthy Campus Campaign Questionnaire (HCCQ) as a measure of health behaviors within the college campus community. Methods: A 35-item general health questionnaire was distributed to students, faculty, and staff at the University of Massachusetts Lowell over a five year period. An exploratory factor analysis was performed using the data from 567 completed questionnaires in order to identify the underlying factors of the HCCQ. Results: A principal components analysis (PCA) was performed on 14 items of the HCCQ. The Kaiser-Mayer-Olkin (KMO) measure demonstrated a sampling adequacy of 0.626. Five factors were extracted based on Kaiser’s eigenvalue method, accounting for 55.95% of the total variance. A varimax orthogonal rotation was used to maximize factor loadings. The following 5-factor solution emerged: campus environment, personal
health habits, sidewalk maintenance, self-image, and campus traffic and transportation. Conclusion: The clinical utility of the HCCQ as a measure of health behaviors among individuals within the campus community seems favorable at this time; however, additional research and pilot testing are still needed for instrument refinement. A confirmatory factor analysis is recommended as the next step to ensure construct validity. Before implementing strategies within the campus community, validation of the HCCQ as a measure of health behaviors of individuals across campus is imperative.

Pedicini, Robert, Ross Robarge, Marissa Hold

*Physical Therapy*

**EFFECTS OF OVERFEEDING ON RESTING METABOLIC RATE**

(Advisor: Danielle Day)

It has been hypothesized that overfeeding may elicit an increase in resting metabolic rate (RMR) as a natural homeostatic response to regulate energy storage. However, due to contrasting levels of sex hormones in males and females this response could be highly variable between sexes. Therefore, the intent of this analysis was to explore sex differences in the RMR response to overfeeding and provide insight on why some gain more weight than others. Women in the early-follicular (EF) and mid-luteal (ML) menstrual phases were also included to detect any metabolic differences due to hormonal fluctuations specific to those phases. Methods: RMR was measured before and after a 3-day period in which subjects (n= 4f, 5m) consumed a 50% surplus of their usual caloric intake in the form of ice cream based on original RMR and a physical activity factor. Subjects were divided into two groups based on gender. Women were tested in both the EF and ML phase of their cycle. Results: In response to overfeeding RMR increased in males and EF group (M +58, EF +61 kcal/day). Decreases were observed in ML group (-67 kcal/day). Conclusion: No significant differences were observed between males and females in the EF phase of the menstrual cycle. The distinct contrast between the EF and ML group suggests a hormonal fluctuation between these two phases that impacts RMR response to overfeeding. Further research should be invested to isolate the source of the fluctuation.

Raymond, Jennifer, Allison Buckley

*Physical Therapy*

**SALIVARY IMMUNOGLOBULIN A AND PERCEIVED STRESS IN COLLEGIATE ATHLETES**

(Advisor: Cynthia Ferrara)

Purpose: The purpose of this study was to examine changes in sIgA and perceived psychological stress in collegiate level track and field athletes over competitive and non-competitive seasons. Methods: Eight athletes between the ages of 18 to 22 participated in this study between September 2009 through April 2010 during competitive and non-competitive seasons. Four subjects met the inclusion criteria for statistical analysis. Levels of general stress, emotional stress and social stress were measured through the Recovery-Stress Questionnaire for Athletes Sport Survey; levels of sIgA were analyzed by obtaining saliva samples from the athletes each week. Correlations between sIgA and three RESTQ stress constructs were performed. Comparisons between competitive and non-competitive seasons were performed using unpaired t-tests. Statistical significance was at p<0.05. Results: Levels of sIgA and stress between competitive and non-competitive seasons showed minimal differences, with a statistically significant difference noted for general stress values for one subject. Correlations between changing sIgA and stress levels also yielded little significance, with only one subject demonstrating a significant correlation between sIgA and social stress (r = -.580). Discussion: This study demonstrated that much inter-subject variability exists in regards to levels of sIgA and stress in athletes. It could be speculated that such variability may be due in part to individual immune characteristics as well as the level of intensity of each athlete’s training protocol. Further research in this area is needed to examine the relationship between sIgA and stress. [Buckley, A., Raymond, J]
Silvia, Pamela  
*Physical Therapy*  
**STRESS, ATHLETIC COMPETITION AND EFFECTS ON SALIVARY CORTISOL**  
(Advisor: Cynthia Ferrara)

Purpose: The purpose of this literature search was to investigate the effects of competition-related stress on salivary cortisol. Methods: The current review is based on the findings from an extensive search of the OvidMedline and PubMed databases, which was accessed through the University of Massachusetts Lowell login. Limits were set on the databases to only search for articles that used human subjects and those that were published in English. The inclusion criteria included (1) an athletic activity must be involved in the study, (2) cortisol must be measured with salivary means, and (3) participants of the study must be 18 years or older. Results: Of the 12 studies identified, nine studies showed a significant increase in cortisol concentrations with athletic competition, whereas the remaining three showed a trend in increasing cortisol concentrations without statistical significance. Six of the 12 articles looked at cortisol concentrations over a single athletic competitive event, and the remaining six looked at concentrations over a multiple competitive event/tournament or over a complete athletic competitive season. Conclusions: According to these findings, it can be concluded that cortisol concentrations do increase significantly during an athletic competition and from the stress associated with an athletic competition. Further research is needed to determine if the relationship between increased cortisol concentrations and competition-related stress is an association, or in fact is a causal relationship.

Skeldon, Jason, Timothy Duffy  
*Physical Therapy*  
**VERTEBRAL LIGAMENTS IN SQUAMATE REPTILES**  
(Advisor: Bruce Young)

One of the key specializations that occurred during the evolution of snakes from a monitor lizard-like ancestor was a dramatic increase in vertebral mobility. To document the anatomical basis of this increased vertebral mobility we compared the morphology of the four main intervertebral ligaments from three different areas of squamate reptiles: the (relatively stiff) mid-trunk region of the water monitor lizard (*Varanus salvator*), the (moderately flexible) mid-tail region of *V. salvator*, and the (highly flexible) mid-trunk region of the yellow anaconda (*Eunectes notaeus*). The results of the study revealed that the differences in relative mobility among the three body regions cannot be explained by the anatomical differences in the intervertebral ligaments.

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