



UNIVERSITY OF
NEW ENGLAND

3rd Annual College of Arts and Sciences
Undergraduate Summer Research Symposium
University of New England

August 19, 2011

Symposium Presentations - Harold Alfond Center for Health Sciences Room 205
Poster Presentations – Harold Alfond Center for Health Sciences 2nd & 3rd floor lobbies

Organized by the CAS Undergraduate Research Committee:
Pam Morgan, Undergraduate Research Coordinator
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Markus Frederich
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Schedule

2:00 – 2:10	Opening Remarks
2:10 – 2:30	Archiving History: World War Two Letters and the Archival Process, Jennifer Cox (History), <i>Elizabeth DeWolfe/Cally Gurley</i>
2:30 – 2:50	Populations and Habitat Use of a Rare Wetland Turtle, Brendan Bennett (Environmental Science), <i>Bethany Woodworth</i>
2:50 – 3:10	The Politics of Justice: Navigating the Waters between Legal Efficacy and Racial Profiling in the State of Maine, Joseph Gousse (Political Science), <i>Ali Ahmida</i>
3:10 – 3:30	Evaluating the Saco Bay Estuary System as a Nursery Ground for Commercially Valuable and Ecologically Important Fish Species: A Saco River Estuary Field Study, Kayla Smith (Marine Biology), <i>James Sulikowski/Pamela Morgan</i>
3:30 – 3:50	Effects of Modifying Neurons Involved in Sexual Behavior in <i>Drosophila melanogaster</i> , Kelsey Kincaid (Medical Biology), <i>Geoffrey Ganter</i>
3:50 – 4:10	Student Conceptions About Fluid Statics: What Does Floating Really Mean? Matthijs van den Berg , (Chemistry), <i>James Vesenka</i>
4:10 – 5:30	Poster Presentations – Harold Alfond Center for Health Sciences 2 nd & 3 rd floor lobbies
5:30 – 7:30	Dinner – Decary Hall, Upper Cafeteria

Student author(s) in **bold**, faculty mentors in italics

ABSTRACTS FOR ORAL PRESENTATIONS

B.T. Bennett and B.L. Woodworth

Populations and Habitat Use of a Rare Wetland Turtle

As wetlands worldwide are drained or altered by human expansion, the unique creatures that dwell in them are forced out, with grave consequences for ecosystems and populations. Here in southern Maine, the spotted turtle (*Clemmys guttata*) lives in seasonally variable woodland wetlands. In spring and early summer, they live in vernal pools, which are filled annually with snowmelt and dry annually with summer heat. As their pools disappear, the turtles travel overland to other wetlands to breed, aestivate in late summer, and hibernate in winter. This type of lifestyle requires large, unfragmented blocks of habitat to contain all the turtles' life stages. UNE owns a 363-acre block of habitat that has historically been known to house spotted turtles. This project aimed to locate and radio-track turtles in order to better understand their habitat use and movements, and to assist in drafting future conservation easements. We surveyed over 42 wetlands and confirmed spotted turtles in six of them. We captured and marked 22 turtles and equipped five with radio transmitters to follow their movements over the spring and summer 2011. Our results show that conservation zones within the UNE woods contain four out of the six known turtle wetlands, but they fail to contain all movements of any of the turtles. Importantly, the wetland that contained 75% of the turtles is *not* within the conservation zone. Juvenile turtles have been found repeatedly in wetlands in the road where they are vulnerable to ATVs. Finally, 80% of tracked turtles left UNE property entirely at one point or another, often for extended periods. These results show the need for increased cooperation between UNE and abutting landowners for the continued survival of the spotted turtle population in the UNE Woods.

J. Cox, E. De Wolfe and C. Gurley

Archiving History: World War Two Letters and the Archival Process

The Randall Cushing Collection recently acquired by UNE contains twenty-one individual collections of soldiers' wartime correspondence in total comprising nearly two thousand letters.

My summer research project goal was to organize these letters so other researchers could find them useful. I also wanted to identify the content of the letters. The process of understanding the collections started by reading the letters. Initially I was looking for key words, items, facts, names, anything that would stand out to me as something important a researcher could use. The end result was placing all my findings in rediscovery for future researchers to use. As I read more letters I realized the importance of the young soldiers' life stories filling every letter with youthful vigor. Soldiers weren't allowed to write about where they were, what they were doing, who was in charge of them or who was with them. Military information was a secret. However, the censors restrictions made the soldiers think hard about what meant a lot to them and that was home. Within each letter the soldiers sought a piece of home.

In this presentation I will highlight the story of Private Charles Wilson to show how truly youthful these World War Two soldiers were. One soldier's story represents so many of the soldiers' tales in the Cushing collection. Charles Wilson fought hard and died young for his country. Wilson was at Pearl Harbor in the weeks leading up to December 7, 1941. In letters home to his parents he informs them about the American soldiers' fear of the Japanese, warning this parents not to talk about it. Wilson believes this fear is unfounded. The information within these letters got by military censors and shows one soldier's personal reflection on a global event.

J. Gousse and A. Ahmida

The Politics of Justice: Navigating the Waters between Legal Efficacy and Racial Profiling in the State of Maine.

W.E.B. Du Bois once noted that "the problem of the twentieth century is the problem of the color-line." Today, there exists no social and political issue more pressing and relevant to American history than that of race and racial tensions. Over the decades, race-related issues and movements have come to shape the very course of politics and day-to-day lives of American citizens in profound and ever-expanding forms on a variety of fronts. Presently, the issue of race presents itself no more clearly than through the venue of the American penal and correctional systems. Through *Politics of Justice* the central question

being identified is one of race and power within the justice system. Specifically, how has the question of race and power manifested itself within the nation's criminal justice system through specific cases from the state of Maine's correctional and penal systems?

This project employs both primary and secondary sources, first exploring national prison data to cultivate a preliminary understanding of the larger context, with the focus then narrowing to address the issue within the state of Maine. Through intensive collaboration with the Maine Department of Corrections and Commissioner's Office, statistical data is analyzed in determining the level of racial disparity in Maine's penal system as compared to national figures. In an effort to represent the minority perspective and provide a historical context, several key texts have been analyzed and used a lens through which the narrative of the project has been derived including W.E.B. Du Bois' *The Souls of Black Folk*; Malcolm X's *The Autobiography of Malcolm X*; Ralph Ellison's *The Invisible Man*; and Douglas Blackmon's *Slavery by Another Name*. In total, the sum of this research has produced a working thesis that various cofactors serve to explain the apparent disparity among races in the national and Maine penal systems.

K. Kincaid, J. Davis-Heim and G. Ganter

Effects of Modifying Neurons Involved in Sexual Behavior in *Drosophila melanogaster*

At a basic genetic and physiological level flies and humans remain very similar, allowing researchers to study complex influences on behavior that would be difficult or unethical to manipulate in human subjects. Our lab and many other research groups have established that *Drosophila* neurons that express the *fruitless* gene are heavily involved in fly sexual behavior. We now try to elucidate the function of *fruitless*-expressing neurons in two ways. Firstly we are increasing *fruitless* neuron activity by driving the mutant potassium channel gene *ether-a-go-go* in *fruitless* neurons. *Ether-a-go-go* brings neuron membrane potential closer to threshold to produce hyperactivity of *fruitless* neurons. Secondly, because our group has previously shown that the steroid hormone ecdysone affects sexual behavior, we are increasing the amount of a novel plasma membrane bound receptor called the Dopamine/Ecdysone receptor (DopEcR) in all

neurons. Males with hyperactive *fruitless* neurons were found to have increased male-male courtship compared to wild-type males assayed under the same conditions. Male flies with increased Dop/EcR in all neuron membranes showed inconclusive results. Female flies with increased Dop/EcR in all neuron membranes were found to have decreased ovipositor extrusion (rejection behavior) compared to wild-type and wild-type/Dop/EcR heterozygotes. Our results suggest that the sexual behavior of *Drosophila melanogaster* can be influenced by modifying neurons through hyperactivation and plasma membrane ecdysone modulation. Future directions include analysis of hyperactive *fruitless* neurons in females to discover if comparable changes in female sexual behavior occur. We will also confine Dop/EcR overexpression to *fruitless* neurons in order to determine whether plasma membrane dopamine and ecdysone receptor overexpression in the *fruitless* neurons can affect sexual behavior in males and females.

K. Smith, J. Sulikowski and P.A. Morgan

Evaluating the Saco Bay Estuary System as a Nursery Ground for Commercially Valuable and Ecologically Important Fish Species: A Saco River Estuary Field Study

Coastal river systems, such as the Saco River, are known to play an important role in the early life history of many marine species within the Gulf of Maine (GOM). Although the Saco River is the fourth largest in Maine, data regarding the fauna within this dynamic system is limited. The goal of this project is to compile an up to date baseline ecosystem structure of the wild fish populations within the Saco River estuary (SRE). Over the course of this study, various sampling methods including beach seines, modified lobster traps, plankton tow nets, and settlement collectors were used to collect larval, post-larval, and juvenile fish species from this habitat. Sizes and relative abundances of species caught have been recorded and compared on a monthly basis. Out of a total 48 fish species collected, 44 species representing 31 families have been observed using the SRE system as a nursery ground in juvenile life stages increasing in size over consecutive months. Overall, fish abundance and diversity was highest during spring and summer months with both marine and freshwater species observed representing resident, migratory, and transient life

history categories. *Alosa aestivalis* (blueback herring), *Alosa pseudoharengus* (alewife), *Menidia menidia* (Atlantic silverside), *Ammodytes americanus* (American sand lance), and *Pomatomus saltatrix* (bluefish) were among the most abundant species collected. Examining early life history characteristics of the significant species richness present in these waters is essential for future conservation and management of commercially important and threatened GOM fish stocks.

M.P. van den Berg and J. Vesenka

Student Conceptions About Fluid Statics: What Does Floating Really Mean?

Fluid statics, which includes the concept of buoyancy, is a subject taught in second semester physics at UNE. Because of the relatability of buoyancy to concepts in biology and health sciences and its ubiquity in everyday life, an understanding of the physics behind this phenomenon is important to students' undergraduate and postgraduate success. Our research, however, indicates that buoyancy is a particularly hard subject to understand as well as to teach. Previous assessments have shown that students continue to hold on to faulty but persistent preconceptions, even after guided inquiry instruction. To gain an understanding of these preconceptions, groups of students from spring as well as summer semester Physics II classes were tested on their understanding of buoyancy before and after instruction. Using feedback from an activity applied last summer, as well as open-ended and multiple-choice questioning, a novel assessment was developed to measure student knowledge of fluid statics. In combination with a previously developed lab activity, this assessment focuses on multiple representations of a buoyancy experiment, and encourages the students to think of the problem from different multi-representational perspectives.

POSTER PRESENTATIONS (Student Author(s) in bold, Faculty Mentors in Italics.)

1. Invasive Plants in Estuarine Marshes: *Phragmites australis* along the Saco River. **William Almeida** (Environmental Science), *Pamela Morgan*
2. Functions of Transcription Factor Sox11 in Brain Development. **Mike Anderson** (Biological Sciences), *Lei Lei*
3. Effects of PBDEs on Thyroid Hormone Receptors in Bone Cells. **Megan Bagdon** (Medical Biology), *Deena Small*
4. In Vivo Characterization of Novel Neutral Antagonists NAP & NAQ, in Opioid Dependent Mice. **Amanda Braithwaite** (Medical Biology), *Edward Bilsky*
5. Computational Investigation and Nuclear Magnetic Resonance Spectroscopy Analysis of Derivatives of 6-beta Naltrexol. **Vernon Chan**, (Biochemistry/Medical Biology), *A.M. Deveau and J.M. Stubbs*
6. Grey Squirrel (*Sciurus carolinensis*) Habitat Use on the University of New England's Biddeford Campus. **Cody C. Chretien** (Environmental Science), *Noah Perlut*
7. Using Stomach Content and Stable Isotope Analysis to Identify Direct and Indirect Competition by Spiny Dogfish, *Squalus acanthias*, on Commercially Important Fish Species from Southern New England. **Anna Clabaugh** (Marine Biology), *James Sulikowski*
8. Age and Size of the Barndoor Skate, *Dipturus laevis*, at Sexual Maturity in the Northwest Atlantic. **Karson Couture** (Marine Biology), *James Sulikowski*
9. Assessing the Age Distribution of Sox Shark Species within the Mississippi Sound Nursery Ground. **Daniel Crear** (Marine Biology), *James Sulikowski*
10. Targeting Novel FAAH Inhibitors for the Treatment of Inflammatory and Neuropathic Pain. **Jordan Faloon** (Neuroscience), *Edward Bilsky*
11. Bird Communities of the Saco River's Tidal Marshes. **Cory French** (Environmental Science). *Noah Perlut/Pamela Morgan*
12. The Book of Kells as a Source of Inspiration for W.B. Yeats's Lyric Poetry. **Constance Glynn** (English and Language Studies/History), *Matthew Anderson*
13. 17 α -Ethinylestradiol Decreases Overall Responsiveness and Behavioral Consistency in Juvenile Siamese Fighting Fish, *Betta splendens*. **Olivia Hebert** (Medical Biology), *Teresa.Dzieweczynski*
14. Privacy in the Modern Age: A Response to the Implications of Technology on Personal Privacy. **Brandon Hotham** (Psychology/English), *Cathrine Frank*
15. The Effects of Supercritical Carbon Dioxide on the Solubility of Ethyl Benzene and 1-Octene within a Polyethylene Glycol Solution. **Michael Huber** (Biochemistry), *John Stubbs*
16. Immediate Early Gene Expression During Fear Conditioning in Developing Rats. **Miles Hughes** (Animal Behavior), *Michael Burman*
17. Optimizing the Synthesis of 1, 1-Dimethyl-2,3,4,5-tetraphenylsilacyclopentadiene. **Abby Jones** (Chemistry), *Amy Keirstead/Jerome Mullin*
18. Adjusting to College: How Parent's Influence the Well-being of their Adolescents. **Katelyn Kaulback** (Psychology), *Amanda Hare*
19. The Projection of Responsiveness Buffers People with Low Self-esteem from the Negative Effects of Relationship Conflict. **Bethany Kay** (Psychology), *Julie Longua Peterson*
20. Effects of FGF1 Expression on Adipose Tissue Development. **Tyler Keeley** (Biochemistry), *Deena Small*
21. The Effects of Genotypic Diversity on *Spartina alterniflora* Response to Sea Level Rise and Nutrient Loading. **Ryan Kingston** (Environmental Science), *Greg Zogg*
22. Investigating Reproductive Anomalies in the Spiny Dogfish, *Squalus acanthias*, along the United States East Coast. **Ryan Knotek** (Marine Biology), *James Sulikowski*

23. To Be a City Gull or Not? Comparing Herring Gull Breeding Success in Urban and Natural Nest Sites. **Jason Lariviere** (Biological Sciences), *Noah Perlut/Peggy Friar*
24. Investigating the Photochromism of Spiropyran in the Ionic Liquid [BMIM][BF₄]. **Annie Leslie** (Neuroscience) and **Sean Naughton** (Biochemistry), *Amy Keirstead*
25. Induced Compounds in Brown Macroalgae. **Kyle Martin** (Medical Biology) and **Eric Paulette** (Biochemistry), *Ursula Roese*
26. College Community Mentoring Project: Does Mentoring Structure Matter? **Brittany Morley** (Psychology), *Maryann Corsello/Sam McReynolds*
27. Determining the Function of Unexplained Vascularization in the Uterus of the Spiny Dogfish, *Squalus acanthias*. **Eric Nuber** (Marine Biology), *D. Koester and J. Sulikowski*
28. Ecdysone Signaling Modulates Nociceptive Pathways in *Drosophila melanogaster*. **Joselle O'Brien** (Medical Biology/Mathematics), *Geoffrey Ganter*
29. Effect of PBDEs on Adipocyte and Preadipocyte Phenotype Expression. **Olivia Paquette** (Medical Biology), *Deena Small*
30. Determining the Gestation Period of Spiny Dogfish (*Squalus acanthias*) using Ultrasound and Plasma Hormone Analysis. **Cassidy Peterson** (Marine Biology/Mathematics), *James Sulikowski*
31. The Role of Inhibition in Reading Comprehension among Skilled and Less-skilled Readers. **Julia Rich** (Psychology/English) and **Hadleigh Smith** (Education/Psychology), *Jennifer Stiegler-Balfour*
32. Stewards of the Saco River Estuary. **Tristian Rowe** (Communications) and **Reilly Sullivan** (Environmental Science), *Bistra Nikiforova/Pam Morgan*
33. Fecal Indicator Bacteria in the Saco River and the Effect of Environmental Factors on the Survivability of *Escherichia coli*. **Tyler Spillane** (Marine Science), *Stephan Zeeman*
34. In Vivo Characterization of Novel Opioid Peptides, in Mice. **Lindsay St. Louis** (Neuroscience), *Edward Bilsky*
35. Plant Community Structure of Tidal Wetlands in the Saco River Estuary. **Rachel Tamulonis** (Biological Sciences), *Pamela Morgan*
36. Anoxia and Hypoxia Tolerance of the Two Color Morphs of *Carcinus maenas* Using RNA Interference. **Casey Toombs** (Medical Biology), *Markus Frederich*
37. Analyses of Motor Activities of the Dorsal Forebrain-Specific Sox11 and Klf7 Conditional Knockout Mice. **Aubrey White** (Medical Biology), *Lei Lei/Edward Bilsky*

ABSTRACTS FOR POSTERS

W. Almeida, C. French, R. Tamulonis, and P.A. Morgan

Invasive Plants in Estuarine Marshes: *Phragmites australis* along the Saco River

The Saco River Estuary Project brings together the social and natural sciences with a long-term goal of sustaining the structure and function of the Saco River estuary. We are surveying the avian, plant and fish species that use the estuary's marshes, and will connect these surveys to economic and community values. Moving upstream from the mouth of the river we have found salt marshes, brackish marshes, and tidal fresh marshes. One objective this summer was to establish baseline information concerning the presence of *Phragmites australis* along estuarine marshes of the Saco River. All patches surveyed along the Saco River were discovered to be the invasive haplotype. The patch size varied from 1.5m by 1 m, to 108m by 21.5m. The living stem densities ranged from 7 stems to 572 stems per 2.5m² quadrat, and the average heights from 75cm +/-12 to 282cm +/- 16. This data collection will allow for long term monitoring of the invasive plants patches, with hope that alongside local community collaboration, management practices may be established.

M. Anderson, E.Y. Lee, K. Nash, J. Brancelly and L. Lei

Functions of Transcription Factor Sox11 in Brain Development

New neurons are continuously generated from neural progenitor cells (NPCs) residing in two regions of the adult mammalian brain: the subventricular zone (SVZ) of the lateral ventricle and the subgranular zone (SGZ) of the hippocampal dentate gyrus. Correct migration and differentiation of these NPCs are directed by signaling from a variety of different molecules and growth factors. In this study we examined the role of the transcription factor Sox11 on hippocampal neurogenesis using a variety of transgenic mouse models. We generated conditional knockout mice (CKO) lacking a functional Sox11 gene in forebrain dorsal progenitor cells. These CKO mice give us a model in which we can study the function of Sox11 in the mammalian forebrain through

analyzing the effect of ablating Sox11. We collected the brains of Sox11 CKO mice and control mice at different ages and performed histological and immunohistochemical analyses. We found that there were anatomical differences in the forebrain between the CKO and the wild type mice. We also generated a transgenic mouse line in which the ablation of Sox11 can be induced by injecting tamoxifen intraperitoneally. This approach allows us to induce the ablation of Sox11 after the hippocampus develops, so that we can study the importance of Sox11 on hippocampal neurogenesis in adult mice. In the future we hope to conduct specific behavioral tests on Sox11 CKO mice. The combination of molecular, cellular and behavioral approaches will provide novel insights on the roles of Sox11 in brain development.

M. Bagdon and D. Small

Effects of PBDEs on Thyroid Hormone Receptors in Bone Cells

For years Polybrominated Diphenyl Ethers (PBDEs) have been used as flame retardants in everyday items such as textiles, plastics, and electronics. Although production and use of many of the 209 congeners of PBDEs have recently been banned, these chemicals are bioaccumulative, so it is important to understand their effect on the human body. Studies have shown that PBDEs are strong competitors against the thyroid hormone 3,5,3',5'-L-tetraiodothyronine (T4) for thyroid hormone receptor binding and also have a negative effect on thyroid hormone production and activity. Thyroid hormones play a part in maintaining the necessary balance between the production of osteoblasts, which are bone-forming cells, and osteoclasts, which are bone-resorbing cells, and thus regulate bone remodeling. To better investigate whether PBDEs have a negative effect on bone cell development and function, the ability of cultured MC3T3 bone cells treated with PBDEs were analyzed for their ability to differentiate into mature bone cells. In addition, *in vivo* studies were also conducted in which mice were fed daily doses of PBDEs immediately after birth. The litters were sacrificed at ages ranging from five to eight days old in order to determine how PBDEs affected bone development during early developmental stages. Calvarial cells were extracted from the mouse skulls and plated in culture flasks with media specific for primary

bone cell cultures so that osteogenic cell populations could be characterized. Experiments are currently being conducted with both types of cell cultures -using methods including RNA extraction, gene expression, and Von Kossa staining- to provide information about the effects of PBDEs on thyroid hormone receptor-regulated processes in bone cells. These studies will show whether PBDEs act as Thyroid Hormone Receptor antagonists in osteoblasts by providing information on the expression of proteins and functions coded for by thyroid hormone receptor-responsive genes.

A. Braithwaite, D. Giuvelis, E. Bilsky and Y. Zhang

In Vivo Characterization of Novel Neutral Antagonists NAP & NAQ, in Opioid Dependent Mice

Opioid use and abuse has been reported as increasing in frequency over the past few years along with a decreased quality of life and the social and economic costs associated with it. Opioid antagonists are used to reverse life threatening opioid overdose (naloxone), treat addictions (naltrexone) or reduce peripheral side effects of opioid agonists (methylnaltrexone). Each of these compounds acts as an inverse agonist in opioid exposed subjects, thereby increasing the severity of withdrawal and complicating patient management. Neutral antagonists, upon administration, reverse the agonist effects back to a basal level (rather than bringing them below normal). In collaboration with a chemistry colleague at Virginia Commonwealth University, we have tested a novel class of opioid ligands that are competitive (reversible) antagonists, displaying high selectivity for the mu opioid receptor (MOR) and having neutral antagonist properties. We have assayed these compounds (NAP and NAQ) in the following assays to determine potency, time courses and other in vivo pharmacology on the lead molecules: 55°C tail-flick, locomotor, gastrointestinal transit and physical dependence. We found that these compounds are effective at antagonizing a morphine effect in an acute model of thermal nociception, they can dose-dependently reverse the hyperlocomotion that follows morphine administration, and NAQ does not precipitate as severe a withdrawal in an acute model of physical dependence as does naloxone.

V. Chan, A.M. Deveau and J.M. Stubbs.

Computational Investigation and Nuclear Magnetic Resonance Spectroscopy Analysis of Derivatives of 6-beta Naltrexol

Naltrexol derivatives are interesting for their potential as addiction and pain therapies. In this research, synthetic C-Ring derivatives of naltrexol have been studied using quantum chemical calculations and nuclear magnetic resonance (NMR) spectroscopy. Previous attempts to synthesize 6-desoxynaltrexone led to the unexpected result of an alkene with an opened E-ring. Efforts have been put into studying the mechanism of the unexpected reaction through computer simulations. NMR spectroscopy data has been assimilated regarding the protons of interest to understand the chemical environment surrounding the C-ring.

C. Chretien and N. Perlut

Grey Squirrel (*Sciurus carolinensis*) Habitat Use on the University of New England's Biddeford Campus

The eastern grey squirrel (*Sciurus carolinensis*) is the most commonly encountered mammal in southern Maine and throughout New England. However little is known about the ecology of this species. In 2010-11 we studied squirrel movement and survival on the University of New England Biddeford Campus, a coastal suburban habitat. Twelve squirrels were live-trapped (8 male, 4 female), ear tagged, radio-collared and released. We also took standard morphological measurements. Individuals captured within the campus core were considered to be living in a more urban environment than those living outside the campus core. Radio-collared individuals were located an average of 48% of the days they were collared. The average home range size was 3.4 ha (SD 2.62). Individuals captured in the campus core had smaller home ranges (n= 7, 2.07 ha, SD 2.95) than those captured in the campus periphery (n=5, 5.26 ha, SD 1.36). Although the sexes were similar in body size, males had a larger home range (3.85 ha, SD 3.06) than females (2.5 ha, SD 1.29). Campus core individuals, with smaller home ranges, likely met their nutritional needs through both natural and anthropogenic sources, while periphery individuals needed larger ranges to meet their nutritional needs with more natural sources. Home ranges in this study were greater

than comparable studies on the East Coast, but were much smaller than studies in regions where grey squirrels were recently introduced.

A. Clabaugh and J. Sulikowski

Using Stomach Content and Stable Isotope Analysis to Identify Direct and Indirect Competition by Spiny Dogfish, *Squalis acanthias*, on Commercially Important Fish Species from Southern New England

Spiny dogfish, *Squalis Acanthias*, inhabit the northwest Atlantic from Nova Scotia to North Carolina. Believed to be opportunistic feeders, previous research suggests that spiny dogfish feed on any available prey from herring and cod to mussels and crabs. Since spiny dogfish tend to travel in large packs their opportunistic feeding behavior may lead to competition with other commercially important species, such as cod, haddock, and sea bass, for available resources. My research will focus on the diet of spiny dogfish from Southern New England, examining stomach contents and analyzing stable isotope ratios of muscle and liver samples. Stomach and tissue samples will be collected monthly for both spiny dogfish and similarly sized bony fish that could possibly compete with the spiny dogfish for resources. Stomach content analysis will provide a snapshot of what the spiny dogfish are feeding on, while analysis of ¹³C and ¹⁵N isotopes in muscle and liver tissue will provide a long term view of the dogfish trophic level. The use of both techniques will provide a more complete picture of the trophic impact of spiny dogfish on the Southern New England ecosystem. Preliminary analysis suggests herring is the primary food item preferred by the dogfish. Similarly herring was also the primary prey item of cod, suggesting there is possible dietary overlap and potential competition between these two species. Over the coming academic year and next summer, stable isotope analysis will be conducted and compared to the stomach content data.

K. Couture, D. Rudders, T. Gedamke and J.A. Sulikowski

Age and Size of the Barndoor Skate, *Dipturus laevis*, at Sexual Maturity in the Northwest Atlantic

The barndoor skate is the largest species of skate found in the northwestern Atlantic Ocean

reaching a maximum total length of 150 cm. Although there is no commercial value for this species, barndoor skates are commonly caught as bycatch in commercial trawling and scallop dredging fisheries in the northwest Atlantic. Due to indirect fishing pressures and a k-selected life history pattern, the barndoor skate population nearly became extinct in the Northwest Atlantic by the late 1990's. This drastic decline prompted their prohibited status in the commercial fishing industry. The goals of this study are to provide precise estimates of the size and age at sexual maturity for the barndoor skate in the northwestern Atlantic and assess temporal changes in growth rates. This life history information is pertinent for the formation of a fisheries management plan. To assess whether the life history has changed in this species, 380 specimens from Virginia Institute of Marine Science (VIMS) captured between 1998-2001 will be compared to specimens caught from 2010 to 2011. All specimens utilized in this study were captured by scallop dredge on VIMS research cruises. For new captures, external measurements such as total length for both sexes and clasper length for males were taken prior to dissection. Internally the reproductive organs were weighed, measured, and assessed for maturity. To evaluate age, a gem saw was used to cut a cross section of each vertebra and age will be assessed by counting annual growth rings. Currently a total of 615 vertebrae have been mounted on slides. The oldest specimen aged thus far is 13 years old with a total length of 133.5 cm. Previously for this species, it was found that the maximum age was 11 years with total lengths of up to 133.5 cm using a sample size of 118 specimens. These preliminary differences suggest a possible shift in the growth of barndoor skates over time which must be understood for proper management.

D. Crear, J. Hendon, E. Hoffmayer and J. A. Sulikowski

Assessing the Age Distribution of Six Shark Species within the Mississippi Sound Nursery Ground

Global declines in shark populations have been observed, including several species in the western North Atlantic and Gulf of Mexico (GOM). Attributing to this collapse is a lack of abundance and distribution data of early life stages, particularly within essential habitats such as

nursery grounds. Previous research has defined the Mississippi Sound as a multispecies shark nursery; however no studies have examined the species specific age structure of sharks within this area. Determining how and why abundance and distribution patterns change on annual and seasonal basis is important in understanding this multispecies shark nursery. Thus, the objective of this study is to describe the age distributions and population structure of six shark species in the Mississippi Sound. From March 2009 through July 2011 vertebral samples from 322 sharks, representing 6 species were collected from the Mississippi Sound in conjunction with the Gulf Coast Research Lab Coastal Shark Survey. A total of 322 vertebrae have been processed to assess age including, 241 Atlantic sharpnose, 44 blacktip, 10 finetooth, 0 blacknose, 25 bonnethead, and 2 spinner. The processed vertebrae will undergo age analysis to determine the species specific age classes utilizing this inshore habitat and how these distributions may vary on both seasonal and annual time scales. In the future, temperature and salinity measurements associated with each collection site will be correlated to each sample to determine how these parameters affect these sharks. The results of my study will expand our understanding of how various shark species utilize coastal nursery habitats and assist the establishment of critical conservation and management practices.

J. Faloon¹, D. Giuvelis¹, D. Boger², and E. Bilsky¹

¹University of New England, ²The Scripps Research Institutes, La Jolla, CA

Targeting Novel FAAH Inhibitors for the Treatment of Inflammatory and Neuropathic Pain

Fatty acid amine hydrolase (FAAH) inhibitors have previously been shown to be potent and efficacious in a number of preclinical models of pain. The more selective inhibitors have had non-competitive (irreversible) interactions with the FAAH enzyme. The current study evaluated OL-135 (a first generation FAAH inhibitor) and CE-2-313-2 (a second generation compound), both of which are reversible and selective inhibitors. The anti-hyperalgesic and anti-allodynic activity of OL-135 and CE-2-313-2 were evaluated in a carrageenan-induced mouse model of inflammatory pain using the plantar and von Frey tests, respectively. Both compounds dose-

dependently reversed thermal hyperalgesia but were less potent than morphine. Both compounds were equally efficacious to morphine at lower doses; however, higher doses did not show further analgesic effects. OL-135 and CE-2-313-2 also dose-dependently reversed tactile allodynia with OL-135 showing less potency than morphine and CE-2-313-2 showing equal potency to morphine, respectively. In conclusion, our data supports a functional role of FAAH inhibitors in a mouse model of inflammatory pain. Additionally, both of compounds are being tested in a mouse model of neuropathic pain using the spinal nerve transection surgery (SNT). The FAAH inhibitors are being tested for their efficacy in reversing tactile allodynia and thermal hyperalgesia using the plantar and von Frey tests. Although this data is not yet completed, time courses for the plantar test and von Frey tests show a clear distinction between the SNT and sham mice. Gabapentin, a drug used clinically for neuropathic pain, shows efficacy in reversing tactile allodynia associated with the neuropathic pain state. If the compounds demonstrate excellent efficacy, additional studies will be designed to assess side effects as we try and develop better drugs for chronic pain.

C. French, N. Perlut and P. Morgan

Bird Communities of the Saco River's Tidal Marshes.

The Saco River Project started in 2010 to understand the diverse ecological and human-use of the tidal marshes from the dams in Biddeford to the mouth of the river. Birds are a critical indicator of marsh health and function, and they are an important part of the human experience on the river. Marshes are important for birds because they provide food and habitat for breeding, resting, staging prior to migration, and as stopover during migration. We evaluated bird communities in 10 (2010) to 16 (2011) tidal marshes on the Saco River. In 2010 we collected data from late-April to early-September; in 2011 we began counts in early-May, continuing until September. We conducted 10 minute fixed-radius point counts once during the low and once during the high tide each month between the hours of 5am to 9am. Across years, we counted 7103 individuals and 110 species, including 10% of the state threatened species and 28% of the species of special concern. We counted 33% of the 331 species known to occur in Maine. This diverse species assemblage included birds that

use all habitat types and foraging substrates, spanning from core forest (black-throated blue warbler) to grassland (bobolink) to shrubland (brown thrasher) to marsh (Virginia rail). Along with continuing the current methods, future work may include nocturnal counts, beginning the count earlier, and continuing later in the fall.

C. Glynn and M. Anderson

The Book of Kells as a Source of Inspiration for W.B. Yeats's Lyric Poetry

My research examines how *The Book of Kells* may have influenced the lyric poetry of W.B. Yeats, a prominent Irish writer. I look at the aspects of the illuminated manuscript (e.g., its visual motifs) that find expression in Yeats's poetry—specifically in his poetry he writes prior to the events of 1916—and the form that they take. How are they refracted through the lens of Yeats's poetic imagination? This project contributes to our understanding of the source and significance of the Celtic imagery that we find in Yeats's poetry prior 1916. Yeats's turn to Celtic sources was consistent with the cultural mood and expressed the energies of an emerging Irish Nationalism. Surprisingly, however, though Yeats consulted *The Book of Kells* during this period, in the scholarship on Yeats's work very little attention has been given to it as a reference and possible source of inspiration for his poetry. By examining *The Book of Kells* alongside Yeats's lyric poetry, I contribute to our understanding of the inspiration behind Yeats's poetry and the workings of his imagination. Given the significance of Yeats's work, the findings of this project also contribute to our understanding of Nationalism and of literary Modernism, especially at the turn of the 20th century.

O. L. Hebert and T. Dziweczynski

17 α -Ethinylestradiol Decreases Overall Responsiveness and Behavioral Consistency in Juvenile Siamese Fighting Fish, *Betta splendens*.

Recent work has found that individuals often behave consistently in response to a given context or stimulus over time but differ from others within the species in these responses. These consistent individual differences have been found in a wide variety of species for a range of

behaviors, including courtship, aggression, and boldness, and may have fitness consequences. Endocrine-disrupting chemicals (EDCs) within the water pose a serious threat to aquatic species, altering both reproductive and aggressive behaviors, both of which are crucial to individual survival. One prevalent EDC worldwide is 17 α -ethinylestradiol (EE2), a major component in birth control pills that is not filtered out of water in treatment facilities, allowing it to have a constant and considerable impact within our water sources. To assess the effects of EDCs on behavioral consistency, thirty-five male Siamese fighting fish were presented with an environmentally relevant amount (15ng/L) of EE2 each day and their behavior was observed 4 hours later in response to conflicting stimuli in the form of a male and female conspecific presented simultaneously. Overall, there was a decrease in all male and female directed behaviors and all behaviors were found to be less repeatable after chemical exposure. Consistent individual differences were not found regardless of chemical exposure, however, this finding may be attributed to the fact that the fish were juveniles and individuals become more consistent with age. These findings show that relevant chemical concentrations within the natural environment are impacting both aggressive and reproductive behaviors, which can have severe long and short-term fitness consequences.

B. Hotham and C. Frank

Privacy in the Modern Age: A Response to the Implications of Technology on Personal Privacy

This study examines how privacy law interacts with the current state of modern technology that has become a huge part of our culture. With the increase in technology and its uses over the past twenty years, there are numerous, major identifiers about ourselves online. Though many of these facts about our personal identity are protected in some ways, there are still numerous ways in which our personal privacy can be infringed upon. Two prominent social media technologies that are used today are social media sites and internet blogging. This study examines how one's privacy may be infringed through these two mediums. The majority of people using these technologies are young people who are not considered to be adults in the legal community. This study raises the question: what impact will

this have on young people in their future when they are older? This content posting is done voluntarily, but what does it mean when this voluntary act is committed by underage users? The majority of the content published through these mediums is also private in nature. This raises the question: what exactly does privacy mean today, and what rights do individuals have when content is published about them without their knowledge? In this paper, recognizable examples from present media are examined as well as the opinions of various legal and literary scholars to identify more closely what privacy means in our modern time, and how the use of social media technologies is affecting us all.

M. T. Huber and J. Stubbs

The Effects of Supercritical Carbon Dioxide on the Solubility of Ethyl Benzene and 1-Octene within a Polyethylene Glycol Solution

The effects of supercritical carbon dioxide on solute solubility in polyethylene glycol (PEG), was studied at 323.15 K and 15MPa. We aimed at answering whether the amount of CO₂, a nonpolar molecule, improves PEG's ability to dissolve nonpolar solutes. We studied the effect CO₂ concentration has on the solubility of two solutes, primarily rigid ethyl benzene and mostly flexible 1-octene. This provided insight into what role solute rigidity plays in solute solubility. Our experiment was modeled with Monte Carlo molecular simulation. Simulations consisted of four concentrations of CO₂ in PEG as solution environments for the solute, and a solute vapor phase. Results were analyzed quantitatively using the radial distribution function, and qualitatively with molecular visualization.

M. Hughes, S. Shiers and M. Burman

Immediate Early Gene Expression During Fear Conditioning in Developing Rats

Contextual fear conditioning, or fear of an environment, emerges later in development (postnatal day 23; PD 23) than learning an explicit fear stimulus, fear of a shock, (PD-15-17). As the amygdala is required for both tasks, but the hippocampus is only required for contextual fear, this behavioral difference was thought to reflect a delayed emergence of hippocampus function. However recent studies from our lab have suggested that hippocampus

function may be intact earlier and that the fear system may be developing later than previously believed. Our hypothesis is that the perirhinal cortex, which serves as a bridge between the hippocampus and amygdala, is a critically developing structure. In order to determine whether evidence can be found for the involvement of the perirhinal cortex, fear conditioning was examined in rats at PD 17 and 23. Rats were subjected to 5 conditioning trials consisting of pairings between a tone and a mild footshock. Rats were euthanized one hour later and brain tissue was harvested. The brains then went through immunohistochemistry to detect c-Fos, a transcription factor from the immediate early gene FOS, which is marker of strong synaptic activation. This creates a record of where neural activity has recently occurred. By examining these c-Fos proteins we can discern which structures were active during fear conditioning at PD 23 that were not active at PD 17, providing some insight into which structures are essential to developing the ability to form contextual memories.

A. L. Jones, J. L. Mullin and A.E. Keirstead

Optimizing the Synthesis of 1,1-Dimethyl-2,3,4,5-tetraphenylsilacyclopentadiene

Siloles are substituted cyclopentadienes where a silicon atom replaces one of the ring carbons. This novel class of molecules has been found to have unusual electronic and photophysical properties. One of the most interesting aspects of siloles is that they exhibit aggregation-induced emission (AIE); in other words, their photoluminescence increases when they are forced to aggregate, in contrast to the aggregation-induced quenching that most luminophores exhibit. Consequently, siloles are being examined for use in electroluminescent devices and as chemical sensors.

One of the projects currently underway in our research laboratory involves examining the influence of ionic liquid media on silole photoluminescence. The silole 1,1-dimethyl-2,3,4,5-tetraphenylsilacyclopentadiene has been chosen as the first probe molecule for study since its photoluminescence properties have already been well characterized in traditional media, which will allow us to focus on the medium effects. The first step in this project has been to adapt literature protocols for the synthesis of this

compound to our laboratory, so that large amounts of silole material can be produced. This poster will present advances towards optimizing the synthesis and purification of the silole 1,1-dimethyl-2,3,4,5-tetraphenylsilacyclopentadiene.

K. Kaulback and A. Hare

Adjusting to College: How Parent's Influence the Well-being of their Adolescents

New research from the Higher Education Research Institute at UCLA shows that the emotional health of the college freshman is at an all time low. Unfortunately, feeling stressed and overwhelmed can prevent students from performing their best in college. So why is it that some students have difficulty transitioning to college, while others are very successful? My research focuses on one possible predictor of students' adjustment to college: their parents. More specifically, I am interested in how a parent influences his or her adolescent's sense of self, and how the adolescent's self-esteem in turn effects his or her college transition. To examine this relationship, I collected pilot data as a research assistant on the College Transitions Study during my junior year. This survey of 61 first-year students enrolled in Introduction to Psychology allowed me to analyze how students were feeling about their first year of college. Results showed that parental behaviors were predictive of students' adjustment during the first year, but the strength of this association depended on the students' self-esteem. However, these preliminary findings raised new questions. How do parenting style and student self-esteem influence adjustment to college over time? Are there differences between how parents report their own behaviors and how adolescents perceive the same behaviors? In order to answer these questions, I worked this summer to recruit participants and collect new data for a longitudinal study. Both incoming students and their primary caregivers were recruited and surveyed during summer orientation, and those students will be surveyed again at the end of their fall and spring semesters. This data will allow me to see the progress of students throughout their first year of being away from home and in the college setting as part of my senior thesis. Expected results and hypotheses will be discussed.

B. Kay and J. Longua Peterson

The Projection of Responsiveness Buffers People with Low Self-esteem from the Negative Effects of Relationship Conflict

The current study has two goals. First, we plan to investigate how perceptions of a romantic partner's self-esteem can influence how a participant responds to threat. Previous research shows that people with low self-esteem give off signals regarding their self-esteem, and others pick up these signals. In fact, romantic partners are accurate when predicting their partner's self-esteem (MacGregor & Holmes, 2011). Previous research also suggests that people with low self-esteem are more hurt by romantic conflict, and their romantic partners correctly identify them as more hurt (Campbell et al., 2005). The current study would like to replicate and expand these findings by investigating further the effect of romantic partner self-esteem on the self.

Second, the current study plans to extend research on perceived partner responsiveness. We would like to see whether perceiving one's self as responsive helps people with low self-esteem see their romantic relationships more positively after threat. Research has shown that people with low self-esteem engage in self-protective behaviors that can hurt their relationships (Murray, Derrick, Leder, & Holmes, 2008). Research has also shown that people project their own feelings of responsiveness onto their romantic partners (Lemay & Clark, 2008). By projecting own responsiveness onto romantic partners, people perceive their partners as responsive to their needs (Lemay, & Clark 2008). The current study hopes to eliminate or decrease the protective behaviors that people with low self-esteem use when faced with a relationship threat by increasing feelings of own responsiveness. In doing so, people with low self-esteem will project their own responsiveness onto their romantic partner and should feel that their partners will be there for them in a time of need. We think this will eliminate or decrease self-protective behaviors in people with low self-esteem.

T. Keeley, D. Small, and I. Prudovsky

Effects of FGF1 Expression on Adipose Tissue Development

Problems in adipose tissue abundance result in severe pathological conditions in obese individuals, including cardiovascular disease and Metabolic Syndrome.

Therefore, understanding key metabolic pathways in adipose tissue and the part they play in fat gain is important. Fibroblast growth factor 1 (FGF1) is a critical factor in the normal upkeep of adipose tissue, but its role in regulating adipose tissue development is not completely understood. We used two groups of mice - one control and one transgenic line with enhanced endothelial-specific FGF1 expression - to better understand how FGF1 impacted adipose tissue growth. Both groups were fed a high fat diet over the course of fourteen weeks and the mass of each mouse was taken on a weekly basis. Fat tissue and blood samples were harvested at the end of the period. Visceral tissue was fixed for imaging to determine if FGF1 had visible effects on the size of the adipocytes as well as to determine if there was increased vasculature in the transgenic mice. ELISAs were performed on blood samples and tissue extracts to determine if the increased FGF1 caused changes in the expression of Leptin, Adiponectin, and VEGF, proteins important for regulating insulin sensitivity and vascular growth. A glucose assay was also performed on the bloods to establish the level of blood glucose in the mice. Liver samples were also taken to determine if FGF1 helped prevent fatty liver caused by the high fat diet. The data obtained from these studies indicates that FGF1 release may alter adipose tissue development and function, but its ability to modulate this important endocrine tissue may be impacted by other factors that have yet to be identified.

R. Kingston, G. Zogg and S. Travis

The Effects of Genotypic Diversity on *Spartina alterniflora* Response to Sea Level Rise and Nutrient Loading

Genetic diversity is known to enhance resistance to disturbance in seagrass ecosystems, but little to no research has been done to determine how genetic diversity plays a role in *Spartina alterniflora*-dominated salt marshes. As sea level rise and nutrient loading threaten the structure and functions of these marshes, the role of genetic diversity must be understood to better protect these ecosystems. *Spartina* can propagate by growing genetically identical stems, or clones, out of its roots and rhizomes. Stems growing in clusters of four were collected from the Wells National Estuarine Reserve in June. The sediment was removed so the connections between stems could be confirmed before they were physically separated for the experiment. Stems were then planted in pots containing a 50-50 mixture of sand and potting soil. Each pot was assigned one of three levels of genotypic diversity. A diversity of one contained three genetically identical clones; a diversity of two contained two clones

from one location and one stem from another; a diversity of three contained three unique stems. Half the pots were given nutrients to simulate Nitrogen loading. Half the pots were then placed in “low” tanks to simulate a natural tidal cycle and half were placed in “high” tanks that simulate a sea level rise of approximately 40cm. A survey was conducted one month into the experiment to determine the percentage of stems that were still green. The data from this survey showed that pots with a higher genetic diversity had a higher percentage of green plants. Pots with nutrients had a higher percent green than the control pots, and pots with normal hydrology had a higher percent green than those in the “high” hydrology. The combined effects of these treatments showed no distinct pattern. This experiment is still ongoing and more data will be collected in the fall.

R. Knotek, C. Peterson and J. A. Sulikowski

Investigating Reproductive Anomalies in the Spiny Dogfish, *Squalus acanthias*, along the United States East Coast

The spiny dogfish, *Squalus acanthias*, is a k-selected species with a long gestation period, low fecundity, long life, and late maturation that makes their populations sensitive to fishing pressures. In the late 1980's, declines in commercially important groundfish stocks led commercial fisherman to target spiny dogfish as an economic resource. Increased fishing pressure from 1987 to 1996 resulted in a ten-fold increase in the amount of dogfish landings within the U.S. In 2000, the biomass of the species was reduced to critically low levels. Despite the implementation of a strict management plan in 2002, the life history characteristics of the species suggested that the population was incapable of rebounding until 2020. However between 2005 and 2008 a four-fold increase in the population's biomass was observed, an anomaly that is biologically impossible for this species. Previous research on the reproduction of *S. acanthias* has suggested a 22-month gestation period; however, these studies are outdated and no study has never examined the full reproductive cycle for a consecutive 22-month period. Additionally, reproductive data has only been collected for specimens in the Gulf of Maine despite a known U.S. range that spans Maine to South Carolina. Thus far preliminary data has been collected from a total of 1200 female dogfish; 400 from New

England, New Jersey, and North Carolina, which suggests that regional differences as well as a possible shorter gestation period, may exist for this species.

N. Perlut and M. Friar and **J. Lariviere**

To Be a City Gull or Not? Comparing Herring Gull Breeding Success in Urban and Natural Nest Sites

Herring Gulls (*Larus argentatus*) naturally nest on islands off the coast of Maine. As found in other regions like the Great Lakes, gulls also choose to nest on certain rooftops and ledges on large buildings in Portland, ME. This study sought to understand if there is a cost or benefit to nesting in urban areas by comparing reproductive success on Wood Island, Biddeford, and a colony on 100 Middle Street, Portland. Egg size, clutch size, and hatching success was measured at both sites. Chick growth measures were recorded at the urban site, but not the natural site. There was no significant difference in egg size, clutch size or hatching success. The buildings allow a safe nesting site in which the ledges provide protection from predators. All the nests were located against the ledges, rather than in the open. Along with this, food is easily available for one parent to fetch while the other protects the young, using the height of the building to scope out dangers, and the walls as a sort of shield. On the island everything is much more competitive, and the chicks are constantly under watch from other gull predators. To put it simply, the gulls choose the buildings because it is a great place to raise their young.

A. Leslie, S. P. Naughton and A. E. Keirstead

Investigating the Photochromism of Spiropyran in the Ionic Liquid [BMIM][BF₄]

Ionic liquids (ILs) are salts that are liquids at or below room temperature, and are typically composed of an organic cation and an inorganic anion. These novel materials have recently attracted attention due to their “green” nature, and ability to change the properties of the IL by modifying the cation- anion combination. Ionic liquids are also very chemically and thermally stable and are being examined as hosts for molecular electronic devices, such as switches and sensors.

In this project, the influence of ionic liquid media on the chemistry of spiropyran is being examined. Spiropyran is a class of molecular switching devices that interconvert between two isomeric forms when exposed to specific wavelengths of light, a property referred to as photochromism. This change between two isomers results in a change in color, molecular conformation, and polarity; the ring-closed “spiro” form is colorless and uncharged, while the ring-opened “merocyanine” form is a red-violet color, and zwitterionic. The viscous and ionic nature of ILs could potentially alter the dynamics of the interconversion between these isomers compared to traditional media such as molecular solvents. Furthermore, ILs could “protect” the spiropyran from degradation, extending the lifetime of the switching device.

This poster will present results obtained for three spiropyran compounds, differing in their substituents (methyl, methoxy and methyl ester) in the ionic liquid 1-butyl-3-methylimidazolium tetrafluoroborate [BMIM][BF₄]. UV-Vis absorption and emission spectroscopy were used to study the dynamics of the ring-opening and ring-closing reactions. Our preliminary results suggest that the ring-closing reaction is slowed in the IL compared to ethanol, a phenomenon that could be exploited in molecular electronic devices.

K. Martin, E. Paulette and U. Roese

Induced Compounds in Brown Macroalgae

The brown macroalgae *Fucus vesiculosus* remain abundant in the intertidal zones of the coast of Maine and the North Atlantic despite significant pressure from herbivores. This suggests that they may have defense mechanisms that protect them against herbivore and microbial attack. These defenses can be categorized into defenses that are always present in the algae and inducible defenses that are only produced by the algae when in the presence of an herbivore or injury. *F. vesiculosus* at the intertidal zone at Biddeford Pool, Maine, U.S.A. were subjected to both mechanical injury and the plant signaling compound Methyl Jasmonate to investigate the inducibility of defense compounds. After a six-day treatment, significant amounts of at least two compounds were synthesized in response to Methyl Jasmonate and mechanical injury in

comparison to control algae. Quantitative and qualitative differences in induced compounds were observed between vegetative and reproductive tissues. These findings may be significant in light of the possibility of the compounds having antiherbivore or antimicrobial properties. Additional experiments are in progress to determine the identity and function of these compounds as well as experiments to determine the specific time-course for their synthesis.

B. Morley, M. Corsello and S. McReynolds

College Community Mentoring Project: Does Mentoring Structure Matter?

Due to the success of mentoring programs across the United States, the types of structured mentoring programs have increased. Although all mentoring programs aim to promote youth outcomes, they vary in their goals and emphasis. Many programs are measuring changes in positive behaviors to provide insight on the growth of what are known as developmental assets, or the social and psychological strengths that promote healthy outcomes for children and adolescents. Previous studies have shown that group mentoring focuses upon assisting youth in peer relationships, and thus is associated with greater changes in external assets, such as social skills. By contrast, individual mentoring focuses upon providing support and guidance and thus is associated with greater changes in internal assets, such as feelings of self-worth. This study investigates whether mentoring structure is associated with mentor perception of positive developmental changes in youth in three sites across the state of Maine. The results showed a statistically significant association between individual mentoring and a greater increase in internal assets across two separate sites. Specifically, youth showed significant improvement in relationships with family members and peers, attitudes towards school, and a positive view of the future. Although significant improvements were not found between group mentoring and external assets, the results may have been influenced by outside factors, such as youth's age cohort. However, by implementing random assignment and increasing sample size, a more robust test of this association can be conducted. This research project has important implications for youth and for practitioners designing mentoring programs, as it suggests that mentoring structure may influence developmental

outcomes in children, and that individual mentoring may yield more powerful results.

E. Nuber, D. Koester and J. Sulikowski

Determining the Function of Unexplained Vascularization in the Uterus of the Spiny Dogfish, *Squalus acanthias*

In 2002 the national marine fisheries service implemented a strict management plan for the commercially and environmentally valuable Spiny Dogfish, *Squalus acanthias*, due to critically low populations surveyed in 2000. Updated stock assessments completed in 2008 revealed an unexpected fourfold increase in *S. acanthias* populations that was thought to be biologically impossible based on their K-selected life history. In effort to explain this population increase, fellow students are re-evaluating the proposed 22-month gestation period and testing a new hypothesis of annual reproduction. In support of this new hypothesis, my project uses histological techniques to analyze unusual vascularization in gravid *S. acanthias*. The functions of unusually large blood vessels developing with the cycles of pregnancy are being evaluated to determine if these structures facilitate the development of uterine embryos. In other species of elasmobranchs histotroph producing uteri nourish developing embryos, decreasing gestation time; likewise other species have developed vasculature that aid in waste removal and osmoregulation within the uterus, increasing the fitness of partitioned young. Independent from the possible role in reproduction, this unexplained vascularization has not been observed in other squalid species. The implications of the *S. acanthias* uteri possessing advantages properties beyond housing the developing embryos could contribute to the hypothesis of annual reproduction and help, in part, explain the large population increase.

J.R.M. O'Brien, A. Panaitiu, A.J. Squarr and G. Ganter

Ecdysone Signaling Modulates Nociceptive Pathways In *Drosophila melanogaster*

Nociception is referred to as the ability to encode and process noxious or tissue damaging stimuli. This activity is initiated by nociceptors that can detect mechanical, thermal or chemical stimuli. These nociceptive mechanisms underlie the

sensation of pain. Despite the availability of well-developed health-care, pain affects at least 116 million Americans each year, which makes it not only emotionally burdensome, but also financially. We are investigating the mechanism of nociception using *Drosophila melanogaster* as the model organism. We chose *Drosophila* because it presents a scaled down model of more complex systems as are present in mammals, it is easy to manipulate genetically, and because no ethically substantial debates have been raised against its use for genetic research. Our research tests the hypothesis that, like the human steroid estrogen, ecdysone, the lone active hormone in *Drosophila*, plays a role in regulating sensation and response to noxious stimuli. We are conducting two types of nociception assays on *Drosophila* adults and larvae. We found that ecdysone depleted adults are hypersensitive to wasabi, a noxious chemical stimulus, and we are now finishing analysis of ecdysone depleted larvae. Tests of thermal nociception in ecdysone depleted adults using a heat barrier were inconclusive, but when ecdysone depleted larvae were tested using a heat probe, they showed a nominal hyposensitivity. We also found that neuronal over-expression of the novel membrane receptor, DmDopEcR, causes hypersensitivity to noxious chemical stimuli. However, when DmDopEcR is overexpressed or the nuclear ecdysone receptor EcR is underexpressed specifically in *painless* sensory neurons, both treatments resulted in hyposensitive adult *Drosophila*. These studies show that in *Drosophila*, steroid hormones modulate neuronal pathways responsible for sensation of noxious stimuli, as is well established in humans.

O. M. Paquette and D. J. Small

Effect of PBDEs on Adipocyte and Preadipocyte Phenotype Expression

Polybrominated Diphenyl Ethers (PBDEs) are flame retardants used in production of many common items, such as textiles and furnishings. They are able to diffuse out of these products and become airborne. Through inhalation and digestion of contaminated food, PBDEs can then accumulate in animal and human tissues. Little research has focused on the effects of these PBDEs in the body, but previous results in our laboratory on adipose tissue indicate that PBDEs show a negative effect on the differentiation potential of fat cell progenitors. Since

mesenchymal stem cells must exit the cell cycle in order to differentiate into fat cells, it is possible that PBDEs may be preventing these cells from proliferating properly and/or exiting the cell cycle. To test this hypothesis 3T3-L1 preadipocytes were exposed to PBDEs and then assayed for cell growth, cell cycle progression, apoptosis, and the presence of certain proteins important for cell cycle regulation. These studies found there is a difference in cell cycle progression for cells treated with PBDEs, although the mechanism for this activity is still unknown. It has also been found that PBDEs are not causing significant cell death or apoptosis when compared to vehicle and no treatment controls in culture. This study is important because it has allowed us to recognize the potential threat that PBDEs present to humans and begins to narrow down their biological activity once present in the tissue.

C. Peterson, R. Knotek and J. Sulikowski

Determining the Gestation Period of Spiny Dogfish (*Squalus acanthias*) using Ultrasound and Plasma Hormone Analysis

The spiny dogfish (*Squalus acanthias*) is a small shark species globally distributed in temperate regions. As a schooling species, spiny dogfish have the potential to be incredibly destructive by a combination of direct and indirect pressures. Directly, they opportunistically feed on other commercially important species like cod, haddock, and herring. Additionally, they indirectly compete with commercially important species for space and food resources, while disrupting commercial fishermen's catches and destroying fishing nets. Consequently, species management is required to protect the ecosystem and the commercial fishing industry, while also maintaining sustainable populations of dogfish. The spiny dogfish was once considered the most abundant shark from Greenland to Florida. Therefore, in 1991, fishermen were encouraged to focus on this species for commercial harvest, causing their population to rapidly decline to roughly 15% of their original biomass level. Despite conservation attempts established in 1999, the population remained below biomass threshold levels for the next 6 years. However, the population has undergone a fourfold increase of spawning stock biomass from 2005-2008. Due to the species reaching sexual maturity at a late age (approximately 12 years), a long gestation

period (22-24 months), small litter sizes (6 pups), and a skewed male to female ratio (4:1), the ability of the species to rebound so quickly is thought to be biologically impossible. A potential explanation for this population anomaly is a gestation length that is less than 2 years. Information presented herein will describe a new methodology currently being developed in order to non-lethally assess the reproductive cycle of this species. This technique will couple bimonthly ultrasound images with circulating steroid hormone analysis in order to track and determine distinct stages of spiny dogfish gestation during the reproductive cycle.

J. Rich, H. Smith, T. Shahin and J. Stiegler-Balfour

The Role of Inhibition in Reading Comprehension among Skilled and Less-skilled Readers

Studies by the National Assessment of Education Progress (NAEP, 2009) indicate that the inability to comprehend text is one of the primary reasons students perform poorly in academic settings and display reading difficulties well into adulthood. Recent research into the relationship between cognitive processes and reading skill has revealed that working memory capacity, suppression mechanisms, domain knowledge, and reading strategies are essential factors in determining comprehension levels. The current study examined why some readers can easily suppress or inhibit irrelevant text information while others quickly overload their working memory capacity by trying to remember everything. During the experiment, participants were asked to differentiate between even and odd numbers, as well as consonants and vowels. We measured the switch cost accrued when switching between the two tasks using a task-cuing paradigm. Analysis of the data revealed that skilled readers adapted significantly faster to switching rules for each classification than less-skilled readers. These findings suggest that less-skilled readers' lack of comprehension may be due to their inability to suppress irrelevant information.

T. Rowe and **R. Sullivan**

Stewards of the Saco River Estuary

There are many different ways to take care of an ecosystem including the concept of stewardship. Stewardship expands upon the concepts of preservation, conservation, management, and sustainability while still maintaining a scientific approach to environmental protection. Stewards are the relay between the wealth of knowledge created by scientists from multiple disciplines and the general public. Stewardship requires an ability to leave behind the desires of humans and to focus upon the needs and health of the entire ecosystem, including human society. Stewardship is the lifestyle of nurturing and promoting the relationships between all things. The basis of our study on stewardship was to examine what stewardship is, what it entails, and how it can be beneficial to the Saco River Estuary. Our findings suggest that stewardship of the Saco has the power to initiate great change, and greatly improve upon the ongoing efforts to protect the river. However, there are currently no designated stewards of the Saco.

T. Spillane and S. Zeeman

Fecal Indicator Bacteria in the Saco River and the Effect of Environmental Factors on the Survivability of *Escherichia coli*.

Fecal Indicator Bacteria (FIB), which include *Escherichia coli*, detect the presence of fecal waste in an environment which can have an overall effect on humans and other organisms health. The Saco River flows through many towns, farms and wetlands making it a potentially high in FIB. The study focuses on 18 sights along the 134mile river, starting from Crawford Notch, NH to the mouth in Biddeford, ME. Through the months of December 2010 continuing through the summer of 2011, water and sediment samples are retrieved using the Idexx Colilert-18 water testing system which gives the number of FIB in the sample. The Colilert-18 test for both total coliform bacteria and total number of *Escherichia coli*. The results show relatively low concentrations of bacteria in the winter months, leading to a large spike in April after a rain event and increasing throughout the summer months. In order to fully understand the data a side study was done to determine the effects of environmental factors on *Escherichia coli*. Three different survivability experiments were done testing against varying degrees of sunlight, temperature, salinity. The base test showed that *E.coli* can survive for weeks in

sterile river water, but in contact with sunlight deactivated within a couple hours. Similar results showed that with increased temperature (40 C) the bacteria died within a few days, and high salinity (30 ppt) also increased death rates. Some of the results translate to the data on the river, with very low numbers of FIB found at Biddeford Beach, a high salinity environment. Sample collection along the river will continue into December, completing a year of data collection, and may continue into 2012.

L. St. Louis, J. Lowery, D. Giuvelis and E. Bilsky

In Vivo Characterization of Novel Opioid Peptides, in Mice

Acute and chronic pain is undeniably a major medical problem that has significant social and economic costs associated with it. Current pain management relies heavily on the use of opioid analgesics (e.g. morphine and oxycodone) for the treatment of moderate to severe pain. Unfortunately, opioids are associated with significant side effects including abuse and addiction liability, opioid-induced bowel dysfunction, tolerance, physical dependence, and respiratory depression. Currently, there are three opioid receptor subtypes that have been cloned and characterized: mu (MOR), delta (DOR), and kappa (KOR). Most opioid analgesics being used clinically target the MOR. The stimulation of these receptors produces the desirable analgesia along with many of the undesirable side effects. There is a renewed interest in developing new and improved pain relieving drugs. Enkephalin and endorphin based peptides are being developed, glycosylized, and modified, to target both MOR and/or DOR. These compounds have shown to produce similar antinociceptive efficacy to morphine with a reduction in the side effect profiles. Current research is applying glycosylation strategies to larger endorphin-based peptides to determine the general applicability of the approach to enhancing peptide bioavailability. The new series of glycopeptides were tested for their efficacy in the 55°C Tail-flick test and compared to morphine and enkephalin-based glycopeptides. We found that the new series of glycopeptides are generally more potent than morphine following intracerebroventricular (i.c.v.) administration but not after intravenous (i.v.) administration. We are using that data to determine next steps for further optimization.

R. Tamulonis and P. A. Morgan

Plant Community Structure of Tidal Wetlands in the Saco River Estuary

To date, very little research has been done regarding the distribution of plant species in the tidal wetlands of the Saco River Estuary. This study aims to determine what plant species are present in the estuary's marshes and what patterns are occurring regarding their distribution among the varying salt, brackish, and freshwater tidal wetlands located along the Saco River. Ten tidal wetlands were selected in a stratified random manner. Transects were randomly placed on each site, and the percent cover of plant species was determined using 1m² quadrats placed along the established transects. PC-ORD analysis software was then used to define plant groups and find dominant indicator species among each group using both cluster analysis and indicator species analysis, respectively. Eight groups were defined and their dominant plant species were identified. The next step for this research is to look for correlations with environmental data such as soil pore-water salinity, distance up-river, available nitrogen, and percent development along the shoreline.

C. Toombs and M. Frederich

Anoxia and Hypoxia Tolerance of the Two Color Morphs of *Carcinus maenas* using RNA Interference

The European green crab, *Carcinus maenas*, lives in intertidal and subtidal habitats. Despite its name, this species displays red and green color morph. Earlier studies using organismic parameters suggest differences in the stress tolerance between those two color morphs, but a detailed study on their differential cellular physiology has not been done before. We tested the hypothesis that the difference in stress tolerance at the organismic level between red and green color morph is reflected in a difference in cellular stress parameters when exposed to anoxia and hypoxia.

Red and green color morphs were exposed to anoxia and hypoxia. Heart samples were collected at different time points. We analyzed righting response, heart rate, oxygen consumption, and running endurance on a

treadmill at the whole animal level. At the cellular level, we measured lactate accumulation, AMP-activated protein kinase (AMPK) activity and heat shock protein (HSP70) levels. Recent studies of different crustacean species showed that during stress, energy metabolism is regulated by the enzyme AMP-activated protein kinase (AMPK).

At the organismic level, red and green morphs showed no differences during normoxia and anoxia. Only during hypoxia did green morphs perform better. At the cellular level green morphs showed elevated levels of all stress parameters, which contradicts earlier publications that describe green morphs as being more tolerant to stress. Our findings provide the first data of physiological differences between color morphs at the cellular level.

To further test the stress tolerance between the color morphs and the role of AMPK during stress, we used RNA interference. In a preliminary experiment, the injection of dsRNA for AMPK resulted in a nearly 50% reduction of AMPK mRNA expression. In a further experiment, both color morphs will be injected and exposed to the hypoxia and anoxia conditions to test the difference and the effect of AMPK.

A. White and J. Faloon

Analyses of Motor Activities of the Dorsal Forebrain-Specific Sox11 and Klf7 Conditional Knockout Mice

The hippocampus is important for certain types of learning and memory, and is particularly vulnerable to diseases such as hypoxia/ischemia, trauma, Alzheimer's disease, and epilepsy. The development of the hippocampus is regulated by growth factors, cell-surface receptors, and transcription factors. Our previous studies have implicated two transcription factors, Sox11 and Klf7, in the development of the hippocampus in mice. Both genes have been implicated in several neurological disorders in humans. The goal of this study was to begin to assess the phenotypes of tissue-specific conditional knockout mice lacking these transcription factors. We characterized the motor activities of two strains of conditional knockout mice. In the first strain, FSX, the Sox11 gene was specifically deleted in the dorsal progenitor cells of the mouse forebrain; in the second strain, the Klf7 gene was

specifically deleted in the dorsal progenitor cells of the mouse forebrain. Animals were tested in a variety of behavioral assays including locomotor activity (LMA) and motor function (Rotorod). Locomotor activity using TruScan software was assessed for all parameters to compare conditional knockout mice and control mice. The locomotor activity data showed that there are few differences in activity between the conditional knockout mice and the control mice. The Rotorod assay revealed that in the FSX mice, the conditional knockout mice had a larger change in learning abilities than the control mice. Results from the FKX mice showed that the control mice had a larger change in learning abilities than the conditional knockout mice. Future tests will include other learning and memory assays, and sensory assays. We hope to be able to fully characterize the phenotypes of the FSX and FKX mice, and provide insights on the physiological functions of these important transcription factors.

**UNE Faculty that Supervised Undergraduate
Research Students During Summer 2011**

Ali Ahmida, Political Science Department

Matthew Anderson, English & Language Studies
Department

Edward Bilsky, Pharmacology Department,
College of Osteopathic Medicine

Michael Burman, Psychology Department

Maryann Corsello, Psychology Department

Elizabeth DeWolfe, History Department

Amy Deveau, Chemistry & Physics Department

Teresa Dzieweczynski, Psychology Department

Cathrine Frank, English & Language Studies
Department

Markus Frederich, Marine Science Department

Peggy Friar, Biology Department

Geoffrey Ganter, Biological Sciences Department

Cally Gurley, Department of Special Collections

Amanda Hare, Psychology Department

Amy Keirstead, Chemistry & Physics Department

David Koester, Anatomy Department, College of
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Lei Lei, Biology Department

Samuel McReynolds, Sociology Department

Pam Morgan, Environmental Studies Department

Jerome Mullin, Chemistry & Physics Department

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Noah Perlut, Environmental Studies Department

Julie Longua Peterson, Psychology Department

Ursula Roese, Biology Department

Deena Small, Chemistry & Physics Department

Jennifer Stiegler-Balfour, Psychology Department

John Stubbs, Chemistry & Physics Department

James Sulikowski, Marine Science Department

Jamie Vesenka, Chemistry & Physics Department

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Stephan Zeeman, Marine Sciences Department

Gregory Zogg, Biological Sciences Department