Name: Kylie Cowens  
Department: Animal Sciences  
Present Type: Poster  
Title: POLYBROMINATED DIPHENYLETHER (PBDE) DISRUPTION OF LIVER METABOLISM

Abstract:
PBDEs are a suggested disruptor of liver metabolism, although the physiological consequences of this disruption are unknown. The purpose of this study was to evaluate PBDE-induced histological and metabolic perturbations in the liver that may contribute to physiological changes. Sixteen male, weanling Wistar rats were gavaged daily for 28 days with 14 mg/kg body weight DE-71 (n=8, TRT) or corn oil (n=8, CON). After 48 hour fast, rats were euthanized and blood collected. Livers were removed, weighed, a portion fixed in formalin for histological examination, and the remainder frozen for later mRNA extraction and transcriptome profiling. TRT rats had greater liver weights compared to CON (14.2 vs 10.2 g, respectively, p<0.05), along with greater lipid vacuolation and 27% lower serum triglycerides, suggesting impairment of fat export from the liver. TRT rats had elevated serum ketones compared to CON, and a 1.4-fold increase in hepatic acyl-CoA synthetase long-chain 1, suggesting increased fatty acid oxidation (p<0.05). TRT rats were hypoglycemic compared to CON (91.6 vs 176.9 mg/dL, respectively, p<0.05), suggesting impaired gluconeogenesis. These data confirm that PBDEs disrupt liver metabolism and suggest physiological consequences to glucose and lipid homeostasis.
Name: Andre D Pereira
Department: Animal Sciences
Present Type: Poster
Title: Evaluating Carbon Fluxes Variability in Late Lactation Organic Jersey Cows Using a Portable Automated Gas Quantification System During the Grazing Season

Abstract:

The objective of the current study was to determine methane and carbon dioxide fluxes (JCH4 and JCO2, respectively), and carbon emissions variability from 7 primiparous and 3 multiparous lactating organic Jersey cows (200 ± 53 DIM and 13.3 ± 2.4 kg of milk yield). Measurements were taken from July to October 2012 yielding a total of 72 d of data collection. A portable, automated system [i.e., The GreenFeed® (GF) system; C-Lock Inc., Rapid City, SD] consisting of an air sampling and gas quantification modules, powered by solar energy, uses radio frequency identification and controlled release of pellet concentrates to reinforce voluntary visitations by individual animals several times throughout the day. Cows were moved to a new strip of fresh, mixed mostly cool-season grass herbage twice a day after each milking (am and pm) yielding a total of 17 h of access to pasture daily. Cows were supplemented with a TMR composed (DM basis) of 51% grass-legume baleage, 47% concentrate, and 2% liquid molasses fed via Calan doors. The GF was moved once daily to remain with the cows. Number of animal visitations to the GF, JCH4 and JCO2, within animal JCH4 and JCO2 coefficient of variation (CV), and between animal CV of 3 d rolling average were calculated. Average herbage DMI (6.5 kg/cow/d) was calculated by subtracting estimated total DMI (14.6 kg/cow/d; NRC, 2001) from measured TMR intake (8.1 ± 2.9 kg/cow/d), yielding a JCH4 of 21 g/kg DMI. Each animal averaged 128 ± 30 total visits to the GF. Daily JCH4 and JCO2 averaged 308 ± 18 g/d and 8,716 ± 519 g/d, respectively. The within animal emissions CV averaged 11.1% ± 2.13 and 8% ± 2 for JCH4 and JCO2, respectively, while the between animal emissions CV averaged 5.9% for both JCH4 and JCO2. Results suggest that the GF methodology for JCH4 and JCO2 measurements appears to be reliable and repeatable as indicated by the relatively low CV.
Abstract:
The invasive green alga Codium fragile subsp. fragile was first observed within the Northwest Atlantic during the 1950’s. It has spread to the Gulf of Maine and the Canadian Maritime Provinces, as well as southward to the mid-Atlantic. We are investigating the phylogeography of C. fragile in the Northwest Atlantic and have observed haplotype variation among populations in Prince Edward Island (PEI), Canada. We detected 2 rps3-rpl16 haplotypes, one of which was restricted to Malpeque Bay PEI. As chloroplast DNAs are too conserved for a population study, and there are no available nuclear sequences for Codium, we constructed a partial transcriptome using RNA seq. This library yielded 163 million reads averaging 93 bp that were assembled into 125,000 contigs, 68,180 were coding sequences. Of these, 29,000 were complete exons. Fourteen primer pairs targeting SNP and microsatellite regions were used to survey NW Atlantic populations. No nuclear variation was observed. The transcriptome’s coding sequences were queried against the BLAST non-redundant nucleotide database, and the translated protein sequences were queried against the Pfam and Signal Peptide databases. The BLAST resulted in 800 sequences matching other plants. While 36,000 sequences had matches to the Pfam database, and 8,000 sequences were determined to be either eukaryotic or prokaryotic based on signal peptide matches.
Abstract:

Photoreceptor phosphodiesterase (PDE6) is the central effector enzyme in the visual excitation pathway in rod and cone photoreceptors. Tight regulation of PDE6 is essential for the speed, sensitivity, recovery and adaptation of visual detection. Although the major steps in the PDE6 activation/deactivation pathway have been identified, we lack detailed information about the molecular organization of the PDE6 holoenzyme (αβγγ) needed for a mechanistic understanding of PDE6 regulation. The traditional methods (NMR and X-ray crystallography) to study PDE6 structure are not successful because of its high molecular weight and failure to express functional recombinant PDE6. Therefore, we structurally characterize the PDE6 holoenzyme with an integrative biochemical approach, utilizing chemical cross-linking, mass spectrometric analysis and computational modeling of the PDE6 catalytic dimer (αβ). Our models elucidate a parallel organization of the two catalytic subunits, with juxtaposed α-helical segments within the tandem regulatory GAF domains to provide multiple sites for dimerization. The two catalytic domains exist in an open configuration when compared to the structure of PDE2. Differential binding of the γ-subunit to the GAFα domain of the α- and β-subunit is observed, providing insight into the regulation of the PDE6 activation/deactivation cycle.
Abstract:

The objective of my thesis was to design and produce a unique, novel recombinant pituitary glycoprotein hormone (GpH) in a basal vertebrate, the sea lamprey (Petromyzon marinus). Lamprey GpH, unlike other pituitary hormones in jawed vertebrates, may control both gonadal and thyroid functions. In jawed vertebrates, there are three known heterodimeric pituitary glycoprotein hormones called luteinizing hormone, follicle-stimulating hormone and thyroid stimulating hormone, each consisting of α and β subunits. In any one species, the α subunit is identical while the β subunit confers specificity. Thyrostimulin, a recently discovered hormone, consists of subunits Gpα2 and Gpβ5. These subunits are considered to be ancestral to the vertebrate glycoprotein hormone family. In lampreys, there are only two putative glycoprotein hormones instead of the three found in all other jawed vertebrates. Lamprey GpH consists of Gpβ and Gpα2, a combination of subunits not previously discovered. The Gpβ subunit is a homolog of the β subunits for jawed vertebrate pituitary hormones. To test the hypothesis that lGpα2/lGpβ (lGpH) forms a biologically active heterodimer, a recombinant version of this hormone was designed and expressed in Pichia pastoris, a methylotrophic yeast. Recombinant products were purified using metal affinity chromatography and biological activity was assayed by measuring cAMP accumulation in COS7 cells transiently transfected with one of two lamprey glycoprotein hormone receptors (lGpHR-I, -II). The results show that the recombinant hormone elicited significant cAMP elevation in cells expressing lGpHR-I, but not lGpHR-II. In summary, recombinant lGpH was successfully designed, produced and shown to be biologically active. Funded by NSF IOS-1257476 and NHAES 00571.
Name: Krist N Hausken, Karen L. Carleton, James R. Gargan, and Stacia A. Sower
Department: Biochemistry
Present Type: Poster
Title: Analyses of Glycoprotein Hormone Receptor RNA Expression in Adult Sea Lamprey Treated with Lamprey Gonadotropin-Releasing Hormone-I, II or –III.

Abstract:

In the Sower laboratory, the working hypothesis is that there are primitive, overlapping, yet functional hypothalamic-pituitary-gonadal and hypothalamic-pituitary thyroid endocrine systems in the lamprey, a basal jawless vertebrate. These systems involve one and/or two pituitary glycoprotein hormones and two glycoprotein hormone receptors (Sower et al., 2009). This is in contrast to gnathostomes (jawed vertebrates), in which three or four glycoprotein hormones interact specifically with three glycoprotein hormone receptors. The functions of these glycoprotein hormones and receptors in lampreys have yet to be elucidated. To this end, the objective of my study is to identify the RNA expression of glycoprotein hormone receptors (GpHRs) in the adult sea lamprey, Petromyzon marinus, after injections with the hypothalamic gonadotropin-releasing hormones (GnRH)-I, II, or -III. To determine the RNA expression of the two identified glycoprotein hormone receptors (IGpHR-I, II, Freamat et al., 2006; Freamat and Sower, 2008) by real time PCR in ovary and thyroid tissues, sexually mature, female, adult sea lampreys were injected twice with either 50 μg/kg or 100μg/ kg of lamprey GnRH-I, -II, or –III, or 0.6% saline (control) 24 hours apart. 24 hours following the last injection, sections of ovaries and thyroid from each lamprey were removed, flash frozen, and stored at -80°C. Individual samples were homogenized, followed by total RNA extraction and cDNA synthesis. My ongoing progress includes the characterization of real time PCR for these studies. The results are expected to yield differential expression of each of the glycoprotein hormone receptors in the ovaries or thyroids in a dose-dependent manner. Funded by NSF IOS-1257476 and NHAES 00571.
Cervical cancer is the second most frequent cause of cancer-related death among women worldwide. Expression of keratin intermediate filaments within cervical cancer cells is diagnostic of metastasis, but may also protect the cells from immune-mediated death. In other cell types, keratin filaments consisting of one acidic (K8) and one basic (K18) subunit are O-GlcNAcylated, making the cells resistant to apoptosis. However, the role of K8/K18 filaments and O-GlcNAcylation in cervical cancer is not clearly understood. In general, hyper-O-GlcNAcylation of proteins is a common characteristic of many cancers. The present study investigated the role of O-GlcNAcylaion of K8/K18 keratin filaments in apoptosis of cervical cancer cells.

The cervical cancer cell line, SiHa cells, were treated with the O-GlcNAc transferase inhibitor, Alloxan, and the O-GlcNAcase inhibitor, PUGNAc, to promote states of complete O-GlcNAc removal (Gly-) and hyper-O-GlcNAcylation (Gly+), respectively. A comparison of Gly- and Gly+ whole cell lysates by gradient gel electrophoresis revealed three protein bands of interest. These proteins were identified via LTQ-Orbitrap with analysis on Protein Prospector database SwissProt. Additionally, cultures of Gly- and Gly+ cells were exposed to cytokines to assess cytokine-induced cell death.

Proteomic analysis of Gly- lysates revealed an up-regulation of the apoptotic protein, Programmed Cell Death Protein 5 (PCDP5) and down-regulation of the eIF4A complex, a downstream product of the Akt pathway. Moreover, O-GlcNAcylation had a significant effect on the susceptibility of cells to Fas ligand-, TNF-α-, and TRAIL-induced cell death (p=0.045). Gly+ cells were resistant to these cytokines, while Gly- exhibited increased susceptibility. Thus, O-GlcNAcylation in cervical cancer (i.e., SiHa cells) is postulated to augment the expression of cell survival proteins, and provide protection from cytokine-induced death. Supported by the COLSA Karabelas Fund.
Name: Kevin John Leahy
Department: Biochemistry
Present Type: Poster
Title: Charting the temporal maintenance of histone modifications in response to DNA damage

Abstract:
DNA damage in response to double stranded breaks is a serious threat to the integrity of the cell, as a result cells have developed a complicated set of responses collectively known as the DNA damage response to detect and repair this damage. This response is controlled through the use of post translational histone modifications which act to recruit DNA damage repair proteins to the damage site or in other cases to alter the chromatin-DNA interaction allowing for a wide variety of effects (gene silencing, easier DNA access). The goal of this project is to map the changes in histone modifications over time in response to double stranded breaks and elucidate the interactions of DNA damage response proteins to these histone modifications. While much work has been done on individual histone modifications few comprehensive efforts have been made to map histone modifications to the DDR protein network.
Sabah Ul-Hasan
Biochemistry
Poster
IDENTIFICATION OF GLYCOPROTEIN HORMONE SUBUNIT GPB5 IN LAMPREY, PETROMYZON MARINUS, PITUITARY

Abstract:

Sea lampreys, Petromyzon marinus, are one of two extant Agnathans (jawless vertebrates). Studying the sea lamprey offers an opportunity to examine the molecular evolution of glycoprotein hormones in vertebrates. The goal of my project is to determine the function and role of a pituitary glycoprotein hormone subunit, GpB5, by molecular cloning, phylogenetic and syntenic analyses, and functional studies. The glycoprotein hormone family in the pituitary of gnathostomes (jawed vertebrates) consists of follicle stimulating hormone (FSH), luteinizing Hormone (LH), thyroid Stimulating Hormone (TSH), and recently discovered thyrostimulin (TS). All glycoprotein hormones are heterodimeric and belong to the cystine knot family. In any one species, the alpha (A1) subunit of FSH, LH, and TSH is identical in amino acid structure while the beta (B1, 2, 3) subunit has a slightly different amino structure, conferring specificity. In contrast, thyrostimulin consists of unique subunits designated as GpA2 and GpB5. Unlike gnathostomes, lampreys possess one, novel pituitary glycoprotein hormone (GpH) consisting of a GpA2 and an ancestral B subunit instead of the three classical pituitary hormones (LH, FSH, and TSH). The results to date include the characterization of Petromyzon marinus glycoprotein hormone subunit GpB5 by genomic sequencing, molecular cloning, and phylogenetic analysis. The deduced amino acids of the cDNA sequence shows 10 conserved cysteine residues and one putative glycosylation site corresponding to GpB5 subunits across vertebrates and invertebrates. Phylogenetic and syntenic analyses confirms that Petromyzon marinus GpB5 belongs to the vertebrate GpB5 family. Functional studies are ongoing. In summary, the cDNA of sea lamprey GpB5 has been determined in the sea lamprey and it is proposed to form a functional heterodimer with GpA2. Funded by NSF 1257476 and NHAES 00571.
Abstract:

We numerically simulate the flow of a membrane bound capsule as it moves through a straight cylindrical channel with a sudden expansion or constriction. A three-dimensional axisymmetric volume of fluid method with a front tracking scheme is used to simulate the flow. The capsule flow dynamics are characterized by calculating the deformation parameter as the capsule flows through the expansion / contraction and the excess pressure drop required to maintain a constant flow rate. We study the capsule dynamics at a low but finite Reynolds number for a variety of drop sizes, elastic capillary numbers, and channel expansion ratios. The dynamic deformation of the capsule is determined for different constitutive equations for the membrane tension such as Hooke’s law, Mooney-Rivlin law and Evans and Skalak’s law for biological membranes. For small deformations, the non-linear constitutive equations reduce to the linear Hooke’s law. Geometries and elastic capillary numbers are chosen to ensure large deformations to highlight the effect of membrane tension laws on capsule behavior. In addition, the effect of membrane viscosity is also included in some of the dynamic studies. The viscosity of the encapsulated fluid also has a strong effect on the overall flow behavior of the capsule. At large capsule fluid viscosities, the motion and deformation of the capsule is damped and the effect of the different membrane constitutive laws on capsule dynamics diminishes.
Name: Tony Castagnaro
Department: Chemical Engineering
Present Type: Poster
Title: Overexpression and Characterization of a Laccase from Geobacillus Thermoglucosidasius

Abstract:

Laccases are multi-copper oxidases that can oxidize a disparate range of organic substrates using oxygen and producing water as a byproduct without requirement for additional reactive compounds, making them excellent candidates for industrial oxidants. Compared to fungal laccases which are difficult to produce in active forms in heterologous hosts due to incorrect glycosylation, bacterial laccases are much easier to express heterologously and are more active and stable at high temperatures, pH and salt concentrations. Geobacillus is a genus of Gram-positive thermophilic bacteria, many of which have been found to naturally secrete proteins at high levels. In this work, we successfully constructed a plasmid for the overexpression of laccase in Geobacillus. We now seek to isolate and characterize this laccase by determining the types of substrates it can oxidize, along with its temperature and pH stability.
Name: Ye Deng
Department: Chemical Engineering
Present Type: Poster
Title: Transgenic Expression of Thermomyces Lanuginosus and Candida Antarctica Lipases in Plants for the Enzymatic Production of Biodiesel

Abstract:

Enzymatic transesterification with lipase as the catalyst eliminates soap formation. Unlike alkali-based reactions, the products can easily be collected and separated. Moreover, enzymes require much less alcohol to perform the reaction, and can be reused despite some loss in activity at the end of each cycle. We have genetically engineered plants to constitutively express a lipase for biodiesel production from spent oils. We have cloned the gene of a lipase with known transesterification activity from Thermomyces lanuginosus, and Candida antarctica. Cloning of TL enzyme involved isolation of total RNA, reverse transcription of the mRNA into cDNA and PCR amplification of the lipase gene using specific primers. The gene was first inserted into a cloning vector (pCR8/GW/TOPO) and sequenced to confirm its identity. The gene has been inserted into a plant destination vector (pGWB408 and pMDC83) via LR clonase reaction. Nicotiana tabacum (tobacco) leaf was transformed with the lipase gene using Agrobacterium tumefaciens (strain GV3101) and transferred onto selection media plates. We have also grown Arabidopsis thaliana from seeds that were transformed using the floral dip transformation method. The recombinant enzyme was collected from the genetically engineered plants, purified, and tested for both hydrolytic and synthetic activity. The activity results will be compared with enzyme catalysts from commercial Thermomyces lanuginosus and Candida antarctica, and the effect of solvent addition will also be presented.
Abstract:

An aqueous high concentration polymer solution has been proven effective as an anti-traction material (ATM). The anti-traction property however is highly dependent on the water content of the solution. Using emulsion polymerization, the ATM material will be encapsulated in a semi-impermeable encapsulant to increase the time over which the material remains effective regardless of the external environment. An effective encapsulant will prevent water loss over a wide range of temperatures, allow for the encapsulation of a large volume of material relative to the capsule shell thickness, and rupture easily under foot pressure. Different polymer shell materials, reaction times, and additives are tested to determine the optimum conditions for encapsulation. Water permeability of the capsule shell is measured by monitoring osmotic swelling of the capsule in an aqueous solution. The minimum force to rupture the capsule shell is measured as a function of reaction parameters and shell thickness. The capsules’ carrying capacity of anti-traction material will be evaluated in conjunction with the force required to rupture the shell.
Helicobacter pylori, microaerophilic Gram-negative bacteria which resides in the stomach causes peptic ulcer and gastric cancer in humans. Currently employed treatment methods include antibiotics, bactericidal agents and antiprotozoal agents. However treatment over prolonged periods using current methods results in side effects and drug resistance. Hence more selective and effective drugs are to be developed to combat these limitations. In an attempt to contribute in that direction, we propose the synthesis of natural products CJ-12,954 and CJ-13,014, which were found to be potent anti-Helicobacter pylori agents, using a zinc mediated tandem chain extension-aldol methodology which was developed in our group. Spirocyclization of the hemiacetal derived from β-keto imide, subsequent hydrolysis to carboxylic acid followed by Barton decarboxylation completed the formal synthesis. This approach can further be extended in our research group to synthesize similar molecular frameworks having biological activity. Successful syntheses of these natural products can lead to the development of new anti-Helicobacter drugs once they are tested on various specimens.
Name: Peter Frank  
Department: Chemistry  
Present Type: Oral  
Title: Intra-chain photodimerization of pendant anthracene units as an efficient route to single-chain nanoparticles fabrication

Abstract: We report the synthesis of single-chain nanoparticles using the photodimerization of anthracene as an intramolecular cross-linking reaction. Polymers with various amounts of anthracene incorporation were synthesized via RAFT polymerization. Dimerization of anthracene, induced by 350 nm centered UV light, was monitored by observing the disappearance of the characteristic absorption peaks in the UV-VIS spectra. Size exclusion chromatography (SEC) measurements confirm the folding of the linear chains into particles via shifts to longer retention time, indicating a reduction in the hydrodynamic volume.
Name: Caitlin Hoffman
Department: Chemistry
Present Type: Poster
Title: New Synthetic Routes to Graphene Nanoblocks

Abstract:

Because they are precursors to graphene nanoribbons, the synthesis of graphene “nanoblocks” has become of intense recent interest. Previous nanoblock precursors, primarily periacenes and circumacenes, have been available only in small quantities. Our proposed synthetic routes will utilize superacid/oxidant conditions to efficiently generate m, n-periacenes. Microwave flash pyrolysis (MFP) will be used to form circumacenes in gram scale quantities. The synthesis of bisanthene will be optimized. Smaller circumacenes have been explored; however a short, efficient synthesis has not been reported. MFP offers both these advantages. Making these substances readily available will contribute to the fields of organic dyes, electronics, and even bioimaging.
### GRC Presenter Abstracts

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<tr>
<th>Name:</th>
<th>Tong Jin</th>
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<tr>
<td>Department:</td>
<td>Chemistry</td>
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<tr>
<td>Present Type:</td>
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<td>Title:</td>
<td>Combining molecular catalysts and nanostructured surfaces for solar CO2 reduction</td>
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**Abstract:**

Carbon dioxide (CO2) is a renewable carbon feedstock for the production of chemicals, materials, and fuels. Photochemical reduction is a promising approach to achieving sustainable CO2-to-fuel conversion. Our current research focuses on developing innovative hybrid photocatalysts for use in solar CO2 reduction. The photocatalysts are prepared by attaching molecular catalysts based on transition metal complexes onto nanostructure surfaces. A variety of techniques, including in situ FTIR spectroscopy, were used to characterize the surface molecular catalysts. Our research highlights the advantages of integrating well-defined molecular catalysts with robust solid-state surfaces in solar energy applications.
Abstract:
Aromatic hydrocarbons readily undergo rearrangements under acidic conditions. Through formation of an arenium ion intermediate, group migrations and skeletal rearrangements can occur. The research presented will focus on rearrangements of different aromatic compounds. Computational models will also be presented that explain the observed product distributions. These rearrangements can also be observed through formation of a free radical intermediate. Results on these types of rearrangements will also be presented.
Cyclization and coupling reactions are also common in polycyclic aromatic hydrocarbons and are observed under similar conditions molecular rearrangements. Reactions of this type will also be presented.
Name: Chao Liu  
Department: Chemistry  
Present Type: Poster  
Title: Heterogenized Molecular Catalysts for Solar CO2 Reduction

Abstract: Carbon dioxide is a renewable C1 feedstock for the production of chemicals, materials, and fuels. Molecular catalysts based on metal-ligand complexes are highly efficient in mediating multi-electron CO2 reduction. Integrating molecular catalysts with surfaces could improve stability, enhance reactivity and provide novel reaction pathways. It remains a challenge to effectively couple catalysts with energy sources (photosensitizers and/or electrodes.)
Name: Kyle Joel Rodriguez
Department: Chemistry
Present Type: Oral
Title: Exploring Syntheses of Arene-Thiolate Ligands possessing internal N—H···S Bonding

Abstract:
Select heme-thiolate proteins have become a popular research topic due to their versatility in biological systems. The hydrogen-bonding environment that envelops the cysteine heme ligand by NH···S type hydrogen bonds from the peptide backbone is believed to play a critical role in determining the function of the enzyme. The goal of this project is to synthesize model heme-thiolate protein active sites to explore the hydrogen-bonding network inside native proteins’ active sites. The model ligand series design is based off of previously studied 2-(acetylamino)thiophenolate and 2,6-bis(acetylamino)thiophenolate derivatives as well as 2-(acetoxy)thiophenolate and 2,6-bis(acetoxy)thiophenolate derivatives. The design and synthesis of these model ligands will provide varying electronic and structural features that will mimic the native hydrogen-bonding network of heme-thiolate proteins.
Deanna M Silva
Department: Chemistry
Present Type: Poster
Title: The Development of Polymerization and Fluorescence Spectroscopic Methods for Ratiometric Fluorescent Ion Indicators

Abstract:
Ratiometric fluorescent ion indicators were developed for the sensing of free copper in aqueous solutions. A Zeiss LSM 510 META Confocal Microscope and a Varian Eclipse Spectrofluorometer were used to measure a ratiometric fluorescence resonance energy transfer (FRET) signal. Two polymerization methods were used to develop the sensors: Atom Transfer Radical Polymerization (ATRP) and Reversible Addition-Fragmentation Chain Transfer (RAFT). The fluorescent ion indicators were prepared by adding an amine-reactive fluorophore to amine functionalized silica nanoparticles. A polymerization method was employed to grow strands of poly(n-isopropylacrylamide)-co-3-(aminopropyl)methacrylamide from the silica gel surface. A metal coordinating ligand was polymerized into the p(NIPAm-co-APMA) strands for the sensing of free copper ions. A second fluorophore was reacted with the polymer. An increase in temperature of p(NIPAm-co-APMA) strands induces a thermal phase transition of p(NIPAm) causing the polymer to collapse onto the surface; reducing the distance between the donor and acceptor fluorophores. At a specific temperature, ion binding yields a change in the ratiometric FRET response of the polymer indicating the presence of free copper in solution.
Name: Christian Alexander Tooley  
Department: Chemistry  
Present Type: Oral  
Title: Design and Synthesis of Polymer-bound Azadithiodiiron Cluster Model Complexes to Model [FeFe] Hydrogenase

Abstract:  
Due to increasing output of harmful greenhouse gases, clean energy routes are being developed to combat damage to the environment. A solution to reducing greenhouse gas emissions is hydrogen fuel cells, which convert H2(g) and O2(g) to water. Unlike traditional batteries that are limited by finite lifetimes, fuel cells can last indefinitely as long as a source of H2(g) and O2(g) are readily available. Since O2(g) is naturally abundant, developing a catalyst for producing H2(g) in situ to sustain a fuel cell is necessary.

Nature has allowed for the evolution of efficient enzymes to catalyze the oxidation and production of H2(g) at a mild reduction potential (-0.4 V vs. NHE) and neutral pH, namely hydrogenase. Each hydrogenase is characterized by the metallic active site: [NiFe], [FeFe], and [Fe]. [FeFe] hydrogenase has the highest turnover frequency for both production and oxidation of H2(g). Hence, many synthetic models of the active site of [FeFe] hydrogenase have been characterized. However, each model reduces at approximately -1.6 V vs. NHE and in mildly acidic conditions. The protein environment must play an important role in tuning the redox potential of the active site.

We propose covalently anchoring and enveloping a synthetic model complex of [FeFe] hydrogenase to a polyamide backbone will allow the metal center to reduce at milder potentials in this peptidic environment. Herein, we report various polymer backbones bound to an active site analog of [FeFe] hydrogenase using thiol-ene "Click" chemistry. X-ray crystallography, NMR and IR spectroscopy were used to characterize the structure of the model active sites. Molecular weight distribution was acquired by size exclusion chromatography (SEC).
Name: Varouna Appiah  
Department: Civil Engineering  
Present Type: Poster  
Title: Characterizing Manganese Removals in Rapid Biofiltration Systems

Abstract:
Manchester Water-Works Drinking Water Treatment Plant (MWTP) sources its water from Lake Massabesic. During the summer months, the level of manganese in the incoming water reaches up to 0.25 mg/L. Consequently, the biofilters in their treatment train are operated at an elevated pH of 8.0 with the aim of enhancing manganese removal.

The objective of this study is to comprehend biological removal of manganese. The study will first look into differentiating between biological removal and MnOx media coated removal of manganese in sand filter columns. Results from high temperature conditions will be compared to those in low temperature conditions. It is hypothesized that biological removal will be negligible at the low temperature condition. Similarities and differences in removals and rate constant will help establish and quantify biological removal actually occurring in the filters.

The treatment train at MWTP involves rapid mixing, coagulation/flocculation/sedimentation, ozone disinfection, and anthracite and GAC filtration. The water being used in the laboratory experimental setup is from MWTP right after the ozonation process. It is hypothesized that the amount of phosphate remaining in this water having may be limiting biological activity, and thereby biological removal of manganese. Therefore, the addition of phosphate to the water to enhance biological activity for manganese will be investigated.

Numerous bacteria capable of synthesizing manganese are also capable of doing the same for iron (Degrémont and Ondéo, 2002). While some bacteria will specifically choose manganese over iron, others will likely choose iron if the latter is more accessible. Therefore, this section of the study investigates whether adequate amount of manganese will still be removed despite iron being at a competing level.
Graduate Research Conference

GRC Presenter Abstracts

Name: David Mensching
Department: Civil Engineering
Present Type: Poster
Title: Low temperature properties of plant-produced RAP mixtures in the Northeast

Abstract:
The impact of reclaimed asphalt pavement (RAP) materials on pavement performance is an important topic of study in the industry due to environmental and cost benefits. The primary concern for increasing allowable RAP percentages in hot mix asphalt relates to the presence of aged materials, which may embrittle the mixture and decrease cracking resistance. Low temperature cracking is a major distress in cold temperature climates. Currently, there are several procedures to analyze low temperature performance of asphalt binders and mixtures. These methods use different starting temperatures and cooling rates that may not represent actual field temperatures and cooling rates. This paper presents the results of a study on low temperature performance of plant-produced RAP mixtures. Eighteen mixtures from three states were tested with varying RAP contents and different virgin binder grades. The objectives of the study were To- (1) evaluate the impact of cooling rate and starting temperature on the critical cracking temperature of RAP materials; (2) evaluate the impact of RAP content on the low temperature properties of mixtures; (3) evaluate the benefit of using softer virgin binder grades to mitigate the impact of the aged RAP binder in the mixture; and (4) to compare the low temperature cracking properties determined from different mixture and binder tests. Based on the results, warmer starting temperatures and faster cooling rates result in warmer critical cracking temperatures for all mixtures. Based on results from the Indirect Tensile Test, tensile strength increases with RAP content. The data also shows that analysis procedure and test protocols can have a profound effect on critical cracking temperature. The conclusions presented reinforce the need for more accurate representation of RAP materials, and careful selection of analysis parameters.
GRC Presenter Abstracts

Name: Lukas Moschen
Department: Civil Engineering
Present Type: Oral
Title: A response spectrum method for assessment of peak floor acceleration demands in elastic regular frame structures

Abstract:

In this paper an extended complete quadratic combination rule for quick assessment of peak floor acceleration demands (PFA) of elastic structures subjected to seismic excitation is proposed. The simplification from time history analysis to the response spectrum method is shown in detail. Based on a relative acceleration formulation combined with nonlinear optimization techniques cross correlation coefficients are determined to estimate relative and absolute PFA demands. For estimation of central tendency and dispersion of the seismic response, regression equations are derived to provide a simple implementation of the method in civil engineering design practice. Application of the proposed procedure to a 24-story moment resisting generic frame structure shows the improvement compared to common response spectrum methods.
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<tr>
<td>Department:</td>
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<td>Present Type:</td>
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<td>Title:</td>
<td>Epistemic Uncertainty Reduction on Collapse Simulation of Multi-Story Buildings Through Hybrid Testing</td>
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Abstract:

A numerical updating approach within fully simulated hybrid testing through collapse with substructuring is presented. The procedure is aimed to reduce the inherent epistemic uncertainty in hybrid simulation and the consequent systematic propagation of errors along the test.

Conventional hybrid testing with substructuring assumes that the component properties of the numerical substructure are either well known or can be represented with a high degree of fidelity. Properties are usually obtained based on protocoled testing procedures or data from previous tests published on the specialized literature. However, a high level of correlation on the component parameter values is not always possible to achieve. Thus, epistemic uncertainty associated with the lack of knowledge in accurate calibration of component properties could arise from different sources.

The proposed approach is based on utilizing the measured response from the experimental substructure to update during the test the parameters of the numerical components of the substructure.

The main research objective is to improve the ability to predict and simulate collapse through hybrid testing with substructuring techniques, via mitigation of epistemic uncertainty associated to component properties. The completion of the objective includes: 1. the reliable estimation of updated information on the most important modeling parameters that control the response of multi-story structures near collapse and, 2. the reduction of uncertainty in numerical component responses of conventional hybrid simulation.

Results of the hybrid simulation using the proposed numerical updating approach on several cases including component parameter random errors are to be discussed.
Abstract:

Suspended ion exchange (SIX) has been shown in ongoing bench and pilot scale research as being adept at removing organic precursors (NOM) and nitrate, and increasing advanced oxidation efficiency, as an alternative to sludge-producing coagulants. For this system, salt use during regeneration is a key sustainability concern. This research reports on using adsorption stoichiometry and kinetic models to monitor salt use and optimize process design and operation.

A best-fit model for exchange stoichiometry was built based upon experimental data for lab created waters and IJssel Lake water. The linear regression models were then applied to kinetic removal data collected for three different resin types. The performance of each resin was quantified using chloride-use efficiency, or the percent of total chloride exchange attributed to the exchange of target constituents (i.e. NOM and nitrate).

Using the model and the chloride-use metric, contact time and resin type (specifically the nitrate selective resin) were identified as significant factors to minimize chloride use during regeneration. The potential savings from different scenarios with varying contact times and resin types were quantified and these findings are being applied to the optimization of the full scale 32 MGD SIX treatment plant known as Andijk III, being constructed by PWN Water Company, Netherlands.
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<tr>
<th>Name:</th>
<th>Shokoufeh Zargar Shoushtari</th>
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<tr>
<td>Department:</td>
<td>Civil Engineering</td>
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<td>Present Type:</td>
<td>Poster</td>
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<tr>
<td>Title:</td>
<td>Experimental Studies on the Inelastic Behavior of Deep Steel Columns Subjected to Large Deformation Demands and High Axial Load</td>
</tr>
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</table>

Abstract:

Exterior columns in perimeter steel moment resisting frame structures exposed to strong earthquakes experience bending moment demands with high levels of axial load due to overturning. Deep wide flange sections can be used as exterior columns to increase the lateral stiffness of moment frames without significantly increasing the overall weight of the structure. However, there is a lack of available data on the response of these sections when exposed to large drift and axial load demands. The poster introduces results from an experimental program used to identify and evaluate the dominant failure modes and the effect of axial, drift, and rotation demands on the behavior of deep steel columns to collapse. Moreover, the quantification of relevant model parameters used to characterize the strength and stiffness deterioration present in deep wide flange columns is conducted. The experimental program involves testing six 1:8 scaled W36X652 column sections exposed to quasi-static (monotonic and cyclic) lateral drift and rotation protocols in the presence of constant and variable axial loads. The column specimens are subjected to drift ratios of up to 10% and axial load demands of up to 60% of the axial load carrying capacity of the column.
Abstract:

Individuals with disabilities experience health disparities including but not limited to cancer screening, obesity care and prevention, and screening for and prevention of heart disease and stroke. Some of the largest disparities are in oral health and women’s reproductive health. To address these disparities, oral health and women’s reproductive health handouts were created to educate individuals with disabilities and their caregivers on the importance of visiting health providers regularly. In collaboration with the New Hampshire Institute on Disability, this leadership project aims to empower individuals with disabilities to utilize preventative health and screening.
Abstract:

Our research looks at the impact of a leadership program on the fidelity of implementation of the "Healthy Families America" home visiting standards within the state of New Hampshire.

Our role in the project has been to collect qualitative observations during the training sessions. We were particularly interested in documenting the engaged and disengaged behaviors of team members and observing the impact of engagement during the sessions on adherence to the program.
Abstract:
Hop-by-hop transport and in-network storage have been widely used in intermittently connected networks. As a way to provide hop-by-hop congestion control, backpressure has been used in hop-by-hop transport and in-network storage protocols to provide quick congestion alleviation. However, relying on backpressure to direct traffic can introduce large packet delays, especially when traffic load is light, which in turn can degrades the energy efficiency of the system.

In this paper, we propose a cross-layer protocol, Reactive Store-and-Forward (ReSaF) protocol. This protocol adopts a conditional-forwarding routing algorithm to route packets on a per-block basis. The conditional-forwarding algorithm takes advantage of estimated delivery probability, available buffer space and energy level of nodes to provide an energy efficient way to delivery packets with a high rate of success.
Graduate Research Conference

University of New Hampshire Graduate Research Conference
April 16 and 17, 2014
Poster Presentations Whittier Center Arena
Oral Presentations Holloway Commons Conference Rooms

GRC Presenter Abstracts

Name: Patrick Ian MacArthur
Department: Computer Science
Present Type: Oral
Title: An Efficient Method for Stream Semantics over RDMA

Abstract:
Most network applications today are written to use TCP/IP via sockets. Remote Direct Memory Access (RDMA) is gaining popularity because its zero-copy, kernel-bypass features provide a high throughput, low latency reliable transport. Unlike TCP, which is a stream-oriented protocol, RDMA is a message-oriented protocol, and the OFA verbs library for writing RDMA application programs is more complex than the TCP sockets interface. UNH EXS is one of several libraries designed to give applications more convenient, high-level access to RDMA features. Recent work has shown that RDMA is viable both in the data center and over distance.

One potential bottleneck in libraries that use RDMA is the requirement to wait for message advertisements in order to send large zero-copy messages. By sending messages first to an internal, hidden buffer and copying the message later, latency can be reduced at the expense of higher CPU usage at the receiver. This presentation presents a communication algorithm that has been implemented in the UNH EXS stream-oriented mode to allow dynamic switching between sending transfers directly to user memory and sending transfers indirectly via an internal, hidden buffer depending on the state of the sender and receiver. Based on preliminary results, we see that this algorithm performs well under a variety of application requirements.
Abstract:

Magnetic susceptibility (MS) is a mixed signal in marine sediments, representing primary depositional and secondary diagenetic processes. Production of hydrogen sulfide via anaerobic oxidation of methane (AOM) at the sulfate-methane transition (SMT), and sulfate reduction (SR) above the SMT results in the dissolution of iron oxides, altering MS in sediments in methane gas and gas hydrate bearing regions. We investigated records of MS on the Cascadia margin (ODP Sites 1249 and 1252; IODP Site 1325) using a Zr/Rb heavy mineral proxy from XRF core scanning to identify intervals of primary MS and intervals altered by early diagenesis. The upper 100 m of Site 1252 contains a short interval of MS driven by primary magnetite, with multiple intervals (> 90 m total) of decreased MS correlated with elevated sulfur content, consistent with dissolution of magnetite and re-precipitation of pyrite. MS in the upper 90 m of Site 1249 is almost entirely altered by diagenetic processes, with much of the low susceptibility explained by a high degree of pyritization, and some intervals affected by precipitation of magnetic iron sulfides. At Site 1325, MS 0-20 mbsf represents primary mineralogy, between 20-42 and 46-51 mbsf MS may be reduced due to pyritization, and 42-46 and 51-80 mbsf MS is primarily driven by detrital magnetite with peaks of MS driven by the presence of magnetic iron sulfides. This integrated approach allows for a prediction of primary MS and the amount of MS loss at each site when compared to actual MS measurements. In the case of magnetite dissolution and full pyritization, these drawdowns in MS are supported by sulfur measurements, and the exposure times of magnetite to H2S can be modeled. The presence of methane and methane hydrates at these sites, as well as large variations in TOC content, suggest that the past migration rates of the SMT and variation in SR may be driving factors of MS alteration along the Cascadia margin.
Abstract:

With increasing suburbanization in coastal New England watersheds, anthropogenic dissolved inorganic nitrogen inputs to river systems from atmospheric deposition, fertilizers, and septic systems are increasing and threaten the ecological health of these areas. This research determines the spatial variability of nitrate uptake in headwater stream reaches by focusing on a stream reach of Sawmill Brook located in Wilmington, MA containing a wetland area and a forested channel. Nitrate uptake rate constants were determined within benthic chambers and used to characterize the variability of nitrogen uptake at this site. The nitrate flux exiting the study site (relative to entering flux) was estimated by combining the wetland residence time distribution and the mean patch-scale uptake rate constant for the wetland. Uptake rates within the wetland were found to be variable but significantly higher than observations in the adjacent forested channel, resulting in faster reduction in nitrate. Therefore, headwater fluvial wetlands are likely important for nitrate uptake in urbanizing New England rivers.
**GRC Presenter Abstracts**

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<tr>
<th>Name</th>
<th>Sophie M Wilderotter</th>
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<td>Department</td>
<td>Earth Sciences</td>
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<td>Present Type</td>
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<td>Title</td>
<td>Distribution of Fluvial Wetland Area and Stream Elevation along the Lamprey River</td>
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</table>

**Abstract:**

River networks provide the important ecosystem service of nutrient retention, with much of that retention of natural and anthropogenic inputs occurring in biologically productive hot spots including off-channel fluvial wetlands. The functional significance of wetlands depends on their connectivity with the stream channel and their location within the river network which is important in network-scale nutrient cycling. We used ArcGIS to compare existing spatially explicit datasets for river networks, stream channel elevation, and fluvial wetland extents. Stream elevations along the main stem of the Lamprey River were obtained from creating 5 meter reaches by placing evenly spaced points on top of the stream flowline. LIDAR data was interpolated to these points. Wetland area within 100 meters from the stream channel was summed for stream reaches of 200 and 500 meters using the National Wetland inventory dataset which was ground truthed at one study site by comparing to wetlands delineated in the field. Stream elevation decreased downstream at varying rates; with sections of low stream slopes and sections with high stream slopes. Stream-connected wetland area was higher in the low stream slope sections, and was lower in the sections with higher stream slopes. An improved understanding of the distribution of fluvial wetlands will be useful for predicting the location and magnitude of nutrient retention in New England coastal rivers.
GRC Presenter Abstracts

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<th>Name:</th>
<th>Jia Gao</th>
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<td>Economics</td>
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<td>Present Type:</td>
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<td>Title:</td>
<td>Maternal Employment, the School Breakfast Program and State Mandates: Case Studies of New Jersey and Illinois</td>
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Abstract:

In an effort to increase the School Breakfast Program (SBP) participation, NJ and IL implemented mandates requiring certain schools to offer this program in 2004 and 2005, respectively. In this paper, we perform case studies of NJ and IL to investigate effects of the mandates on maternal labor supply, by using CPS data during 1997-2012 and employing difference-in-difference models and a synthetic control approach. Although we fail to obtain consistent results from these two methods, our results do suggest that there exists a spillover effect of the SBP on maternal labor supply. From a policy perspective, this study may help policy makers to better design the program.
Abstract:

My work identifies and explains the key differences between the two leading models used in evaluating teachers based on student test scores. In recent years there has been a strong push to improve K-12 teacher quality, and teacher performance data are increasingly used in pay, tenure, and retention decisions. Underlying this trend is the question of how to measure teacher quality. Currently, teacher evaluation is based heavily on classroom observation, as well as peer and administrator evaluations. While few policy makers suggest these subjective measures should be discarded, many advocate for the inclusion of more objective measures of teacher performance based on student test scores.

While conceptually similar, the two models differ in estimation method and can lead to sizably different estimates of classroom effects. Specifically, I show the two models disagree about an estimated classroom effect when the classroom distribution of test scores (conditional on prior test scores) is skewed (i.e. when a classroom serves a disproportionate number of high- or low- growth students). Further, and more importantly, the magnitude of this skewness needed to drive these models apart by three or more deciles is well within the range observed in actual classroom data. This finding is significant because states implementing this type of evaluation typically select a single model to use and assign the estimated classroom effect to the teacher. As such, a teacher who appears to be a poor teacher in the selected model may appear to be a good teacher when evaluated by the other. If these types of evaluation are to be used in high-stakes decisions such as payment, retention, and tenure, a complete understanding of the implications of model choice is vital.
Investor sentiment is the attitude or feeling about future stock returns. Its importance has been increasingly recognized due to its seemingly close association with the episodes of U.S. stock market bubbles and crashes in recent decades and the inability of traditional financial theory in explaining these episodes. This paper investigates how the market can better guide the movement of investor sentiment and whether an extra profit exists by arbitraging on the biases caused by investor sentiment. In particular, a respective study of individual investor sentiment and institutional investor sentiment is conducted.
Name: Smart Louise Carrie
Department: Education
Present Type: Poster
Title: Development of a Lunch Time Training Module - Responsive Practice: Improving Health Care and Screening for Individuals with Disability

Abstract:

The information represented in this poster is a lunch time learning module regarding responsive care for public health care workers in New Hampshire. The module was created to remind public health care workers to take the time to learn about disability and people with disabilities in order to better support the overall health of their communities and to enhance the level of care provided during health visits. This first module on responsive care focuses on person-first language with discussion relating to barriers, prevalence and disparities faced by individuals with disability seeking health care. It also provides suggested strategies and approaches for enhancing NH's public health care for individuals with disability.

The NH Disability and Public Health (DPH) project is directed by Dr. Charles Drum at the Institute on Disability. This poster reflects the interdisciplinary work completed by NH Leadership Education in Neurodevelopmental Disability (LEND) trainees and their mentor. The DPH project includes more than training modules. For more information about the DPH project, its sponsors and partners you can visit the following website http://iod.unh.edu/Projects/dph/project_description.aspx. For more information about the NH LEND program visit: http://www.mchlend.unh.edu/home.aspx.
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<tr>
<th>Name</th>
<th>Shaleen Cassily</th>
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<td>Department</td>
<td>Education</td>
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<td>Present Type</td>
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<tr>
<td>Title</td>
<td>Literature: A Transition Object to Create a Curriculum of Mourning</td>
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Abstract:

My paper proffers a curriculum of mourning using the suffering experienced by students in the film Freedom Writers as a contextual example. I first turn to Zembylas’s notion of a pedagogy of mourning to argue for the restructuring of classrooms as affective places that would allow students to mourn the loss and disillusionment in their lives. However, Zembylas does not address what a curriculum of mourning might look like. This becomes my departure point for considering Farley’s 2009 article “Radical Hope: Or, the Problem of Uncertainty in History Education” as an analytic paradigm to discuss Freedom Writers as a curriculum of mourning. As Farley outlines, curricula needs to address the “difficult knowledge” of students’ lives to allow them to make sense of it, or as Freire says, they must be able to “name the world” (1970) in order to begin to change it. Finally, I turn to Winnicott’s theory of transitional objects and phenomenon to explore the transformative possibilities of language and literature for opening up space for students and teachers to re-symbolize the reality of their lives.
Abstract:

This presentation comes from the part of the 6 month ethnographic course project. The second language acquisition (SLA) is also the acquisition of a second culture. In terms of learning second language as learning second culture, it is important to understand what the process of culture learning is. The purpose of this presentation is to investigate the relationship between the acquisition of a second language and the acquisition of culture in English as a Second Language context. This presentation explores notions of success in second language acquisition (SLA) in terms of language socialization, and culture acquisition. One Korean-speaking boy, age 5, acquired English for 6 months in the US. On the cultural aspect, data obtained throughout the 6 months from the child in interaction with friends and his caregivers show that the boy developed the ability to participate successfully in some aspects of social interaction. Dominant venues of interaction were outside home and kindergarten. On the language aspect, the second language is acquired in terms of cultural acquisition. The data present that different cultural elements facilitated his language acquisition. In this sense, linguistic development depends on social context. This has educational implications to EFL/ESL teachers who teach English. One clear implication of this assertion is that language learning will be facilitated if the culture acquisition takes place and impeded if it does not.
Abstract:

The purpose of this presentation is to provide an introduction to the importance of understanding the impact of different cultures on adventure programming using Hofstede’s cultural model. Hofstede (2001) proposed five culture characteristics: Power Distance, individualism and collectivism, uncertainty avoidance, Masculinity and Femininity, and long-verse short-term orientation. As the population continues to become more diverse in the United States, many facilitators of experiential/outdoor education are facing the challenge of delivering programs that effectively deliver the programs for different cultural groups. This presentation focuses on examining the five concepts of cultural differences in order to provide suggestions in modifying the facilitation techniques in adventure programming.
Graduate Research Conference

GRC Presenter Abstracts

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<tr>
<th>Name</th>
<th>Carla M Evans</th>
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<td>Department</td>
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<td>Present Type</td>
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<tr>
<td>Title</td>
<td>Revising Kenneth Strike’s ‘Bill of Rights for Teacher Evaluation’ Based on the Changing Landscape of Measuring Effective Teaching</td>
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</table>

Abstract:

The recent release of the Bill & Melinda Gates’ Foundation’s Measures of Effective Teaching Study results are the continuation of a long-standing debate and discussion in the field of education about methods of teacher evaluation and how fair and effective teacher evaluation systems should be designed. My goal in this paper is to elucidate the ethical principles that should be upheld in the design of any fair and effective teacher evaluation system. This will require a quick, hopefully painless, dip into the pool of new teacher evaluation methodologies such as value-added modeling, student perception surveys, and observational protocols with the hopes of understanding how these different measures of effective teaching can be used in accord with ethical principles in designing fair and effective teacher evaluation systems. In order to do this, I rely heavily on Kenneth Strike who, before this current wave of reform in teacher evaluation, deftly laid out the moral context of teacher evaluation by focusing on the components of fairness – equal respect of persons and reasonableness. Strike also laid out a detailed ethical framework for teacher evaluation including a Bill of Rights for Teacher Evaluation that aimed to balance two different views about what is central in ethics – the principle of benefit maximization and the principle of equal respect. In this paper, I argue that since the methodologies employed in teacher evaluation have changed significantly from when Strike wrote the Bill of Rights for Teacher Evaluation, his ethical framework for teacher evaluation needs to be updated to provide guidance to school, district, and state-level policymakers for the continued ethical design of fair and effective teacher evaluation systems. Towards this goal, I have revised Strike’s Bill of Rights for Teacher Evaluation in order to account for the new moral landscape in teacher evaluation.
Abstract:

The purpose of this mixed method research study is to investigate the educational effects of digital storytelling as a communicative language learning strategy in an EFL elementary school class. In order to find out the benefits and challenges of digital storytelling in EFL class, this study was conducted for 12 weeks in a rural elementary school. Digital storytelling was selected and utilized in the after-school English class, as main teaching and learning tool. The results showed that the digital storytelling increased academic skills related to learning English, and it also helped to improve students’ communicative ability, encouraging their collaboration, motivation and creativity to be heightened.
Abstract:

Next generation wireless systems will leverage multiple antennas to increase capacity and connectivity. However, antenna arrays tend to be obtrusive, which limits the locations in which they can be deployed. The purpose of this work is to present an optically transparent antenna array for beamforming applications as transparent arrays would be useful for a wider range of applications. We present a 1 x 8 array of dual polarized mesh antennas suitable for inter-building connectivity. This design includes details regarding patch modifications and inter-element spacing to address mutual coupling, fit overall physical design goals, and achieve high enough spatial diversity for beamforming applications. The performance of the antenna array is modeled in HFSS and compared to similarly designed arrays made from non-transparent materials (FR-4 and copper). Additionally we include an analysis of the resulting beamwidth and scan angles of the array using beamforming techniques.
Abstract:

Heterogeneous Networks, such as those with Femtocells and Macrocell Basestations, face the task of resource allocation to ensure all users, both primary (mobile user) and secondary (femtocell user), receive assurances of quality of service. One method of performing this allocation, Q-learning, involves the use of a reward function (defining objectives) and a Q-table (storing policy information). This Q-table can be shared between users to speed up convergence on a policy ensuring a desired quality of service. In this paper, a reward function and state structure are presented and compared to another Q-learning reward function. The reward function presented in this work is shown to increase the sum femtocell user capacity in most scenarios while maintaining the desired quality of service for the mobile user. The sharing of Q-tables formed using the designed reward function and state structure with nodes entering the network is shown to significantly speed up convergence in most scenarios when compared to convergence without sharing Q-tables.
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<th>Name:</th>
<th>Jason Andreason</th>
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<tr>
<td>Department:</td>
<td>English</td>
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<tr>
<td>Present Type:</td>
<td>Oral</td>
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<td>Title:</td>
<td>The Origin of Falling: Trauma in The Amazing Spider-Man Comics</td>
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Abstract:

Superhero comics have a long-established relationship with trauma. Often, a personal trauma becomes the “origin” of a hero, an event in response to which the superhero identity is adopted. The compulsive repetition of one such origin trauma, the death of Peter Parker’s Uncle Ben, is the motivating force behind the narrative of the Amazing Spider-Man comics. Spider-Man’s method of travel, “web-swinging,” is an act of falling, representative of Parker’s traumatized state. In Unclaimed Experience, Caruth describes the falling body as the body that is without or between reference while referentiality occurs upon landing. Parker willingly places himself in the unstable position of falling because the Spider-Man identity relies on the constant motion of falling that precludes the stability that would allow for reference, and closure, to take place. For Spider-Man to exist, Parker must be traumatized and so his identity is defined by the origin trauma and its repetitions. Trauma is thus ubiquitous in the narrative of The Amazing Spider-Man because not only does the origin story and its repetitions propel Parker towards super-heroism, but also his super-heroic acts of web-swinging perpetuate his traumatized state. Thus, the story of Peter Parker, Spider-Man, complicates definitions of trauma that suggest a process of working-through is necessary for survival.
Abstract:

Although the author Sanora Babb wrote several books, including a collection of short stories and a volume of poetry, she is mainly known today for her novel Whose Names Are Unknown. Thanks to its belated publication in 2004 and to Ken Burns’ film The Dust Bowl, which discussed Babb’s work in the Farm Security Administration with Dust Bowl refugees as well as Whose Names Are Unknown, Babb is gaining a small critical reputation and a more general readership. But her fictionalized memoir An Owl on Every Post, first published in 1970, is still largely ignored or forgotten as an important work of American literature.

An Owl on Every Post depicts Babb’s childhood in southeastern Colorado, where she lived in a dugout with her parents, sister, and grandfather; the poverty and hardship that her family experienced while trying to make a living on the land is central to her story. On one level, her text shows the difficulty of life on the frontier for the homesteaders who struggled to make their living in the unforgiving landscape of the plains. But just as important to An Owl on Every Post is young Sanora’s relationship to the land. In particular, Babb calls attention to the immensity of the Colorado plains and the feelings they evoke in their inhabitants. In many ways, Babb is similar to Willa Cather, who explores both pioneer life on the frontier and the pioneers’ interactions with the sense of absence in the landscape of the plains. The purpose of this paper will be to explore how Babb depicts the interactions between herself and the vastness of the plains in An Owl on Every Post. I will also briefly discuss the interesting thematic connections between Babb and Cather in terms of the human-plains relationship. In doing so, I hope to draw more attention to Sanora Babb, who I believe deserves to be more widely read.
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<th>Name:</th>
<th>Matthew Cheney</th>
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<tr>
<td>Present Type:</td>
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<td>Title:</td>
<td>Dark Reflections: Samuel R. Delany in the Literary Marketplace</td>
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**Abstract:**

Published in the spring of 2007, Samuel R. Delany's novel *Dark Reflections* presented the story of a moderately successful black, gay poet, Arnold Hawley, during three periods of his life. Hawley struggles to make a life as a poet, and through these struggles Delany is able to illuminate the challenges faced by writers who negotiate multiple margins: of genre, culture, class, race, and sexuality. In his own essays, Delany has used poetry (its form, history, pedagogy) as a foil for science fiction, and a comparison of ideas from his book *About Writing* suggests that *Dark Reflections* continues this analogy while also extending it in new ways. Delany’s own greatest economic successes have been as a science fiction writer, and *Dark Reflections*, though in no ways a science fiction novel, was noted and reviewed by multiple science fiction periodicals. Delany’s fame, in the first half of his career, as a science fiction writer has overshadowed the innovations and variety of work he has done over the last twenty-five years, because that identity, as much as the multiplicity of other identities flowing through his work and life, affects the expectations of his audiences: publishers, booksellers, academics, readers. *Dark Reflections* not only extrapolates from Delany’s theories of the (ever-changing) marketplace for writers, but also meditates on the experience and effect of that marketplace for all its participants. The fate of the book itself has exemplified many of those theories and experiences.
Abstract:

From 1898-1902, Charles Chesnutt became the first African American to publish fiction with the prestigious Houghton Mifflin & Co. This presentation examines Chesnutt's relationship with Houghton Mifflin, looking especially at the marketing materials and paratexts the company produced to advertise his work. Using archival material that has rarely been considered by scholars, I show that Chesnutt's first book *The Conjure Woman* "passed" into the popular culture by masking its author's background. The trajectory of Chesnutt's career then took a sharp turn when his African American identity was revealed. The reception and interpretation of Chesnutt's fiction thus registers the hostile racial climate in the U.S. at the turn of the century, and indicates the ways by which authorial identity impacts readings of the artistic text.
Name: Emily Jean Dolive
Department: English
Present Type: Oral
Title: Physical and Intellectual Journey in Keats’s Poetry and Prose

Abstract:
While the Romantic poet is often envisioned as secluded and brooding, leaning head on hand like a Joseph Severn painting, their period witnessed advancements in transportation that were in fact irresistible and conducive to poetic construction. Throughout the nineteenth century, Southey and Coleridge were drawing plans for an American Utopia, Byron and Shelley were exploring Italy, and Wordsworth was writing his famous Prelude which made us shudder when the Alps were crossed without a blink. Used as fuel for poems or metaphors for self discovery, journeys remained a significant Romantic motif, corresponding beautifully to the landscape paintings that bloomed amongst artists such as Turner and Friedrich. Yet it is the unlikeliest traveler, the young, flowery, far-from-bourgeois Keats who ardently considered travel necessary to the cultivation of a poet. I plan to trace the effects of Keats’ traveling, from his sabbatical in Margate to the famous Scottish walking tour and the pull of Italy on his subsequent poetry. This will reveal the Romantic impetus to travel and connect one’s mind to the world around, and within. A couple months before tossing his on scant knapsack, Keats delegated his projected tour as a simple “sort of Prologue to the Life I intend to pursue.” When he returns to London, the poet plans to be able to replace the concrete landscape with the misty, mountainous, lush, sublime scenes this tour will impress upon his mind. This trip nourishes much ‘in the moment’ poetry and prose, but significantly affects the famous compositions of 1819. The journey must continue in these poems because Keats does not complete his tour; the prologue and the intended life are cut short. By looking at travel-inspired poems and letters, I will examine how Keats’ physical travels shaped his intellectual travel and cultivation of poetic identity.
### GRC Presenter Abstracts

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<tr>
<th>Name:</th>
<th>Marino Ivo Fernandes</th>
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<td>English</td>
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<tr>
<td>Present Type:</td>
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<tr>
<td>Title:</td>
<td>Hicks, Lobstah, and Massholes: Ideological dialect boundaries in Eastern New England</td>
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**Abstract:**

Northern New England is in the midst of large-scale dialect shift away from traditional Eastern New England features. The question remains as to whether speakers are converging on a supra-local norm or diverging from Boston, despite its historical influence. To examine this question we use 110 perceptual dialect maps, collected in southern NH and analyzed using ArcGIS. Our analysis confirms expected negative attitudes toward Boston and reveals evidence of unexpected solidarity with traditionally Western New England dialect regions. We present results suggesting the ongoing change is motivated by both a divergence from Boston and a convergence with a supra-local norm.
GRC Presenter Abstracts

Name: Marino Fernandes
Department: English
Present Type: Oral
Title: How SLA scholarship lightens the ethical load in the writing center

Abstract:

I present research from applied linguistics and writing center scholarship that informs inclusive, dynamic, and democratic writing conferences for multilingual writers.
<table>
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<tr>
<th>Name</th>
<th>Sarah B Franco</th>
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<tr>
<td>Department</td>
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<tr>
<td>Present Type</td>
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<tr>
<td>Title</td>
<td>Responding to Wartime Narratives: Opening Conversations Between Student Veterans and Writing Instructors</td>
</tr>
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</table>

Abstract:
Despite the controversy raised by teacher-response to student disclosure, the truth remains that writing teachers receive narratives about trauma (Payne, 2000). Considering ways of opening a dialogue between student veterans and writing instructors, this panelist will share her analysis of an ongoing qualitative study examining student veterans’ process of writing about wartime experiences and the teacher-feedback they receive and hope for. While writing about trauma can complicate teacher-student relationships, such personal writing also offers opportunities for student veterans to engage in a “narrative of developmental progress” in which the writer’s “self” is in a state of risk and play (Newkirk, 1997), as opposed to a coherent, stagnated “self” (Faigley, 1992); in other words, students’ performance of self through their writing assists them in making meaning and growing as writers (Newkirk, 1997). Trauma narratives also present writing instructors with meaningful content to frame conversations with student veterans about their role as writers. Through presentation of case studies and transcribed interviews, this panelist will share student veterans’ thoughts on how teacher-feedback supports or hinders their role as writer, and the ways in which writing about war-narratives affects their performance of self.
GRC Presenter Abstracts

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<tr>
<th>Name:</th>
<th>Molly Volanth Hall</th>
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<td>Department:</td>
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<td>Present Type:</td>
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<td>Title:</td>
<td>Wollstonecraft---Unnatural Woman: Between the Nature of the Feminine and a Gendered Nature</td>
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Abstract:

I will be exploring the way in which Mary Wollstonecraft’s use of what I will tentatively term animalistic and natural dictions and metaphors in her major nonfiction work, A Vindication of the Rights of Woman, affects the rhetorical viability and outcome of her main argument concerning sexual equality. Such an investigation will be necessarily aided and enhanced by the inclusion of the theories of established Ecofeminists such as Greta Gaard and Karen Warren, whose scholarship has made significant headway into other literary and linguistic connections between the oppression and exploitation of women, animals, and nature. I shall use their insights as well as my own close readings of Wollstonecraft’s text, in order to come to some cohesive conclusions about Wollstonecraft’s use of animality and “nature” in this piece. Of particular interest is her use of “natural” language to describe sexist situations and ideologies. Within these cultural descriptions and prescriptions she also makes ample use of cultivation and animal husbandry and/or companionship metaphors. By linking the domestication of plants, animals, and women, and consequently their mutual exploitation, Wollstonecraft’s language in Rights of Woman indirectly exposes a system of oppression which mutually reinforces the exploitation of the environment, non-human animals, and people, especially women.
Abstract:

The 18th century could be said to be synonymous with “taste.” One’s taste in fashion, art, manners and material goods distinguished one from others without the right kind of taste. But taste is also sensory, allowing the individual to experience a limitless supply of flavors presented in culinary dishes. Beginning in the 18th century, aesthetic principles of taste were applied to gastronomy, scrutinizing the way in which food was prepared and consumed by fashionable society. One way in which this was transmitted was through the publication and distribution of cookery books. English society became infatuated with the types of food they were consuming, partially because the empire was expanding to new regions across the globe. With these imperial destinations incorporated, new ingredients were finding their way into English cuisine via ports and the printed word.

How imperialism affected the English diet is not a new line of inquiry. What has been largely ignored, however, is the way in which this culinary obsession impacted other subjects of the empire during the eighteenth century, specifically those living in the American colonies during the pre-Revolution period. T.H. Breen has argued the colonists very much viewed themselves as English subjects and asserted this identity through the importing and purchasing of British goods. His study ignores the significance of books being imported to the colonies – a gap this paper will examine. First it will discuss the significance of cookbooks in English society and their rise in popularity by looking at Hannah Glasse’s The Art of Cookery Made Plain and Easy. With a greater understanding of the role these books played in 18th century society, it will look at one particular instance of Glasse’s book in the American colony of Virginia, combining Darnton’s notion of a communication circuit with methodologies found in food studies, demonstrating how colonists ate their way into a unified sense of Englishness.
Name: Corey Stephen McCullough
Department: English
Present Type: Oral
Title: “What about Bob (Connors)? Opening Up Archival Research through Digital Media”

Abstract:

Session Description:

Session comprises a 45-minute video we have assembled based on Robert (Bob) Connors’ work on/in the University of New Hampshire (UNH) archives with a brief reflection to follow. We employ Connors’ archival methods to explore the intersections between Connors’ work as an archivist and his work as a historian of rhetoric and composition. The time period from 1980-1990 was a key moment in defining our discipline, and Connors followed the threads from the past that connect to current work being done in rhetoric and composition. By examining composition textbooks, Connors created what became known as the Richard S. Beal Collection, which is housed at UNH and a part of the larger National Archives of Composition and Rhetoric collection. We will open up the archives through digital media and allow others to have an embodied presence within the materials. The archives will also be triangulated with those who worked beside Connors to create the collections that are currently available to the public. Following the video, we will reflect on how this use of digital media presents new considerations for conducting and presenting archival research.
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<th>Name:</th>
<th>Lisa Meerts-Brandsma</th>
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<td>Title:</td>
<td>Salt, Sugar and School Fees</td>
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**Abstract:**

What does it mean to be tethered to your land? This summer, I lived with several Ugandan families to understand the lives of subsistence farmers. I will read an excerpt from the writing I produced from my research at this conference.
Name: Elizabeth L. Preysner  
Department: English  
Present Type: Oral  
Title: In the Beginning: Authorial Development in the Short Text of Julian of Norwich’s The Revelations of Divine Love

Abstract:

Julian of Norwich’s fourteenth century work, the Short Text of The Revelations of Divine Love, is often overlooked in favor of her more theologically complex Long Text. The Short Text is seen as a type of “prequel,” one that does not merit consideration because the Long Text supersedes it. To hold these views, however, misrepresents Julian of Norwich and her writings by failing to see the ways in which even her first attempt in writing The Revelations of Divine Love contains the beginnings of complex theological thought.

I propose that the Short Text offers key insight into the early stages of Julian’s process of constructing her newfound identity as a mystic within a greater Christian community and the development of an authorial voice as she begins to articulate a theology of God’s love to her contemporary audience. I will contrast Julian’s writing with the mystical writings of both Margery Kempe and St. Bridget of Sweden to show that even in the Short Text Julian’s writing reveals a skepticism of thought and rationality of mind that actively reflects on the implications of her visions for both herself as a fledgling author and for her audience. Although twenty-first century readers have the privilege of both the Short Text and the Long Text of The Revelations of Divine Love, the Short Text needs to be considered on its own accord to truly understand Julian of Norwich’s process of individual authorial growth.
Abstract:
At the beginning of Nella Larsen’s Quicksand, we are introduced to Helga Crane with a peculiar but insistent narrative gesture that we should be looking at her very closely. The text quite pointedly places her in a spotlight, “shadowy just then with the drawn curtains and single shaded light [...] the spot where Helga sat was a small oasis in a desert of darkness” (1). Through this initial image, readers are implicated in an act of invasion of privacy, denying Helga her “intentional isolation” by reading her text: “An observer would have thought her well fitted to that frame of light and shade” (1, 2). The narrator playfully nudges the reader’s self-conscious awareness of participation in the creation of the narrative, and invites a lingering gaze on Helga; we are secret voyeurs in her inner sanctum. This invasion of privacy, this lack of personal space belonging to Helga as a subject, is the primary thrust which pushes the narrative forward, creating a set of discrete vignettes characterized primarily by space. By approaching Quicksand with the concepts of cultural geography, theories about the gaze, systems of power, and urban navigation, I will explore Larsen’s text and how it depicts the precarious nature of being unclassifiable in both American and European systems and spaces in the late 19th century. In so doing, this project aims to clarify the peculiar relationship between geographic identity and culturally based visual schema in terms of gender and race within this time period.
Name: Catherine Welter
Department: English
Present Type: Oral
Title: A Juggernaut in the Streets of London: Walking in Stevenson’s Strange Case of Dr. Jekyll and Mr. Hyde

Abstract:

In “Walking in the City,” Michel de Certeau construes walking not only as an intimate and embodied activity, but as a creative force (128). Walking, in other words, enables individuals to create the city in a way that opposes the hegemonic order. But what happens when walking becomes destructive? In the labyrinthine streets of late nineteenth-century London, Edward Hyde has a dangerous advantage over fellow city-dwellers; as the embodiment of chaos, he possesses the ability to walk London’s streets without becoming disoriented. In this sense, I would argue that Hyde is a prefiguring of the postmodern city-walker, as defined by Bill Brown in “The Dark Wood of Postmodernity.” Hyde’s extraordinarily deft mobility suggests an orientation of disorientation, which indicates that instead of representing the degeneration of the species, as argued by many scholars, he is, in fact, the most evolved character in the novel. His unique way of walking enables his victimization of others and disrupts their ability to walk normally, thereby increasing his own supremacy. Thus, walking becomes a destructive form of power that enables Hyde not only to dominate city-dwellers at street level, but to prevent them from creating city-texts that might compete with his own.
### GRC Presenter Abstracts

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<th>Name</th>
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<td>Title</td>
<td>&quot;Beyond 'Just Writing Out The Facts'&quot;</td>
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**Abstract:**

In this presentation, I address challenges that adolescent multilingual writers face with personal writing and research papers. I then discuss how two approaches—sequenced research papers and contextualized prompts—might help teachers address these challenges.
You, Xiaoqiong

Department: English
Present Type: Oral
Title: Rhetorical Education in the Age of New Media: Oral Presentation in College English Classrooms in China

Abstract:
In China, while English writing is almost always out of teachers’ focus in both college English classes and across subject courses in the university, oral presentation has been widely adopted in college English classes as a pedagogical strategy, as a productive genre. It incorporates both writing and public speaking skills into one activity, covering a range of topics, presented in a multimodal format (words, pictures, cartoons, sounds, etc.), embodying students’ creativity, voice and identity, and therefore welcomed by the students. This study examines how oral presentations, as both learning and teaching activities, are operated in college English classes in a university in Shanghai, China. As a case study, its data comes from survey, class observations, interviews (with teachers and students), and artifacts (including PowerPoint slides, recorded speeches, notes, etc.). After the data is triangulated and analyzed, this study finds that though oral presentations are encouraged by instructors, they haven’t really offered students sufficient both instruction and feedback on how to compose and perform oral presentations; students, as the composers and performers, however, have demonstrated a certain degree of audience awareness, page-designing agency, and the other rhetorical skills, though they still need systematic rhetorical education.
**GRC Presenter Abstracts**

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<td>Title</td>
<td>“The question of freedom never arises”: The Relationship Between Brave New World and Walden Two and its Implications for [Anti-] Utopia</td>
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**Abstract:**

In this research, I posit that by comparing BF Skinner's Utopian Walden Two and Aldous Huxley's dystopian Brave New World, we can better understand how a dystopia could develop. By starting with more altruistic motives and gradually becoming more restrictive, despots could easily transform a utopia into a dystopia.
Abstract:

Weeds are a major challenge on organic farms, where ecological weed management without the use of synthetic chemicals is challenging and strategically different from traditional farming practices. Impacts of invasive species and weeds are also expected to rise in response to climate change. In an effort to develop more efficient weed management strategies, we must gain a better understanding of the current biodiversity of these weed species. A collaborative research approach will also be used to correlate genetic biodiversity with seed bank and climate data analysis. Ten of the most invasive weed species in Northern New England (NNE) were selected for genetic analysis based on a survey that identified the most problematic weeds on organic farms in NNE. Genetically assessing the biodiversity of weed populations at different locations throughout NNE, where there is an extreme difference in temperature zones, will allow us to predict how these plants may respond to climate change in the future, as well as aid scientists in better advising farmers on weed management strategies. Developing strategies to both predict and reduced the impact of invasive weeds on growers will help them save money and resources in weed management.
Biofuel produced from algae is a promising source of renewable energy. Algae biomass from the salt tolerant, thin walled, green algae of the Dunaliella is currently of interest as a potential source of biofuel. However, its efficiency for biofuel production needs to first be improved by increasing its capacity to sequester carbon and nitrogen into biomass production, in this respect a group of metabolites called polyamines can help. They are nitrogen rich molecules present in all living organisms. By increasing the biosynthesis of putrescine (a diamine - the smallest polyamine) in Dunaliella through genetic engineering we can increase the rate of carbon fixation and accumulation. However, currently no reliable system is available for genetic engineering of Dunaliella. Our research project has two objectives: (1) to develop a reliable protocol for the transformation of Dunaliella, and (2) to manipulate the polyamine (putrescine) pathway in Dunaliella to establish if it will increase total nitrogen and carbon assimilation. To achieve this we will improve the transformation efficiency of two techniques, electroporation and biolistic bombardment, also known as the gene gun. The availability of a reliable transformation system would also make these algae desirable for use in the production of pharmaceutically important proteins on large scale. In addition we will transform the algae with genes to increase the rate of putrescine biosynthesis. By increasing putrescine biosynthesis we aim to increase the rate of carbon fixation and accumulation through which we expect to increase the biomass available for biofuel use.
Abstract:

Background: Actinorhizal plants form a symbiotic association with the actinobacteria, Frankia, and are able to tolerate a variety of abiotic stresses including salt stress. The bacterial partner, Frankia, of the actinorhizal symbiosis plays a role in the ability of these plants to survive under harsh conditions. The aim of this study was to identify salt-tolerant Frankia strains and to determine the genes responsible for the molecular mechanisms of salt stress tolerance. Methods: A 24-well growth assay was used to determine salt tolerance levels for Frankia strains. The genome of three strains were sequenced and compared to the salt sensitive sequenced strain CcI3. RNA sequencing was carried out to identify genes and pathways differentially regulated under salt and osmotic stress. Quantitative PCR was performed on a sub set of the genes to confirm results of the RNA seq analysis. Amino acid analysis was used to determine changes in the amino acid profile under salt stress. Result: Three highly salt tolerant strains (Allo2, CcI6 and CeD) with minimum inhibitory NaCl concentrations greater than 900 mM were identified. Among the strains tested, Frankia strain CcI6 had the highest level of salt tolerance. Amino acid analysis from the 4 strains shows that proline, tryptophan/phenylalanine, alanine, GABA, and serine accumulated under salt and osmotic stress conditions. Preliminary analysis of RNA sequencing data from the relatively salt sensitive strain CcI3 revealed that more than 500 genes were differentially expressed under salt stress, whereas about 100 genes were differentially expressed under osmotic stress. The differentially regulated genes include genes involved in secondary metabolite synthesis, RO scavenging, ion transport and osmolyte synthesis. KEGG pathway enrichment analysis on the data revealed that amino acid biosynthesis and carbon metabolism pathways were significantly up regulated under salt stress. RNA Seq results were confirmed by RT-qPCR results.
Name: David Wood  
Department: Genetics  
Present Type: Poster  
Title: A genomic sequence of an ancestral strawberry species: Fragaria iinumae

Abstract:

The genus Fragaria, commonly known as the strawberry, contains 22 species, of which only one, Fragaria x ananassa, is of substantial commercial importance. Species in Fragaria range in ploidy from diploid to decaploid. In all Fragaria species, there are 7 chromosomes in a basic chromosome set, but at different ploidy levels there are different numbers of basic sets: for instance 2 sets in a diploid and 8 sets in an octoploid. Polyploids can be difficult subjects in both genetic and genomic studies due to the elevated numbers of chromosome sets and gene copies. The sub-genomes of F. x ananassa have originated from two to as many as four ancestral diploid genome donors. Ancestral forms of the diploids F. vesca and F. iinumae have been implicated as being two of these subgenome contributors, and the latter is the species being sequenced and assembled in this study.

Fragaria iinumae is a diploid (2n = 2x = 14) species, and its populations are native to Japan and eastern Russia. The F. iinumae genome is another step in developing the resources needed to conceptually and bioinformatically reduce the complexity of the octoploid genome. It will be used as both a reference sequence and comparative model with other Fragaria species to elucidate evolutionary phenomenon, of which polyploidization and subsequent diploidization are of the highest priority to the strawberry research community. We would like to understand how the polyploids arose (polyploidization) and subsequently how their sub-genomes diverged (diploidization).
Abstract:

The Northeast U.S. has experienced a dramatic increase in the incidence of shellfish-borne vibriosis cases in the past few years. Vibrio parahaemolyticus (Vp) is the most prevalent cause of disease, yet little is known about the origins and characteristics of Vp clinical strains. Total and potentially pathogenic Vp populations in oysters, sediments and overlying waters from the Great Bay Estuary have been studied since 2007, while clinical Vp strains from Maine, New Hampshire, Massachusetts and Connecticut have been studied from cases occurring in 2010-13. Vp clinical and environmental strains have been analyzed to determine the presence of an array of genetic markers associated with pathogenic potential to provide genotype differentiation of strains. A subset of isolates has also been analyzed by Multi Locus Sequence Analysis (MLSA) to determine relatedness between regional clinical and environmental strains, and with strains from other area. As is typical, pathogenic type strains are rarely isolated from oysters. Genotyping and MLSA analysis indicate an array of different types for clinical strains, and that environmental populations are extremely diverse. However, this approach did identify a dominant endemic pathogenic lineage from MA. A few environmental strains were closely related to local and global clinical strains, suggesting the potential endemic emergence of pathogenic strains from local populations. Total Vp populations are now detected for longer duration and at higher levels in some sites compared to the 1990s, which may be a factor contributing to population changes and the potential for further emergence of pathogenic strains.
Name: Sarah Aiken & Andy Gray
Department: Grad Non-Degree
Present Type: Poster
Title: Genetics Education Materials for School Success

Abstract:

The aim of GEMSS is to assure all children with genetic health conditions succeed in school-life. Children who have genetic conditions are members of neighborhood schools across the country. Our research includes recent survey results pertaining to the GEMSS website and the effectiveness of social networking as a means to attract individuals to the website. Please note this presentation will be given by Sarah Aiken and Andy Gray.
GRC Presenter Abstracts

Name: Stephanie Swanick, Allison Freeman, and Michelle Grimm
Department: Grad Non-Degree
Present Type: Poster
Title: State Planning Grant for Autism Spectrum Disorders

Abstract:

As LEND (Leadership Education for Neurodevelopmental and Related Disabilities) trainees, my colleagues and I are assisting in the development of a comprehensive, measurable state plan for improving the system of care for children and youth with autism spectrum disorder (ASD) and other developmental disabilities by September 30, 2015. Specifically, we are on a Needs Assessment Workgroup which has a goal of developing a comprehensive needs assessment which will identify disparities and needs of children and youth with ASD/DD and their families and providers to inform the development of a comprehensive, measureable state plan for improving the system of care.
Abstract:

Huey Long’s life consisted of highs and lows, good and bad, manic behavior, and the ability to out work his contemporaries. He had moments of grandeur, at least in his own mind. T. Harry Williams, in his fawning biography, thought his successes the building of thousands of roads, bridges, schools, and a great university. The thesis of my research, its embryonic stage, is that Huey Long was Bipolar Type I. In the next several weeks, I hope to scratch the surface of this huge topic, and later extend it to the effect of his bipolar illness on the historiographic work of T. Harry Williams. There is nothing yet published on Bipolar illness and Long. I feel especially competent to do this work. I am a University trained, board certified internist and gastroenterologist, and have been the training director in medicine and gastroenterology at UCLA and UCSF (Chief Resident and Chief Fellow, respectively).
The GRC will allow me the chance to share research from a chapter of my dissertation: “The Ravages of Teredo.” My research seeks to tell the lost history of teredo, a term given to an assortment of marine invasive wood-boring species that caused havoc along the American coastline during the period between the Civil War and World War Two. Teredo, also known as shipworm, earned a reputation for its nasty habit of boring into wooden planks and piles until waterfront infrastructure crumbled to pieces. Coastal people did not take the threat of teredo invasions lightly and often went to great efforts to limit its ravages.

The history of teredo endeavors to pull historians, especially environmental historians, into unfamiliar terrain: coastal landscapes. In recent years, the environmental history of the ocean has been the object increasing scrutiny. Leading the way are UNH’s Jeff Bolster and Kurk Dorsey. One opportunity that remains is a closer look at near-coastal marine environments, which my dissertation seeks to explore.

One of the more peculiar aspects of my research is the way teredo wormed its way into American cultural. The word “teredo” resonated with turn-of-the-century Americans in remarkable ways. The biologic processes of shipworm inform its cultural meaning. As larvae, teredo penetrate wood as microscopic juveniles, after which they grow to maturity beyond view. Hundreds of teredo could occupy a plank or pile. On the outside, boards looked normal; however, inside, teredo honeycombed, or perforated, their new homes until they unexpectedly crumbled. As a result, the word teredo took on cultural meaning as synonyms for “unstable,” “collapse” or “furtive” and became handy metaphors in books, poems, songs, newspaper reports and even crosswords. I would like to share at the GRC how these forgotten worms penetrated colloquial language as racial slurs, political aspersions and metaphors for human corruption and secrecy.
Abstract:
The Nation of Islam (NoI) is often only portrayed as the religion that nurtured, intellectually strangled, and finally killed Malcolm X. Many aspects of the religion continue to be neglected in academia. Particularly, my research focuses on the "science" embedded in NoI theology. This science surfaces in many areas. For example, the white race is created by a mad scientist who gradually weakens the "black germ" through racial miscegenation.

That the Nation of Islam drew upon these scientific beliefs is intriguing. But what purpose did they serve? I argue that the Nation of Islam benefited from being a "new religion," able to easily incorporate scientific discoveries into their theology. Often, NoI ministers would use scientific discoveries to invalidate old religions like Christianity. Science, whether correct or not, gave the NoI authority over religions that could not as easily shift their theological doctrines.

The same could be said for other "new religions" like Christian Science or Scientology. These cases all illustrate that the dichotomous conflict of religion vs. science is not altogether true. In fact, science can help religion.
History

Gallaher Boddy, Molly

GRC Presenter Abstracts

Name: Molly Burns Gallaher Boddy
Department: History
Present Type: Oral
Title: Power in the Borderlands: The Nineteenth-Century New England Church and the Battle to Organize Northern Catholics

Abstract:

This study uncovers the religious and ethnic history of northern New England (Maine, New Hampshire, and Vermont) which has remained for too long on the periphery of scholars’ attention. The extensive literature on the history of the American Catholic Church maintains a strict geographic and ethnic focus. It rarely ventures into the northern borderlands, focusing instead on the more central city of Boston, the apparent site of New England Catholicism’s “birth” with the arrival of Irish Famine-era immigrants.

Yet, this paper argues that well before Boston emerged as the powerful center of New England Catholicism, rural Catholics, independent missionaries, and struggling bishops built the Catholic religion in the northern borderlands despite a dire lack of resources and a crippling absence of central authority. With a close proximity to Canada, French-Canadian, Native American, and English Catholics lived in a malleable religious world that was not divided by the firm parish, diocesan, or national boundaries that would later come to define the structure of American Catholicism. This research is part of a larger dissertation which maintains that an Irish-led, urban-centered, geographically rigid model of “American Catholicism” was not a foregone conclusion before the 1890s. In fact, before this time, the very idea of “American” Catholicism was a fluid one; New England Catholicism’s expansion in the 1890s through the early twentieth century owed as much to the practice of the religion in Canada and the northern borderlands as it did to Irish immigration.
Abstract:

As old-stock Americans struggled to attenuate the dislocating effects of industrialization and mass immigration in the last third of the nineteenth century, so did the Roman Catholic Church. American Catholics, long seen as a foreign, threatening body by Protestants, also sought to prevent labor and ethnic conflicts, but did so on distinct grounds. Initially, their efforts occurred on an ad hoc basis, with bishops and local pastors sorting out strategies with little claim to consistency. Examples from New England, especially in French-Canadian and Irish working-class parishes, abound. Reacting to continued anti-Catholic sentiment, the Lay Congress of Baltimore of 1889 would tie those ventures into a vaguely defined organicism which, if offering no universal strategy, would nevertheless provide a consistent philosophy of order and common ends for laity and clergy alike.

Struggles with modernization in the United States were heard in Rome where, in 1893, Pope Leo XIII issued the encyclical Rerum Novarum. This landmark document set the tone for future Catholic social and political action. Organicism, one of its tenets, had great bearing on Catholic encounters with liberalism, communism, and fascism, and its corollary, corporatism, molded Church-State relations throughout the Western world. From the streets of Manchester, New Hampshire, to halls of power here and abroad, the Church’s embrace of an organic metaphor as the basis for order proved to be difficult to sustain and, while enduring through the twentieth century, in the United States it remained marginal in the system of governance. The implications for the Catholic Church’s place in relation to modernity are significant.
### GRC Presenter Abstracts

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<td>Compliance and Complaints: Contested Places in the Shifting Landscape of the Merrimack River</td>
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**Abstract:**

In 1972 a national mission to restore the physical, chemical, and biological integrity of the navigable waters of the United States was enacted with the Clean Water Amendments. At three places along the Merrimack River -- Sewalls Falls and Merrimack in NH, and the Greater Lawrence Sanitary District in MA -- local people contested public policies that opposed their more immediate interests. A civic movement stopped a dam project at Sewalls Falls in 1987, and the State of New Hampshire bought the dam for NH Fish and Game. A local protest stopped hazardous waste plant construction in Merrimack in 1987, and a private corporation (Anheuser-Busch) paid the costs to buy out the project. Local people in North Andover, MA sued the sanitary district over complaints about noise, traffic, and odors. The case went all the way to the Massachusetts Supreme Judicial Court, affirming that local people have a say in what public agencies do within their town boundaries. After years of disputes, a settlement agreement worked out disputes over noise, traffic, and odors from a wastewater treatment plant in 2005. These three incidents demonstrate what can happen when a national mission is applied to a series of local landscapes that do not sit still while issues are worked out. Seeing how local places are contested invites us to consider how environmental policy can affect local people differently according to their particular circumstances. But it also shows us how those contested processes create the landscape that we now envision. A restored river is a contested place.
Abstract:

This essay explores the career of Anne Lynch Botta. Between the 1840s and 1860s, she hosted an influential salon in her New York City home. Her poems and essays appeared in popular nation-wide publications. From 1850 to 1853, she worked as Senator Henry Clay’s secretary. Anne Lynch Botta was clearly an eminent figure in antebellum America. Yet, Botta’s notoriety and influence faded considerably in the decades after the Civil War. My research places Botta in the broader context of the ante- and postbellum cultural and intellectual trends that made possible both her astonishing professional accomplishments and her virtual erasure from historical memory. I show that the very thing that made Botta successful—her embrace of sentimentalism—also led to her declining notoriety. Sentimentalism, a literary style and an ideo-cultural construct which conceptualizes human relationships as springing from internal—rather than external—bonds, played a significant role in the lives of middle-class antebellum Americans like Botta. Positing that a person’s internal qualities are more important than their external characteristics, sentimentalism helped break down class hierarchies, making room for the nation’s burgeoning middle-class to rise in status. Further, sentimentalism permitted women like Botta to transverse antebellum gender norms without suffering from social stigma because it conceptualized professional and public activities as informal and private occurrences. However, the Civil War marked a turning point; it undermined the belief that internal bonds between diverse humans could bind the nation together. By the turn of the twentieth century, a clear line separated private and public activities. Yet, Botta’s career illustrates that sentimental language and action helped guide business practices in antebellum America.
Name: Tricia Peone  
Department: History  
Present Type: Oral  
Title: Preternatural Phenomena in Early New England  

Abstract:  
In early New England, interpreting preternatural phenomena was a way of understanding the invisible forces at work in the universe. Preternature served an important ontological role in theology and natural philosophy as an intermediate category for extraordinary phenomena of uncertain origin. It was predominately used as a way of describing wonders, witchcraft, or works of the Devil. The correct interpretation of such phenomena was critically important, and so New Englanders recorded their experiences in letters and diaries, and sometimes these accounts circulated and appeared in print. There was a vibrant transatlantic flow of information about preternatural phenomena, and New England authors participated in a larger debate over the boundaries of this rather ambiguous category. Learned men such as John Winthop, Jr. and Cotton Mather who observed preternatural occurrences (or heard stories from credible witnesses) appealed to the Royal Society in London for help interpreting their meanings. This paper examines accounts of preternatural phenomena, such as unusual weather, encounters with apparitions, and cases of witchcraft, to reveal the complex processes by which early New Englanders made sense of their world.
Abstract:

In 1828 free African Americans in Portland created their own church in order to work toward economic betterment and political enfranchisement for all. This church, the third oldest independent African American church in the nation, was known as the Abyssinian Church. This paper explores how Congregational theology (which encouraged a sense of moral responsibility) and economic liberalism, including a conscious class awareness, motivated the members of the Abyssinian to fight slavery. This paper attempts to fill the gap in scholarship by connecting the Abyssinian Church to the broader narrative of the market revolution and identifying the role of economic liberalism in shaping religious actions and doctrine, especially in regard to abolition.

The story of the Abyssinian Church and its social activism is situated squarely in the midst of the historiographical controversy regarding the relationship between abolitionism and capitalism. Neomarxists, including Amy Dru Stanley, argue that abolitionists pushed for reform in order to legitimize wage labor, and thus a market economy. Other scholars, siding with the evangelical Christian interpretation, argue that abolitionists saw slavery as inherently immoral and opposed to Christian virtues. The story of the Abyssinian Church provides an important corrective to such reductionist views by illustrating that economic liberalism and biblical political thought coalesced in the origins of that church and its abolitionist activity. This paper explores not only the motivations behind Abyssinian attempts at reform but also the origins of such motivations within the market revolution.
Name: Michael Verney  
Department: History  
Present Type: Oral  
Title: Teaching the Early United States as a Global Maritime Civilization

Abstract: In recent years, undergraduate college courses entitled “America and the World” have predominated across institutions of higher learning. At the same time, many United States historians have taken a “global turn” in their academic research, publishing more and more articles and monographs on United States citizens’ connections to and interactions with others on a global stage. This paper discusses how presenting the United States as a maritime civilization during the period of the Early Republic (1783-1860) allows instructors to tell new stories about one of the central issues in American history: race and multiculturalism. Two subjects will be examined in some detail: sailors and merchants. The sailors who manned the American merchant marine could be black, white, brown, red, or even yellow, speak various languages, and hail from nations across the globe. Limited American regulation, the dangerous and demanding qualities of seafaring life, and the need for seamen made American merchantmen and whalers in the Early Republic hives of intercultural and interethnic contact, cooperation, and conflict. At the same time, merchants’ quest for profits and European colonial trading policies often resulted in Americans forming cross-cultural business partnerships with non-whites across the globe. In discussing these two sets of national characters, this paper hopes to stimulate discussion of how the maritime history of the United States informs the nation’s interactions with the world as well as how world history courses might incorporate more United States actors.
Abstract:

From the inception of the American hospital system, directors and boosters have used case examples to increase awareness, draw sympathy, and promote financial investments in institutions of healing. Benefactors drew especially heavily on pediatric cases, and these examples provide insight not only into the fundraising strategies of savvy donors, but also the lives of child patients, the role of pediatrics in the larger medical realm, and pervasive ideas about youth's malleability and vulnerability. This presentation introduces three such examples in different centuries -- Catherine Smith of the 1750s Pennsylvania Hospital, the children of 19th century seashore homes, and Jimmy of Boston Jimmy Fund fame -- to illustrate that the pediatric case study is well-entrenched in public awareness campaigns over time and space.
Abstract:

On February 19, 1987, three 20-year-old sophomores raped an 18-year-old freshman in one of the dorm rooms at the University of New Hampshire: Stoke hall. The three were arrested and went before the UNH Judicial Committee, as well as in the Strafford County Superior Court in Dover, NH. In April of 1987, the judicial committee cleared them of all sexual assault charges. At the Superior Court two were charged with misdemeanor sexual assault and the youngest’s charges were dropped (Keegan, 1988). After 27 years, this case is re-analyzed. Written in the form of an oral history, this narration (story) will convey the community’s response through their personal perspectives. This response includes how the students and faculty responded to the case through protests, articles written, and handling of the trial. “One Campus’s Story” demonstrates the influence that culture has on a community’s reaction and the impact this culture has on each individual’s story. This concept concerning the discrepancies in rape narratives surrounding one sexual assault case has yet to be studied. This knowledge, therefore, provides a new avenue for understanding the communal reactions and responses towards sexual assault cases and the ways in which culture is an underlying factor.
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<tr>
<th>Name:</th>
<th>Alexander Michael Parkes</th>
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<tr>
<td>Department:</td>
<td>Justice Studies</td>
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<tr>
<td>Present Type:</td>
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<tr>
<td>Title:</td>
<td>Assessing student and faculty relationships to improve campus safety</td>
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Abstract:

I am currently working on a project for the UNH Behavioral Intervention Team (BIT), to help improve its offerings and services to students. The Behavioral Intervention Team is an organization that looks to ensure student and campus safety, while also looking to help students who are experiencing significant emotional distress. For the BIT campus safety model to work effectively it is essential that students feel comfortable approaching faculty and staff with concerns that they may have about themselves or fellow students. This project will study the extent to which this is going on at UNH by asking both students and faculty about their relationships with each other.

This project will consist of two separate surveys; one for students and one for faculty. The survey questions will look to determine whether or not both groups feel comfortable talking to each other about issues in students’ personal lives, whether students know where to turn to if they are feeling emotional distress, and whether students are aware of on-campus services that offer help to students experiencing distress.

Hopefully this survey will help the UNH BIT by offering an illustration of the way students at the university interact with their faculty/staff.
Abstract:

It is known that relative strength is strongly associated with an older adults’ ability to walk 400m. However, walking 400m may be dependent on aerobic capacity. PURPOSE: The purpose of this study was to compare relative lower extremity strength and estimated VO2 max between slow and fast walkers in older adults at risk of mobility limitations. METHODS: Twenty older adults (76±8y) considered to be at risk of developing mobility limitations based on their unilateral knee extensor strength participated in this study. The participants were separated into two groups dependent on completion of the Long Distance Corridor Walk (LDCW):>5.5 minutes (330s) was for slow walkers and <5.5 minutes for fast walkers. VO2max was estimated from total METS achieved during a maximal treadmill stress test. Strength relative to body mass was determined via knee extensor torque at 180°sec-1 and expressed as the strength-to-weight ratio (SWR). This velocity was chosen due to its strong association to walking speed. Independent t-tests were used to compare SWR and VO2max between slow and fast walkers. Pearson correlations were used to assess the relationships between time to completion of the LDCW, SWR and VO2max. RESULTS: The fast walkers completed the LDCW in 401.13+92.86s while the slow walkers completed it in 289.64+22.78s; P<0.01). The slow walkers had lower estimated VO2max (20.08+8.91 vs. 33.73+7.49 ml·kg-1·min-1; P<0.01) and were weaker at 180°sec-1 than fast walkers (0.57+0.18 vs. 0.87+0.19Nm·kg-1; P< 0.01). Strong negative correlations were evident between estimated VO2max and LDCW time (r=-0.81; P<0.01), and isokinetic strength at 180°sec-1 and LDCW time (r=-0.68; P<0.01). CONCLUSION: While strength and aerobic capacity are both important in one’s ability to walk 400m, estimated VO2 max was most related to walking speed. It is possible that declines in knee extensor strength impose increasing aerobic demands while walking. Supported by: NIH Grant 1R15 A6040700-01A1
Name: Emma Jean Baillargeon
Department: Liberal Studies
Present Type: Oral
Title: The aristocrats: an examination of the traveling freak show from the 1840's to the 1920's

Abstract:
From the 1840's to the 1920's, the traveling freak show reigned supreme as an entertainment model. They traveled with circuses and the American museum circuit circling the world and becoming famous for their displays of bodily anomalies. Diane Arbus, a famous freak photographer of the 1950s, once stated that freaks were aristocrats because they concurrd their test in life. In my research, I compare lifestyles, profitability and language to prove that freaks, only amongst the frame of the circus, were indeed aristocrats. I prove this through the work of Alexis deToquville and his work surrounding the Indian and Native American race.
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<tr>
<th>Name</th>
<th>Evan Brand</th>
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<td>Department</td>
<td>Mathematics &amp; Statistics</td>
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<tr>
<td>Present Type</td>
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<td>Title</td>
<td>A doubly-localized solution of plane Couette flow</td>
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Abstract:

We present an equilibrium solution of plane Couette flow that is localized in both the spanwise and streamwise directions, embedded in a background of laminar flow. The solution shows slow exponential decay to laminar in both the streamwise and spanwise directions. It is constructed via windowing from a known doubly-periodic solution and shows similarities to turbulent spots and localized edge states in size and structure. The solution is unstable, with perturbations leading initially to a disruption of the interior roll-streak structure. Subsequent evolution is Reynolds number and perturbation dependent.
Abstract:

Functions are a crucial topic in the study of mathematics. Research has found that a lack of deep understanding of functions is one of the main reasons why students struggle in calculus (Eisenberg, 1991; Ferrini-Mundy & Graham, 1991; Lauten, Graham, Ferrini-Mundy, 1994; McDonald, Mathews, & Strobel, 2000; Monk, 1994). In light of these studies, we investigate – using traditional paper-and-pencil assessments, concept maps, and an interview – what pre-calculus students’ understanding of functions is, to what extent students have a repertoire of functions at their disposal, how students’ understanding evolves over a semester, and what non-traditional assessments can tell us about this understanding. We found that (1) As Williams (1998) suggested, concept map assessments do reveal something that traditional assessments do not; (2) participants have trouble giving non-examples of functions, and (3) there does not seem to be a major change in participants’ understanding of functions over time.
Name: Anek Janjaroon
Department: Mathematics & Statistics
Present Type: Oral
Title: HOW DOES UNDERGRADUATES’ UNDERSTANDING OF THE FUNCTION CONCEPT EVOLVE DURING THE COURSE OF A SEMESTER?

Abstract:
Functions are a crucial topic in the study of mathematics. Research has found that a lack of deep understanding of functions is one of the main reasons why students struggle in calculus (Eisenberg, 1991; Ferrini-Mundy & Graham, 1991; Lauten, Graham, Ferrini-Mundy, 1994; McDonald, Mathews, & Strobel, 2000; Monk, 1994). In light of these studies, we investigate – using traditional paper-and-pencil assessments, concept maps, and an interview – what pre-calculus students’ understanding of functions is, to what extent students have a repertoire of functions at their disposal, how students’ understanding evolves over a semester, and what non-traditional assessments can tell us about this understanding. We found that (1) As Williams (1998) suggested, concept map assessments do reveal something that traditional assessments do not; (2) participants have trouble giving non-examples of functions, and (3) there does not seem to be a major change in participants’ understanding of functions over time.
Abstract:

Two-dimensional materials (e.g., graphene and dichalcogenides) are an exciting new class of materials whose geometry creates interesting electronic properties that are potentially very useful in electronics and energy applications. Some of these materials consist of just a few atomic layers of common materials (one millimeter of which would contain millions of layers). For instance, graphene consists of one (or a few) layer(s) of its bulk counterpart, graphite, long-used in pencils, and 2D molybdenum disulfide consists of a few layers of a material commonly used in dry lubricants. After a brief introduction to 2D materials, I will present our results from simulating an important experimental probe of these materials, low-energy electron diffraction (LEED). LEED-IV curves are produced by recording the intensities of low-energy electron beams reflected or diffracted back from a material surface. These curves, when compared to calculations of these reflectivities (relative intensities of reflected beams) using mathematical models of the scattering of the electrons from the material, can reveal information about the structure and properties of the material. Our calculated reflectivities are found using our new theoretical framework for low-energy electron scattering based on first-principles methods. I will present the results of our expansion of this framework from normally-incident beams on graphene to arbitrary angles of incidence and to the exciting new 2D material, molybdenum disulfide. I will also discuss how certain aspects of the reflectivity spectra can be explained by electronic properties of the bulk materials.
Abstract:

Chaotic systems are typically analyzed via their dense set of unstable periodic orbits, which forms the skeleton of an associated attractor (picture the standard Lorenz "butterfly" attractor). That is to say, an infinite number of orbits exhibiting regular, predictable behavior coexist among the irregular, chaotic motion. This talk will introduce cupolets, which are generated when a chaotic system is approximately stabilized onto its set of unstable periodic orbits by a certain control scheme. Cupolets play important roles in a number of theoretical and practical investigations. The major goal of this talk is thus to demonstrate new applications of cupolets for investigating chaotic systems. For instance, cupolets may be combined with algebraic graph theory and Dijkstra's shortest path algorithm in order to efficiently transition between periodic orbits of chaotic systems. This essentially provides an effective algorithm for the steering and targeting of nonlinear systems. Finally, from a sufficiently large set of cupolets, a hierarchal subset of fundamental cupolets may be obtained. These cupolets function as the building blocks of many higher-order cupolets, which are subsequently regarded as amalgamations of simpler fundamental cupolets, possibly through bifurcations.
Name: Yibin Pan  
Department: Mathematics & Statistics  
Present Type: Poster  
Title: Downscaling Precipitation Extremes in New England Based on Spatial-Temporal Analysis

Abstract:
Projection of precipitation extremes is a primary concern that indicates potential changes of impactful events, such as floods, storms, hurricanes, which account for considerably losses every year in U.S. We propose to utilize spatial-temporal statistics for downscaling precipitation extremes and uncertainty assessment in New England. Extending our application of XCDFt method, we fit the Generalized Pareto Distribution for precipitation extremes of model and station observations via a Bayesian Hierarchical Model, with assuming a spatial prior on parameters of GPDs, then apply the CDF transfer function to downscale the future extremes at local-level from regional climate model (NARCCAP). This methodology has been performed and used to generate estimate of m-year return levels with MCMC simulations throughout 58 stations in New England. It has been successfully tested under cross-validation process, and significantly reduced the variability of estimates of return level in previous work.
Abstract:

A variety of ecological systems exhibit nonlinear or chaotic dynamics. Here, we explore such a system where the dynamics are due to the driving equations themselves. The logistic map is a well-studied example of a simple one-dimensional density-dependent population model, exhibiting a variety of behaviors ranging from periodic to chaotic. Traditional applications of the logistic map to spatially extended populations (such as the coupled map lattice (CML) or spatial logistic map (SLM)) lack an explicit length scale, and therefore model output is not easily interpretable or applicable to real-world ecological problems. We seek to remedy this omission by applying the logistic map to a spatially extended population existing along a one-dimensional domain with discrete generations and absorbing boundaries. Dispersal of the children from the parents proceeds with a Gaussian kernel to represent a Fickian diffusive process, a well-established dispersal mechanism. In this way, we introduce dispersal shape and length scale, along with realistic boundary conditions largely neglected by previous models. We find that for a substantial range of parameters, spatiotemporally chaotic population distributions abruptly give way to periodicity, even in the chaotic parameter range of the logistic map. Such dynamics are illustrative of a system in which regime shifts occur without external perturbation, but are instead due to the driving equations themselves. As growth rate and dispersal distance increase, we witness an evolving metapopulation structure with three phases, where we use “metapopulation” to describe the population over the entire domain. Depending on the combination of dispersal distance and growth rate, we witness distinct uncorrelated populations within the domain, a single highly correlated population across the entire domain, or a domain of perfectly correlated/anti-correlated patches, where size and number of patches depends on the dispersal distance.
**GRC Presenter Abstracts**

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<tr>
<th>Name</th>
<th>Willem Wallinga</th>
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<td>Department</td>
<td>Mathematics&amp;Statistics</td>
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<tr>
<td>Present Type</td>
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<td>Title</td>
<td>Formative Assessment in Mathematics Education</td>
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**Abstract:**

The study of formative assessment methods designed to promote learning and guide teaching is becoming more prevalent in mathematics education research. Several recent international studies have demonstrated the benefits experienced by students: higher levels of classroom engagement and better results on end-of-year exams, to name a few. However, these studies have also shown that implementing formative assessment is a daunting task. Teachers, especially those at the secondary level, have reported many practical obstacles internal to the classroom (such as large class sizes) as well as administrative and political issues (such as meeting curriculum requirements) that limit the use of formative assessment. In this presentation, I will report on a study designed to examine the benefits of formative assessment from the teacher’s point of view. The results of this study will shed light on the complex interplay between assessment and accountability in mathematics education in the United States.
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<tr>
<th>Name</th>
<th>Michael Allard</th>
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<td>Department</td>
<td>Mechanical Engineering</td>
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<td>Present Type</td>
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<td>Title</td>
<td>Importance of understanding coupled feedback mechanisms between an erosive flow and an erodible surface</td>
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Abstract:

Flow-induced erosion is of great practical concern in many engineering and science fields due to material degradation and corresponding safety concerns and infrastructure maintenance costs. Consequently, understanding and predicting erosion is a critical aspect of system design and erosion control strategies. Current predictive erosion models, however, do not account for the two-way coupled dynamics between an erosive flow and an erodible material after the onset of erosion, and as a result typically underestimate erosion rates. The objective of the proposed research is to conduct a systematic scientific study using experiments of increasing complexity to investigate and model the feedback loop between a flow and an eroding surface. This talk will describe the newly constructed facility dedicated to understanding this complex phenomena and our initial findings.
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<th>Name:</th>
<th>Alireza Ebadi</th>
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<td>Department:</td>
<td>Mechanical Engineering</td>
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<tr>
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<td>Title:</td>
<td>An Integral Method to Evaluate Wall Heat Flux Suitable For Experimental Data</td>
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Abstract:

An integral method to evaluate wall heat flux in turbulent boundary layers is presented. The method is mathematically exact and has the advantage of having no explicit streamwise gradient terms, thus making it amenable to experimental data. Using existing data sets, the method is shown to work in both zero- and adverse-pressure gradient boundary layers. The method is particularly useful for the latter case where Reynolds analogy does not hold and the wall heat flux must be measured directly.
Abstract:

This study proposes pose detection and control algorithms in order to control the relative pose between two Unmanned Underwater Vehicles (UUVs) using optical feedback. The leader UUV is configured to have a light source at its crest which acts as a guiding beacon for the follower UUV which has a detector array at its bow. Pose detection algorithms are developed based on a classifier, such as the Spectral Angle Mapper (SAM), and chosen image parameters. An archive look-up table is constructed for varying combinations of 5-degree-of-freedom (DOF) motion (i.e., translation along all three coordinate axes as well as pitch and yaw rotations). Leader and follower vehicles are simulated for a case in which the leader is directed to specific waypoints in horizontal plane and the follower is required to maintain a fixed distance from the leader UUV. Proportional-Derivative (PD) control (without loss of generality) is applied to maintain stability of the UUVs to show proof of concept. Preliminary results indicate that the follower UUV is able to maintain its fixed distance relative to the leader UUV to within a reasonable accuracy.
Abstract:

A sinusoidal shaped cellular structure model was developed to predict the mechanical behavior of carbon nanotube (CNT) bundles. The geometric parameters of the model were obtained by performing Fast Fourier Transform (FFT) image analysis on the scanning electronic microscope (SEM) image of a CNT bundle. The results of the finite element (FE) simulations of uni-axial compression of the cellular structure model qualitatively captured the experimentally-measured strain-stress behaviors of CNT bundles with different nano-structure and indicate two different buckling modes which are related to the two different failure modes of CNT. The results indicate that the sinusoidal shaped cellular model based on the FFT image analysis of SEM image of CNT bundles is promising in predicting the deformation mechanisms and the mechanical properties of CNT bundles. This new modeling technology can be used not only for predicting the mechanical behavior of CNT bundles, but also for developing the design guideline of CNT bundles for multi-functional applications.
Name: Ali Nassiri
Department: Mechanical Engineering
Present Type: Oral
Title: Wavy Interfacial Pattern During Magnetic Pulsed Welding

Abstract:

During Magnetic Pulsed Welding (MPW), a flier workpiece impacts a stationary workpiece to create a solid state weld. If the velocity of the flier workpiece is sufficient, a wavy pattern is observed at the interface between the two workpieces. The pattern has similarities to shear instabilities observed in fluid dynamics. In order to investigate this behaviour and assess if a connection between the two phenomena exists, shear instability analyses were conducted. Keys to these analyses are the constitutive behavior of the materials and the profile of the base flow at the interface. Numerical simulations were used in order to characterize the general shape of the shear profile, approximate the thickness of the shear zone, and estimate the material velocity close to the weld interface. The interdisciplinary collaboration in this research project is addressing fundamental questions related to the welding mechanism during MPW.
Name: Ivaylo Petrov Nedyalkov
Department: Mechanical Engineering
Present Type: Poster
Title: Theoretical, Numerical, and Experimental Studies of Bi-directional Hydrofoils

Abstract:

Foils (airfoils and hydrofoils) are 2-dimensional shapes representing a cross-sectional area of sections of 3D wings or turbine and propeller blades. Bi-directional hydrofoils in particular are foils suitable for applications in water, in which the flow reverses direction – such as in tidal current turbines or marine remotely operated vehicles. Theoretical studies outlined the basic required features for such foils and compared various foil design approaches. A numerical “test-bed” was then developed to study a large number of foils using CFD (Computational Fluid Dynamics). The developed software allows the user to specify the foil geometry and flow and simulation parameters, and generates all files necessary for simulations and data processing, as well as a summary of the parameters for the studied cases. The actual simulations are then performed automatically, using the open-source, high-fidelity CFD software OpenFOAM, which is widely used in industry and academia. The numerical “test-bed” results were validated using foil performance data obtained from experiments with selected foil shapes in the newly renovated UNH High-Speed Cavitation Tunnel (HICAT).
Abstract:

This research is focused on development of a new method for real-time tool condition monitoring in the milling process. The method is based on tracking force model coefficients during the cutting process. The behavior of these parameters are shown to be independent from the cutting conditions and correlated with the condition of the cutting tool. Several experiments with variable cut geometry are run to investigate the feasibility of tool wear monitoring using this method. Preliminary testing shows that this method can be used in real-time to track flank wear and detect the transition point from gradual flank wear to tool edge chipping.
Abstract:

Recent simulations of a vortex pair in a stratified fluid show that for small Froude number $W/Nb$ the vortices disintegrate into internal waves, where $W$ is the vortex strength, $b$ is the vortex spacing, and $N$ is the buoyancy frequency. The kinetic energy loss from the vortex pair in this regime can be remarkably fast, essentially annihilating the coherent vortex pair before any noticeable propagation. If the Froude number is large the vortices remain coherent and propagate as they would in constant density flow. The transition in behavior occurs near a Froude number of unity, but is apparently not a sharp transition, as some wave-making appears to happen for Froude numbers above unity. Here we quantify the wave-making with an integral of the momentum flux around a sequence of circles centered on the vortex pair and moving with it. Numerical solutions are obtained using a spectral method, the flow is treated as Boussinesq and viscous, and the initial conditions are approximately the flow due to a line vortex. The results confirm that the transition is gradual, although the complexity of the wavy flow makes interpretation difficult. These results are related to vortex roll-up in a stratified fluid.
Graduate Research Conference

GRC Presenter Abstracts

Name: Kateryna Vyshenska
Department: Mechanical Engineering
Present Type: Oral
Title: “Investigation of Microcracking in 3D Woven Composites”

Abstract:

3D woven composites composite materials are widely used in aerospace industry due to their high specific strength and stiffness, corrosion resistance and long fatigue life. When compared to laminated composites, materials with 3D woven reinforcement architecture do not delaminate and they can be manufactured as a seamless structure. Also controlled amount of fibers in all three directions allows tailoring material properties for intended applications.

However, a combination of certain weave patterns with certain resin types may result in microcracking of the epoxy resin during the manufacturing process. We assume that this phenomenon occurs due to mismatch of the coefficient of thermal expansion (CTE) between carbon fiber and epoxy resin materials. When the material cools down from the resin curing to room temperature epoxy resin with high CTE tends to shrink much more than the carbon fiber with much lower CTE. This leads to formation of residual stresses in the epoxy resin pockets and as a result – formation of microcracks.

To resolve this issue, we are working on the development of resin failure criteria and on the finite element analysis (FEA) modeling of the resin shrinkage due to curing process. In our simplified finite element analysis we model the cooling stage of the curing process where we subject the material to uniform temperature change from the resin curing to room temperature. We validate our results by performing mechanical testing using extensometer and digital image correlation as strain measurement techniques.
GRC Presenter Abstracts

Name: Ethan Baker
Department: Microbiology
Present Type: Poster
Title: The Molecular Response of Frankia QA3 to Naphthalene Stress

Abstract:
Frankia are soil actinobacteria that form a symbiotic nitrogen-fixing association with actinorhizal plants. The symbiosis plays a significant role in actinorhizal plant colonization of land contaminated with heavy metals and other industrial waste. These bacteria may remediate anthropogenic compounds including toxic aromatic hydrocarbons. The availability of various Frankia genomes has provided a database to predict the metabolic versatility against these compounds. The aim of this study was to elucidate the molecular response of Frankia QA3 toward naphthalene, including resistance and degradation at a genetic and proteomic level. A comparative genomics approach was used to data mine the Frankia genome databases to identify potential naphthalene catabolic pathways and related xenobiotics. A growth assay was used to determine tolerance levels and the ability of Frankia to grow on naphthalene as a sole carbon source. Gene expression was monitored by quantitative RT-PCR and used to confirm the in silico findings. A proteomic profile was created to identify proteins induced under naphthalene stress. Peptides were identified using LC-MS. Differential expression of the corresponding genes were confirmed by quantitative RT-PCR. Bioinformatic analysis identified a potential operon for aromatic compound degradation as well as several ring-hydroxylating dioxygenases in Frankia QA3. Growth assays confirmed tolerance to naphthalene. The growth yield showed a linear correlation with naphthalene concentrations, suggesting an ability to utilize naphthalene as a sole carbon source. The expression of several genes, including those for the identified degradation operon, was up-regulated with the addition of naphthalene. Proteomics results yielded differential expression of proteins involved in metabolism and transport when subjected to naphthalene stress. These results support the hypothesis that Frankia QA3 has metabolic versatility, is resistant to and can degrade naphthalene.
Abstract:

Many bacterial genomes are composed of multiple chromosomes, in which one is primary, larger and harbors more essential genes, and others are secondary, smaller, and contain more variable genes. Studies using two multi-chromosome genera, Vibrio and Burkholderia, have revealed that secondary chromosomes are replicated later in the cell cycle, expressed less, and evolve more rapidly. However, the extent to which this rapid evolution results from reduced purifying selection on less essential, less expressed genes or as an inherent feature of the mutational process affecting secondary chromosomes has yet to be addressed experimentally. We conducted a mutation accumulation experiment using daily single-colony bottlenecks to collect and enumerate mutations in the near-absence of natural selection using three bacteria with multiple chromosomes: Burkholderia cenocepacia, Vibrio cholerae, and Vibrio fischeri. Genome sequencing of 50 lines from each species enabled us to calculate and compare mutation rates between chromosomes and between regions within the same chromosomes. Base substitution rates (ubs) on secondary chromosomes were higher than those on primary chromosomes. Further, ubs within individual chromosomes followed a wave-like pattern extending bi-directionally from the origins of replication and the pattern on secondary chromosomes mirrored that of the concurrently (late) replicated regions of primary chromosomes. These results suggest that delayed replication timing has the important consequence of increasing the base substitution rate. This dynamic affects genes near the terminus of primary chromosomes and especially those on secondary chromosomes, and contributes to these regions becoming evolutionary test beds enriched for variation within and among species.
### GRC Presenter Abstracts

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<th>Name:</th>
<th>Kenneth Mark Flynn</th>
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<td>Department:</td>
<td>Microbiology</td>
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<td>Present Type:</td>
<td>Poster</td>
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<td>Title:</td>
<td>Evolutionary Genomics of Experimental Pseudomonas aeruginosa Biofilms</td>
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#### Abstract:

Pseudomonas lung infections of persons with cystic fibrosis (CF) are characterized by unpredictable patterns of evolutionary diversification (1). This unpredictability creates highly dynamic infections with rapid turnover of medically important phenotypes. Experimental evolution in structured environments enables the study of interactions between local and global adaptive processes that may alter adaptive outcomes and contribute to the unpredictability of these populations. To examine this interaction, we experimentally evolved replicate populations from P. aeruginosa strain PA14 under a regular cycle of biofilm formation and dispersal (2). Sequencing of both clones and communities through time revealed the number and frequencies of adaptive mutations within and among lineages with high resolution. In these biofilms, populations repeatedly evolved a mutator haplotype that fixed and subsequently gave rise to numerous genetically distinct subpopulations. Surprisingly, ‘losing’ subpopulations were never truly lost; isolates with specialized traits such as high-biofilm, small colony variants tended to represent rare genetic lineages below the threshold for population-genomic detection (<2% allele frequency). Regardless of genetic origin, more than 70% of the variation distinguishing these specialists from predominant generalists could be explained by mutations in only a few functional categories implicated in host-association and virulence (3). These results suggest that diverse genetic lineages distinguishable by medically important traits persist as biofilm specialists via motility and attachment mutations. This increased standing genetic variation likely contributes to the unpredictable fluctuations characteristic of chronic Pseudomonas infections.
Abstract:

Management of cover crops and soil structure directly affects the temporal and spatial turnover of nutrients and their contributions to future cash crop productivity. Additionally, intensive management practices like in-season tillage can alter soil food web composition such that below-ground processes are either stimulated or constrained. We conducted a litterbag study to determine the effects of in-season soil disturbance and litter quality on the rate of cover crop litter decomposition. The study was conducted in summer 2012 at the Russell Larson Agricultural Research Center in Rock Springs, PA. We placed bags filled with litter of hairy vetch (low C:N) or cereal rye (high C:N) along transects running perpendicular to the direction of soil disturbance (i.e. mid-ridge, row, interrow) in a corn-soybean cropping system managed under two disturbance regimes: uniform disturbance (chisel plow) or zonal disturbance (ridge-tillage). Litter bags were collected three times during the growing season to determine mass remaining. We also measured decomposition processes indirectly by assessing the growth response of a corn phytometer.

Hairy vetch decomposed significantly faster than cereal rye regardless of disturbance regime. Rates of hairy vetch litter decomposition were also spatially variable, and were lowest for litter placed directly in the crop row. Overtime, however, these spatial relationships diminished. Corn yields in the zonal disturbance treatment were significantly higher than yields in the uniform treatment. Similarly, leaf nitrogen content and plant heights were higher after in-season tillage in the zonal treatment compared to the uniform disturbance treatment suggesting that the zonal disturbance stimulated nutrient turnover. The effects of zonal disturbance on the corn phytometer may have been mediated, in part, by increased resource inputs to the soil food web community that stimulated nutrient turnover following disturbance to the crop root system.
Name: Amanda Daly  
Department: Nat Resrces&Earth Systems Sci  
Present Type: Poster  
Title: Proposed methodology for investigating plant-microbe controls on nitrogen priming in an agroecosystem

Abstract:

Priming, or the upregulation of soil organic matter (SOM) turnover by microbes in response to labile substrate inputs (e.g. from plant roots), could constitute an important control on nitrogen (N) cycling and, ultimately, plant N acquisition in agroecosystems. However, the plant-microbe controls on priming are not well-understood. I propose to determine:

1) To what extent plants can supply themselves with N by exploiting microbial responses to priming,
2) Whether plant-associated arbuscular mycorrhizal fungi (AMF) can induce priming effects, and if so, whether AMF community composition matters, and
3) How different soil microbial communities respond structurally and functionally to the influence of roots and AMF.

I here present my plans to address these questions using soil from in-growth cores installed in May 2013 at the Rock Springs Agricultural Experiment Station at Penn State University. Cores constructed from different mesh sizes allow in-growth of roots and AMF (2 mm), AMF only (30 um), or no in-growth (1 um), and are installed adjacent to maize plants under agricultural management regimes of contrasting intensity. I discuss my experimental plans, which include using metatranscriptomics to analyze bacterial and fungal (including AMF) active community structure and expression of functional genes involved in N cycling, and integrating these observations with direct measurements of N pools, N mineralization, and extracellular enzyme activities. I also present my current progress toward these goals, and seek constructive feedback and advice on sequencing methodology, bioinformatics, and experimental design.
Name: Abigail D'Ambrosia  
Department: Nat Resrces&Earth Systems Sci  
Present Type: Poster  
Title: Mammalian dwarfism associated with the early Eocene ETM2 hyperthermal event, Bighorn Basin, Wyoming

Abstract:

The early Paleogene was marked by a series of extreme global warming events known as hyperthermals, characterized by global atmospheric carbon isotope excursions (CIEs). The largest hyperthermal, known as the Paleocene-Eocene Thermal Maximum (PETM), was also coincident with transient mammalian dwarfism. Understanding hyperthermals and their effects on terrestrial biota is important for predicting future ecological changes in response to present day CO2 and temperature increases.

To better understand the relationship between mammal body size, temperature, and atmospheric CO2 levels, these variables should be analyzed across multiple hyperthermals. Until recently, hyperthermals other than the PETM have only been recorded in marine sediments. However, recent analysis of paleosol carbonates from stratigraphic sections in the Bighorn Basin of Wyoming has uncovered continental records of two smaller magnitude early Eocene hyperthermals known as ETM2 and H2.

To investigate how mammal body size changed during ETM2 and H2, mammal fossils were collected from Bighorn Basin stratigraphic sections known to encompass these events. Body size was tracked by measuring the crown area of lower cheek teeth, which is known to correlate with adult body size. Direct evidence of the CIEs was provided by geochemical analysis of paleosol carbonates.

Results show that several mammalian lineages experienced a clear decrease in body size during ETM2. For example, estimates of Hyracotherium mean body size decrease by ~22% from pre-ETM2 to mid-ETM2, coinciding with a -3.8‰ CIE. Body size reverts to pre-ETM2 levels when background carbon isotope values reappear. This pattern is quite similar to the PETM when Hyracotherium body size decreased ~30%, coinciding
with a -5.9‰ CIE. Decrease in mammal body size seems to be a common evolutionary response to early Paleogene hyperthermals, and thus may be a predictable natural response for some lineages to future global warming.
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<th>Name:</th>
<th>Jose Antonio Gutierrez Lopez</th>
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<tr>
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<td>Title:</td>
<td>Ecohydrological impacts of feedstock production for bioenergy across the Americas: a multidisciplinary study to assess long-term sustainability</td>
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Abstract:

As the demand for alternative sources for energy increases, the sustainable production of bioenergy feedstock becomes a major challenge for researchers, policymakers and land managers. Research comparing petroleum- and bio-based fuels has focused on differences in CO2 and other emissions, while less attention has been given to ecohydrological impacts. Understanding of these impacts in fast-growing woody species (e.g. Aspen and Eucalyptus) and palms is lacking. The objective of our research is to assess the impacts of producing woody feedstock on water balance across the Americas, focusing on Populus tremuloides (Wisconsin, USA), Eucaliptus globulus (Corrientes, Argentina), and oil palm (Pará, Brazil and Tabasco, Mexico). We calculate water balance based on measurements of transpiration (sap flow), canopy evaporation (throughfall), stemflow, precipitation and other climatic variables. We present here current findings and future directions for assessing the ecohydrological implications and long-term sustainable production of woody biomass for energy in four different environmental, socioeconomic, and cultural contexts. The findings of this study will provide a baseline for the development of sustainable production of crops for bioenergy, quantify its effects to the water balance and provide policymakers, land managers and researchers with unique information relevant for future development of alternative sources of energy.
GRC Presenter Abstracts

Name: Ian Wiley Honsberger  
Department: Nat Resrces & Earth Systems Sci  
Present Type: Poster  
Title: Linking Metamorphic Petrology and Geochemistry through Geothermobarometry and Tectonic Discrimination of Subduction Zone Rocks: Rowe-Hawley Zone, Vermont

Abstract:

Whole rock major and minor element geochemistry of amphibole-bearing greenstone within the Rowe-Hawley Zone, Vermont is utilized in both geothermobarometric modeling and tectonic discrimination to describe a Wilson Cycle. Metamorphosed tholeiitic basalts of oceanic origin record a chemical history beginning in the Late Precambrian during the final breakup of Rodinia and culminating in the Ordovician with subduction of the Iapetus Ocean. Ti-Zr-Y, V-Ti, Zr/Y-Zr and Cr-Y igneous tectonic discrimination indicates that these metabasalts formed from a magma source transitional between MORB and island arc tholeiite, implying rift-related generation at the onset of Iapetus Ocean development.

Original spatial distribution of source region between the two types of basalts influenced subsequent metamorphism along P-T-t subduction and exhumation paths. Bulk chemistry and amphibole compositional data integrated in Perple_X (Connolly, 2005) through pseudosection and isopleth calculations indicate that Taconian subduction metamorphism of an ultramafic-mafic-pelitic unit in Stockbridge reached 535-540°C and exceeded 8.8 kbar. Exhumation of these mafic rocks and polymetamorphism at lower pressures and temperatures is predicted theoretically by decreasing NaM4SiCa-1Al-1 and AlVIAlIVMg-1Si-1 substitution from core to rim in amphiboles preserving three distinct chemical zones. Projections of electron microprobe data using Na and Al compositional isopleths calculated in Perple_X indicate metamorphism for one amphibole equilibria at 445-475°C and 6.3-7 kbar, corresponding to 20-21 km depth. A final phase of exhumation is marked by actinolite growth at ~10 km depth during greenschist facies metamorphism at 400°C and 3 kbar.
Name: Lauren Koenig  
Department: Nat Resrces&Earth Systems Sci  
Present Type: Poster  
Title: Dissolved organic matter dynamics in a suburbanizing watershed: the importance of wetlands, people, and flowpaths

Abstract:

Human development of a watershed often yields fundamental and quantifiable changes in water quality and inorganic nutrient cycling. The effects of suburban development on the cycling of dissolved organic matter (DOM), however, have received relatively less attention, and the understanding of local dissolved organic matter dynamics is rarely a stated goal of watershed management. In this study, we examine the effects of suburbanization on concentrations of dissolved organic carbon (DOC) and dissolved organic nitrogen (DON) as well as the optical properties of DOM using 17 study sites in the Lamprey River watershed, NH that integrate varying levels of human development and population density. We show that concentration of DOC and DON is related to wetland cover but is not correlated with population density. Further, we observed no response in DOC concentration with increased flow at the mainstem site, while DON concentration is diluted. The optical properties of dissolved organic matter, however, showed different trends. Fluorescence Index (FI) decreases with increasing wetland cover and lower population density. We show that in a coastal watershed, while DOM quantity is driven by the presence of wetlands, DOM quality changes with both wetland cover and human development. The decoupling of DOM quantity and quality in this suburbanizing watershed indicates that DOM quality may be an important yet overlooked control on watershed-scale biogeochemical cycling and nutrient export.
### GRC Presenter Abstracts

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<th>Name</th>
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<td>Title</td>
<td>Effects of White Pine Needle Damage on sap flow and growths rates of eastern white pine at the Fox State Forest, New Hampshire</td>
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**Abstract:**

White Pine Needle Damage (WPND) is a complex of fungal pathogens which cause chlorosis and defoliation of infected eastern white pine (Pinus strobus) foliage in the spring and throughout the summer. Since 2009 stands of pine in the Northeastern US have experienced an unprecedented outbreak of WPND, causing crowns of infected trees to thin significantly and often casting all but the current year needles. This research investigates the extent which these defoliations affect water uptake and induce growth reductions that can be attributed to the disease. Whole tree transpiration was measured using high temporal resolution sap flow probes August through September 2013 at the Fox State Forests, Hillsborough, NH. Tree ring analysis of 20 trees within this stand revealed that WPND has induced a mean growth decline of 50% in highly infected trees that have been subject to repeated defoliations.
Abstract:

The largest earthquakes on mid-ocean ridge transform faults (RTFs) exhibit the most systematic behaviors known in seismology. Many of the largest events occur by repeatedly re-rupturing the same portion of the fault on a relatively regular basis. On the Gofar transform fault on the East Pacific Rise (EPR), magnitude ~6.0 earthquakes occur every ~5 years. During the last five seismic cycles on Gofar transform fault, the largest earthquakes have ruptured only a single rupture patch, suggesting that the intervening fault segments (rupture barriers) stop the propagation of the largest earthquakes. In 2008, an ocean bottom seismometer (OBS) deployment successfully recorded the end of a seismic cycle on Gofar transform fault [McGuire et al., 2012], including an extensive foreshock sequence localized within a 10 km rupture barrier, the magnitude 6.0 mainshock and its aftershocks that occurred in a ~20 km rupture patch, and an earthquake swarm that was located in a second rupture barrier. Using seismic data recorded by the OBSs, we determine the stress released by earthquakes in the foreshock and aftershock regions to investigate how the rupture properties of moderate magnitude earthquakes (3.6 < magnitude < 4.5) differ between rupture patches and rupture barriers. We find an average stress drop of 2 MPa in the foreshock region compared to an average stress drop of 1.2 MPa in the aftershock region, suggesting no observable systematic difference between the rupture process of moderate magnitude earthquakes in rupture patches and rupture barriers on Gofar transform fault.
Name: Jesse Sadowsky
Department: Nat Resrcs&Earth Systems Sci
Present Type: Poster
Title: Ectomycorrhizal enzyme activities under long-term nitrogen enrichment reflect altered fungal communities and conserved species traits

Abstract:

Species traits and resource availability shape the structure and function of communities in ecosystems. Mycorrhizal fungi are root symbionts that provide an interface for energy and nutrient transfer between plants and soils. Mycorrhizal fungi comprise multiple independently evolved lineages of species that encompass wide functional breadth. Species-level tradeoffs arising over evolutionary time may underlie contemporary variation in mycorrhizal communities along resource-supply gradients. We investigated extracellular, organic matter-degrading enzymes of ectomycorrhizal fungi as species traits in the long-term Chronic Nitrogen Addition study at Harvard Forest. We assayed enzyme activity on hyphae encapsulating the surface of ectomycorrhizal roots over a period between tree-leaf emergence in spring and after leaf senescence in fall. Ectomycorrhizal fungi were then identified by DNA sequencing. Ectomycorrhizal carbohydrolytic enzyme pools reached peak levels when tree photosynthesis was inactive in spring and late autumn. Along the experimental nitrogen-supply gradient, changes in ectomycorrhizal enzyme pools coincided with compositional shifts in ectomycorrhizal fungal communities. Ectomycorrhizal fungal species that predominated nitrogen-enriched soils harbored large pools of enzymes that catalyze release of carbon from soil organic matter, while ectomycorrhizal fungal species that were most abundant in soils with low nitrogen availability had large pools of nitrogen-mobilizing aminopeptidases. These findings conform to ecoenzymatic theory of resource supply and demand, and support niche-based models of community assembly. Enzyme secretion by ectomycorrhizal fungi may aid in maintenance of homeostasis at times of high carbon demand and where environmental nitrogen supply exceeds cellular demand.
Name: Jessica Veysey
Department: Nat Resrces&Earth Systems Sci
Present Type: Poster
Title: What size buffer? A large-scale experiment tests buffer impacts on amphibian demography

Abstract:
Forested buffers are a common management tool for pool-breeding amphibians in eastern North America, yet the demographic consequences of buffer size have not been experimentally tested. We used clear cuts to manipulate buffer width at 11 vernal pools in central Maine. We assigned each pool to one of three treatments: uncut (i.e., reference), 100m buffer, or 30m buffer. From 2004 to 2009, we captured all adult spotted salamanders (Ambystoma maculatum) and wood frogs (Lithobates sylvaticus) using these pools. We assessed the relative importance of buffer treatment and other factors on abundance, recapture rates, sex ratios, and size. Buffer treatment affected salamander abundance, but pool hydroperiod mediated treatment effects. Wood frog abundance increased with mean hydroperiod across all treatments. For both species, the proportion of recaptured adults was lowest at 30m pools. Salamander sex ratio increased post-cut at both cut treatments, while frog sex ratio did not vary with treatment, year, or hydroperiod. Salamanders and frogs were smallest at 30m pools. Salamander, but not frog, recapture rates and size recovered with time. Our clear cuts were associated with short-term negative demographic consequences for these species, with 30m-treatment populations experiencing the most severe impacts. Conservation plans for these species should address both buffer width and pool hydroperiod.
Abstract:

Hybridization is influential in shaping species dynamics and has many evolutionary and conservation implications. Accurate identification of admixed individuals is critical for monitoring abundance and distribution of natural populations. We evaluated the effectiveness of morphological features in identifying admixed individuals in an overlap zone between two tidal marsh birds: Nelson’s (Ammodramus nelsoni) and Saltmarsh (A. caudacutus) sparrows. We sampled 230 sparrows from 31 marshes from Maine to Rhode Island, including the 208 km hybrid zone. We scored each individual for 13 morphological traits, including plumage color and definition, and bill color, and also collected morphometric data, including bill measurements, wing chord, and mass. We genotyped individuals at 24 microsatellite loci and used an allele-frequency based approach to calculate a hybrid index for each individual. Individuals were placed in one of three categories (pure Saltmarsh, pure Nelson’s, admixed) based on genetic hybrid index values. We used linear discriminant function analysis to identify morphological features that best identified admixed and pure individuals. While all functions performed well in identifying pure Saltmarsh and Nelson’s sparrows (80 – 97% pure individuals were correctly classified), models were unable to classify admixed individuals. The top function failed to classify 32 of the 34 admixed individuals, and 68% of these admixed individuals were instead classified as pure Saltmarsh Sparrow. We posit that extensive backcrossing has generated high variation in morphological features, such that the identification of backcrossed individuals is challenging in the absence of genetic data.
Abstract:

Derelict lobster gear (DLG) is a multifaceted issue that affects a variety of stakeholders across a broad geographical scale. This case study focused on understanding lobster fishing and its management in New Hampshire (NH) state waters from the perspectives of local stakeholders. Current regulations are protecting the livelihoods of lobster fishers at the expense of the removal of DLG. Despite these barriers, groups exist within NH who are tackling the challenges of gear removal within the Gulf of Maine. Their efforts could be augmented by more communication and collaboration as well as shifting focus to the prevention of DLG. Recommendations are provided in this report to increase participation and collaboration between relevant stakeholders to improve the effectiveness of efforts to reduce the abundance of DLG in NH.
Abstract:

Dissolved oxygen is a vital compound for sustaining fish populations and aquatic vegetation within the Ipswich Watershed. It is an important component of aquatic metabolism, and is an indicator of stream health, which has been a recent topic of concern for the Plum Island LTER. Recent research shows that dissolved oxygen levels (% DO) are low in sections of the headwater streams of the watershed. In some areas, DO levels drop to 0 percent saturation, and remain at low levels for a significant length of stream. These low DO levels throughout the watershed can be attributed to water withdrawals, however we hypothesize it is likely the cause of the numerous wetlands that exist in the headwaters of the Ipswich. With the rebound of the beaver populations, and increased urbanization in the watershed (road crossings, dams, etc), the hydrology of the headwater streams has been altered considerably. The increased amount of pools, caused from underestimations of culvert size, beaver dams, etc, causes decreases in flow, increased organic matter buildup, and higher water levels above the impoundment, which creates riparian wetlands. These areas of high productivity have high oxygen demand, and therefore decrease the amount of dissolved oxygen in the water column below the impoundment.

My research aims to tease apart the relationship between alterations in the stream channel and dissolved oxygen. To do this, I measure dissolved oxygen, metabolism, nutrients, and biogeochemical in fluvial wetlands of the Ipswich River Watershed. Transient storage is also assessed through rhodamine additions at each field site. The details of my approach and recent findings of my work are presented in this poster.
Abstract:

Changes in land use and regulatory legislation have had a substantial influence on the abundance and distribution of bobcats (Lynx rufus) in New Hampshire. Bobcats are sensitive to habitat fragmentation and thus, are good indicators of landscape connectivity. Using genetic data from historic and contemporary samples, we are assessing how population declines and the increasing prevalence of high-traffic volume roads in the late 20th century have affected population structure and genetic diversity of bobcats. Using a landscape genetic approach, we are measuring the barrier effects of roads, waterways, elevation, and climate (especially average winter snow depth) on bobcat movements and assessing if these features have subdivided the NH bobcat population. To date, we have genotyped 97 contemporary specimens at 13 microsatellite loci. A preliminary analysis revealed genetic diversity was 14% lower than expected. The number of alleles per locus ranged from 5 to 11 (mean = 7.9). Furthermore, we found that despite the great dispersal potential of bobcats, NH bobcats seem to be subdivided into 5 genetic clusters. A Mantel test did not support isolation by distance (P = 0.002). Additionally, inbreeding coefficients ranged from 0.13 – 0.21, suggesting significant levels of inbreeding in subpopulations north of the White Mountains and in southern New Hampshire. We plan to expand this project to include samples from surrounding states and Quebec, Canada.
Abstract:

Eleven of the eighteen assessment zones in the Great Bay Estuary have been on the New Hampshire Department of Environmental Services’ list of impaired water bodies due to high levels of nitrogen since 2008. Because of the role that runoff plays in the nitrogen load to this estuary, changes in its nitrogen concentrations may reflect increasing sewer discharge and impervious surfaces associated with population increases, land use changes in the watershed, or changes in precipitation patterns. Nitrogen fertilization can increase algal growth, which competes with and may stress rooted aquatic plants such as eelgrass.

Research conducted in Great Bay Estuary between 2008 and 2010 showed a dramatic increase in the abundance of macroalgae since the last study, conducted thirty years earlier. To improve our understanding of the changes in macroalgae populations in response to nitrogen loading to the estuary, we collected data through three approaches: 1) continuing parts of the 2008-2010 macroalgal assessment; 2) assessing groundcover at 175 randomly selected points; and 3) comparing the nitrogen isotope ratios of macroalgae collected from various habitats. Whereas many previous studies have focused on limited species, sites, or sampling events the preliminary data we have at this time illustrate the significance of macroalgae in the estuarine communities of Great Bay.

We aim to use the knowledge and experience gained from the 2013 macroalgal monitoring season and previous macroalgal monitoring efforts to help the Piscataqua Region Estuaries Partnership (PREP) develop a long-term plan to monitor macroalgae. PREP set a management goal of “no increasing trends in macroalgae” for the Bay in its 2013 State of the Estuaries Report. A monitoring plan is needed to ensure that this goal is met.
Abstract:

Rural communities with amenity-driven economies across the Inland Northwest are experiencing increased out-migration of the younger work force residents and increased in-migration of the slightly older population. Many of these communities in the Inland Northwest are facing increasing potential for catastrophic wildfires due to warmer winters, decreased rainfall, and prolonged drought. Wildfires threaten economic livelihoods, forcing people to make tough decisions about land use based on their perceived vulnerability to wildfire. The geographical linked database Wildland-Urban Interface (WUI) from the University of Wisconsin outlines areas across the United States where structures and other human development overlap with undeveloped wildlands and potential wildfire fuels. The relationship between county-level wildfire vulnerability and net-migration of the county is examined using the WUI dataset in combination with county-level data from the Age-Specific Net Migration Estimates dataset from the University of Wisconsin. Counties with high correlations between net-migration rates and wildfire risk outlined as WUI intermix/interface are identified using geospatial regression. The Age-Specific migration signatures of these identified counties are compared in order to outline similar age-specific migration trends. Additionally, the National Land Cover Dataset change values from 2001-2006 are quantified at county level for these identified counties of high correlations between wildfire risk and net-migration. Identifying both trends between wildfire risk and net-migration rates and the counties experiencing these trends allows for further understanding of rural community characteristics.
Abstract:

Minimal data is available for nutrients and little is known about carbon-nutrient interactions in arctic streams of Central Siberia. Previous studies in this region show variable DOC quantity as a function of fire (years since last burn). Our recent data show that NO3 also varies as a function of fire with higher concentrations in streams affected by recent fire (low DOC) as compared to watersheds with older fire history (high DOC). To assess differences in nutrient processing along a DOC:NO3 gradient in Central Siberian arctic streams, TASCC experiments for PO4, NH4, and NO3 were conducted over three weeks in June 2013 at four sites as the region was transitioning from high spring floods to drier summer conditions. Results show that 1) fire history does influence DOC and NO3 concentrations in these streams, 2) uptake length (Sw) of PO4, NH4, and NO3 generally declined with higher DOC:NO3 concentrations, and 3) PO4 uptake was faster than NO3 and NH4 at most sites. These data suggest that heterotrophic uptake is the dominant pathway for nutrient retention in these streams.
In 2006, commercially viable oil reserves were discovered in Murchison Falls Conservation Area (MFCA). MFCA is a protected area located in Western Uganda in the Albertine Rift biodiversity hotspot. The recent discovery of oil reserves inside MFCA has resulted in the presence of international oil and gas companies, with operations scheduled to begin in 2015. Increases in road network and oil activities and infrastructure (e.g. wells, drilling pads, and heavy trucks) could have large impacts on both the flora and fauna of the area. Independent empirical studies of new oil development are surprisingly limited, despite the approval of oil related activities. Thus, it is important to develop an assessment of landscape change and human demographic change to explore potential long-term impacts to this highly sensitive region, both in and surrounding the protected area. We compare historical and current human migration patterns and population change using population density grids for the census years between 1932 and 2012. We also use a MODIS Enhanced Vegetation Index time series analysis for a preliminary view of landscape change occurring in this area. The initial results suggest an increasing and expanding human population in this area, drawn in because of oil, but also because of increased tourism and presumed other economic benefits. The increased road density and infrastructure has caused fragmentation, particularly in the northwest part of MFCA, north of the Nile River.
GRC Presenter Abstracts

Name: Natallia Leuchanka
Department: Natural Resources
Present Type: Poster
Title: A collaborative approach to socio-economic assessment to increase coastal marsh and community resilience to sea level rise on the Chesapeake Bay

Abstract:

Sea level rise and other stressors in the mid-Atlantic U.S. are impacting the resilience of coastal communities, and increase their overall physical and socio-economic vulnerabilities. The Deal Island Peninsula on the Eastern Shore of the Chesapeake Bay, MD is used as a case study of a coastal heritage community that is undergoing these stressors and is involved in stakeholder-driven resilience and adaptation planning. In this interdisciplinary socio-ecological project funded by the NERRS Science Collaborative, a socio-economic analysis of a culturally rich coastal community is performed as a sub-study. The goals of the socio-economic analysis are to 1) better understand stakeholder relationships with marsh ecosystems and services they provide, 2) bring stakeholder perceptions and values of socio-ecological services into a coastal decision-making framework, and 3) bridge the gap between science and decision-making through improved communication and collaboration. The methodologies employed take the nature of a collaborative learning approach, coupled with the Q-sort technique. In this presentation, discussion topics include the collaborative approach taken toward a socio-economic assessment, preliminary results of the Q-sort, and indicators of community adaptation efforts.
Abstract:

The challenges of determining the status of low density and secretive species, such as bobcats, are well known. We compared several efforts that relied on volunteers as potential low-cost approaches toward monitoring bobcats in New Hampshire. Incidental observations (including roadkills), hunter surveys, and an organized effort that incorporated trail cameras were used to determine the distribution and variation in relative abundance of bobcats. These approaches were then compared to a statewide assessment of habitat suitability based on transmitter-equipped bobcats in two study areas. Since 2008, we have received ~1,000 incidental observations and records of ~170 road-killed bobcats. These data did provide insight into the distribution of bobcats, including a recent range expansion, but are clearly biased toward areas with abundant human populations and extensive road networks. Townships with frequent sightings or roadkills of bobcats did not correspond to townships that contained an abundance of suitable habitat (based on our telemetry-derived model). Hunter surveys (number of bobcats seen/1,000 hours in the field) did show substantial agreement with our telemetry model. The trail camera-based effort provided limited data. Approximately 150 trail cameras were deployed for 14-17 days in southern New Hampshire. Despite use of attractants, preliminary analysis indicated that bobcat detection rates were extremely low (0.1-1.0/100 camera nights). Based on these results, we suggest that hunter surveys may provide an effective, low-cost method to monitor changes in the distribution and relative abundance of bobcats on a statewide basis.
Abstract:

Habitat connectivity is vital for dispersal and metapopulation persistence. Land use change and landscape modification alter the distribution and availability of habitat, thereby decreasing connectivity and impeding organisms’ dispersal abilities. Reduction of connectivity is a relevant concern for the New England cottontail (Sylvilagus transitionalis), a species of high conservation priority that has experienced a dramatic decline of its required shrubland habitat. To better understand New England cottontail connectivity, we used a landscape genetics approach to assess the impact of landscape features on cottontail dispersal in two landscapes in southern Maine and New Hampshire. Least Cost Path (LCP) algorithms were implemented in ArcGIS in conjunction with resistance maps representing hypothesized costs of dispersal. Using expert opinion values from the Maine Beginning with Habitat Connectivity Project as a starting point, we tested a range of resistance values for roads, development, open water, forest, wetlands, fields, and scrub-shrub habitat. Optimal values were chosen as those that produced the highest Mantel correlation of LCP effective distance with individual-based genetic distances (Rousset’s a) from 151 cottontail microsatellite genotypes. We found that development, forests, water, fields and interstate highways but not other roads act as dispersal barriers, while scrub-shrub patches, wetlands and shrubby linear features (powerline right-of-ways and roadsides) act as facilitators of New England cottontail dispersal. The relative influence of specific landscape features differed across the two landscapes, according to differences in landscape composition. Using our findings, we generated a modified connectivity map for New England cottontail. These results can inform shrubland habitat restoration efforts.
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<th>Bianca Rodriguez-Cardona</th>
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<td>Title:</td>
<td>NITRATE UPTAKE KINETICS IN SUBURBAN STREAMS OF NEW HAMPSHIRE</td>
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Abstract:

The underlying mechanisms driving the coupled interaction of organic matter quantity and uptake of inorganic nitrogen forms are not well understood, particularly in surface waters. To determine the influence of DOC quantity on NO3 uptake in streams, a series of NO3 and DOC (acetate) TASC additions were conducted in two contrasting streams within the Lamprey River watershed in New Hampshire, one stream with relatively high DOC (6.8 mg/L), low NO3 (40 μg/L) and the other with relatively low DOC (3.5 mg/L), high NO3 (667 μg/L). NO3 uptake showed opposite or inconsistent trends in kinetic metrics between the two sites; however, ambient uptake metrics showed consistent and stronger relationships with physico-chemical parameters (light, temperature and DOC) as well as seasonal trends. NO3 uptake in these streams seems to be insensitive to DOC quantity and largely driven by physico-chemical parameters. Ambient Vf increased with increasing temperature, ambient U increased with increasing light and ambient Sw decreased with increasing DOC concentrations.
Abbie Sherwin

Natural Resources

Oral

Refining Freshwater Inflow Management through Stakeholder Engagement and Collaboration

Abstract:

Freshwater quality and quantity are the most significant challenges facing Texas resource managers today. Extended periods of drought and increased demand for freshwater have led to decreased flows reaching the coast where freshwater is critical to the health and productivity of estuaries. Texas estuaries are vital to the state’s economy and support multibillion dollar commercial and recreational activities.

To address the mounting issue of freshwater inflows, the Mission-Aransas National Estuarine Research Reserve, in partnership with the University of Texas and Texas A&M University, initiated a project to engage stakeholders in a collaborative process to address several of the identified research gaps and to refine environmental flow standards for the Guadalupe-San Antonio bay/basin. The project engaged stakeholders from a range of backgrounds representing diverse values, interests, and perspectives. The ongoing project is employing mediated modeling and a series of workshops to promote stakeholder engagement and collaboration. Mediated modeling is a participatory, collaborative process that can help diverse groups develop shared systems learning and address complex socio-environmental issues. Throughout the project, stakeholders and researchers has collaboratively developed a system dynamics model of the Mission-Aransas Estuary. The model will ideally be used to inform freshwater management and improve flow recommendations for the Guadalupe-San Antonio bay/basin.
Name: Nicholas Shonka
Department: Natural Resources
Present Type: Poster
Title: Water quality sensors provide insight into the suspended solids dynamics of high flow storm events in the Lamprey River, NH

Abstract:

During high flow storm events, the suspended solids dynamics of the Lamprey River exhibit large and fast fluctuations in the amount of Total Suspended Solids (TSS) with Turbidity levels peaking before TSS and Discharge levels, suggesting sources of the dominant suspended solids change depending on timing, duration, and magnitude of flow events. These short lived but highly important flushing events of suspended solids can be easily overlooked with traditional weekly or monthly sampling techniques. By using continuous in-situ water quality instruments (turbidity and laser diffraction sensors), along with automated water sampling equipment, the understanding of how much and when the majority of suspended solids and associated nutrients are being transported by storm events in the Lamprey River can be improved upon.
### GRC Presenter Abstracts

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<tr>
<th>Name:</th>
<th>Alena Robin Warren</th>
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<tbody>
<tr>
<td>Department:</td>
<td>Natural Resources</td>
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<tr>
<td>Present Type:</td>
<td>Poster</td>
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<tr>
<td>Title:</td>
<td>Evaluating managed habitats for New England cottontails</td>
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**Abstract:**

The New England cottontail (NEC, Sylvilagus transitionalis) is an early-successional obligate that has experienced substantial population declines throughout its range. These declines were a direct result of wide-spread habitat loss and fragmentation. To reverse this downward trend, land management initiatives by federal, state, and nongovernmental organizations are increasing the abundance of young forests and native shrublands. To facilitate these efforts, we are developing a method that evaluates land management activities that are meant to enhance NEC-dedicated habitats. Our approach is patterned after the habitat suitability index (HSI) developed by the U.S. Fish and Wildlife Service. Essentially, the quantity and quality of a group of essential habitat features (“life requisites”) that describe food and cover requirements are used as variables and incorporated into a model that generates a score ranging from 0 (intolerable) to 1 (optimal conditions). Resulting HSI scores can be used to describe relative suitability of a specific site over time or compare conditions among different sites. Our initial model is being developed and verified by sampling life requisites at parcels with known densities of NEC. We will solicit expert opinions and sample additional sites to further evaluate its performance. To date, candidate life requisites include: winter forage, travel cover, escape cover, and summer forage. One immediate application of this approach may be to determine if managed habitats are suitable for reintroducing NEC. Future applications also may include monitoring sites to identify habitat features that may be in decline, thus prompting management actions long before the site becomes unsuitable.
Graduate Research Conference

GRC Presenter Abstracts

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<tr>
<th>Name</th>
<th>Justin P Williams</th>
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<td>Department</td>
<td>Natural Resources</td>
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<td>Present Type</td>
<td>Poster</td>
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<tr>
<td>Title</td>
<td>Remote Sensing of Hemlock Woolly Adelgid Infestations in Southern New Hampshire and Maine</td>
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</table>

Abstract:

The hemlock woolly adelgid (HWA) is an invasive pest causing damage to Eastern and Carolina hemlock trees on the east coast of the United States. Maine and New Hampshire are currently the northernmost front of HWA spread. Developing methods to remotely detect the location of infested stands is paramount in monitoring the spread of this pest. The effect of HWA on hemlock needle reflectance was evaluated using laboratory based spectroscopy, pigment extractions and fluorescence measurements. Hemlock habitat suitability was modeled using MaxEnt software and thirteen environmental predictor variables. Partition modeling of leaf-on multi-year (1995-2013) Landsat Thematic Mapper (TM) data was used to develop classification rules that detect and predict HWA infested areas. Spectral measurements indicated that infested foliage was most different from non-infested foliage during June and July. Chlorophyll extractions and fluorescence measurements suggested that infested foliage had significantly greater functioning concentrations of chlorophyll. The hemlock habitat suitability model was evaluated using a 110 point reference data set; overall accuracy was 68.2%. Agreement with the habitat model was also evaluated with points of known HWA detections in the study region; overall agreement was 78.1%. Partitioning of Landsat TM data resulted in a training R2 = 0.782. Validation agreement with known HWA infestations was 86.7% in conifer forests, 44.3% in mixed forests and 31.6% in deciduous forests. Targeted field surveys of fourteen stands predicted to be infested resulted in eleven new HWA detections. Traditional field surveys for invasive pests like HWA consume time, resources and money. Remotely sensed products such as the one produced here offer the advantage of mapping changes in forest health on a landscape scale which ultimately can be used by federal and state agencies to target specific areas for surveying, suppression and eradication efforts.
Abstract:

As the second group of students working on this project, we implemented responsive practice training that had been created the year before us by LEND students. The focus was to train practitioners of community health centers to provide responsive practice to people with disabilities. We will present our findings and experience.
Abstract:

A physics-based formulation for characterizing the momentum transfer mechanisms responsible for ripple mobilization has been implemented on an extensive set of small- (1:15) and full-scale PIV observations of the wave bottom boundary layer over rippled sediment beds. The formulation is based on the temporal and spatial integration of the full momentum equations and yields a stress partitioning scheme including contributions from waves-currents, turbulence, viscosity, and the presence of bedforms. Our analysis suggests that the sum of these mechanisms is responsible for the observed intra-wave bedform modulation. Bedform-induced stresses, i.e. stresses that arise due to the presence of bedforms, are explained by the presence of sediment-carrying coherent structures. Comparisons with flat bed cases show form-induced effects on the wave-current covariance, suggesting a potentially significant role of nonlinearities in the nearbed momentum balance. With forcing including regular, bichromatic, and spectrally defined free surface gravity waves, boundary conditions including natural and synthetic sand grains, and three different cross-shore measuring locations, these observations constitute an all-encompassing range of hydrodynamic and morphological conditions. Its synthesis will increase our ability to resolve the flow field evolution and seabed dynamics in coastal environments by improving the predictive skill of bottom roughness parameterizations assumed in larger scale coastal sediment transport models.
Abstract:

Auroral precipitation results in multiple effects on the ionosphere, including the heating of ambient ionospheric electrons and the phenomenon of ionospheric feedback. Data and conclusions from several sounding rocket missions and comparisons with models have recently yielded further insight into these effects. A new study shows data from multiple sounding rockets, both on the dayside and nightside and at different altitudes, and compares these observations to modeling predictions. The results provide more understanding if and how heating of ambient electrons in regions of auroral precipitation plays a fundamental role in ion outflow and, possibly, neutral upwelling processes. We also show data from the ACES rocket mission, which obtained the first in situ measurements indicative of the observational characteristics associated with the ionospheric feedback instability (IFI) as it flew through an auroral arc and its associated return current region. These observations are compared to existing models of IFI and used to develop a new model that decouples the upward and downward current regions and produced results very similar to the ACES observations.
Graduate Research Conference

GRC Presenter Abstracts

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<th>Name</th>
<th>Maxwell Grady</th>
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<td>Department</td>
<td>Physics</td>
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<td>Present Type</td>
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<td>Title</td>
<td>Influence of Subsurface Hydrogen on the Structural Properties of Graphene Templates</td>
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Abstract:

Graphene has aroused tremendous interest due to its remarkable electronic and mechanical properties. Graphene’s optical properties and conductance make it an ideal candidate for use in nanoelectronic devices and organic photoelectric devices. We will present a STM/LEED/DFT study of the single layer graphene on Ru(0001) system grown via a novel growth mechanism that co-adsorbs atomic hydrogen and carbon vapor to the ruthenium surface while simultaneously segregating carbon from the crystal bulk to the surface. Structural studies show a wide array of moire superlattices sizes ranging from 0.9 to 3.0 nm. DFT calculations help explain the appearance of these graphene reconstructions driven by the H presence at the Ru interface. A LEED I(V) study guided by DFT calculations will accompany the STM investigation to provide insight into the graphene layer thickness. The structural polymorphism displayed by this system is of interest for the study of directed self-assembly. Control over moire superstructure size can aid in future work using graphene as a nanotemplate for self-assembled growth of nanoelectronic and organic photovoltaic devices based on pentacenes and fullerenes. Finally the impact of the structural changes on the electronic properties of the system will be studied.
Abstract:

The novel pentacene derivative 5,6,7-trithiapentacene-13-one (TTPO) is a robust electron donor candidate for use in high temperature photovoltaic devices. STM imaging has revealed interesting nanoscale surface structures of TTPO molecular chains as well as an ordered self-assembled monolayer on 3.9nm wide gold (788) surface terraces. TTPO is a polar species of pentacene with centered oxygen and sulfur bridge substituents. It is along this sulfur bridge that TTPO arranges itself laterally with a small cant angle between the molecule and the gold surface. This lateral assembly varies from the common flat-lying and standing-up phases of pentacene on surfaces. Combining imaging with density functional theory calculations allows for classification of these self-assembled structures with particular interest being directed toward the interaction between TTPO and gold at this organic-metallic interface. Understanding the structure of organic-metal interfaces with molecular precision potentially allows for the tailoring of those interfaces in order to maximize charge carrier transport.
Abstract:

We present Polar observations of a reconnection layer at high latitudes. Interplanetary conditions from Wind show a field of 25 nT pointing strongly northward continuously for 13 hrs. During this inbound pass, Polar observed sunward and southward jets and remained on the earthward side of the X-line. The event is hallmarked by a large density asymmetry (~ 140) and a moderate guide field. The data show a large contrast in the behavior of the field and particles before/after the current sheet (CS) crossing, those on the magnetosphere (MSP) side being much more intense. A density cavity occurred at both separatrices where also electric field (E field) fluctuations stopped. The E field fluctuations were intense (60 mV/m) and confined mainly to the E field normal to the CS. Isolated EN field peaks occurred at the density dip regions. The guide field pointed opposite to the Hall field, leading to the overall weakening of the out-of-plane magnetic field. The field reversal at the CS occurred before the outflow jet without any overlap, which we argue to be due to the large density asymmetry. The stagnation line was not co-located with the X-line and was shifted towards the MSP side of the CS. We compare observations with simulations which emphasize the density asymmetry [Tanaka et al., 2008] and with those which consider a guide field in addition to the density asymmetry [Pritchett and Mozer, 2009]. We find good agreement. Remaining discrepancies may be explained by the high density asymmetry in the observed case which is much larger than those in the simulations. This is to our knowledge the first study of a reconnection layer at high latitudes (1) an extreme density asymmetry (2) steady and strong interplanetary Bz. Will also be presenting a complete analysis of several other high latitude events through Cluster data, to determine the influence of plasma asymmetries, guide fields and flow shear on collisionless diffusion region physics.
Abstract:

Seaweeds inhabiting the upper intertidal zone are subjected to a wide variety of temperature, light, and water stresses and vertical distribution has been correlated to environmental tolerance. Porphyra umbilicalis Kützing is an aseasonal red alga inhabiting the upper intertidal zone in temperate and subarctic regions of the North Atlantic. It is a member of the economically important group of foliose Bangiales, and has been the focus of research aimed at the development of an aquaculture industry in New England. The goal of this study was to assess whether frozen storage is a practical method of preservation for mass quantities of seed stock of P. umbilicalis by determining the effects of long-term freezing on blade viability. Cultured blades of P. umbilicalis (4.8 ±0.22 mg) were air dried to 30% or 5% absolute water content (AWC) and frozen for 1, 3, 6, or 12 months at -20°C or -80°C. Following freezing, blades were rehydrated and growth rate was measured weekly for 4 weeks. Photosynthetic efficiency (FV/FM) was assessed for each blade 3 hours and 4 weeks post-freezing. Blades frozen at -80°C and 5% AWC showed the highest overall growth rate (8.03 ±0.16% day-1), while blades frozen for 1 month at 5% AWC grew significantly slower (7.06 ±0.16% day-1) than blades frozen for 3, 6, or 12 months at either AWC. Growth rates peaked two weeks post-freezing followed by a small decline in weeks 3 and 4. Length of freezing significantly affected FV/FM 4 weeks post-freezing with blades frozen for 6 months performing better than blades frozen for 12 months. There was 100% blade survival and both growth rates and FV/FM were equivalent to those recorded in non-frozen blades. Overall, these results indicate that long-term frozen storage has little physiological effect on blades of P. umbilicalis and is a practical method of preservation for mass quantities of seed stock.
Abstract:

In recent years, phylogenetic and other evidence has accumulated implicating diploid (2n=2x=14) F. iinumae as a second subgenome contributor to the octoploid (2n=8x=56) strawberries including the cultivated strawberry, Fragaria x ananassa and its immediate ancestors F. chiloensis and F. virginiana. Previously, diploid F. vesca was the only identified ancestral subgenome donor, and the F. vesca Hawaii4 reference genome was published in 2011. We have developed germplasm and genomic resources for F. iinumae, including high throughput genomic sequence data and a linkage mapping population. We now report the construction of a high density map of Fragaria iinumae. This map was constructed using SNP markers from two sources: 1) GBS, and 2) the new IStraw90® strawberry SNP array from Affymetrix (to be described at PAG XXII). The map consists of 7 linkage groups with over 3000 markers. This map is based on segregation data from an F2 population derived from a cross between two F. iinumae accessions (CFRA1955 and CFRA1849) collected in Hokkaido, Japan by Tom Davis and Kim Hummer in 2004. The F. iinumae linkage maps will be used to anchor an F. iinumae genome assembly, thereby providing an important new genomic resource for Fragaria.
Abstract:

The primary objectives of this project are to initiate a willow culture in our lab and then investigate whether upregulation of polyamine (PA) biosynthesis in a hybrid poplar (P. nigra x maximowiczii clone NM6) and a willow (Salix purpurea Var. Fish Creek) results in increased nitrogen (N) and carbon (C) assimilation, translates to increased biomass, and causes any significant physiological or metabolic consequences that will effect the tree’s environment. After successful initiation of willow into culture, upregulation in both species was accomplished via Agrobacterium mediated transformation with an inducible or constitutively expressed mouse ornithine decarboxylase (mODC) gene. Successful transformation will be confirmed and trees will be transferred to the greenhouse for observation and testing during the growing season. Initial HPLC analyses will confirm whether the manipulated pathway actually causes increased PA production. We will then extend our current knowledge of the role of PAs by investigating links between PA synthesis and biomass accumulation, with anticipated applications to biofuel production, phytoremediation of toxins from contaminated soils, and riverbank stabilization. Increases in biomass as evidenced by weekly chlorophyll and soluble protein measurements and increases in C and N assimilation as demonstrated by CHNS analysis and radioactive 14CO2 incorporation into leaves will signify further testing of wood properties, water usage, effects on soil microbial communities, and environmental risks like volunteerism and reproduction shifts, while unchanged biomass will direct us towards more qPCR and sequencing to pursue a genetic investigation of related pathways and possible regulatory mechanisms that could be preventing biomass accumulation.
Abstract:

Ubiquitous in the neritic ocean it is now believed that iron-limitation is the most important factor controlling primary production in oceanic phytoplankton. To investigate the effects of iron deficiency Dunaliella tertiolecta was cultured under limiting (100 nM Fe) and replete (1μM Fe) iron concentrations. The physiological status and the Water-Water antioxidant defense system were evaluated. Iron limitation effected a 21% drop in PSII efficiency (replete= 0.634± 0.012; limiting= 0.507± 0.012) concurrent with a 17.5% reduction in photosynthetic rates (replete= 265.8 umol O2/mg chl/hr ± 5.7; limiting= 219.3 umol 02/mg chl/hr ± 5.7). Both heme and non-heme based antioxidant enzyme activities were assessed. Heme-based Ascorbate peroxidase (APX), exhibits an 84% iron limited rate reduction (replete and limited = 36.23 and 5.72 umol ascorbate mg prot-1 hr-1 ±2.96, respectively). Conversely, the flavin-based Monodehydroascorbate reductase (MDHAR), exhibits a significant rate increase, 2.16±0.19 (replete) to 3.86±0.19 umol NADH mg prot-1 hr-1 under iron-limitation. Iron deficient cultures exhibit a 34% increase in total available ascorbate. These investigations suggest that D. tertiolecta is able to maintain a stable growth rate under iron limitation by re-allocating its subcellular usage of available iron and increasing the availability of total ascorbate. Further investigations will determine the presence of additional iron/flavin based molecules involved in the photosynthetic apparatus and anti-oxidant scavenging mechanisms.
Name: Yilong Yang
Department: Plant Biology
Present Type: Poster
Title: Phylogeny of species within the genus Fragaria revealed by next generation sequencing of multiple low copy nuclear markers

Abstract:
While the utilization of next generation sequencing technologies is rapidly growing, the application of this approach to phylogenetic analysis has been fairly limited to date. We are conducting large scale phylogenetic analyses of Fragaria (strawberry) species using the Fluidigm Access Array system and 454 sequencing platform. Our aim is to clarify phylogenetic relationships among Fragaria species and to elucidate the sub-genome composition of the polyploid species. Twenty-four single-copy or low-copy nuclear genes distributed across the genome were selected, and amplicons were sequenced from ninety six genomic DNA samples representing species from diploid to decaploid. Individual gene trees and species trees were reconstructed by different tree-building methods. Our results support the monophyly of Fragaria, and illuminate phylogenetic relationships among diploid species. Our findings also suggest the presence of three types of sub-genomes within the octoploid strawberry genome, and support the prior implications of ancestry for three diploid species: F. vesca and/or F. mandshurica, and F. iinumae. We developed a bioinformatics pipeline that is useful for large scale phylogenetic analysis of other polyploid species, and demonstrate the power of high throughput sequencing technology to enable robust phylogeny estimation from multiple nuclear genes.
<table>
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<tr>
<th>Name:</th>
<th>Christina Pretorius</th>
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<tbody>
<tr>
<td>Department:</td>
<td>Political Science</td>
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<tr>
<td>Present Type:</td>
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<td>Title:</td>
<td>The Role of Age in Voter Attitudes: A Demographic Study</td>
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</table>

Abstract:
This study aims to explore the relationship between voter age and attitudes toward social programs including federal funding for child care, welfare, and public schooling. The study will observe trends in age, voting behavior, and geographic patterns and explore the political and societal implications as a result of these differences.
## GRC Presenter Abstracts

<table>
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<tr>
<th>Name:</th>
<th>Sidney Bennett</th>
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<td>Department:</td>
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<td>Present Type:</td>
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<td>Title:</td>
<td>Do Friends Really Help Friends?: The Effect of Relational Factors on Bystander Intervention for Sexual Violence</td>
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**Abstract:**

A growing body of literature has examined the individual and situational factors that impact bystander intervention for sexual violence, but have neglected the impact of relational factors. Thus, in the present study, 545 students were randomly assigned to two vignettes (low and high severity) varying in the relationship between the bystander and the victim and perpetrator (close or not). Results suggested that severity and the relationship with the victim and perpetrator differentially impact bystander attitudes.
Abstract:

The integrated legal socialization model attempts to explain rule-violating behavior (RVB) variation among adolescents. Although this model predicts much of adolescents’ engagement in RVB, the researchers ignored one component, perceived wrongfulness, despite research support for perceived wrongfulness predicting attitudes toward RVB. We hypothesize that perceived wrongfulness cannot be used interchangeably with approval towards RVB despite being semantically opposite, because they are separate constructs. When normative status, wrongfulness, and enforcement status are included within the model, enforcement does not predict any RVBs; while both normative status and wrongfulness remain as separate mediating pathways. Further implications of our findings will be discussed.
The purpose of the current study was to determine the relation between perceived police legitimacy prior to becoming a juror and perceived police officer witness credibility in a trial. Participants were placed into groups of six and completed a questionnaire about legal attitudes. The groups then watched a dramatized trial video in which a police officer was a key eyewitness to the purported crime. After watching the video, participants completed a questionnaire about their individual attitudes about the case including perceptions of the police officer witness. Each group then deliberated to come to a unanimous decision of guilt for the defendant, as a jury. After deliberation, each participant completed a second questionnaire about their individual perceptions of the case, congruent with the pre-deliberation questionnaire. Participant perceptions of police legitimacy predicted both pre-deliberation and post deliberation credibility ratings of the police officer witness. Those who did not perceive the police as having legitimate authority viewed the police officer witness as less credible than those who perceive the police as having legitimate authority. Juror credibility ratings in turn predicted juror decisions of guilt, pre-deliberation and post deliberation. Participants who felt that the police officer witness was credible found the defendant guilty more often than participants who felt the witness was not credible did. Therefore, witness credibility ratings mediated the relation between perceptions of police legitimacy and juror decisions of guilt. Implications for these findings will be discussed.
Abstract:

Sexual assault, partner abuse, and stalking are major problems on college campuses (Dardis et al., 2012). Past research has demonstrated a host of physiological and psychological outcomes associated with victimization (Breitenbecher, 2006). However, there has been little research conducted on the potential academic outcomes associated with victimization.

The purpose of this study was to measure the relationship between academic outcomes and experiences of sexual violence, intimate partner violence, and stalking victimization among college students. Participants consisted of 6,482 undergraduate students (men = 2207; women = 4275) currently enrolled at one of eight universities in New England. Academic outcomes were measured with subscales of the College Persistence Questionnaire (Academic Efficacy, Collegiate Stress, Institutional Commitment, and Scholastic Conscientiousness; Davidson, Beck, & Milligan, 2009).

We used a series of MANOVAs to examine differences between victims and non-victims of unwanted sexual contact, unwanted sexual intercourse, relationship abuse, and stalking on the four academic subscales. All four types of victimization were associated with significant differences on academic outcomes after controlling for sex and year in school. At the univariate level all four victimization types were associated with lower academic efficacy, higher stress, lower institutional commitment and lower scholastic conscientiousness.

These findings demonstrate the high rates of victimization on college campuses and the potential academic costs both to students and to administrators concerned about institutional retention. Research on academic outcomes could help inform new or revised campus policies.
Abstract:

More than any other age group in any other country, adolescents in the U.S. are more likely to engage in rule violating behavior (RVB) and to be incarcerated. Because of this, it is important to understand factors that predict adolescent RVB, such as the influence of authority figures. One model that helps explain the relation between experiences with authority figures and adolescent RVB is the procedural justice model. Despite significant support for this model in predicting RVB, limitations remain in the extant research. The goal of the current study was to utilize longitudinal and experimental methodology to extend the legitimacy component of the procedural justice model by separating authority figure trust and obligation to obey and also include an additional component, “authority figures’ right to make rules”. Results revealed support for the procedural justice model with this new conceptualization of legitimacy. Furthermore, differential findings were revealed across authority figure types. Implications of these studies for establishing stronger relationships between adolescents and authority figures will be discussed.
## GRC Presenter Abstracts

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<th>Name:</th>
<th>Michael Cameron Melville</th>
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<td>Present Type:</td>
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<td>Title:</td>
<td>Generating a new construct: Implicit theories of perceived partner responsiveness</td>
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**Abstract:**

How can we explain why individuals in romantic dyads react to situations in their relationships in different ways? The following research explores a previously unaddressed component of close relationship research; namely, understanding how individual differences in how stable people perceive others’ responsiveness to be may affect how they respond to their relationship partners. Perceived partner responsiveness may be defined as perceptions of others’ care, regard, and commitment to the self. Quite simply, it is how we know that other people care about us. Indeed, the importance of perceived partner responsiveness in predicting relationship outcomes is well documented. The goal of the current research was to construct and validate a new measure to test individual differences in how stable or unstable people believe others’ responsiveness to be on a general level. In one study, a pool of items designed to measure a new construct that we call implicit theories of perceived partner responsiveness was administered to 200 participants. Analyses of the factor structure of the pool of items yielded a 15-item scale that demonstrated excellent internal consistency, as well as convergent and discriminant validity with other previously validated measures. In addition, an analysis of predictive validity suggests that this new scale of implicit theories of perceived partner responsiveness does indeed predict important relationship outcomes. In a second study, preliminary analyses indicate that implicit theories of perceived partner responsiveness predicts how people respond to an experimentally manipulated threat to their romantic relationship. Whether individuals choose to respond to situations that are threatening to their relationship in a prosocial or relationship-undermining manner may depend on their unconscious beliefs (i.e., their implicit theories) of how much stability they generally perceive in others’ care, regard, and commitment to their relationships.
Abstract:

Central thalamus influences prefrontal cortex (PFC) through specific projections of the mediodorsal nucleus (MDn) to middle cortical layers. The MDn is reciprocally connected to widespread areas of PFC and is an important target of pallidal areas driven by prefrontal projections. Earlier studies in our lab and other labs have demonstrated that lesions damaging MDn interfere with aspects of spatial memory that depend on PFC. Here we extend this research by comparing memory-coding properties of MDn neurons with results for PFC neurons using common behavioral measures and recording procedures. Here we used moveable tetrode arrays to compare the memory-coding properties of neurons in MDn. Rats were trained to perform a right/left delayed non-matching to position (DNMTP) task in octagonal chambers with retractable levers located on the N, E, S, and W sides. The location of the lever used to initiate each trial was varied at random to distinguish between egocentric and allocentric navigation. Recording arrays consisted of four tetrodes two each in separate cannulae, one aimed more medially at the MD and central medial nuclei and one aimed more laterally at the centrolateral and paracentral nuclei. Recording implants consisted of four tetrodes mounted in an acrylic base attached to machine screws that allowed them to be lowered gradually in approximately 60 steps through thalamus. TTL pulses were generated to mark specific behavioral events within the task in order to correlate activity from identified discrete neurons. Data analyses entailed the use of Klustakwik spike sorting software and examination of raster plots and peri-event time histograms based on behavioral events. Behavioral analyses have also been conducted using time-stamped video recordings made throughout all recording sessions. Our results allow direct comparison between MDn neurons with results from a parallel study of memory coding properties of PFC neurons.
Name: Angela Marie Neal  
Department: Psychology  
Present Type: Poster  
Title: The Principle of Least Interest: Power and Behavioral and Inhibition in Relationship Conflicts  

Abstract: According to the principle of least interest, the relatively more committed member of a romantic relationship has less social power relative to the less committed member. Using this as a framework, the current research examined whether social power would moderate effects of anger proneness on hostile behavior during conflict interactions in romantic relationships. High relationship commitment and low perceptions of the partner’s commitment eliminated the effect of anger proneness on hostile behavior. Consistent with the principle of least interest, these findings suggest that lack of social power brought about by asymmetric involvement acts as an inhibitory factor, weakening tendencies to act on anger.
Name: Kristen Onos
Department: Psychology
Present Type: Poster
Title: Coding properties of prefrontal cortical neurons in the rat

Abstract:
Prefrontal cortex (PFC) supports a number of aspects of executive function, including working memory. PFC, as defined by the projection areas of the mediodorsal thalamic nucleus (MDn), consists of a diverse series of cortical fields that line the medial and ventral surfaces of frontal cortex in the rat. Here we used moveable tetrode arrays to compare the memory-coding properties of neurons in MDn projection areas along the medial wall of rat PFC. Rats were trained to perform a right/left delayed non-matching to position (DNMTP) task in octagonal chambers with retractable levers located on the N, E, S, and W sides. By randomly varying the location of the lever pressed to start trials, we are able to distinguish between egocentric and allocentric coding. Recording arrays consisted of four tetrodes oriented vertically down the medial wall, 3 mm anterior to Bregma in the left and right hemispheres. The tetrodes were mounted in plastic bases with a tripod of machine screws that allowed them to be lowered gradually in approximately 80 steps through cingulate, prelimbic, and infralimbic areas of PFC. Signals originating from single neurons were identified with Klustakwik spike sorting software and analyzed as raster plots and peri-event time histograms based on TTL pulses marking significant behavioral events. Behavioral analyses have also been conducted using time-stamped video recordings made throughout all recording sessions. Our results have mapped several populations of neurons on to the cortical fields studied. These include: responses occurring just before the start of DNMTP trials, increased activity during periods of movement between locations of levers, delay period activity related to the direction of turning during correct choice responses, and activity associated with lever pressing and positive reinforcement (water).
Name: Nathaniel Stafford  
Department: Psychology  
Present Type: Poster  
Title: Norepinephrine involvement in a one-day Morris water maze procedure following intermittent swim stress  

Abstract:

Exposure to stress increases the risk of developing depression and produces deficits in cognitive functioning of learning and memory. Deficits observed in depressed humans are thought to be mediated, in part, by the effects of glucocorticoids and norepinephrine (NE) in the hippocampus. Inescapable stressors, such as intermittent swim stress (ISS), impair both instrumental and hippocampus-based spatial learning. Furthermore, ISS affects NE activity as administration of norepinephrine selective reuptake inhibitors (NSRIs) attenuates stress-induced behavioral deficits. Recent investigations in our laboratory have demonstrated ISS-induced spatial learning and memory deficits in a three-day spaced Morris water maze (MWM) procedure. Administration of an NSRI, reboxetine (20 mg/kg), reversed behavioral learning (days 2 and 3 of the task) and memory deficits. These deficits have also been noted during a massed, one-day MWM, although NE involvement has yet to be assessed. In order to extend our previous findings, we explored the role of NE on behavioral performance during the one-day MWM procedure.

Adult male Sprague-Dawley rats were divided to either ISS or control and received either 20 mg/kg reboxetine or equivolume saline i.p. injection, so that rats were randomly assigned to ISS/reboxetine, ISS/saline, control/reboxetine, or control/saline. Injections occurred 23.5, 5, and 1 hour prior to testing in the MWM. Intermittent swim stress consisted of exposure to 100 inescapable, 5-second cold-water swims. MWM testing occurred 24 hours later and consisted of 18 learning trials to find a hidden platform followed 1 hour later by a memory probe test. Results showed pretreatment with reboxetine impairs MWM performance; this may be due to increased bioavailability of NE following ISS during a subsequent one-day MWM procedure.
Name: Kateryna Sylaska
Department: Psychology
Present Type: Oral
Title: Disclosure of Intimate Partner Violence Among LGB Young Adults: A Mixed Methodological Study

Abstract:
A recent report from the Centers of Disease Control and Prevention indicated that LGB-identifying persons are at equal or higher risk than heterosexual-identifying persons to experience intimate partner violence (IPV). Given prevalence rates and an understanding of positive effects associated with disclosure of IPV, it is important to investigate disclosure experiences of LGB persons. Research has identified additional barriers (e.g., not being out, fear of homophobic responses – which are parallel to minority stress variables) and negative responses from social supports reported by LGB community adults who disclose IPV. The purpose of this mixed methodological study was to explore disclosure experiences and related factors of LGB young adults experiencing IPV. Results are based on a national sample of 391 college students in same-sex relationships. Quantitative and qualitative indices were used to examine minority stress and disclosure for each type of IPV (physical, psychological, sexual) victimization. Disclosure rates for physical, psychological, and sexual IPV were 44%, 58%, and 61%, respectively. Persons reporting physical IPV perceived partners as more responsible for violence and scored significantly lower on measures of minority stress (e.g., identity concealment, internalized homonegativity) than did nondisclosers. Across all types of IPV, reasons for nondisclosure included minimization of the violence and believing that the situation was a private matter. Although higher scores on measures of minority stress were associated with nondisclosure in quantitative analyses, these factors did not emerge in preliminary thematic codes based on participants’ responses to open-ended items. Discussion will focus on implications for understanding LGB persons’ help-seeking processes and educational efforts that may be targeted to LGB young adults.
Name: Benjamin Wormwood
Department: Psychology
Present Type: Poster
Title: Memory-coding properties of prefrontal cortical neurons in the rat

Abstract:
Prefrontal cortex (PFC) supports a number of aspects of executive function, including working memory. PFC, as defined by the projection areas of the mediodorsal thalamic nucleus (MDn), consists of a diverse series of cortical fields that line the medial and ventral surfaces of frontal cortex in the rat. Here we used moveable tetrode arrays to compare the memory-coding properties of neurons in MDn projection areas along the medial wall of rat PFC. Rats were trained to perform a right/left delayed non-matching to position (DNMTP) task in octagonal chambers with retractable levers located on the N, E, S, and W sides. By randomly varying the location of the lever pressed to start trials, we are able to distinguish between egocentric and allocentric coding. Recording arrays consisted of four tetrodes oriented vertically down the medial wall, 3 mm anterior to Bregma in the left and right hemispheres. The tetrodes were mounted in plastic bases with a tripod of machine screws that allowed them to be lowered gradually in approximately 80 steps through cingulate, prelimbic, and infralimbic areas of PFC. Signals originating from single neurons were identified with Klustakwik spike sorting software and analyzed as raster plots and peri-event time histograms based on TTL pulses marking significant behavioral events. Behavioral analyses have also been conducted using time-stamped video recordings made throughout all recording sessions. Our results have mapped several populations of neurons on to the cortical fields studied. These include: responses occurring just before the start of DNMTP trials, increased activity during periods of movement between locations of levers, delay period activity related to the direction of turning during correct choice responses, and activity associated with lever pressing and positive reinforcement (water).
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<tr>
<th>Name:</th>
<th>Dustin Michael Alger</th>
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<tr>
<td>Department:</td>
<td>Recreation Management &amp; Policy</td>
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<td>Present Type:</td>
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<td>Title:</td>
<td>Benefits of Fly-fishing for Veterans with PTS</td>
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Abstract:

My research has been a partnership with the Project Healing Waters Fly-fishing program and myself to conduct a summative evaluation of the programs strengths and benefits towards helping Veterans with Post-traumatic Stress. It consisted of a focus group strategy aimed at understanding what programmatic aspects were beneficial to the Veterans ability to healthily cope and manage their symptoms stemming from PTS. Ultimately the study sought to understand how Fly-fishing could be utilized as a therapeutic medium for Veterans and how the Veterans could utilize Fly-fishing as an autonomous and self-directed form of self care and therapy.
Abstract:
Part-time student employment was previously dismissed as an “unfortunate part of student survival rather than as part of the student learning experience” (Neill et al., 2004, p. 125). However, recent studies have indicated that this is not the case. Several recent studies indicated that student employees developed valuable skills through their campus recreation work experiences, and they anticipated these skills would be beneficial in their future employment (Carr, 2005; Hall, 2011). Additionally, a study of employers ranked part-time college employment substantially above the relative importance of college major, extracurricular activities, and college grade point average. This qualitative study utilized transcendental phenomenology to explore the essence of the experiences of past Intramural Sports Student Supervisors from the University of New Hampshire. The purpose of this study was to examine the post-graduation impact of campus recreation student work experiences and the transfer of learning to careers. The results of this study substantiate the gains that occur during part-time student employment, which align with student learning outcomes and skills desired by employers.
Each of the participants in this study previously worked as a part-time Intramural Sports Student Supervisor with University of New Hampshire Campus Recreation and graduated within the preceding four years. All of the study participants were sent an online survey to complete. A purposive selection of respondents were contacted to participate in an interview.
Graduate Research Conference

GRC Presenter Abstracts

Name: Robin Nicole deAlmeida
Department: Social Work
Present Type: Poster
Title: Partnering for Strength

Abstract:

My capstone poster will visually exhibit the work I completed during my leadership in action placement at New Hampshire Family Voices (NHFV). NHFV is a family to family health information center that provides families and professionals who care for children and youth with special healthcare needs (CYSHCN) with one to one phone assistance, educational materials, an online support community, a lending library and the only detailed resource guide for CYSHCN in the state, Maneuvering the Maze. NHFV also participates in several projects, each with a specific focus on different ways to help families become informed, experienced advocates for their children and themselves. This organization is a program of the Parent Information Center NH and is funded by state and federal grants as well as donations from community partners and supporters. My assignment was to assist in coordinating the annual NHFV state wide conference. Coordination of this event involved researching the interests of the families and professionals that NHFV currently serves, identifying topics and presenters based on this research, securing presenters who were available and fell within budgetary constraints, organizing logistics and evaluating the outcome. Throughout this assignment I actively sought out leadership opportunities that went beyond the scope of the assignment. I identified some critical needs in not only the promotion of this event but in the promotion of the organization NHFV as well.
GRC Presenter Abstracts

Name: Courtney Gray  
Department: Social Work  
Present Type: Poster  
Title: Health Policy affecting People with Disabilities

Abstract:

I am a 2013-2014 fellow for the Institute on Disabilities’ NH Leadership Education for Neurodevelopmental and related Disabilities (LEND). In fulfillment of the requirements for LEND, I have interned at Congresswoman Ann Kuster's office. My role at Rep. Kuster’s office is to conduct research, attend meetings and public information sessions, and talk with leaders regarding NH policies with impact people with disabilities.
<table>
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<tr>
<th>Name:</th>
<th>Megan Oliviero</th>
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<tr>
<td>Present Type:</td>
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<td>Title:</td>
<td>Leadership in Action</td>
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Abstract:
Highlight activities of Leadership in Action at Community Crossroads, an area agency for individuals and families who experience disability. I will share information about the work of Public Policy Outreach Committee, Policy Partners program and insights from one to one conversations and relationship building. There will be reflections on leadership and how it connects to the overall mission of the NH LEND Program.
Abstract:

Perceptions of environmental issues are influenced by a variety of factors. Sociological research on this topic has largely taken a social-psychological approach and as a result the effects of community and biophysical contexts on individual perceptions are given less attention than individual-level predictors, such as political party affiliation or measures of educational attainment. Using survey data, weather event data, and other demographic data from several coastal regions across the United States, this study will employ a mixed-effects modeling technique to investigate the effects of county-level weather impacts and demographic composition on public perceptions of unusual or extreme weather, water quality and pollution, and loss of scenic beauty. In addition to the quantitative portion, this study will include a qualitative content analysis of local and regional news sources in order to tease out some of the social and informational processes underlying the formation of public perceptions of environmental issues. This research will add to a growing body of literature on public perceptions of environmental issues by illuminating the contextual nature of issue perception formation through the use of both quantitative and qualitative methods.
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<th>Name:</th>
<th>David Louis Gonzalez</th>
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<tr>
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<td>Title:</td>
<td>Age-Specific Migration and Education in New Hampshire</td>
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Abstract:

This paper looks at age-specific net migration patterns in New Hampshire, using aggregate data from the 2000 and 2010 Census. Who is moving out, and who is moving in, and how does this vary within the state? This paper then applies these findings to explain associations in education, welfare, and economic growth.
GRC Presenter Abstracts

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<tr>
<th>Name:</th>
<th>Nikhail Sinea Maestas</th>
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<td>Present Type:</td>
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<td>Title:</td>
<td>Economic Disparities Between Heterosexual and Same-Sex Households with Children</td>
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Abstract:

Same-sex marriage and its effects on family structure and child bearing is a topic that has been receiving increasing attention. The high levels of interest have sparked numerous different opinions on whether same-sex child bearing will have negative or positive impacts on children. In this research project the income levels of same-sex couples with children will be assessed and compared to the income levels of heterosexual couples with children in the United States. The Census Bureau began collecting data in 1990 on same-sex couples by adding the category “unmarried partner” to the decennial census survey. The “unmarried partner” category brought with it many complications for the Census and has been continually modified in an attempt to decrease over counts and under counts for this category. Same-sex couple data has been collected in the American Community Survey since its beginning in 2005 (Census, 2014). The 3 year Public Use Microdata Samples (PUMS) from the American Community Survey 2010-2012 will be utilized as the primary data set used to assess and compare income levels for heterosexual couples and homosexual couples with children. The variables: health care, race, gender, educational level, and age will all be assessed in terms of their impact on households with children’s incomes.
Abstract:

Direct and indirect forms of exposure to violence have been linked to deviance for decades in the criminological theory. No study to date has been able to analyze the individual and cumulative effects of the broad range of victimizing and violent experiences proposed in the current study. Analyses will be conducted on a sample of 2,095 10 to 17-year-olds using the National Survey of Children’s Exposure to Violence, a cross-sectional, US national survey with data on a multitude of victimization experiences collected in 2008. I specifically seek to answer the following research questions: What percentage of youth are Victim-Only, Perpetrator-Only or Both? Are poly-victims, children exposed to a variety of victimizing incidents, more likely to be poly-perpetrators, children who engaged in a variety of deviant behaviors? Are the types of violence experienced, the types of violence committed against others, or are the effects of exposure more generalized. Are these results moderated by gender or whether the violence is witnessed or personally experienced? The main objective is to expand our understanding of exposure to violence on delinquency in order to better inform policies aimed at reducing the incidence of victimizing behaviors committed by and against children.
Abstract:

The Great Recession, which began in 2007-2008 resulted in a variety of significant and ongoing shifts in the United States and throughout the developed world, not the least of which was a decline in fertility rates beginning around 2009 (Percheski and Kimbro 2013, Goldstein, Kreyenfeld, Jasilioniene, and Karaman-Orsal 2013). Fertility among women under thirty is the most influenced by recession, although among women between ages thirty and forty-four second births are associated with unemployment (Myrskyla, Goldstein, and Cheng 2013, Goldstein et al. 2013). Most recently, despite some positive economic shifts, figures on 2012 fertility indicated that the fertility rates in the US have not recovered from the recession. Fertility among young women remains low, while among older women fertility has slightly increased. With the continuing low fertility rates, it becomes important to understand who the women are that are not having children, and if the effects of the recession are short term, or if they are likely to significantly influence completed fertility rates of the cohorts currently experiencing declines in fertility. Despite the significant decline in fertility, fertility in the US has not ceased, the goal of this paper is to develop a more precise image of who are and are not having children across the country. This project uses data from the annual Social and Economic report put out by the Census Bureau and Bureau of Labor Statistics in conjunction to answer the research questions who and where are the women who are choosing to and not to have children, how has the recession affected higher order births among these same groups, are there any groups of women for whom fertility is recovering, or has significantly increased, and relatedly, what are characteristics of the regions these women reside within? In addition, how is fertility associated with migration across the country?
### GRC Presenter Abstracts

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<th>Name:</th>
<th>Desiree Wiesen-Martin</th>
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<td>Sociology</td>
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<tr>
<td>Present Type:</td>
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<tr>
<td>Title:</td>
<td>Forced Sex, Intimate Partner Violence and Help Seeking</td>
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**Abstract:**

Research has found that women who report experiencing sexual assault in addition to physical abuse in an intimate relationship used more help seeking services, but were also more likely to report that they did not seek help when it was needed. Research has been done examining the impact of individual characteristics on help seeking behavior. Much less research has examined how community characteristics may impact help seeking behavior, and absent from the literature is an examination of interactions between individual and community characteristics and how they may be associated with help seeking behavior in intimate relationships. This paper examines the impact of community characteristics, as well as the interaction between individual and community characteristics, and the impact they may have on the help seeking behaviors of women who have experienced forced sex and those who have not.

Utilizing data collected from STOP Violence Against Women grant funded programs in eight states and two samples of women a multilevel analysis is used to examine the impact of individual and community characteristics and cross-level interactions and their association with help seeking of women who have experienced forced sex and those who have not experienced forced sex in their intimate partner relationships.
Researchers interested in the spatial distribution of ethno-racial inequality tend to focus on nonwhites’ overrepresentation in disadvantaged places, but less is known about places that are both diverse and economically advantaged. We use county-level data to explore the relationship between socioeconomic prosperity and diversity, paying particular attention to metropolitan status and other factors that might separate prosperous diverse counties from ones that are diverse but not prosperous. We find, among counties that are more diverse than average, only 13 percent are “prosperous” (that is, they experience less poverty and unemployment, lower high-school drop rates, and fewer housing problems than the nation). These diverse, prosperous counties are most commonly on the fringes of large core metropolitan areas, whereas diverse places that are not prosperous are typically classified as nonmetropolitan. Logistic regression models will be used to identify other dimensions along which diverse counties are stratified, including labor-market composition and migration-related characteristics.
Name:  Michael Leydon  
Department: Spanish  
Present Type: Oral  
Title: Después que it is taught, it must be forgotten- The use of the indicative and subjunctive moods in dependent clauses following two similar adverbial antecedents

Abstract: An investigation into the difference between the Spanish adverbial clauses "después de que" and "después que" in the antecedent, and the frequency of the indicative and subjunctive moods and the future and conditional tenses in the dependent clause. The meanings and uses of these two phrases will be determined and shown, and some examples of the methods used to teach beginning Spanish students will also be shown to display the errors sometimes associated with the pedagogy behind teaching the subjunctive in Spanish. This analysis will be followed by the research portion of the presentation. The CREA database of corpuses of the Real Academia Española will be the basis for the research conducted. Using the key phrases "después de que" and "después que," the object will be to determine how often each phrase is followed by the subjunctive or indicative mood or the future or conditional tense, and to display those results as the findings of the presentation.
Name: Anna Lindsey Chase  
Department: Zoology  
Present Type: Poster  
Title: Testing the influence of substrate identity on settlement and growth of introduced ascidians in the Gulf of Maine

Abstract:
Non-native ascidians, also known as sea squirts, often dominate communities on submerged man-made structures, but are not always prevalent on adjacent natural surfaces. The influence of substrate identity on ascidian settlement and growth appears to be species-specific and geographically variable, but has not been thoroughly studied. To systematically examine this topic, my Master’s research will include field surveys and lab and field studies. In order to characterize patterns of ascidian abundance on different surfaces in the Gulf of Maine, I will photographically sample the sea floor and man-made underwater structures using scuba in August 2014. In laboratory studies, I will examine larval substrate preferences by quantifying settlement of native and introduced ascidian species on various commonly occurring natural and artificial marine materials. I will also determine how substrate type influences ascidian settlement and growth in the presence of other benthic organisms in the field by submerging arrays of settlement plates, composed of the same materials used for my lab study, from floating docks at the UNH Coastal Marine Lab in Newcastle, NH. Information gained through these studies will help us understand what features contribute to non-native species establishment and habitat dominance, and may have implications for introduced species management policies.
GRC Presenter Abstracts

Name: Helen Cheng
Department: Zoology
Present Type: Poster
Title: Evaluating the spawning activity of the American horseshoe crab (Limulus polyphemus) in Great Bay Estuary, New Hampshire USA.

Abstract:

The Great Bay Estuary, NH is near the northern end of the geographic range of the American horseshoe crab. It is unique estuary because there are few ideal beaches for spawning, horseshoe crabs have not been harvested in Great Bay Estuary in recent years, and there is no organized monitoring program to keep track of changes in the population. The goals of this project were: 1) initiate a monitoring program in Great Bay Estuary, 2) identify the most dominant spawning locations, and 3) compare the temporal patterns of spawning activity with more thoroughly studied locations. From 2012 to 2013, over 5,000 adult horseshoe crabs were counted in two large areas of the estuary. Surges in the numbers of horseshoe crabs sighted corresponded to the most dramatic increases in water temperature during the spring. Interestingly, more horseshoe crabs were observed earlier in the season in areas at the head of the estuary, where the water warms up the fastest. In addition, there was no clear relationship between horseshoe crabs sighted during the day than at night or that peaks of spawning activity occurred during the times of the new or full moon, all of which contrasts with other regions.
Morgan Carol Dube

Zoology

Poster

The Biology and Prey of Cerceris fumipennis and its use in bio-surveillance for the Emerald Ash Borer

Abstract:

Ash trees are a prominent feature and resource in New England forests and are important to our forest biodiversity and economy. The destruction of large populations of this species can have severe ecosystem-level consequences. Currently, the greatest threat to ash trees comes from extensive and serious infestations of the Emerald Ash Borer (EAB, Agrilus planipennis). Fortunately, Cerceris fumipennis (or the “smoky-winged beetle bandit” [SWBB]), a predatory wasp, is recognized as presenting an extremely effective technique for locating and parasitizing adults of this serious pest that was recently introduced to New Hampshire (2013). The NH Department of Agriculture Markets and Foods and Division of Forests and Lands regard an understanding of the biology of this wasp as being critical in development of their plans to detect low density populations of EAB. My project was to monitor two large colonies of SWBB, Boscawen State Forest Nursery and Epsom American Legion parking lot in New Hampshire. Incoming female SWBB with prey were captured and their prey were collected and documented. Emergence of SWBB appears to be nearly synchronous with 200 females emerging within 15 days of each other. Closer monitoring of this time period is necessary to obtain a more accurate estimate of first prey preferences. SWBB continues to forage for beetle prey after Aug 22nd but the wasps become unproductive by the 31st. Thirty different prey species were produced and seasonality was documented for ten of the most commonly taken species. During the field season of 2013 there were no EAB observed at either site. Monitoring for EAB is a key step in keeping the forests of New England and New York healthy and intact. Effective management in New England forests can be implemented early with the help of C. fumipennis in the detection of low density populations of EAB.
Abstract:

Ash trees are a prominent feature and resource in New England forests and are important to our forest biodiversity and economy. The destruction of large populations of this species can have severe ecosystem-level consequences. Currently, the greatest threat to ash trees comes from extensive and serious infestations of the Emerald Ash Borer (EAB, Agrilus planipennis). Fortunately, Cerceris fumipennis (or the “smoky-winged beetle bandit” [SWBB]), a predatory wasp, is recognized as presenting an extremely effective technique for locating and parasitizing adults of this serious pest that was recently introduced to New Hampshire (2013). The NH Department of Agriculture Markets and Foods and Division of Forests and Lands regard an understanding of the biology of this wasp as being critical in development of their plans to detect low density populations of EAB.

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Name: Morgan Carol Dube
Department: Zoology
Present Type: Oral
Title: The prey and foraging range of the predatory wasp Cerceris fumipennis and its use for bio-surveillance of the Emerald Ash Borer

Abstract:

Ash trees are a prominent feature and resource in New England forests and are important to our forest biodiversity and economy. The destruction of large populations of this species can have severe ecosystem-level consequences. Currently, the greatest threat to ash trees comes from extensive and serious infestations of the Emerald Ash Borer (EAB, Agrilus planipennis). Fortunately, Cerceris fumipennis (or the “smoky-winged beetle bandit” [SWBB]), a predatory wasp, is recognized as presenting an extremely effective technique for locating and parasitizing adults of this serious pest that was recently introduced to New Hampshire (2013). The NH Department of Agriculture Markets and Foods and Division of Forests and Lands regard an understanding of the biology of this wasp as being critical in development of their plans to detect low density populations of EAB.

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Abstract:

Amidst increasing reports of recent ecological change, concern over shifting baselines has arisen. Lough Hyne Marine Reserve, Ireland offers a unique opportunity to study recent ecological changes because baseline data records of the lough’s ecology date back to the early 1900s. Following the collapse of the purple sea urchin, Paracentrotus lividus, within the lough, the algal community has changed dramatically (Trowbridge et al 2011). Three brown algae, Himanthalia elongata, Fucus serratus, and Saccharina latissima, have displayed expanded distributions within the lough (Trowbridge et al 2013). To assess the current grazing pressure along the expansion gradient of these three algae, a transplant study was conducted in which cuttings of each species were outplanted at sites within Lough Hyne. The temporal incidence of grazing varied as a function of time, site, and species (MANOVA p<0.001). Despite the observation of grazing damage at all sites for nearly all species, most of the damage resulted in insubstantial mass loss. These results suggest that the current grazer community is insufficient to exert biological control of continued range expansion of these brown algae. Distribution shifts of algal species will likely have significant impacts on the community structure, due to their function as both food and structure.
Graduate Research Conference

GRC Presenter Abstracts

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<tr>
<th>Name</th>
<th>Seth Goodnight</th>
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<td>Department</td>
<td>Zoology</td>
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<tr>
<td>Present Type</td>
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<tr>
<td>Title</td>
<td>Effects of temperature on reproductive effort of Placida dendritica</td>
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Abstract:

Placida dendritica (Sacoglossa, Gastropoda) settles preferentially on Codium fragile in the Gulf of Maine. It reproduces continuously and is able to store sperm for several months after copulation. My current investigation looks at the effects of temperature and season on the life cycle of P. dendritica by quantifying the effect of temperature on reproductive effort in the lab, and settlement rates in the field. Individual animals were paired and allowed to mate, then isolated and kept at different temperatures. Temperature had a negative correlation with the rate of egg production, but not on the number of eggs produced per animal. My field studies have focused on the abundance of C. fragile and the settlement rates of P. dendritica. Settlement is continuous throughout the year, although it peaks during the summer months. The abundance of C. fragile followed a similar pattern, though major storms scoured the study area. Future work will build off of these results in order to model the life cycle if P. dendritica, and how it relates to the abundance and seasonality of C. fragile.
## GRC Presenter Abstracts

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<tr>
<th>Name:</th>
<th>Amanda Lee Murby</th>
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<td>Zoology</td>
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<tr>
<td>Present Type:</td>
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<td>Title:</td>
<td>Seasonal Occurrence and Microcystin Toxicity of Picocyanobacteria in NH Lakes</td>
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### Abstract:

The incidence of harmful toxic cyanobacteria blooms and cyanotoxins in freshwater are a growing concern, linked to illness and deaths of farm animals, wildlife, and people. However little is known on the potential pathways of cyanotoxins through the food web of aquatic communities. Since the lake organisms that graze directly on cyanobacteria are generally selective, feeding on small particles (<50 um), it is less likely that the large, colonial cyanobacteria (generally associated with surface blooms and often >50 um) are directly linked to the classic pelagic food chain in lakes. However, small, autotrophic picocyanobacteria (0.2-2 um) are a potential source of toxins that may rapidly transfer, accumulate, or bio-magnify at various trophic levels in lake food webs. This research examines the picocyanobacteria as a source of transfer of microcystins as they are the most abundant of the picoplankton, contributing significantly to total primary production in lakes, and may be an integral component in the accumulation of microcystins to higher trophic levels in lakes.
Zoology
Pugh, Tracy

GRC Presenter Abstracts

Name: Tracy L Pugh
Department: Zoology
Present Type: Poster
Title: Spermatophores produced by electro-stimulation of male lobsters (Homarus americanus) vary in size and content

Abstract:
Variation in the quality of ejaculate produced by male Homarus americanus has been previously described, but never quantified. We subjected 141 males (size range: 60 mm CL to 109 mm CL) to an electro-stimulation technique to obtain ejaculate for analysis of size and composition. Gonopods were electrically stimulated, producing the ejaculate which is a single tubular spermatophore composed of an inner tube or ‘pocket’ of spermatozoa surrounded by acellular material that hardens into a sperm plug. Each spermatophore was weighed, then placed in a small amount of sea water and photographed under a dissecting microscope with transmitted light. Spermatophores were then fixed in Bouin’s solution, rinsed and stored in 70% ethanol. For histology, fixed spermatophores were dehydrated (graded ethanol), cleared in xylene, then embedded in paraffin wax. Blocks were sectioned longitudinally at 5μm thickness and sections were mounted on glass slides and stained with modified Masson’s trichrome. The composition of each spermatophore was determined using two different methods. The first method utilized the two-dimensional image taken of the entire structure, while the second utilized multiple serial histological images of the spermatophore. Image analysis software was used to measure the area of the entire spermatophore, then of the internal sperm “pocket,” to calculate the relative composition of the spermatophore (% sperm). Not all males produced a spermatophore with this technique; 52% percent of the males produced a spermatophore from each gonopod, 24% of males produced only one spermatophore, the remainder produced none. Preliminary results suggest that while spermatophore weight increases with male size, there is no relationship between male size and spermatophore composition.
Abstract:

Tenellia adspersa, a tiny estuarine nudibranch, is found in temperate climates globally. Scientific literature is conflicted and vague in officially describing which Tenellid species reside in which region. By composing a study of the biogeography of Tenellid nudibranchs using molecular data, I will resolve this issue. A molecular approach is needed (as opposed to morphological and developmental comparisons) because Tenellids exhibit poecilogony (more than one developmental mode) and morphological comparisons have not produced a clear way to identify the species. This research has ecological, evolutionary, and even human health implications; Tenellia spp. may be used to study drugs that affect memory and learning due to their quick learning patterns and ease of culture. However, the species must be fully described before this type of testing occurs. This research is part of my Master of Science thesis dissertation, “Ecological Implications of Tenellid Nudibranch Phylogeography,” and will provide me with the experience needed to continue on and pursue a Ph.D.