17th ANNUAL Student Research & Community Engagement Symposium 2014
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This study presents a fuzzy lung allocation system (FLAS) in order to determine which potential recipients would receive a lung for transplantation when it becomes available in the USA. The developed system deals with the vagueness and fuzziness of the decision making of the medical experts in order to achieve accurate lung allocation processes in terms of transplant survival time and functional status after transplantation. The proposed approach is based on a real data set from the United Network for Organ Sharing (UNOS) to investigate how well it mimics the experience of transplant physicians in the field of lung allocation. The results are very promising in terms of both prediction accuracy (with an R2 value of 98.73%) and interpretation capabilities and hence are superior to the existing techniques. Furthermore, the proposed decision process provides a more accurate, effective, and systematic decision support tool for this problem with two criteria being considered i.e. graft survival time and functional status after transplantation.

This research addresses the characterization of metabolic pathways in the production of biopharmaceuticals. The effects of variability in the constituents of raw materials that drive the chemical reactions in the generation of end products are analyzed. An analysis of CHO cells in response to eleven different sets of wheat hydrolysate inputs is carried out using metabolic flux analysis. The input data includes a control set and six sets that have a range of composition variation. The input variation was analyzed to determine the variation of extracellular flux rates. The stoichiometric matrix is formed by metabolites and their respective reactions. A linear program was employed using biomass as the objective function to be maximized. The optimum intracellular metabolic fluxes are found with given constraints. The impact of raw material variability with respect to the calculated intra and extracellular flux rates is investigated.

Liposomes are a promising drug delivery vehicle to target cancer cells and deliver agents to the diseased tissue. Most cancer drugs are poorly water-soluble which limits their effectiveness and increases the toxicity to body. Since their solubility is a problem, drugs are administered using surfactants that create severe dose-limiting toxicity. To overcome these solubility issues, liposomes offer a practical solution. Using liposomes, both hydrophobic and hydrophilic drugs can be encapsulated and delivered to the diseased tissue. Moreover, liposomes can be easily modified with ligands to generate targeted drug delivery. With targeted delivery, the toxic drug or agent can be delivered specifically mostly to the
cancerous site in the body reducing collateral damage to health tissue. In this study, verteporfin or Benzoporphyrin derivative monoacid (BPD) was chosen as photosensitizer that can be used for photodynamic therapy. In photodynamic therapy, the non-toxic photosensitizer (BPD) is remotely irradiated by light to initiate formation of toxic molecular species that destroy the tumor cells. BPD-loaded liposomes were synthesized and characterized in terms of size, zeta potential, drug encapsulation efficiency. These liposomes were targeted towards breast cancer cell line (MDA-MB-231) in vitro. Curcumin is another drug that has been encapsulated inside targeted liposomes and can produce cancer cell killing in the presence or absence of light. Results from these studies will be presented.

Fylaktou, E.
Biomedical Engineering and Biotechnology
PHARMACEUTICAL IMPLANTS: DRUG INCORPORATED ANTIMICROBIAL SUTURES FOR MEDICAL APPLICATIONS
(Advisor: Stephen McCarthy)

Surgical Site Infections (SSIs) are acquired by patients during hospitalization for treatment of irrelevant medical conditions. SSIs are the second most common type of healthcare associated infections in the United States, accounting for 20% of post-surgery hospital infections in surgical patients. Dispersion of a pharmaceutical agent into a polymeric fiber that can be used as an antimicrobial suture can eliminate the development of SSIs via the increase in bioavailability and the inhibition of bacterial growth caused by sustained, localized delivery of the antimicrobial agent at the infected site via the diffusion mechanism. Hot Melt Extrusion (HME) has received considerable attention from both the pharmaceutical industry and academia as a novel design and manufacturing method for delivery of pharmaceutical agents. HME is a stable, continuous, economical, massive production procedure that results in improved content uniformity due to intense agitation and mixing of the extruded components. This work focuses on the blending of Ethylene-co-Vinyl Acetate (EVA) and Polycaprolactone (PCL) with Tetracycline Hydrochloride (TC HCl) via HME, in two separate formulations and the development of antimicrobial fibers for surgical suturing applications. Thermogravimetric Analysis was performed to investigate the blending ratio of the polymer versus the antimicrobial agent. Tensile testing proved the fibers’ mechanical properties as sutures and Scanning Electron Microscopy images were used to characterize the fibers’ morphology.

DeJesus Vega, M.
Chemical Engineering
CELL SEPARATION IN MICROFLUIDIC DEVICES
(Advisors: Nese Orbey, Carol Barry)

Separation of white blood cells from red blood cells is the first step in the analysis of blood. Separation of cells in microfluidic devices is performed by different approaches such as hydrodynamic, microfiltering, acoustic, electrokinetic, dielectrophoretic, and magnetic approaches. Microfiltration is the simplest of these approaches. Different microfiltering approaches are: weir, pillars, membrane, cross-flow, tortuous channels designs, between others. This project presents a review on the different designs that have been previously used and the efficiencies obtained. These devices are fabricated using photolithography techniques with silicon. It has been shown that cross-flow filters avoid the clogging and jamming problem encountered with other designs. Moreover, higher efficiencies were obtained using the cross-flow filters. Separation efficiencies of around 70-95% for trapping WBCs have been achieved.
Sudur, F., Orbey, N.  
Chemical Engineering  
HYDROGEN PEROXIDE STABILITY IN SILICA XEROGELS  
(Advisor: Nese Orbey)

Hydrogen peroxide is an environmentally friendly oxidant whose disproportionation products are oxygen and water, with applications ranging from sterilization to catalysis. The shelf-life of hydrogen peroxide is very limited due to its propensity to disproportionate exothermically in the presence of certain catalytic impurities such as metal ions. Aqueous solutions of H2O2 can be stabilized in the presence of acid, which can promote peroxide encapsulation into stable matrices of certain size. Lipid gels and biodegradable polymer matrices containing hydrogen peroxide are known, but organic matrices tend to degrade upon storage and/or allow for rapid H2O2 release in the presence of moisture. In the present work, a xerogel is formed upon polymerization and drying of ion exchanged sodium silicate solution. Stabilization of hydrogen peroxide is achieved in xerogels due to strong interaction between hydrogen peroxide and silica network. Under certain conditions, the resulting xerogels contain variable, but significant fractions of hydrogen peroxide and are stored at room temperature up to 140 days. The morphology, hydrogen peroxide loading, and release rates of hydrogen peroxide are discussed. The solid-liquid phase transitions of hydrogen peroxide in silica xerogels are also investigated as a function of hydrogen peroxide concentration using differential scanning calorimetry (DSC).

Sundararaman, D., Adejumo, A., Sohal, I., Tsiros, C.  
Chemical Engineering, Biology  
EFFECT OF METFORMIN ON BREAST CANCER CELLS AT VARYING GLYCEMIC LEVELS  
(Advisor: Prakash Rai)

Metformin, the most common first-line drug in the treatment of type-2 diabetes, has been shown in previous studies to reduce breast cancer risk, improve survival, and increase the effectiveness of chemotherapy. Numerous Phase III clinical trials are currently evaluating the benefits and best uses of metformin in breast cancer patients. While metformin has been associated with chemo-preventive attributes, encapsulated paclitaxel (in albumin bound nanoparticles) - Abraxane is a chemotherapeutic drug with more cytotoxic effects. In this study, the effects of both metformin and Abraxane are tested on MCF-12A cells (Non-tumorigenic breast cell exhibiting hyperplasia) versus MDA-MB-231 cells (Triple-Negative Breast Cancer cells). As a non-cancerous cell line, the MCF-12A cells should have been more vulnerable to the effects of both Abraxane and metformin, which was shown with this study. Both the MCF-12A and MDA-MB-231 cells exhibited similar EC50’s when incubated with these drugs for 72 hours. As a drug impacted by the glycemic levels, metformin’s role is studied under the effects of normoglycemic and hyperglycemic levels along with a focus on Abraxane to examine the difference between chemotherapeutic and chemo-preventive drugs. Future work will include testing these drugs in 3D acinar structures, which would be more representative of breast cancers as compared to conventional monolayer cultures. Results of this study may help guide dosing - patients with high glucose may require different doses of the drug metformin to achieve the same anti-cancer activity as patients with normal glucose levels.

Butera, H.  
Civil and Environmental Engineering  
TOWN OF LEXINGTON STORMWATER MONITORING PROJECT  
(Advisor: Edward Hajduk)

During 2013, the University of Massachusetts Lowell American Society of Civil Engineers (ASCE) student chapter started a unique partnership with the Town of Lexington’s Department of Public Works (DPW) Engineering division. The partnership consists of 24 UMass Lowell students collecting and
analyzing water samples from Shawsheen River watershed outfalls. The students are divided into six field sampling teams, known as Stream Teams, and a data analysis team. Field sampling teams record various conditions at the time of sampling (e.g. temperature, precipitation) and collect water samples for laboratory testing. Laboratory testing is used to determine the presence and/or quantities of Escherichia coli (E.coli), surfactants, and ammonia. Elevated concentrations of these parameters are used as indicators to determine the source of contamination into the storm water system. In addition this program is supplementing the laboratory testing for ammonia concentration with field test kits recommended by Environmental Protection Agency (EPA) Region 1. The ammonia concentration from the laboratory results will be compared with those from the field test kits. This will help to determine the effectiveness of the test kits in this application. The collaboration between the UMass Lowell ASCE Student Chapter and the Town of Lexington provides the Town of Lexington with additional testing and analysis support to meet an unfunded mandate relating to storm water run-off from the EPA while at the same time providing real world experience to the students. It is hoped this program can serve as a model for other municipalities seeking to meet the EPA unfunded storm water mandate.

Owusu Twumasi, J.
Civil and Environmental Engineering
DIELECTRIC MODELING OF CEMENTITIOUS MATERIALS
(Advisor: Tzuyang Yu)

The civil infrastructure systems (e.g., bridges, buildings, tunnels) in the United States are deteriorating due to aging, excessive loading, inadequate maintenance and severe environmental conditions. Maintaining these deteriorated infrastructure systems has become an important and urgent issue to the nation as well as worldwide. The use of non-destructive evaluation (NDE) techniques (e.g., radar) for condition assessment of deteriorated infrastructure systems is an effective approach for preserving the sustainability of these systems. Among existing NDE techniques, radar NDE utilizes the interaction between radar signals (electromagnetic waves) and materials (e.g., cementitious materials) for surface and subsurface sensing. This interaction is based on the dielectric properties of materials. In the success of radar inspection, it is imperative to develop models capable of predicting the dielectric characteristics of the materials under investigation, which is the focus of this research. Two models are developed for oven-dried and room conditioned cementitious materials (cement paste and cement mortar). Modeling results agree with the experimental data measured by our group. Additionally, an inverse algorithm capable of predicting the water-cement ratio of the specimens is proposed.

Sullivan, C.
Civil and Environmental Engineering
DISPOSABLE VOLTAMMETRIC SENSOR FOR THE DETECTION OF HEAVY METALS
(Advisor: Pradeep Kurup)

Elevated concentrations of heavy metals in groundwater and soil present a significant health risk. Ingestion of high levels of heavy metals can cause damage to the nervous system, gastrointestinal system, kidneys, and liver. Current methods of metal detection involve sampling water from the contaminated site and subsequent transportation to a laboratory for testing. This process is both costly and time consuming. This research presents a novel disposable voltammetric sensor for identification and characterization of heavy metals in water. The disposable voltammetric sensors, consisting of a bismuth electrode and carbon paste electrode, have the potential to analyze a broad range of heavy metal concentrations, with low cost and maintenance. Experiments were conducted using carbon screen printed electrodes and bismuth screen printed electrodes for the detection of lead in water. The sensors were able to detect concentrations between 50 ppb and 1 ppm of lead. Several parameters were extracted from each electrode response, including the height, area, slope and location of the resulting peaks in current output. Powerful machine learning techniques were then used to interpret the extracted parameters and predict concentration.
DESIGN OF A TEXT ADVENTURE GAME
(Advisor: Kavitha Chandra)

In this project, an interactive text adventure game was designed, written, and implemented into a computer program by students from Haverhill High School. The game consists of three different difficulty levels which are based on three different stories written by the creative members of the team. The game begins with the user inputting which level they would like to play on - the harder the difficulty, the fewer mistakes the user is allowed to make in order to win. The coding members of the team wrote the game in the Java programming language. This purpose of this game is to expose high school students to computational thinking and computer programming.

THE OPTICAL LOSSES SUPPRESSION IN METAMATERIALS
(Advisor: Alkim Akyurtlu)

Metamaterials (MTMs) are artificial materials engineered to provide properties which "may not be readily available in nature". Some promising applications are the creation of super lens and optical clocking/invisibility. However, to realize useful MTMs using current approaches appears to be far to resolve, because they suffer from a common problem: the optical losses. These losses for MTMs become more significant in the near infrared and visible region, which considerably restrict their usefulness. Many efforts have been proposed to compensate these losses, including the nano-plasmonic laser approach with optical gain, or the usage of quantum optics coherence approach. However, these approaches have far not been able to resolve the optical losses problem. In this work, a novel mechanism for reducing the optical losses in MTMs as well as optical materials based on noble metals and semiconductors is theoretically proposed and is experimentally validated. This new mechanism is based on the theory of Bichromatic Loss Suppression, or simply the parametric two-wave coherent coupling technique, rather than the traditional one wave irradiation method. This study shows that by adjusting the parameters phase shift between the probe and support waves, and their amplitudes, the optical losses can be considerably reduced to near zero.

RANDOM BEAM PATTERNS FROM LINEAR ARRAYS
(Advisors: Kavitha Chandra, Charles Thompson)

The design of linear microphone arrays with randomly spaced elements is investigated. The probability distribution function for the element positions is derived in the continuum limit by matching the response of the array to an objective beam function. An analysis of the expected value and variance of the beam is presented as a function of the angular direction. Comparison of these metrics to those generated from uniformly distributed array positions is conducted. The number of elements and random ensembles required to meet a desired sidelobe level is obtained. It is found that using a probability density function of a particular beam pattern can reduce the side lobe levels of the random samples of the transducer positions.
Bhatta, A.  
*Electrical and Computer Engineering*  
**ANALYSIS OF RESPONSE OF AN ACOUSTIC WAVEGUIDE IN A THREE LAYER MEDIUM**  
(Advisor: Charles Thompson)

This work investigates the response of an acoustic waveguide to a point source formed when three mediums of different characteristic properties interact. The middle layer behaves as the waveguide. It is of a particular interest when the speed of sound in the middle layer is faster than that in the other two mediums. The approach demonstrates the contribution of geometrically constructed image sources to the response.

Bhowmik, L., Armiento, C., Akyurtlu, A., Chirravuri, J., McCarrol, C.  
*Electrical and Computer Engineering*  
**DESIGN OF PRINTED X-BAND PATCH ANTENNA ARRAYS WITH SWITCHED LINE PHASE SHIFTERS**  
(Advisors: Craig Armiento, Alkim Akyurtlu)

Microstrip phased array antennas printed on flexible substrates have broad applications in radar, aerospace, point-to-point communications, operations (e.g., RFID) and health monitoring. We report on the design, fabrication and characterization of 1x2 and 1x4 microstrip arrays operating at 10 GHz. The radiation characteristics of the arrays were simulated as a function of bending radius for three different bending configurations: concave, convex and longitudinal concave. Simulations examine the impact of bending radius and the number of radiating elements on performance compared to the planar case. As the number of radiating elements increases, the mutual coupling between patch antennas plays a vital role in the performance of the arrays. The results indicate that there is not a significant degradation in array performance until the substrate bending radius is below $20\lambda_o$. As shown in Fig. 1(f) and 1(g), for extreme bending (e.g., $[R=\lambda_o]_o$), $S_{11}$ significantly shifts to lower frequency whereas for longitudinal concave these shift observed lower than others. Also, for longitudinal concave arrays, the half power beam width (HPBW) remains almost unchanged though extreme bending of the substrate occurs (e.g., $[R=\lambda_o]_o$). Finally, antenna arrays were optimized and simple switched line phase shifters were designed and implemented to steer the beam. Moreover, phase compensation for these antennas, when conformed, are analyzed. Antennas were fabricated using an additive manufacturing printing technique (aerosol jet) on Kapton substrates. In addition, the design of phase shifting elements in the arrays will be discussed as well as designs of different feed structures. The details of the printing techniques for the array with details on the material selection and phase shifters will be provided.

Deylamsalehi, A.  
*Electrical and Computer Engineering*  
**ENERGY-COST AWARE ROUTING USING REAL-TIME PRICING OF POWER GRIDS**  
(Advisor: Vinod Vokkarane)

Information and communication technology (ICT) plays an important role in worldwide electricity consumption. Up to 4.6 percent of global energy consumption are estimated to be caused by data centers and communication infrastructure. Energy reduction is a main goal of operators seeking to reduce operational expenses. Existing routing strategies, oblivious to location dependent energy prices, incur considerable cost to network operators. This study proposes a new approach to take advantage of today’s power system to increase the cost-efficiency of routing. During the last two decades, the liberalization of energy markets introduced the concept of real-time pricing (RTP). The RTP model encourages consumers to reduce their consumption during peak hours or shift the demands to off-peak hours. The utility companies are charging higher prices during peak hours and offer discounted prices during off-peak times. We propose an algorithm to find the best manner of transferring data between two sites that avoids
costly peak charges. The proposed approach is based on the advantages of using dynamic routing. Depending on the real time energy price alternative geographical paths in wide area networks are preferable. In a realistic large-topology network scenario we show the effectiveness of the approach resulting in a significant reduction of operational expenses.

Gandhi, P., Chandra, K., Thompson, C.
Electrical and Computer Engineering
THROUGHPUT ANALYSIS FOR UNLICENSED USERS
(Advisors: Kavitha Chandra, Charles Thompson)

In this research the throughput performance of unlicensed (secondary) users sharing radio spectrum with a licensed (primary) user is analyzed. A six state Markov model based on primary user’s channel access statistics is designed for secondary sensing, transmission and back off protocol. The mean time to successfully transmit a secondary packet is derived using an absorbing Markov chain and verified using the simulation results. It is determined that secondary throughput decreases as the primary user duty cycle increases. Contour plots for secondary throughput are derived as a function of normalized back off and secondary packet sizes. The secondary user throughput sensitivity is also analyzed in the presence of an additional cooperative or non-cooperative secondary user.

Haghzadeh, M., Bhowmik, L.
Electrical and Computer Engineering
PRINTED TUNABLE MINIATURIZED FREQUENCY SELECTIVE SURFACE WITH BST/POLYMER COMPOSITE FILLED INTERDIGITAL CAPACITORS
(Advisors: Alkim Akyurtlu, Craig Armiento)

We present an electrically tunable Frequency Selective Surface (FSS) at X-band utilizing a novel version of Interdigital Capacitors (IDCs), in which the space between fingers are filled with a ferroelectric composite of Barium Strontium Titanate (BST) suspended in a polymer. We also introduce a low temperature, printed fabrication process on flexible films. A composite by mixing micro and nano size particles of sintered Ba0.55Sr0.45TiO3 with a thermoplastic polymer, that has very low loss tangent at high frequencies, was prepared. It was found that when the key parameters – particle size and volume fraction – are tailored, high dielectric tunability up to 30% and low loss tangent are obtained for the composite, but the dielectric constant can be as low as 30 for high RF frequencies. To get around the low permittivity limitation, we introduced the filled IDC configuration that requires a dielectric constant as low as 20 for a frequency sweep range from 5.6 GHz to 12.8 GHz including full X-band (based on full-wave electromagnetic simulations), instead of the conventional IDCs with fingers on top of a BST ceramic layer that would require epsilon of few hundreds. Although, we demonstrate the implementation of this tunable filled IDC on FSS structures, this printable varactor can be utilized in several applications such as phase shifters and phased arrays.

Katz, D., Kim, D., Lenthal, M., Merousis, A., Sundramaupthy, N., Kim, J.
Electrical and Compute Engineering
AN ANALYTIC FORM FOR GALACTIC LUMINOSITY PROFILES
(Advisor: Kavitha Chandra)

The Sersic form has traditionally been used to model radial galactic luminosity profiles because of their near-linearity on a log-log scale. The negative exponential of a power, it fits a wide range of galaxy types quite well making its fitting parameter useful for classification. However, many astronomical/astrophysical calculations require integrals involving a galaxy's luminosity profile, and in those situations the Sersic form is very unruly. In recent years Spergel has proposed a power times a
Bessel function as an alternative. In this work we investigate the Spergel profile by comparing its goodness-of-fit with that of the Sersic profile for a sample of galaxies.

Li, P.
*Electrical and Computer Engineering*

**TRANSFORMER: RUN-TIME REPROGRAMMABLE HETEROGENEOUS ARCHITECTURE FOR TRANSPARENT ACCELERATION OF DYNAMIC WORKLOADS**
(Advisor: Yan Luo)

Heterogeneous architectures face challenges on resource allocation to cores and accelerators as well as transparent acceleration. We propose "Transformer", a run-time reprogrammable, heterogeneous architecture with cores and reconfigurable logics for supporting coarse-grained acceleration of dynamic, unpredictable workloads presented in mobile and cloud computing environments. The architecture allows run-time instantiation of one or more acceleration functions in an on-chip reconfigurable logic in response to the demands of compute-intensive software libraries. We design a hardware controller and software wrapper functions to profile workloads, reprogram the logic and invoke accelerators. Novel heuristics are derived to schedule accelerator functions. We explore the optimal chip resource allocation for cores and accelerators. Our simulation results show that Transformer brings significant improvement on both performance (up to 14x for single-type workloads and up to 2.3x for dynamic workloads) and energy efficiency (up to 6.9x) for a wide range of workloads.

Miniter, J., Doan, C.
*Electrical and Computer Engineering*

**GRAPH BASED CHARACTERIZATION OF US AIR TRAFFIC**
(Advisor: Kavitha Chandra)

This research investigates air traffic data in the eastern time zone of the United States. ASDI flight data were mapped to adjacency graph structures with nodes representing airports and undirected edges representing departure-arrival pairs. Structural metrics such as strength and degree were used to characterize the graphs and visually represented. The degree distribution of aggregate traffic is found to exhibit a power law decay rate. The origin of this scale-free behavior is examined. The hypothesis is that persistent components in the graph occurring at ranging periodicities may result in scale-free structures. This is investigated by design of filters that identify and remove repetitive components in the graph.

Misiunas, N., Chandra, K., Thompson, C.
*Electrical and Computer Engineering*

**ANALYSIS OF DIRECTIONAL BEAM PATTERNS FROM FIREFLY OPTIMIZATION**
(Advisors: Kavitha Chandra, Charles Thompson)

An analysis of the positional distributions of the elements of a linear antenna array is conducted. The movement and clustering of fireflies based on their intensity is applied as an optimization technique to determine the element positions that achieve a desired radiation pattern, consisting of a main beam bandwidth and sidelobe level. The expected value and variance of the resulting beam pattern with respect to angular position and probability distribution of inter-element distances as the number of elements are discussed. It is shown that the distribution for inter-element distances that meet the desired radiation pattern yields a bimodal structure, one where arrays consisting of a high number of elements experience clustering, with elements having a higher probability of being spaced closer together.
Nguon, C., Chandra, K., Thompson, C.
Electrical and Computer Engineering
DIFFERENCE-FREQUENCY GENERATION FROM DUAL-FREQUENCY ULTRASOUND BEAMS
(Advisor: Kavitha Chandra, Charles Thompson)

The scattering due to the interaction of dual-frequency beams on a three-dimensional object is considered. The difference-frequency generated from this interaction has the potential to improve the classification of biological tissue. This work examines the contrast parameter on the scattered field produced from an ellipsoid scatterer.

Plante, J.
Electrical and Computer Engineering
DUAL POWER-SOURCE AWARE OPTICAL MANYCASTING
(Advisor: Vinod Vokkarane)

Scientific is advancing at unprecedented rates, and the degree of global collaboration is following suit. Communication is essential to every modern and future discovery and development, but in order to facilitate a changing world, the world of communication must also grow. Due to the global nature of interdisciplinary collaboration, experiments that are conducted at a centralized laboratory must be relevant to satellite or peer labs. Data must be distributed to multiple sites for computation, storage, experimental recalibration, often under tight deadlines. Multicast communication is typically preferred, but as the focus of communication shifts from location-driven models to data-driven models, the idea of spatial locality is becoming less important to application needs. Multicast is limited in such a paradigm because all the destinations must be specified in advance. Modern applications call for more flexible, manycast communication schemes wherein a set of destination sites is specified, but only a subset of them must be reached for application success. Such demands provide reliable performance but excessive demands on energy resources used to power the network. Many works focus on improving the energy efficiency of networking, but the Khazzoom-Brookes postulate points out that as energy efficiency increases, so too does overall energy consumption. Therefore, in order to make networking more green, care must be taken to consider the types of energy sources being used, whether they are fossil fuels, or renewable resources. Green manycasting is therefore essential for both efficient network resource and energy resource consumption.

Schondienst, T.
Electrical and Computer Engineering
RINSE: REDUCING THE IMPACT OF NETWORK SURVIVABILITY ON THE ENVIRONMENT
(Advisor: Vinod Vokkarane)

Resilience is a key concern for operators of core networks. Forces of nature, unintentional, or malicious human interference are a threat to our communication infrastructure. Yet, this infrastructure’s role is of principal importance especially for disaster recovery, and generally in the presence of any kind of threat. Thus network survivability is not only desirable but an absolute requirement for service providers. Power consumption has become another increasing issue in high-speed networks. The cost of electricity and environmental responsibilities necessitate energy-efficient network operation. By its very nature, however, the survivability requisite is increasing energy consumption unavoidably. We propose methods to reduce the impact of this additional energy requirement on the environment. The emergence of smart electrical grids and the growing availability of electricity generated from renewable sources are combined with adaptive routing strategies. Green energy sources are not homogeneously distributed and their availability varies with environmental changes, weather, and generally over time. Our central concept is to dynamically route network traffic along green-energy supplied paths during normal operation. Resources along paths that result in higher greenhouse gas emissions are reserved for backup. At the scale
of wide area core networks, potentially spanning entire continents, we develop green survivability solutions. We present a linear program to obtain a greenhouse gas emission-optimal solution. Our results indicate that emission-aware network planning and traffic engineering can lower greenhouse gas emissions by up to 20%. Despite the emission reduction we maintain high network performance compared to existing emission-blind approaches.

Bhatta, S., Nagassou, D., Castro, R.

Mechanical Engineering

SOLAR PHOTO-THERMOCHEMISTRY: FROM CO2 TO FUELS USING SOLAR ENERGY
(Advisor: Juan Pablo Trelles)

The dominant and detrimental effects of anthropogenic carbon dioxide (CO2) on global climate, together with our persistent utilization of fossil fuels and our expanding CO2 emitting infrastructure, make imperative the need for strategies to mitigate CO2 emissions. The use of solar energy for chemical processing of CO2 to produce added value products, like solar fuels, is an appealing alternative to mitigate emissions while expanding the reach of renewable energy utilization. This research encompasses the devising of approaches for the use of concentrated solar energy for the photo-thermochemical reduction of CO2 to fuels. A 6.5 kW high flux solar simulator operating with a short-arc xenon lamp coupled to a truncated ellipsoidal reflector is used to deliver high flux radiation onto a reactor for gas-phase photo-thermochemical processing. The reactor’s reaction chamber is designed to resemble an optical resonant cavity to allow high residence time of solar photons and gas flow in order to promote gas-phase thermochemical as well as photochemical reactions. Characterization of solar simulator and the design of photo-thermochemical processing reactor are presented. This research is complemented with the devising of a novel Finite Element Method (FEM) to solve radiative transport problems. Results of two and three-dimensional benchmark tests show that the method has comparable accuracy to the commonly used discrete ordinates method (DOM) while approximately 50% fewer unknowns. The effectiveness of the method is demonstrated with the simulation of radiative solar energy transport through a parabolic solar concentrator under different angles of incidence and with and without scattering.

Bielmeier, C., Sherwood, J.

Mechanical Engineering

STUDY OF FABRIC MICRO-MECHANICAL BEHAVIOR DUE TO IMPACTORS RANGING FROM KNIVES TO INSECTS
(Advisor: James Sherwood)

Natural and synthetic fabrics protect against a variety of low-velocity impactors including insect proboscis, rocks, needles, knives, and syringes. Current traditional stabbing standards for fabrics, issued by the National Institute of Justice (NIJ), focus on large-scale impactors, such as knives and spikes, and use quasi-static and dynamic tests to investigate peak energies. Smaller impactors, such as sewing needles, have been studied for tow-needle interaction and equations have been developed for needle puncture through Kevlar fabric. A standard for assessing how stabbing of small impactors alters the mechanical behavior of fabric would be a useful tool to assist in the design of stab-resistant fabrics. In the current research, insect proboscis and sewing needle penetration was studied and geometrically equivalent impactor testers were created for testing conducted on the Dynamic Mechanical Analysis (DMA) instrument with a penetration fixture installed. A standard for comparing fabric resistance to puncture is detailed. A finite element model is developed in Abaqus and correlated with test data.
Dangora, L.  
*Mechanical Engineering*  
A DISCRETE MESOSCOPIC FINITE ELEMENT MODEL FOR INVESTIGATING THE FLEXURAL BEHAVIOR OF TEXTILES DURING COMPOSITE MANUFACTURING  
(Advisor: James Sherwood)

In fabric reinforced composites, out of plane deformations, also known as waves, wrinkles and buckling, are recognized as a common manufacturing defect that can significantly compromise the strength of the cured structural part in the local vicinity of the defect. Such waves can result in resin-rich pockets in the cured composite and fabric folds. Adjustments in processing parameters or modifications to design specifications can prevent the onset through thickness fiber misalignment. Traditionally, experimental parametric studies are employed to isolate the effect of each processing parameter on wrinkle formation. With the sensitivity of each factor characterized and understood, a potentially appropriate combination of processing conditions can be identified and defect free components can be fabricated. These experimental procedures can be costly and time consuming. An alternate and more efficient methodology is to use a virtual model to explore and assess the sensitivity of each parameter on part quality. Therefore, it is valuable to have a simulation tool that can accurately represent the fabric bending properties and predict the locations where waves or folds are likely to form and then to use the simulation to explore changes in the process that can eliminate the formation of such defects while maintaining the overall structural intent of the part. A hybrid finite element model used with a discrete mesoscopic approach was previously developed and has since demonstrated its ability to capture the tensile and shear behavior of continuous fiber reinforcements. The aim of this research is to implement flexural properties into this model such that the formation and shape of out-of-plane defects can be correctly predicted.

Hays, S.  
*Mechanical Engineering*  
CHARACTERIZATION OF 3D PRINTABLE WATER SOLUBLE COMPOSITE MOLDS  
(Advisor: Christopher Hansen)

Molding is an integral part of industrial composites manufacturing. Unfortunately, composite molds are often time consuming and expensive to produce and are restricted in their shape and complexity due to their inability to accommodate negative drafts or other protruding features. One emerging alternative to typical molding methods is 3D printing of water soluble molds for composites. This technique allows researchers to quickly develop inexpensive, disposable and diversely applicable composite molds using in-house 3D printers and CAD drawings rather than utilizing expensive, over manufactured, less versatile molds made from metals or other materials. The water solubility of the molds enables dissolution from within complex shapes that would normally inhibit the removal of molds. Successful integration of water soluble 3D printable composites into the composites manufacturing process would accelerate manufacturing and expand the diversity of shapes possible for industrial composite molding.

Kirkwood, R.  
*Mechanical Engineering*  
SUSTAINED CAD INTEGRATION: RESOLVING DEFICIENCIES RELATED TO DATA IMPORT  
(Advisor: James Sherwood)

Engineering projects of any serious scale require sustained integration among applications creating solid model data and applications using that data. Homogeneous proprietary systems are able to support this capability within very strict usage rules. Heterogeneous (export/import) systems have no such success. Engineers are generally able to export/import with reasonably good success, but integration with subsequent imported versions is lost. Proposals for improved heterogeneous CAD integration typically begin with new requirements for how the data writes from the source systems. These requirements
generally manifest themselves as new standards or proposed extensions to existing standards. With CAD models/formats fairly stable for the last 20 years, perhaps new standards are not the solution. This research explores solutions that can be applied working only with the as-imported data.

Mitchell, C., Dangora, L., Akerstrom, M., Pratto, L., Sherwood, J.
*Mechanical Engineering*

**MODELING THE FORMING PROCESS AND SUBSEQUENT CURED PROPERTIES FOR A TEXTILE-REINFORCED COMPOSITE MATERIAL**
(Advisor: James Sherwood)

Access to a credible design tool that can relate the composite manufacturing process to the resulting structural response of the cured composite has the potential to accelerate the composite design process. Such a tool could remove the need to pursue an iterative prototyping process in the design of a new composite structure. Modeling techniques have evolved such that they can predict with a high degree of confidence how composite reinforcements deform to conform to the mold and can predict if and where defects such as fabric wrinkling, in-plane waviness, or fabric tearing may occur. The objective of the current research is to extend one forming model to relate the manufacturing process to the resulting structural response of the cured composite. Once a high-fidelity map of the locations and directions of the fiber tows has been created using the forming simulation, this map can subsequently be transformed into a finite element model of a cured composite. To achieve such a model, the respective contributions of the resin and the yarns to the overall stiffness of the composite system need to be isolated. The current research proposes using flat plates created from undeformed fabric as the starting point to isolate these properties. Flexure tests can be performed to calculate the stiffness, and the resin and yarn properties can be discretized using a modified rule of mixtures. Impact modal testing of physical plates can be compared to the finite element models of the same composite system to validate that the model has the same overall stiffness and mass distribution as exists in the physical composite. The methodology will then be explored for its ability to capture the stiffness of sheared flat plates and geometries with compound curvatures.

Su, J., Kakhki, I., Gao, F.
*Mechanical Engineering*

**MAGNETICALLY ASSEMBLING AND SOLDERING OF NANOSCALE METAL NETWORK INTO PHASE CHANGE MATERIAL**
(Advisor: Hongwei Sun, Majid Charmchi and Zhiyong Gu)

The objective of this study is to explore a new generation of phase change material (PCM) --nanowire matrix embedded PCM (NanoPCM) that is fabricated by magnetic assembly and nanosoldering of nanowires into controllable matrix structures in PCM for enhanced thermal transport as desirable in energy storage systems. First, Multi-segmented magnetic nanowires with a magnetic core (Ni) and two soldering heads (Au) is fabricated using a template based electrodeposition method. These nanowires will be well-dispersed in the PCM material (paraffin) by sonification. Then, the NanoPCM material will be placed in a test cell between the magnetic poles providing a stable and linear high magnetic field (~1 Tesla). Under a strong magnetic field the nanowires will form arrays of columns controlled by dipole-dipole interaction, (also called magnetic polarization). These columns will be connected to a Ni micro pattern on side walls of the test cell to prevent sedimentation of the whole nanowire columns. The photolithography and lift off procedures are applied to fabricate the Ni pattern on the sidewalls. Finally, once the magnetic assembly is completed, the copper wall temperatures will be elevated to the required melting temperature of the solder materials (183 °C to 220 °C) to permanently solder the nanowires lined-up in each columns and each column to a Ni micro pattern printed on the sidewalls. Due to the transparency of paraffin, the morphology of nanoPCM can be characterized by optical microscope. The electrical conductivity of the nanoPCM is measured during the synthesis procedure to evaluate the
alignment and nanosoldering. After the synthesis, the conductivity of the NanoPCM will be monitored in several melting/solidification cycles.

**Jadia, R., Adejumo, A., Rai, P.**  
*Plastics Engineering, Biomedical Engineering and Biotechnology, Chemical Engineering*  
CYTOTOXICITY OF DRUG LOADED POLYMERIC NANOPARTICLES AGAINST BREAST CANCER  
(Advisor: Prakash Rai)

Curcumin is a potent small molecule drug that has shown promising results against cancer as a chemopreventive and chemotherapeutic treatment. In spite of being a multimodal anti-cancer drug, the efficacy of curcumin is limited due to poor solubility, bioavailability and sub-optimal pharmacokinetics. In this study, the focus has been on designing and synthesizing a drug delivery system for curcumin using poly-lactic-co-glycolic acid (PLGA) nanocarriers to enhance its applicability and induce sustained release of the drug. PLGA nanoparticles and Curcumin loaded PLGA nanoparticles were synthesized and characterized for particle size, size distribution, zeta potential, encapsulation efficiency, and its morphology using standard techniques like electron microscopy and dynamic light scattering (DLS). The stability of this system was further enhanced by conjugating PEG to PLGA, thereby promoting a passively targeted nano-carrier system towards cancer cells. These nanoparticles were tested against a breast cancer cell line, MDA-MB-231, in vitro. Imaging was performed to confirm uptake of the drug by these cancer cells. Both, the Curcumin encapsulated PLGA / PLGA-PEG nanoparticles have shown cytotoxic effects, and were internalized by the cancer cells. Results of these studies will be presented.

**Moller, J., Kuncho, C., Schmidt, D., Reynaud, E.**  
*Plastics Engineering*  
SUSTAINABLE WIND TURBINE BLADE MANUFACTURING USING EPOXIDIZED LINSEED OIL AND E-Glass  
(Advisors: Daniel Schmidt, Emmanuelle Reynaud)

Our current research efforts aim at demonstrating that polymers from renewable resources are a viable platform for reworkable binders in structural composites applications. This particular study focuses on the manufacturing and characterization of glass fiber reinforced composites made with bioepoxies. The resin chosen for this work is epoxidized linseed oil (ELO) cured with an amine (Polyethylenimine (PEI)) or an anhydride (Nadic Methyl Anhydride (NMA)) as curing agents with a 1,8-Diazabicyclo[5.4.0]undec-7-ene (DBU) as a catalyst. Test coupons are manufactured with these two resins and unidirectional E-glass fiber reinforcement through vacuum bagging. Various processing parameters (temperature, vacuum pressure) are screened to minimize the void content of the composites. The exact content of fiber is determined by ignition, the mechanical behavior is tested in flexure and hardness. To get a better insight into the material behavior under the processing conditions FTIR and rheological testing are performed on the resins. The ELO-PEI-glass fiber systems are characterized by high void contents linked to the low resin viscosity, which is detrimental to the materials properties. The ELO-NMA-glass fibers composites on the other hand form denser materials; they are characterized by a stiffness close to the high-performance epoxy-anhydride control, and exhibit a much higher ductility. We have hence demonstrated that it is possible to produce rigid, strong, void-free panels with these biobased resins.
Tan, B., Palacios, M., Sobkowicz Kline, M.
Plastics Engineering
PREPARATION OF FIELD EFFECT TRANSISTORS BASED ON POLY(3-HEXYLTHIOPHENE) COLLOIDAL DISPERSIONS
(Advisor: Margaret Sobkowicz Kline)

This work outlines the preparation of colloidal dispersions of poly(3-hexylthiophene) (P3HT) and corresponding manufacturing techniques used to produce thin-film field effect transistor (FET). The morphology of both colloids and thin films coated from colloids were characterized using TEM, SEM and AFM. Furthermore, the crystallinity, optical properties of thin films and electrical performance of FET were investigated and compared with specimen coated from organic solutions. We show that both size and crystallinity of these colloids and their films can be tuned by controlling the initial solution concentration, type of solvents and surfactants as well as manufacturing parameters. The presence of surfactant affects the crystal structure and optical properties of P3HT colloids, which in turn could further affect the field-effect mobility of FET. The good performance of FET produced by these colloids reveals their promising applications as alternative materials to eliminate the conventional toxic issues associated with the manufacture of organic electrical devices.

Zubricki, J.
Plastics Engineering
VALIDATION OF SOLIDWORKS PLASTICS
(Advisor: Stephen Johnston)

This research was intended to assess the accuracy of simulations produced by Solidworks® Plastics, a software that predicts the filling behavior of polymer in injection molds. Validations consisted of comparing data collected from physical injection molding processes with simulation results. Molds used for validations were selected in a manner such as to showcase issues (weld lines, air traps, uneven fill, etc.) commonly encountered during injection molding, thus testing the accuracy of the software. Each validation involved creating a three dimensional model of the critical mold components, processing the mold to collect parts for analysis, and running a simulation using the process parameters determined during molding. The comparison of simulation data with the physical parts showed that the simulation could successfully predict the fill pattern of parts (as shown by the short-shot progression) and common defects. Further research will be conducted to in order to provide more data to be used for further advancement of Solidworks® Plastics.

Bowser, T., Marietta, M.
American Studies
YOUR FACTS OR MINE? THE EPISTEMOLOGY OF THE POLITICAL FACT-CHECKING INDUSTRY
(Advisor: Morgan Marietta)

The increasing partisanship of American politics has created a very different arena of debate from what has existed previously. Where there once existed a set of arguments from varying opinions over a static pool of facts, the political poles now root themselves in distinct sets of fact perceptions. In the last decade, the changing business model of journalism has invented a whole new media actor in response to this phenomenon: the political fact-checker. This paper examines the history and epistemology of the political
fact-checking industry, and provides close readings of the three major agents in this industry. An in-depth content analysis of these new media authorities examine their selection of subjects, the source materials or authorities chosen to determine the validity or falsehood of political statements, and the meanings of the numerical and narrative scales applied upon the facts in question.

Carter, C., Daly, K., Patts, M., Asagba, J., Sawicki, M.
*Criminal Justice*
**1993 WORLD TRADE CENTER BOMBING CASE STUDY**
(Advisor: Neil Shortland)

The Center for Terrorism and Security Studies (CTSS) addresses complex challenges of domestic and foreign security by disseminating scientific research, education, and training to better understand and respond to terrorism. Since available research does not adequately explain the involvement, roles, and functions of the individual terrorist there exists a crucial need to develop a typology of involvement in terrorism. In order to support the developments of these typologies, CTSS interns are collecting data on over 300 convicted Al Qaeda inspired terrorists in the U.S. and Europe. This data is collected by using open source court documents and media coverage on the events. The information is used to populate a 121 variable coding dictionary that contains data points ranging from demographics, ideology, planning the attack, and the event itself. This poster focuses on the 1993 World Trade Center bombing, one of the first radical Islamist terror attacks on US soil. Information relating to the five conspirators in this case is presented to demonstrate the different roles within terrorism and provides an example of how a dynamic terrorist cell operates. The data generated will hopefully contribute to the goal of understanding the involvement at the individual level, that will provide guidance for sentencing, managing, releasing, and monitoring potential terrorist offenders in order to support existing and future Homeland Security issues.

Figueroa, A., Paige, J., Sutherland, P., Gibbons, C.
*Criminal Justice*
**DEVELOPING A TYPOLOGY OF TERRORISM INVOLVEMENT**
(Advisor: Neil Shortland)

The Center for Terrorism and Security Studies leads and facilitates scientific research, education and training to help understand and respond to the evolution, convergence, and complexity of domestic and foreign security challenges. Individuals engaged in terrorism are highly diverse yet the nature of their involvement is still perceived as binary (as in people are, or are not terrorists). An absence of deeper knowledge exists on what precisely is the nature of involvement in terrorism. To develop understanding of what it means to be ‘involved in terrorism’ interns working at CTSS are developing a 300+ database of jihadist terrorists convicted in the United States. In order to generate this data a codebook is populated using information collected through detailed analysis of open source reporting and court documents. This codebook contains data points relating to demographics, previous criminality, religious knowledge and commitment, terrorist network variables, functions and roles within the terrorist plot, the attack planning, the charges against the individual, and the sentence the individual received. One significant case reviewed in this project was the 1998 United States embassy bombings in Kenya and Tanzania. This attack by Al-Qaeda serves as an example of the various types of roles and functions that individuals involved in terrorist attacks undertake. The data generated from this case, and the wider data collected as part of this project will be used to develop a descriptive typology of involvement in terrorism that will provide guidance for sentencing and managing, releasing, and monitoring of terrorist offenders.
Luke, K.  
*Criminal Justice*  
**EXPLORING THE CSI EFFECT: CAN PERSONAL EXPERIENCE LIMIT ITS EFFECT?**  
(Advisor: Paul Tracy)

In the United States juries serve a major role in the justice system. Juries render the verdict for the case which can decide whether a person goes to prison or if they walk away with a fine. Yet, jurors are can be influenced or have their own bias. One of the ways that jurors are influenced in their decision making is by the "CSI Effect". This term describes the belief that the amount of time an individual spends watching crime dramas such as CSI and Law & Order will cause them to put more emphasis on and expect more forensic evidence. This study sought to examine the effect and whether or not it can be mitigated by individual's firsthand knowledge or experience with the justice and court system. Study results and conclusion to be posted at a later date.

Shea, M., Strong, L., Thompson, C.  
*Criminal Justice*  
**THE FAILED LAX BOMBING: A CASE STUDY IN TERRORIST TYPOLOGIES**  
(Advisor: Neil Shortland)

The Center for Terrorism and Security Studies (CTSS) conducts scientific research, education, and training to help understand and respond to the evolution, convergence and complexity of domestic and foreign security challenges. One such project aims to investigate typologies of terrorist involvement. Currently terrorist involvement is often perceived as binary - people either “are” or “are not” involved in terrorism - with a conspicuous absence of deeper appreciation of what involvement actually entails. In order to investigate this, an ongoing large-n open source data collection activity is being undertaken via the CTSS internship. Throughout this internship we have generated a database by populating a 121 variable codebook spanning an individual's background, involvement in terrorism, their roles within a terrorist network, arrest, court case, and sentencing. In this poster we present one case featured in this project: the failed Los Angeles Airport (LAX) bombing. Through the process of populating codebooks with cases of Jihadist related terrorism in the United States, this project will generate data that will facilitate the development of descriptive typologies of terrorist involvement as well as a continuum of involvement based on behavioral qualities. The purpose of this research is to offer a structure for making more systematic discriminations between terrorist offenders that can inform future decisions about sentencing, management, and possible release of terrorist offenders.

*Criminal Justice*  
**TYPOLOGY OF TERRORISM INVOLVEMENT**  
(Advisor: Neil Shortland)

Understanding the levels of involvement in terrorism at an individual level has become an increasing need among many facets of the justice system. The Center for Terrorism and Security Studies (CTSS) is working to understand this need. Focused on leading and facilitating scientific research, education, and training; CTSS works to respond to the evolution, convergence, and complexity of domestic and foreign security challenges. One such project is funded by the U.S. Department of Homeland Security, and the National Consortium for the Study of Terrorism and Responses to Terrorism (START) and will develop a data-set of 300+ Al-Qaeda members and affiliates in the US and abroad. CTSS interns are developing this data-set by populating a 121 variable codebook with information obtained through the analysis of open-source court documents and media reports. This codebook consists variables that include demographics, religion, ideology, attack-planning, and court involvement. One case researched for the project is the New York City Landmark Plot of 1993. This is presented here in order to provide an example of the different
levels of involvement and different roles that an individual can hold when involved in a terrorist network. This together with the other data collected for this project will support the development of descriptive typologies of involvement in terrorism. This can provide a basis to inform decisions regarding planning, sentencing, management, risk reduction, release, and monitoring of terrorist offenders.

Walfield, Scott
Criminal Justice

WHEN CLEARED ISN'T CLEARED: A MULTILEVEL STUDY OF RAPE

As rape remains one of the most underreported and least likely to be cleared of the violent crimes, it is important to understand the factors associated with the likelihood of an arrest in cases that are reported is of paramount importance. Although previous research has documented the role of victim, offender, and incident characteristics in rape clearance, little research has questioned whether aggregate-level characteristics of the police department contribute to clearance rates. Additionally, only two prior studies since 2000 have included cases in which rapes were cleared exceptionally. This study uses data from the National Incident-Based Reporting System (NIBRS) and the Law Enforcement Management and Administrative Statistics (LEMAS), and a multilevel modeling approach to examine the relationship between victim, offender, incident and police department characteristics contrasting arrest with exceptional clearance. Results indicate rapes which result in injury to the victim, co-occur with another crime, and use of a weapon increased the likelihood of arrest. Among the department variables, departments which were located in the Northeast and Midwest as well as those with more female officers had a positive effect on arrest. Implications for future research on exceptional clearance and NIBRS are discussed.

Cultural Studies

THE UML EIFFEL TOWER PROJECT
(Advisor: Jennifer Cadero-Gillette)

Students in Honors Comparative Arts have undertaken a “green” project: the creation of an eight-foot, electrified interpretation of the Eiffel Tower from recycled materials. As a Service-Learning project, our UML Tower is a gift to the French Consulate in Boston as a cultural exchange in the spirit of France’s gift to the United States of the Statue of Liberty. Supplemented by lectures in French art history, the first half of the semester involved various levels of planning and design. Each student in the class prepared a plan for the Tower, and the final draft came together out of these initial ideas. We had to consider the ways our Tower would be adapted from the original, the dimensions and materials to be used and the space in which it would be exhibited; we also had to locate a blacksmith to create a framework and find recycled materials from a wide variety of sources. Under a strict deadline and involving Spring Break, we scoured town dumps, scrap yards, local food and bicycle shops, and UML recycle bins to locate the bicycle chains, rims, corks and even some official University blue turf to express our vision for the “green” UML Tower. The creation of this project was made possible by financial grants provided by the French Embassy, the Department of Cultural Studies and Service-Learning.
Romera, E., Durce, D., Hennessey, C., Vasquez, D.

*Cultural Studies*

**EARLY START TO FRENCH AT STE. JEANNE D’ARC : UN PRINTEMPS DE L’ENSEIGNEMENT DU FRANÇAIS À L’ÉCOLE STE. JEANNE D’ARC**

(Advisor: Danielle Boutwell)

As part of our French 4 and Culture class, we participated in a Service Learning project. This presentation highlights our Service Learning experience. For seven weeks, we served at Ste. Jeanne d’Arc Elementary School in Lowell, Massachusetts. This Service Learning project provided us with an opportunity to work in a French language classroom with elementary school children in kindergarten, first, and third grades. We collaborated with the lead French teacher and provided support for children that needed extra help learning new concepts. Teaching methods directed toward new language acquisition were implemented, they instructed new concepts through games or practice worksheets depending on the grade level. This Service Learning project allowed us to practice vocabulary and grammar that we learned in our French classes during our time as students in the French program at UMASS Lowell, improving French conversational skills while gaining invaluable experience working in a classroom. We also saw firsthand some of the cultural concepts taught in our French classes. Working with the students at Ste. Jeanne d’Arc has helped us to see the benefit of learning a foreign language at such a young age. The Ste. Jeanne d’Arc students show an enthusiasm for learning each week. Their excitement motivates us to do everything possible to help.

Shuman, B.

*Cultural Studies*

**PARLONS FRANÇAIS! LEARNING TO TEACH HIGH SCHOOL FRENCH**

(Advisor: Carole Salmon)

Over the past five decades different methods of teaching a foreign language have come and gone. Some have been more successful than others, but today we use what is called eclectic methodology, that incorporates portions of many different methodologies. As a graduating senior majoring in French, I am currently completing a French Practicum off-campus experience at Hudson High School in Hudson, MA, where I help the French teacher in course levels 2 – 4, for 10 hours per week over a 10-week period. For the first half of the semester I have been attending every French class and I have been involved with the students in small group activities as well as teacher centered activities, and I have been working closely with the teacher as well as with my university advisor in order to get familiar with the ongoing pedagogical techniques of creating a progression and various lesson plans. Eventually, drawing from authentic documents, such as videos and news articles, I created my own lesson plans for the French 3 class and was able to teach some courses on my own. In this poster, after briefly presenting the various foreign language teaching methodologies as well as the current National Standards, as established by ACTFL, I present one of the lessons that I created and then I explain how it relates to the current methodology. Finally I review the success of the lesson and evaluate the outcomes of this teaching experience both from the students perspective and my own.

Bauer, J.

*Economics*

**INTERNATIONAL TRADE AND NON-MONETARY COMPENSATION**

(Advisor: Tommaso Tempesti)

In the last two decades manufacturing employment has markedly declined and this has created policy concerns. Some consider the entry of China into the world market as a major factor of the U.S. de-industrialization. This study investigates the effect of trade with China on labor market outcomes in the manufacturing sector in the United States. We utilize individual-level longitudinal data from the National
Longitudinal Survey of Youth 1979 (NLSY) to study monetary and non-monetary components of compensation including health insurance, pension plans, and other fringe benefits. By utilizing a longitudinal data set we are able to capture changes in compensation and employment levels for individuals over time. A major distinction between this study and similar research is that we consider not only compensation and employment, but also non-monetary components of compensation. We construct an import penetration ratio as a ratio of imports from China to domestic consumption at the industry-level and merge this with the individual-level NLSY data. In order to do this, we download trade data from the UN Comtrade dataset; we then merge the trade data with production data from the NBER manufacturing dataset so as to compute the import penetration ratio. In order to merge the trade data with the NLSY data, we concord the industry classifications across the two datasets. In the NLSY data we use the various information on health insurance and other benefits in order to create the dependent variables for our regressions.

Cote, V.
Economics

ACHIEVING A SUSTAINABLE ENERGY PATHWAY FOR WIND TURBINE BLADE MANUFACTURING
(Advisor: David Turcotte)

There are approximately 108,000 wind turbines in the world. This means the world will need to dispose of about 324,000 blades within the next 15 years. On top of this, it is expected that the U.S. wind turbine industry will grow to about 170,000 by the year 2030, meaning the necessity to dispose of about 34,000 blades per year in the U.S. alone. Problems arise because of the combination of material used to create the blade. The current blade requires the use carbon and/or fiberglass fabrics embedded in petroleum based epoxy resin. Recycling is not feasible because this material is very difficult to break down; therefore the most common disposal method of the blades is landfilling. The NSF is currently funding a grant focused on the creation of a bio-based epoxy system made of renewable resources, while attempting to understand a possible way to reuse this product at the end of its life. Due to the need for both science/engineering and economic expertise, this team is interdisciplinary. David Turcotte leads the economic focused team comprised of graduate and undergraduate students who strive, through literature review and interviews with key informants, to collect and analyze information on education and workforce development, the cost of both the current and proposed epoxy system, and disposal methods for blades comprised of both epoxy systems. With this information, we plan to conduct a cost benefit analysis of the two systems. This presentation will discuss the first two years of results from this four-year grant.

Horne, C.
Economics

URBAN AGRICULTURE AND EDUCATION: COLLEGE STUDENTS’ ATTITUDES
(Advisors: William Mass, Rachel Mansfield)

Our dependence on cheap, mass produced foods filled with sugars and fats is a serious problem facing Americans. As I walk through my local supermarket I am completely overwhelmed with the multitude of options that lay before me. Most of things I can choose from are in fact mass-produced, packaged items that give the appearance of “healthy” eating but are actually chemically engineered products that are giving rise to many health problems increasingly prevalent today. People are drawn to these items due to their cheap cost and addictive tastes. Children are brought up thinking a diet mainly focused on fast food burgers, fries, and soda is normal. They are completely disconnected from the production of fresh produce and most believe food comes from these supermarkets and fast food restaurants. My project is designed to help educate and build people’s awareness on the importance of locally grown healthy food. I am doing this by building upon garden projects I conducted in the summer of 2013, and tracking the subsequent evolution of events. My project is designed as a life cycle examination of attitudes using two case studies,
one from a local middle school garden in Lowell and the other from an elderly home where I designed and implemented hanging herb and vegetable gardens. The last is a survey about the attitudes and food consumption choices of my fellow college students here at the University. All deal with better understanding experiences that shape attitudes in order to create opportunities to bring people closer to the food they consume.

**Rungu, R., Spera, S.**  
*Economics*  
**LOWELL HEALTHY HOMES PROGRAM**  
(Advisor: David Turcotte)

Studies show that asthma is under-diagnosed among senior citizens and the asthma rates in adults in Lowell are about 2 percent higher than the state average. Healthy Homes Lowell has recently received a grant from the Housing Urban Development (HUD) to improve the quality of life of elders 62 years and older, physician-diagnosed with asthma and/or COPD and living in public housing. We partner with the Lowell Housing Authority and Lowell Community Health Center to help with outreach, education and intervention. The program includes home environmental assessments, health assessments and medical history information and asthma triggers intervention. Home environmental assessments involves collecting dust samples, measuring ambient air NO2 measurement, and healthy homes assessment for asthma triggers such as rodents, cockroaches, dust, mold, and mildew. After the assessments our intervention involves providing supplies targeted at improving quality of life for elders. This program is very educative for us and we have gained an incredible amount of work experience. Interacting with professionals and elders with asthma has afforded us opportunities to participate in Healthy Home training’s and interventions.

**Andersen, B.**  
*English*  
**BALLET BASICS: PREVENTING INJURY WITH PROPER ALIGNMENT**  
(Advisor: Jenna Vinson)

Ballet dancers face numerous injuries each year. Myriad fractures, ligament tears, and pain associated with movement can interfere with a dancer’s performance and overall health. Although many of the injuries dancers face occur from overuse, a large portion of them can result from a dancer’s incorrect form and alignment. A dancer’s proper positioning of his or her body can significantly reduce the likelihood of injury. However, for most dancers, altering form and alignment is easier said than done. Dancers’ technique and body placement are first developed during their pre-ballet classes, making it difficult for adult ballet dancers to change their alignment. To help alleviate this predicament, I believe emphasis on proper technique and form is crucial for pre-ballet students. I have designed a reference book showcasing proper technique and alignment of the basic positions and movements in ballet. The book will be distributed to young dancers in order to develop proper technique and prevent future injuries.

**Caldwell, B.**  
*English*  
**UMASS LOWELL CHEERLEADING: CLUB OR SPORT?**  
(Advisor: Jenna Vinson)

The University of Massachusetts Lowell Cheerleaders are National Champions for the first time in the school's history; yet, current students and faculty often do not even know the squad exists. In order to get the team recognized and respected, I will design promotional materials that highlight the squad's past, present, and future endeavors. This will help entice future students to join the squad. It will also provide
information about current students on the team, with hopes of earning the respect of the school's student body. It is time this Division 1 team is recognized as a sport!

Carney, C.
*English*
LAZARUS LEADERSHIP
(Advisor: Jenna Vinson)

Every day, people are left out to sleep in the cold. Lawrence, Massachusetts has been cited as one of the poorest areas in New England. For many living there, food and clothing are scarce. The Lazarus House Ministry, established in downtown Lawrence, provides food pantries, soup kitchens, thrift stores, job training programs, and emergency/transitional housing to aid those in need. However, the program needs more volunteers. Many are unaware of the incredibly powerful impact that volunteering has on the community. My goal is to establish a new line of social media campaigning that will entice young people in Massachusetts to volunteer and contribute to the efforts to bring Lawrence out of poverty. My goal is to educate the viewer on the seriousness of the poverty issue in the city and to prove to them the kind of power that volunteering their time will have on the situation. Volunteering not only makes a huge impact on those living on the streets, but also provides the volunteer with a life-changing perspective, making it a situation where everyone truly wins.

Celona, G.
*English*
WOMEN CAN SKATE TOO – IMPORTANCE OF WOMEN'S HOCKEY
(Advisor: Jenna Vinson)

The sport of hockey has continued to grow in recent years. More fans have come to love the sport, but research shows that there is still not enough attention given to women’s hockey. This is true for both professional and college hockey. Women’s hockey needs love too. It becomes a problem for women who want to play hockey professionally, but can’t make a living solely off that pay check. Women’s hockey can be highly entertaining, but doesn’t draw the attention it deserves outside of the Olympics. It’s time for that to change.

Fitzgerald, C.
*English*
WOMEN IN VIDEO GAMES
(Advisor: Jenna Vinson)

The vast majority of video game players are male. In the past, when video games were still a fledgling genre, game designers would appeal to male gamers by creating sexually-appealing female characters that served no purpose but to attract males. Today, video games are a huge part of mainstream media. The complexity, depth, and stories being told continue to improve, yet the archaic belief that females need to be sexually appealing in order to be successful still exists. Recent games have shown that this is not the case, and until this stereotype is removed, video games will never be a genre that is taken seriously.

Gagnon, B.
*English*
MAKING FREE WHEELERS EASIER & MORE ACCESSIBLE
(Advisor: Jenna Vinson)

As a commuter student who works full time, something I’ve found very difficult while going to school is finding time during the week to get proper exercise. Being a biking enthusiast, I would love for the
opportunity to easily rent a bike anywhere on campus as a healthy and alternative method of transportation between classes, campuses, or nearby stores/restaurants. While the Free Wheelers bike-rental program on campus does offer this alternative, I feel that the program is not sufficiently advertised to students. Not only this, but the Free Wheelers registration and rental process could be improved for students who would like to use this service but don’t have the time to register inside. For these reasons I have designed a few changes which I propose would make the Free Wheelers program more well-known and also much more accessible. These changes are based off of a very successful public bike-rental service in Chicago known as Divvy, and they would be very cheap and easy to implement on top of the pre-existing Free Wheelers program. If the changes I propose are implemented, students would be able to easily identify a bike-rental station anywhere on campus and easily rent a bike just with the use of their student ID.

Hannaford, M.

**English**

**COPING WITH BIPOLAR DISORDER**
(Advisor: Jenna Vinson)

Mental illness is often not talked about as there is, often times, a stigma attached to it. When a loved one is diagnosed, we often do not know what to do or how to react. According to the National Institute of Mental Health, “bipolar disorder affects approximately 5.7 million American adults, or about 2.6 percent of the U.S. population age 18 and older in a given year.” Bipolar disorder is more complex than most people understand. It is highly important that people are informed so that they know how to handle a situation in which a friend or relative is diagnosed. For this reason, I designed an informative brochure that will highlight strategies for friends and family members of those who have bipolar disorder. This brochure can be used by clinics such as the student counseling center on campus for example.

Harris, K., Arpin, D.

**English**

**LIGHTS. CAMERA. FILM CLUB**
(Advisor: Jenna Vinson)

By researching what motivates a student to join a club and how popular films are today, we hope to expand the number of members in UML Film Club and increase the diversity of our members. UML Film Club is a great community where students can enjoy movies with peers who like to watch, discuss, and potentially make films. At the current moment, we have too few members to create our own movies and we are too small to spark diverse discussions of topics commonly seen in movies. By displaying our brochures, posters, and video around South Campus we seek to generate a more varied interest in Film Club, so that students will join us to produce and appreciate films as much as we do.

Howard, J., Shaffer, R., Awadallah, A., DiMeglio, K.

**English**

**SERVICE LEARNING AT UMASS LOWELL: WORK FOR MUSIC CLUBHOUSE AT THE BOYS AND GIRLS CLUB OF GREATER LOWELL**
(Advisor: Diana Archibald)

Through service-learning at the University of Massachusetts at Lowell, students work in class to enhance skills with real-world, hands-on work with the community. In Community Writing 1, under the direction of Dr. Diana Archibald, students have learned to actively engage community partners, to correctly and thoroughly analyze all rhetorical aspects of a project, and to properly use media software to create a usable end product for the community partner. This past semester, the students worked with the Music Clubhouse at the Boys & Girls Club of Great Lowell on two projects. The first was a poster design for a
fundraising and awareness-raising event held in February. Four student designs were chosen: two for the first portion of the fundraiser, and two for the secondary part of the fundraiser. The second project was to create a brochure for the Music Clubhouse, for which one student design was chosen. For both of these projects, all students in the class used an analysis method called the Rhetorical Square. The basis of this method is to consider four key aspects: Purpose, Audience, Message, and Persona—more simply: who, what, when, and how. In combination with this method, students learned how to operate software such as Adobe Photoshop and InDesign. They received in-class instruction, and were expected to take advantage of other resources such as tutorials and the knowledge of other classmates.

**Koufogazos, M.**  
*English*  
**CHARLES DICKENS AND THE PARIS MORGUE: THE FASCINATION WITH REPULSION**  
(Advisor: Diana Archibald)

During the Victorian period, many people considered visiting the morgue to be a form of entertainment, and would often make day-trips there. Charles Dickens frequented the Paris Morgue during his various trips to France. He was so intrigued by the morgue that he wrote about it in five different pieces. In *The Uncommercial Traveller*, a collection of his non-fiction essays, Dickens portrays his feelings through the speaker, “Whenever I am at Paris, I am dragged by invisible force into the Morgue. I never want to go there, but am always pulled there.” Dickens even described his experiences at the morgue in his letters. He once wrote to his wife saying, “We looked into the Morgue just now, where there was a body horribly mutilated with a musket ball in the head, afterwards drowned.” He continued his letter by poking fun at his friend who had gotten sick upon seeing the corpses. As noted in Britta Marten's article “Death as Spectacle: The Paris Morgue in Dickens and Browning,” “Dickens's text on the Paris morgue presents a graphic picture of the sensationalism that also lies at the heart of the British middle-class culture.” Dickens was not the only author who was fascinated with the Paris Morgue. Nineteenth-century authors such as Frances Trollope and Robert Browning also frequented the morgue. As part of my Honors co-op research, I will depict Dickens's fascination with the morgue in a poster, with information from his personal letters, journal articles, books, and images.

**Lally, E.**  
*English*  
**LIFE IS THE ULTIMATE EXPERIENCE**  
(Advisor: Jenna Vinson)

As college students, we often forget how important it is to live a life that truly makes us happy. People often complain about the amount of time they spend disliking their jobs and find little encouragement to follow their passions and do the things they love. I created a website, called Life Is The Ultimate Experience (LITUE), to provide the community with the opportunity to come together and share our “ultimate” life stories. Through inspirational life philosophies posted on LITUE and the act of sharing personal stories, I plan to promote imagination, creativity, and exemplification of our amazing human experience.

**Linskey, M.**  
*English*  
**THE RUSSIA AND UKRAINE CONFLICT**  
(Advisor: Jenna Vinson)

Tension in Eastern Europe between Russia and Ukraine continues to rise, as does most American citizens' confusion and a lack of information on the conflict. Drawing on research on this issue, I am designing an educational comic to break down these complex and continent-spanning geopolitical actions. A comic
will help adults, both young and old, build their literacy on the subject in ways that traditional methods--such as news articles and research papers--fall short.

Loranger, J.  
*English*  
REFORM THE COMPUTER FRAUD & ABUSE ACT FOR CURRENT STANDARDS AND PRACTICES  
(Advisor: Jenna Vinson)

The theft of intellectual material is a crime, but should the crime of stealing electronic scholastic documents be prosecuted more harshly than the physical theft of the same value? In a recent court case, MIT and the U.S. Department of Justice suggested that it should. The case lead to the suicide of defendant Aaron Swartz, Reddit co-founder, who was a victim of the outdated Computer Fraud & Abuse Act (CFAA). This draconian act contains loose wording and harsh penalties that could be reformed if the bill "Aaron's Law" is put into effect. This law clarifies what "unauthorized access" denotes, helping defendants avoid being prosecuted over a blanket term. I aim to educate readers with an epideictic memorial about Aaron Swartz's life achievements and the importance of reformation of the CFAA.

Lynch, N.  
*English, Sociology*  
LILY BRISCOE DEFIES VICTORIAN DOMESTICITY IN “TO THE LIGHTHOUSE”  
(Advisors: Marlowe Miller, Mignon Duffy)

This work primarily concerns Victorian-era gender roles in the private sphere of the home. These roles were rigidly defined, confining women to work within the home and men to work outside of it. Although the home was thought to be the woman's domain, she was still expected to tend to it in order to fulfill the expectations of her husband; his work outside of the home was stressful, and so he occupied the space within the home as a means of relaxation. In this way, the private sphere did not really belong to the woman. My work draws upon both the lived experience of Virginia Woolf and the fictionalization of this experience in her novel, To the Lighthouse. Mr. and Mrs. Ramsay function as archetypes of typical Victorian gender roles. Finally, my research draws upon Lily Briscoe as a modern woman trying to assert her independence within this rigid domestic framework. Lily Briscoe not only represents Woolf herself, but more broadly represents the Victorian-era woman breaking free of the dominant patriarchal narrative. Woolf rejected the examples of her mother and father through her writing, whereas the fictional Lily Briscoe constructs a new life in opposition to Mrs. Ramsay's through her art. Mrs. Ramsay did not allow herself to be independent or self-fulfilling because of societal pressures and constraints and prioritized motherhood and her role as wife. As my work demonstrates, Lily Briscoe was able to function as a fully autonomous human being concerned primarily with her art.

Mayer, A.  
*English*  
WHO OWNS YOUR DNA?  
(Advisor: Jenna Vinson)

We live in an age where health care is a big business and medical science advances in leaps and bounds every day. Soon enough, screening one's DNA for mutations will be commonplace. Private medical research companies are already battling for the rights to your cells. Last year, the US Supreme Court ruled on who holds the patents. This controversial issue has been overlooked by mainstream media so I will present credible research on this issue in a visually engaging and easily accessible way. Do you know who owns your DNA?
Morton, A.

*English*

**SAY NO TO SECOND-HAND SMOKE**
(Advisor: Jenna Vinson)

People are aware of the dangers that come with smoking cigarettes, but what about second-hand smoke? Second-hand smoke can cause serious health issues, including cancer, and can affect anyone. For this reason, I have chosen to research the risks and consequences of second-hand smoke, as well as to promote a reform to the smoking policies here on campus. Second-hand smoke is a serious issue that could affect the health of members of our campus and is something that needs to be addressed.

Raymond, E.

*English, Political Science*

**SAVING OUR COMPANIONS: RAISING ANIMAL ADOPTION AWARENESS**
(Advisor: Jenna Vinson)

Approximately 8-12 million animals are put into shelters each year. Often, shelters face challenges when trying to get specific types of animals adopted. There are numerous ways to address animal discrimination and my mission is to begin tackling it on a local level. As an animal rights activist, it is essential to give compassion and time to those in need of it, regardless of their breed, age and gender. With the help of Massachusetts’s shelters, musicians, and a local art gallery, I am putting on a benefits show on in May 2014 to help the animals and volunteers in need. By generating visually-engaging promotional materials I seek to encourage donations and/or attendance of this show to raise awareness of shelters and the wonderful benefits of choosing to adopt.

Santos, S.

*English*

**TO THE GIRLS WHO ARE TOLD THEY CAN’T**
(Advisor: Jenna Vinson)

I first started reading Seventeen, a leading magazine for young women, when I was thirteen years old. Seven years later, the magazine's content has not changed much. In an open letter to the editor, I call on her to start addressing the 21st century issues affecting young women of all races, sexualities, and gender identities, to challenge traditional notions of femininity, and to inform and empower a broader audience, so that all who identify as “girl” can be part of the magazine’s discussion and celebration of ascent into womanhood. I provide an example article written by myself, titled “To The Girls Who Are Told They Can’t.”

Wood, H., Young, D.

*English*

**MY MOTHER NEVER BURNED HER BRA**
(Advisor: Dale Young)

Who taught you how to be woman, or a man? Who taught you how to grow up? Who taught you what your strengths are, your weaknesses? This project focuses on a dramaturgical approach to portraying the human experience using the true life events of Susan Adamek. Starting from her very early childhood, her experiences will be chronicled through staged dialogue and the use of multimedia representations to explore how different events can shape a life. This project is meant to be a spoken and staged piece, using research found through personal journals, newspaper articles, as well as written and verbal correspondence to derive a creative approach at exploring the human experience through one major perspective. This one perspective of Susan Adamek, however, will then be supplemented with my own
personal experiences to give a multidimensional exploration of certain aspects of the human experience such as family, jobs, and education. This piece does not necessarily offer answers to broad-based questions but rather offers insight into questions that are rarely ever asked.

Schneider, D.
History
UKRAINE'S STRUGGLE: EAST VS. WEST
(Advisor: George Deak)

The region occupied by modern Ukraine, historically referred to under various names, including Rus or Kievan Rus, has been fraught with controversy for centuries. Its geographic boundaries as well as ethnic diversity and political landscape have gone through many changes. Mostly ruled by its neighboring empires and border states such as Russia, Austria-Hungary and Poland, Ukraine gained its independence with the dissolution of the Soviet Union in 1991. In light of current events, this research will examine the historical foundations of Ukraine, and assess how key factors such as geography, nationalism, formation of cultural identity, economics, and national security have had a role in creating the modern-day Ukrainian nation-state, and the current crisis.

Gates, N.
Political Science
CAPITALISM, CERTIFICATION, AND COFFEE: THE RELATIONSHIP BETWEEN FAIR TRADE AND GLOBALIZATION
(Advisor: John Wooding)

In the last quarter century, the idea of “fair trade” has grown into a movement. While it started as a slang term among mercantile lords and manufacturing giants to describe protectionism and the “old moral economy,” it came to be associated with something entirely different. It came to be seen not as protectionism, but as a means of creating an alternative market, a market based on ethics, standards, and decency. In this way, it could be conceptualized as being against the market instead of within it. This study assesses the link between Fair Trade and globalization, establishing the extent to which Fair Trade is both against the market and within it. We find that it is in fact both, a way of managing globalization that has only recently begun to achieve success. It operates within the globalized market to carve a niche for itself by allowing consumers to make a choice to support a different set of values. But it simultaneously goes against globalization by seeking to improve labor standards, protect the environment, and pay a living wage. Fair Trade is a reaction to the excesses of globalization. The key to its future success lies in its ability to expand into the market it has been fighting against for so long.

Muise, D., Thawnghmung, A.
Political Science
POLICY IMPLICATIONS: INTERNATIONAL TRIAL AND ERROR WITH A LENS ON MYANMAR
(Advisor: Ardeth Thawnghmung)

This work is part of the Co-op Scholar Program, and is part of Dr. Ardeth Thawnghmung's work on grassroots politics coping strategies of the poor in Myanmar. Her current authorial work is intended to provide scholars, policy writers, and advocates alike with a better-informed view of the reality of daily life in Burma/Myanmar. My main role in this work was to uncover, report, and analyze the results of policies and programs in other developing countries throughout recent history, and to extract a lesson out of each country's experiences. This multiple policy analysis takes into account the extreme and varied political conditions of Myanmar and other nations, wherein government capacity, economic freedom, and meritocracy are generally not present in any distinguishable form. In the context of this work's greater goal, each policy or program is intended as a remedy to the aggregate macroeconomic effect of individual
peasant’s strategies of coping with life under an undeveloped government. Examples include: an NGO-run cash-lottery as a remedy to the aggregate detriment of a systemic gang-run gambling culture (Taiwanese concept); subsidies for new mothers whose children attend school as a remedy to the aggregate lack of education caused by education-related opportunity-costs (Latin American Concept); and an international-outreach HR bureau as a remedy to the aggregate lack of professionals due to international pull-factors (Malaysian concept.) This work culminates in a policy menu to be published within Dr. Ardeth Thawnghmung's upcoming book, Grassroots Politics and Coping Strategies in Myanmar.

Casavant, J., Shahin, S.
Psychology
TATTOOS AND PERCEPTION OF OTHERS
(Advisor: Mary Duell)

This research study asked 122 college students to evaluate images of either a male or a female with or without tattoos. Each participant was asked to rate one of four possible images on both positive and negative characteristics, such as attractiveness, intelligence, aggression, and rebelliousness. We expected the results to show that the images with tattoos would be viewed more negatively than those without tattoos, and that females with tattoos would be viewed the most negatively overall. We also expected that non-tattooed individuals would be viewed more positively than tattooed individuals. Our findings indicated that the presence of tattoos resulted in both higher positive and negative ratings regardless of gender of the person in the image.

Clark, C., Murphy, D.
Psychology
PERCEPTIONS OF STUDENTS, FACULTY AND STAFF REGARDING PHYSICAL ACCESSIBILITY ON A UNIVERSITY CAMPUS
(Advisors: Deirdra Murphy, Ashleigh Hillier, Bridget Marshall)

With the rise in enrollment of postsecondary students with disabilities it is becoming increasingly important to have an accessible university. However, students with disabilities are not the only ones who encounter accessibility challenges in higher education. This study investigates the perceptions of students, faculty and staff of the University of Massachusetts about the accessibility of the campus. There were 12 participants total. A qualitative IRB approved research study was conducted to assess the perceptions of people with and without disabilities on campus. Four focus groups were conducted, audio-taped, transcribed and analyzed using NVivo software. Focus group discussions were about one hour long with eight structured questions. Questions asked focused on the current opinion of accessibility on campus, areas that are easy or more challenging to access, how accessibility affects quality of life, and potential solutions to accessibility challenges. A basic demographic sheet and a short questionnaire were handed out following the group discussion. Several themes emerged from the focus groups. Access to the physical campus environment was more challenging for individuals with disabilities. Faculty, staff, and students did not know who or how to report accessibility issues. Weather and signage were significant factors for access on campus. Many participants also noted that acquiring accommodations for accessibility challenges is difficult when a person has a temporary disability. Accessibility is more than meeting the letter of the law, Americans with Disabilities Act (ADA). Designing an accessible campus will benefit a variety of users and will enhance everyone's experience.
Donnelly, S., Hillier, A., Mendes, E., Trietsch, R., Goldstein, J., Keeves, J.

*Psychology*

**EVALUATING THE EFFECTIVENESS OF A SUPPORT GROUP FOR UNIVERSITY STUDENTS WITH ASBERGER’S SYNDROME**

(Advisor: Ashleigh Hillier)

Increasing numbers of students with autism spectrum disorders (ASD) are entering colleges and universities. These students’ success can be jeopardized by academic, social, and organizational challenges if appropriate supports are not in place. Universities across the country are struggling to find cost-effective methods to improve retention rates and academic achievement. While institutions that receive federal funding are required to provide students with disabilities accommodations aimed to “level the playing field”, often these do not address all areas in which support may be needed. While it is becoming more common for universities to offer specialized programs for students with ASD, there is a lack of empirical literature to support the effectiveness of such programs. Participants were recruited through the university’s Office of Disability Services. All participants had received a diagnosis of an autism spectrum disorder prior to their enrollment in the program. Pre- and post-intervention self-report questionnaires were administered, and consisted of the Rosenberg Self-Esteem Scale, the UCLA Loneliness Scale, and the Counseling Center Assessment of Psychological Symptoms-34 Scale, which was made up of 7 subscales – depression, generalized anxiety, social anxiety, academic distress, eating concerns, hostility, and substance use. Groups met for 1 hour a week for a 7-week period and ranged in size from 3 to 5. Groups were facilitated by psychology faculty, staff from the university Counseling Center, and staff from the Office of Disability Services. A curriculum guided the weekly discussions and consisted of topics such as time and stress management, managing group work, and interpersonal relationships. Responses on the pre- and post-measures were analyzed using two-tailed paired t-tests. Significant decreases (p<.05) from the start to the end of the support group were found for self-reported stress, loneliness, depression, general anxiety, and social anxiety. Findings indicated that participation in facilitated support groups for university students with autism spectrum disorders can have a range of psychological benefits, highlighting the usefulness of making such programs available within a university setting. Given the cost effectiveness of such interventions and the potential for improving academic outcome and retention of students with ASD, further research examining the efficacy of this and similar program models is warranted.

**Hunt, A.**

*Psychology*

**TECHNOLOGY USE AND ITS RELATIONSHIP TO IMPATIENCE AND DELAYED GRATIFICATION**

(Advisor: Mary Duell)

Nowadays, it is nearly impossible to find someone between the ages of 13 and 45 without a cellphone, laptop, tablet, or some other kind of digital device on their person. Most notably, technology use among teens and young adults has grown exponentially over the past decade, creating an addiction to instant gratification and subsequent higher impatience levels when that instant gratification is delayed. An extensive search through the current literature has yet to produce research on the possibility that increased use of technology is associated with increased impatience when feedback on a task is delayed. My objective was to investigate this relationship. I hypothesized that the frequency of technology use would be associated with more impatience on a computerized questionnaire where the opportunity to respond was delayed on some questions. I was also interested in determining whether a mood measure administered after the computerized questionnaire would be different in participants who were heavy users of technology versus those who were not. Preliminary findings are presented regarding the relationship among these variables. Additional research will be needed to further clarify relationships among these variables. If a strong relationship exists between the three variables, this could prompt further research concerning the role of technology in our lives.
Khan, M.S., Kollin, R., Weinstein, Y., Trubey, R., Raudales, R., Dutta, U., Wooding, J., Pagliarulo, M.

Psychology

WHAT DRIVES CONSUMPTION? FAIR TRADE PREFERENCE AMONG UML STUDENTS
(Advisor: Jana Sládková)

As consumers we are more connected to the manufacturing process than we could have ever dreamed a mere 50 years ago; recent events overseas have brought issues of trade and social justice into the limelight. The present study examined attitudes and hypothetical purchasing behaviors of students at UMASS Lowell, and whether there is any effect or influence on them from taking a 400-level Psychology seminar about fair trade. We wanted to gauge students’ familiarity with issues of fair trade, the mechanics of the global economy, and the topic of undocumented immigration by measuring attitudes and opinions at different points during the semester. We recruited 30 male and female students from five different 400-level Psychology seminars. One of these seminars, taught by Dr. Sladkova, was on fair trade and acted as our experimental group which we hoped to influence a change in by the second survey. The rest of the students from other seminars served as the control group. Participation was voluntary, and our methods were approved by UMASS Lowell’s Institutional Review Board. After the administration of the first survey and in our preliminary data analysis, we noticed a low level of familiarity with our topics of interest among students as was initially expected. After the intervention, the control group leaned more towards price, which we deduced was due to end-of-semester budget constraints. Conversely, in Jana’s seminars, fair trade shot up in importance to the detriment of price and brand. Organic preference stayed constant (low) in both groups.

Martocchio, N.

Psychology

PYRAMIDAL TRAINING TO TEACH IMPLEMENTATION OF THE PICTURE EXCHANGE COMMUNICATION SYSTEM
(Advisor: Rocio Rosales)

The Picture Exchange Communication System (PECS) is an augmentative communication system that is often used with individuals who have developmental disabilities and exhibit language delays or deficits. Research has shown that parents and educators can be taught to implement PECS via behavioral skills training packages, which often include instructions, modeling, practice, and feedback provided by an experienced professional. However, this type of training can be costly in terms of both monetary and human resources. The pyramidal training or train-the-trainer model, is a method of training in which a professional teaches a skill to a small group of individuals who then teach that skill to another set of individuals. This model has been shown to be effective to teach the implementation of preference assessments, functional analyses, and other behavioral intervention techniques to parents, teachers, and direct care staff in a timely manner. The purpose of the present study was to extend the literature on pyramidal training to include teaching university students to implement the first four phases of PECS. Fourteen graduate and undergraduate students comprised three tiers of the pyramidal training model. A multiple baseline across participants design was used to demonstrate the efficacy of this model. Results to date indicate pyramidal training may be an alternative for recruiting a single professional to teach a set of skills to a large number of individuals at once. Discussion will focus on implications of the results and the limitations to be addressed in future work.
Morello, K.

Psychology

BULLYING, VICTIMIZATION AND ITS RELATIONSHIP TO PSYCHOLOGICAL WELL-BEING
(Advisor: Mary Duell)

Research has consistently shown that the inability to cope with the experience of being bullied can lead to long-lasting, negative psychosocial effects. Additionally, individuals who engage in bullying have been reported to suffer from self-esteem issues as well as mood-related disorders. The present study investigated whether bullies and/or victims of bullies suffer from self-esteem issues and mood-related problems in their adult lives. This online study examined a sample of 639 undergraduates at the University of Massachusetts Lowell. Researchers used three self-report questionnaires. The first was an inventory created by the researchers, which measured the extent to which each participant was a victim of bullying or engaged in bullying during the middle school and high school years. The State-Trait Anxiety Inventory was used to assess the individual’s current level of anxiety as well as a more general disposition toward anxiety. Lastly, the Coopersmith Self-Esteem Inventory measured the participant’s emotional attitude toward himself or herself. Results suggested that the experience of victimization during high school was the most important predictor of later psychological well-being.

Petrychova, K., Ejaife, O.

Psychology

DIFFERING PSYCHOLOGICAL DEFINITIONS OF LIBERALISM AND CONSERVATISM: THEIR STATISTICAL ASSOCIATION WITH PERSONALITY AND WITH RACISM
(Advisor: Robert Kunzendorf)

Instead of defining liberalism and conservatism as opposite ends of a political continuum, this study measured 3 psychological definitions of liberalism—‘visionary liberalism focused on the future’, ‘pragmatic liberalism focused on the present’, and ‘guilt-ridden liberalism focused on the past’—as well as 3 psychological definitions of conservatism—‘dread-ridden conservatism focused on the future’, ‘pragmatic conservatism focused on the present’, and ‘nostalgic conservatism focused on the past’. Correlations between these 6 definitions and ‘big 5’ personality traits showed that neuroticism is not associated with liberalism in general, as previous research has suggested, but is associated with ‘guilt-ridden liberalism focused on the past’—among other personality-related findings. In addition, regressions showed that racism is not associated with conservatism in general, as past research has suggested, but is associated with ‘dread-ridden conservatism focused on the future’.

Powell, R.

Psychology

CREATING CREATIVITY: AN EXPERIMENTAL COMPARISON OF TWO METHODS
(Advisor: Yana Weinstein)

Recent psychological research into the concept of creativity has demonstrated that prospective thinking (i.e. thinking about the future) can increase creativity. Additionally, inspiration (i.e. the process of evocation, motivation, and transcendence) has been shown to lead to the production of a creative artifact. The current study is the first to compare the relative strengths of both prospective thinking and inspiration as manipulations of creativity. This study used validated manipulations of prospective thinking and inspiration, in addition to a control condition, to examine differential effects upon a standard measure of divergent thinking, Guilford’s Unusual Uses Task (UUT). A between-subjects design was used with 30 undergraduate students participating in each of the three conditions. The UUT allows for two different measures of creativity to be calculated: fluency (the total number of responses) and originality (statistical uniqueness of responses divided by the total number of responses). I predicted that while the inspiration condition should produce more unique responses than either the prospective thinking manipulation or the
control condition, the prospective thinking condition should produce greater fluency than the other two conditions. This would suggest that while inspiration is more effective at generating overall creativity, its power comes not from the quantity but from the quality of responses, a characteristic that should also lend itself to domain specific creative measures.


*Psychology*

**TECHNOLOGY AND TEENS WITH ASD: A “SOCIAL” PROJECT THROUGH A MUSIC EDUCATION AND PSYCHOLOGY PARTNERSHIP**

(Advisor: Ashleigh Hillier)

When one thinks of technology and the word “social” it is usually in the context of social networking. However, our project seeks to harness music technology for the purpose of developing face-to-face socialization skills in a population of students whose ability to misread social cues is well documented. Our SoundScape project seeks to address the social challenges experienced by those with Autism Spectrum Disorders (ASD) by providing participants with the opportunity to meet others, practice effective communication and successful interactions, and potentially form rewarding friendships through the students’ inherent interest in music and technology. Students in the Music Education and Psychology graduate and undergraduate programs have the unique opportunity to help design, implement, and evaluate this music technology intervention. Our current research uses iPads, which feature user-friendly and collaborative interfaces rather than desktop computer-based music technology. Feedback from parent focus groups conducted over the past two years underscore the benefits of listening to or playing music in the lives of their children. These parents believe our current music intervention have positive social benefits for their children, since music is often used to regulate their moods and as a “de-stress” mechanism. As opposed to desktop computing where one person is in control, our feedback resulted in the iPad interface encouraging collaboration and social interaction. Parents also believe this university-based program allows their children to explore their natural interest in music listening, music making, and technology in a social setting with the university students serving as skillful facilitators.

**Querol, B., Rosales, R., Soldner, J.**

*Psychology*

**A REVIEW OF THE IMPACT OF INTERTEACHING ON COLLEGE STUDENT PERFORMANCE**

(Advisor: Rocio Rosales)

Interteaching (Boyce & Hineline, 2002) emphasizes student-driven learning and has been demonstrated to be an effective teaching method for both undergraduate and graduate students. The purpose of this literature review is to outline the conceptualization of interteaching as a behavioral teaching method and its applications in the college classroom. We conducted an investigation of peer-reviewed empirical studies on interteaching published from 2002-2014. Relevant keywords were inserted in three search engines: PsychINFO, EBSCO, and Google Scholar. Three inclusionary criteria (i.e., time of publication, experimental or correlational design, and college classroom application) narrowed our initial list of interteaching literature. This poster will highlight the results of this review, with a focus on the application of interteaching to varied academic disciplines, class sizes, and weekly class times; and will emphasize both its positive quantitative (i.e., test probes) and qualitative (i.e., social validity questionnaires) impact on college student learning and satisfaction. These results indicate interteaching methods have been found to produce promising effects on college students’ success. A guide for future directions of interteaching research and practice will also be discussed.
Silva, K. 
*Psychology*

**THE EFFECTS OF BILINGUALISM ON TREATMENT AND SERVICES FOR CHILDREN WITH AUTISM SPECTRUM DISORDER**
(Advisor: Rocio Rosales)

Autism Spectrum Disorder (ASD) is characterized by deficits in social interaction and communication and the presence of restricted and repetitive behaviors. Given the presence of a language delay or impairment, the focus of early intervention often revolves around ways to improve language and communication. To date, research has shown that for typically developing children, bilingualism has no major impact on language development and may help improve executive control, working memory, and cognitive performance. There is little research, however, on the impact of bilingualism for individuals with ASD. As of 2007, 51 million citizens of the United States spoke a language other than English (U.S. Census Bureau, 2011). Since ASD affects individuals of all ethnic backgrounds, there is growing concern of how empirically validated interventions should be implemented with linguistically diverse populations. Specifically, the question of whether bilingualism should be promoted for individuals with ASD is one that has not been widely studied. The purpose of this review is to explore issues related to raising children with ASD in a bilingual environment. While the empirical literature on this topic is limited, results of studies conducted to date have suggested that being bilingual has no significant impact on language development in children with ASD. Results also suggest children may prefer treatments delivered in their native language. Discussion will focus on limitations of the studies found and areas for future research, including the importance of educating medical professionals, parents, and ASD specialists as they continue to work with a growingly diverse population.

Walkling, K., Green, J., Colak, B. 
*Psychology*

**“WE ALWAYS BLAME SOCIETY FOR EVERYTHING BUT WE ARE SOCIETY:” LOCAL YOUTH PERSPECTIVES ON COMMUNITY**
(Advisor: Urmitapa Dutta)

Youth perspectives have been largely absent from the psychological literature on urban social issues, especially community violence. Furthermore, the bulk of existing research tends to focus on individual risk factors and resiliency, which undermine the contextual factors and structural inequities associated with community violence experienced by youth. Our project attempts to address these gaps by documenting community perspectives from the vantage point of youth in Lowell using participatory action research approaches. These approaches reposition traditional research “subjects” as partners in the researcher process including them in the formulation of research objectives and questions, data collection, analyses, and dissemination. Conducted in collaboration with Teen BLOCK, our study engaged local youth as agents of inquiry and as experts about their own communities. We elicited youth participation through activities such as brainstorming, focus groups, collage-making, and critical discussions. In this poster, we will present our findings to elucidate how youth in Lowell define, delineate, and experience their local communities. Our findings highlight community assets and liabilities as theorized by our youth participants. These findings allow us to identify points of intervention in the local community, which can potentially inform local violence prevention efforts and policies in Lowell. By creating a space for young people’s voices and by collaborating with them in developing action plans to address their concerns, we can more effectively understand and address the physical and structural violence encountered by youth. Our research findings also have implications for creating more positive ecologies for youth development in Lowell.
There is a well-known shortage of skilled paraprofessionals for delivering behavioral intervention services to children with Autism Spectrum Disorders. Online training geared toward preparing staff may be part of the solution. LearningABA, an asynchronous, online-training program, models on-the-job training through video instruction, video demonstration, and video simulation of real-life work with a child. Previous research has shown that the LearningABA curriculum is effective in establishing discrete-trial-training (DTT) skills, as measured during live performance. The present program of research investigated what aspects of the training program may have led to participants’ success, across three experiments. In Experiment 1, the DTT skills of college students were assessed before and after one of three DTT training conditions: Linear Video presentation, Interactive Video Simulation and a Combined condition of both video and simulation. Results showed that the Combined condition resulted in slightly greater pre-/posttest gains in accurately implementing DTT than the Linear Video condition. Interactive Video Simulation alone showed the least gains. Results of the study suggest that the use of interactive videos to teach skills is useful, but only when used with a video component. The results also prompted additional research questions concerning the most effective ways to combine linear and interactive video to produce the most accurate live DTT performance. Thus, the structure of combined linear and interactive video was manipulated in Experiments 2 and 3. Data collection and analyses for these experiments are ongoing.

Wilkie, E.

A COMPARISON BETWEEN COPING STRATEGIES AND THEIR USES IN THE MILITARY
(Advisors: Yana Weinstein)

Trauma psychology has been a growing field in the United States since 2001. Much of the research and developing theories have been aimed at creating resilience in the military, as they are expected to experience traumatic situations during their career. Recently the United States Army has implemented a program based on positive psychology called the Comprehensive Soldier Fitness (CSF) program which seeks to promote intrapersonal and interpersonal well-being as well as preventing future problems. CSF does not provide soldiers with the ability to comfortably seek help when under mental stress, which the experimental variable is believed to accomplish. This study measures the effect of the CFS program on overall measures on affect (PANAS) and resilience (RSA), as compared to a program that promotes communication between soldiers and mental health care professionals, a program called Seeking Social Support(SSS). At the beginning of the study baseline affect is taken of all participants through the PANAS evaluation. The control group is asked to watch a short film overviewing the CSF, whereas the experimental group is asked to watch a brief film pertaining to soldiers discussing personal experiences of reaching out to support networks after having experienced trauma. Overall affect is again measured after watching the assigned film. A resilience measure (RSA) is then taken of each participant. Affect and resilience measures have been linked to the likelihood of someone willing to seek help for trauma-related stress disorders, and serves as a proxy for help-seeking behaviors in this study comparing CSF to SSS.
Bridges, U., Rajai, S., Garland, A., Cabral, A., Pereira, T., Douglass, R.

Sociology
UMASS LOWELL AND SAYDANAR: BRIDGE TO BURMA
(Advisor: Susan Thomson Tripathy)

As students in the sociology course “Community Service” at UMass Lowell, we are conducting a community service project at SayDaNar, a community development organization serving Lowell’s Burmese refugee community. Our project is focused on helping the Burmese community adjust to their new life in Lowell, Massachusetts and become more independent and involved in community activities. In particular, we recognize that one of the greatest barriers they face to increased participation is language. For this reason, our goal is to help adults learn how to read and write in English, and help schoolchildren with their homework, including language and math skills. To accomplish these goals, we participate in an after-school Homework Help program, and we have organized a separate reading group for the adults. We meet with the adults twice a week on Tuesday and Thursdays, and work with them individually to accomplish their academic goals and improve their English language skills. We also view the reading group and Homework Help as an opportunity for mutual sharing and learning about both Burma and the United States. In this way, we work to create a safe, comfortable and pleasant learning environment.

Emery, T., Young, A., DeJesus, N., Thomas, M., Forsman, C., O’Neil, R.

Sociology
CAMBODIA TOWN AND UMASS LOWELL “EXPERIENCE THE CULTURE”
(Advisor: Susan Thomson Tripathy)

Cambodia Town is a historically Cambodian-American community located in the Lower Highlands of Lowell, about a 5 minute drive from UMass Lowell’s south campus. The goal of our project is to increase awareness of Cambodian culture amongst UMass Lowell students by providing opportunities to visit and interact with the business community in Cambodia Town. In this way, we hope to foster camaraderie, increased social connections and a bridge between cultures. To accomplish this goal, with the help of the Cambodian Mutual Assistance Association, we are creating an interactive website and a walking-tour brochure of Cambodia Town to make available for prospective and current UMass Lowell students. These tools can be used as a guide to encourage student exploration.

Overton, T.

Sociology
GENDER, CAREERS AND SUCCESS: SURVEY OF UMASS LOWELL UNDERGRADUATES
(Advisor: Susan Thomson Tripathy)

Prior to the Women's Movement in the 1960's, women in the United States were less likely to commit themselves to careers. Instead, they usually married and became stay-at-home mothers, occupying their adulthood with childcare and housework. Considering this social context, and especially how it affected women in college, Matina Horner (1969) alleged that a "fear of success" took root. Now, in 2014, students at University of Massachusetts Lowell have been surveyed about how they feel about this paradigm of careers vs. family and social relationships. The population sample - 600 undergraduate students - has been asked about their opinions about several statements concerning their careers and their perceptions of success. Questions ranged from their feelings about their partners' success to their confidence in their own abilities and potential. On average, students are favoring their careers over the values of family. This is happening regardless of gender, rather than only for men as it was for so many years.
TRIO is an early awareness program divided into three smaller branches: Educational Talent Search, GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs) and Upward Bound. Overall, the goal of this program is to increase the number of students going to college from low income households and under-represented groups. The mission of our community service group, “Students Assisting Students” is to help Lowell High School students enrolled in TRIO become familiar with and ready for the college application process through the first-hand perspectives of current students at UMass Lowell. This was accomplished by working one-on-one with the high school students on a weekly basis and organizing four workshops. The first workshop was geared towards the Freshman Academy, in this workshop we addressed the things we wished we had known about high school to prepare for college. The next two workshops addressed the Common Application and Financial Aid application process. The final workshop was a variation of the first workshop, geared towards upperclassmen, teaching them about what we wished we had known about college before entering. During these workshops, we used an interactive approach to involve the high school students and respond to their questions and concerns. We are also organizing a campus tour on April 24th for students in the GEAR UP program. Throughout this process, we have documented our observations and reflections through regular postings on an online e-Portfolio.

College of Health Sciences

Alnajidi, H., Vann, C., Drenas, W., Goodyear, N.
Clinical Laboratory and Nutritional Sciences
THE ROLE OF SOAP DISPENSERS IN INFECTIOUS DISEASE TRANSMISSION
(Advisor: Nancy Goodyear)

Hand washing is an important component of daily hygiene. Soap dispensers are vulnerable to bacterial contamination on the surface and inside the dispenser. This presents serious health implications especially for immunocompromised individuals; contaminated soap dispensers have been identified as sources of hospital outbreaks. Opportunistic and coliform bacteria have been found in soap and on the outside of dispensers, thus transmitting the bacteria to the hands of users. Our study objectives are to determine 1) how long bacteria survive in commercial hand soap, 2) the validity of retrograde contamination (from hand to soap), 3) if contaminated bulk refillable soap dispensers can be effectively cleaned and sanitized, and 4) if sealed cartridge systems can become contaminated. Our initial bacterial survivability study indicates that Klebsiella pneumoniae can actively proliferate in soap for up to 6 days, but not at 30 days. An investigation of the time between 6 and 30 days is underway. Retrograde contamination was tested by using a gloved hand to apply Klebsiella pneumoniae (7.5x10^7 CFU/mL) to the dispenser daily for 4 days. Soap samples (~2ml = 1 pump) were collected daily and at 7 days and mixed with 0.1 ml DE neutralizing
broth to stop any antibacterial activity. Samples were plated on tryptic soy agar and incubated at 37°C for 48 hours and examined for growth. To date, no significant contamination has occurred after 7 days, indicating that retrograde contamination may not be a valid means of contaminating soap dispensers. Future studies will include other methods of contamination.

Beato, C., Lam, D., Saliba, S., Becker, B., He, G.
Clinical Laboratory and Nutritional Sciences
SUSCEPTIBILITY COMPARISON TO ANTIBIOTICS BY USING GRAM-POSITIVE AND GRAM-NEGATIVE BACTERIUM
(Advisor: Gui-Xin He)

Bacterial antibiotic resistance is becoming an emerging issue for treatment of nosocomial infectious diseases. Thus, determination of bacterial susceptibility to antibiotics in vitro is critical for selecting a proper antibiotic and its dosage for chemotherapy. Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa are the most common nosocomial infectious agents, and their resistant isolates are increasing in the United States. In order to evaluate the susceptibility accurately, we compared the minimal inhibitory concentration (MIC) of S. aureus, E. coli and P. aeruginosa to different class of antibiotics by using Kirby-Bauer's (KB) method and the broth microserial dilution method. The test results indicated the MIC of serial dilution method is more accurate than the KB method, as KB method has disadvantages such as getting false zones of inhibition, having to maintain the McFarland standard, or having to purchase the expensive antibiotic discs. Therefore, we believe serial dilution method is more effective, accurate, and cheap approach for determining the susceptibility of S. aureus, E.coli and P. aeruginosa to antibiotics.

Jamil, N., Dopler Nelson, M., Ajama, J., Grewal, N.
Clinical Laboratory and Nutritional Sciences
THE IMPACT OF FRIED FOOD CONSUMPTION ON INDIVIDUALS GENETICALLY PREDISPOSED TO OBESITY
(Advisor: Mindy Dopler Nelson)

Obesity is a complex condition that modern day scientists and researchers are still struggling to understand. Genetics plays a vital role when it comes to obesity; however, environmental exposure is required for its manifestation. An estimated 30.6% people in the United States are obese (BMI>30) and the overall healthcare costs linked to obesity is about $254 billion dollars. Complications of obesity go beyond diabetes and heart disease by impacting a person’s mood, level of energy, sleep, breathing and joint pain. Among the genes strongly associated with obesity, individuals carrying two copies of a specific gene variant, known as FTO, have a 70% greater probability of being obese opposed to those who do not carry any copies. Since increased activity of FTO can make an individual overeat and become obese, we investigated whether certain types of food cause people with a higher genetic risk for obesity to gain more weight compared to people with a lower risk. Our literature search on Pub-med using key words ‘obesity’, ‘fried food’ and ‘genetics’ identified 20 studies that reported a positive association between fried food consumption and BMI in relation to 32 obesity genes. In conclusion, we recommend that individuals who are genetically predisposed to becoming obese should decrease the intake of fried foods to decrease their risk of becoming obese and the comorbidities associated with obesity.

Khoder, J., Dopler Nelson, M.
Clinical Laboratory and Nutritional Science
ASSOCIATION BETWEEN FOOD ADDICTION AND DIETARY INTAKE IN SHIFT WORKERS
(Advisor: Mindy Dopler Nelson)

Recent research has reported similar regions of illumination in the brain between alcohol, drugs, and food in those with addictions. The Yale Food Addiction Scale (YFAS) was designed to diagnose food
addiction (FA) based on substance abuse criteria outlined in the DSM-IV-TR guidelines. The purpose of this study was to determine if there is an association between FA and higher intake of sugar, fat, and salt intake in night and day shift female nurses. Methods: The data obtained from this clinical study was gathered from the YFAS questionnaire and 3-day diet records (3DD) that were administered to 5 day and 5 night shift workers. Participants with > or equal to three symptoms and clinical distress and/or impairment were diagnosed with having FA. Participants with > or equal to three symptoms were classified as high symptomology of FA. Sugar, fat, and salt intake was determined from 3DD. Results: More day shift workers had diagnosis of FA (p=0.004). Diagnosis of FA was associated with significantly higher dietary intake of trans fat (p=0.004). Conclusion: The current findings suggest that day shift workers are more likely to be diagnosed with FA and increased dietary intake of trans-fat. However, since only 10% of the participants had FA, a larger sample size may have supported our initial hypotheses.

Kilroy Bain, G., Mayhew, J., Phiv, T., Dopler Nelson, M.
Clinical Laboratory and Nutritional Sciences
ANEMIA RELATING TO CHRONIC KIDNEY DISEASE: A THOROUGH INVESTIGATION OF CURRENT RECOMMENDATIONS
(Advisor: Mindy Dopler Nelson)

It’s no secret that the prevalence of obesity concurrently with Type 2 Diabetes has dramatically increased over the last 20 years. Type 2 Diabetes is serious because over time excess circulating blood glucose damages critical organs and tissues throughout the body. Unmanaged, diabetes damages the nephrons in the kidneys, causing irreversible loss of function, and ultimately leads to chronic kidney disease (CKD). Patients with CKD receiving hemodialysis treatments are at higher risk for iron deficiency anemia as a result of decreased production of erythropoietin (EPO). It’s important when treating a patient with multiple health issues to delay disease progression as well as prevent other diseases from developing. Since medical nutrition therapy interventions are highly individualized, establishing recommended guidelines can be difficult. The purpose of this study was to determine whether there is enough research to support a change in the recommendations by the Academy of Nutrition and Dietetics for the treatment of anemia as it relates to CKD. Our findings suggest a recommended increase in vitamin C, either through diet or supplementation, to better utilize iron stores, therefore reducing the risk of anemia in hemodialysis patients.

Nicoloro, J., Marika, D., Duty, S., Scott, E., Goodyear, N.
Clinical Laboratory and Nutritional Sciences
A PILOT STUDY TO EXPLORE CONTAMINATION OF STUDENT NURSES’ SCRUBS WITH STAPHYLOCOCCUS AUREUS AND MRSA BEFORE AND AFTER LAUNDERING IN COLLEGE DORMITORY
(Advisor: Nancy Goodyear)

The role of environmental factors, including nurses’ scrubs, in the spread of infection is an area of growing interest. Laundering plays an important role in decontaminating scrubs. Our goal was to qualitatively assess the presence of S. aureus and MRSA on nursing student scrub tops, before and after laundering in college dormitory facilities. Study participants included junior and senior nursing students from Simmons College, Boston MA, who interned in acute inpatient clinical units during the 2013-14 academic year. Using the provided swab and template, participants swabbed the designated area after clinical rotation, and again after laundering. Swabs were collected on Simmons campus, refrigerated and delivered weekly to UMass Lowell. Samples were cultured within 24hr to mannitol salt agar, tryptic soy agar and Staphylococcus enrichment broth to ensure recovery of low numbers. Colonies morphologically consistent with S. aureus were identified with Gram stain, catalase and a commercial kit. Oxacillin and chromogenic MRSA plates were used to confirm methicillin susceptibility. Forty-three scrub tops were sampled pre and post laundering. Of the pre laundering samples, 11 (26%) were contaminated with S.
 aureus, 5 (45%) of which survived the laundering process. There were two instances of S. aureus on the post sample but not the pre. These pilot study findings demonstrate that student nursing scrub tops may act as a vector for infectious microorganisms, and that traditional laundering practices may not remove all pathogens. Additional samples will be obtained, and laundry conditions analyzed for possible correlation to survival post laundry.

**Shick, E., Goodyear, N.**
*Clinical Laboratory and Nutritional Sciences*
**COMPARISON OF THE DISINFECTION EFFECTIVENESS OF LIME, LAVENDER, RED THYME, AND TWO DIFFERENT TEA TREE ESSENTIAL OILS ON S. AUREUS**
(Advisor: Nancy Goodyear)

Public interest in safer disinfectants is growing, including do-it-yourself (DIY) formulations made from household products. Essential oils may be included for scent and purported disinfectant properties. Some oils have been shown to have antimicrobial activity, including thymol, a purified extract from thyme oil. We assessed the disinfection effectiveness of lavender, lime, red thyme, and two tea tree essential oils on Staphylococcus aureus. The red thyme oil was most effective, with a >5.00 (100%) log reduction. Lavender oil had a 0.73 (84%) log reduction, while lime oil had a 1.14 (90%) log reduction. The two tea tree oils achieved differing results; one tea tree oil had a 0.58 (69%) log reduction, while the other had a 1.59 (97%) log reduction. Variability in source and purity of commercial essential oils may result in differences in antimicrobial activity. The drastic difference in activity of the two tea tree oils may be due to the differences in sourcing and manufacturing. We have previously tested a do-it-yourself (DIY) disinfectant (1 cup distilled white vinegar, 1 cup club soda, 8 drops tea tree oil.) Future work will include testing each essential oil against additional organisms, in combination, and in modified versions of our original DIY formulation. Additional research into the impact of soil and surface wiping on the antimicrobial activity of each of these oils, alone and in DIY formulations is suggested, as household surfaces to be disinfected may have such soil present and household disinfection generally incorporates surface wiping.

**Specht, H., Dopler Nelson, M.**
*Clinical Laboratory and Nutritional Sciences*
**OPTIMAL BMI CUT POINTS AND ANTHROPOMETRIC MEASUREMENTS TO PREDICT CARDIOVASCULAR DISEASE**
(Advisor: Mindy Dopler Nelson)

Obesity is on the rise in the United States and all around the world. It has devastating impacts in the cost of living and quality of life. There are many chronic diseases associated with obesity such as cardiovascular disease, metabolic syndrome and diabetes. The purpose of this literary research study was to determine the appropriate cut points for body mass index (BMI) and other anthropometric and biochemical measurements, such as waist circumference (WC) and lipid concentrations, that best predict CVD. High BMI, large waist circumference and large percent trunk fat (%TF) are all associated with CVD and other devastating diseases associated with obesity. Based on our literary research, the best predictor of CVD is central adiposity. Waist circumference and %TF were highly correlated with high LDL cholesterol, low HDL cholesterol and hypertension, all predictors of CVD. BMI has a lower correlation with predicting CVD than %TF and WC. Although BMI is currently the main indicator of obesity status and predictor of the diseases associated with obesity, other anthropometric measurements that focus on central adiposity seem to be more accurate, but impractical in a clinical setting. BMI cut points should be lowered in order to better predict CVD and obesity related disease in certain populations with a tendency toward central adiposity.
Nano-sized TiO2 is useful for sunscreens, cosmetics, and can be utilized as a photocatalyst. However, the nanometer size and the large specific surface area of the TiO2 materials are physicochemical characteristics which may contribute to human red blood cell (RBC) damage. Using RBCs as a cellular model, we have evaluated the effects of TiO2 nanoparticle exposure to RBCs by quantifying oxidized glutathione, oxidized membrane vitamin E, hemolysis, hemoglobin adsorption, and cellular aggregation. Results: Red blood cells are rich in the antioxidant glutathione (GSH) and their membranes contain the antioxidant vitamin E. HPLC testing revealed that, due to physicochemical characteristics, some TiO2 materials have the ability to cause oxidation of GSH to the oxidized form, glutathione disulfide (GSSG), and oxidize membrane vitamin E. Additionally, some TiO2 materials have the ability to adsorb protein (visualized as hemoglobin) to their surface, form RBC aggregates, and ultimately cause RBC hemolysis via multiple different mechanisms. Conclusions: Our results indicated that some of the TiO2 polymorphs assayed contributed to red blood cell hemolysis via different mechanisms, whereas some polymorphs did not cause cellular damage. These data indicated that red blood cells can ultimately be hemolyzed by biological oxidative damage (BOD), intracellular oxidation of GSH to GSSG, oxidation of vitamin E in the RBC membrane, material adsorption to the RBC membrane, physical contact, or by a combination of these mechanisms.

While high rates of risky sexual behaviors have been documented among college students, family influences, such as parental health knowledge and values, can moderate such behaviors. The purpose of this study was to investigate the association between level of parental education and college students’ risky sexual behaviors while under the influence of substances. Survey data were collected for a cross-sectional analytic study at a public University between September 18th 2013 and October 2nd, 2013. Students whose parents did not finish high school were least likely to engage in sex under the influence while those whose parents received associates degrees were most likely to fail to use condoms. These results may help health professionals to target education activities to students at risk.

The goal of this Service Learning Project, with the Tewksbury Board of Health, was to help educate seniors at the Tewksbury Senior Center about how they could help prevent Opioid abuse and misuse in their community by knowing the signs of Opioid abuse and by safeguarding any medication they may have. Our role was to create a brochure that provided information about the physical and environmental signs that indicate Opioid abuse, and local resources information for those in need of counseling, detox, or rehabilitation services. We used the information to conduct presentations during the Tewksbury’s Drug Awareness Week. We also produced a 60 seconds PSA, “Voices of Addiction”, to be utilized by the Board of Health with local radio stations. Throughout the process of creating this program, we gained
experience in working with several municipal organizations and increased our knowledge about drug abuse.

**Amoako, A., Peterson, S.**  
*Community Health and Sustainability*  
**SERVICE LEARNING WITH WOMEN, INFANTS AND CHILDREN**  
(Advisor: Craig Slatin)

We did a project with WIC called Food Week 2013 which featured many different local farmers. The food choices included fresh fruits and vegetables, organic coffee made using solar power, fresh caught fish and shellfish, and homemade sweets. Many of the WIC families come to shop and they can use their checks! While the parents were shopping for food the children played games from the FitWIC program with the WIC staff dressed up as fruits and vegetables. We will be creating a movie of the pictures taken at Food Week for WIC to promote the event next year in hopes to have an even bigger turn out! We also attended the Great Expectations event at Lowell General Hospital and answered questions regarding WIC to expecting mothers.

**Crowell, S., Williams, M.**  
*Community Health and Sustainability*  
**GREATER LAWRENCE FAMILY HEALTH CENTER – FAITH-BASED ORGANIZATIONS**  
(Advisor: Leland Ackerson)

The goal of this service learning project, with the Lowell Community Health Center, is to expand outreach to a number of Faith Based Organizations in the greater Lowell Area. This included creating a database of existing contacts, as well as, gathering information on Faith based Organizations in the towns of Tewksbury, Tyngsboro, Westford, Billerica, Chelmsford and Dracut. Letters, using professional outreach formats, were then sent to these organizations leaders to inform them of the services provided by the health center. Working in this department also allowed us to participate in outreach during tabling events and community health screenings. This gave us an opportunity to be involved in a number of forms of community engagement.

**Kaikai, J., Coffey, M., Megnigbeto, M.**  
*Community Health and Sustainability*  
**ADOLESCENT REPRODUCTIVE HEALTH SERVICES IN GREATER LOWELL, MA**  
(Advisors: Craig Slatin, Leland Ackerson)

While the teen birth rate in Lowell has declined between 2000 and 2010, the rate remains one of the highest in the state. At present, Lowell has the eighth highest teen pregnancy rate of all cities and towns in Massachusetts. In 2012, a preliminary survey administered on behalf of Lowell Community Health Center’s (LCHC) Teen Pregnancy Prevention Task Force examined the attitude of Lowell teens and parents on the delivery of preventative and reproductive health services. The findings revealed a gap in adolescent provider input. This presented research study was completed to survey health providers in Lowell and the surrounding towns on their current practices and beliefs in regards to adolescents accessing reproductive healthcare. Students evaluated which factors interfere with the comprehensive delivery of services. This included evaluating what the significant factors contributing to teenage pregnancy in Lowell are, and what barriers exist in providing effective interventions. Preliminary data suggests that, among the most significant factors were insurance companies’ sending of detailed reports of information regarding visits, medications and procedures, and practitioners not having enough time to during routine visits to discuss sexual health.
Megnigbeto, M., Fuanyi, P.
Community Health and Sustainability
ADHD PREVALENCE AMONG UNIVERSITY STUDENTS
(Advisor: Leland Ackerson)

Purpose: ADHD has the potential to severely reduce the quality of life of young adults. While ADHD can be controlled with treatment, misuse of ADHD medications can severely impact long-term health status. This descriptive cross-sectional study investigated the prevalence of ADHD and ADHD drugs misuse among college students. Method: We conducted an anonymous online survey. Our population target was students enrolled at a public university in fall of 2013 and the sample included 1,980 students. Results: Data indicate that 12.7% of the students have diagnosed ADHD and 15.4% have undiagnosed ADHD symptoms. Approximately 17.8% of the students reported using ADHD medication without a prescription. The majority of this medication misuse was intended to boost academic performance. Discussion: This indicates that untreated ADHD and medication misuse are highly prevalent among college students. Health promotion on campuses should continue to focus on these problems.

Moran, T., Patel, R.
Community Health and Sustainability
HEALTHY YOU: GIRLS INCORPORATED
(Advisor: Craig Slatin)

Our service learning project helped us gain knowledge on how to create an effective lesson plan. Well collaborating with Girls Inc., we learned how to implement engaging lesson plans to girl’s ages 5-12 years old. The goal of our project was to raise awareness about the importance of physical activity, nutrition and stress management. Giving girl’s effective tools that can be used in their daily lives to help handle stress, eat healthier and increase physical activity. Our service learning project, Healthy YOU, allowed us to take the information we have learned in class and apply it to real life scenarios. Giving us confidence in our field, as well as the ability to network with other young professionals in our area.

Musialowski, K., Saing, P.
Community Health and Sustainability
MILL CITY GROWS: STRENGTHENING THE LOCAL FOOD OPTIONS IN LOWELL
(Advisor: Craig Slatin)

The purpose of our service learning project was to work alongside Mill City Grows to strengthen local food options in Lowell. Specifically we assisted in hands-on projects working with residents at the Community Gardens and also assisted in coordinating the annual Harvest Festival. We also researched strategies to assist the organization to discover existing data-driven models of food production in low-income communities as a tool for health improvement. The experience allowed us to work both as leaders in community gardening and also allowed us to get some research experience. The value of the work that Mill City Grows does is that local residents not only get to learn to grow their own food, but also get to interact with their fellow residents in a positive learning environment.

Ngo, B., Fuanyi, P., Rungu, R.
Community Health and Sustainability
SENIOR CENTER HEALTH FAIR COORDINATION
(Advisor: Leland Ackerson)

In our service learning project, our group assisted the workers at the Community Teamwork Incorporated (CTI). Along with our preceptor, Elaine Melanson, we have devoted our service learning to help Elaine and her CTI department, the “Senior Corps Volunteer Program”. The purpose of our service learning
The goal of our senior resource fair was to bring in seniors to the fair in order to provide them information about the organizations and agencies that deliver services to the senior residents of Lowell. To make the Senior Resource Fair a great success, our group had many tasks and responsibilities. Our first task was to identify and invite relevant community organizations and agencies to participate in the fair. Once we get a response from each service agency, we assisted Elaine in promoting the resource fair such as creating promotional materials and flyers to advertise the event. The last job we had to do was to construct a catalog of the community services that are participating in the fair in a booklet that the seniors can use and also develop a survey to help us evaluate the seniors’ experience at the end of the event.

Saint-Elme, L., Dansowah, T.
*Community Health and Sustainability*

**COMMUNITY ORIENTATION**
(Advisor Craig Slatin)

The term “refugees” has a very strong negative stigma associated with it, which often times, makes it difficult for an individual, or their family members, to seek the necessary assistance and resources needed for a successful transition to their new home within the Lowell community. The International Institute of England (IINE) is a non-profit organization that helps each family member to overcome negative stigma, barriers, and re-establish themselves in the Lowell community. IINE is funded by the federal government to assist immigrants and refugees to establish themselves as permanent residents. The organization’s mission statement is to help refugees and immigrants become active participants in the social, political, and economic richness of American life. IINE welcomes refugee families and provides families with housing, food, clothes, utilities, health care benefits and case management. The organization has staff members who are dedicated to educate as well as orient the refugee families to the laws and regulations of Massachusetts in addition to those within the Lowell community.

Spera, S., Nguyen, H.
*Community Health and Sustainability*

**STUDENT HEALTH SERVICES**
(Advisor: Leland Ackerson)

The goal of this service learning project was to educate and come up with engaging activities for the first year students living on the UMass Lowell campus covering Mental Health and Stress Management. Hoa was responsible for gathering information and presenting the general overview of what is stress, what causes it, and the long term effects and ways to deal with stress in a healthy manner. Stephanie was responsible for gathering the activities for the first year students to participate themselves in. She found activities which include “Stress Ball Fight”. During the “Stress ball Fight” activity, students each have a piece of paper where they write what stresses them the most, and on average how many hours of sleep they get each night. Then separate into groups and discuss others stresses and the healthy and positive ways on how to manage them. The goal of our program was to deliver the message that even living on college campus, the stress of financial concerns, maintaining a high GPA and sacrificing social life is never ending when it comes to the commitment of earning a degree. Also, this program was to prevent students from turning to alcohol and drugs as a stress management. There are other healthy alternatives such as writing, reading, or engaging in physical activities such as working out or playing sports to help manage stress.
Valdouin, J., Akwe, B.

*Community Health and Sustainability*

**PRE-THEANKSGIVING COOKOFF**
(Advisors: Craig Slatin, Leland Ackerson)

The North Suffolk Mental Health Association is a human service provider founded in 1959 with the prime goal of providing mental health services to individuals. Part of the agency's mission is to assist its client base achieve independence by providing a wide variety of treatment and rehabilitation services. It was in view of this that a pair of Community Health students from UML partnered with five of NSMHA's adult residential programs to assess the nutritional needs of the persons served, plan, implement, and evaluate interventions geared towards nutritional health and wellness. A cookbook with over 30 recipes for breakfast, lunch, dinner, and snack; nutritional facts regarding serving size, daily nutrient requirements, and other useful information was compiled during this service learning project. This cookbook is intended for use as a guide to healthy eating throughout the adult residential programs within the agency. The students involved in this project learned and improved on skills needed to plan, coordinate, and host an event. A pre-thanksgiving cook-off for staff and persons served in the five participating programs was hosted by the students. Participating programs presented meals that were sampled and judged by all in attendance, while a panel of three judges declared winners based on based on nutritional value, presentation, and taste of the food presented.

Chenette, E., Leblanc, J., McLaughlin, K., Sinclair, A., Martin, A., Vraibel, J.

*Exercise Physiology*

**SELF-SELECTED EXERCISE INTENSITY IN POPULAR FITNESS APPS**
(Advisor: Cynthia Ferrara)

There are many exercise apps available to the public through iTunes and smart phones. These are a great resource; however, there is a lack of evidence regarding their effectiveness. The purpose of the study was to determine the self-selected exercise intensity of the fitness apps, 7 Minutes to Health (7MH) and Cardio Free (CF). Nine healthy and active subjects ages 19-27 (7 men, 2 women) were recruited from the undergraduate student population. Study participants were healthy and had no limitations to exercise. On the first visit, participants completed a VO2 max test to determine exercise capacity. On the second visit, participants completed two exercise bouts using the free exercise apps, CF and 7MH exercise bout. The order of exercise bouts was randomly determined. Indirect calorimetry and heart rate was used to find the subjects’ VO2 max and the intensities at which the subjects were working at while participating in each of the exercise programs. A paired t test was performed to compare the exercise intensity (percentage of VO2max) achieved by all subjects in the two applications. All subjects reached a significantly higher exercise intensity on the CF exercise app in comparison to the 7MH exercise app (57+7 versus 42+7 p<0.001). Based on these findings, the self-selected intensity chosen by the subjects falls within the moderate intensity level requirements. The average exercise intensity for CF was higher than the average exercise intensity seen in 7MH.

Croce, N., Scott, B., McConnell, D., Collins, S.

*Exercise Physiology*

**RADAR PLOTS TO SUMMARIZE OFF-ICE PHYSICAL PERFORMANCE IN NCAA DIVISION I MEN’S ICE HOCKEY PLAYERS**
(Advisor: Sean Collins)

The purpose of this study was to demonstrate the use of radar plots in an attempt to summarize physical performance in NCAA division I men’s ice hockey players. Division I ice hockey demands elite physical conditioning; optimal performance requires high levels of skill and bouts of intermittent high power sprints. To sustain performance, athletes must have adequate power generation, energy availability, and
aerobic capacity to assist with recovery. Fitness could be defined as the optimal combination of a variety of physical capacities realizing that over training of some capacities may be at the expense of others. It would be useful to have a simple system for characterizing a fitness profile for players that accounts for several important physical attributes. UMass Lowell men’s ice hockey players were tested as part of their pre-season physical conditioning program. Players willing to have their data included for further analysis provided informed consent approved by the UMass Lowell IRB (n=25). Players completed a battery of physical and physiological performance tests including power cleans, vertical jump, split squats, shuttle runs, anaerobic threshold, VO2 Max, bench press and weighted chin up. After normalizing weight resisted measures by body weight (clean, RFE, bench, chin up) team level means and standard deviations were used to calculate individual player standardized (Z) scores (i.e. Z-Clean). Z-scores were utilized to generate radar plots in Excel (Microsoft), which were identically scaled for each player for graphical analysis. Future research should focus on identifying optimized fitness profiles for specific game demands and player roles.

Fokin, K., McConnell, D., Collins, S.
Exercise Physiology
MAXIMAL OXYGEN CONSUMPTION AND REPEATED SPRINT ABILITY IN NCAA DIVISION I MEN’S ICE HOCKEY PLAYERS
(Advisors: Sean Collins, Devan McConnell)

The purpose of this study was to determine the relationship between maximal oxygen consumption (VO2max) and repeated sprint ability (RSA) in NCAA DI men’s hockey players. Due to the anaerobic demand of relatively short and high intensity shifts (45-90 seconds), the importance of VO2max has been debated in ice hockey. UMass Lowell men’s ice hockey players were tested as part of their pre-season physical conditioning program. Players willing to have their data included for further analysis provided informed consent approved by the UMass Lowell IRB (n=25). Players completed a battery of physical and physiological performance tests. Specific to this report was an incremental treadmill ramping protocol to volitional maximal exertion to obtain VO2 max; and repeated shuttle runs (3 x 300m in 25m increments). RSA was determined based on the change in a player’s 1st and 3rd shuttle run (S3-S1). Mean (s.d.) seconds for S1: 57.76 (1.48), S3: 62.56 (2.82), RSA: 4.80 (2.36), VO2 max 62.10 (5.19) ml/kg/min. Pearson correlation of VO2 max and RSA revealed an r = -0.45 (p = 0.024). Players with higher VO2 max had a smaller increase in shuttle run time from the S1 to S3. This suggests that players with higher VO2 max may have recovered more completely prior to the next shuttle run. Carey (2007) demonstrated no relationship between VO2max and RSA in a sample of female ice hockey players with lower aerobic capacity. Further research should attempt to identify whether a critical threshold of aerobic capacity is beneficial for improved RSA.

Pomerleau, D.
Exercise Physiology
FACTORS INFLUENCING WEEKLY STEP COUNTS IN DOG OWNERS
(Advisor: Cynthia Ferrara)

PURPOSE: Almost 60% of dog owners do not achieve the recommended 150 minutes of weekly physical activity. This study examined factors influencing walking in dog owners. METHODS: Ninety-eight dog owners (20 men and 78 women, 48+1 yrs) participated in the study. Participants completed demographic questionnaires and the Neighborhood Environment Walkability Scale (NEWS), which examines perceptions of the neighborhood environment. Weekly step counts were recorded with an activity monitor. RESULTS: A majority of the study participants were married or living with a partner to whom they are not married (67%), with the remainder single, divorced, or widowed. Ninety percent of the study participants had attended or graduated from college with an Associate’s, Bachelor’s or graduate degree. Fifty-seven percent of the participants were employed full-time, with the remainder working part-time
The majority of study participants earned more than $75000 (45%), while 18% earned $50000-74999, 28.5% earned $25000-49999, and 8% earned 0-$25000. Weekly pedometer counts were 33767±1234 steps (mean±SEM). Those study participants who worked full-time had higher step counts than those participants who were unemployed or disabled (36757 vs. 27606 steps, p<0.05). There were no other significant differences in weekly step counts between demographic groups based on yearly earnings or employment status. There were no significant correlations between step counts and NEWS subscales. CONCLUSIONS: Participants who worked full time had higher step counts than participants who were unemployed or disabled. Environmental factors were not related to step counts in dog owners.

Scott, B., Croce, N., McConnell, D., Collins, S.

Exercise Physiology

VENTILATION PATTERNS AND OXYGEN UPTAKE EFFICIENCY IN NCAA DIVISION I MEN’S ICE HOCKEY PLAYERS
(Advisor: Sean Collins)

This study tested the effect of ventilation pattern on oxygen uptake efficiency (OUE) as assessed by VEO2 in a group of NCAA DI men’s hockey players. Ice hockey relies on anaerobic energy systems during play due to muscular power demands of acceleration. Aerobic energy plays a role during recovery between repeated sprints (i.e. micro breaks in play and between shifts). Oxygen intake during recovery is influenced by the efficiency of ventilation (assessed by VEO2 (ventilation / VO2) interpreted as the liters of ventilation per liter of oxygen uptake. UMass Lowell ice hockey players were tested during the pre-season. Players willing to have their data included for further analysis provided informed consent approved by the UMass Lowell IRB (n=25). Players completed an incremental treadmill protocol to volitional maximal exertion. During the test breathing volume, rate and oxygen consumption was recorded with the Sensormedics VMax. Within subject standardized values for tidal volume (Vt) and respiratory rate (RR) were computed (Z-Vt, Z-RR). Within subject linear regression coefficients were used to determine the impact of Z-Vt and Z-RR on VEO2. Fifteen players exhibited the expected pattern of increased OUE with increasing Vt and reduced OUE with increasing RR. Between subject variability in regression coefficients (coefficient of variation = CoV), Z-Vt (CoV=4.25), Z-RR (CoV=1.18), intercept (CoV=0.11), reveals that there is more variation in Vt response. Since Vt is an important factor in OUE, future research should test whether training to improve Vt response can improve OUE and recovery from repeated sprints.

Walsh, A., Falco, J., Leoni, M., Mungeam, R., Pelletier, M., McConnell, D., Collins, S.

Exercise Physiology

MAXIMAL OXYGEN CONSUMPTION AND VENTILATORY THRESHOLD IN NCAA DIVISION I MEN’S ICE HOCKEY PLAYERS
(Advisors: Devan McConnell, Sean Collins)

The purpose of this study was to determine the maximal oxygen consumption (VO2 max), ventilatory threshold (VT), maximal heart rate and heart rate at VT in a group of NCAA DI men’s hockey players. Aerobic capacity has been related to on-ice performance as measured by net scoring chances (Green, 2006) and the data provided from testing is useful in conditioning programming and planning, particularly for heart rate (HR) assessment of training load. UMass Lowell men’s ice hockey players were tested as part of their pre-season physical conditioning program. Players willing to have their data included for further analysis provided informed consent approved by the UMass Lowell IRB. Twenty-five players provided consent. Players completed a battery of physical and physiological performance tests. Specific to this report was an incremental treadmill ramping protocol to volitional maximal exertion and fatigue. During the test subjects’ breathing flow, volume, rate, oxygen consumption and carbon dioxide production was recorded for each breath with the Sensormedics VMax. HR was monitored with the
Marquette Cardiosoft electrocardiogram (ECG) system (real-time) and stored for analysis with the Acti-cardio ambulatory ECG system. VO2 max mean (s.d.) was 62.10 (5.19) ml/kg/min; VT occurred at 83.56 (.04) percent VO2 max; Max HR 190.64 (8.93) bpm; VT HR 159.20 (11.41) bpm. VO2 max exceeded reported values for collegiate (DI) men’s hockey by 0.66 standard deviations (Green, 2006) and 0.98 standard deviations (Zachreich, 2008). Additional analysis related to the use of exercise testing data in training programming and planning is currently underway.

Adamkowski, K., Feltz, V., Byrnes, M., Alexander, A., Rooney, G., Yeo, J.

Nursing

DECREASING CARDIOVASCULAR DISEASE IN ELDERLY WITH HEART HEALTHY LIVING EDUCATION IN METHUEN
(Advisor: Margaret Laccetti)

The aim of this project was to educate the seniors at the Methuen Senior Center on “heart-healthy” living, to increase awareness of this issue while providing information to assist this community with primary and/or tertiary prevention of this disease. Background: After thorough research it was found that in the city of Methuen, Massachusetts, the overall death rate from heart disease in those 65 years or older is 1277.4 deaths where the state average is 889.8. Methods: The study participants were presented with strategies to manage cardiovascular health by educating the audience with a “healthy bingo game” and “heart-healthy” handouts. This educational event was implemented on April 8, 2014. A survey was given at the beginning and end of the teaching session to analyze the project’s effectiveness. In the survey, many participants identified “heart-healthy” changes they were planning to make and their confidence in their ability to make these changes. Our project was limited to one educational event. However, by presenting information about cardiovascular disease in an engaging way with simple “heart-healthy” strategies, the participants reported being confident and eager in making lifestyle changes. Therefore, our overall goal of increasing knowledge on a heart healthy lifestyle was achieved. We believe that this project has provided strategies for the public to take home and incorporate in their daily life to improve their overall health. Keywords: cardiovascular disease, heart, heart-healthy, education, elderly, Methuen

Bailey, V., Bolza, D., Byrne, J., Mahoney, B., Silva, C.

Nursing

EDUCATING AND RECRUITING THE BURLINGTON COMMUNITY FOR THE PROMOTION OF MINUTEMAN SENIOR SERVICES MEALS ON WHEELS PROGRAM
(Advisor: Alison Basmajian)

Purpose: The purpose of this project was to heighten awareness and provide education to Burlington residents of health risks from insufficient nutrition in elders and benefits of volunteering at Minuteman Senior Services. Background: 24% of Burlington residents are 61 or older. Minuteman Senior Services reported 59 residents were eligible to receive home delivered meals. Due to lack of volunteers, funds supporting the program have been utilized to pay drivers to deliver meals. Many elders are homebound and unable to prepare meals resulting in poor diets and malnutrition. Volunteers would not only deliver meals but provide much needed socialization. Design/Methods: At the October 2013 Lahey Clinic flu clinic an educational display was presented including an informational poster, bookmarks and brochures, complimented by healthy snacks. Attendees were engaged and invited to view the information regarding meals on wheels and volunteer need. Those who provided their contact information to learn more about volunteer opportunities were entered into a raffle for a Market Basket gift card. Results: A post survey concluded the goal of 20 participants was exceeded by 30. In addition, the goal of five attendees to provide their contact information was exceeded by 10. Implications/Conclusions: The display was effective in increasing awareness of nutritional risks to Burlington elders. Visitors were very receptive receiving information about nutrition, volunteering and assisting elders. Although there was much interest
in volunteering, attendees were deterred related to the holidays and winter travel, as reasons not to volunteer. A recommendation includes replicating this information at a summer event.

**Carritte, C., Gillis, A., Doherty, Z., Laflamme, S., DiBurro, A., Hamway, J.**

**Nursing**

**LYNN: COMMUNITY ASSESSMENT & TUBERCULOSIS EDUCATION**
(Advisor: Margaret Laccetti)

The city of Lynn, Massachusetts was studied in order to identify health disparities that exist within its communities and subpopulations. This study was conducted through a windshield survey, allowing group participants to make inferences based solely on observational data. This data allowed inferences to be made regarding the ways the city of Lynn provides services for its population, including health and social services, economic standing, politics and government, transportation, and education. Our observational findings most strongly supported the conclusion that Lynn is a highly diverse city with many social action programs that serve lower income families. After analysis of the windshield survey, official census data on various health and social indicators provide a framework in which health disparities of the community can be identified and addressed. The city of Lynn was found to have a high incidence of Tuberculosis compared to the rest of the state of Massachusetts. The number of people living with tuberculosis in Lynn is 6.5 per 100,000, while the state average is 3.5 per 100,000 (crude rate). In conjunction with the Medical Outreach Program of Greater Lynn, our group members worked to increase the awareness and knowledge of Tuberculosis in the city of Lynn through a health fair located at the local soup kitchen, My Brothers Table.

**Cecchini, A., Billimoria, S., Cusato, L., Sullivan, K., Monaghan, C., O’Neil, A.**

**Nursing**

**CARDIOVASCULAR AND OBESITY AWARENESS IN HAVERILL, MA**
(Advisor: Alison Basmajian)

Purpose: The purpose of this project was to promote cardiovascular and obesity awareness in the city of Haverhill, Massachusetts. The target population was persons between the ages of 17 and 45. Background: Haverhill, Massachusetts is a large city with a population of approximately 60,000 residents. According to The Department of Massachusetts Public Health (2010), Haverhill has a higher rate of cardiovascular disease and obesity than its surrounding towns. Specifically ages 20 through 54 have a 25 percent higher rate of cardiovascular hospitalization and mortality than compared to the state average. Also the coronary artery disease rate for this age group is 28.1 percent compared to the state average of 18 percent. Methods: The project was separated into two different community events: an educational pamphlet presentation and blood pressure screenings. One event was held at the YMCA, the second event was held at elementary school. After taking blood pressure readings, we educated participants on what the numbers meant and whether they were at risk. We Results: Participants completed a pre and post test which evaluated their knowledge of blood pressure parameters and individual risk factors. The data identified a a 90% increase of correct responses related to risk factors.. Discussion/Conclusion: These community events reached the desired target population. We were able to assess approximately 50 participants and provide important cardiovascular health information. Community screenings are a viable and cost effective method of primary prevention. After taking the blood pressure readings, we educated participants on what the numbers meant and whether they were at risk.
Chauncey, N.

Nursing

BRING DIVERSITY TO NURSING (BDN) PROJECT: HOW AFTER SCHOOL CLUB STRUCTURE RELATES TO STUDENT ATTENDANCE, PARTICIPATION AND SATISFACTION
(Advisor: Laura Hajjar)

The Bring Diversity to Nursing (BDN) project at UMass Lowell aims to recruit, retain and graduate high-quality minority and economically disadvantaged nursing students. With the goal of assisting minority and disadvantaged students in becoming professional nurses, the project partners with the cities of Lowell and Lawrence, both of which have high minority populations, to educate and recruit ethnically diverse middle and high school students into nursing as a career choice. BDN has organized two afterschool clubs that visit Lowell and Lawrence schools; the “Young Nurse of the Future” club for middle school students, and the “Nurse of the Future” club for high school students. Students in these clubs participate in hands-on learning activities related to health and nursing. Student attendance, racial and ethnic demographics, as well as evaluations by students for each club are collected. Since changing the club schedules from monthly to weekly meetings taking place over four consecutive weeks, student participation and attendance has improved notably. Student opinions as expressed in program evaluations are quite positive. BDN offers a great opportunity to graduate safe, confident and competent nursing students as well as enhance the diversity of the nursing workforce of the Lowell and Lawrence areas. Compared to the general U.S. population, the population of Registered Nurses who self-identify as racial and ethnic minorities is disproportionately low, and. Building a more diverse nursing workforce is important in creating a nursing profession better prepared with the knowledge and skills necessary to provide more competent and equal care to an increasingly diverse population.

Connolly, J.

Nursing

BREATHE EASY: METHODS TO DECREASE LUNG CANCER IN TYNGSBORO, MA
(Advisor: Margaret Laccetti)

The town of Tyngsboro, located in the northwestern part of Middlesex County, is a rural community home to upper-middle class citizens. Despite an overall healthy community, the prevalence of lung cancer is high, almost double the state’s average. Lung cancer is accountable for twenty-eight percent of all cancer deaths in the United States. Nationwide, smoking is the leading risk factor in relation to becoming diagnosed with this type of cancer, and is attributed to ninety percent of all lung cancers. Due to Tyngsboro’s high lung cancer rate, the main goal of this project is to educate the young and middle-aged adult population in Tyngsboro through the use of statistics and visual aids. The focus of the project is on the prevalence, risk factors, prevention methods, and signs and symptoms of lung cancer.

Dave, S., Chauke, E., Mifflin, C., Howarth, A.

Nursing

PROMOTING HEALTHY EATING AND EXERCISE IN LAWRENCE, MASSACHUSETTS
(Advisor: Alison Basmajian)

Purpose: The purpose of this project is to address the incidence of childhood obesity in the city of Lawrence, MA by teaching school-aged children about healthy eating and exercise. Background: Lawrence has high obesity rates in school-aged children. An astounding 34.5% of the children in grades 1, 4, 7, and 10 in Lawrence are overweight and/or obese. The city has 17.8 percentage rate of obesity among school-aged children compared to the state average of 14.5%. Childhood obesity can lead to a number of medical problems in the future which include, but are not limited to: Type 2 diabetes, stroke, heart disease, high blood pressure and certain cancers. Teaching children at an early age about healthy eating and exercise can decrease their chances of obesity and in turn their risk for other health problems.
Method: A one-hour teaching session was conducted at the Guilmette Middle School in a 5th grade health classroom that consisted of 22 students. The teaching content was displayed on a poster board and was designed based on the recommendations from the USDA regarding health eating (“MyPlate”) and exercise. The teaching session included an initial assessment of nutrition knowledge, 30-minutes of teaching and two interactive group activities. The first activity included making a healthy ‘MyPlate’ with the correct foods and serving sizes. The second activity included a questionnaire ball-toss that involved questions on exercise that the children would answer. Handouts regarding ‘MyPlate’ and warm-up stretches were given out at the end of our teaching and rewards were handed out for participation. Evaluation: Our evaluation was based on the two interactive activities done at the conclusion of our teaching. Student responses were evaluated by supervising how accurately the students performed during the activity. For the ‘MyPlate’ activity, 4 students out of 22 did not complete the plate accurately. During the ball-toss game, all students were able to answer the questions correctly. Results/Discussion: Based on the student responses, it can be seen that teaching healthy eating and exercise can be successfully done with 5th graders in a school-setting. The students thoroughly participated in the lesson and provided great input when asked questions, which showed that they were enthusiastic about learning these topics. Implication/Conclusion/Recommendations: Educating children at a young age regarding nutrition and exercise is a crucial intervention to implement when they are trying to form healthy habits. By intervening early, these habits can follow them into adulthood and can provide long-term health benefits. A nutrition/exercise program can help decrease childhood obesity and other health problems such as heart disease or diabetes.

Downs, C., Wentworth, M., Florence, L., Short, K., Andrade, K., Thibodeau, N.

Nursing

ASSESSMENT OF SALEM, NH
(Advisor: Margaret Laccetti)

Salem, NH has over 300 restaurants and fast food establishments that allow residents easy access to unhealthy foods. These citizens are more vulnerable to having decreased cardiovascular health base on this convenience. This access contributes to the unhealthy life styles that may lead to decreased cardiovascular health. The primary aim of this project is to educate senior citizens about incorporating chair exercises into their weekly activity routine. The study included members of the Ingram Senior Center of Salem, NH who are over the age of 60. They then participated in an educational program about cardiovascular health that included a 20 minute session of chair exercises and a take home educational pamphlet. The participants’ knowledge regarding cardiovascular health was assessed at the beginning and end of the program to determine the seniors’ willingness to complete chair exercises on their own. The goal of our project was for the seniors to participate and commit to incorporating chair exercises at home at least three times per week. After implementing our project, we are aware that our program was successful due to the survey. We found that 93% of the seniors enrolled in the exercise class verbalized that they would integrate chair exercises into their weekly activities.

Edwards, K., He, L., Shannon, A., Slupski, K.

Nursing

BRINGING LYME DISEASE EDUCATION TO NORTH READING ELDERS
(Advisor: Alison Basmajian)

Purpose: The community education project aimed to educate seniors on Lyme disease, a serious tick borne chronic illness that can be prevented using simple strategies. Background: In 2012, Massachusetts Department of Public Health reported a 19% increase in Lyme disease compared to 2011. The report also revealed that Lyme disease has almost doubled in the Middlesex County. The most reported cases were in individuals between five to nine years old and 65-69 years old. Method: An educational presentation was provided at the Edith A. O’Leary Senior Center on October 24, 2013. The presentation included
information regarding Lyme disease prevalence, signs and symptoms, prevention, and proper tick removal. Informational pamphlets, handouts, and refreshments were available to the participants. Two interactive stations were displayed including how to properly remove a tick and insect repellents exhibiting varying concentrations of DEET. Results: Following the presentation, participants completed a quiz. Participants achieved project goals by averaging a quiz score greater than 90%, indicating a positive educational outcome. Conclusions: Bi-annual education in the North Reading community is recommended to coincide with peak tick seasons of June, July, and August.

Edwards, N., Correale, L., Dogra, P., Fusconi, D., Kane, C., McCormick, S.

Nursing

SUICIDE AWARENESS IN CHELMSFORD, MA
(Advisor: Margaret Laccetti)

The purpose of our project was to educate Chelmsford families and adolescents about suicide prevention with the intention of raising awareness. After speaking with the Chelmsford public health nurse about a relevant topic, she suggested choosing suicide prevention. She stated the Chelmsford suicide rate among adolescents was higher than the state average. We provided information for visitors of the Chelmsford Wellness Fair on this topic for 5 hours on March 22. We included educational information and resources through a poster board, educational pamphlets, bracelets, and suicide life line cards. We also aimed to eliminate common misconceptions about suicide. After a review of the literature on suicide prevention, we found that educating families and health care providers about the warning signs of suicide promotes prevention. Healthy People 20/20 supports suicide being an urgent problem in American society. During the wellness fair, we were able to raise awareness of suicide prevention by circulating 59 informational packets and 45 brochures. We were also able to engage approximately 20 people in discussion, related to suicide prevention. During our presentation, we learned through conversation with the public that many who lost loved ones to suicide stated there were no warning signs. As health educators, it is our responsibility to understand suicide and educate others so we can make prevention possible.

Guzzi, S.

Nursing

VINCRISTINE CHEMOTHERAPY: INCIDENCE OF NEUROPATHY AND PARALYSIS IN PEDIATRIC PATIENTS DIAGNOSED WITH ACUTE LYMPHOBlastic LEUKEMIA
(Advisor: Jacqueline Dowling)

The purpose of this study is to investigate the incidence of neuropathy cases with Vincristine (Oncovin) use in pediatric patients diagnosed with acute lymphoblastic leukemia (ALL) receiving treatment at UMass Memorial Medical Campus in Worcester, MA. Vincristine is a vince alkaloid which works by interfering with cancerous cell growth during cell duplication and division. Cancerous cells duplicate faster than normal cells and therefore are more likely than normal cells to be affected and destroyed by this drug. Vincristine-induced peripheral neuropathy is an adverse effect that can be avoided through dosage reductions or alternative drug choices. Paralysis is another adverse effect that poses a serious threat towards permanent nerve damage and an aggravated underlying problem. Methods: A Case Study approach was used, following a 2 year old female diagnosed with ALL. A comprehensive search was completed using the Ebsco health and nursing databases to support the findings of the case study. Articles were included if they met the following criteria: publication within the last ten years, derived from a peer-reviewed journal, pediatric male and female participants, aged 18 and under diagnosed with ALL, Vincristine was at least one of the chemotherapy drugs used in treatment, and neuropathy or paralysis was listed as at least one of the adverse effects. Research results show that Vincristine-induced neuropathy is more common than paralysis; Vincristine-induced paralysis is occurring more frequently with the concurrent use of other chemotherapy drugs that mask the symptoms of permanent nerve damage.
Johnson, G., Brush, A., Destrempe, G., Ford, A., Spinney, S.

*Nursing*
HELPING CHILDREN TO RECOGNIZE AND REDUCE STRESS AND ANXIETY IN WESTFORD MASSACHUSETTS
(Advisor: Alison Basmajian)

Purpose: Children of Westford were identified as at risk for high levels of stress and anxiety as evidenced by the Emerson Hospital Youth Risk Behavior Survey. The objective of this project was to teach elementary students methods to identify stress and anxiety, and techniques on its reduction. Background: Westford was noted to have increasing levels of stress and anxiety compared to surrounding communities. 26 percent of sixth grade students reported stress and anxiety, and the number increases to 67 percent by grade eleven. Design: An educational presentation was created to engage elementary students in identifying symptoms of stress and anxiety. It included age appropriate and evidence-based interactive techniques. Activities included “Chester the Cat,” the 5-Point Anxiety Scale, integrated movements, breathing techniques, an informal, oral group post-test, and distribution of stress balls, and a team-designed parent education pamphlet. Evaluation: Project evaluation included return demonstration, accurate utilization of techniques, and verbalized understanding of symptoms of stress and anxiety. All students participated in a post-test which yielded correct answers. Feedback was later received from school faculty that students were seen employing integrated movements prior to an exam. Conclusion: The team was able to create student awareness in identifying signs and symptoms of stress and anxiety by increasing knowledge and teaching concrete exercises for children to perform in stressful situations. It further provided information for parents to follow and reinforce. The project exceeded expectations, is sustainable, and should be replicated for all elementary age Westford students.

Khvilivitzky, N.

*Nursing*
CHILDHOOD RESILIENCY: AN INTEGRATIVE LITERATURE REVIEW
(Advisor: Jacqueline Dowling)

Purpose: The intent behind this research was to determine the definition of resilience as it relates to pediatric medicine, distinguish factors that determine the degree of individual resiliency, examine the effects of pediatric resilience on recovery, and identify where further research in this area is needed. Background: Pediatric resiliency fascinates the medical world with children’s abilities to overcome the worst of medical adversities. While research exists, it involves patients of different age groups, all examining various factors believed to affect pediatric resiliency. Method: A thorough search of the University of Massachusetts Lowell library databases, including CINAHL, PubMed and MEDLINE, Psych Info, Ovid, and the Cochrane library, was conducted between January and March of 2014. Articles were initially evaluated to determine whether the literature was clinically written or based on actual studies performed. All included articles were then reviewed and synthesized into a summary encompassing all significant findings. Research based articles were also specifically reviewed for the ages of the study participants and the factors analyzed regarding resiliency. Results: Ten articles were included; a combination of clinical and research based literature. The present research has found there are indeed numerous personal, biological, and psychosocial variables contributing to an individual child’s levels of resiliency. Conclusions: Despite some limited research already available, there still remains a severe lack of knowledge in this area for the pediatric population. More research is needed to further investigate underlying factors of resiliency and associated effects with the purpose of educating children, families, and healthcare professionals.
Leslie, S., Cullinane, C., Fournier, P., Rooney, L., Tucker, T.
*Nursing*

**EDUCATING DRACUT SENIORS ON STROKE PREVENTION**
(Advisor: Alison Basmajian)

Purpose: The purpose of this project is to educate older adults in Dracut, MA on the signs and symptoms of stroke and when to seek medical help. An additional objective is to increase awareness of the benefits of maintaining a healthy lifestyle through diet and exercise to help reduce their risk of stroke.

Background: Dracut has a population of 28,000 of which 18.3% is over the age of 60, which is lower than the state average of 19.4%. Dracut has an elevated incidence of stroke for this age group in comparison to the state average. Massachusetts Department of Public Health statistics indicate that strokes occur at a rate of 1391.7 in this age group versus 1153.3 in the state (per 100,000 persons over a 3 year period). (MassCHIP, 2013). Methods: A blood pressure screening and stroke information session was conducted at the Dracut Council on Aging. Take-home literature included how to recognize the signs of stroke using the F.A.S.T. acronym in addition to examples of hearty healthy food choices. Results: Forty-four participants attended. Adults with increased blood pressure were counseled on medication compliance, physician follow-up and maintaining a low-sodium diet. Discussion: Project was limited to elders visiting the Council on Aging that day and agreeing to participate. Implications/Conclusions. Participants found the literature easy to understand and beneficial. As older adults in Dracut adopt healthier lifestyle options and learn to identify stroke symptoms, it may lower the incidence of stroke to the state average.

Nubuor, R., Tengey, F., Tang, T., Nguyen, A., Patel, P.
*Nursing*

**IMPORTANCE OF INFLUENZA AND PNEUMONIA VACCINES TO THE ELDERLY POPULATION OF LOWELL**
(Advisor: Alison Basmajian)

Purpose: This project was aimed to educate the Cambodian, Vietnamese, and Spanish elderly population at the Lowell Elder Care center on the importance of the Influenza and Pneumonia vaccines. Background: The target population was identified as high risk for hospitalization secondary to Influenza and Pneumonia because vaccines were not accepted and received due to misconceptions resulting from language barriers, low level of education, and lack of knowledge. Design/Methods: Educational materials comprised of a poster presentation, pamphlets, and handouts were presented in diverse languages with the use of interpreters. Visual demonstrations of respiratory and hand hygiene using hand sanitizers were simulated with the effective use of interpreters at appropriate level of literacy. In addition, pretest and posttest questions were implemented with rewards and healthy snacks. Results: Posttests and return demonstration indicated that participants understood the information presented. Out of 61 and 70 participants who did not receive Flu and Pneumonia vaccines, respectively, approximately 23% of participants planned to receive the flu vaccine, and 14% of participants planned to receive the pneumonia vaccine. According to the Nursing Director’s report, 82% of participants actually received the Flu vaccine the next day during Flu clinic. Conclusion: This project succeeded in dispelling some cultural beliefs and myths held by the participants and resulted in acceptance of the flu vaccine. Future Plans: This project is sustainable and highly recommended to continue to expand to additional diverse population every season at various locations.
Nursing

EDUCATING HIGH SCHOOLERS ON SUBSTANCE ABUSE AND RESISTANCE SKILLS
(Advisor: Alison Basmajian)

The purpose of our teaching implementation was to educate Billerica Memorial High School students about the detrimental effects of heroin and prescription drug abuse. We also provided drug resistance skills techniques and anti-drug incentives for students in grades 9-12. Background: In the town of Billerica there has been a steady increase in the abuse of prescription drugs and heroin. Statistics show that out of the five hundred nineteen hospitalizations documented in Billerica, fifty percent of them were related to heroin use and fourteen percent were related to improper use of prescription drugs (Department of Public Health, 2013). Methods: Utilizing the process of primary prevention, we implemented a teaching plan for the adolescents of Billerica Memorial High School on drug abuse in their community. We educated them on the effects of drugs such as heroin, stimulants and opioids and resistance skills they could use to say no to drugs. The teaching highlighted the negative impacts these substances have on the human body. Videos from documentaries about heroin and opiate addicts were shown to the students. The adolescents were receptive to our teaching and actively participated in role-play activities. Results: A post-test showed an increase in student knowledge of substance abuse. The mean score for the students’ pre-test was a 40 out of 100. When we averaged the post-test scores, the class mean was an 81 out of 100. This statistical data supports our conclusions that our teaching was effective. Discussion: Although the project was limited to one health education class, this educational method was successful in increasing knowledge to this population at risk for drug use. Implication/Conclusion: Education regarding drug use, risks and building resistance skills should be considered as an integral part of health education for all high school students.

Semprit, J., Meas, S., Vasquez, A., Adhikary, K., Labrie, L., Chebba, M.

Nursing

TEEN PREGNANCY IN LOWELL, MA
(Advisor: Margaret Laccetti)

The purpose of this project is to address the incidence of teenage pregnancy in Lowell, Massachusetts by providing information to female adolescents about the use of safe sex practices. Background: Lowell is a large and diverse city; its population is approximately 108,522. In 2010 Lowell had 185 teen births (maternal age less than 20), 11% of pregnancies compared to the state average of 5.4%. Of those 185 teen pregnancies 22.1% are of Hispanic or Latino origin (Massachusetts Department of Public Health, 2013). Methods: The project was implemented at Community Teamwork Incorporated at a meeting for teenage parents. It consisted of a pre-test to assess knowledge on safe sex practices, followed by a presentation which consisted of information about sexually transmitted diseases, safe sexual practices, various contraceptive measures, ways to manage peer pressure and personal stories shared by the presenting nursing students. Following the presentation, post-tests were distributed to assess retention of the information provided. Brochures were distributed to provide additional information and resources. Results: Information was successfully provided to a receptive group. Discussion/Implications: Addressing safe sex practices among the adolescent population has the potential to prevent further increasing rates of teenage pregnancy and in turn they can pass the knowledge on to future generations.
Perez, M., Pavlakos, A., Tea, S., Thomas, J., Hernandez, J., Ajama, M.

Nursing

SLIP! SLOP! SLAP!
(Advisor: Alison Basmajian)

Purpose: This community project focused on educating the town of Westford's Middle School population on risk factors, preventative measures, and identification of melanoma.

Background: The incidence rate of melanoma in the town of Westford is significant. MassCHIP 2010 statistics indicate 31.7 age adjusted rate (AAR) for males and 33.8 AAR for females, compared to the state average of 28.2 AAR for males and 19.3 AAR for females. Methods: An educational session was held for Stony Brook School middle grade students. The session included poster information, use of interactive "Jeopardy" game, and group discussion. Education was directed to risks, prevention, preventable lifestyle habits, and self-skin examination. Results: A total of 21 students participated in a pre and post-test evaluation of their knowledge. The pre-test resulted in a mean score of 80% and the post-test resulted in a mean score of 100%. These results indicate that learning had occurred due to an increased mean score of 100%. Discussion: This project was well received by the students, the activities engaged all students and the information was reinforced using different interactive methods. Implication/Conclusion: This project identified that middle school students are an appropriate and receptive audience for information for prevention of a significant disease.

Sullivan, T., Cappiello, N., Collings, K., Hospad, K., Mahoney, B., Vaillancourt, A.

Nursing

PARTY IN MY TUMMY: TEWKSBURU MEMORIAL LIBRARY, TEWKSBURY MASSACHUSETTS
(Advisor: Alison Basmajian)

The purpose of this project was to promote healthy eating and the establishment of adequate nutrition among preschool children and their parents. Background: Middlesex County has an above average obesity rate in low-income preschool children at eighteen percent compared to the state average of sixteen and a half percent (City-data, 2013). Tewksbury was identified along with many other towns in Middlesex county to have an above average obesity rate in its pre-school age children population by a study conducted at Lawrence General Hospital. Methods: The multi-activity presentation “Party in my Tummy” was developed using evidence based nutrition information. The presentation was held at the Tewksbury Library and was free and accessible to all preschoolers of the Tewksbury community. The education was directed to parents and preschoolers ages 2-5 with age appropriate information and activities. Preschoolers were asked to identify which foods were healthy vs. which foods were not healthy using pictures of different foods. A second activity was guiding preschoolers to cut out images of healthy foods and make their own “healthy” plate. In addition a fitness activity where the children danced and froze every time a healthy food was verbalized. A pamphlet on providing healthy meals to children and picky eaters was provided for parents. Results: To evaluate learning we used an informal survey. Ten parents were interviewed about the effectiveness of the presentation. Some identified the presentation at a higher learning level than anticipated. The parents agreed the presenters were professionals and prepared. The parents affirmed that the presentation was a solid base for educating their children about healthy eating habits. Discussion: Parents agreed the presentation was helpful and their children gained fundamental knowledge of a well balanced diet. Implication/Conclusion: Educating preschoolers regarding healthy nutrition establishes a foundation for a healthy and active lifestyle and reduction of risk of diabetes and cardiovascular disease as adults.
Talavera, J., Englehardt, K., Lamontagne, C., O'Brien, V., Steere, J.

Nursing

BULLYING IN NORTH ANDOVER
(Advisor: Margaret Laccetti)

Purpose: To educate North Andover middle school students about types of bullying and actions of a bystander. Background: North Andover Youth Center’s (NAYC) coordinator stated students have a lack of understanding about effects of bullying. In North Andover, a teen committed suicide due to bullying; another spoke out through media. Qualitative data suggests it is an important issue. Methods: A seminar about bullying was presented at the NAYC on March 27, 2014. Posters, skits, and parent hand-outs were distributed. Snacks provided incentive for participation. Results: Data was obtained by tallying the number of hand raises for questions. Twenty-nine students attended. Questions were asked to evaluate students’ learning before and after the presentation. Before presentation of posters and skits, 28% of students claimed that they understood bullying, 52% reported having seen bullying, and 62% have been bullied. After the presentation, 93% of students acknowledged they have been a bystander. All students were able to give an example of what they would do if they see bullying and to define the three types of bullying. Discussion: Results showed that the majority of student have been bullied and have seen bullying. The presentation was effective because all students could state the types of bullying and actions of a bystander. Nursing Implications/Conclusion: Early education as primary prevention is important when trying to decrease the incidence of bullying. Middle school students are the target population because they are going through major social changes, and the goal is to reduce its occurrence in high school.

White, E., Barry, S., Handford, C., O'Connor, K., Lindsey, J., Robb, R.

Nursing

NUTRITIONAL EDUCATION IN NASHUA NEW HAMPSHIRE
(Advisor: Alison Basmajian)

Purpose: The purpose of this project was to utilize a primary prevention approach to address obesity and inadequate nutrition in children. The focus of the project was to teach healthy nutrition options for the students in the first grade classroom of Dr. Norman W. Crisp Elementary School. Background: This project is designed to address the problem of risk for altered nutrition less than body requirements related to lack of education about healthy food choices or lack of access to such options as evidenced by 88% of Nashua residents eating less than the required amounts of daily fruits and vegetables. Methods: We displayed large pictures of several different types of food and asked the students to identify which foods are healthy and which foods are unhealthy and then we placed the photos on the correct side. A rainbow, created out of photographs of foods from each color, was displayed and we discussed the importance of eating foods of every color and why they are important for health. The students participated in a group coloring activity where they had to choose the healthy food options. We also provided additional information for the students to bring home to their families to provide extra information to promote healthy nutrition for the student and the families. Results: Our group measured the effectiveness of our teaching by how many students chose the nutritious options. Seventy six children participated in the presentation, 76% of the children answered their worksheet correctly the other 24% of the students only had one wrong answer. Discussion/Implications for Nursing: Our project worked to achieve primary prevention by teaching the children of Nashua, NH healthy eating habits at a young age. This presentation was sustainable because the teachers were able to keep all of our posters and all of our extra teaching material to use in the future. Conclusion: We accomplished our goal as the majority of the children were able to verbalize and identify healthy foods.
Young, N., Brown, S., Le, M., Santiago, O., Smith, K., Trembly, M.

Nursing
REDUCING CHILDHOOD OBESITY IN BILLERICA, MA MIDDLE-SCHOOL AGED CHILDREN
(Advisor: Alison Basmajian)

Purpose: Provide nutritional education to middle-school aged children at the Billerica Boy’s and Girl’s Club to encourage healthy eating habits by incorporating the recommended servings of fruits and vegetables in their daily diets. Background: A recent study commissioned by the Massachusetts Department of Public Health measured children’s obesity and overweight rates in over 60 towns across Massachusetts. This report indicated that obesity rates in 7th grade students in Billerica were significantly higher than the state average. The Boy’s and Girl’s Club provided us with access to a diverse sample of the Billerica target population. Design/Methods:The design included an educational presentation using “Today I Ate A Rainbow” and “MyPlate,” a discussion with the children about their current lunch choices and ways to make healthier choices, interactive food games, and a variety of exotic fruits and vegetables for the children to sample. Results: Pre and post-tests indicated an increase from 75% to 100% in the children’s ability to choose healthy foods for their lunch bags. Discussion: The educational program was successful as evidenced by post-survey results, which indicate that the children possess increased ability to make healthy food choices. Implications and Conclusions: While the results of the post-tests are encouraging, we were unable to determine if the children will actually eat a variety of fruits and vegetables everyday; a longitudinal study is recommended. Future goals would include presenting this program to middle school children in the Billerica Public school system.

Corr, M., Hoffman, K., Armstrong, A.

Physical Therapy
BEST FOR OF GAIT TRAINING IN CHILDREN 0-11 WITH SPASTIC DIPLEGIA CEREBRAL PALSY
(Advisor: Linda Kahn-D’Angelo)

Purpose: The purpose of this literature review was to investigate the different forms of gait training for children between the ages of 0-11 and diagnosed with Spastic Diplegia Cerebral Palsy. The four categories researched were Partial Body Weight Supported Treadmill Training (PBWSTT), Robotic-Assisted Gait Training (RAGT), EStim-Assisted Gait Training and Anti-gravity Gait Training. Methods: A comprehensive search utilizing PubMed, MedLine, APTA.org, and the database at Boston Children’s Hospital/Harvard Medical School was performed. Our search parameters included children ages 0-11 years, English-language research articles published after 2000, and primary diagnosis of Spastic Diplegia Cerebral Palsy. The article types chosen were systematic reviews, meta-analyses, randomized control trials, case studies, clinical trials and pilot studies. Major Limitations to the literature chosen include small sample sizes, selection biases, and shortened treatment durations among others. Results: 15 articles were found to fit our criteria (Sackett’s Levels of Evidence: 2: V, 3: IV, 10: II) and were utilized for this literature review (7: PBWSTT, 4: RAGT, 3: Estim, 1: Anti-gravity). While all 15 articles demonstrated encouraging results for the participants in all four categories, none were able to demonstrate statistically significant results due to small sample sizes. This also led to the inability to separate the effectiveness of these treatments from traditional over-ground walking treatment plans. Conclusions: While the current literature demonstrates positive effects for PBWSTT, RAGT, EStim-Assisted Gait Training and Anti-gravity Gait Training, further studies are needed to establish treatment protocols in children with Cerebral Palsy with similar GMFCS classifications.
Dion, J.  
*Physical Therapy*  
COMPARING KNEE JOINT ANGLE AND CENTER OF MASS DURING WARRIOR III POSE IN INDIVIDUALS WITH AND WITHOUT CARDIO KICKBOXING EXPERIENCE  
(Advisor: Yi-Ning Wu)

Introduction: Impaired balance is often found in individuals with neuromuscular or musculoskeletal dysfunction. Moreover, balance can be compromised during natural aging. Strength programs have been proposed to improve balance; however there’s limited information regarding exercise which includes cardiopulmonary, coordination and strength training. Cardiopulmonary kickboxing consists of all three components which might benefit people who face the challenge of maintaining balance. Objective: The overall aim of the study was to examine the impact of cardio-kickboxing (CKB) on the balance of individuals. Methods: Eight participants ages 19 to 22 years (three experienced CKB, five inexperienced CKB) were recruited. Joint motion and muscle activation (non-dominant leg and core muscles) were recorded using the 3D motion capture system while the participants performed a series of balance tests including Berg Scale Balance Test and 6 select yoga poses. In this abstract, we focused on kinetic data analysis of the Warrior III yoga pose. The knee angle of the standing leg and center of mass (COM) were derived by the commercial software. The trajectory of the COM vertical displacement (z-axis) was further compared between the two groups Preliminary results: The knee flexion of the standing leg is greater in inexperienced participants (26.97° ± 14.99°) than in the inexperienced participants (17.29° ± 9.35°). It was noted that the average vertical displacement of COM in the inexperienced group was larger than that of the inexperienced group (0.042 ± 0.029 and 0.021 ± 0.032 respectively). It was also discovered that the experienced group had an overall lower lifted leg than the inexperienced group. (0.224 ± 0.168 and 0.367 ± 0.118 respectively) Discussion: Experienced CKB participants had greater knee flexion, lower vertical COM and lower lifted leg. This might be due to the better balance control (in terms of recruiting more quadriceps muscle, and shifting the COM further away from the center) compared to those with no CKB experience. However the further data analysis of EMG and projected COM displacement are required to validate the findings. On the other hand, the current preliminary data show the potential of CKB application in improving or perfecting the balance.

Dumais, J., Most, M., Young, B., Collins, S.  
*Physical Therapy*  
GRIP STRENGTH OF THE WATER MONITOR (V. SALVATOR)  
(Advisors: Bruce Young, Sean Collins)

The inclination to grasp and the anatomical characteristics that underlie the mechanics of gripping can be found in all of the major groups of tetrapods. Prior reptilian biomechanics studies have solely looked at forearm and hand anatomy specific to grip strength (Sustaita 2010). Varanus salvator is described as an aquatic (Smith 1932) or semiaquatic (Mertens 1942; Wikramanayake and Dryden 1993) species that has arboreal characteristics supported by their well developed limbs, each digit being accompanied by a strong claw (Deraniyagala 1953). The Varanid’s natural behavior is fostered by hand strength, as they climb trees (Traeholt 1995), dig burrows (Traeholt 1993), and disembowel prey (Traeholt 1994) using these dexterous limbs. This study combined anatomy, physiology, and high-speed video analysis of V. salvator’s forearm and hand to quantify and detail gripping mechanics. The anatomy of the hand indicated that deep intrinsic muscles are responsible for grip strength, while the physiological data indicated that there is no significant difference between the superficial or deep muscles (N=20, p=0.000015) in the positioning or gripping of the hand. Further investigation in gripping strength and musculature may elucidate new insight into how hand strength is refined by natural behaviors and has played a vital role in the evolutionary success of V. salvator.
Background and Purpose: Normal age related declines of the sensory and motor systems negatively impact postural stability. These deficits result in increased episodes of balance loss impeding activities of daily living. Identification of contributing factors and prevention strategies to reduce fall risk is critical for the wellbeing of community dwelling elders. The purpose of this systematic review was to examine current evidence regarding a Pilates intervention in community based elders and evaluate the quality, internal and external validity of such evidence in regards to fall prevention. Methods: Two hundred and forty-two articles were retrieved and screened for inclusion and exclusion criteria. Of those 242 articles, only 6 met the inclusion criteria and were included in this review. The included studies were further reviewed utilizing the PEDro scale and the data was extracted. Results: Application of the PEDro scale revealed 4 high quality studies and 2 poor quality studies. The existing literature reviewed suggests both static and dynamic balance are improved by incorporating Pilates into the exercise programs of elderly. The direct causal effect between Pilates training and a decreased fall risk requires further investigation. Discussion and Conclusions: The authors conclude that Pilates is a potentially effective exercise intervention to improve balance and decrease fall risk in the healthy elderly population. Further research is recommended to develop a specific Pilates exercise prescription and dosage for decreasing fall risk in the elderly.
determine if it is synovial in nature, and identify how force is transmitted through the joint. Four specimens of VS were obtained commercially and maintained individually in terraria. Three sets of adjacent vertebrae were excised from freshly euthanized specimens. The first segments were used to create microscope slides and cross-section models, then analyzed for synovial joint characteristics, such as a joint cavity, synovial membrane or articular cartilage. The third segment was embedded into a plastic mold for biomechanical testing. Six strain gages were aligned with the joint surfaces and a force transducer was coupled to one end of the mold. Force was applied to the joint, dynamically with an actuator, and statically by placing weight onto the free-standing mold. For all trials, output from the force transducer and strain gages was recorded using MIDAS OS. Histology and cross-sections revealed no synovial characteristics. Data from the strain gages revealed joint compression when force was applied vertically, and return to resting joint position when force was removed, demonstrating elastic recoil. With repeated horizontal force application, a decrease in force recorded by the transducer was observed when compared to calibration trials, thus demonstrating force attenuation within the joint.

Macduff, A., John, N., Lyons, B.

Physical Therapy

MULTIPLE PERSPECTIVES ON THE FUNCTIONAL SEGREGATION WITHIN THE MUSCLES OF AQUATIC PROPULSION IN THE ASIATIC WATER MONITOR (VARANUS SALVATOR)
(Advisor: Sean Collins)

Varanus salvator is a semi-aquatic species in which swimming is made possible through coordinated undulations in the tail base. It is well known that skeletal muscle is a dynamic tissue having functional properties that are influenced at a variety of organizational levels. This means that there are a number of factors, including molecular composition, muscle histochemistry, muscle fiber type, and neural stimulation that affect the timing and force of a muscle’s contraction. Although this is widely recognized, the majority of published studies focus on a single analytical technique applied to just one level of muscle organization. This study applies a variety of analytical techniques to 3 muscles that insert on the tail base [Caudofemoralis, Longissimus (an epaxial muscle), and Iliocaudalis (a hypaxial muscle)] in attempt to determine their functional contribution to swimming. To explore the functional roles of these muscles, we performed whole muscle physiology, work loops, enzymatic fiber typing, and molecular analysis of the contractile proteins. We found that the Iliocaudalis is the primary propulsive muscle involved in swimming while caudofemoralis functions more in stabilization. This is supported by our findings that the caudofemoralis has a significantly different contractile rate and force output profile, a different pattern of fatigue, and more slow-type MHC than the axial muscles. The longissimus and iliocaudalis have similar molecular composition and physiological properties but the longissimus has minimal impact on tail propulsion. Examining this locomotor system using these diverse analytical approaches may provide insight into the physiological properties of reptilian muscle.

Marcotte, J.

Physical Therapy

SMARTPHONE GONIOMETER: TESTING RELIABILITY AND VALIDITY
(Advisor: Joyce White)

Background and Objective: In the contemporary practice of physical therapy the universal goniometer (UG) is the most widely used instrument to objectively measure joint motion. Today, with the development of smartphones and associated phone applications, a new type of goniometer has been developed, the Dr. Goniometer phone application (iPhone goniometer). The purpose of this study was twofold: (1) to determine the intrarater reliability of the iPhone goniometer when measuring knee flexion; and (2) to determine the concurrent validity of the iPhone goniometer based on the reference standard universal goniometer. METHODS: Thirty healthy subjects were recruited. Each subject’s right lower leg was moved into a randomly selected position among three knee flexion subgroups: subgroup 1 = 0-45°;
subgroup 2 = 46-90°; or subgroup 3 = 91-135°. Three repeated measurements were taken with each device by one rater with steps taken to reduce bias. RESULTS: Knee joint angles ranged from 22° to 124°; mean = 70°±35°. The UG and iPhone goniometer demonstrated high intrarater reliability with all ICC values > 0.97; SEM for the UG and iPhone Goniometer ranged from 0.97° to 1.84° and 1.13° to 2.17°, respectively. Measurements between UG and iPhone goniometer were highly correlated (r = 0.91-0.98). No significant differences were found between devices except for subgroup 3 (t = -2.44, p = 0.038).

CONCLUSION: High intrarater reliability was found for both the UG and iPhone goniometer when measuring knee flexion positions ranging from 0° to 135°. However, flexion angles greater than 90° may result in less valid measurements when using the iPhone goniometer.

McLean, S., Levesque, J., Perreault, D., Ramani, C.

*Physical Therapy*

CALCULATING THE MCID FOR THE 10 METER WALK AND TUG TEST FOR THE GENERAL GERIATRIC POPULATION USING AN ANCHOR BASED METHOD

(Advisor: Connie Seymour)

Purpose: The purpose of this study was to establish the Minimal Clinically Important Difference (MCID) for the 10 Meter Walk (10MW) and the Timed Up and Go (TUG) tests within the geriatric population. These two tests are reliable and valid measures for assessing an individual’s mobility status and risk for falls. Participants: Twenty-one community dwelling elders (average age of 75.12) volunteered to participate in this study. All participants were in good overall health and were physically able to participate in exercise programs at the Dracut Senior Center. Methods: Data for the 10MW and TUG tests were collected from each participant at two separate time intervals, scheduled approximately 16 weeks apart. A Health and Quality of Life Questionnaire accompanied the latter data collection. The MCID was calculated through use of an anchor-based method of calculation. An improvement of 1 rating (better) on the “Overall Impressions” section of the provided health questionnaire indicated a perceived improvement by the subject and was used to determine if an MCID was achieved. Results: The MCID for the 10MW test at a comfortable walking speed was 0.11 m/s; while the MCID for the 10MW test at a fast walking speed was 0.07 m/s. The MCID for the TUG test was 0.54 seconds. Conclusions: The findings from this study support previously established MCID values with regards to the 10MW test. A MCID for a community dwelling geriatric population was established for the TUG test.

O’Malley, H.

*Physical Therapy*

HIPPOTHERAPY AND HORSEBACK RIDING AS A THERAPY OPTION

(Advisor: Connie Seymour)

The purpose of this community engagement co-op project was to explore the use of hippotherapy and horseback riding as viable, supplementary rehabilitative therapy options. My work at Windrush Farm Therapeutic Equitation Inc., in North Andover, allowed me to work closely with individuals in both hippotherapy and therapeutic horseback riding sessions, including a wide array of individuals ranging from stroke victims, children on the Autism spectrum, and children with deficits due to a poor home life. I worked under the supervision of an occupational therapist or physical therapist during hippotherapy sessions, and certified therapeutic riding instructors during group therapeutic horseback riding sessions. There are distinct differences between hippotherapy and therapeutic horseback riding; hippotherapy uses the horse as a tool, utilizing the movement of the horse in order to improve balance, stability, and strength. Therapeutic horseback riding is most often performed in a group setting with clients who do not need individual interaction with a therapist, and focuses on physical, emotional, mental, and cognitive health of the individual. Being an exercise physiology student with hopes to pursue physical therapy, as well as having a strong background as an equestrian, I was able to fully appreciate the programs present at Windrush Farm. I’ve come to the conclusion that hippotherapy and therapeutic horseback riding are both
extremely viable extensions to traditional forms of rehabilitative therapy. Greater recognition and utilization of hippotherapy and therapeutic horseback riding by rehabilitative professionals would make a positive impact on the quality of life of individuals requiring therapy.

Passanisi, S., Rodriguez, S., Demerdjian, D., Watroba, A.

*Physical Therapy*

**THE EFFECTIVENESS OF THE WALKAIDE DEVICE ON GAIT KINEMATICS IN POPULATIONS WITH MULTIPLE SCLEROSIS: A SINGLE-SUBJECT STUDY**

(Advisors: Gerard Dybel, Connie Seymour)

Gait deficits such as muscular incoordination and foot drop are among the underlying causes of functional limitations commonly found in neurological disease processes such as Multiple Sclerosis. These deficits result in increased fall risk and decreased quality of life. Evidence has shown that utilization of a Functional Electrical Stimulation (FES) device, such as the WalkAide, has been effective as a supplement to physical therapy program for improving gait. Objective: Evaluate the effectiveness of the WalkAide on correcting foot drop and improving gait mechanics by minimizing compensatory strategies and increasing walking efficiency. This will provide insight as to the overall impact on functional mobility. Design: A single subject study design consisting of a 53 y/o female with foot drop as a result of MS. Methods: The single subject design was video recorded while walking on a treadmill from both rear and side views, with and without wearing of the Walkaide device. MaxTRAQ motion analysis software was used to analyze the gait kinematics of our female subject, specifically looking at degree of ankle dorsiflexion and knee flexion AROM. Results: The knee and ankle joint angles were measured throughout the cycle in order to quantify the potential effectiveness of the WalkAide device on the subject gait mechanics, specifically ankle dorsiflexion and knee extension. A p-value of 0.000 (p < .001) with a CI of 95% was obtained for midswing and acceleration phases. Discussion: This study provides evidence to support the use of the Walkaide FES device to facilitate dorsiflexion and decrease compensatory strategies in patients with Multiple Sclerosis. Range of motion at the ankle joint and knee joint during various phases of gait provided evidence for effectiveness of the Walkaide, particularly during heel strike and swing phases of gait and decreased compensatory strategies. Conclusions: Decreasing compensatory mechanisms will result in improved gait efficiency and decreased energy cost, ultimately increasing safety and reducing fall risk. Additional research is warranted to further validate these results and conclusions.

Das, S., Marshall, J.

*Work Environment*

**THE REMOVALS OF SURFACE SOILS USING THE APPLICATION OF AZEOTROPE VAPOR DEGREASING**

(Advisor: Michael Ellenbecker)

Azeotrope vapor degreasing uses a binary azeotrope solution combined with de-ionized water at certain weight percentages to eliminate a soil from a steel surface. These “coupons” are coated with certain soils and suspended inside a beaker containing the azeotrope which is brought to a boil in order to remove or degrease the soil from the coupon. In this experiment initially conducted by Jason Marshall Sc.D and John B. Durkee Ph.D, the cleaned coupons were weighed and compared against their dirty and initial weights. Along with measuring the amount of soil removed from the coupon, contact angle measurements were taken of the clean coupon (initial) versus the degreased coupon (final). This novel approach has been implemented that was not included in the original experiment conducted by the principal investigators. The results showed that when the three azeotropes were compared with the four soils, two distinct azeotropes (DI H2O/tert-butyl acetate and DI H2O/undecane) removed on average 66.87% and 55.70% respectively of soil of every soil(Castrol Quench, Cargill Canola, C.P. Hall, and Solex Polybutene) as compared to the DI H2O/methyl acetate azeotrope which removed 99% soil. The amount of soil removed also varied upon the amount of time the coupon was left for degreasing. The data
extracted from the contact angle measurements concluded that there is poor correlation between the initial and final contact angle measurements.

**Tenaglia, K., Abrea, F., Goodyear, N., Cifuentes, M.**  
*Work Environment, Clinical Laboratory and Nutritional Sciences, Biology*  
**STEAM AS AN ALTERNATIVE FOR HOSPITAL DISINFECTION**  
(Advisor: Nancy Goodyear)

The purpose of this study is to determine the efficacy of steam technology as a method of hospital disinfection. Background: Over the past few decades, there has been an increasing amount of data regarding the negative health effects of many of cleaning and disinfecting products. This knowledge has been particularly important for the cleaning industry where traditional cleaners and disinfectants have been linked to a number of health problems, such as work related asthma. Several steam-based products are available, with a wide range of costs and claims. Methods: Two steam products were tested in a laboratory setting against S. aureus and E. coli. Several surfaces were tested, including stainless steel and aluminum. The MondoVap 2400 Steam Vapor System (high cost) and the Shark Vapor System (low cost) have been tested and several other products will be tested shortly. The MondoVap was piloted in a small community hospital, utilizing adenosine triphosphate (ATP) measurements. Results: The MondoVap achieves a ≥5.00 log (100%) reduction against S. aureus and E. coli on both surfaces with a contact time of 5 seconds. The hospital ATP measurements from the pilot study suggest that the MondoVap is effective and could be considered as an alternative product. Testing with the Shark is underway, but has shown inconsistency to date. Further studies are underway to investigate possible causes for the inconsistency Conclusion: Steam technology is a viable option for a safer alternative; however, not all steam-based products appear to perform equally. Continued testing is needed to guarantee success.

**College of Sciences**

**Achorn, C., Dewilde, A., Fish, B., Moulder, J., Medhora, M., Tries, M., Braunhut, S.**  
*Biology, Physics*  
**GENERATION OF A NOVEL RAT MODEL OF NEUTRON-GAMMA RADIATION-INDUCED LUNG PNEUMONITIS FOR THE DEVELOPMENT OF BIOMARKERS**  
(Advisor: Susan Braunhut)

Neutron-gamma radiation poses a serious risk to human health, and has the potential to affect large groups of people who would require mitigating treatment for survival. Biomarkers would be useful for triaging survivors by indicating the received dose and designing mitigation, and first responders would require protectors to minimize their exposure while assisting survivors. However, biomarkers, mitigators and protectors have only undergone limited testing with high linear energy transfer (LET) radiation sources (neutron-gamma). UMass Lowell is one of only 26 US universities with a nuclear research reactor and we have built a unique monorail system designed to expose animals to high LET radiation likely to be experienced from neutron-gamma exposure. We are developing a rat model that can serve as a human surrogate of neutron-gamma irradiation to study survival from and biomarkers of radiation-induced lung pneumonitis. Unanesthetized female Sprague Dawley rats (120-150 gms) will be exposed to total body irradiation (TBI) of mixed gamma-neutron (80:20%) over 30-60 mins (6-12 Gy) without shielding and then will receive an autologous bone marrow transplant (BMT) post-irradiation to reconstitute their immune system. Survival curves will be reported and necropsy performed at sacrifice over 14 weeks, or upon death. Blood and urine samples, and kidney, lung, heart, and GI tissues will be analyzed for biomarkers and evidence of pathology. This new model will be used for the identification of biomarkers
Neutrophils play a key role in innate immunity and are often identified by their hyper-lobulated nuclei. Essential functions of neutrophils include phagocytosis of infectious microbes, production of oxygen radicals, and chemotaxis-dependent extravasation from vascular networks. Extravasation is thought to be facilitated by the increased fluidity of neutrophil nuclei provided by lobulation. As previously shown by our group and others, neutrophils that lack expression of a nuclear envelope protein called the lamin B receptor (LBR) fail to exhibit nuclear lobulation. Interestingly, while LBR expression increases during neutrophil differentiation, expression of A-type lamins, which are critical components of the nuclear lamina, have been shown to decline. The role of A-type lamins in neutrophil nuclear maturation, however, is not well understood. In order to elucidate roles for these lamins in regulating nuclear maturation, we overexpressed lamin A and its alternately spliced isoform, lamin C, in a well-established mouse promyelocytic cell line, termed MPRO cells. We then analyzed the effects of ectopic lamin A or C expression on the morphologic and functional maturation of these progenitors during neutrophil differentiation. Here we present our most recent results demonstrating that overexpression of either A- or C-type lamins in neutrophils causes hypo-lobulation of nuclei and an impaired ability to migrate during chemotaxis, but does not impair the ability of mature cells to produce oxygen radicals. Importantly, both abnormal phenotypes were more severe in cells overexpressing lamin A, suggesting decreased expression of this lamina component is most critical to normal neutrophil nuclear maturation.

Metalloproteases are enzymes that contain a metal, such as zinc or nickel, at their active site. They have a diverse array of typical functions, ranging from involvement in embryogenesis to wound healing. In snakes metalloproteases have been exploited in venom to interfere with clotting and promote hemorrhaging. The evolutionary history of these enzymes in snakes is dynamic, and includes episodes of adaptive evolution. Yet, while spiders are the largest group of venomous animals, very little is known about metalloprotease evolutionary history or their function in spider venom. Using the sequenced transcriptomes (set of transcripts from all expressed genes) of three tissues (cephalothorax, silk gland, venom gland) in the notorious western black widow spider Latrodectus hesperus, we identified transcripts with expression specific to the venom gland, including 8 metalloproteases. We identified 85 additional metalloproteases in the larger L. hesperus transcriptome lacking in venom gland specificity. We used sequence alignment tools and phylogenetic analysis to explore the evolutionary history of metalloproteases in L. hesperus. In particular, we tested the number of times that metalloproteases with typical cellular functions have been recruited for use in venom, and the potential role of gene duplication events in this process. We then explored whether these changes were adaptive by testing for positive selection, and explored whether changes in the domain structure of the metalloprotease enzyme were involved in promoting functional alteration.
Gendreau, K., Haney, R., Garb, J.

Biology
CHARACTERIZATION AND EVOLUTIONARY ANALYSIS OF THE HIGHLY DIVERSE LATROTOXIN VENOM GENE FAMILY FROM THE COMMON HOUSE SPIDER GENOME
(Advisor: Jessica Garb)

Animal venoms attract wide scientific attention because of their biomedical applications and are an excellent model for understanding the origins and diversification of ecologically important genes. Black widow spiders (Latrodectus spp.), infamous for their potent venom, produce an assortment of toxic proteins that alter neuronal function and signaling. One such protein is α-latrotoxin, the molecule responsible for the extreme pain, paralysis, and death occurring in vertebrates injected with Latrodectus venom. While most studies of black widow venom have focused on α-latrotoxin, little is known about the diversity and evolution of the latrotoxin gene family. Using bioinformatics tools to mine the recently sequenced genome of the house spider Parasteatoda tepidariorum, we have identified forty-five latrotoxin genes, many of which are arranged in tandem clusters on two genomic scaffolds, providing evidence of gene family expansion through non-homologous recombination. Bayesian phylogenetic analysis of latrotoxin protein translations indicates that Parasteatoda and Latrodectus species possess distinctly different sets of latrotoxin genes, due to significant lineage specific gene duplications since the divergence of these genera. Structural analyses of latrotoxins predicted from the house spider genome indicate they contain a greater diversity of functional domains than previously seen in latrotoxins, including differing numbers of ankyrin repeats, transmembrane regions, and coiled-coils. This suggests that latrotoxins substantially differ in their activities as neurotoxins, and in their affinities for extra-organism cellular targets. Current work is focused on relating house spider transcriptional data to its genome to determine how latrotoxin venom expression differs between the house spider and black widow species.

Hill, K., Persons, W.

Biology
EFFECTS OF AMUR HONEYSUCKLE (LONICERA MAACKII) ON VERTEBRATE AND PLANT COMMUNITY ABUNDANCE
(Advisor: Carol Myers)

The widespread invasive Amur honeysuckle (Lonicera maackii) is known to decrease plant diversity and richness in urban forests. While the invasive plant dominates many urban landscapes, its effects on wildlife are not well understood. The first study, carried out at Twin Parks in Louisville, Kentucky, tested the effect of Amur honeysuckle abundance on small mammal (Peromyscus spp.) abundance and plant species richness. The area was divided into plots of equal size, and trapping took place between summer 2011 and spring 2013 with 55 individuals captured. A vegetative census was also taken. Honeysuckle abundance lowered both plant species richness and Peromyscus abundance, as shown with a stepwise regression model. The second study, carried out at Blackacre Nature Preserve in Louisville, aimed to determine if increased presence of Amur honeysuckle decreased the presence of Eastern box turtles (Terrapene carolina). Wild turtles were tagged with a unique ID and radio telemetry was used to track their movement patterns. Neither increased honeysuckle abundance nor size class had an effect on the presence of box turtles. A larger sample size and more tracking data may produce statistically significant results if the study is conducted further.
Manzi, A., Goldberg, M.

*Biology*

**NANO-ENGINEERED NOVEL TREATMENT FOR ORAL CANCER: A LOCAL, TOPICAL APPROACH**
(Advisor: Manijeh Goldberg)

Oral cancer (OC) is a major problem that has gone largely unaddressed throughout the recent years in terms of new, innovative methods of treatment. According to the Oral Cancer Foundation, over 640,000 cases are diagnosed annually around the globe. In the United States, one person dies per hour per day due to OC. The “Gold standard” of chemotherapy that has traditionally been used to treat OC is an intravenous administration of the potent anticancer drug Cisplatin. Its mechanism of action involves forming crosslinks between DNA molecules, inducing an intracellular signal that initiates programmed cell death, or apoptosis. Although it is very efficacious, the problem is that Cisplatin targets all rapidly proliferating somatic cells, rather than specifically cancer cells. This can result in an array of undesired side effects from chemotherapy treatment such as ototoxicity, nephrotoxicity, and neurotoxicity. This limits the dose of Cisplatin that can be delivered through an IV. We have developed a nano-engineered local, topical treatment for oral cancer that is not only more efficacious than IV chemotherapy, but drastically reduces the toxic side effects. Our ChemoThin Wafer (CTW) consists of two major components: A bioadhesive polymeric matrix and Cisplatin encapsulated within polymeric nanoparticles. CTW is a topical treatment that is applied directly to the cancerous lesion, eliminating systemic toxicity while providing a targeted, much higher dose of Cisplatin compared to IV administration. Preliminary studies in mice and hamsters have shown very promising results of our treatment’s efficacy against tumors.

Matte, T., Wernick, N.

*Biology*

**DEVELOPMENT AND ASSESSMENT OF INTRODUCTORY BIOLOGY COURSES TO IMPROVE LEARNING AND RETENTION OF FRESHMAN BIOLOGY MAJORS**
(Advisor: Naomi Wernick)

Improving retention rates in science, technology, engineering, and mathematics (STEM) fields has become a nation-wide priority at undergraduate institutions. To aid in STEM retention efforts, all incoming biology students at University of Massachusetts Lowell are required to take Freshman Seminar in Biology, a college preparatory course geared for biology students. Recently, significant efforts have been taken to improve the course in order to facilitate the transition from high school to higher education. Specifically, the focus was to adequately prepare students for the rigorous biology major. Based on previously published freshman seminars as well as Vision and Change (AAAS), seven main goals for the course were devised: career planning, self-esteem building, goal setting, learning strategies, self-management, interpersonal relationship development, as well as biology-specific skills. To gauge the effectiveness of this course, a pre- and post-survey were developed, with questions measuring competence in the main goals devised. Results from the 2012 post-survey indicate that students (n=59) felt freshman seminar increased their ability to set realistic goals (78%), academic motivation (64%), understanding of biology’s role in society (83%), and ability to work in groups (63%). After adjustments were made for the following year, a number of goals were improved upon in the seminar. Furthermore, preliminary results indicate that overconfident students perform undesirably in their freshman introductory biology course; further investigation is underway.
Paquette, R.
*Biology, Physics*

EDUCATION AND IMPLEMENTATION OF THE BIOBUBBLER, A SAND-BASED WATER FILTRATION
(Advisors: Peter Gaines, Robert Giles)

Nearly one billion people in the world lack access to purified water. In Haiti, only 40-45% of the population has access to clean drinking water. The remaining 55% of the population consumes contaminated water, resulting in the fourth leading cause of death, diarrhea. This digestive disorder is often caused by excessive amounts of bacteria, such as Escherichia coli, that are often found in contaminated food and drinking supplies. We have designed a water filtration system using only indigenous materials easily found in these impoverished regions, which can provide an effective means of purifying contaminated water. The system, named the BioBubbler, is a modified version of the sand filtration system that eliminates bacteria. The components utilize a biolayer composed of microorganisms that develop as the sand and water interact. As the microorganisms proliferate, they begin to compete for resources through predation and thereby eliminate bacteria. The system is particularly appropriate for use in third world countries as it is made with local materials, requires neither harsh chemicals nor electricity, is inexpensive, and is easy to maintain. Here we present the design features of the BioBubbler and our results of recent applications of the system, including the purity of water provided by the system. The BioBubbler will now provide the people of Haiti with a reliable and sustainable mechanism to obtain potable water and that they can easily construct and implement.

Pelletier, M., Fylaktou, E., Giadone, R., Gaines, P., McCarthy, S.
*Biology, Plastics Engineering*

NOVEL ANTIMICROBIAL SUTURES FOR MEDICAL APPLICATIONS PROVIDE STAINED ANTIBIOTIC DELIVERY AND BIOCOMPATIBILITY WITH HUMAN CELLS
(Advisors: Peter Gaines, Stephen McCarthy)

The Centers of Disease Control and Prevention (CDC) estimates approximately 500,000 surgical site infections (SSI) occur annually in the United States. To improve treatments of patients undergoing surgery, we have developed novel suture materials with incorporated antibiotics that can be locally released to the surrounding tissues, thereby decreasing the need for systemic antibiotic therapy. Tetracycline hydrochloride was incorporated into two types of polymers: Ethylene-co-Vinyl Acetate (EVA) sutures that are non-biodegradable but provide excellent tensile strength for external suturing, and Polycaprolactone (PCL) sutures that are biodegradable and therefore appropriate for internal sutures. Each of these fibers were exposed to bacterial killing assays that tested both for long term release of drug in serial transfers accompanied with new bacterial inoculations and short term release in cultures with high bacterial titers. Biocompatibility was tested using mammalian cell lines (myeloid HL-60 and NB4 cells) that tested for potential aberrant effects of the fibers on white blood cell growth. Our results demonstrate that both types of fibers provide for impressive long-term drug release, and the capacity to eradicate extreme bacterial infections. The mammalian cells showed no adverse growth in the presence of the unloaded fibers, whereas their growth was equivalently inhibited by tetracycline alone or that eluted from the fibers. Our studies demonstrate that these novel suture materials show great promise as a prophylactic SSI therapy either in a hospital setting or for use in field applications, such as those required for injured military personnel who lack immediate access to hospital treatments.
Meeting the internationally agreed upon goal to avert dangerous human interference with the climate system and limit global warming to no more than 2 °C above preindustrial temperatures demands large-scale, near-term policy and action to reduce greenhouse gas emissions. There is a narrowing window of time in which effectively addressing climate change is not only possible, but could also lead to substantial economic, health, and quality-of-life co-benefits for most Americans. Despite this urgency and opportunity, misconceptions about both climate change impacts and actions to mitigate it are widespread. Cognitive science research has suggested that information delivery alone is insufficient for building robust mental models about climate change. Here, we describe a ‘serious game’ that is an immersive, experiential learning tool in which participants can explore a hypothetical future society, set in about 2040, which has taken strong action to address climate change. ‘Climate Futures’ enables participants to come to their own conclusions about the personal costs and benefits of individual, community, and national actions and policies that reduce emissions, as well as develop a better understanding of how the climate change impacts that are now unavoidable may affect individuals.

In response to the immune system, cytotoxic T lymphocytes (CD8+ T cells) recognize modified antigenic peptides on cell surface presented by major histocompatibility complex (MHC) class 1 molecule. These antigenic peptides are modified by a protein called Endoplasmic Reticulum Aminopeptidase 1 (ERAP1). ERAP1 possesses a unique property of trimming down antigenic peptides to the preferred size (8-10 residues) in order for them to bind to the MHC class 1 molecules. Studies have shown that there are two featured domains of ERAP1: a regulatory binding pocket located at the carboxyl terminal domain and a peptide cleavage site located on N terminal domain. Our group has shown that the carboxyl end of a peptide containing six-histidine binds specifically to the C-terminal regulatory domain of ERAP1 and increases the peptide-trimming efficiency. However, the mechanism of how the carboxyl terminal anchor residues affect its conformational changes is not well understood. In this study, we designed four different natural peptides (6-10 residues) that are co-expressed with the ERAP1 regulatory domain hoping to determine the key interaction residues. By determining how this molecular interaction works, we will be able to further study the cleavage mechanism of the intact ERAP1 protein upon binding to antigen substrate.

Earlier research (1,2) has shown that polydiacetylenes with near infrared electronic absorption can be obtained from monomers with tricyanovinyl and dicyanovinyl aromatic groups. However, the earlier materials were difficultly soluble. We now propose to synthesize new diacetylene monomers with tricyanovinyl aromatic substituents and having an aliphatic chain terminated with a carboxyl group as the other side group. Our progress toward this objective will be reported.
Chittigori, J., Thota, S., Kumar, A., Li, L., Sandman, D., Kumar, J.
Chemistry, Physics
DESIGN AND SYNTHESIS OF WATER COMPATIBLE CURCUMIN ANALOGS FOR THE DETECTION OF TOXIC HEAVY METAL CATIONS
(Advisors: Daniel Sandman, Jayant Kumar)

Curcumin, used as a curry spice by many Asians, is a non toxic and environmental friendly phytochemical that possesses interesting photophysical (absorbs and emits in visible region) and metal binding properties. As accumulation of heavy metal cations such as Cu+2, Al+3, Hg+2 and Cd+2 have deleterious effects on both environment and biological systems, developing sensitive and selective methods to detect them is a serious topic of interest. As the major occurrence of these metals is in water, water compatible sensors are highly desirable. Exploiting the interesting photophysical properties of curcumin structure, we report the development of water compatible, sensitive, selective and environmental friendly Cu+2, Al+3, Hg+2 and Cd+2 sensing novel curcumin analogs that can be potential candidates for both biological and environmental applications as chelators and sensors. Our first goal was to attach polyethylene glycol units (Mn=350) to curcumin to improve the water compatibility of hydrophobic curcumin without affecting its photophysical and metal binding properties. Interestingly, it self organizes into nanoparticles in water and still exhibits similar photophysical properties as non functionalized curcumin and interacts sensitively with toxic metals such as Al+3, Cu+2 and Hg+2 cations undergoing dramatic changes in its absorption and emission properties. Our second goal was to improve the sensitivity and selectivity of curcumin towards Cd+2 ions by attaching poly amide receptor that has high affinity towards Cd+2 ions on both sides of curcumin analog. Synthetic strategy, chemical characterization and photophysical properties are provided. Investigation on its ability to interact with Cd+2 ions is underway.

Herring, C., Sandman, D.
Chemistry
SOLID STATE POLYMERIZATION OF CYANOALKYNES
(Advisor: Daniel Sandman)

While the lattice controlled solid state polymerization of suitably substituted diacetylene monomers is well-known, the analogous 1,4-addition polymerization of the isoelectronic cyanoalkynes is unknown. An earlier attempt (1) led to polymerization only at the cyano group due to structural reasons. In this work we seek to convert 10-undecynoic acid to the corresponding cyanoalkyne acid and amide and then proceed to study their solid state structure and reactivity. Our progress toward these ends will be presented.

Kamayou, F., Marceau, R., Russel, A.
Computer Science
POINT SENSITIVITY FOR RADIAL VISUALIZATION WITH APPLICATIONS TO BARYCENTRIC CLUSTERING AND DIMENSIONAL ANCHOR PLACEMENT
(Advisors: Karen Daniels, Georges Grinstein)

This research extends prior work with normalized radial visualizations (NRVs) that includes the RadViz mapping onto the two-dimensional unit disk. We examine how data records’ images move under varying assumptions about dimensional anchor (DA) motion. First, we describe the role of the barycenter of the DAs for NRVs. For RadViz we employ a robotic motion planning analogy to show that when some of the DAs’ positions are free to move on the unit circle, then a data record maps inside an annulus. Extending the motion planning analogy, we determine a DA configuration which places a data record image point at a chosen position. To illustrate this, the Weave visualization system has been enhanced to include interactive point sensitivity features. We also apply these results to visualize clusters of multi-dimensional data using barycenters as cluster representatives within RadViz. Where in the RadViz multi-stage
transformation cluster barycenters are formed is a key decision. Motivated by the nature of mapping, we form cluster barycenters at the end of the first stage. In the second stage we must select an appropriate DA configuration. We present a heuristic to: 1) separate clusters and 2) move clusters away from the barycenter of the dimensional anchors. The heuristic uses our Voronoi quality assessment technique and our annulus results. We demonstrate the benefit of our barycentric approach for a variety of clustered datasets.

Schroeder, B.  
*Computer Science*  
**LET'S BAG PART DEFORMATION: EXAMINING WAYS TO IMPROVE THE COMPLEXITY OF DERFORMABLE PARTS MODELS**  
(Advisor: Kate Saenko)

The current state-of-the-art in multi-class object detection is to use deformable parts models to detect objects in a wide range of photometric and viewpoint variation. The deformable parts model (DPM) is a robust object detection algorithm which can localize fine-grained salient features of an object (e.g., for a person, the head, shoulders, and feet) through the use of high resolution part filters. The part filters also account for the deformation of an object, which can range greatly depending on the class of object. However, the complexity of the DPM algorithm incurs high run-time costs (~2 sec/image on fast multi-core machines), which can limit its application in practical scenarios (e.g. real-time pedestrian detection). The goal of this project is to examine the need for parts (e.g. can part deformation be turned off?) and further look at machine learning ensemble methods such as model bagging (bootstrap aggregation) as ways to improve run-time performance through reduced algorithmic complexity. Combining these methods, we have found that simplifications to the original DPM algorithm, through spatial selection of features in multi-resolution filters, can be made without significantly affecting the original detector (DPM) results.

Shultz, A.  
*Computer Science*  
**EMBODIMENT OF MURINE CORTICAL CULTURES IN A ROBOTIC SYSTEM**  
(Advisors: Holly Yanco, Thomas Shea)

In collaboration with the Center for Cellular Neurobiology and Neurodegeneration Research, we have developed a software and hardware system that allows a murine cortical culture to control a robot arm over the campus network. The culture receives computer-generated stimulation based on video input from an arm-mounted camera. The activity of the culture is converted into control signals for the arm, which results in motion of the arm-mounted camera in the real world. In addition to this system, we have developed a simulator that models the activity of cultured neurons. Our intent is to use this system to explore the effects of embodiment on learning in cultured neurons, and to use this understanding of the development of cultures to improve the simulation.

Coe, D.  
*Environmental, Earth and Atmospheric Sciences*  
**CLIMATOLOGY OF SNOW SQUALLS IN NEW ENGLAND SINCE THE 2006-2007 WINTER**  
(Advisor: Frank Colby)

Short duration, intense snowfalls that wreak havoc on travel and cause near whiteout conditions define a snow squall. There are no warnings issued for them and they are practically unpredictable when it comes to weather forecasting. These types of events mostly affect areas of Southern New England, New York state and Pennsylvania and usually form due to a low pressure area over the Great Lakes Region, which is what was typically seen in older cases. Snow squalls usually feature gusty winds and visibility less than
2.0 miles, however with the current technology at hand, wind gusts at certain observation stations were not always picked up, so use of surface and upper air maps was needed to determine whether or not gusts were possible in the given conditions. After going through all the potential snowfall dates for the past six years, four events were picked out of the over 50 total snow events as potentially being squalls. Station data was then collected through the NCDC data library and the times of the events were plotted on maps of New England. These maps were then analyzed using isochrons to determine whether there was any pattern to the squalls (i.e. a squall line) or if they were widespread. Then Level II radar data was analyzed to determine the intensity and size of each cell of the storm. These four cases seem to suggest a decreased activity in snow squalls in New England over the past decade, however further data analysis will need to be done in the coming years to define a trend. They also show a change in formation as none of these cases followed the normal pattern when compared to the past cases that have been documented.

Farese, M.
Environmental, Earth and Atmospheric Sciences
WIND AND PRECIPITATION PATTERNS IN THE NORTHEASTERN UNITED STATES IN MARCH, APRIL AND MAY FROM 1980 TO 2010
(Advisor: JianHua Qian)

The aim of the research conducted is to determine a correlation between the wind and precipitation patterns in the Spring months in Northeastern United States. Seven different weather types were found using the k-means function in Matlab. From this point, Fortran and GrADS were used to depict the average precipitation amounts and average wind patterns. As research continues on this project, the goal is to determine whether an outlying factor, such as oscillation, may be the reason for pattern repetition.

Kaminsky, M.
Environmental, Earth and Atmospheric Sciences
CONSTRUCTION OF DEUTERATED WATER ISOTOPOLOGUE LINE LIST FOR SPECTROSCOPIC STUDIES
(Advisor: Robert Gamache)

Accurate spectroscopic data are needed to interpret remotely sensed data recorded in planetary atmospheres or in space. A key species of interest is deuterated water isotopologues, HDO and D2O. Of the spectroscopic parameters, the pressure-broadened half-width is the least well known. The ratio between deuterium (heavy hydrogen, 2H) and hydrogen (1H) (the D/H ratio) in natural waters, in water combined in hydrous minerals, or in atmospheres is a useful proxy. This ratio yields information about the origin and geologic history of the fluid as well as fluid and rock interactions. Importantly, the D/H ratio can indicate how old a planetary atmosphere is, in addition to the source of water. Often for the deuterated isotopologues, the half-width data is obtained by scaling H2O data yielding data that is in error by orders of magnitude at times. Working with colleagues at the NASA Langley Research Center and the College of William and Mary, a spectroscopic line list is being compiled for the deuterated water isotopologues. The work at UML has focused on conducting a literature search for HDO and D2O that has resulted in 22 journal articles consisting of lineshape data. Measurements for HDO and D2O collisions for N2-, O2-, air-, He, and self-broadening have been retrieved and are being added to the database. By improving the accuracy of the deuterated water database; the more precise measurements will specifically aid in interpreting remotely sensed data of the atmospheres of Venus, Earth, and Mars.
Lopes, E., Roller, C., Lamouroux, J., Gamache, R.

Environmental, Earth and Atmospheric Sciences

TOTAL INTERNAL PARTITION SUMS FOR ANALYSIS OF MOLECULES PRESENT IN PLANETARY ATMOSPHERES AND INTERSTELLAR SPACE
(Advisor: Robert Gamache)

Total internal partition sums (TIPS) are calculated for a variety of molecules present in the terrestrial atmosphere and interstellar space. TIPS are defined as a direct sum of the factor $e^{-(hcE/kT)}$ over all states of a molecule. The specific molecule addressed in this study was HNO3. Principal isotopic species as well as other less common isotopomers & isotopologues were considered. TIPS were calculated from a range of 5-3005 K, useful for remote sensing applications of the terrestrial atmosphere (specifically the number density of molecules in a particular state at a given state and pressure) and for interstellar space where the lower and upper limits of the temperature range can be found in deep space and stellar disks respectively.

The two primary processes for this are direct summation and use of analytical models. Direct summation was primarily used for lower temperatures while analytical models were used for higher temperatures. These were smoothly joined to create a uniform solution. For HNO3 a comparison between a calculation of energies via the Watson-Hamiltonian and energies directly obtained from HITRAN was done. In addition to this the unique vibrational states for HNO3 were found and the in the output file the energies were sorted in order to make convergence plots. Another update to this ongoing project was the use of the IUPAC values of $h$, $c$, and $k$ reported to 9 significant figures. This update was done in order to have the precision to include this data on the OCO-2 mission from NASA’s Jet Propulsion Laboratory.

Scarano, D.

Environmental, Earth and Atmospheric Sciences

ANNUAL AND DIURNAL CYCLE OF PRECIPITATION IN VIETNAM
(Advisor: Jian-Hua Qian)

This project offers a look into the climate variability of Vietnam through rainfall patterns due to monsoonal winds, orographic effects, and their relationships. The project focuses on the diurnal, monthly, and annual rainfall pattern in Vietnam using remote sensing from satellites (CMORPH). This data is then mapped using GrADS software. The relationship between the monsoonal winds, mountains, and the diurnal cycle of rainfall is critical to the understanding of the climate of Vietnam and helps with climate and meteorological forecasting.

McLaughlin, E.

Mathematics

WATER WHEELS AND MATHEMATICS
(Advisor: Sumudu Lewis)

Teaching through Project-Based Instruction involves designing a unit of work which incorporates a variety of instructional approaches cross-cutting through multiple disciplines. In this project the high school students were asked to construct a working water wheel, explain how it functions, and test its efficiency. In constructing the water wheels the students had to apply various mathematics concepts such as geometry and trigonometry. They then had to apply principles of engineering, and connect all these disciplines together to construct their water wheel. Teaching through Project-Based Instruction assist students to make in-depth connections of abstract concepts and relate to what they are learning.
Romano, J., Kaminski, K., Manseau, B., Muth, S., Tangarife, K., Ernst, D., Dy, S.
Mathematics, Plastics Engineering
DEVELOPING A MEDICAL DEVICE: COLLABORATION PROJECT WITH M2D2, LOWELL HIGH SCHOOL AND UTEACH UMASS LOWELL
(Advisors: Sumudu Lewis, Steven Tello, Stephen McCarthy)

M2D2 (Massachusetts Medical Device Development Center) provide entrepreneurs with the resources and facilities required to move their ideas for innovative medical devices from the development stage to marketplace. Working collaboratively with UTeach UMass Lowell and Lowell High School, M2D2 launched their new entrepreneurship course titled “M2D2 Partnership Experience” in fall 2013. The purpose of this project was to identify a need for a medical device and then through research of market needs, design a prototype and pitch ideas to industries. The Honors students from Lowell High, together with the help of the UTeach interns synthesized an idea for a project for a modular phone case where many medical devices can be housed. The selling point of the device is that it will be that various devices may be purchased and installed onto the same phone case as the need arises. The device will include a standard model that would include a heat beat sensor and a thermometer. The device would be marketed towards first respondents, doctors, and the average person. All of the data will be stored using cloud computing and would allow doctors easy access to up to date health information about his/her patient.

Gill, H., Thota, S., Ren, H., Li, L., Mosurkal, R., Kumar, J.
Physics
NANOSTRUCTURES BASED SERS SENSORS FOR DETECTION OF CHEMICALS
(Advisor: Jayant Kumar)

Nanostructured sensors for sensitive detection of chemicals based on surface-enhanced Raman spectroscopy (SERS) were fabricated. Silicon nanospikes were first photo-inscribed on silicon wafers with femto-second laser pulses at 400 nm. Silver nanoparticles were then formed on the nanostructures by reducing silver nitrate with hydrazine and Vitamin C for plasmonic enhancement. The fabricated SERS sensors were able to detect Rhodamine 6G molecules at 10-12 M in water, indicating that the sensor is capable of detecting about 12 molecules in the focal spot of the excitation laser beam. An enhancement of 107 was estimated. Experimental details and characterization will be presented.

Maguire, R., Hewawasam, K., Cook, T.
Physics
HIGH-THROUGHPUT SPECTROGRAPH IMAGING
(Advisor: Timothy Cook)

High Through-put and Multi-slit Imaging Spectrograph (HiT&MIS) is a high-throughput imaging spectrograph for use in auroral and spectroscopic physics. It uses an echelle grating at high dispersion to permit the observation of spectral lines from the aurora with a high spectral resolution. HiT&MIS will be used to study the aurora by examining the light that is emitted from atmospheric gases excited by auroral processes. By studying a select group of emission lines, HiT&MIS can show us how concentrated these particles which cause the aurora are. This will in turn show us how the sun influences the Earth’s space weather. Recent studies by the Lloyd’s of London have shown that disruption in space weather could cause up to 2.6 trillion dollars in damages. In the 1800’s a large solar storm called the Carrington Event occurred, however there were no satellites or power grids at the time. Should this happen again, the damages would be catastrophic. This spectrograph allows light to enter through a set of filters, allowing only certain wavelengths to pass through, and collimate onto an echelle grating. This diffraction grating disperses the light at high orders that are proportional to the wavelength of the light. These processes allow for specific wavelengths of light to be detected, which allows us to measure the characteristics of the wavelengths of interest.
Verras, A.

Physics

GAMMA-RAY SPECTROSCOPY USING A MULTI-DETECTOR ARRAY
(Advisor: Partha Chowdhury)

When atomic nuclei collide at high energies, they are “excited” to short-lived quantum states that have energy and angular momentum. They decay back to the “ground” state by emitting characteristic gamma rays that carry information about the nucleus, such as its shape and spin. In this experiment, energetic xenon ions from a superconducting accelerator at Argonne National Laboratory were used to bombard a stationary tungsten target, surrounded by a spherical array of 100 high-resolution semiconductor germanium detectors called Gammasphere, one of the most powerful spectrometers in the world for detecting gamma rays. In a simple experiment with one detector, the information recorded is limited – involving typically a single variable, such as the gamma-ray energy. The electronics of Gammasphere allow the data to be recorded in multi-parameter "event-by-event" mode, where, e.g., the energy, time and emission angle for each gamma ray as well as the recoiling ions are stored sequentially for each collision "event". This makes it possible to "play back" the data subsequently, and create conditional spectra to analyze, say, time, energy or angle correlations between the gamma rays and/or the nuclei emitting them. Several suites of software are used to analyze this data such as: ROOT – developed at CERN for use with the Large Hadron Collider for sorting and histogramming; RadWare – for analyzing the gamma spectra; as well as original C++ subroutines developed for specific tasks, such as correcting for Doppler shifts in the gamma-ray energy from the moving nuclei.

Graduate School of Education

Covino, K.

Language Arts and Literacy

THE CHALLENGES AND LIMITATIONS OF USING CRITICAL LITERACY WITH EARLY-ELEMENTARY SCHOOL STUDENTS
(Advisor: Jay Simmons)

Critical literacy, with its emphasis on multiple perspectives, evaluative interpretation, and a recognition of power dynamics is a valuable tool for students and educators interested in working to address issues of gender in school. That said, critical literacy practices are not uncontested, particularly in the early-elementary grades (Ralfe, 2009). As Lalik and Oliver (2007) make clear - “critical literacy cannot be applied unproblematically” (p.67). While critical literacy presents many inroads and opportunities for deconstructing the gender biases that reside in interactions with teachers, peers, and texts, there are complexities in designing and implementing such measures. Even Vasquez (2000), a prominent and vocal supporter of critical literacy use with young students, comments on “the frustrations and pitfalls in attempting to construct a critical literacy curriculum” (p.8). Deconstructing gender messages in school language practices, texts, and discourses can be difficult for teachers and students alike. Recognizing these potential hurdles, this paper will review the limitations and challenges that critical literacy presents. Chief among these are - 1) power relations in critical literacy classrooms, 2) teachers privileging their agendas, 3) students rejecting critical interpretations, and 4) reservations about using critical literacy with very young early-elementary school students. Having explored and addressed these concerns, this paper will conclude with a final review of the benefits of critical literacy, not just as a tool for addressing school-based gender biases, but also as a means for infusing today’s classrooms with equity, inclusivity, and social justice for all students.
Manning School of Business

Balasubramanian, S.
Business Administration
EFFECT OF MARKET ORIENTATION ON ACADEMIC RESEARCH AND TECHNOLOGY COMMERCIALIZATION
(Advisor: Yi Yang)

The research project aims to study the market orientation of academic researchers and its impact on their commercial and scholarly performance. Since first proposed by Narver and Slater in 1990, market orientation and its relationship to firm performance have been extensively studied but its impact in a university setting has been rather understudied. A component wise approach will be adopted by disintegrating market orientation into its core components of customer orientation, competitor orientation and interfunctional coordination. The impact of each component on the research productivity and commercialization success will be studied at the individual researcher level. The study will be of significant value to universities and more specifically Technology Transfer Offices to better understand the motivations of researchers and channel support strategies to enhance research productivity and increase revenue through commercialization. In the first stage, the data will be collected within UMass Lowell through surveys and archival documents. Based on initial results, it is also proposed to secure funding to expand the research scope to the UMass system and other research universities in the Northeastern region.

Kartal, H.
Business Administration
AN INTEGRATED METHODOLOGY OF MACHINE LEARNING METHODS WITH MULTICRITERIA DECISION MAKING FOR MULTI-ATTRIBUTE INVENTORY CLASSIFICATION
(Advisor: Asil Oztekin)

The purpose of this study is to develop a methodology that integrates machine learning algorithms with multi-criteria decision making (MCDM) techniques to effectively conduct multi-attribute inventory analysis. First, ABC analyses using three different MCDM methods (i.e. simple-additive weighting (SAW), analytical hierarchy process (AHP), and VIKOR) are employed to identify the classes for the inventory of each item. Then, naïve Bayes, Bayesian network, artificial neural network (ANN), and support vector machine (SVM) algorithms are implemented to predict classes of initially determined stock items. Finally, prediction accuracies of algorithms for each method are determined. A case study application executed at a large-scale automotive company revealed that the best classification performance is achieved by SVMs, the results appeared to be satisfactory to suggest that all machine learning algorithms are highly applicable to inventory classification problems. Therefore, this study presents uniqueness in that it is the first and foremost one which successfully combines MCDM methods with machine learning algorithms in multi-attribute inventory classification and is practically applicable in various inventory settings.
President Obama stated that “Then there's the problem of rising cost. We spend one and a half times more per person on health care than any other country, but we aren't any healthier for it.” In line with this, this research focuses on identifying what the determinative factors of a high-cost but a relatively lower quality healthcare system are. An integrated decision making methodology is devised to utilize the data from WHO in order to reveal this fact. The outcomes of this research will hypothetically help healthcare policy makers make more efficient and effective decisions so that while the costs are decreased, the performance of health outcomes are not deteriorated.