4-1-2010

2010 Annual Research Symposium Abstract Book

Trinity College

TWENTY-THIRD ANNUAL SYMPOSIUM OF TRINITY COLLEGE UNDERGRADUATE RESEARCH

TABLE OF CONTENTS

Poster # **Title** **Page #**

CHEMISTRY

COMPUTER SCIENCE

Poster # **Title** **Page #**

ENGINEERING

Poster # **Title** **Page #**

ENVIRONMENTAL SCIENCE

PHYSICS

PSYCHOLOGY

SOCIOLOGY

BIOLOGY

1.

HISTOLOGY AND ULTRASTRUCTURE OF THE PLACENTAL MEMBRANES OF THE VIVIPAROUS LIZARD *SCELOPORUS JARROVI*, WITH COMPARISON TO THE OVIPAROUS LIZARD, *SCELOPORUS UNDULATUS*

Kristie Anderson '10
Faculty Sponsors: Daniel Blackburn, Ann Lehman

In oviparous (egg-laying) snakes and lizards, fetal membranes sustain the embryo throughout development through gas exchange and water provision. In viviparous (live-bearing) lizards, these same membranes contribute to placentas with analogous functions. Studies of oviparous and viviparous congeners can therefore reveal information about the evolution of viviparity. In this study, techniques of scanning electron microscopy and light microscopy were used to investigate the structure and function of the placental and fetal membranes of two congeners, the viviparous lizard *Sceloporus jarrovi*, and the oviparous lizard *Sceloporus undulatus*. *S. jarrovi* exhibits two placentas, which persist through the end of gestation: an allantoplacenta and a yolk sac placenta. The yolk sac placenta of *S. jarrovi*, shows unusual specializations for maternal – fetal exchange, including intimate folding of the maternal and fetal epithelia over a region containing a concentration of debris, including shed pieces of shell membrane. Through the loss of the shell membrane, the highly vascularized uterine epithelium and chorioallantois of *S. jarrovi* are directly apposed, making the allantoplacenta an ideal site for gas exchange. In *S. undulatus*, the entire egg is initially surrounded by omphalallantois. However, as development proceeds, the omphalallantois is gradually transformed into a secondary chorioallantois through the depletion of the isolated yolk mass. The resultant arrangement provides an extensive, vascularized tissue for gas exchange. Fetal membrane structure and function in *S. undulatus* generally is consistent with that of *S. jarrovi.* The structural and functional similarities between the membranes of *S. jarrovi* and *S. undulatus*, are indicative of homology and also reveal functional characteristics that have been retained during the evolution of viviparity.

2.

USING *ARTEMIA* AS A MODEL SYSTEM FOR DIGESTION RATE COMPARISONS

Katherine Bibi '10
Faculty Sponsor: Kathleen Archer

An interesting symbiotic relationship exists between the sea slug, *Elysia chlorotica*, and its algal food source, *Vaucheria litorea*. *E. chlorotica* ingests the contents of *V. litorea* filaments , including the algal chloroplasts. Most of the contents are digested normally, but somehow many of the chloroplasts are able to avoid digestion. Instead, they are phagocytotically incorporated into the epithelial cells lining the slug's digestive system. Here, they can remain for many months and provide the slug with nutrients through photosynthesis. How the chloroplasts are able to avoid digestion is unknown. It is possible that the slug's digestive system is uniquely weak, the chloroplasts are uniquely hardy, or it is possible it is a combination of these two factors. In my research, I decided to look specifically at symbiotic chloroplasts and determine whether or not they were uniquely tough. If true, the symbiotic chloroplasts should resist digestion in an independent system longer than non-symbiotic chloroplasts. To test this prediction, the model system of *Artemia salina* was used, and the *Artemia* were fed their natural

food items, symbiotic chloroplasts, and non-symbiotic chloroplasts. Digestive rates were determined by viewing the digestive tracts of *Artemia* and counting the total number of organisms empty at various time points until all exhibited empty tracts. In my most recent experiment, I determined that for a natural food item, *Dunaliella tertiolecta*, it takes 1.35 hours for half the *Artemia* population to complete digestion. Experiments with chloroplasts are in progress.

3.

BRAIN CELL PROLIFERATION IS ENHANCED BY NATURAL ENVIRONMENT AND BREEDING SEASON IN ADULT ELECTRIC FISH, *BRACHYHYPOMUS GAUDERIO*.

Michael Chung '11
Faculty Sponsors: Kent Dunlap, A. Silva

In many animals, including the weakly electric fish, *Apteronotus leptorhynchus*, social interaction in the laboratory increases brain cell proliferation. Our study examined the effect of naturally-occurring social interaction on brain cell proliferation in a wild population of weakly electric fish, *Brachyhypomus gauderio*, near Tacarembo, Uruguay. The natural habitat presents two social complexities absent in the laboratory setting that may affect brain cell proliferation. Such complexities may generally be divided into reproductive elements and ecological elements. To assess the effect of reproductive cycles, fish socially-housed in the reproductive season (January) were compared to socially housed fish in the non-reproductive season (June). To assess the effect of "natural" social treatment, fish sampled directly from their native habitat were compared to fish housed socially or in isolation in the laboratory. All fish were injected with bromodeoxyuridine (BrdU), a marker of cell birth, and sacrificed 3h later. Brains were dissected out, sectioned with a microtome and the density of newborn cells in six regions of the hindbrain and midbrain were quantified with BrdU immunohistochemistry. Fish in the reproductive season showed significantly more +BrdU cell density than fish in the non-reproductive season. Fish from their natural habitat consistently showed more +BrdU cell density than laboratory isolated fish and laboratory socially housed fish, though this difference was not always significant. The reproductive season and the rich ecological and social dynamics of natural environments are independently associated with elevated levels of adult brain cell proliferation in *Brachyhypomus gauderio.*

4.

MOLECULAR-ASSISTED ALPHA TAXONOMY OF THE '*CENTROCERAS CLAVULATUM* COMPLEX' (CERAMIALES, CERAMIACEAE) IN BERMUDA, WESTERN ATLANTIC

Elisabeth Cianciola '10
Faculty Sponsors: Craig W. Schneider, Thea Popolizio, Christopher E. Lane, Department of Biological Sciences, University of Rhode Island

The variable morphology of red algae (Rhodophyta) has historically made species-level identification quite challenging. For this reason, the use of molecular-assisted alpha taxonomy is becoming increasingly widespread for these algae. Molecular-assisted taxonomy combines DNA analysis of specimens with subsequent analysis of the vouchers' morphological features so that only morphological features which are taxonomically significant are used in the identification

process. *Centroceras clavulatum* (C. Agardh) Mont. (Ceramiales, Ceramiaceae) was a cosmopolitan complex of cool temperate to tropical red algae until molecular sequencing of a number of isolates worldwide greatly restricted its biogeography to the Pacific Ocean. Thus, analysis of specimens from other locations in the Atlantic, Pacific and Indian Oceans not presently sequenced, such as the Caribbean, Bahamas and Bermuda, to name a few, is necessary. In this study, we perform molecular and morphological analyses of collections previously identified as *C. clavulatum* from various locations in the Bermuda islands. Performing *rbc*L analysis for eight Bermuda isolates and the morphological analysis of 52 collections, two potentially undescribed species have been identified and the distributions of three taxa recently segregated from the 'complex' in western Atlantic, *Centroceras gasparinii* (Menegh.) Kütz., *C. hyalacanthum* Kütz., and *C. micracanthum* Kütz. , have been expanded to include Bermuda.

5.

THE EFFECTS OF MUTATED SERRATE LIGANDS ON THE NOTCH SIGNALING PATHWAY IN *DROSOPHILA MELANOGASTER*

Gina V. Filloramo '10
Faculty Sponsor: Robert J. Fleming

The Notch signaling pathway is a highly conserved cell-to-cell signaling system that controls cell fate. In *Drosophila melanogaster*, the transmembrane protein, Serrate (Ser), acts as a ligand capable of binding to and activating the Notch receptor on adjacent cells. Conversely, when Ser and Notch are co-expressed on the same cell surface, Ser has the ability to inhibit the Notch receptor, a phenomenon termed, cis-inhibition. Earlier studies have shown that specific regions of the Ser protein are required for interaction with Notch. Recently, we have found that an altered form of Ser that lacks the 6^{th} EGF-like repeat (Ser^{Del6}) is no longer capable of cis-inhibition, indicating that this specific EGF-like repeat is required for this property. The Notch receptor's processing events are well understood; however, less is known about ligand processing for successful interaction with the receptor and signal transduction. Previous studies have used the epsin encoding gene *liquid facets (lqf)* which promotes protein internalization to show that endocytosis is required for the wild type Ser ligand to activate Notch and generate proper signaling (Wang & Struhl, 2004). There are two present models that stress endocytosis for ligand activation. One proposes that Ser is first placed on the cell surface in its inactive form. This ligand is endocytosed, modified and replaced on the cell surface in its activated, pro-ligand form which is capable of binding with the Notch receptor. The alternative theory suggests that after the extracellular domains of Ser and Notch bind, Ser is endocytotically pulled into the signal sending cell, causing a mechanical stress on the Notch receptor in the signal receiving cell. This results in cleavage of Notch's intracellular domain and activation of the pathway. Based on the aforementioned Notch expression pattern generated by Ser^{Del6}, it was assumed that this form of Ser would already be present on the cell surface in its activated form, therefore, bypassing the requirement for endocytosis. To gain greater insight into the proposed models of ligand activation, we used imaginal wing discs of *D. melanogaster* to analyze the expression patterns of Ser^{Del6} in the presence and absence of the epsin, *lqf*. It appears that Ser^{Del6} is not an already activated form of the Ser ligand in that it too requires *lqf* and endocytosis for Notch activation. These results reject the ligand activation model suggesting that the ligand is present on the cell surface first in its inactive form. Thus, current data supports the mechanical stress model for Ser's ability to effectively interact with Notch.

6.

A MORPHOLOGICAL ANALYSIS OF *GAYLIELLA TRANSVERSALIS* (CERAMIACEAE, RHODOPHYTA) FROM ITS TYPE LOCALITY IN BERMUDA, WESTERN ATLANTIC

Gina V. Filloramo '10
Faculty Sponsor: Craig W. Schneider

Recent molecular studies of *rbc*L and LSU rDNA sequence data from members of the genus *Ceramium* supported the creation of a segregate new genus, *Gayliella* T.O. Cho, McIvor et S.M. Boo in the tribe Ceramieae of the Ceramiaceae (Rhodophyta) for six species worldwide. The only species from the western Atlantic, *Gayliella transversalis* (Collins et Herv.) T.O. Cho et Fredericq, was transferred on the basis of morphological and molecular data collected from specimens harvested in Key West, Florida. The present study analyzes the morphological and reproductive features of multiple *Gayliella transversalis* specimens collected in Bermuda, the site of its type locality. The Bermuda data is compared with the morphological characteristics of specimens from other western Atlantic sites to determine similarities/dissimilarities. Additionally, this study provides a comprehensive description of *G. transversalis* from its type locality. Future molecular data of *G. transversalis* from Bermuda is needed to further illustrate the degree of similarity between Atlantic isolates.

7.

USING FLUORESCENT MICROSCOPY TO OBSERVE LYSOSOME-PHAGOSOME FUSION IN *NOCTILUCA SCINTILLANS*

Jacob Gire '10
Faculty Sponsor: Kathleen Archer

An endosymbiotic relationship has evolved between the sea slug *Elysia chlorotica* and the chloroplasts of the alga, *Vaucheria litorea*, in which chloroplasts persist within the digestive tract of the sea slug and continue to photosynthesize. Although it has been shown that chloroplasts are not digested, the exact reason is still unknown. Recently, it was observed that *V. litorea* chloroplasts persisted longer during digestion in a non-symbiont protist model, *Noctiluca scintillans*, in comparison to non-symbiotic chloroplasts and *N. scintillans* normal food source, *Dunaliella tertiolecta*. We hypothesized that digestion could be delayed if the timing of lysosome-phagosome fusion is altered. We decided to test this idea by examining the sequence of events in the lysosome phagosome pathway, comparing the timing for a normal prey item with that of symbiotic chloroplasts. For this research, fluorescent microscopy was used to visualize lysosomes in *N. scintillans* after they were presented with *D. tertiolecta*. Acidic vesicles were characterized through the use of Lysosensor Green and observations on lysosome position and phagosome acidity and color were recorded at specific time intervals. We observed that all phagosomes were acidic at time point zero. Furthermore, *N. scintillans* produced natural vesicles which took up dye that were similar to lysosomes. These structures interfered with our ability to confidently ascertain lysosome location. Based on our preliminary observations, we determined that *N. scintillans* does not serve as a useful model for observing lysosome-phagosome fusion and have thus begun investigating whether *Paramecium tetraurelia* will serve as an appropriate alternative model.

8.

DO CHANGES IN THE NORMAL FLORA OF THE UPPER RESPIRATORY TRACT CORRELATE WITH UPPER RESPIRATORY TRACT INFECTIONS?

Lam Hoang ‘13, Youna Kang ‘13
Faculty Sponsor: Lisa-Anne Foster

The normal flora of the upper respiratory system is defined as a collection of microorganisms that have adapted to live and grow within the upper respiratory tract. These organisms play an essential role in the human body by preventing the colonization of pathogenic bacteria. In order to determine the correlation between the changes in the normal flora and various upper respiratory tract infections, examinations must be made to determine the bacteria present in the normal flora. In order to make these examinations, PCR reactions were first run to detect the presence of the 16s rRNA gene which is present in all bacteria; however, the DNA sequence for this gene varies by organism. After the gene was amplified and purified, it was digested by using the Terminal Restriction Fragment Length (tRFLP) method. This method employed specific enzymes to cut the DNA into smaller fragments. The digested samples were sent to Yale University for further accurate analyses. Evidence from experiments indicate that the universal primers were successful in amplifying the 16s rRNA gene. In addition, the restriction digests suggested that there exist distinct patterns when using different combinations of organisms and enzymes. These distinct fragment patterns of the known organisms will provide future studies with the first step in correlating the bacteria present with upper respiratory tract infections.

9.

THE EFFECT OF CORTISOL ON NEUROGENESIS AND CHIRPING BEHAVIOR IN WEAKLY ELECTRIC FISH, *APTERONOTUS LEPTORHYNCHUS*

Denisa Jashari ‘10, Kristina Pappas ‘10
Faculty Sponsor: Kent Dunlap

Adult neurogenesis is both influenced by social experience and regulated by hormones. In adult weakly electric fish, *Apteronotus leptorhynchus*, long term social interaction promotes neurogenesis and modifies electrocommunication behavior while increasing plasma cortisol levels. To determine whether this socially-induced increase in cell addition and electrocommunication signaling is mediated by cortisol, we experimentally blocked the glucocorticoid receptors using RU486 in isolated and paired fish. We monitored the production of electrocommunication signals (chirps) for 7d and then assessed cell proliferation through BrdU immunohistochemistry. We found that RU486 treatment decreased cell addition in both isolated and paired fish in the periventricular zone of the diencephalon. However, cell addition was greater in paired fish implanted with RU486 than in sham implanted isolated fish. This indicates that cortisol only partially mediates socially induced cell addition and that social interaction promotes neurogenesis through a separate, perhaps more direct mechanism. Blocking glucocorticoid receptors in paired fish also reduced chirp production to levels similar to isolated fish, showing that socially induced chirping depends entirely on cortisol. We then tested whether producing chirps or sensing chirps through electroreceptors is the cause of increased chirping by manipulating the chirping of one fish pharmacologically and seeing how it affected the chirping behavior of a second fish. We found that control fish had increased chirping over fish implanted with RU486 regardless of how much the partner fish chirped, but that the amount a partner fish chirps does affect how much the subject fish chirps. These preliminary results suggest that neurogenesis may be increased by both sensing and producing chirps.

10.

THE FORAGING BEHAVIOR OF THE EASTERN GRAY SQUIRREL (*SCIURUS CAROLINENSIS*) IN AN URBAN ENVIRONMENT

Sohaib Khan ‘10
Faculty Sponsor: Michael O’Donnell

Foraging is affected by predation risk, but the cues animals use to assess predation risk, especially in urban areas, is unknown. The goal of this study was to determine if tree canopy is an indirect cue for predation risk affecting the foraging behavior of the eastern gray squirrel (*Sciurus carolinensis*) in an urban environment. We used foraging trays to measure the amount of sunflower seeds left behind (giving up density [GUD]) under tree canopy and outside of tree canopy. We measured GUDs from fall to spring at deciduous and evergreen trees located at two sites on or adjacent to the Trinity college campus. Our results indicate that canopy cover affects squirrels’ foraging behavior. At the less disturbed site, GUDs were significantly lower under canopy than outside of canopy at trees with full canopy cover. There were no differences in GUDs under canopy and outside of canopy at trees without canopy cover. At the site with more human disturbance, GUDs were lower overall, and results were opposite of those we obtained at the less disturbed site. Our results suggest that changes in overhead canopy, caused by seasonal differences, are important for *S. carolinensis* in an urban environment because of predation risk from avian predators. It is not the distance from escape (e.g., tree trunk) that is important, but the overhead cover. However, foraging behavior becomes less sensitive to canopy cover close to buildings in an area of much human disturbance because of lower predation risk.

11.

A BIOSYNTHESIS EXPERIMENT TO DETERMINE THE ORIGIN OF A GERMACRENE SESQUITERPENE IN THE PUPAL DEFENSIVE SECRETION OF THE LADYBIRD BEETLE *DELPHASTUS CATALINAE*

Jackie Knapp ‘10
Faculty Sponsor: Scott R. Smedley

Insects are known to utilize chemicals such as terpenes as pheromones, hormones and defensive secretions. Both the larval and pupal stages of *Delphastus catalinae* (Coleoptera: Coccinellidae) have glandular hairs that secrete a novel germacrene sesquiterpene and polypropanoids, both of which serve a defensive role against predatory ants. The larvae of *D. catalinae* feed on the immature stages of the whitefly *Bemisia tabaci.* A previous study conducted by Patrick McCarthy (Class of 2009) used ^{13}C-labeled and unlabeled sodium acetate, a potential precursor to sesquiterpenes, to determine whether the germacrene was biosynthesized *de novo* by the beetles or sequestered from the diet. The findings were ambiguous. Consequently, I conducted a biosynthesis experiment in which ^{13}C- labeled and unlabeled glucose were applied to the whitefly egg diet and presented to late instar *D. catalinae* larvae. The larvae were allowed to pupate and the pupae were then sampled for chemical analysis. Liquid chromatography-mass spectrometry (conducted by collaborators at Cornell University) will establish whether glucose was incorporated into the core of the germacrene molecule, thus indicating *de novo* biosynthesis. Absence of such incorporation would suggest that the germacrene was sequestered directly from the diet or derived from a biosynthetic pathway involving a different precursor. Results of the chemical analysis are pending.

12.

MORPHOLOGICAL OBSERVATIONS ON FOUR ISOLATES OF *PEYSSONNELIACEAE* (RHODOPHYTA) CRUSTS

Kristen Liska ‘10
Faculty Sponsor: Craig W. Schneider

The crustose red algal family *Peyssonneliaceae* (*Peyssonneliales, Rhodophyta*) is poorly studied, making identification and classification of isolates a difficult task. A cosmopolitan family, crusts have been collected worldwide from cold temperate to tropical waters. Due to similarities in the habit of members of the *Peyssonneliaceae*, identification and descriptions of crusts must be made from microscopic analysis of morphological and reproductive characteristics, as well as molecular data. In this study, four isolates, collected in the subtidal and intertidal of Bermuda from 2005-2009, were decalcified, sectioned and stained for microscopic analysis. Measurements of the rhizoids, upper cortical cells, hypothallial cells, hair cells, vein cells and vegetative crust thickness were made. Amount of calcification and degree of adherence of both the margin and the thallus, along with the number and size of perithallial filaments were measured. Although species identifications have yet to be made, it has been determined that isolate *CWS/CEL* 09-34-17 belongs to *Polystrata*, as it has prominent axial veins typical of the genus. The other three isolates, *CWS/CEL* 09-34-20, *CWS/CEL* 05-10-5 and *CWS/CEL* 08-45-1, are members of the genus *Peyssonnelia*, possessing rhizoids for hypothallial attachment to the substratum. Isolates *CWS/CEL* 09-34-20 and *CWS/CEL* 05-10-5 appear to be the same species and the data suggest they are what is called *Peyssonnelia ‘inamoena’* in the western Atlantic and tropical seas worldwide. Notable features of the intertidal crust *CWS/CEL* 08-45-1 include a tight hypobasal adherence of both the margin and the thallus to the substrate giving this species a mechanical advantage in its high-energy environment. Unfortunately, reproductive structures were not found in any samples investigated. Positive identification will require molecular sequencing/analysis and reproductive structures from other collections.

13.

ISOLATING A SINGLE CELL CLONE EXPRESSING MUTANT SERRATE IN THE IMAGINAL WING DISC OF *D. MELANOGASTER*

Ayiti-Carmel Maharaj-Best ‘13
Faculty Sponsor: Robert J. Fleming

The presence of the wild-type Serrate ligand on a cell activates the Notch receptor of adjacent cells, while inhibiting Notch on its own surface. In cells expressing a mutant form of Serrate, the Notch receptor of the Serrate-expressing cell also becomes activated. The mechanism of this cell-to-cell communication is not yet understood. Through the isolation of single cell clones expressing the mutant form of the Serrate ligand, it should be possible to determine whether the mutant form of Serrate can carry out auto-activation or whether the ligand simply loses the ability to inhibit cis-activation of Notch. To do this, third instar larvae of *Drosophila melanogaster* containing the mutant Serrate ligand were incubated at 37˚C for 1 hour and then allowed to develop for about a day. The heads were then dissected from the bodies of the larvae, exposing the imaginal wing discs, and treated with antibodies over a series of days to elucidate the position of clonal cells by fluorescence. No single cell clones within the discs expressed the mutant form of Serrate, as is necessary for this experiment. The cells within the disc appeared to have stopped dividing by the third instar stage during which heat shocks were performed. Future experiments will be conducted, performing heat shocks at an earlier stage to induce expression of the mutant Serrate in cells within the imaginal wing discs.

14.

THE MARINE ALGAE OF SOUTHERN LONG ISLAND, NEW YORK

Lincoln McMahon ‘10
Faculty Sponsor Craig W. Schneider

Monthly collections of drift and benthic marine algae were made from two locations on the southern shore of Long Island, New York from May 2009 to March 2010. Additional collections were made in six other southern Long Island locations over the same time period. Upon collection, specimens were preserved and identified by morphological and ecological characters. Species composition was compared to those from similar sites published in 1940 by William Randolph Taylor. Notable changes in the seventy years between the two studies include numerous introduced species such as the prominent invasive *Codium fragile* (Suringar) Hariot, as well as substantial changes to the local environment. Three novel invasive species for Long Island were discovered. Thirty-six species were identified by Taylor in southern Long Island, while forty-eight were found in the present study. Seventeen species were discovered in both studies.

15.

THE EXPRESSION OF PPARS AT VARIOUS STAGES OF OLIGODENDROCYTE DEVELOPMENT

Nitin Sajankila ‘13
Faculty Sponsor: Hebe Guardiola-Diaz

Activation of peroxisome proliferator activated receptors (PPARs), a type of ligand-activated nuclear receptor, has been shown to promote neuroprotection in various models of neurodegenerative diseases. Oligodendrocytes produce the myelin sheath, a lipid membrane that insulates neurons for rapid neural firing, in the central nervous system. The neurosupportive nature of oligodendrocytes makes them interesting candidates for studying PPAR function. Currently, many discrepancies exist as to what the functions of PPARs are in oligodendrocytes. Without understanding the expression of PPARs at various stages of development, it is difficult to understand these receptors since the function of the potential oligodendrocyte changes throughout its development. In order to begin studying the concentration of PPARs, qPCR was used to practice quantifying the expression of PPAR genes. Immunoflorescence was used to study oligodendrocyte precursors and cells at different stages of development: PDGF (before differentiation), Day 2, and Day 4. These time points were stained using A2B5/O4/HCP to highlight the presence of immature oligodendrocytes, which display many developing external processes that exist in mature cells. The concentration of immature oligodendrocytes in the presence of PDGF was 5%, at Day 2 and in the absence of PDGF was 4%, and at Day 4 was 32%. This trend shows that as time proceeded, under these specific conditions, the concentration of cells in more advanced stages of development increased. Eventually, the techniques of qPCR and cell counting based on immunoflorescence will be used to specifically study which PPARs are present at which stage and at what concentration, in order to inductively understand their function.

16.

WILDLIFE VISITATION TO DIFFERENT TYPES OF RESIDENTIAL COMPOST PILES: DO ANIMAL PRODUCTS MAKE A DIFFERENCE?

Katherine R. Sausen '11, David W. Pierce '13
Faculty Sponsor: Scott R. Smedley

Composting is a widespread activity for households to dispose of food waste. This eco-friendly practice prevents additional waste products from being added to landfills and yields a nutrient-rich soil supplement for home gardens. As composting has become more popular, a widely held view has emerged stating that adding animal-based kitchen scraps to compost piles may lead to undesired wildlife visitation. However, no experimental data exist to examine this claim. Therefore, our experiment was designed to gather such data from a rural/residential woodland area. Beginning in February 2008 in Andover, Connecticut, 12-week long replicates have been conducted in which three types of compost piles (vegetable products only, vegetable and animal product mix, and control) have been monitored for wildlife visitation, using heat-motion sensitive cameras. The seventh and most recent replicate (early February 2010 – early May 2010), is currently underway. However, we have analyzed data from the fourth replicate (mid-February 2009 – mid-May 2009). During this replicate, 18 species visited the piles, resulting in a total of 629 encounters. Significantly more visitors were attracted to the mix pile than the other piles, and the five most frequent visitors (American crow, opossum, raccoon, domestic dog, and gray fox) all showed preference for the mix pile. Both of these findings support the notion that compost piles with animal products attract more wildlife. With a growing number of households utilizing composting, understanding how animal visitation is affected by the content of compost piles is clearly an important issue. Our results may influence how households practice composting. Further work will analyze the invertebrate visitors to different pile types, as well as comparing all replicates to determine whether animal-based products consistently attract more wildlife visitors to compost piles.

17.

THE EFFECT OF COMPOST PILE CONTENT ON INVERTEBRATE INHABITANTS

Jessica Scordamaglia '10
Faculty Sponsor: Scott R. Smedley

Residential composting has become a popular practice for environmentally conscious households. Composting decreases the amount of biodegradable waste going into landfills. In addition to microbes, many macro-organisms are also involved in the decomposition in a compost pile. A survey was conducted to compare invertebrate communities in three compost piles of varying content. The piles included a vegetable products pile (VEG), an animal and vegetable products pile (MIX), and a control pile with no food scraps (CON), but with the same leaf mulch core and straw cover as the other two piles. The field experiment was conducted in a rural/residential area in Andover, Connecticut from June 1 – August 12, 2009. Three invertebrate sampling techniques were utilized. Pitfall traps were used to collect ground-crawling invertebrates along the pile periphery. Adhesive-coated sampling cylinders above the piles were used to collect flying insects. Tullgren funnels were used to collect invertebrates living directly within the piles' mulch and straw. The pitfall trap samples were analyzed this semester to compare invertebrate communities among piles. The number of invertebrates sampled differed significantly among piles. The most abundant invertebrates in the pitfall samples were beetles, sow bugs, ants, springtails, and flies, all of which differed significantly

among the pile treatments. Beetles and flies were found more commonly in the MIX and VEG piles than the CON. Ants, sow bugs, and springtails were found more commonly in the CON pile than in the MIX and VEG. The abundance of beetles in the MIX and VEG piles and the lower numbers of springtails, sow bugs, and ants could be explained by the fact that 35-48% of beetles were of the family Staphylinidae which is primarily predatory. For ants, the effect of colony location should be ascertained from future replicates. Subsequent work will analyze the adhesive cylinder and Tullgren samples.

18.

A COMPARATIVE STUDY OF BENTHIC AND CORAL REEF FISH COMMUNITIES ON ARTIFICIAL VERSUS NATURAL REEFS OF BONAIRE, NETHERLANDS ANTILLES

Frances M.L. Thomas ‘10
Faculty Sponsor: Craig W. Schneider, Amanda Hollebone, Rita Peachey, CIEE Research Station Bonaire, Bonaire, Netherlands Antilles

In an effort to alleviate anthropogenic impacts (*e.g.*, anchor damage) in marine systems, artificial reefs are often deployed with most unintentionally becoming habitat or a food source for a variety of organisms. This study compared the composition of benthic habitat and associated fish communities utilizing man-made mooring blocks versus natural coral reefs in Bonaire, N.A. Percent live benthic cover of the blocks was estimated and compared to physically paired natural reef sites (n = 8). Additionally, a visual census of fish abundance and diversity was conducted at each site. Results showed significantly greater live benthic cover on the natural versus artificial reefs, but benthic and fish community diversity did not differ. The composition of this diversity, though, differed between the natural and artificial reefs. *Montastrea annularis*, *Agaricia agaricites*, and sponges dominated the natural reefs while *Diploria* spp. and *Millepora complanata* dominated artificial reefs. Bicolored damselfish and brown chromis were found at the highest densities on the natural reef, while sergeant majors and bluehead wrasses were found at the highest densities on the artificial reef. This study suggests that artificial reefs do not cause a shift in overall benthic and reef fish community diversity on natural reefs, but may strongly influence community composition and function.

19.

tRFLP AS A MOLECULAR APPROACH IN ASSESSING THE BACTERIAL COMMUNITY OF THE UPPER RESPIRATORY TRACT (URT)

Andrew Williamson ‘10
Faculty Sponsor: Lisa-Anne Foster

The human body is a host to a variety of complex microbial communities that share a dynamic relationship with surrounding microorganisms and the human host. The normal flora of the upper respiratory tract (URT) is a primary example of such a diverse and dynamic microbial population. Understanding the relationship between various organisms and their role in the human body is essential to understanding the role of the normal flora and the development of disease in the URT. Developing and utilizing accurate and effective tools for assessing a microenvironment is fundamental to these goals. Currently, culture methods and a few molecular approaches such as restriction fragment length polymorphisms (RFLP) are used to analyze microbial populations within the body. This study aims to illustrate how tRFLP, a relatively new

molecular technique, can be used as a reliable and accurate alternative to assess the microenvironment of the URT. Specifically, we show that this method addresses many of the obstacles that arise from culture methods and RFLP methods. tRFLP proves to be a sensitive approach that yields highly reproducible data. This molecular technique also produces data with high resolution that yield consistent and accurate results. This study shows that tRFLP results in peaks representing digested DNA fragments that are characteristic to bacterial species. Using these peaks, we can distinguish the presence of a bacterial species in an environment with multiple different organisms. This ultimately suggests the role that PCR and tRFLP have as potential methods in assessing the bacterial relationships within a complex environment such as the URT.

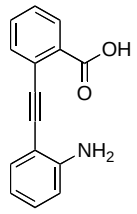
CHEMISTRY

20.

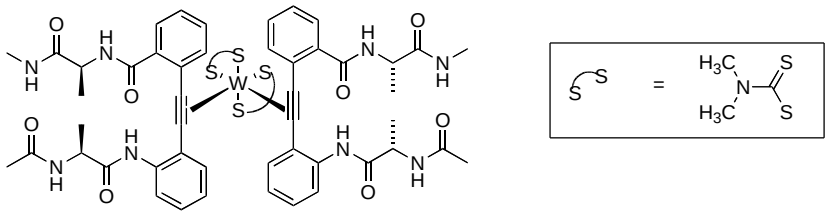
COORDINATION OF A PEPTIDE β-TURN MIMETIC TO TUNGSTEN: POSSIBLE APPLICATIONS FOR THE STUDY OF β-SHEETS

Adam N. Boynton '12
Faculty Sponsor: Timothy P. Curran

In 1995 Kemp and Li described the synthesis of 2-amino-2'-carboxyphenylacetylene (**1**) and its use as a peptide turn mimetic.[1,2] Their work showed that **1** does function as a β-turn mimetic, and that

1 

peptide derivatives incorporating **1** adopted β-sheet structures. A key structural element in **1** is the alkyne group that links both phenyl rings. Because of our ongoing interest in the use of tungsten-alkyne coordination for generating constrained peptides,[3,4,5] we have begun investigations into whether peptide derivatives of **1** can be reacted with $W(CO)_3(dmtc)_2$ to yield tungsten-bis(alkyne) complexes (like **2**), and whether the peptides maintain a β-sheet structure after coordination to tungsten. If the peptides do maintain their sheet structure, then it would be of interest to know whether the two β-sheets interact with each other via stacking arrangements. Owing to solubility and oligomerization issues, there are very few model systems for investigating β-sheet stacking interactions.

2 

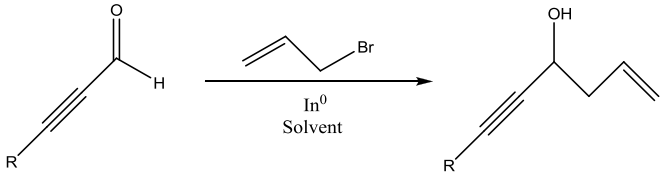
This presentation will detail the status of our efforts to prepare and study these novel bioorganometallic species.

21.

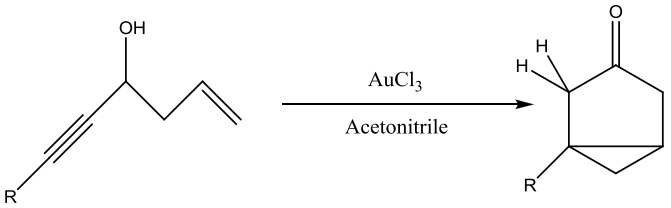
SYNTHESIS OF BICYCLIC ORGANIC COMPOUNDS

Mark Chesson ‘13, Boris Margarian ‘13
Faculty Sponsor: Thomas Mitzel

Currently, the process used to make bicyclic products requires a great deal of time and resources, and generates relatively low yields. Our goal is to improve the method of their production by combining steps that are typically performed in many “pots,” or flasks, into a single pot. Synthesis of bicyclic products is a three step process. Propargyl aldehyde compounds are formed from an alkyl halide and an alkene containing aldehyde in a two-step indium coupling reaction:



These compounds are in turn used to synthesize bicyclic products when mixed with large radius metals like gold and platinum:



We have shown that this type of indium coupling reaction works on a number of different aldehydes using both water and N-methylformamide as solvents. In addition, we have successfully synthesized an aldehyde with a conjugated triple bond. In the future, the additional steps involved with the formation of a bicyclic product will be carried out, including the actual cyclization of the propargyl aldehyde using gold or platinum as a catalyst. The production of these cyclic and bicyclic products is important, as they are used in the production of drugs and natural products.

22.

PROGRESS TOWARDS THE SYNTHESIS AND CHARACTERIZATION OF AN ALPHA-HELICAL TUNGSTEN-CROSSLINKED TETRAPEPTIDE

Zephyr D. Dworsky ‘10
Faculty Sponsor: Timothy P. Curran

Helices are shown to play an important role in bioactivity due to their interactions with DNA, RNA and proteins. It has been shown that some of these interactions play key roles in protein pathways disrupted in diseases such as cancer. Pharmaceuticals using helical peptides show promise for new treatments. Therefore, the goal of the Curran laboratory is to synthesize protein fragments that are helical and display an ability to induce apoptosis. Previous work in the lab has shown that by coupling a tetrapeptide with ferrocene, the peptide was constrained to an α-helical conformation. In the interest of having multiple synthetic routes to constrain peptides, the goal of the current study is to couple a tetrapeptide with a tungsten complex, constraining it to a helical conformation. The proposed tetrapeptide has a cysteine derivative with an attached alkyne at the

N- and C-termini to couple with the tungsten. The tetrapeptide has been synthesized using solution phase synthesis and reacted with tungsten. Future research includes characterizing the tetrapeptide-tungsten complex as well as synthesis of the tetrapeptide via solid phase synthesis.

23.

SEM-EDS ANALYSIS OF ROMAN *TERRA SIGILLATA* POTTERY

Samuel A. Gauthier '12
Faculty Sponsors: Maria Parr, Martha Risser, Ann Lehman

This project used Trinity College's JEOL JSM-IC848A Scanning Electron Microscope (SEM) to analyze Roman *terra sigillata* finewares excavated at Caesarea Maritima. The analysis focused mainly on using Energy Dispersive X-ray Spectroscopy (EDS) for elemental analysis of various parts of the fragments. Throughout the preparation process of the pottery shards, various photographic records were kept, as the shards needed to be cut, polished and coated prior to analysis with the electron microscope. After preparation, the instrument was used to examine the clay, inclusions within the fragment, and even the paint of one sample. This SEM-EDS analysis seeks to discover what some of these inclusions are made of and then use this knowledge to determine what the inclusions may be. Preliminary data shows that the inclusions seem to be high in silicon and oxygen, and are probably SiO_2, or sand. The information attained through SEM-EDS analysis can ideally be used to help establish the provenance of these pottery samples, possible trade routes, and provide insight into use of resources, as well as what specific style of pottery is being dealt with.

24.

ANALYSIS OF HAZARDOUS SEMI-VOLATILE ORGANICS AND TRACE METALS IN LOCAL AREA SOIL USING GC/MS AND ICP-AES

Alden Gordon '10, Christopher Gromisch '11, David Murison '10, Linda Tam '10
Faculty Sponsor: David Henderson

The lot at 54-56 School St., in Hartford, Connecticut contains fill soil that was brought in from an unknown location. For this reason it must be tested for toxins before a home can be build at the location by SINA. This soil was tested in 18 locations for both volatile organic toxins, and and toxic trace metals. Analysis of soil sample for organics was performed via solid phase micro extraction- gas chromatography - mass spectrometry, while trace metal analysis was performed using inductively coupled plasma - atomic emission spectroscopy after soils were digested in acid using EPA method 3050B.The results of the analysis will be presented.

25.

MAPPING THE TYPE I COLLAGEN BINDING SITE ON OSTEOCALCIN

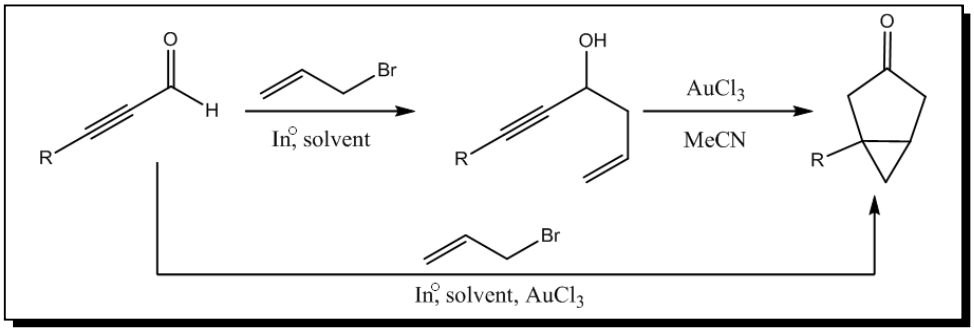
Andrew M. Janiga ‘11, Joseph C.C. Lim ‘12, Pratheek P. Kalyanapu ‘12
Faculty Sponsor: Richard V. Prigodich

Osteocalcin and Collagen are two proteins that play a role in bone structure. It is known that these two proteins bind together. Testing with 10, 12, 14, and 16-mer osteocalcin solutions showed the amino acids of the amino-terminus region of osteocalcin bind to collagen. Averages were calculated and scatchard plots were constructed to determine the equilibrium binding constant. Tighter binding was observed as the number of proline amino acids on the amino-terminus region increased This study will complete a quantitative analysis of amino terminal peptides of 10, 12, 14 and 16 amino acids in length to determine what portion of the osteocalcin molecule is binding to collagen.

26.

GOLD CATALYSIS AND INDIUM PROMOTED COUPLING IN ALKYNE CYCLIZATION WITH COPE REARRANGEMENTS

Jo-Ann Jee ‘10
Faculty sponsor: Thomas Mitzel



The use of gold as a catalyst has been gaining popularity in recent years due to its chemical properties and ability to promote a diverse range of enyne cycloisomerization reactions (Horino et. al, 2009). Previous research in our lab has shown that a two step coupling-cyclization reaction between 3-Phenylpriopiolaldehyde and allyl bromide system is possible under gold catalysis. The goal is to obtain a cascade coupling-cyclization under one-pot Barbier-type reaction with various R-groups. This research focuses on the use of 3-Phenylpriopiolaldehyde as the R-group. The results of the attempt at the gold-catalyzed cascade reaction will be discussed.

27.

SYNTHESIS AND ANALYSIS OF FERROCENE-LINKED TETRAPEPTIDES

Michael Lee ‘10
Faculty Sponsor: Timothy P. Curran

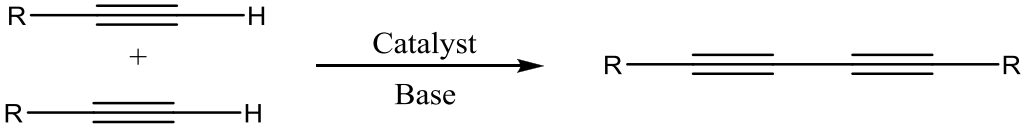
Amino acids are the building blocks for proteins, and these amino acids can be strung together in long chains, and these chains can take on specific three-dimensional conformations that give a protein its secondary, tertiary, and quaternary structures. Within the protein, one of the secondary structures adopted is the helix. Protease enzymes cleave peptide and protein chains, usually at specific amino acids in the peptide or protein sequence. It is generally believed that proteases will only act on peptides in an extended conformation. The goal of this study is determine whether a constrained tetrapeptide having a helical conformation is protected from undergoing hydrolysis by the protease chymotrypsin. Previous research by Emma Handy accomplished the synthesis of a tetrapeptide crosslinked by a tether that joins two lysines and a 1, 1'-disubstituted ferrocene, and the helical conformation was confirmed with NMR methods. Once crosslinked, a ferrocene-linked tetrapeptide complex will be analyzed using NMR methods to determine if it has a helical conformation. Both the constrained and unconstrained tetrapeptides will be tested using HPLC techniques to see if they undergo cleavage by chymotrypsin, which is known to cleave the Phe-Ala peptide bond. Current research is focused on studying the reactivity of the 1’1-ferrocene dichloride and understanding its linking ability. A ferrocene-linked hexamethylenediamine was successfully synthesized and is currently being characterized.

28.

ROSS COUPLING OF TERMINAL ALKYNES VIA A MODIFIED HAY COUPLING METHOD

Darleny Lizardo ‘12
Faculty Sponsor: Thomas Mitzel

As recurring building blocks found in nature and manufactured intermediates, the properties and reactivity of diynes have been carefully looked at for many years now. The Glaser group was the first to synthesize diynes in the laboratory by coupling two similar terminal alkynes and obtaining a symmetrical diyne as their product. Other scientists adapted the Glaser method of coupling and made a few adjustments of their own by changing the catalyst or the structure of the reactants.



General coupling conditions

In our research lab we have endeavored to make asymmetrical diynes via a coupling condition that combines the hay coupling and the cadiot-chodkiewics methods using acetone, which is cheap and benign, as a solvent and no oxidative agent. Our conditions are therefore very useful and practical for the creation of asymmetrical diynes.

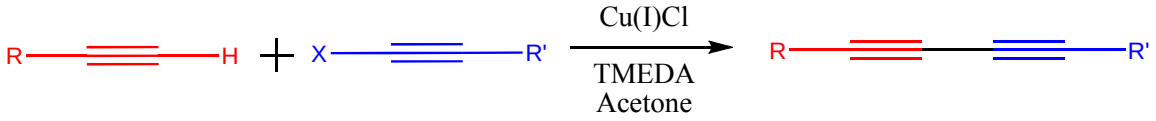
Modified Hay Coupling

29.

SYNTHESIS OF ASYMMETRICAL DIYNES THROUGH A MODIFIED HAY COUPLING REACTION

Jack Love '10
Faculty Sponsor: Thomas Mitzel

The asymmetrical diyne architecture is an interesting synthetic target in the Mitzel lab for its potential use in synthesizing hydrocarbon cages. The use of copper(I) has long been known to couple terminal alkynes well, however when used to form asymmetrical diynes these methodologies typically result in a mixture of homo-coupled and hetero-coupled products. Modification of one alkyne to a haloalkyne allows for selective cross-coupling forming only the asymmetric species. The use of TMEDA as a base and acetone as a solvent provides a highly versatile set of reaction conditions that are inexpensive and environmentally benign. Development of this methodology will be discussed.

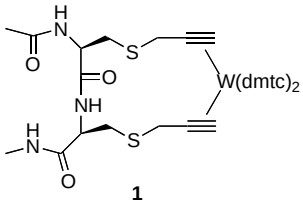


30.

CONSTRAINED PEPTIDES CONSTRUCTED BY COORDINATION OF PROPARGYLCYSTEINES WITH TUNGSTEN

Thomas A. McTeague '12
Faculty Sponsor: Timothy P. Curran

In prior work we have demonstrated that alkynes can be appended to peptide carboxylic acids (via acylation with propargylamine) and amines (via acylation with propargylchloroformate), that peptides bearing two alkynes can be prepared, and that reaction of these dialkynylpeptides with $W(CO)_3(dmtc)_2$ yields a cyclic peptide that incorporates the tungsten atom (which is called a metallacyclicpeptide). We have sought to use the tungsten-alkyne coordination to constrain peptides to specific three-dimensional conformations; in one case peptide turns were constrained by the tungsten-alkyne coordination.[2] In an effort to create helical peptides we have appended alkynes to the side chain amines of lysines, and have constructed peptides having two of these alkynyllysines. Coordination of these dialkynylpeptides to tungsten has produced metallacyclicpeptides. Investigations using NMR spectroscopy has shown that these metallacyclicpeptides are too flexible to constrain the peptide to a specific conformation. In particular, in these metallacycles we have found that the two alkyne groups can rotate around the tungsten center, generating a number of conformational isomers in solution. We have hypothesized that appending the alkyne group to the side chain amine of lysine locates the π-ligand too far from the peptide backbone for coordination to tungsten to constrain the peptide. Accordingly, we have begun investigations to see whether locating the alkyne group closer to the peptide backbone will make the complexes more rigid. Towards this end we have been investigating the use of propargylcysteine as our alkynylamino acid. Attractive features of propargylcysteine are that it can readily be prepared in multigram quantities from cysteine, and derivatives of propargylcysteine are easy to work with in peptide synthesis. This presentation will discuss the preparation and characterization of metallacyclicpeptide **1**.



1

31.

MEASURING PHOSPHONATE METAL ION STABILITY CONSTANTS BY ^{31}P NMR

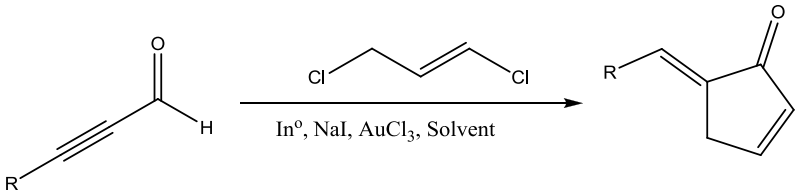
David Patrick ‘11
Faculty Sponsor: Richard V. Prigodich

The binding of metal ions and other cations to phosphorus containing compounds is of general interest and has great relevance to the behavior of nucleic acids in the presence of electrolytes. ^{31}P NMR chemical shift changes can be induced by the binding of cations to phosphorus containing acids because of the increased possibility in shielding or deshielding. Using tetramethylammonium chloride to control chloride concentration and the non-ionizable compound trimethylphosphate as a chemical shift standard, the chemical shift and coupling constants were measured for methylphosphonic acid at a pH = 10 as the concentration of metal chloride salts were varied. Sodium chloride had an association constant of 0.46 M^{-1}, while magnesium chloride had an association constant of 38.62 M^{-1}. The coupling constants for both metals were the same at 15.63 Hz. Methylphosphinate, other cations, and cationic ligands will be used to further this study.

32.

USE OF INDIUM METAL AND CATALYTIC $AUCL_3$ TO PROMOTE COUPLING AND CYCLIZATION OF PROPARGYL ALDEHYDES IN A ONE-POT SYSTEM

Katie Pearson ‘10
Faculty Sponsor: Thomas Mitzel



Organic chemists focus on finding more environmentally friendly reaction conditions to carry out chemical transformations of organic templates that are usually formed under “harsh” conditions. Indium metal has been shown to promote C-C bond formations under environmentally benign conditions, including the use of water as an “organic” solvent, with good regio- and stereocontrol. Previous research in the Mitzel laboratory shows that the use of indium metal led to an oxy-cope rearrangement and the coupling and cyclization of an alcohol product in a two-pot system. The main focus of this research was to complete the coupling and cyclization in a one-pot system and to determine the most favorable conditions for the reaction.

33.

DEVELOPMENT OF A SYSTEM TO STUDY PHOTOCHEMISTRY OF THE LIQUID-VAPOR INTERFACE

Baltazar Ramos Jr. ‘11, John Hasychak III ‘11
Faculty Sponsors: Maria Krisch, Hendrik Bluhm

Unique aspects of the liquid-vapor interface cause its composition, and sometimes chemistry, to be different from bulk liquid. Here we discuss the development of a droplet train apparatus, using a vibrating orifice, to study photochemistry at the liquid-vapor interface. Our goal is to compare bulk and interfacial chemistry, starting with atmospherically interesting organics

dissolved in aqueous salt solutions as a proxy for atmospheric aerosols. We test several analytical methods for detecting products, evaluating UV-Vis spectroscopy, fluorescence spectroscopy, and ATR-IR spectroscopy as a means to follow the photochemistry of both KI and CH2ICl. In order to directly probe chemistry at varying depths from the solution surface, we also obtain molecular-level depth profiles of atomic composition for potassium iodide solutions exposed to an ultraviolet laser. Composition measurements are performed with an ambient pressure x-ray photoelectron spectroscopy apparatus at the Lawrence Berkeley National Laboratory. Initial data show no significant difference between the bulk and interfacial photochemistry of potassium iodide. This result provides a basis for further study of atmospherically interesting organics dissolved in aqueous salt solutions.

34.

CONFORMATIONS OF CYCLIC COMPLEXES FROM METALLACYCLES

Duyen Tran ‘13
Faculty Sponsor: Timothy P. Curran

The notion of using alkynes as ligands in coordination with Group VI metals began in the early 1960s when Tate and Augl studied the properties of $W(CO)(3\text{-hexyne})_3$ and found that the alkyne was linked to the metal via two separate bonds. The work was continued in the 1980s by Joseph Templeton at UNC-Chapel Hill, where extensive information on the synthesis and behavior of Group VI metals, particularly molybdenum(II) and tungsten(II) alkyne complexes, was obtained. He and his co-workers showed that the synthesis of a variety of tungsten(II) and molybdenum(II)-alkyne complexes was relatively simple, if prepared under the right conditions. More specifically was the establishment of the conformations and stabilities of the bis(alkyne) tungsten complexes. In our work we used Templeton’s synthetic methods for forming bis(alkynyl) species. In his work two monoalkynes were coordinated to one metal. In this project one dialkyne is being coordinated to one metal, with both alkynes in the dialkyne being linked to the metal. Coordination of both alkynes in the dialkyne will generate cyclic structures, forming a metallacycle. Metallacycles employing bis(alkyne) complexes have not been reported before. The purpose of this research is to make such metallacycles and then determine their molecular shape. Under our experiment, a variety of complexes (1-hexyne & 1,8-nonadiyne) were reacted with $W(CO)_3(dmtc)_2$. The bis(alkyne) products were isolated, and their structures determined using NMR and MS methods. Electrospray mass spectrometry provided an isotope pattern for the molecular ion peak that is unique to the target molecule.. NMR provided information on the shape and flexibility of the molecules. The 1-hexyne complex was used as a control molecule for the metallacyclic 1,8-nonadiyne molecule. Results from this work will be presented.

35.

SEM-EDS ANALYSIS OF A COPPER BEAD EXCAVATED IN SOUTHERN NEW ENGLAND

Lan Anh Tran ‘13
Faculty Sponsors: Maria Parr, Ann Lehman

Two major sources of native copper are exposed surface veins and copper which has drifted down from another location. Since copper-based artifacts can retain a similar composition to their original source, by determining the elemental composition of the copper artifact, the results can be compared with original sources and the origin of the artifact can be established. The copper bead in this study was excavated in the area and was first photographed from many

different angles under the light microscope in order to document the original state of the artifact. A piece of the artifact was then removed and mounted onto a stub. The mounted sample was analyzed with a JEOL JSM-IC848A scanning electron microscope (SEM) equipped with an energy dispersive X-ray spectrometer (EDS). The EDS function of the SEM was employed to determine the elemental composition of the copper bead. Three different areas on the bead were subjected to elemental analysis and all three showed a very high concentration of copper. Also present were traces of silicon and oxygen which could be the result of corrosion due to interactions with the environment or a characteristic of the vein from which the copper was taken. Traces of iron were also found in one area. This element could have been introduced through the smelting process during the creation of the copper bead. Further analysis will be done to determine the exact elemental composition of the artifact and the data will be compared with the compositions of different sources to attempt to establish the origin of the copper. If the copper did not originate from a copper deposit located in Connecticut, possible trade routes or migration patterns may be inferred.

COMPUTER SCIENCE

36.
PGP ON ANDROID
Vinit Agrawal ‘10
Faculty Sponsor: Takunari Miyazaki

PGP (Pretty Good Privacy) is an email encryption service which provides cryptographic privacy and authentication. Although PGP has been already implemented in most of the email-systems for desktop environments, it has still not been implemented in most mobile and embedded devices. So the project entails an open-source solution of providing PGP Support in Android phone. The functionality has been achieved by successfully integrating java API for Open PGP, Bouncy Castle in Android. The future goal of the project is to integrate PGP with the native email client available in Android- K9Mail.

37.
ONTOLOGY-BASED TEXT MINING FOR PREDICTING DISEASE OUTBREAKS
Nicolae Dragu ‘12, Fouad Elkhoury ’11 (University of Hartford)
Faculty Sponsors: Takunari Miyazaki, Ralph A. Morelli, Nicolas di Tada, InSTEDD

Biosurveillance predicts and prevents the spread of diseases and bioterrorism events under different forms of information. The Riff project, by the Innovative Support to Emergencies Diseases and Disasters organization (InSTEDD), provides a valuable approach to solve the diverse issues of biosurveillance by monitoring, detecting and responding to emerging hazard indications by granting the user a hypothesis and the possibility of a detailed analysis.

This poster explores the basic architecture of a plug-in application for Riff to improve early disease detection, in the context of text mining systems. This tool analyzes online health-related news reports given to the system though RSS feeds. The parsed content is then matched against a medical web ontology language (OWL) to determine the likelihood of a new disease outbreak. For this purpose, a scoring metric is used to list the most probable diseases that could pose a threat. The results indicated by our plug-in would aid human experts in the field of biosurveillance to draw conclusions regarding the possibility of a disease outbreak. As part of

our prototype, the BioCaster Ontology (BCO) is chosen by default to provide the medical information needed by the application. Protégé-OWL was also used for obtaining the relevant information from the ontology. This tool is designed to be used as a free and open-source plug-in for InSTEDD's interactive biosurveillance system, Riff.

The main result of our text-mining project is to extend the functionality of the Riff system and improve the way health threatening events are detected and prevented. The plug in tool augments the knowledge of news articles related to diseases by using a medical web ontology and assigning scoring metrics for diseases that would be more likely to cause an outbreak in the near future.

38.
AD-HOC NETWORKING ON THE ANDROID PLATFORM
Christopher Fei ‘10
Faculty Sponsor: Ralph Morelli

POSIT (Portable Search and Identification Tool) is an Android application written by students with the Humanitarian FOSS Project. The application helps aid search and rescue efforts by allowing the transmission of data recorded in the field to and from a central server. Data is typically sent to and from an Android device via a WiFi connection or cellular data network such as 3G. However, when POSIT is deployed to help relief efforts in a disaster situation, there is no way we can rely on the existence of such wireless infrastructure. Thus, POSIT and the Android platform need a way to allow devices to communicate directly with one another, without employing a central server. That is, we need a way for Android devices to form an ad-hoc network. We have implemented ad-hoc communication as a module in POSIT by using the Random-Walk Gossip (RWG) protocol, developed at the Real Time Systems lab at Linkoping University in Linkoping, Sweden. The protocol functions with reasonable latency and with no knowledge of the rest of the network, making it suitable for mobile devices. POSIT's ad-hoc communication functionality currently supports sending and receiving text-based message. I report results of field experiments testing the limits of both my implementation and of the protocol itself.

39.
INTEGRATING TWO FOSS SYSTEMS: SAHANA AND POSIT
Rachel Foecking ‘11
Faculty Sponsor: Ralph Morelli, Trishan de Lanerolle

This project is an attempt at integrating two free and open source software systems related to disaster management: POSIT and Sahana. Sahana is an all-purpose, one stop disaster management system. It is a web based collaboration tool that addresses the common coordination problems during a disaster: managing aid and supplies, finding missing people, managing volunteers and the victims themselves. POSIT is a portable, open source tool written on the Android platform for use with mobile devices that aids search and rescue efforts by enabling them to transmit field data between users and central servers. This project establishes a basis for communication between Sahana and mobile phone software like POSIT. Sahana administrators and users would benefit from on-site information that mobile devices can provide by giving them more awareness of the situation out in the field. The POSIT project (a small, homegrown effort) will benefit by being associated with a well-known FOSS project, which might spark contributions from newly interested developers.

40.
ONLINE PRESCRIPTION SYSTEM
Chris Hawley ‘10
Faculty Sponsor: Timothy Richards

Physicians spend a non-trivial amount of their time calling in prescriptions to pharmacies, resulting in a net loss of time that they can be helping patients. Innovations as simple as the “waiting room in the doctor’s office” have helped to decrease this time loss. Example: A doctor’s time, as a skilled professional, is relatively more valuable than the average person. Therefore, as a society, we should try to maximize their time by enabling them to always have a patient to help. By having a waiting room full of queued patients, while the doctor is working, he/she always has someone to help- i.e. no wasted time. A further solution to this problem would be to minimize the time doctors are dealing with clerical work.

My project’s solution is to create a secure online system where doctors can prescribe medicine for patients, pharmacies can receive the prescriptions, and patients can adjust the prescription at their convenience. This is an improvement in efficiency for both the doctor’s office and the pharmacy, an improvement in patient convenience and a victory for the environment by removing much of the paper involved in this process.

41.
TRINITY SOFTBALL PLAY-BY-PLAY WEB APPLICATION
Jessica Tait ‘10
Faculty Sponsor: Madalene Spezialetti

College athletes play for schools that are often far from their homes, families and friends. Therefore, it is often difficult for those people to see the games in which their loved ones compete in person. This can make it difficult for fans to keep up with the team. One solution to this problem is to broadcast the games online through statistics. This idea is similar to the program that Major League Baseball uses to broadcast its games online called Gameday. The Trinity Play-by-Play web application is comprised of two parts: an administrator page and a viewer page that are written mainly in Actionscript, Javascript, mySQL and html, among other programming languages. The administrator page includes buttons that someone watching the game in person can use to record the events of the game. These events are uploaded to a web server where the viewer page can access them so that anyone at home can go to the viewer webpage and be able to follow along with the game. The main statistics that are recorded are ball, strike and out counts, the type of play that occurs, the scores, as well as the names of the teams playing, their players and the player’s statistics.

42.
WRITERS WORKSHOP WEBSITE
Sarah Thayer ‘10
Faculty Sponsors: Ralph Morelli, Robert Peltier

The Writers Workshop Website (http://writers-workshop.org) is a forum-based website aimed at helping writers receive constructive feedback from fellow writers. Many other writing websites require intensive registration forms before the user is allowed to view creative pieces. Most do not prompt constructive comments, so writers struggling with a work do not get help to improve upon it. The Writers Workshop Website does not require any registration to view the forums. This transparency allows potential users to get a feel for what the forums are like before joining the community. Multiple literary genres have been included in the forums, and additional comment fields encourage helpful feedback. Implementation of this project initially included database configuration and server setup with the aid of phpMyAdmin and MySQL. For software, Wordpress.org (an open-source Content Management System) was used in conjunction with modified PHP code and CSS to achieve desired functionality and design. Additional technologies used include FileZilla, BBCode, Facebook, MeetUp, LinkedIn, and VastHTML. Results have been positive: the website launched on March 17, and after just over 5 weeks, total views were up to 747 and there were 18 users, 18 posts and 15 topics on the forums. The Writers Workshop Website also includes forums dedicated to writing prompts and site feedback, as well as mobile-friendly viewing, automatic broken link checks, and a constantly-updated “Tips and Tricks” page for users.

ENGINEERING

43.
DESIGN OF A FLYWHEEL ENERGY STORAGE SYSTEM
Russell Bennum ‘10
Faculty Sponsor: John D. Mertens

There is currently a need for energy storage in many applications. Energy storage can greatly increase the usefulness of renewable generation resources, as well as improve the efficiency of automobiles through kinetic energy recovery. Many energy storage technologies, such as batteries, degrade over time. When properly designed, a flywheel energy storage system will significantly outlast other systems, leading to a lower lifetime cost. With this in mind, the goal of this project is to design and build a flywheel energy storage system capable of storing energy over a period of time. Further goals include optimization of stored energy per unit cost, volume, and mass; the ability to intermittently add and subtract energy to and from the flywheel; and minimization of energy losses in transferring and storing energy. To accomplish these goals, a flywheel energy storage system has been designed consisting of the following: a cylindrical 1018 steel flywheel of 8 in. diameter rotating at 4000 rpm and mounted on a 5/8 in. shaft supported by 5,039 rpm rated ball bearings; a DC motor capable of bringing the flywheel to its operational speed and back; a clutch capable of coupling and decoupling the flywheel and motor shafts; and a housing enclosing the rotating components capable of absorbing all energy stored in the flywheel in the event of failure. The design is capable of safely storing 1 KJ of energy, and stresses due to the rotation of the flywheel are below the fatigue limit of the steel used, allowing for great durability of the system

44.

DESIGNING A THREE COMPONENT FORCE BALANCE FOR A SUBSONIC WINDTUNNEL

Stephan Bernstorf ‘10, Roger Breum ‘10, Doug Loudon ‘11
Faculty Sponsor: Joseph Palladino

In order to gather data from models in a wind tunnel, there needs to be an accurate force balance upon which the model is mounted. A typical force balance measures between two and six components, depending on complexity and cost. The task of this project was to design, fabricate, and calibrate a three component force balance that measured lift force, drag force, and the pitching moment. Using a compound-rod design, the team created a force balance that independently measures each component successfully.

45.

CONSTRUCTION AND DESIGN OF AN AUTONOMOUS UNDERWATER VEHICLE

Alex Bisson ‘10, Peter Kempson ‘11, Corey Stein ‘10, Paul Wortman ‘10
Faculty Sponsor: David J. Ahlgren

Autonomous Underwater Vehicles are used today in many applications, from research, to salvage, to military. This project attempted to create a fully autonomous underwater vehicle (AUV) that was both relatively cheap and efficient. The desired end product is an AUV that is fully capable of submerging to a depth of approximately 14 feet and then successfully navigating under water along a predetermined course, all while staying within a $1000.00 budget. The budget is significantly below the normal cost of such a venture when compared to the usual cost of creating a competition worthy AUV. To accomplish such a task many of the physical parts used for the AUV were constructed and pieced together in lieu of purchasing a professional product. The primary mechanical systems are side thrusters for horizontal motion, a ballast system for vertical moment, and an interior mass translation system to adjust the pitch of the AUV, all of which were constructed on campus. The parts were all procured at local establishments. The AUV’s course is dictated by a path-line by which will be tracked and followed by a CMUcam2 and Arduino Mega navigation system until the completion of the track. The finished AUV will weigh about 55 pounds with a full ballast. The AUV has dimensions of a main body length of about 26 inches, height of about 9 inches, and a propeller wingspan of about 24 inches.

46.

EMBEDDED LINUX ROBOTICS CONTROL SYSTEM

Adam Grare ‘10, Ankit Saraf ‘10
Faculty Sponsors: David J. Ahlgren, Taikang Ning

The goal of this project was to create an embedded control system that could be used by college level robotics teams or robotics enthusiasts. Emphasis was given on balancing the cost and the flexibility of the system; most products currently being used in the market are either cheap but inflexible, or vice versa. In that regard, the system was developed using the Analog Devices Blackfin B537 processor, a powerful Microcontroller and Digital Signal Processor, combined with an embedded Linux distribution. Further, custom kernel drivers and Application Programming Interfaces (APIs) give developers an inexpensive system with more control. The

source code for all drivers, APIs and example programs are openly available, allowing users more flexibility in development. Wireless functionality was also added to the system via a router, allowing for complete untethered development. A wall-following robot was constructed around this system as a proof of concept design. Nonetheless, this system can find its application in a wide range of settings this system supports interface to a variety of digital and analog input devices, serial devices (such as those using the I^2C protocol), and digital output devices with 8 dedicated Pulse Width Modulated (PWM) wave output pins for motor control.

47.

DEVELOPMENT OF A TERMINATION DEVICE FOR ENDOLUMINAL SUTURING

Jesus Lopez ‘10, Daisy Ramos ‘10, Anant Raut ‘10
Faculty Sponsors: Joseph Palladino, Joseph Bronzino

The demand for minimally invasive surgical procedures has been increasing in recent years due to reduced costs. Endoscopic surgeries are performed using endoscopes that are inserted down natural orifices, such as the esophagus. Since endoscopic surgeries do not require any type of incisions to be made, they do not require the use of general anesthesia and recovery time is quicker. Covidien, a leading manufacturer of medical devices and supplies, diagnostic imaging agents and pharmaceuticals, are in the process of developing their own endoscopic endoluminal suturing device. This device will be used for bariatric surgeries, such as stomach reduction. Although Covidien has developed a successful suturing device, it has yet to find an efficient way to terminate the suture within the body. The small and narrow working environment of endoscopic surgery makes it difficult to terminate the suture using traditional knot tying methods. The goal of this project was to design, prototype and test a device to terminate an endoscopic suture that is easily manufacturable, cost-effective and safe. The device had to fit within a 2mm diameter. The final design of the termination device consists of a hook and clamping mechanism that remains in the body.

48.

CONSTRUCTION OF A ONE-COMPONENT FORCE BALANCE FOR MEASURING AERODYNAMIC DRAG IN A LOW SPEED SUBSONIC WIND TUNNEL

Andrei Marchidan ‘13, Roarke P. McCormick ‘13
Faculty Sponsor: Joseph Palladino, Asnuntuck Community College Machine Shop

Drag forces oppose the relative motion of an object placed in a liquid and are directly proportional to the object’s shape. The accurate measurement of drag forces on models is an indispensable tool for aeronautical engineers and designers. To accomplish this task, the construction of a simple one-component force balance to measure drag force in a subsonic wind tunnel was undertaken. The force balance uses a load cell from an electronic laboratory scale, which is equipped with four strain gauges mounted to a binocular spring element, whose geometry enhances the load cell’s sensitivity. This force transducer is connected to a wheatstone bridge amplifier that converts voltage resistance changes to measured voltage in a computer with a data acquisition system. Signals are then interpreted in a user-friendly LabView program to give the values for the measured strain and drag force that is applied on the model. The load cell was tested with various weights and showed a linear interpretation of the strain applied, accurate to a 9% error which will be taken into account during calibration. The design of the force balance was made in SolidWorks C.A.D. software and is currently awaiting manufacture at the machine shop from Asnuntuck College. This force balance will be used to measure drag force on bluff bodies in the Trinity Engineering wind tunnel.

49.

HIGH-PRESSURE SHOCK TUBE REDESIGN, FABRICATION, ASSEMBLY AND TESTING

Christian Michel ‘10, Carolyn Wolcott ‘10
Faculty Sponsor: John D. Mertens

A shock tube is a device used in the study of high-temperature chemical physics. A shock tube is a metal tube that is separated into two sections by a diaphragm. One section, the driver section, is held at high pressure; the other, the driven section, at low pressure. When the diaphragm bursts (either by natural or mechanical means), a compression shock wave propagates down the low-pressure driven section, briefly raising the temperature, pressure and density of the gas and inducing a net flow in the direction of propagation. The boundary between the driven and driver gas is called the contact surface and propagates behind the shock wave into the driven gas, though at a lower velocity. The shock wave then reflects off the driven section endwall, increasing the temperature, pressure and density of the driven gas further. Concurrently, a rarefaction wave propagates back from the diaphragm into the high-pressure driver section and reflects off the driver section endwall. If the reflected shock wave impacts either the contact surface or the rarefaction wave, the shock wave is dissipated and the test is over (test times are on the order of milliseconds).

The objective of this project was to redesign, fabricate, assemble and test the existing high pressure shock tube in MCEC. Though this had been a senior project in the past, numerous fabrication errors had rendered the shock tube unusable. However, upon completion of this project, the shock tube was to be capable of performing high-pressure shock wave experiments.

50.

GEOTHERMAL HVAC DESIGN AND ANALYSIS

Michael Mortimer ‘10, George Brickley ‘10
Faculty Sponsors: David Giblin, Steve Galligan

The objective of this project was to design a Geothermal HVAC system for the Trinity Hockey Rink, and then determine if it would be a feasible project for the College to undertake in the future. It was determined that the project would be very feasible. The total installation cost of the geothermal system would be approximately $508,000. It was also determined that the school is currently paying approximately $100,000 / year in heating and cooling costs (with primarily gas heat and electric re-heat coils, and some air conditioning in the small support rooms). The new geothermal system would cost approximately $40,000 / year to run (this would be a savings of approximately $60,000 / year). This calculates to about an 8-year payback period (not including interest). The design also introduces Air Conditioning to the Arena area so that it could be used year round for various events, something that was desired by the school.

The second aspect of the project was to design a working model to show the effectiveness of a geothermal system, and to allow testing to optimize the system. This was done by running heated water through a coil in a barrel of soil (representing a geothermal ground loop) and taking temperature readings at the input and output of the coil, as well as various points in the soil. The temperature differences showed the heat transfer between the ground and the water coils (similar to a geothermal system). Different variables were varied such as adding water to the soil and varying the flow rate through the coil to optimize the system.

51.
HOUSE ON FIRE ROBOT
Michael Rueger ‘13
Faculty Sponsor: David J. Ahlgren

The robot that was created for the House on Fire competition was intended to be able to: autonomously locate a pool of water, draw water from the pool, locate a flame, and extinguish the flame with the water from the pool all within a given time period. Additionally, there were specific size restraints that the robot had to adhere to. The creation of the robot required a lot of mechanical as well as electrical work. The robot was built using an irobot create as its base and was equipped with numerous sensors, a reservoir, a water pump system, and electrical boards that allowed it to function. Electrically, programming was needed that would: allow the robot to navigate through the course, allow the robot to know when its pump was in the pool of water, provide the robot with the ability to recognize a flame, and enable the robot to pump water through the system to extinguish the fire. Structurally, the robot was sound as every aspect that we had intended to build was completed and presumably functional. However, the programming of the robot was not completed because one of our electrical boards malfunctioned during testing. The programming that was completed before the disabling of the board was well-functioning during testing and should not have presented problems once being implemented into the contest setting. Ideally, some of the mechanisms of this robot would have contributed to the eventual development of a household robot that would be able to extinguish a fire without human control.

52.
OCEAN CURRENT TURBINE DEPTH CONTROL PROTOTYPE
Colin Touhey ‘10
Faculty Sponsor: David J. Ahlgren

This project explores ocean current technology, which provides a relatively consistent, definitive, and predictable water velocity and flow rate. Ocean currents act as enormous rivers spanning the globe, and can be miles wide and hundreds of miles long. In fact, the Gulf Stream alone provides a funneled water current 30 times the entire freshwater river flow of the world.This is so much power, that “if less than 0.1% of the renewable energy in the oceans could be converted to electricity, it would satisfy the present world demand for energy five times over.”

To harness this energy, however, becomes an immensely difficult problem. There are 1.8 billion acres of Outer Continental Shelf. Most of this ocean is incredibly deep (around 150m). For an electricity generation device to survive these depths, the engineering behind is incredibly complex and expensive. This is even the more reason to ensure that the device is optimizing the amount of electricity produced consistently and efficiently. As can be seen in Figure 1, a buoyant turbine will be anchored to the ground and flown much like a kite. The constant flow of seawater past the turbine will keep it above the ocean floor but below the surface using different controls. As seen in Figure 1, there are two main controls that will change the depth of the OCT. The first is the buoyancy control, which will essentially control how much the entire body sinks or floats. This will be done by controlling the amount of air or water in the turbine at all times. Second, since there is a relatively constant water flow (in Figure 1 from left to right) across the turbine, there will be Lift Force Hydrofoils changing their angles of attack depending on the desired lift

force. How this control is implemented, however, is the thrust and main focus of this design project.

The electronics involved in this design use multiple inputs and multiple outputs to constantly monitor the water velocity, depth, and position of the turbine body, as well as change all of these factors using complex algorithms to control depth. The electronics onboard include pressure transducers, water velocity impellers, optical encoders, and H-bridge DC motor control.

These electronics, though external input and output devices, are controlled with a National Instruments USB data acquisition board. This USB interface provides flexibility when designing the control system of the turbine buoyancy and lift control, and gives the user the ability to constantly monitor the depth, velocity, and potential power production of the system.

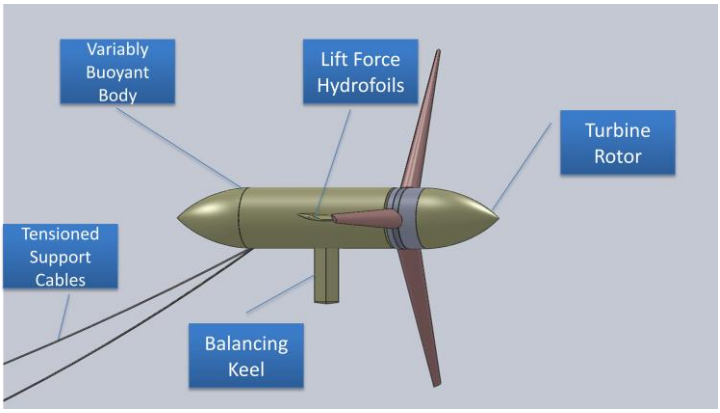


Figure 1: Basic OCT Diagram

53.

DESIGN AND IMPLEMENTATION OF AN AUTONOMOUS ROBOT WITH A SIMULTANEOUS LOCALIZATION AND MAPPING ALGORITHM

Adam Wright ‘10, Orko Momin ‘10, Nathan Swaim ‘10
Faculty Sponsor: David J. Ahlgren

Exploration of unmapped terrain like Mars or other planets requires autonomous robots to be able to self-steer around obstacles and to ‘know’ position with respect to key landmarks. Reliance on measures of displacement from an initial position to build a map suffers from cumulative inaccuracies that can render such a map useless. This project applies a technique called Simultaneous Localization and Mapping (SLAM) to dramatically reduce cumulative error. Key to building this map and the resulting location history is use of a vision sensor that measures obstacle position relative to the robot. The high accuracy of multiple distance scans combined with inaccurate displacement measurements and a probabilistic mathematical method, Kalman filtering, yield a very accurate map. This map is sufficiently accurate that it may be used to make navigation decisions. The primary project objective is to develop a robot capable of performing SLAM. The second key objective in this project is to package the SLAM code and algorithms into undergraduate tutorial, so subsequent undergraduates will be able to use this work as a building block, and to incorporate SLAM into robotics projects more easily, advancing the average level of robotic intelligence.

ENVIRONMENTAL SCIENCE

54.
LEAD LEVELS IN URBAN RAPTORS
Gina Dinallo ‘12
Faculty Sponsor: Joan Morrison

As tertiary predators, raptors are prone to bioaccumulation of toxins from prey and other environmental sources, so their health generally mirrors that of the overall local ecosystem. If the raptors in a local area are displaying lead poisoning symptoms, this indicates that there may be a lead problem in their environment that other wildlife species and, potentially, humans are exposed to as well. This concept raised questions about raptors—specifically red tailed hawks—living in and around the urban environment of Hartford. Are raptors in the Hartford area accumulating lead at sub-clinical and higher levels in their bodies? If so, where in their environment is the lead coming from? To determine lead levels in the local hawk population, blood samples from live hawks and liver samples from any dead hawks will be analyzed via ICP spectrometry. General raptor studies indicate that background blood lead levels are less than 0.2mg/kg, sub-clinical values range from 0.2-0.6mg/kg, clinical values range from 0.6-1.2mg/kg, and severe clinical values are levels greater than 1.2mg/kg. Liver lead levels are much higher than blood lead levels because liver tissues have a greater retention time, causing them to accumulate more of the metal. We expect local hawks to show sub-clinical lead levels because both the hawks and their prey (primarily small rodents) likely incur long-term exposure to low lead levels. The primary urban lead sources are emissions from past use of leaded gasoline that have contaminated the soil and lead paint used on building exteriors. Lead can be taken into the body through respiration, ingestion, direct contact, or other means. Hawks may increase their lead levels through their own daily activities and by ingesting additional lead that has accumulated in their prey over its lifetime.

55.
THE TRINITY COLLEGE SEISMOGRAPH STATION (TCCT)
Daniel Echavarria ‘12
Faculty Sponsor: Jonathan Gourley

On November the 10th 2009 the Trinity College Environmental Science department installed an EQ-1 seismometer on the first floor of the McCook building. This instrument measures the vertical ground motion in the form of seismic waves that are generated by earthquakes around the World. The station is a member of the IRIS (Incorporated Research Institutions for Seismology) consortium, which was founded in 1984 with support from the National Science Foundation and is dedicated to the acquisition, management, and distribution of seismological data.

The seismograph is connected to a regional network with real time data from other participating stations. Since the seismometer was installed, it has been uploading real time data to the IRIS website (http://www.iris.edu/hq/sis) and has recorded 12 earthquakes, including the Haiti earthquake on January the 12th 2010 and the Chile earthquake on February the 27th 2010.

56.

A CAMERA STAND FOR HIGH-RESOLUTION CORE IMAGERY

Isabel Iwachiw ‘10
Faculty Sponsor: Christoph Geiss

High-resolution images are a valuable tool for the study of sediment samples and drill cores. Regular digital cameras can produce images with a resolution up to 12 megapixels, which translates into a spatial resolution of approximately 40 pixels / cm. Higher resolutions can be achieved through automated (and very expensive) linescan cameras or through photo mosaics which stitch several photographs into one large image.
I designed a photo stand that can take several high-resolution pictures of one meter sediment cores which can later be stitched into one continuous image with ease.

The stand consists of a baseboard, sliding tray, adjustable camera holder, and locking device, which allows for controlled sample movement. The baseboard and sliding tray are made from melamine resin coated cabinet shelving. The camera holder uses recycled pieces of an overhead projector. The locking device is a simple door bolt and is used to keep the sliding tray in place while a picture is being taken. The stand allows for pictures being taken at minimum intervals of 2cm, which enables the creation of high-resolution core mosaics. Core images can be stitched together using freely available software (Microsoft ICE). The total cost of the instrument is approximately $110.00 which compares rather favorably to the 6-figure price tag of a commercially available product.

57.

NEST-SITE SELECTION BY RED-TAILED HAWKS IN AN URBAN ENVIRONMENT

Rick MacLeod ‘11
Faculty Sponsor: Joan Morrison

Many studies have been conducted on nest site selection of Red-Tailed Hawks in suburban environments, but few have looked at nesting habitats in urbanized environments. This study looks at the nest site selections of Red-Tailed Hawks in the urbanized area in and around the city of Hartford, CT. Although most nests were found in coniferous and deciduous trees, nests also were found on structures such as billboards and a tall building. In an attempt to understand nest-site selection of the hawks in this environment several aspects of the nest site were described; nest tree species (or structure), nest tree (or structure) height, nest height, canopy cover, nest tree diameter, direction of nest access, and surrounding microenvironment including shrub and ground cover. We evaluated selection of nest tree by comparing the height and diameter of the nest tree with the height and diameter of surrounding trees within the nest stand. Distance between one nest and a neighboring nest is also thought to have a strong influence on which trees are used for nesting, most likely due to competition for resources between the neighboring hawks. In light of this, GIS software was used in order to construct home range contours for a number of Red-Tail Hawks in the urban environment.

58.

MAGNETIC PROPERTIES AS AN INDICATOR OF ALEWIFE POPULATION CHANGE

Michael Oleskewicz ‘13
Faculty Sponsors: Christoph Geiss, David Post, Derek West (Yale University)

Alewives are anadromous fish that live primarily in the ocean and migrate inland to breed in fresh water. Over the past few decades, alewife populations have been declining in Connecticut, and Bride Lake is one of the few sites in the state where they can still be found in relatively large numbers. In collaboration with Yale University, this study characterizes the magnetic properties of Bride Lake sediments. We would like to know whether changes in alewife population size (as estimated from variation in nitrogen isotopic ratios) have had a geochemical effect on the lake environment. We measured several magnetic properties to characterize the magnetic component of the sediment. Variations in magnetic susceptibility (κ) were used to determine the relative depths of five partially overlapping sediment cores. Magnetic remanence parameters (ARM and IRM) were used to characterize the ferrimagnetic mineral component of the core. κ, ARM and IRM all show higher values for the core top and lower values for the remainder of the core. ARM – ratios (ARM/IRM) suggest that the magnetic minerals in older sediment are mostly fine-grained. S-ratios indicate variations in magnetic mineralogy. Changes in S-ratios display a correlation between sediment magnetic properties and the magnitude of Alewife runs (shown by variations in $\delta^{15}N$). Summer research will explore the nature of this correlation and provide more insight into the history of alewife populations in prehistoric times as well as the processes that link Alewives to sediment magnetic properties in CT lakes.

59.

DON’T DRINK THE WATER: AN ANALYSIS OF STORM WATER FROM TRINITY COLLEGE PARKING LOTS

Kate Pool ‘12
Faculty Sponsor: Jonathan Gourley

Urban runoff, which includes water from storm drains, is considered a non-point source, one that is not typically measured or controlled. Unlike the water in sanitary sewer systems, which is treated and then released into bodies of water, water from storm drains is discharged directly without treatment. Water flowing into storm drains has the potential to be extremely polluted and can contain gasoline, fertilizers, pesticides, motor oil, and heavy metals as well as suspended sediment. Urban runoff can have detrimental effects on bodies of water such as eutrophication and reduced biotic richness. Two parking lots at Trinity College, McCook and Hansen, were chosen for this study. McCook contains one storm drain and Hansen contains two storm drains from which samples were collected. Both were faculty parking lots in which cars were parked short term. Samples were collected from February to March during times of snow melt and rain. This study was focused on analyzing the metals and salts that Trinity College parking lots contribute to urban runoff. Samples were analyzed using an ICP-OES. The phenomenon of first flush, the initial surface runoff after an extended period of no precipitation, was found to have occurred. The first flush contains high concentrations of pollutants. The first flush sample collected from the lower Hansen drain contained high concentrations of metals and salts relative to all other samples analyzed. For example, on February 17, the snowmelt flowing into the lower Hansen drain was found to contain 5780 parts per million of sodium.

60.

APPLYING GIS TECHNOLOGY TO BIRD SIGHTINGS IN THE GREAT MEADOWS REGION

Jonathan T. Quinn ‘10
Faculty Sponsor: Jonathan Gourley

GIS is a strategic tool to reproduce data in a visual manner. This idea was applied to bird watching data from the Great Meadows region located along the Connecticut River. Bird sighting data was gathered by bird watchers and uploaded to the Avian Knowledge Network server. That data was acquired and displayed on a map of the Great Meadows region. The resulting map will be used with ArcGIS 9.3 to spatially and temporally show the importance of this region and its surroundings on bird populations. This data shows how heavily birds use certain areas of the region, as well as which times of the year they are most prominent. The map will also provide information on how the use of the area has changed over time.

61.

APPARENT SURVIVAL OF EIGHT BIRD SPECIES AT TWO SITES IN NORTHEASTERN CONNECTICUT

Nathan Sell ‘10
Faculty Sponsors: Joan Morrison, Carol Millard (St. Joseph’s College)

We used nine years of live recapture data (2001-2009) to estimate apparent survival for eight bird species in Connecticut. Site, sex, and winter severity were investigated as to their influence on survival. Data were collected at two Monitoring Avian Productivity and Survivorship (MAPS) stations. At the Trinity College Field Station, TCFS, the forest has regrown in the past 60-80 years, sincefarming ended there. The second site has regrown over the past 40 years, and is maintained as an early successional landscape (Connecticut Audubon Society at Pomfret, CASP). Survival estimates were made using Cormack-Jolly-Seber models and Program MARK. Higher apparent survival for the Black-Capped Chickadee (BCCH), Ovenbird (OVEN), and Veery (VEER) were recorded at TCFS. These species require continuous forest to successfully breed, and fared better in the interior forest of TCFS. Common Yellowthroats (COYE) and Gray Catbirds (GRCA) had higher apparent survival at CASP. These species require shrubland to breed successfully perhaps why early successional habitat of CASP fostered higher survival. The Downy Woodpecker (DOWO), Tufted Titmouse (TUTI) and Wood Thrush (WOTH) showed no difference in survival between the sites. The captured population of DOWO was young and likely represents a transient population. Low survival of WOTH at both sites is representative of their declining populations throughout their range since the late 1970’s. Male BCCH had higher survival at TCFS, and female OVEN and VEER had higher survival at TCFS. At CASP, male COYE, GRCA and WOTH exhibited higher survival, whereas female OVEN and VEER had higher survival at this site. Male birds tend to have higher survival due to their increased mobility and territorial defense behaviors, and nesting by females requires a lot of energy, influencing survival. BCCH has a higher survival estimate in the more “severe” winters than in “normal winters,” possibly because they are winter specialists.

62.

PHARMACEUTICAL DRUGS' EFFECTS ON *DAPHNIA MAGNA*

Pooja Shakya ‘11, Richard Kim ‘13
Faculty Sponsor: Alison J. Draper

Human pharmaceuticals are not effectively removed in wastewater treatment and end up in aquatic environments. There is increasing concern about the exposure of aquatic organisms to these chemicals because over time, aquatic organisms are exposed to a complex mixture of pharmaceuticals. In this study, *Daphnia magna* were used to examine the effects of commonly-used pharmaceuticals on aquatic organisms. Six human pharmaceuticals were chosen for this study: all are water-soluble and thus, complications of solvent effects are eliminated, and all are commonly used in the U.S. and have been detected in the aquatic environment. *Daphnia magna* were exposed to a range of concentrations of cetrizine, metformin, metoprolol, propranolol, ranitidine, and terbualine along with negative controls for 48 hours at room temperature and the surviving *Daphnia magna* were counted. The LC_{50} (50% survival) and NOAEL (highest concentration that causes no toxicity) concentrations of each pharmaceutical were estimated. In a subsequent experiment, *Daphnia* were exposed to a mixture of metformin, metoprolol, propranolol, and terbualine and there was evidence of both antagonism (one ameliorates the toxicity of another) and synergism (one worsens the toxicity of another). These results are important because the interaction of toxic chemicals in the environment is not well understood. Additionally, frequent use of pharmaceuticals by consumers coupled with imperfect methods of wastewater treatment will likely increase pharmaceutical residue in the aquatic environment. Future work will be directed toward elucidating the mechanisms of the observed toxicity and drug-drug interactions.

63.

FLUID FLOW AND MUD VOLCANISM IN THE ACTIVE CHISHAN FAULT ZONE, TAIWAN

Stephen Sobolewski ‘10
Faculty Sponsor: Jonathan Gourley

During a 2008 investigation in the footwall of the active Chishan thrust fault in southern Taiwan, foliated, dark, planar bands were mapped as cross-cutting Plio-Pleistocene mudstones of the Gutingkeng Formation. It was originally hypothesized that these bands were localized shear zones associated with the Chishan Fault, but normal sense-of-shear indicators observed in this thrust fault zone proved problematic. We developed a new hypothesis that the dark bands are inactive fluid migration pathways from now-eroded mud volcanoes in the over-pressurized footwall of the Chishan Fault. Dark band and wall rock mudstone samples, along with sediment from several currently active mud volcanoes along the Chishan Fault, were gathered in March 2009 and tested for mineralogical and chemical variations. You et al. (2004) recorded a high concentration of boron in Chishan Fault mud volcano fluids, and preliminary results of our rock and sediment samples using Inductively Coupled Plasma Optical Emissions Spectroscopy (ICP-OES) show elevated concentrations of boron in the active mud volcano sediments and dark band mudstones versus the unaltered mudstones, indicating the role of mud volcano fluid flow. Since fluid pathways will often coincide with permeable shear zones, the overprinting of sheared rock fabrics and fluid/mud transport is likely in these localized structures.

64.
FROG HOLLOW REVITALIZATION
Brenna Spingler ‘10
Faculty Sponsors: Jonathan Gourley, David Corrigan

This semester I’ve been working with the Neighborhood Revitalization Committee and the Southside Neighborhood Institution Association to do research on housing in Hartford. Houses marked as problem houses were investigated by reviewing land grants and liens located at city hall in Hartford. These houses were often investigated at the direct level by visiting the locations and monitoring access to the building. These damaged houses provide unsafe living environments for Hartford and also facilitate drug trade. To improve the area of Frog Hollow, which neighbors Trinity College to the West, we must first look to the residential area and its citizens. By mapping the Frog Hollow area, I am able to pinpoint houses that are labeled as problems and determine if there is any relevance to location and demographics.

65.
TOXIC TRACE METAL CONTAMINATION IN SEDIMENT OF THE PARK RIVER WATERSHED
Shuyang Zhu ‘13
Faculty Sponsor: Jonathan Gourley

Due to discharges of toxic metals from metal finishing industries nearby, metal concentrations within the south branch of the Park River appeared to be significantly higher than those within the north branch. The primary goal of this project is to quantify spatial and temporal variations in metal concentrations within the south branch. Previously collected samples were tested and to see if the results could be reproduced. At the selected sites, sediment samples were collected and stored in plastic bottles. In the lab, after drying all samples, 0.5g of each sample was measured into digitubes, into each of which 10 mL of 0.6N hydrochloric acid solution was added. Samples were then shaken by the oscillator for two hours and filtered into test tubes before finally being analyzed in ICP-OES. Concentrations of nine toxic trace metals including lead, chromium, and manganese were measured. It generally suggested that the results of previous analyses were duplicated but due to different times and places between two comparative samples, some of the data showed large variations. For instance, with the exactly same sample-collecting day, Cu concentration at the east bank of pbA001 was 51.76 ppm but it became 163.3 ppm at the west bank. In addition, since shaking enables more metals to dissolve in the acid, most of the new data were somewhat higher than before. At the site of tbA001, previous and updated Pb concentrations were 11.292 ppm and 12.054 ppm respectively, and the t-test indicated that they were significantly different ($p=0.005$). Comparisons between current and past toxic metal concentrations will be further analyzed to determine how concentrations vary throughout time and space, and whether toxic trace metals will stay within the sediment of the Park River or flow into the Connecticut River, thereby causing the dispersion of pollution downstream.

HEALTH FELLOWS

66.
THE IMPACT OF AGE AND TYPE OF SURGERY ON LONG-TERM NEUROPSYCHOLOGICAL OUTCOMES IN UNILATERAL CRANIOSYNOSTOSIS
Max Alderman ‘11
Faculty Sponsors: Sarah Raskin, Maryann McGuire, RN, MPH, Paul Kanev MD, Connecticut Children’s Medical Center

Approximately 35-50% of children with nonsyndromic, unilateral craniosynostosis have neurocognitive disabilities, a strikingly higher prevalence compared to the general population. The effect of either the type of cranial reconstructive surgery or the age of patients at the time of surgery on such long-term neuropsychological outcomes remains unclear. Given the paucity of scientific evidence in regards to the age and type of surgery for patients with craniosynostosis, considerable debate exists over the optimal treatment options for this craniofacial disorder. It is hypothesized that children with unilateral craniosynostosis who are operated on under 6 months of age and undergo the more comprehensive whole-vault cranioplasty will have a lower incidence of long-term neuropsychological defecits requiring less special support (teachers, small class size, special education, etc.). Individuals who were treated for nonsyndromic, unilateral craniosynostosis without complications and are between the ages of 6 and 16 were administered a series of tests that evaluated their cognitive abilities. The results suggested a trend that infants who receive a strip craniectomy and undergo surgical intervention before the age of 6 months will yield, on average, better long-term neuropsychological outcomes. More study subjects are needed to achieve a conclusion with statistical significance.

67.
ANALYSIS OF FAMILY INFORMANTS’ PERCEPTION OF HOARDERS INSIGHT
Claire Doucette ‘10
Faculty Sponsors: Sarah Raskin, Maryann McGuire, RN, MPH, David F. Tolin, Ph.D., ABPP; Gail S. Steketee, Ph.D.; & Randy O. Frost, Ph.D., Institute of Living

Research suggests that individuals with compulsive hoarding have a high failure rate and poor insight into the severity of their problem, both of which tend to contribute to futile attempts at treatment. Research on compulsive hoarding has been negatively affected by the lack of adequate scales to measure the behavior and thought patterns. This study examined whether individuals who hoard underestimate the severity of their problem according to non-hoarding family members, and whether this level of insight is related to the severity of their hoarding. We hypothesized that individuals who hoard would show significantly reduced insight on a standardized measure of insight, which would be a predictor of severity of hoarding behaviors. Data was collected from 492 individuals who identified themselves as family or friends informants of hoarders. Specifically, insight into hoarding behaviors was assessed using an adaptation of item 11 from the Yale-Brown Assessment Scale (Y-BOCS), while severity of symptoms was measured using the Hoarder Rating Scale Self-Report (HRS-SR) which addressed clutter, difficulty discarding, acquisition, emotional distress, and impairment. Results showed that majority of family/friend informants rated the hoarder as having poor insight in addition to

severe hoarding symptoms. Furthermore, a correlation was found between poor insight and severity of the hoarding symptoms. Future work is being done to include a more precise evaluation of these perceptions. This study includes pairs of individuals, in which discrepancy scores are created through both the family/friend informants and the hoarders.

68.

PARTNERING WITH FAMILIES TO ENHANCE DEVELOPMENTAL SCREENING IN THE MEDICAL HOME

George Duryea '11
Faculty Sponsors: Sarah Raskin, Maryann McGuire RN, MPH, Catherine Wiley MD,
Connecticut Children's Medical Center.

Current research indicates that clinical efforts detect only about 20 to 30 percent of children with developmental issues before they begin school. This study at the Primary Care Center (PCC) at the Connecticut Children's Medical Center (CCMC) in Hartford, CT evaluated an attempt to improve the developmental screening process by bridging the gap between physicians and families. This project involved recruiting parents of pediatric patients to become members of a family advisory council who provided feedback to the clinical staff about their experiences with the developmental screening process.

This study aimed to assess the success of the Family Advisory Council within 18 months of its establishment. Patient records of children from 8 to 35 months of age who visited the PCC for a well child examination in 2009 were compared to those from 2007, before the council's formation. Specifically, the study examined the percentage of patients screened with the Parental Evaluation of Developmental Status questionnaire (PEDS), the percentage of these that screened positive for concern, and the percentage of patients who were subsequently referred to developmental intervention programs.

Results indicated a 4% increase in PEDS screening between pre- and post-intervention cohorts, although the difference was not significant. Further analysis showed that a significant increase of likelihood to screen occurred specifically among nurse practitioners. Their rate of screening increased by 10.2% ($p=0.01$). There was only a 0.7% increase in proportion of screens which were positive for concern between cohorts which was not significant. Further analysis of this variable by language of patients' parents indicated that those families who spoke both English and Spanish, 11.9% more reported positive screens post-intervention than pre-intervention, although the difference was not significant. The proportion of positive screens that resulted in a physician referral increased by only 7.8%, which was not significant.

The establishment of the family advisory council did have some positive impact on the developmental screening process, though not as much as was expected. One possible explanation is that 18 months is too short a time period for any lasting changes to occur. Also, further research needs to be conducted on the effect of different demographics on the effectiveness of the council.

69.

UNDER THE KNIFE WITH A MECKEL'S DIVERTICULUM: THE SURGICAL MANAGEMENT OF THE MOST COMMON CONGENITAL ANOMALY OF THE DIGESTIVE TRACT

James Fisher '12
Faculty Sponsors: Sarah Raskin, MaryAnn McGuire, RN, MPH, Brendan Campbell, MD,
Connecticut Children's Medical Center

Meckel's diverticulum, an out-pocketing of the last section of the lower intestines caused by an incomplete obliteration of the vitelline duct during the 8th week of gestation, can cause serious gastro-intestinal complications including abdominal pain, nausea, vomiting, abdominal distention, and rectal bleeding. A diverticulectomy or a segmental small bowel resection can be performed in one of two ways to remove the Meckel's diverticulum: through open surgery or laparoscopic surgery. To determine which of these surgical approaches yields better results post-operatively, data was taken from the Pediatric Health Information System Database (PHIS) which included general patient information along with bills charged and length of stay for each patient from 45 different hospitals around the country. Data was organized into categories of simple cases (Meckel's diverticulum as the primary diagnosis) versus complex cases (Incidental findings of Meckel's diverticulum) and open surgery versus laparoscopic surgery. 852 cases were analyzed for this criteria. In simple cases, the length of stay was four days longer for open surgery (9.33 days (SD 16.5)) compared to laparoscopic surgery (5.17 days) ($p=0.005$). Charges were almost doubled in open surgery ($61,630) compared to laparoscopic surgery ($35,806) ($p=0.021$). Complex cases yielded similar results but, it was difficult to decide if the results gave a conclusion in terms of lower cost and short length of stay for the surgery on the Meckel's diverticulum or for the surgery of the previous diagnoses. When treating a Meckel's diverticulum, in this study, having laparoscopic surgery benefited the patients.

70.

CLINICAL PRESENTATION OF CELIAC DISEASE IN 2010

Navneet Kaur '12
Faculty Sponsors: Sarah Raskin, Maryann McGuire, RN, MPH, Francisco Sylvester MD,
Connecticut Children's Medical Center

The purpose of this retrospective study was to determine the clinical symptoms that prompted screening for celiac disease by referring providers to an academic pediatric gastroenterology practice in Hartford, CT. It was proposed that children with celiac disease are referred to pediatric gastroenterologists for the classical symptoms of indigestion, bloating, diarrhea, anemia, and growth failure.

The study was conducted via review of 185 medical charts, obtained from Hartford Hospital Pathology database and CCMC billing database (IDX), of children under the age of 18 years diagnosed with celiac disease at Connecticut Children's Medical Center from 2002-2010. The data was used to analyze the frequency of the classical celiac disease symptoms of indigestion, bloating, diarrhea, anemia, and growth failure via histograms. To compare the height, weight, and BMI across different ages, the values were converted to z-scores; the means were then compared via t-tests.

The results showed that the most common clinical symptoms associated with celiac disease are recurrent abdominal pain, growth delay/short stature including weight loss, diarrhea, constipation, and vomiting/nausea. When comparing the z-scores of height and weight over age and BMI at time of diagnosis and follow-up, there was an increase in all of the variables. The results showed us that there was improvement in the height, weight, and BMI of patients with celiac disease after they were diagnosed with celiac disease and put on the gluten free diet.

Overall, the results correlate with our hypothesis that most children with celiac disease are in fact referred for the classical symptoms. The results from the study are essential for providing clinical symptoms present in most celiac disease patients and can be used as an enhanced guideline to help detect patients that go undiagnosed.

71.

ACHIEVEMENT OF OXYGEN SATURATION GOALS IN PREMATURE INFANTS BEFORE AND AFTER A NICU QUALITY IMPROVEMENT MEASURE

Samantha Sinche '10
Faculty Sponsors: Sarah Raskin, Maryann McGuire, RN, MPH, James Hagadorn, MD/MPH, Connecticut Children's Medical Center

BACKGROUND: Retinopathy of prematurity (ROP), characterized by abnormal eye development in premature infants, is associated with blood oxygen saturation fluctuations and hyperoxemia. A target oxygen saturation range of 85-93% has been associated with improved ROP outcomes, however the percent of target range achievement (TRA) required to decrease ROP is unknown.
OBJECTIVE: To compare TRA and hyperoxemic time in infants <1500 grams birth weight (very low birth weight, VLBW) before and after the neonatal ICU (NICU) quality improvement intervention, "Oxygen With Love" (OWL).
METHODS: Continuous oxygen saturation data were obtained for VLBW infants <36 weeks postmenstrual age (PMA) before and after OWL, and organized into monitoring periods by nurse work shifts. For each monitored shift of six hours, TRA and hyperoxemic time were determined. Independent samples t-tests and Mann-Whitney U tests were used to compare TRA and hyperoxemic time before and after OWL overall and in important subgroups.
RESULTS: Data were collected for 14 babies before and 23 different babies after OWL. TRA increased for each postmenstrual and chronologic age group, and all nurse to patient ratios. All respiratory support modes increased TRA except the high frequency oscillating ventilator, which had no significant change. For respiratory support mode and both age variables, there was a significant decrease in time spent in hyperoxemic saturations after OWL. Hyperoxemic saturation times decreased significantly when nurses cared for 2 or 3 babies, but increased when nurses cared for one baby. Correct alarm settings were significantly associated with an increase in TRA and a decrease in hyperoxemic time.

MATHEMATICS

72.
RUNNING IN THE MONEY
Remi Evans ‘11
Faculty Sponsor: Philip Brown Jr.

According to the daily Racing Forum, the probability is about 0.67 that the favorite in a horse race will finish in the money. In the next five races, what is the probability that the favorite finishes in the money at least twice? Suppose for each race, if the favorite is in the money, Tom will earn $100; otherwise, he will earn nothing. Find the average of Tom’s total earning for the next five races using Monte Carlo Simulation.

73.
COLLEGE ADMISSIONS USING LINEAR PROGRAMMING
Amanda Poole ‘10, Benjamin Dawson ‘11
Faculty Sponsor: Philip Brown Jr.

We will solve the following program with linear programming:

The admissions director of a small college is faced with the task of admitting a freshman class of at most 500 students. They typical male applicant can be expected to have a combined SAT score of 1,200, contribute $8,000 to the college as an alumnus, cause $200 damage to dormitory buildings and classrooms, and cost $2,400 per year to teach. The typical female applicant can be expected to have combined SAT scores of 1300, contribute $3,000 as an alumna and cause $100, in damages. Because of different courses selections, she can be educated at a cost of $2,000 per year.

The college president demands a freshman class that will eventually contribute at least $2.5 million to the college, the faculty insists that the average SAT score be 1250 or higher, and the maintenance department can handle up to $85,000 in damages. The college treasurer wants to educate the class at the lowest possible cost.

NEUROSCIENCE

74.
MEASURED OUTCOMES OF NEUROSURGERIES DURING THE IRAQ WAR
Nicole Albino ‘10
Faculty Sponsors: Sarah Raskin, Jonathan Martin MD, Connecticut Children’s Medical Center

There have been many studies of the treatment of penetrating head injuries. Advancements in neuroimaging have allowed for a better understanding of this treatment. In the Iraq war, the use of the computerized tomography (CT) scan in the field allowed for the collection of radiographic and neurologic data. This study will look at how the use of this radiographic data has improved the ability to predict the postoperative status and brain function of the patients operated upon during the Iraq war. Data collected included patient demographics, radiographic data, neurologic

examination findings, and neurologic outcome score judged by the Glasgow Outcome Scale (GOS). ANOVA results showed cisterns patent, midline shift, interventricular hemorrhage, intraperenchmal hemorrhage, bihemispheric, multilobar, compartment, volume of intercranial hemorrhage (ICH), mode of injury and Marshall Score to have significant differences in the mean Glasgow Outcome Score (GOS) between groups. The mean GOS for extraaxial hemorrhage between the groups were not shown to be statistically different. Regression analysis showed that the variables: Interventricular hemorrhage, intraparenchymal hemorrhage, multilobar injury, patency of cisterns, and midline shift were all shown to have their own statistically significant effect on GOS. Now that we have identified variables as good predictors of outcome, the next step is to standardize the use of these variables for assessment of brain trauma in future conflicts. This information could be valuable for triaging, an essential component to treating patients in the field of conflict.

75.

THE EVOLUTION OF THERMAL HYPOALGESIA RELATED TO THE KETOGENIC DIET

Josh Altschuler ‘13
Faculty Sponsor: Susan Masino

The ketogenic diet, which is high in fat content and low in carbohydrates, is being widely tested as a means to treat neurological disorders. The diet forces the body to use an alternate cellular metabolism, known as ketolytic metabolism, which uses ketone bodies instead of glucose to generate ATP. This means of cellular metabolism is hypothesized to increase adenosine levels in the brain, which inhibits neuronal activity signaling and increases neuroprotection as a result. It has been used as a treatment for epilepsy, and has been shown to reduce pain. In this study male juvenile rats were divided into two groups: those on the ketogenic diet, and those on the control diet. Each group was fed its respective diet for one week, and placed on a warm plate. Licking of the hind paw was observed as the first sign of discomfort on the warm plate. The results showed that after one week of feeding, there was a statistically significant difference in latency of paw licking between rats on the control diet and the ketogenic diet. Specifically, rats on the ketogenic diet showed an increased latency, and thus an increased pain threshold, compared to those in the control group. If further experimentation continues to show positive results such as those from the above experiment, the ketogenic diet has the potential to serve as a great alternative treatment to drugs for pain management and other neurological conditions alike.

76.

BEAR PERCEPTIONS

Ellen Anderson ‘11, Katherine Apfelbaum ‘11, Benjamin Koren ‘11
Faculty Sponsor: Dan Lloyd

The Mcgurk Effect observes a link between visual and sound perception. In this experiment, we will examine the relationship between visual perception and taste. We will investigate whether subjects’ taste experiences are affected by color stimuli when eating gummy bears. In a comparison between a blind tasting and a tasting in which the subject is in a bright, monochromatic room, we anticipate that the subjects will be more likely to taste a flavor that is associated with the color of the room. Before the tasting in the colorful room, the subject will write down three observations about the room. This will trigger a stronger visual awareness, allowing for a higher likelihood of positive interference in taste. We hypothesize that seeing a color will influence the subject to anticipate and taste the corresponding flavor more frequently.

77.
INATTENTIONAL BLINDNESS PHENOMENON
Elsie Arce ‘12, Leo Liyeung ‘13, Melike Sunay ‘10
Faculty Sponsor: Dan Lloyd

Meticulous attention to detail can often be a handy tool in everyday life. Famous success stories, such as C.S.I and Sherlock Holmes, imply the close relationship between cognition and recognition. However, one may be more oblivious to one’s environment as one may think. This phenomenon is characterized by the failure to recognize a big change when two scenes are shown in an interrupted succession. Our hypothesis is that most subjects have largely the same ability to recognize change in general, but individual subjects may pay more specific attention to specific details for various reasons. Around fifteen subjects, between the ages of 18 and 22, have participated in the study. They were required to view a color changing card trick video that consisted of a card trick and changes in color of four other items. In order to test the subjects’ awareness of the changes other than the color of the cards, subjects were asked whether or not they have noticed anything different in the video. The second half of the video showed the changes of these items. The subjects’ reactions were recorded before and after being informed of these changes. Out of 15 subjects, 13 of them reported not seeing any of the other four color changes. Subjects’ reactions were as expected; surprised and in denial. Most of these subjects asked to view the video once more to specifically watch for these changes to be further convinced. One subject was aware of one color change, which she reported it as her favorite color. These results show that humans have a limited capacity for attention which limits the amount of information processed at any particular time.

78.
MRI SCANS AND YOUR BRAIN
Ashley Ardinger ‘12
Faculty Sponsor: Dan Lloyd

This poster project will use two separate MRI scans, one showing scans of a clean and healthy brain, while the other shows one that has a tumor in it. I believe that at first glance a person will have the same feelings towards the scans because they will not have any knowledge that one scan is significantly different. I would like to ask between 10 and 15 people to tell me what it is they think they are looking at and how they experience a set of two different scans. An example for an answer for the first set may be indifferent, interested, confused, etc. Then, I will tell them that the second set of scans is from a 4 year old patient who has a brain tumor. I will show them where the tumor is located in the brain and tell them a story where the tumor cannot be removed because of where it has developed. I will tell the participant the life long effects of the tumor on the patient which include partial blindness, learning disabilities, years of chemotherapy, etc., and then ask the participant to tell me how they experience this set of scans for the second time. If my hypothesis is correct, the participant will feel an increased amount of empathy in their second experience with the scans than the first. The noema and noesis, according to Husserl, will change because the way the participant perceives the scans will change. The poster will include all reactions of the participants, along with background information about the hypothesis from Husserl and others, and both sets of MRI scans so viewers can also experience the phenomenology involved when the story of something you have experienced is changed.

79.

ASSESSING THE EFFECT OF THE EXPECTATION OF POLYMORPHISM ON THE PERCEIVED INITIAL ORIENTATION OF MULTISTABLE FIGURES

Alexandre Fuad Bibi II ‘10
Faculty Sponsor: Dan Lloyd

Phenomenologists have often concerned themselves with suspending judgment of the external world and allowing phenomena to vary freely in order to discover the invariants that compose their essence. Ihde (1977) asserts that once the noetic context, or means of perception, is allowed to vary freely the numerous possible forms of a phenomenon, termed polymorphism, can be accessed. The Necker Cube is a well-known multistable figure. As a subject stares at the cube, the orientation of the figure changes spontaneously. The ambiguity of the subject’s perception of the cube results from the lack of depth cues within the figure; the brain is therefore forced to resolve the figures’ orientation independently. Psychologists have focused on the implications of the spontaneous reversal of the Necker Cube and other multistable figures for the organization of the visual system; however, the spontaneous reversal of the figure between its two prototypical orientations is largely mediated by the knowledge or expectation that the figure is in fact a cube (Ihde 1977). According to Ihde, when shown a multistable figure, a subject who has consolidated the polymorphic possibilities of the figure may immediately experience any one of its possible orientations, not merely the prototypical ones, upon the initial presentation. In this experiment, a series of Necker Cubes will be shown in a number of different possible orientations; each orientation will be highlighted with a fixed visual cue. Subjects will be allowed to study these various orientations for five minutes. Subsequently, the figure will be presented without visual cues and the subject will be asked to report which orientation was perceived first. If the expectation of polymorphism does indeed allow any of the variations of the Necker Cube to be perceived first, the distribution of responses will be random.

80.

NEURAL NETWORK ABNORMALITIES IN AD/HD: A STUDY USING DYNAMIC CAUSAL MODELING

Ritika Chandra ‘10
Faculty Sponsors: Susan Masino, Michael Stevens, Institute of Living

Attention Deficit Hyperactivity Disorder (AD/HD), characterized by impulsiveness, hyperactivity and inattentiveness, is one of the most common childhood mental disorders. Previous fMRI and other functional neuroimaging studies have indicated that AD/HD likely arises from dysfunction involving the prefrontal cortex, striatum and anterior cingulate cortex – areas that directly impact executive functioning. One important domain of impaired executive functioning in AD/HD is response inhibition, commonly measured by laboratory Go/No Go tasks. In concurrent research in our laboratory, a cingulo-opercular circuit has been established to play a key role in mediating engagement of brain regions needed for response inhibition. This neural network might be abnormally engaged in persons with AD/HD, but to date no study has examined the effective connectivity among the brain regions that comprise this circuit. Effective connectivity can be quantified using fMRI as the influence that brain regions exert on one another. The objectives of this study were (1) to study ‘effective connectivity’ of the cingulo-opercular circuit using Dynamic Causal Modeling (DCM) of fMRI time series data collected during performance of the Go/No Go task, and (2) to test for abnormal network interactions among the nodes of this network in adolescents diagnosed with AD/HD. Fifty AD/HD and fifty

demographically-matched non-AD/HD healthy control participants underwent fMRI while performing the Go/No Go task. In healthy controls, DCM results showed that response inhibition primarily involves the left hemisphere. Both AD/HD and healthy control participants engaged a functional neural network that is comparable to that observed previously in healthy controls when performing the Go/No-Go task. Although the AD/HD group and healthy controls had similar intrinsic connections among network nodes, AD/HD participants generally did not have the same pattern of connectivity as controls during response inhibition.

81.

DIFFERENCES IN INCIDENCE AND SEVERITY OF CEREBRAL VASOSPASM FOLLOWING MICROSURGICAL CLIPPING AND ENDOVASCULAR COILING OF RUPTURED INTRACRANIAL ANERYSMS

Shana Conroy ‘10
Faculty Sponsor: Sarah Raskin, Inam Kureshi, M.D., Director of Neurosurgery, Hartford Hospital

Previous studies have been inconclusive about whether the incidence and severity of vasospasm after aneurysmal subarachnoid hemorrhage is lower in patients who undergo microsurgical clipping or endovascular coiling. This study further examines the incidence and severity of cerebral vasospasm following these two treatment modalities at Hartford Hospital. This retrospective cohort study reviewed 146 patients at Hartford Hospital with the diagnosis of aneurysmal subarachnoid hemorrhage -- 101 patients who underwent endovascular coiling and 45 patients who underwent microsurgical clipping. Both groups were a similar cohort in terms of age, Hunt/Hess grade, Fisher Grade, and aneurysm location. To assess the incidence of vasospasm, we compared the percentage of vasospasm in both groups of patients. To assess risk factors in both of the groups, we performed analysis adjusting for age, Hunt and Hess Grade, Fisher Grade and aneurysm location for each treatment modality. We studied the length of stay of each of the patients, need for angioplasty and the GOS score to determine the severity of the vasospasm. There was found to be no significant difference in the incidence of vasospasm in the patients who underwent endovascular coiling versus microsurgical clipping. The incidence of vasospasm could only be predicted in patients who underwent endovascular coiling --- patients who were older than fifty, had a higher Hunt and Hess Grade, had a higher Fisher Grade and had an aneurysm located in the posterior circulation were significant risk factors of vasospasm. There was no difference in the length of stay or incidence of angioplasty between the two groups, but the endovascular coiling group had a higher GOS score at discharge. Since the difference in the incidence of vasospasm was not statistically different for these two groups, the treatment modality should not be used as a protective measure against vasospasm at Hartford Hospital.

82.

THE EFFECT OF NEONATAL STRESS IN RATS ON LONG-TERM NEUROPLASTICITY OF AMYGDALO-HIPPOCAMPAL SYNAPSES

Ela Cross ‘13
Faculty Sponsor: Harry Blaise

The basolateral amygdala, a region of the brain associated with stress and emotions, and the dentate gyrus of the hippocampus, associated with learning and memory, have been shown to be connected creating a link between brain activity and stressful events. To investigate this link, the effect of acute stress on the hippocampus and amygdala in neonatal rats were studied through measurements of long-term potentiation differences in stressed and non-stressed rats. Long-term

potentiation is the increase in signal strength emitted from a neuron and has been shown to play an important role in the formation of memories and associations. The experimental group of rats was isolated from their mothers and other rats for one hour daily from days 2 to 9 of life, while the control group was not isolated or handled by humans. Once both groups of rats matured to adulthood (70-120 days old), stimulating electrodes were implanted into the basolateral amygdala and recording electrodes were implanted into the dentate gyrus in surgery. One week after the surgery, long-term potentiation was induced in the dentate gyrus through tetanization and measured. A comparison between the strength of the long-term potentiation in the isolated rats with that of the control rats could provide support for whether neonatal stress has an enduring effect on neuroplasticity. Further research and data collection is needed for any conclusions to be drawn at this time.

83.

EFFECTS OF BINGE DRINKING PATTERNS ON COGNITIVE FUNCTIONS IN COLLEGE STUDENTS

Damien DeCuir ‘10
Faculty Sponsors: Sarah Raskin, M. Ginley, H. Tennen, C. Austad, C.R. Fallahi, R.M. Wood, D. Glahn, G. Pearlson, Institute of Living

Binge drinking among college students has been associated with cognitive impairment and changes in brain function, particularly impairment related to executive and spatial working memory functions. This study administered measures of impulsivity, cognition, mood, and drinking patterns to 342 college students. Binge drinking was defined as a pattern of drinking that brings estimated BAC to 0.08 gram-percent or above. All students were 18 to 21 years of age and in their first year of college; 107 women and 235 men. Exclusion criteria: brain injury with loss of consciousness > 24 hrs., concussion with LOC within 30 days, other neurological disorder, or DSM –IV-TR Axis I psychotic disorders (Clinical interview-MINI). Measures administered: MoodEPI, State-Trait Anxiety test, the Balloon Analogue Risk Task (BART), Groton Maze Learning Test, one-back and two-back tests. Groups: never drank; drink but never binge; binged but not in last 30 days; and binged in last 30 days. Consistent with the literature, females were significantly more likely to binge. Females demonstrated significantly more impulsivity on the BART. When comparing binge categories, those who drink but do not binge demonstrated the lowest impulsivity on the BART. On both the one-back and two-back, those who have ever binged showed significantly poorer performance than either drinkers who never binge or nondrinkers. On Groton Mazes those who binged in the last 30 days made significantly more errors than any other group. These data lend support to the notion that binge drinking is particularly detrimental to cognitive functions, particularly executive functions and spatial learning.

84.

THE EFFECT OF PERSONAL THREAT ON MORAL JUDGEMENTS

Kelsey Doran ‘11, Perry Laberis ‘10
Faculty Sponsor: Dan Lloyd

This study seeks to examine the manner in which situational factors interact with cognitive variables to influence moral judgments. The premise behind this experiment is that an individual will be able to make moral judgments much more readily in neutral situations than in ones that bear weightier consequences on the individual. This logic is based on the findings of Sobesky (1983), where it was found that when negative consequences for the participant were severe, he

or she was less certain of whether or not to help another person, whereas when the consequences for the other were severe, the actor was more certain of helping. By this logic, we predict that if a situation places an individual in a dilemma that threatens his or her positive self-concept, the individual will have greater difficulty in arriving at an appropriate course of action. In order to test this theory, we will present participants with four cases of varying degrees of personal threat and record how long it takes them to come up with a response. For example, asking a person if it is ethical to sacrifice one human life by physically putting them into danger in order to save three lives is a difficult question that would presumably provide a large amount of threat to one's self concept. In turn, we believe that this kind of question would take the longest amount of time to come up with an answer. The principle that underlies this experiment is that the longer it takes the participant to come to a conclusion, the more difficult it was for them to answer. We will not only be testing cases of varying degrees of threat, we will also make a cross-gender comparison in order to tell whether or not there is a difference in moral decision making between genders.

85.

EXERCISING CAUTION IN AN ERA OF OPTIMISM: ADDRESSING THE FUTURE ROLE OF STIMULANT DRUGS IN OUR SOCIETY

Stephen English ‘10
Faculty Sponsor: Dan Lloyd

As new cognitive-boosting drugs further limit adverse side effects, a growing number of individuals with ‘normal’ cognitive abilities are questioning the need for prescription regulation. But as experts contend, increasing the availability of medications approved for ADHD (Adderall, Ritalin, etc.) would extend medicine past treatment to a new field of medical enhancement. Such a transition raises ethical issues concerning public safety, social equality, and potential limits of human intervention in nature. Nevertheless, the principle of autonomy dictates that individual decisions cannot be limited unless they inflict harm. Assuming health risks and adverse consequences can be minimized, the potential benefit these drugs bring cannot be ignored, and we must be ready with clear policies to promote public safety and social justice. Although these policies should allow adults access to future cognitive-boosters, measures must be taken to ensure children do not suffer unwarranted medical intervention from overbearing or misinformed parents.

86.

COMPARING THE EFFECT OF PERSONAL RESPONSIBILITY ON ETHICAL DECISION MAKING

Remi Evans ‘11, Sarah Keller ‘11, Rick MacLeod ‘11, Tracey Suter ‘11
Faculty Sponsor: Dan Lloyd

When faced with an ethical decision, one makes a choice by assessing the possible consequences. The brain’s reward system teaches us what is socially and morally acceptable based on the consequences of our decisions. Modeled after the Greene 2001 study, which explored brain responses to personal and impersonal moral dilemmas, our research will study how personal responsibility for an outcome will determine whether an individual acts morally or immorally. We hypothesize that moral responsibility will increase as perceived personal responsibility increases. This will be measured by posing a scenario in which the individual is not personally responsible for the outcome of the situation and then one in which they are personally responsible for the situation.

87.

ANTIOXIDANT BETA CELL PROTECTION

Jackie Gottshall ‘13
Faculty Sponsor: William Church

Insulin-dependent diabetes is caused by the apoptotic cell death of insulin secreting pancreatic β-cells. This is most likely the result of low antioxidant defense systems within the pancreas. It is believed that the pre-treatment of such cells with anti-oxidizing agents can prevent apoptosis. In an effort to explore these effects, insulin-producing rat β-cells (RINm5F cells) were incubated in a solution of RPMI-1640 feeding media with 10% Fetal Bovine Serum (FBS) in an atmosphere of 5% CO_2 at 37°C. The cells were treated with the oxidizing agent uric acid, before being exposed to alloxan, which has been proven to trigger apoptosis. Live and dead cell assays were then conducted on both the treated and control RINm5F cells. The results have not yet been collected. Experiments will continue to be conducted in search of finding an effective method of neuroprotective therapy. Such therapy has infinite potential in both treating and preventing numerous diseases by way of providing cells with an effective defense against naturally occurring toxins within the body.

88.

ANTIPLATELET EFFECT OF TORADOL AND OVERALL COAGULATION FUNCTION IN PEDIATRIC POST-OPERATIVE NEUROSURGERY PATIENTS AS ASSESSED BY THROMOBELASTOGRAPHY

Lea Jancic ‘10
Faculty Sponsors: Sarah Raskin, Phillip Spinella, MD, Connecticut Children’s Medical Center

After surgery, children often require substantial amounts of analgesics to treat their post-operative pain. Opiate drugs like fentanyl and morphine are considered to be the most efficacious form of treatment for this pain. However, opiate use is associated with a wide range of side effects and complications. The large amount of central nervous system side effects can make opiate use particularly challenging in neurosurgical cases, and can also interfere with neurological assessment post-operatively. The NSAID Toradol is an effective alternative, delivering significant pain relief without the side effects associated with opiates. However, there are concerns over the possible anti-platelet effects of Toradol and the risk of increased bleeding in patients. As of now there is no standard in the surgical community regarding the use of Toradol post-operatively. This study was conducted in order to examine at the anti-platelet effect of Toradol in pediatric post-operative neurosurgery patients. Twelve pediatric patients undergoing an intradural neurosurgical procedure at Connecticut Children’s Medical Center were enrolled and received either Toradol or opiates for post-operative pain management. Blood samples were collected before and after the initiation of analgesic treatment. The blood samples were analyzed using thromboelastography and PT/PTT/INR. All post-post operative complications were also recorded. There were no significant differences between the baseline and post-analgesic values for the Toradol group. There were also no bleeding complications associated with Toradol use. Interestingly, the opiate group experienced a decrease in coagulation function post-operatively. This may be due to brain tumor cells releasing the compound tissue plasminogen activator (tPA), which can lead to hypocoagulability. At this time the sample size is too small to make any definite conclusions, but initial data suggests that Toradol use is not associated with decreased coagulation function post-operatively.

89.

TEST OF PHENOMENOLOGICAL EMPATHY TOWARDS ANIMALS

Annie Jenney ‘11, Kim Weiss ‘11
Faculty Sponsor: Dan Lloyd

Empathy in phenomenology is something people experience and feel towards others based on their own experiences. Empathy is felt by placing oneself into another’s shoes and feeling how they would. In this study, the goal was to see how empathetic subjects felt depending on the type of animal and severity of the injuries inflicted or obtained. Using a sample size of twenty subjects, each subject was shown a minimum of twenty photos of stationary animals and told prewritten stories about them. They were then asked to rank how emotionally affected they were by the various situations. Some photos were shown multiple times with different background stories. This preliminary study shows that an individual’s empathy can change based upon how closely they can relate to the subject or situation. Through various research and personal experience we hypothesized that animals more closely genetically linked to humans, such as deer and dogs, garnered a more empathetic effect on subjects than smaller animals such as birds or squirrels. Additionally, the more “dismantled” an animal became, the less likely a subject was to have an emotional connection to it.

90.

ALTERNATIONS IN PERCEPTION OF BEAUTY BASED ON SOCIAL BACKGROUND AND ETHNICITY

Elan Jones ‘11, Julia Svedova ‘11, Amelia Wattenberger ‘11
Faculty Sponsor: Dan Lloyd

Beauty is a key factor in an individual’s image, influencing the way in which others perceive them. As a result, image can play a role in social discrimination and favoritism. The perception of beauty varies greatly from person to person. There are many environmental factors that can affect what is perceived as beauty such as culture, social background, and education. In addition, it appears that our judgment of attractiveness is also influenced by genetic makeup. In this study, we specifically investigate the effect of social background (family, friends, environment where we live, etc.) versus ethnicity on an individual’s perception of beauty. The subjects evaluate their perception of beauty based on a survey, which consists of two parts: In the first part, subjects answer a questionnaire about their social and ethnic background and the features they consider attractive. For the second part of the study, the subjects are asked to rate attractiveness of unfamiliar faces on a scale from 1-10. We are hoping to unravel the relative impact of nature vs. nurture on one’s discernment of beauty.

91.
COMPARISON OF FEMALE AND MALE EXECUTIVE COGNITION AS DETERMINED BY BARCS
Ethiopia Kabtimer ‘13
Faculty Sponsor: Sarah Raskin

Alcohol abuse is a critical problem that affects numerous college students throughout this country. We cannot properly address this issue if we are not aware of the brain changes and alcohol behaviors of these students. The Brain Alcohol Research in College Students (BARCS) measures cognitive functions, alcohol attitudes, mood and impulsivity in first year students at Trinity. When examining differences between male and female college students, no significant difference was found in cognitive measures of executive functions and verbal learning. Although alcohol has not been found to affect cognition in this sample, our data do suggest that females are much more likely than males to binge drink. Thus, it will be important to determine if this form of excessive drinking can cause a decline in cognition over the next four years. Furthermore, it is important to note that we did not administer customary cognition tests, such as spatial learning tasks, that typically demonstrate differences between males and females.

92.
EFFECT OF A MIRROR BOX ON PERCEPTION AND SENSATION
Edward Kim ‘12
Faculty Sponsor: Dan Lloyd

Phantom limb is the feeling that an amputated limb still exists regardless of the fact that the limb is no longer physically present. A novel method of treating phantom limb pain has been discovered in the usage of a mirror box. The mirror box is a box in which the patient places both his arms. The amputated arm is covered up by the box while the other arm is placed next to the box. A mirror on one side of the box is used to give the patient the illusion that both arms are intact, allowing an illusion of movement that can psychologically alleviate the pain. In this experiment the mirror box was used on people who had both arms. The purpose is to see if the illusion is powerful enough to cause them to feel a stimulus which is applied to the exposed hand in their covered hand. This experiment was inspired by the neurologist Ramachandran and his various tests conducted with the mirror box in order to alleviate phantom limb pain. The experiment will be conducted with multiple test subjects who will place their arms in the mirror box for an amount of time from a starting point of 0-10 seconds up to a full minute in 10 second intervals. The hypothesis is that the subjects who have had their arms in the mirror box for around 30 seconds will be the most likely to witness the illusory effects of the mirror box.

93
LEARNING TO TIME WITH CIRCADIAN RHYTHMS
Felipe H. Luisi ‘10
Faculty Sponsors: Dan Lloyd, Sarah Raskin

Humans have a curious endogenous ability to perceive time, and often to do so internally with impressive accuracy. It is interesting because physics and philosophy have yet to understand time, and neuroscience has yet to be able to explain how humans functionally perceive time, even though the entire human experience is dependent on the existence of time. This senior

thesis analyzes how humans perceive the past, present, and future. In the context of that analysis, the thesis considers current theories as to how the brain endogenously tracks durations such as J. Gibbon's Scalar Expectancy theory, and A. Machado's Learning-to-Time model. Machado's Learning-to-Time model posits that while humans are engaged in activities involving endogenous timing of durations they are passing through a succession of behavioral states of elicited, induced, or adjunctive behaviors and that knowing a duration is a learned association between a state in the succession and a behavioral output. This thesis expands on that theory by suggesting that highly regular 24-hour fluctuations of hormonal ratios in the bloodstream, controlled by the suprachiasmic nucleus in the brain, constitutes a concrete succession of biological states through which humans pass every day. I hypothesize that the day is a prime zone of temporal estimation because humans subconsciously associate the distance between points in their daily hormonal time line with empirical clock time. Durations longer than a day, however, are harder for humans to endogenously estimate as some hormonal rhythms are sleep dependent, resetting the hormonal time line, and because memory is constructive and incomplete.

94.

CHANGES IN OVERALL BRAIN ACTIVITY IN RESPONSE TO AN AUDITORY STIMULUS DETECTION TASK IN SCHIZOPHRENIC PATIENTS

John McInnis ‘12
Faculty Sponsor: Dan Lloyd

Schizophrenia is a neurological disorder of perception and thought that occurs in 1% of the population. The main symptoms are visual hallucinations (particularly auditory), delusions, disorganized thought, and social or occupational dysfunction. This experiment will take a look at subjects scanned with functional magnetic resonance imaging (fMRI) while performing a tone detection task, while distracted by periodic “oddball” noises. The overall brain activation of schizophrenics under the two conditions was compared to the overall activation of a normal brain. Schizophrenia is a dysfunction in both dopamine and glutamate related systems. The dopamanergic mesolimbic pathway has been shown to be significantly overactive. Based on this it was predicted that fMRI would detect an increase in overall brain activation compared to the activation of a normal brain.

95.

THE MEMORY FOR INTENTIONS SCREENING TEST FOR YOUTH (MISTY): PROSPECTIVE MEMORY PERFORMANCE BY AGE, TIME, CUE TYPE, AND RESPONSE TYPE

Ginger Mills ‘12, Julianne Garbarino ‘11
Faculty Sponsor: Sarah Raskin

Prospective Memory, the ability to remember to do something in the future, is an imperative function of daily life for both adults and children. This study examines prospective memory in children, specifically differences in age, time, cue type and response type. Forty-eight children, between the ages of four and twelve, took the Memory for Intentions Screening Test for Youth (MISTY), a novel test of prospective memory based on the Memory for Intentions Screening Test (MIST; Raskin, 2009).The MISTY includes prospective memory measures that differ in time between instructions and requested response (two minutes versus ten minutes), cue type (event-based versus time-based), and response type (verbal versus action). Overall, participants performed better on event-based than on time-based cues, and better on two-minute than on ten-

minute time delays. There were no overall differences between performance on verbal compared with action responses. Participants were divided into age groups (five to six, seven to eight, nine to ten, and eleven to twelve year olds), which differed in performance when looking at time and cue type and on summary scores. When age groups were separated, five through ten year olds performed better on shorter cues and on event-based cues, but showed no significant differences depending on response type. However, eleven and twelve year olds did not differ in performance depending on time, cue type, or response type, perhaps due to a ceiling effect or small group size. There were no gender or ethnicity differences, and there were no age differences in ongoing distractor task performance. The results suggest that future studies that expand the age boundaries may provide further insight into age at which prospective memory development occurs.

96.

SUCCESSFUL ENCEPHALO-DURO-ARTERIO-SYNANGIOSIS (EDAS) FOR ATHEROSCLEROTIC CEREBROVASCULAR OCCLUSIVE DISEASE SUGGESTS AN ALTERNATIVE TO DIRECT BYPASS TECHNIQUES

Jacqueline N. Parrotta ‘10
Faculty Sponsors: Sarah Raskin, Inam Kureshi, M.D., Director of Neurosurgery, Hartford Hospital

The optimal treatment for medically refractory atherosclerotic cerebrovascular occlusive disease is unknown. The Extracranial-Intracranial (EC-IC) Bypass study found that patients with internal carotid (ICA) and middle cerebral artery (MCA) occlusion received no benefit after direct bypass. Although recent EC-IC studies have shown promising effects, EC-IC bypass may be harmful to patients with MCA occlusion and has only been shown successful in a specific subset of patients. An indirect bypass technique encephaloduroarteriosynangiosis (EDAS) offers a surgical alternative to direct bypass and is considered safer, generally less complicated, may avoid rapid flow reversal while providing additional flow to at risk distal areas. This study reports a single center experience measuring the effectiveness of EDAS in patients with medically refractory hemodynamic atheroocclusive disease.

This retrospective study reviewed thirteen indirect bypass surgeries performed at Hartford Hospital from 2002 to 2009 using EDAS. Thirteen hemispheres were bypassed in eleven patients using the superficial temporal artery or occipital artery. All patients fulfilled specific criteria prior to undergoing surgery. Patient evaluation included assessment of Barthel scores, MR angiography, SPECT with diamox challenge, and chart review.

82% of the surgeries showed revascularization of the effected hemisphere. The rate of infarction within one year of surgery is estimated at 8%. Based on data in medically treated patients, the rate of infarction in the first year is estimated at 30%. Barthel score data was available for collection on six of eleven patients. The median pre-surgery, 3, and 12-month post-surgery scores were 20.

This preliminary study suggests that EDAS may be a reasonable alternative to direct bypass techniques that are traditionally studied for atherosclerotic cerebrovascular occlusive disease. This research has highlighted the importance and impact of cerebral revascularization in the treatment of ischemic stroke. Research concerning the mechanism of cerebral angiogenesis and collateral formation is vital to finding an optimal treatment.

97.

IMAGING AND PROSPECTIVE MEMORY: AN ANALYSIS OF CURRENT METHODS

Brooke Powell ‘10
Faculty Sponsor: Sarah Raskin

Prospective memory is the ability to remember to do something in the future; or remembering to remember (for example remembering to pay a bill on time). While most people have the occasional lapse, many people suffer from prospective memory failure. Traumatic brain injury and various neurological diseases, such as schizophrenia or human immunodeficiency virus (HIV) dementia, can have an effect on an individual’s capabilities. Treatment of these diseases is heavily reliant on adherence to a strict medication schedule. However, those suffering from prospective memory failures are often unable to manage their medications effectively. Imaging studies on prospective memory have shown event-related potentials (ERPs) associated with the occipito-temporal region (N300 peak) and the parietal positivity across the parietal, central and occipital regions. These two ERPs are thought to be associated with the recognition of a prospective cue and the recollection of the appropriate response, respectively. However, functional magnetic resonance imaging (fMRI) studies have shown frontal lobe activation as well under prospective task conditions. This activation alludes to the use of executive functioning. Given the differential activations seen between these two types of imaging, the question that arises is whether the tasks used are true measures of prospective memory. The next step that must be taken in prospective memory research is to compare the EEG and fMRI measures to a more naturalistic task, such as the memory for intentions screening test (MIST). This test has been shown to be an effective measure of prospective memory and correlates with self-report and medication adherence measures. In order to test the validity of imaging measures, it is necessary to compare performance under more naturalistic designs. As of now, it is possible that the imaging tasks used are not measuring true prospective memory.

98.

GENDER DIFFERENCES IN GENEROSITY AND ALTRUISTIC PUNISHMENT

Carly Rando ‘12, Dayo Oyedele ‘11, Ginger Mills ‘12
Faculty Sponsor: Dan Lloyd

As human beings, we see ourselves as free agents and it is this notion that enables us to make decisions. Similarly, we see others as free agents as well. According to Chris Frith, there is a correlation between free agency and responsibility, which allows us to negatively view deliberate, unfair acts (Frith, 2007). In this study, we’re investigating differences in generosity and altruistic punishment between males and females. Altruistic punishment is the idea that in some situations an individual will punish another even if it involves some self-sacrifice. We gathered 40 subjects and played 20 games based on the Ultimatum Game. A proposer is allotted a sum of money and must offer an amount of their choice to a responder. The responder can either accept or reject this offer, yet if it is rejected, then neither player is awarded any money. We hypothesized that women will be more generous in the amount of money offered and will reject less often than males. We then analyzed gender differences in the amount offered and the rate of acceptation and rejection. We also anticipate males being more generous towards females than males. This study will help provide insight on self-agency and the willingness to be altruistic. Further studies would be necessary to provide neurological evidence for generosity and altruism between sexes.

99.

EFFECTS OF THE KETOGENIC DIET ON BEHAVIOR AND PHYSIOLOGY OF R6/2 HUNTINGTON'S DISEASE TRANSGENIC MICE

Tiffany Ruiz '10, Jessica Ross '10, Julia Svedova '11, Rachel Riendeau '12, Jessica Cote '12
Faculty Sponsors: Susan Masino, David Ruskin

Huntington's disease is an inherited neurodegenerative disease caused by expansion of CAG polyglutamine repeats in the *huntingtin* gene. The ketogenic diet is a restricted diet that is high in fat and very low in carbohydrates, and has been found to be beneficial in several animal models of neurodegeneration. We tested the effects of the ketogenic diet in a transgenic mouse model of Huntington's disease (R6/2) to determine whether the diet delays or improves symptoms. Both male and female R6/2 and wild type (control) mice were placed on either the ketogenic diet or control diet at 6 weeks old. Mice were tested at 4, 6, 8, 12 and 16 weeks using the rotorod test (locomotor coordination) and Y-maze (working memory and locomotor activity). Mice were weighed twice weekly, deaths were recorded, and CAG length was measured. At each time point, core blood and brain tissue were collected from mice to measure blood ketone levels and regional brain mitochondrial activity. Mice on the ketogenic diet showed a significant increase in blood ketone levels, and a delayed weight loss during the initial progression of the disease. However, the ketogenic diet was unable to slow overall disease progression in the R6/2 mice. Wild type mice fed the ketogenic diet showed increased locomotion (both genders) and improved rotorod performance (males), but there was no discernable effect of the ketogenic diet in these behaviors in the R6/2 mice. Regional analysis of brain mitochondria showed changes in cerebral cortex and striatum in the R6/2 mice. While the ketogenic diet delayed the progression to significant weight loss, it did not benefit longevity or improve behavioral symptoms significantly in the Huntington's mice.

100.

THE EFFECT OF NOETIC ALTERATION ON THE VISUAL PERCEPTION OF COLOR

Nicholas Stewart '11
Faculty Sponsor: Dan Lloyd

Phenomenology is the philosophical study of how perceived events affect the structures of consciousness. The phenomenological perception of a sensory stimulus is influenced by both noetic (subjective) and noematic (objective) components. This study will explore the influence of noetic context on the objective visual perception of color. In the control condition of this experiment the participant will determine the color of a circular shape against a plain white background. The color will be recorded by the participant as a composite perception of the primary colors and the color black (i.e solid purple = 50% red, 50% blue, 0% yellow, and 0% black). In the variable condition of the experiment the participant will read a short story that gives a specific meaning to the spectrum of colors. The subject will then record the color of an altered shape that matches the noetic alteration discussed in the story. Based on a brief pilot study, it is hypothesized that participants who are influenced by the noetic alterations of the story will have an altered noematic perception of the presented colors.

101.

ENDOSCOPIC THIRD VENTRICULOSTOMY IN COMBINATION WITH CHOROID PLEXUS CAUTERIZATION: AN OUTCOME ANALYSIS

Deniz Vatansever ‘10
Faculty Sponsors: Sarah Raskin, Paul Kanev, MD, Jonathan Martin, MD, Connecticut Children’s Medical Center

PURPOSE: Hydrocephalus is a condition in which cerebrospinal fluid (CSF) accumulates in the ventricles of the brain causing increased intracranial pressure. The most commonly utilized treatment towards relieving the symptoms is the placement of a ventriculoperitoneal (VP) shunt which is associated with a number of complications. Thus a less invasive technique, called endoscopic third ventriculostomy (ETV), has been recently revitalized which allows the physician to create a new pathway at the base of the third ventricle for more CSF to reach the absorption sites. The specific aims of our study were to examine how age, mode of treatment and etiology affected the success rate of ETV, and to evaluate the results in light of available information on the mechanics of CSF outflow. METHODS: We retrospectively examined the medical records of 20 hydrocephalus patients at Connecticut Children’s Medical Center with a minimum of 4 months follow-up. An ultimate need for shunt placement or death was regarded as a failure. RESULTS: There were 19 patients included in this study whose ages ranged from 1 month to 20 years (mean=7.7 years) at the time of the surgery. The morbidity rate was zero. Due to the small sample size, we did not obtain statistically significant results. However, trends of higher success rates were seen in children older than five years of age (60%), in children with spina bifida (50%), and in cases where ETV was utilized as the primary choice of treatment (66%). CONCLUSIONS: The outcome suggests important trends that can be further studied to postulate a grading scale for an ETV eligibility criterion.

102.

VARIATION IN PROSPECTIVE MEMORY MEASUREMENT OF THE EINSTEIN AND MIST MEMORY TESTS

Marta Zamroziewicz ‘13
Faculty Sponsor: Sarah Raskin

Prospective memory is the ability of an individual to remember to do a particular activity in the future, including monitoring time, storing the intention in mind, as well as retrospectively recalling the intention. As the scientific study of prospective memory is expanding, the need for a solid understanding of the measurement mechanisms of the two prominent clinical tests, the Memory for Intentions Screening Test (MIST) and Einstein test, of prospective memory has become quite evident. The MIST test is an interactive written, verbal, and action test between the researcher and participant that measures an individual’s prospective memory abilities in activities that would be performed on a daily basis while the Einstein test is a more artificial laboratory computer test. In order to compare the testing mechanisms of the MIST and Einstein tests, a sample population of Trinity College students completed both the MIST and Einstein tests in one testing session along with a questionnaire, the Comprehensive Assessment of Prospective Memory (CAPM), about their prospective memory failures in daily activities. Each individual’s performance on the MIST and Einstein tests were compared to their responses about their prospective memory failures in daily life. The MIST test best corresponded with participants’ answers on the questionnaire about daily prospective memory failures. On the other

hand, the Einstein test correlated only with the recognition portion of the MIST, which is the simplest yet most pure representation of prospective memory. These results indicated that the MIST test is indicative of prospective memory performance in daily activities yet that the Einstein test is an accurate representation of an individual's prospective memory abilities in the absence of other cognitive operations used in everyday tasks.

PHYSICS

103.
PHOTON COUNT RATE AND EXPECTED PERFORMANCE OF A COINCIDENCE COUNTING MODULE
Adam Katcher '12
Faculty Sponsor: David Branning

The expected performance of a Coincidence Counting Module (CCM), as a function of mean input rate, was determined using probability theory. The CCM counter uses sixteen digits of binary storage per time-bin. Exceeding 2^{16} -1 photon arrivals within a time-bin interferes with accurate photon counting for that time-bin. Additionally, data transfer within the CCM causes "blind cycles" that shorten the effective counting time, leading to additional missed counts. The expected number of lost counts due to these errors was calculated as a function of mean input rate. We calculate that our 800 Hz CCM operates with better than 99.998% accuracy, even for Poissonian input rates of up to 50 million photons/s.

104.
THIRD GENERATION COINCIDENCE COUNTING MODULE FOR SINGLE PHOTON QUANTUM OPTICAL EXPERIMENTS
Jared Zimmerman '13 Brandon Clary '13
Faculty Sponsor: David Branning

Spontaneous parametric down conversion (SPDC) is a process by which a single parent photon is converted to two photons while conserving energy and momentum. Quantum optical experiments often require these photon pairs to be counted 'in coincidence' as they hit separated photon detectors. We have created an inexpensive coincidence counting module (CCM) designed to work with SPDC light to carry out quantum optical experiments. Using a 4x8 array of LED light switches, and a logical AND gate system, our coincidence counting module is able to count any combination of two, three or four fold coincidences. Testing shows that the practical count rate limit for the CCM is 50 megahertz. This CCM design could be a very useful teaching tool, seeing as its low cost, ease of assembly and adaptability make it a perfect instrument for conducting quantum optical experiments in small teaching laboratories. In the future we hope to design a CCM that consists only of a field programmable gate array (FPGA) that is controllable and programmable from a computer.

PSYCHOLOGY

105.

THE EFFECT OF ADD/ADHD ON MULTI-TASKING ABILITY

David Anderson ’10, Felipe Luisi ’10, William Trautmann ‘11
Faculty Sponsor: Susan Averna

The ability to multi-task is a strong indicator of an individual’s ability to direct his or her attentional resources. Previous research has shown that children with ADHD have a more difficult time adopting new skill sets than do children without ADHD. Children with ADHD are also more likely to have deficient planning with delayed intentions. In this study, we sought to explore whether this trend remains true for Trinity College students, with the skill set being the simple multi-tasking iPhone game “Flight Control”. Subjects were asked if they had been diagnosed with ADD/ADHD and were tested for ADHD using the *Jasper/Goldberg Adult ADD/ADHD Screening Quiz.* We hypothesized that people who are prescribed for medication and people who test negative on the *Jasper/Goldberg Adult ADD/ADHD Screening Quiz* will score higher than will people who test positive for ADHD but are not prescribed for medication. Our hypothesis supports the Huang-Pollock and Karalunas (2010) study that found that children with ADHD had a more difficult time obtaining a new set of skills than did non-ADHD children. Of the 47 subjects, 18 reported having been diagnosed with ADD/ADHD, 13 of which reported being under the influence of prescription stimulants during the test. Statistical testing of the data showed consistency between ADD/ADHD diagnosis and the ADD/ADHD Screening Quiz categories and a non-significant trend for use of prescription stimulants affecting Flight Control score. Our original hypothesis was unable to be tested, as too few people were diagnosed with ADHD but not medicated.

106.

VISUAL PERCEPTION OF A POINT LIGHT FIGURE BALANCING AN INVERTED PENDULUM

Shraddha Basnyat ‘13, Chislon Richardson ‘13, Austin Tewksbury ‘13
Faculty Sponsor: William M. Mace

It was discovered in the early 1970s that ten to twelve bright spots representing the motion of body joints could provide compelling visual information of biological motion. A human can accurately identify these spots, when in motion against a static background, as a person walking, running, dancing, or performing any number of activities. This study sought to discover whether an observer could distinguish between the lengths of sticks being balanced by an actor based on his motion in this video format, called point-light displays. Two actors were filmed balancing sticks ranging from 24 to 48 inches in length. JPEG images were created from these videos using iMovie HD; these images were converted to point-light displays using original Java programs. Observers will be shown all 10 displays and asked to estimate the length of the stick balanced. The observers will be informed that there were 2 actors and that the possible stick lengths were 24, 30, 36, 42, and 48 inches.

107.

THE DIFFERENCES IN MOTIVATIONS BETWEEN MALE COLLEGIATE ATHLETES AND FEMALE COLLEGIATE ATHLETES

Clay Ciccariello ‘11, Kelsey Doran ‘11, Katherine Stoltenberg ‘11, Nina Yu ‘12
Faculty Sponsor: Dina Anselmi

Sports in our society represent a highly gendered experience. In most sports, men and women do not directly compete with each other and there are some sports in which one or the other sex does not generally compete at all. The reason why men and women choose to engage in athletics is also an important question where gender may play a significant role. Motivations during athletic competitions can stem from childhood experiences such as parental support for athletics or peer play activities. Another reason that has been suggested is that males may be naturally more inclined to want to engage in activities that focus on competition. The present study explored the question of what motivates men and women to engage in athletics. Approximatley 600 collegiate athletes at Trinity College were sent a survey that asked question about their reasons for playing sports. There was a response rate of about 50%. We expected that men would indicate that their reasons for playing sports would be more competition oriented while women would be more interested in seeing their friends and having fun. After analyzing the results, men seemed to be slightly more interested in the competitive nature of sports while women were, in fact, more likely to exhibit signs of compassion and friendship.

108.

COMING UP CLUTCH: EFFECTS OF PRESSURE LEVEL ON FREE THROW SHOOTING ACCURACY OF INTROVERTED AND EXTROVERTED BASKETBALL PLAYERS

Emily Darby ‘10
Faculty Sponsor: Randolph Lee

It is widely known that pressure degrades athletic performance (Baumeister and Showers 1986). Conversely, there are several statistical anomalies in the realm of professional sports. Certain athletes have a propensity to execute a task better than normal when they are under pressure, which is known as a “coming up clutch”. Clutch performance is a well-known phenomenon, but what can it be attributed to? In this study, male and female varsity and intramural basketball players were scored as either introverted or extroverted based on the McCrosky Introversion and Eysenck Extroversion Scales. Their basketball free throw shooting accuracy was evaluated in the presence and absence of video equipment as well as when they were allowed a specific amount of time to complete all of their shots. Compared with the control situation, no significant difference was found between the performance of introverts and extroverts in added pressure situations. However, both groups exhibited a significantly poorer performance in the time pressure condition compared to the control and videotaped conditions. Findings indicate there is a possibility of developing a more scientifically viable solution that coaches and sports psychologists can implement to help athletes deal with pressure.

109.

EFFECT OF PARENTAL DIVORCE ON INTIMACY IN COLLEGE STUDENTS

Briana Feigon ‘11, Emily Talbot ‘10, Alisen Urquhart ‘11, Emily Weedon ‘11
Faculty Sponsor: Susan Averna

Past research suggests that a child’s familial environment is an important predictor of a young adult’s relationship competence (Kirk 2002). Furthermore, young adults from divorced families suffer more negative relationship outcomes independent of parental involvement (van Schaick & Stolberg, 2001). This study has examined the impact of parental separation and divorce on the intimate relationships of 97 Trinity College students (30 males, 67 females). The intimacy levels of students with divorced and separated parents were compared to those with married parents. The Miller Social Intimacy Scale was used to measure intimacy in relationships (Miller & Lefcourt, 1982). It was predicted that participants who have experienced parental divorce or separation would have less intimacy in platonic and/or romantic relationships. This data was analyzed using a *t*-test. Results indicated that parental divorce and separation was not related to intimacy in relationships, t (65) = -0.33, *ns*, but there was a positive correlation between participant’s intimacy in relationships and their rating of the change in their relationship with the parent they did not live with after the divorce or separation, r (12) = 0.54, $p < .05$.

110.

THE EFFECTS OF GENDER, RACE, SCHOOLING, AND RELATIONSHIP STATUS ON COLLEGE STUDENTS’ BODY IMAGE

Taina Fontes ‘12, Alessandra Siraco ‘11, Nicole Dubowitz ‘10
Faculty Sponsor: Dina Anselmi

Body image is a central aspect of a young person’s self-esteem. Research shows a link between body image and the type of schooling one has attended (single-sex or coed) (Tiggemann, 1999). A connection between one’s body image and his/her relationship status/sexual activity of that person has also been shown (MacCorquodale and DeLamater, 1979). We surveyed 544 Trinity College Freshmen, Sophomores, Juniors, and Seniors, and received 145 responses using The Multidimensional Body-Self Relations Questionnaire (MBSRQ). Our four hypotheses were a) that males would have better body image than females, b) African Americans would have a better body image than Caucasians or Latinos, c) females who attended a single sex school would have a worse body image than those who attended co-ed schools, d) people who were single or dating would have a worse body image than those in a relationship. We found that the only significant result was that males had a better body image than females.

111.

ROMANTIC RELATIONSHIP QUALITY AMONGST COLLEGE STUDENTS AS A PRODUCT OF ADULT ATTACHMENT, ALLOCENTRISM AND IDIOCENTRISM, AND CULTURAL ETHOS

Isabella Glaser ‘10
Faculty Sponsor: Dina Anselmi

Relationship quality is the product of an individuals’ adult attachment style, perceptions of others and the nature of the culture in which they live. Past research suggests that the initial attachment formed during childhood can influence the way we experience romantic relationships. In general, securely attached individuals are more likely to experience romantic relationships characterized by greater levels of commitment, satisfaction, and trust (Simpson, 1990). Individuals with

avoidant and anxious attachment are more likely to have difficulty with commitment and trust, and as a result, the quality of their relationships decreases (Simpson, 1990; Hazan & Shaver, 1987). In addition to adult attachment, an individual's self-construal, classified as either idiocentricism or allocentrism, plays a role in influencing relationship quality. Idiocentric individuals are defined as having more concern for themselves than for others, while allocentric individuals are more concerned with other than themselves (Triandis & Suh, 2002). Studies found idiocentric individuals' romantic relationships are characterized as being less intimate and having less love for one's partner. On the other hand, allocentric individuals focus on others leads to more conformity and less self-actualization (Dion & Dion, 1996). Idiocentrism and allocentrism are considered the individual level variable. At the cultural level, cultures have been described as either individualistic or collectivistic. Dion & Dion's research has correlated individualism to endorsing a view of love that is less committal and more pragmatic in style (2001). The same research described collectivism as endorsing relationships that bring group harmony rather than relationships that provide only individual satisfaction. The present study surveyed 323 (121 males and 202 females) Trinity College students to determine their attachment style, their level of idiocentrisism and allocentrism and their relationship quality. No gender differences were found in terms of attachment style, or the quality of romantic relationships. However, there was a significant gender difference in idiocentrism and allocentrism levels. Women were significantly more likely to be allocentric whereas men were significantly more likely to be idiocentric.

112.

COLLEGE ADJUSTMENT AS A FUNCTION OF ADULT ATTACHMENT STYLE

Sara Goldstein '11, Ivica Pavisic '11, Stephanie Rucker '11
Faculty Sponsor: Susan Averna

A person's relationship with his or her primary caregivers in early childhood has been shown to predict his or her relationship style later in life (Bartholemew & Horowitz, 1991). We sought to determine the effect of adult attachment style on college adjustment for first year students and seniors. Using a sample of convenience, we surveyed Trinity College first-years and seniors using Pennebaker, Colder, and Sharp's (1990) College Adjustment Test (CAT) to assess adjustment to college life and Bartholomew and Horowitz's Relationship Questionnaire (RQ) to determine students' adult attachment styles. We found that secure college students scored significantly higher on the CAT than fearful-avoidant and dismissive-avoidant college students. However, there was no significant difference between the adjustment levels of first years and seniors, and no interaction effect was present.

113.

EFFECT OF FINANCIAL DECISION OUTCOMES ON MEMORY FOR CHOICES

DeAnna Hamilton '10
Faculty Sponsor: Nicole Dudukovic

Choice supportive memory refers to the tendency to ascribe positive attributes to a decision one has made in the past. Previous research has revealed that correct and incorrect attributions often tend to favor a chosen option over its competitor, or the rejected option (Mather, Shafir & Johnson, 2000). This memory bias may result from individuals trying to justify their past decisions, but it is unknown in what ways the outcomes of decisions influence this process. The

present study investigated the effects that positive and negative outcomes for financial decisions have on memory for choices. Participants were given three purchasing scenarios. Each scenario consisted of two "products," each with positive and negative features and fixed prices. Participants decided which of the two products they would purchase. After making each decision, participants received a good outcome, negative outcome, or no outcome for their decision. Five minutes later, participants were given a memory test and asked to identify the features and recall the prices of their chosen and rejected options. Participants were more satisfied with their decisions when they received a positive outcome versus a negative or no outcome, suggesting that the outcome manipulation was effective. Furthermore, participants' memory for the features and prices of their choices varied depending on outcome. In particular, participants tended to underestimate the price of their chosen option to a greater extent when the outcome of their decision was positive. The results of this study shed light on how the outcome of our decisions impacts our memory for the options that we choose and do not choose and demonstrate distortions in how we remember the financial impact of our decisions.

114.

THE EFFECTS OF SELF TALK AND VISUALIZATION ON SPORTS PERFORMANCE IN TRINITY SQUASH PLAYERS

Nayelly Hernandez '10
Faculty Sponsor: Randolph Lee

Self talk and visualization are psychological techniques that are widely used to improve performance among athletes (Theodorakis, Hatzigeorgiadis & Chroni, 2008). Since both techniques prompt thoughts and imagined experiences, the brain sends messages to muscles and body just as if it was prompted by physical experiences. In this study, the effects of self talk and visualization on a squash task were investigated. Participants who were trained with both techniques were expected to perform better than participants who were not. It was also expected that participants with more experience would improve more after treatment. ***Methods*** Twenty-four squash players, randomly assigned to one of two groups (control and treatment), performed 20 serves into a 50 x 50 cm square target during two different times: before and after a treatment. The treatment group was taught self talk and visualization while the control was not. The number of good serves was recorded both times. ***Results*** A Repeated Measures was conducted. The experimental group performed slightly better (M = 9.42, SD = 1.29) than the control group (M = 8, SD = 1.29) during post-treatment. However, the interaction between time (pre-treatment vs. post-treatment) and condition (control vs. experimental) was not statistically significant, F (1, 22) = 0.89, ns. The results also yielded a positive correlation between time and years of experience on performance improvement, F (1, 19) = 6.97, p = .016. ***Discussion*** In spite of a non-significant difference in scores in the interaction of time and condition, the experimental group slightly outperformed the control group. Some of the reasons for a low difference could be an odd result from one participant in the control group, treatment diffusion, small sample size, and/or no control over participants' treatment practice. Nonetheless, the results suggest that more years of playing the sport predict more improvement after treatment.

115.

IMPACT OF SCHIZOPHRENIA REHABILITATION PROGRAM ON VOCATIONAL OUTCOMES

Kristen Homiski ‘10
Faculty Sponsors: Sarah Raskin, Silvia Corbera PhD, Rachel Duzant PsyD, Institute of Living

Research indicates that illness factors may negatively impact the vocational productivity of individuals with schizophrenia. These are positive and negative symptoms, and cognitive deficits. The Schizophrenia Rehabilitation Program (SRP) is a long-term outpatient program that provides comprehensive treatment including psychotherapy, cognitive rehabilitation, and vocational services. SRP follows a modified Individual Placement and Support vocational approach which is the most empirically supported one in this field. This study aimed to identify the variables associated with successful vocational productivity during outpatient rehabilitation in the SRP. Data was collected from 35 individuals with schizophrenia including demographics, clinical measures, and cognitive performance (processing speed, attention, working memory, and problem solving). Vocational outcomes were measured by tracking the total hours each client worked per month over the course of a 15-month period. Results showed positive correlations between both the number of hours spent in cognitive rehabilitation and a measure of attention with vocational outcomes, supporting the notion that cognition is related to vocational productivity. A one-way ANOVA exhibited significant differences between the productive and non-productive groups (clients involved in a vocational activity vs. not involved) regarding two quality of life subscales (household duties and general activity), negative symptoms rating, and measures of attention, processing speed, and working memory, which is consistent with the literature. This is an ongoing study, and we expect to explicate the role of job satisfaction and other variables in predicting job tenure in the upcoming months.

116.

RELATIONSHIP AMONG BEHAVIORAL INHIBITION, PARENTING STYLE, AND ANXIETY IN COLLEGE STUDENTS

Kristen Homiski ‘10, Zach Galkin ‘10, Nadjeda Estriplet ‘10, Julie Findlay ‘11
Faculty Sponsor: Susan Averna

The literature suggests that behavioral inhibition in childhood may be associated with anxiety later in life. Studies also show that parenting style may moderate behavioral inhibition. To further explore this notion, we investigated the relationships among self-reported childhood inhibition, parenting style, and anxiety in Trinity College students. The Retrospective Measure of Behavioral Inhibition (RMBI) was used to assess levels of childhood behavioral inhibition and the Measure of Parental Style (MOPS) was used to determine the students’ perception of their parents based on three subscales: indifference, abuse, and overcontrol. Lastly, the Beck Anxiety Inventory (BAI) was used to determine the level of anxiety. Results showed a positive correlation between having an overcontrolling father and total BAI score. A nonsignificant trend suggested that maternal overcontrolling behavior may also predict anxiety. There were no significant relationships between the RMBI and the other utilized measures.

117.

EFFECTS OF ALCHOL ADVERTISEMENTS ON MEMORY AND ATTITUDES

Mallory Levine ‘10
Faculty Sponsor: David Reuman

The current study examined effects of the serial position in which ads were seen on free recall, recognition, and cued recall memory measures. Based on previous research, I predicted that both primacy and recency effects would occur. The study also examined effects of communicator characteristics – the perceived credibility, expertise, and trustworthiness of an ad sponsor – on attitudes toward the ad message. I predicted that a “don’t-drink-and-drive” message would be more credible when sponsored by an alcohol company than by a public service organization, because the alcohol company would be arguing against its own business interest. In order to determine the effects of alcohol advertisements, I worked with a sample of 48 Trinity undergraduate students. Participants watched an episode of “Scrubs” with an ad break edited in. The ad break consisted of six advertisements presented in a counterbalanced design. Three ads were alcohol-related: a Bacardi ad promoted consumption of rum; a Department of Transportation (DOT) ad and a Heineken ad each promoted a “don’t-drink-and-drive” message. Ads promoting Pepsi, Mac/Apple products, and Volkswagen were also included. Participants then completed a set of questions that focused on memory of the advertisements, attitudes toward the advertisements, liking of the advertisements, and judgments about ad sponsors. Position effects were not statistically significant for free recall and recognition measures, but memory for ads was somewhat poorer for ads in serial position 4. There was no effect of serial position on cued recall. As predicted, the DOT ad was judged to be more credible than Bacardi, but contrary to predictions, Heineken was not judged to be significantly more credible than DOT. The message in the DOT and Heineken ads was seen as more important than the message in any other ads. Participants liked the Heineken ad more than any other ad. Participants reported that the DOT and Heineken ads would change how they would act in the future more than any of the other ads. Finally, the credibility of an ad sponsor was most consistently and strongly correlated with positive attitudes toward ad messages; trustworthiness and expertise of ad sponsors were weakly related to attitudes. The results from this research can be used to design ads that effectively promoted a “don’t-drink-and-drive” message.

118.

EFFECTS OF GENDER ON ACADEMIC ACHIEVEMENT AND SELF-EFFICACY

Mallory Levine ‘10. Alexandra Schwartz ‘10. Nathaniel Allen ‘10, Li Jin Yan ‘10
Faculty Sponsor: Dina Anselmi

The current study examined the relationship between gender and academic achievement. Based on previous research, we predicted that female students would have higher academic achievement than males. The study also examined the relationship between gender and self-efficacy. Given research findings that show that women trail men in academic self-confidence, we predicted that females would have a lower self-efficacy than males. In order to determine the effect of gender on academic achievement and self-efficacy, we surveyed 68 Trinity College juniors. Participants responded to questions that asked them to rate a series of statements regarding their perceptions of their personal academic achievement and self-efficacy. As we predicted the results demonstrated that females had significantly higher GPAs than males. However, the study did not reveal a significant difference between male and female responses regarding self-efficacy or academic achievement.

119.

EFFECTS OF TRANSCEDENTAL MEDITATION ON PERCEIVED SELF-EFFICACY OF COLLEGE STUDENTS

Emily Lindon ‘10
Faculty Sponsor: Randolph Lee

Transcendental Meditation (TM), an ancient Vedic form of meditation, has been shown to have both physiological and psychological benefits. College is a critical developmental period during which students learn, or fail to learn, how to handle heavy workloads, analytical thinking, late nights, developing independence and mature social and professional relationships. Various benefits of TM include, but are not limited to: decreased stress and anxiety (Dillbeck, 1977), more widespread brain functioning (Lyubimov, 1999), increased productivity (Frew, 1974), increased personal development and self-actualization (Gelderloos, 1987; Nidich, et al., 1973) and increased IQ and creativity (So, & Orme-Johnson, 2001; Travis, 1979). The present study specifically examines perceived self-efficacy, which pertains to an individual’s belief that he can successfully execute the behaviors necessary to achieve a desired outcome (Bandura, et al., 1977). It was hypothesized that the benefits of TM, particularly those pertaining to reduced anxiety and improved personal development and productivity, will improve feelings of competency in the subjects, thereby increasing scores on the New General Self-Efficacy Scale. Students were trained in the TM technique, and identical surveys were administered to the participants and control subjects six months apart. T-tests indicate a significant increase in the perceived general self-efficacy scores of meditators, and a significant decrease in self-efficacy scores of non-meditators. Implications of these findings suggest that participants experienced benefits such as decreased anxiety and increased productivity and creativity. The use of TM in college settings is likely to bring about more productive, creative and perhaps more emotionally healthy students.

120.

GENDER DIFFERENCES AND AGGRESSION

Ashley Meilleur ‘11, Elizabeth Colicchio ‘11, Leigh Howard ‘12, Kristen Ramsay ‘12
Faculty Sponsor: Dina Anselmi

The common perception of aggression in our society is that men tend to be more aggressive than women. This gender difference is constantly being perpetuated in the media, which in turn is reflected in real life aggressive thoughts and behaviors that are often exhibited by men. In this study, we examined how social context as a function of the gender of the aggressive actor and the receiver of the aggressive behavior can influence our perceptions of aggression. We presented twelve video clips to male and female participants involving men and women engaged in various behaviors. These clips included combined scenarios of male on male aggression, female on female aggression, male on female aggression, female on male aggression, the absence of aggressive behavior between males and female, the absence of aggressive behavior between male, and the absence of aggressive behavior between females. We hypothesized that participants would find it more acceptable for men to display aggressive behavior than women. The results of our study showed that both sexes found male to male aggression to be the most acceptable display of aggression. In addition, we found that male to female aggression had the effect of making both men and women angry and uncomfortable.

121.
TESTING EFFECTS IN ADOLESCENTS WITH AND WITHOUT ADHD
Christine Moody ‘10
Faculty Sponsor: Nicole Dudukovic

Adolescents with Attention Deficit Hyperactivity Disorder (ADHD) often experience deficiencies in memory and executive functioning, as well as academic and social impairments (Pollak, Kahana-Vax & Hoofien, 2008). Previous research has established the beneficial effects of testing on memory, a phenomenon known as the “testing effect” (Roediger & Karpicke, 2006), but testing effects have not been explored in an ADHD population. The present study investigates the impact of testing on adolescents’ later recall, comparing healthy controls with those diagnosed with ADHD. In two experiments, after studying a list of word pairs, participants engaged in a cued-recall test, a restudy condition, or a math distracter task, followed by a five-minute digit span task, used as a measure of executive functioning. Afterwards, participants completed a final cued-recall test, and the number of correct responses and false alarms was recorded. Twenty-one Trinity College students participated in Experiment 1, which served as a pilot study for Experiment 2. Three adolescents with ADHD as well as eight age-matched controls participated in Experiment 2. For both ADHD and controls, the restudy condition resulted in the greatest correct recall, followed by the test condition, and then the math condition. There was a trend for ADHD participants to produce more false alarms in the test and math conditions, whereas controls produced more false alarms in the restudy condition. Furthermore, there was a trend for ADHD subjects to have a smaller forward digit span than controls. These trends suggest that with larger sample sizes, there may be a difference in how students with ADHD respond to testing as compared to studying in preparing for a later test. Further study is warranted as the revelation of effective study methods for adolescents with ADHD may help to improve academic functioning as well as create positive spillover effects in other areas of functioning.

122.
THE EFFECT OF GENDER AND AGE ON CHILDREN’S SELF-REGULATORY BEHAVIORS
Brooke Teittinen ‘11, Alexa Gugliemi ‘11, Courtney Eavenson ‘10, Lindsey Ravesloot ‘11, Sarah Keller ‘11
Faculty Sponsors: Dina Anselmi, Susan Averna

Self-regulation can take on many forms, especially among children who are still learning how to regulate their emotions and place them in the context of the world around them. This study explored the relationship between age, gender, and self-regulation in two and four year old children. Children were presented with an enticing toy, and told to wait until the confederate had finished reading a book (approximately 5 minutes), before they could play with the toy. We hypothesized that the four year olds would display better self-control than the two year olds. Additionally, we hypothesized that girls would exhibit better self-control than boys. We did not find significant differences between male and female children in their self regulation behaviors, as well as between 4 year olds and 2 years olds, although the means were in the direction that we predicted. One potential reason for our lack of predicted findings could be due to our small sample size.

123.

PERCEIVED MODIFIABILITY OF QUANTITATIVE REASONING AND SELF-EFFICACY IN COLLEGE STUDENTS

Lindsay Nyce '10
Faculty Sponsors: Dina Anselmi, Laura Holt, David Reuman

Undergraduate college students hold beliefs about their intelligence and other academic domains that have been associated with academic performance. "Entity" theorists hold that intelligence and quantitative reasoning are fixed abilities, whereas "incremental" theorists believe that these are competencies that can be improved with focused effort. Aronson, Fried, and Good (2002) have shown that beliefs about the modifiability of intelligence can be changed by means of a "pen pal intervention", in which college students write a letter to a younger student, suggesting that ability can be improved. I tried to influence college students' beliefs about the modifiability of quantitative reasoning ability using a similar intervention. Thirty-six Math 101 undergraduate students in two class sections were split into a control group and a pen pal incremental theory intervention. All students completed a questionnaire, measuring their academic ability beliefs, achievement goals, self-efficacy and self-regulation, at the beginning of the semester (Time 1) and after the intervention sessions had been completed (Time 2). Our results showed a significant improvement in the pen pal group's belief about the modifiability of intelligence and quantitative reasoning over the control group whose belief had decreased, suggesting that the intervention helped reverse negative effects over the semester. The pen pal group also showed a higher self-efficacy over time than the control group, whereas neither group changed in self-regulation. These results confirmed the theoretical model underlying this project.

124.

THE EFFECT OF STUDENT PERCEPTIONS OF TEACHER FEEDBACK ON MOTIVATIONAL VARIABLES FOR LEARNING

Ben Gascoigne '10
Faculty Sponsors: David Reuman, Dina Anselmi, Laura Holt

Previous research has shown that feedback about one's academic performance may be an important factor in shaping his/her subsequent performance. Feedback can come in the form of graded exams, quizzes and homework, but also is comprised of teacher-student interactions in and out of class. This study examines how students' perceptions of feedback influence motivational measures such as their self-efficacy, implicit theories of intelligence, study strategies and academic performance over the course of the semester. Seventy-six students (59.2% female) enrolled in 4 sections of Math 101 at Trinity College participated in this study. Starting in week 3 of the semester, students filled out an online weekly feedback journal whereby they recorded experiences of helpful and non-helpful feedback in the previous week. During weeks 3 and 10, students completed measures of self-efficacy, self-regulation and their beliefs about the modifiability of quantitative reasoning. Grades on course exams 1, 2 and 3 were used as the outcome measures. Both correlational and regression analyses were used to examine my hypotheses.

In general, the measures of self-efficacy, quantitative reasoning ability beliefs, self-regulation, exam grades, positive and negative feedback showed appreciable stability from week 3 to week 10 of the semester. Contrary to my hypotheses there were few instances of cross-lagged effects (i.e., where a week 3 measure influenced a different week 10 measure). However, the following

cross-lagged effects were observed: (1) self-efficacy at week 3 predicted increases in incremental beliefs about quantitative reasoning at week 10; (2) the first course exam (week 3) predicted increases in self-efficacy at week 10; (3) negative classroom feedback at week 3 predicted decreases in self-efficacy at week 10; and (4) self-regulation at week 3 predicted decreases in negative classroom feedback at week 10. These findings suggest that motivational variables (self-efficacy, self-regulation) may affect one's perceptions of unhelpful feedback and incremental beliefs, respectively, and that negative feedback may lead to decrements in self-efficacy over time. In addition, better performance on the first course exam may be associated with increases in self-efficacy over time. Implications for effective teacher feedback methods will be discussed.

125.

MOTIVATED TO ACHIEVE: IMPROVING ACADEMIC ACHIEVEMENT BY ENHANCING STUDENTS' SELF-EFFICACY BELIEFS

Erika Klotz '10
Faculty Sponsors: Dina Anselmi, Laura Holt, David Reuman

This study examined the extent to which students' academic motivation influences their academic achievement and whether an email intervention could positively affect their academic motivation. A sample of 54 Trinity students from three Math 101 courses completed a self-report questionnaire that assessed implicit theories of quantitative reasoning ability, academic self-efficacy, goal orientation, and self-regulation in the Math 101 course two times in the semester during the implementation of the email intervention. After the initial assessment, 13 students were assigned to a control group, and the 41 remaining students were assigned to the experimental group. Within the experimental group, students were further divided into three different groups; their group assignment was contingent upon whether they responded to an email offering an extra credit point in the course. Of the 18 students that responded, nine received an email that was designed to enhance their sense of self-efficacy, and the other nine received a neutral email. The 23 students who did not respond did not receive any further correspondence. The results indicated that only the students that received the enhancing email showed an increase in self-efficacy while students in all other groups experienced a decrease or no change in their self-efficacy beliefs. The enhancing email intervention also significantly elevated students' endorsement of a mastery goal orientation. The intervention did not appear to have an effect on students' self-regulation strategies, their implicit theories of quantitative reasoning ability, or their academic achievement (i.e., course exam grades). Findings suggest that students' self-efficacy beliefs play a significant role in their academic achievement and should be regarded by teachers and schools as potentially modifiable constructs and feasible targets of an intervention.

126.

BONDED BROTHERHOOD: AN EXPLORATION OF RELATIONSHIP QUALITY AND MASCULINITY WITHIN FRATERNITIES AND GANGS

Geneva Gann '10
Faculty Sponsors: Randolph Lee, Dina Anselmi

It goes without saying that gang members have a very negative connotation within our society, as they are often associated with many illegal acts. Although being in a gang has a negative connotation, there are significant reasons young adolescents choose to take part in one, such as creating strong and long-lasting bonds. Fraternities, although they do not have the negative

connotation of gangs, create a similar bond among their members. Men often join fraternities in college to help them develop meaningful relationships. The present study looked at the security of bonds for both gang and fraternity members by studying their adult attachment style. Researchers have suggested that different attachment styles (i.e., secure, anxious and avoidant) developed in childhood may carry over and influence the quality of adult relationships. A second focus of research was on the degree of masculinity that gang and fraternity members would exhibit. My findings showed that gang members scored higher in masculinity compared to fraternity members ($\leq .0001$). The results also showed that more fraternity members had a secure attachment style while more gang members exhibited a dismissing style. Finally, the study showed that attachment style had no significant effect on either group's perception of masculinity.

127.
SOCIAL INFLUENCES ON MORAL JUDGMENT
Christopher DiBona '10, Geneva Gann '10
Faculty Sponsor: Dan Lloyd

Ones moral inclinations are not normally outwardly addressed or assessed by others. This study will examine the effects that the presence of other people has on the moral inclinations of the individual. More precisely, we will investigate whether a person's action may differ when placed in a group or individual setting, therefore altering another person's outcome in a specific situation. We will test this by examining an individual's moral judgment on whether to return a lost wallet or keep it for his/her own benefit. The study will be carried out in two different settings, one where many people are present, and one when there is a scarce amount of people in the area. Previous research has shown that people categorized as pro-self and pro-social have a strong inclination to be perceived as morally adept to situations (Van Lange & Liebrand, 1989). From this past research, it is hypothesized that individuals will be more morally inclined to return a wallet when they are in a large group compared to when there are not many people around them.

SOCIOLOGY

128.
THE ACADEMIC ATHLETE
Austen Afridi '11
Faculty Advisor: Theresa Morris

Thousands of American college students compete every year on collegiate sports teams while trying to succeed academically. Academics become of higher importance in Division three schools; sports are secondary. The following investigation presents the academic performance of a Division three in-season collegiate athlete versus a Division three out of season collegiate athlete. My source of data will be primary. I am interviewing 40 athletes at Trinity College. 20 of them are in season (spring) and the other 20 are out of season (Fall). Each of the 20 athletes comprised of 10 girls and 10 boys. Grade Point Average will be the measurement for academic performance. The participants were picked at random from a list of athletes from every fall and

spring team roster that was sub listed by gender. My logic is inductive so I have not hypothesized about the outcome of my research. My research design is a crossectional survey used at the end of the spring. After analyzing the athletes' responses to my questions, I have concluded that a student athlete in season's academic performance was superior to out of season academic performance. The majority of participants who believed they do better in season were out of season athletes. In season females athletes prove to perform academically superior academically than in season males.

129.

SELF-WORTH AND IDENTITY: STAY-AT-HOME MOTHERS VS. WORKING MOTHERS

Donna Austin '11
Faculty Sponsor: Theresa Morris

This research paper explores the identities of mothers and their sense of self-worth. I have examined what affects a mothers' sense of worth. I conducted primary qualitative research by way of focus groups. The design was helpful in obtaining data that was open, honest and rich in detail. The findings highlighted a reoccurring theme of strong immense feelings of guilt. It also showed that a woman's own mother and mother-in-law had a significant impact on how she defines what a "good" mother and wife should be. The data also showed differences in attitudes and behaviors toward husbands. The working mother and stay-at-home mother are constantly trying to find balance in all aspects of their lives. Many of the mothers struggle with finding their own identity and question their worth.

130.

PROFESSIONAL POKER PLAYERS: THE PATH TO CLAIMING PROFESSIONAL STATUS IN THE 21ST CENTURY

Jorge Ricardo Castro '10
Faculty Sponsor: Theresa Morris

This study focuses on examining the identity of full-time live (as opposed to online) casino poker players. Specifically, I ask the question: how and in what ways is poker becoming a professional activity, and poker player becoming a professional identity? Professional identification is discussed first in general, what makes on occupation "professional," then in more specific terms about which aspects of professionalization are specific to poker. My data was gathered through years of observation and participation in the Connecticut tribal casinos, as well as autobiographical data provided by professional poker players and news & information on legal/political issues related to poker in various print forms.

131.

PAPA WAS A ROLLING STONE: THE EFFECTS OF SINGLE PARENT FAMILIES ON THE ACADEMIC ACHIEVEMENT OF AFRICAN AMERICAN STUDENTS AT TRINITY COLLEGE

Alisa G. Cox-West ‘10
Faculty Sponsor: Theresa Morris

This study explores the effects on family composition on academic achievement. More specifically, this study sets out to investigate the effects of single-parent families on the academic achievement of students of color at Trinity College. With the decline of marriage in our current society, it is important to examine how such a change in family dynamic—whether through divorce, separation, or other factors resulting in single-parenthood—affects the children of those families. Using the theoretical framework of conflict theory, this paper takes a look at the struggle for resources (academic achievement and the obtainment of higher education) for students of single parents in comparison to their peers who live in a conjugal family or have two active parents present. I hypothesized that the dependent variable—academic achievement—will be negatively affected by the independent variable of single-parent families due to the lack of parental emotional support and presence. Using open-ended interviews of Trinity College students I was able to contextualize the effects of the independent variable on the dependent variable and draw conclusions that may better the Trinity community.

132.

SCHOOL CLIMATE FROM STUDENTS’ PERSPECTIVE

Claudia Dresser ‘10
Faculty Sponsor: Theresa Morris

A renewed interest by the current administration to assess the No Child Left Behind (NCLB) mandate suggests that educational researchers, anthropologists, and reformers should look more closely at the direct implications of school climate on student motivation and participation. My qualitative research project examines how school climate affects the schooling experience of urban minority students. In order to understand my research question, two surveys were administered to a purposive sample of 18 students at a local elementary school in Hartford. Ethnographic field notes were also collected. My findings suggest that there may be a causal relationship between school environment and students’ schooling experience, however I also found that there might be other factors that influence students’ educational experience.

133.

PRISON CROWDING: A BREEDING GROUND FOR VIOLENCE

Megan Emrick ‘11
Faculty Sponsor: Theresa Morris

This content analysis examines the effect overcrowding has on inmate violence. I hypothesize prison overcrowding has an effect on everyday life in prison and that crowding negatively leads to violent acts towards inmates and staff. Secondary data sources and longitudinal research were gathered and analyzed to show try to prove a positive correlation between the two variables. Violence from overcrowded prisons has canvassed the local and national news with reports of

violent acts stemming from populations increasing daily with increased inmate-on-inmate and inmate-on-staff assault rates. The findings are consistent with showing a positive relationship between prison overcrowding and violence.

134.
GENDEROSITY
Ian Fels ‘10
Faculty Sponsor: Theresa Morris

Generosity itself is a vague topic that is used as a positive description of selflessness in our society. Measuring generosity is difficult because it can take on numerous forms and meanings. However, I decided to measure generosity in relation to gender, either male or female. I wanted to find out which gender would be more inclined to give me money to get food. I hypothesize that women will be more likely to give me money and therefore be more generous then men. To test this I would stand outside of our school’s dining hall and ask every 5th person for money to get food out of a vending machine. Rembering to repeat a formulated question and reduce as many variables as possible I would keep track of responses made by individuals and limit their final answer to either a yes or a no. The results showed that women were more likely to give me money than men. My data was statistically significant because of my large sample size. In conclusion, women were more generous and gave me money more often than men. This research could be implemented throughout society for charitable organizations in helping them gain donations. In addition, marketers and advertisement companies may want to know which gender is more willing to give money depending on the situation.

135.
THE SEARCH FOR SERVICES: DISABLED POPULATIONS AND INTERNAL MIGRATION WITHIN THE UNITED STATES
Henry Fitts ‘10
Faculty Sponsor: Theresa Morris

While there has been considerable research on international migration, the body of research on migration internal to specific countries is limited. This study focuses on migrations within the United States, and the reasons for such movement. To focus the study, I chose disabled populations as a group to analyze because of their use of health and government provided services. This study will investigate whether disabled individuals migrate to areas and locations with better services. Based on a secondary dataset and other statistics on provided services, the study will analyze the possible causal relationship. Using migration theory and calling upon previous studies on migration, I seek to make inferences about the realities of life in America for the special needs and disabled. Understanding their behavior may not only reflect on service provision for the disabled, but also for the rest of the United States.

136.
REPRODUCTIVE HEALTH IN HARTFORD: AN EXAMINATION OF WOMEN SEEKING REPRODUCTIVE HEALTH SERVCES IN CONNECTICUT'S CAPITAL
Molly FitzGerald '10
Faculty Sponsor: Theresa Morris

The life experiences of American women vary extensively based on numerous factors, but American women, like women everywhere, share a physiology that allows them to conceive and bare offspring. However, this potentially uniting force currently separates women due to the cost of reproductive health care services in the United States. Women are divided into distinct groups, those who have comprehensive health insurance to cover the cost of care, and those who do not have the means to pay for private care and thus rely on community based health centers for services. Here I examine the level of access women in and around the city of Hartford, Connecticut have to reproductive health services. I am interested in how one's age, race, and income affect the accessibility of these vital services. I hypothesize that age, race, income are among the most important determinants of the level of access women have to reproductive health care, and that younger women who are racial minorities and do not make a substantial amount of money annually are the least likely to have their reproductive health care needs met. The data used in testing my hypothesis comes from a survey completed voluntarily by female patients at Planned Parenthood on New Britain Avenue. The questions asked pertain to service utilization and personal perceptions of accessibility. My results, though not significant at the alpha level 0.05, likely due to the small sample size used, show clear trends toward significance in many of the variables tested, and suggest that further research on the subject should be done in the city of Hartford.

137.
EDUCATION ON US SHORES: HOW IMMIGRANTS SUCCEED IN THE EDUCATIONAL SYSTEM
Abby Himmelrich '12
Faculty Sponsor: Theresa Morris

Groups of people in society in the United States have different educational attainments, and factors ranging from a family's socioeconomic status to personal opinions about the education system affect attainment. This paper examines the effects of immigration and more specifically, the country of immigration, on educational attainment. I hypothesize that immigrants from Central or South America would have lower educational attainments than immigrants from other (wealthy) countries. To do this study, I am using data collected by the 2004 National Survey of Latinos. I focus on questions that relate to country of origin and educational attainment, as well as race/ethnicity. My results show that there are no statistical differences when comparing Central American immigrants', South American immigrants' and European immigrants' educational attainment.

138.
A TRINITY TRIPOD EXCLUSIVE: MEDIA REPRSENTAION AND IDENTITY, DISCOURSE TO FOLLOW
Monete Johnson ‘11
Faculty Sponsor: Theresa Morris

Issues of media representation have been intensely studied in the field of sociology. Researchers have studied different aspects of media, from the production process itself, who is writing and funding these projects, to how groups are portrayed (if at all), to these implications on the general public. For my research, I have conducted a content analysis on a semesters worth of Trinity College Tripod to look at what it portrays about the students and thus the community as a whole. My hypothesis is that the Tripod will portray certain type of students as more important by emphasizing certain qualities, student organizations and sports, as well as by the specific way groups of people are framed. While much of my hypothesis was supported, I found that the Tripod also serves as a powerful tool for minority students to speak their mind about issues concerning themselves as well as the wider Trinity community.

139.
SINGLE-SEX EDUCATION OR COEDUCATION: THE DIFFERENCE IN ACADEMIC PREPARATION FOR COLLEGE
Kelsey Keating ‘12
Faculty Sponsor: Theresa Morris

This report examines the possible impact on a student’s academic performance single-sex education can have versus traditional coeducation. Using the Education Longitudinal Study, the experience of students enrolled in coed schools, all-girls schools, and all-boys schools were compared. It was expected that students enrolled in single-sex schools would achieve at a higher rate than those in coed schools. What was examined most closely was a student’s perceived ability to go to college and continue their education after high school. Statistical significance was not found between those students who attend single sex schools and being prepared for college. Yet, there was a slight difference between those in the two schools and student enrollment in AP classes.

140.
THE GLORY DAYS OF HIGH SCHOOL: A STUDY OF STUDENTS’ ACADEMIC ASPIRATIONS
Caroline Kelso ‘11
Faculty Sponsor: Theresa Morris

This paper examines the role one’s high school education plays in the future of his academic aspirations. While a significant margin of our government taxes are allotted to public education each year, I believe that the resources and technology of a private school education are unsurpassed, essentially putting those unable to attend such elite schools at a disadvantage. If a student’s ambitions are refused encouragement and go without reinforcement, the likelihood of maintaining such goals will decrease dramatically. In an effort to shed light upon high school students’ academic ambitions for the future, I set out to examine these results while taking into consideration the high school institution of each individual. My hypothesis states that the

facilities and services provided amongst private schools foster an environment that promotes interest in a higher education, and thus, private school high school students will show much more interest in attending graduate school. I explain this phenomena through the Structural Functionalist approach, each individual has expectations of the other's action and reaction to his own behavior, and that these expectations will originate from society's accepted norms and values. Structural Functionalists propose that the relatively small social groups that we belong to work according to the same principles of the larger society, and such, as impressionable minds, students are very much influenced by their communities, peers, and surrounding environments. While students are able to construct their own realities, these realities can differ based on the influence of certain academic institutions. I believe that the difference among these realities is a determinant of an individual's emphasis on acquiring the tools needed to attend graduate school. Using the data collected from the Inter-University Consortium for Political and Social Research Education Longitudinal Study, 2002: Base Year was used in my research to further explore this phenomena. The initial results indicate that one's high school education does in fact affect his academic goals for the future, where it suggests that attending a private school will increase the interest in receiving a graduate school education.

141.
CAN THE ARTS IMPACT STUDENT ACHIEVEMENT? EXPLORING STUDENT WRITING THROUGH MOVEMENT
Stacey Lopez '11
Faculty Sponsor: Theresa Morris

How can movement technique and skills impact student writing? This project examines the role that an arts-focused residency pilot program has on the written expression of 3rd and 4th grade students, as a result of using a movement- based language arts curriculum. I hypothesize that students who participate in the movement-based curriculum classes will demonstrate greater changes in their written expression compared to non-participating students in the same grade, on the same writing topic. I use the sociological theory of symbolic interactionism to explain how learning is a social process and how the integration of the arts, based on this understanding of learning, enhances the scope of individual student writing through a collective, social pedagogy.

142.
MIRROR, MIRROR, ON THE WALL: WHO'S THE MOST VAIN OF US ALL
Nuri Mahmoud '12
Faculty Sponsor: Theresa Morris

In social psychology the way one views them self as a physical, social and spiritual or moral being is extremely important. This self-image one has of themselves is closely tied with their social capital, it has an effect on how we act or interact with others. Vanity or one's concern for their own appearance can be very important to understand, especially on a college campus. Using the primary data collected from an observational field research on 132 Trinity College students this paper will examine the relationship between ones gender and vanity or concern for appearance. I will do this through a bivariate analysis between these two variables and also control for athleticism in order to further test the relationship. Results have shown that there is a statistically significant correlation between gender and vanity, women were found to be more vain than men.

143.

DISCLAIMER: UNDESIRABLE LONG TERM EFFECTS CAUSED BY ADOPTION?

Lira Park ‘12
Faculty Sponsor: Theresa Morris

Each year individuals are looking to adopt children throughout the world and ultimately place those children in an environment that is ideally better than where they were before. However, although the purpose of adoption is to help children, does it make children more susceptible to negative long-term effects by the time they reach adulthood? This paper examines the effect of loss, essentially involved with adoption, on one’s self esteem in adulthood. The loss involved with each adoptee is the independent variable while the adoptee's self esteem is the dependent variable. My hypothesis is that individuals with a high level of loss within their lives will be more prone to have a lower self esteem and ultimately engage in activities that are disadvantageous to their lives. The data used was collected by the Inter-University Consortium for Political and Social Research where a survey was sent out to families that used Holt International Adoption Agency. After analyzing the responses made by both the parents and the adoptees, I have concluded that not all adoptees are in negative situations in their point of adulthood, but rather are more at risk to experiencing negative long term effects.

144.

SOCIOECONOMIC STATUS RELATIVE INFLUENCE ON THE PROBABILITY OF DOMESTIC ABUSE OCCURRENCES

Monica Parker ‘11
Faculty Sponsor: Theresa Morris

This paper uses social-conflict and gender-conflict approaches to explain the inequality that makes women seen as property by men and how capitalism creates socioeconomic classes that causes unequal distribution of resources. When there is high unemployment, many families are having financial stresses that lead to tension and conflict within the household. Studies have shown that low-income families experience more domestic violence within the home versus the higher-income counterparts in society. The data used was collected from the Inter-university Consortium for Political and Social Research (ICPSR). The title of my data set is “Welfare, Children, and Families: A Tree-City Study”.

145.

WHO IS BEING PLACED IN OUR SPECIAL EDUCATION CLASSROOMS? THE STORY OF DISPROPORTIONALITY

Stephen Santos ‘11
Faculty Sponsor: Theresa Morris

The phenomenon that I intended to identify is whether a student’s gender and race affect the chances that they are placed in special education classes. My hypothesis is that the gender and race do play a critical role in the disproportionate numbers of referrals and placements of students in special education. The independent variables that I will be using will be the race and gender of special education students. The dependent variable that I will use will be actual placement numbers of special education students. Using questions posed to students in the Education Longitudinal Study, from the Inter-university Consortium for Political and Social

Research I will compare and analyze the number of students who are *placed* in special education classes with the actual numbers of students who actually are identified with a specific learning disorder. I will draw on various theories by multiple theorists explaining the phenomenon of why minorities (particularly African Americans) are disproportionately in special education classes around the nation.

146.

AESTHETICALLY APPEALING OR UNNECESSARY EMBELLISHMENTS: THE EVOLUTION OF BODY MODIFICATION IN COLLEGE STUDENTS

Natasha Scantlebury '12
Faculty Sponsor: Theresa Morris

This paper strives to examine the various reasons why traditional college aged students (ages 18-23) engage in body modification. Body modification, in the context of this paper, is defined as any decorative additions to the body in the form of ink and/or carvings (which is commonly referred to as tattooing), body piercings (other than traditional ear piercings which consist of one hole in each earlobe) and stretching (which is a modified version of body piercing in which healed piercings are stretched and enlarged). In a more general form, however, body modification refers to any conscious and purposeful alterations to the human body for non-medical purposes. The reasoning for engaging in body modification can range from religious and spiritual reasons to aesthetically and artistically appealing reasons. With this paper, I hope to spark an interest in understanding contemporary reasoning behind getting one's body modified especially in college students ages 18-23. I also hope to spark an interest in understanding this form of body modification as body art and not body mutilation.

147.

DOES SEX REALLY SELL? REACTIONS TO PEPSI ADVERTISEMENTS BASED ON GENDER

Liz Sherman '12
Faculty Sponsor: Theresa Morris

Advertising is something that infiltrates our daily lives in more ways than are seemingly possible. Previous studies have contradicted themselves in trying to prove whether or not sex in advertising is appealing or not to the viewer. Along with the sexual explicitness that is common in many advertisements, there are a number of other variables that can affect a person's reaction to a given advertisement. I have set out to investigate these reactions to different elements of two advertisements, one featuring a sexualized female and one featuring a humorous male for a gender neutral product, Pepsi. After analyzing survey results, I have concluded that in this case, sex is not the selling point for an advertisement.

148.

VIOLENT CRIME: A RESULT OF CONTEMPORARY ROCK MUSIC CONTENT?

Karina Torres ‘12
Faculty Sponsor: Theresa Morris

This study uses a content analysis of contemporary rock music in 1993 and violent crime rate data per census region to determine whether there is a connection between the music preference for rock music and the violent crime rates. I hypothesized that the regions where contemporary rock was liked would also be the regions where the violent crime rates were high, but this hypothesis was disproved following my research. The content analysis of rock music revealed many messages of aggression, antisocial behavior and mental instability. The analysis of secondary data on violent crime rates and music preference for rock music however revealed that there was no significant relationship between the two variables.