



2009

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# *Colby Undergraduate Research Symposium 2009*

*April 29 - May 1, Colby College, Waterville, Maine*

## *Abstracts - Research Symposium*

### **EFFECTS OF CHANGING STIMULUS FORMAT AND TIME PRESSURE ON FALSE RECOGNITION**

**Alexander Fenstermacher ('10) and Emily Merrell ('10), Psychology**

Abstract This study aims to investigate effects of time pressure and stimulus format on false recognition. The spreading activation theory offers an explanation for false memories. This study explores the range of the spreading activation theory, questioning if visual representations are included in a stimuli's activation. The study also tests the effects of time pressure on false recognition. Participants studied study categorical word lists. At test participants were placed in a speeded or un-speeded condition. Participants were asked to determine if they had seen a test stimulus (word or image) as a word at study. It was expected that, while both should elicit false recognition, false word recognition rates would be higher than false image recognition rates. It was also expected that there to be greater false recognition in the timed condition because the effects of spreading activation would be stronger when less time is allotted and the critical item should be falsely recognized. The study found that images could elicit false recognition suggesting the effects of spreading activation are more conceptually driven rather than simply lexically driven.

### **FAMILIAL PARAGANGLIOMAS AND PHEOCHROMOCYTOMAS: SUCCINATE DEHYDROGENASE DEFICIENCY AS A RESULT OF SDHB MUTATION**

**Matthew Strickland ('10) and Jared Tepper ('10), Chemistry**

Succinate Dehydrogenase (complex II; or succinate:ubiquinone oxidoreductase, SDH) is a functional member of both the citric acid cycle (TCA) and the aerobic respiratory chain. Complex II couples the oxidation of succinate to fumarate in the mitochondrial matrix with the reduction of ubiquinone in the membrane. SDH is composed of two hydrophilic subunits, including an iron-sulfur protein (SDHB), both of which are anchored to the membrane by an additional pair of hydrophobic subunits. Recently, reports have shown that germline mutations in the genes coding for the catalytic subunits of SDH are associated with familial pheochromocytomas and paragangliomas. Paragangliomas are a type of neuroendocrine tumour, and are closely related to pheochromocytomas which generally manifest in the medulla of the adrenal glands. The purpose of this review was to investigate whether an association between SDHB subunit mutations and these conditions exists. Further, SDH deficiency as a result of this mutation was examined with respect to metabolism. These findings suggest that there is a strong association between SDHB mutation and the development of paragangliomas and pheochromocytomas thus extending the link between mitochondrial dysfunction and tumourigenesis.

### **'CONTENTMENT IN MY HEART': EVANGELICAL WOMEN AND SPIRITUAL**

## **JOURNEYS**

### **Elizabeth Doran ('09), Sociology**

This honors project is an in-depth, qualitative study of a central Maine evangelical church. My focus is on five women and their religious journeys and experiences as Christian women. I explore a number of issues: the appeal of this church community to contemporary women; the connections and the contrasts between what the church leaders espouse and what ordinary female members believe; the ways in which the women develop their own personal relationships with Christ, the evangelical tradition, and other members of the community; and my own journey as a student of sociology and a qualitative researcher.

### **'JUST IMAGINE IT BEING YOUR SISTER OR MOM, AND THEN THINK ABOUT HOW WE SHOULD TALK ABOUT THAT': THE REPRESENTATION AND CONSUMPTION OF CHRIS BROWN, RIHANNA, AND DOMESTIC VIOLENCE**

#### **Katherine Dammann ('09), Women, Gender, Sexuality**

Domestic violence as a social phenomenon is often overlooked until a visible catalyst prompts public discourse and awareness. This project involves a deconstruction of various cultural texts surrounding the incident of violence between Chris Brown and Rihanna. Considerable attention is paid to those celebrities who spoke out on the notorious event. A variety of differing opinions emerged along boundaries of race and gender within a group of self-selected celebrity representatives. Also of interest is the emerging social tension to both seize upon Brown and Rihanna as a teachable moment as well as excuse Brown's actions based on a series of social conditions including age, class, religion, personal history, and rights to privacy.

### **'LA BELLE AMÉRICAINNE': SARAH JAY'S EXPERIENCE ABROAD DURING THE AMERICAN REVOLUTION**

#### **Lauren Duval ('09), History**

Sarah (Sally) Jay, the wife of John Jay, who served as Minister Plenipotentiary to Spain during the American Revolution was the only wife of an American diplomat to leave the continent during the War when she accompanied her husband to both France and Spain during his diplomatic tenure. Thus, Sarah Jay is in a position to offer a unique perspective upon the experience of an elite American woman in Europe and her deep understanding of contemporary politics along with her observations and experiences provide valuable insight into European culture during the Age of Revolution. At the time, Europe was widely viewed by Americans as a land of corruption and vice. This conception was in part due to the wide, yet informal participation of elite women in the political sphere through the French salon tradition. However, they were not necessarily welcome participants, and particularly elite women were regarded with hatred and suspicion. Hailing from the upper tier of American society, Sally can be regarded as a member of the "elite" American class, and therefore her interactions with European culture offer unparalleled insight into contemporary beliefs about the role of women in the public sphere. As the wife of an important diplomat, Sally was a prominent member of the political culture, and her firsthand observations and interactions with the European court culture offer a unique outsider's viewpoint into European politics and elite society. Her experiences furthermore give significant insight into the founding of a distinctly American identity, as Sally struggled to define herself in opposition to European womanhood, using her religious identity as a means to legitimize her

engagement with a society which simultaneously encouraged and condemned elite women for their participation in politics.

## **'THE HUSBAND, THE WIFE, AND THE LORD IN THE MIDDLE': EVANGELICAL WOMEN, MUTUALITY, AND SUBMISSION**

**Elizabeth Doran ('09), Women, Gender, Sexuality**

Evangelicals and those who study them frequently assert that born-again, conservative Christian women live in submission to their husbands. What this means to women in various contexts is, however, problematical and open to interpretation, as underscored by in-depth, one-on-one interviews I conducted with several local evangelical women. This study, an off-shoot of my senior honors thesis, focuses on the women's understanding of submission, the place of this idea in a particular Christian orientation to life, and reasons for its appeal to contemporary women.

## **10TH AND 29TH MAINE REGIMENTS**

**Emily Schofield ('09), History**

The soldiers who fought in the Civil War are our generations great-great-great-grandfathers. As such, these men hold a personal importance as well as a more general, public significance. In the postwar society, some of these soldiers were celebrated as wartime heroes; others were commemorated amongst the dead. Today, however, the majority of the millions of men who fought and survived this war are regularly unnoticed. As prominent generals and regiments dominate the limelight, the experiences of the common soldiers become marginalized. To gain a more precise understanding of the Civil War and what it meant to the everyday American men who fought in it, this paper explores the experiences of soldiers from two unfamiliar regiments. The men of 10th and 29th Maine regiments are significant because they offer a broad scope of knowledge on Civil War soldiery that other regiments cannot. More specifically, they were deeply involved in the war effort from beginning to end. The Maine 10th was organized in August 1861, the survivors were filtered into the Maine 29th in September 1864, they engaged in reconstruction efforts beginning in June 1865, and they were finally discharged in the fall of 1865. Because of their four year involvement, they fought in over ten engagements ranging from skirmishes to major battles such as Antietam and Gettysburg. By examining the men of these two regiments, we obtain a more inclusive analysis of the common soldiers' experiences.

## **2008 ELECTION ARCHIVE: DIASPORA, ENCOUNTER AND PLACE AS THE PRODUCTION OF POLITICAL IDENTITIES IN THE UNITED STATES.**

**Katie-Elyse Turner ('09), Anthropology**

This project explores the process of archive making through the lenses of the 2008 U.S. Presidential election and concepts of D/diaspora. I make the argument that American presidential political identities are constructed through various forms of movement and interaction between and within physical spaces and time spaces. The identities that are formed from diasporic encounters attain appropriate politicization by becoming homogenous. The various ideas that run through this archive are tied together through careful construction (and also, in many cases, destruction) of life timelines for both Barack Obama and John McCain.

## **A DYNAMIC SYSTEM'S APPROACH TO MOTOR INTERFERENCE**

### **Benjamin Gross ('10) and Annie Tak ('10), Psychology**

Previous research has suggested that rhythmic motor interference, which occurs when executed movements and observed movements are incompatible, is not an error but a spontaneous, task-specific property of a coordination goal. The present research is designed to further examine this possibility by determining whether the variability of a participant's horizontal and vertical arm movements increases (or decreases) when the participant is observing (and coordinating with) vertically, horizontally, and diagonally oscillating stimuli.

### **A LIMOGES RELIQUARY**

#### **Margaret Gribbell ('09), Art**

A reliquary shrine from Limoges, created in the mid-thirteenth century and today in the collection of the Walters Art Museum, is a dynamic example of Limoges enamel work. The shrine is decorated with scenes from the life of Christ, featuring four different enamel colors worked in copper using the champlevé process. The decorative program reflects regional Limoges pride with the inclusion of the city's patron saint, Saint Martial, among Christ's followers. The reliquary is an interesting object due to its intense connection to the actual relics that it once held. Usually a reliquary would be just as venerated as the objects within it. This particular reliquary no longer holds relics, releasing it from its dual nature and making it more of an art object than a religious one. To fully understand the work, what it is now must be considered as much as its original function.

### **A NOUVAL MEASURE OF CENTRAL BANK INDEPENDENCE**

#### **Ling Zhu ('09), Economics**

I develop a novel measure of central bank independence and compare it to the conventional measure using data from 44 countries over the period 1970-2006. There are two key differences between the conventional measure and the new measure: first, the new measure differentiates between unexpected and expected replacements of central bank chairmen; second, the new measure takes into account whether the replacements ever served in the executive sector as the Minister of Finance. Further, I also employ a new approach to capture the gradual change in central bank independence by using the moving averages of various turnover-measures with an 8-year rolling window. The evidence from 44 countries over the period of 1970-2006 shows that the new measure outperforms the conventional one.

### **A PLASMID TO RESCUE THE BRISTLE PHENOTYPE OF SHAVEN MUTANTS AND THE EYE PHENOTYPE OF SPARKLING MUTANTS OF *DROSOPHILA MELANOGASTER***

#### **Sinead Nyhan ('09), Biology**

Pax2 is a member of a family of genes that encode transcription factors essential to organogenesis and patterning during embryogenesis. The members of the Pax gene family are divided into four subgroups based on shared structural attributes. The Pax2 gene, along with Pax8 and Pax5, is a member of the subgroup bearing a paired domain and a truncated homeodomain (Dahl, 1997). Pax2 is important in sensory system organogenesis. Fu et al. (1998) demonstrated that defects in fly homolog D-Pax2 affect both bristle development (shaven

mutants) and eye development (sparkling mutants). The D-Pax2 gene consists of 13 exons. Alternative splicing and alternative transcription termination does occur but the significance of the variant forms is unknown. Previous work in our lab (A Czechowski, K Harmon, unpublished) has demonstrated that one shaven mutant (sv7) contains a stop codon at the end of exon 9 that truncates the final protein product. The bristle shafts are completely missing but the eyes of this mutant are relatively unaffected. This result suggests that 1) the terminal exons of the protein may be required for bristle development but not eye development and 2) alternative splicing may be tissue-specific, generating different forms of the protein in the eye versus the bristle. We are currently testing the functionality of the carboxy terminal portion of D-Pax2 in vivo by generating a full-length rescue construct and plan to test its ability to rescue shaven and sparkling defects in comparison to similar rescue constructs with deletions in the carboxy terminal region.

### **A QUICK LESSON IN CAUSE AND EFFECT**

#### **Andrew Bolduc ('10), Theater and Dance**

A QUICK LESSON IN CAUSE AND EFFECT is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. A QUICK LESSON IN CAUSE AND EFFECT is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

### **A STUDY OF AFRICAN AMERICAN TROOPS AND THEIR MOTIVES FOR FIGHTING IN THE AMERICAN CIVIL WAR**

#### **Noel De Freitas ('10), History**

Although slavery was the primary focus of the American Civil War, African Americans themselves had few opportunities to voice their opinion on the war that changed their lives—either prolonging their status as slaves or making them freed men and women. The ability for African Americans to enlist in the Union army allowed them the opportunity, however small, to help shape their own destiny. How did African Americans view the opportunity to fight in the American Civil War?

### **A TEXTURAL AND MINERALOGICAL ANALYSIS OF SELECTED ENCLAVES WITHIN THE WALDOBORO PLUTON, FRIENDSHIP, MAINE**

#### **Stephanie Grocke ('09), Geology**

Field evidence suggests that the unusual textures of some of the enclaves within the South Pond Phase of the Waldoboro Pluton Complex may be a result of magma mixing processes. The granitic complex that intruded mid-coastal Maine during the Devonian period consists of seven granitoid units. Evidence for melting of country rock formations followed by restite-melt unmixing processes have been suggested for the origin of the enclaves identified within the major phase of gneissic granites. The granite-country rock relationships along the eastern margin of the complex within the South Pond Phase however, are poorly understood due to intense deformation and recrystallization. Three enclaves were sampled from the restite-rich granite porphyry of the South Pond Phase and were found to be texturally and mineralogically distinct. Whereas two of the enclaves appear to represent restites of partial melting, the third enclave

appears to have formed by an alternate process. None of the enclaves show quench textures that would imply magma mixing. Chemical analyses are in progress to help to identify the sources from which the three samples originated.

## **AEROBIC VS. ANAEROBIC ENVIRONMENTS OF *CARCINUS MAENAS* AND ITS EFFECT ON INVASIVENESS**

**Charlotte Carrigan ('09), Biology**

Coastal marine ecosystems, including rocky intertidal zones and estuaries, serve as nurseries for many marine species but biodiversity is negatively affected by threats by invasive species. The Green Crab, *Carcinus maenas*, is a particularly potent invasive species and has already influenced community diversity in many areas of its expanded range. This species can tolerate wide ranges of environmental conditions, so it's important to understand the limits of these conditions to predict how this species will continue its invasive advance. Lower temperatures, higher salinity, and higher dissolved oxygen levels are aerobic conditions; an aerobic metabolism favors long distance movement potentially into new habitats. Higher temperatures and lower salinity and dissolved oxygen levels may favor anaerobic metabolism, which would limit activity level and ultimately long distance movement. *C. maenas* individuals were maintained in different treatment groups varying temperature, salinity and dissolved oxygen level, then tested for locomotor capacity using a motorized treadmill at a standardized speed and time period. Hemolymph was sampled immediately after exercise and levels of glucose and lactate were determined using a YSI2300 Stat Plus. *Carcinus maenas* likely relies more on anaerobic respiration, and may prefer environments in which they can maintain optimal metabolic conditions: higher temperatures, salinities around 20 ppt, and moderate oxygen concentrations. Crabs acclimated to these conditions had the highest post-exercise lactate levels which may reflect a greater reliance on anaerobic metabolism. If crabs rely more on anaerobic metabolism, as suggested by the data here, migration through locomotion may be limited and only invasion by passive transport would be possible

## **AMERICA THE BEAUTIFUL, THE BOUNTIFUL, THE HEALTHFUL AND THE HUNGRY: UNDERSTANDING CONTEMPORARY AMERICAN FOOD CULTURE**

**Melissa Martin ('09), American Studies**

Food has always played a major role in the lives of Americans. Not only does it provide us with the sustenance we need to live, it is also a reflection of personal identity and a key component of many social interactions. However, in recent years, American attitudes towards food have changed, and interest in the subject beyond the old question of, "What's for dinner?" has risen dramatically. We are becoming more aware of the importance of knowing where our food comes from and the impacts our eating decisions have on the health of our bodies and our environment. Food is now considered to be a subject worthy of news coverage, investigative journalism, scholarly research and top-rated television shows. It has truly permeated all aspects of society. By examining food trends of past decades, it becomes easier to understand how we got to this stage, where interest in food has escalated to the point of national obsession, and what challenges may lie ahead for us food-loving Americans.

## **AN ASSESSMENT OF MANGROVE DEGRADATION AND CONSERVATION EFFORTS**

**Lauren Corke ('10), Amanda Lindsay ('10) and Sean Prockter ('09), Environmental Studies**

Mangrove ecosystems are vital for stabilizing vast coastal ecosystems and human activity. The purpose of our investigation is to explore the success and failures of conservation efforts at three mangrove ecosystem locations. Worldwide, the existence of mangrove ecosystems are extremely threatened and over the past 20 years over 5 million hectares of mangrove forests have been destroyed. Through the in-depth examinations of Florida, Bangladesh, and East Africa conservation strategies, we were able to identify certain characteristics of successful policies. These include cooperative involvement of government and private stakeholders in addition to regular funding and management.

**AN IDENTIFICATION AND ASSESSMENT OF HUMAN-CARNIVORE CONFLICT HOTSPOTS AND LARGE CARNIVORE POLICY IMPLICATIONS IN THE UNITED STATES**

**Caitlin Dufraine ('09), Environmental Studies**

Human-carnivore conflict is problematic from both an environmental and economic standpoint. Studies of carnivore conflict typically examine the frequency and distribution of conflict and are species or location specific. There is not a published, nationwide assessment of human wildlife conflict involving three or more carnivores in the US. I used wolf, cougar, and coyote to assess the prevalence of human-carnivore conflict involving the loss of sheep, cattle, and livestock (sheep and cattle) in the continental US. I used GIS analysis to identify human-carnivore hotspots and statistical analysis to assess the relationships between conflict and livestock and carnivore density. I examined the relationship between the use of non-lethal predator deterrent methods and conflict. Finally, I compared states' management of carnivore populations, attitudes toward carnivores, and carnivore conflict policies. Carnivore conflict hotspots occur in western states that support wolf, cougar, and coyote populations. Of these carnivore species only the cougar exhibited a significant relationship between carnivore population and conflict. Significant relationships also exist between livestock density and coyote conflict. As carnivore populations grow their range will likely expand into areas that support agriculture and development. My results suggest that as their range expands into Southeast and Gulf Coast states, increased incidences of conflict may occur. Therefore, understanding why five relationships between non-lethal methods used to protect sheep and conflict were significant will be paramount. Recognizing conflict hotspots and their management of carnivore populations and depredations will help inform policy in those areas and in states where carnivores are being reintroduced.

**ANALYSIS OF THE ELECTRON WITHDRAWING CAPABILITY OF ACETYLENE GROUPS FOR NUCLEOPHILIC AROMATIC SUBSTITUTION.**

**Eric Braunstein ('10), Chemistry**

It is well known that electron withdrawing groups, such as nitro or carbonyl groups, activate benzene rings for nucleophilic aromatic substitution. However, little research has been done to investigate the electron withdrawing capability of acetylene groups for substitution of aromatic halides. We describe our investigations on the reactivity of halogenated phenylacetylenes with oxygen nucleophiles with the eventual goal of using these systems for macrocycle formation.



## **ANTIBIOTICS, HERBS, AND MAGIC: HEALTH PRACTICES IN CONTEMPORARY ST. PETERSBURG**

**Christine Shu ('09), International Studies**

In St. Petersburg, Russia, two seemingly conflicting health doctrines, western medicine and alternative medicine, play significant roles in residents' health culture. I define alternative medicine as all health practices that use such natural products as herbs, natural honey, water, seeds, berries, and even animal products, and as such unobtrusive body therapies as acupuncture, massage, yoga, or animal therapies. I define western medicine as all treatments that involve the manipulation of ingredients in a chemistry laboratory (such as antibiotics, antiviral drugs, antihistamines, or pain killers) and all body therapies intrusive to the body (such as operations). Through interviews with St. Petersburg women who have completed university-level education, this study examines why alternative medicine continues to exist in St. Petersburg, a modern European city, that offers a free well-established state healthcare system, and more importantly, why so many St. Petersburg residents avoid the western medicine available to them, instead greatly preferring to use alternative medicine. Throughout history, the common Russian has not been able to rely on the state to provide him with adequate health care, so she has had to be self-sufficient. This tradition continues today. How residents negotiate the pluralistic medical society in St. Petersburg reflects a balancing act of a need to feel confident that the medical treatment she undertakes is the healthiest and most effective option available, with a wish for autonomy, pride in self-sufficiency, and a distrust of state-sponsored services.

## **ASSESSING BODY IMAGE CONCERNS IN PRESCHOOLERS FROM A SOCIAL COGNITIVE PERSPECTIVE**

**Carla Jacobs ('09), Psychology**

A two-experiment study was conducted to assess body image concerns in preschoolers. In experiment 1, methods for assessing body image concerns in young children were developed, and body image concerns and stigmatization of overweight targets were assessed. Three- to 5-year-old children were presented with ranking tasks, a stigma awareness/knowledge task, and a general knowledge task which assessed both their awareness of the stigma against being overweight and their own body dissatisfaction. In experiment 2, the cognitive components of the stigma against being overweight were explored, in that the research built on previous work relating to whether children view traits as 'fixed' or 'malleable' and children's beliefs about the controllability of weight, and how these components relate to children's stigmatization of overweight targets. Five-year-old children were given a measure to assess their beliefs about the controllability of being overweight, and were read stories about thin and overweight targets performing good and bad actions. Following the stories, children were asked to evaluate targets on a social desirability measure as well as an ability/achievement measure to assess how their beliefs about the traits of goodness and badness interacted with their controllability beliefs about weight in terms of their stigmatization of thin and overweight targets. In Experiment 1, children showed an awareness of the stigma against being overweight, but did not show much dissatisfaction about their own bodies. Also, girls displayed more stigmatization than boys. In Experiment 2, the goodness/badness dimension was more salient to children than the thin/overweight dimension, and controllability beliefs did not affect stigmatization.

## **ATLAS OF MAINE: ATLANTIC SALMON HABITAT AND DAMS IN MAINE**

### **Francis Gassert ('11), Environmental Studies**

This map details Atlantic Salmon habitat within the state of Maine in conjunction with dams, levees, and other hydrological impoundments. It highlights salmon spawning and rearing areas, and represents dams by their hydraulic height. Most Atlantic Salmon populations are anadromous, living most of their lives at sea and migrating upstream into freshwater to spawn. However, the Atlantic Salmon does not require saltwater to survive, and there are a number of landlocked populations of Atlantic Salmon in Maine due to the building of dams.

### **ATLAS OF MAINE: BIOPHYSICAL REGIONS OF MAINE**

#### **Emma Balazs ('09), Environmental Studies**

The Biophysical Regions of Maine map was created using land cover data from the Maine office of GIS. This data layer, combined with a hillshade layer, demonstrates some of the biophysical features that contribute to the categorization of the 15 different biophysical regions of the state of Maine.

### **ATLAS OF MAINE: FARM SIZE AND LYMPHOMA CANCER IN MAINE.**

#### **Aurore Anastassiadis ('11), Environmental Studies**

Lymphoma is a general term for a group of cancers that originate in the lymphatic system. The lymphomas are divided into two major categories: Hodgkin lymphoma and all other lymphomas, called non-Hodgkin lymphoma (NHL), which is displayed on this map. The annual incidence of NHL in Maine has nearly doubled over the last 50 years. Although the reasons for this increase are not certain, it has been established that pesticides are a known risk factor.

### **ATLAS OF MAINE: FIRE INCIDENCES, WATER BODIES, AND POPULATION IN MAINE**

#### **Jennifer Helm ('11), Environmental Studies**

This map shows the locations of fires that occurred between 2000 and 2007. It also shows population in different census tracts to enable comparisons between number of fires and number of residents in an area. Finally, the map shows rivers, lakes, and ponds to determine if more fires occur alongside water bodies where campsites may be present.

### **ATLAS OF MAINE: HURRICANE SURGE INUNDATION AND CRITICAL RESOURCES IN MAINE**

#### **Brian Lynch ('09), Environmental Studies**

This map shows projected hurricane surge inundation often referred to as storm surge for hurricanes ranging in severity from Category 1 to Category 4 as well the locations of critical societal resources such as fire stations, hospitals, emergency management offices, roads etc. Storm surge is caused by the force of the hurricane displacing water as it moves into shallower water. According to the National Hurricane Center, storm surge is responsible for 90% of hurricane-related fatalities in the US. (<http://www.nhc.noaa.gov/pastdeadly.shtml>) In addition, the flooding caused by storm surge may hinder evacuation as well as incapacitate or reduce the capabilities of certain resources by flooding facilities or impinging on mobility.

## **ATLAS OF MAINE: RABIES IN MAINE: 1998-2008**

### **Katherine Orrick ('10), Environmental Studies**

Rabies is a fatal disease of the central nervous system. It is deadly but uncommon in humans in the US. However, animals, especially wildlife, are very susceptible to carrying the disease. Tests are conducted every year by the Maine Department of Health and Human Services to ensure that rabies is not rapidly spreading since it is easily passed by fluids, or tissues touching broken skin or mucous membranes. In the past ten years, the DHHS found 1,236 positive cases of rabies in Maine. This map shows the number, location and type of certain animals found with rabies by county in Maine for the entire decade. It displays the top four species, raccoons, skunks, bats and foxes, found with rabies. These four account for 96% of positive cases in Maine.

## **ATLAS OF MAINE: RANGE OF ENDANGERED TURTLE SPECIES IN MAINE**

### **Meghan Cornwall ('11), Environmental Studies**

This is a map showing the ranges of the three endangered terrestrial turtles in Maine. The three turtles are Blanding's Turtle, Box Turtle and the Eastern Painted. These turtles are on the endangered species list for Maine and the United States. All of these turtles have suffered from territorial fragmentation which is separating turtle populations making it hard to keep population growth sustainable. Most of these turtles live in acidic wetlands or ponds in the southern part of Maine, which is the northern most part of their range in the United States. The endangered turtle species list came from Maine Department of Inland Fisheries and Wildlife ([www.maine.gov/ifw](http://www.maine.gov/ifw)). The information on turtle ranges was found from the PEARL database ([www.pearl.maine.edu](http://www.pearl.maine.edu)). The ranges of turtles that PEARL showed were based off of townships. Their data came from viewings by Maine citizens dating from 1976 to the present. The layers of the townships and of the rivers and streams in Maine were found off of the Maine Office of GIS website ([www.megis.maine.gov](http://www.megis.maine.gov)). This map uses the coordinate system of North American Datum 1983, Universal Transverse Mercator Zone 19N

## **ATLAS OF MAINE: SOURCES OF DRINKING WATER AND AGRICULTURAL CHEMICAL USE IN MAINE**

### **Jordan Schoonover ('10), Environmental Studies**

This map shows the location of aquifers and public water supply wells in Maine. Cultivated lands are shown in green, while the percentage of cropland treated with chemical fertilizers in each county is represented by the gray shading. This map was created by Jordan Schoonover '10, Environmental Studies Program, Colby College.

## **ATLAS OF MAINE: STATE SENATE ENVIRONMENTAL PERFORMANCE**

### **Gordon Padelford ('11), Environmental Studies**

This map portrays the level of support given by senators to environmental issues in the State Legislature during the 2007-2008 legislative session. The environmental voting scorecard was produced by the Maine League of Conservation Voters and is available on their website [www.mlc.v.org](http://www.mlc.v.org). More detailed information on each Senators' district is available in the table on the right hand side of this map. The score was calculated as the percentage of six environmental priority bills the senator's supported or opposed during the 2007-2008 legislative session.

## **ATLAS OF MAINE: WETLANDS, CONSERVATION LANDS AND POPULATION OF MAINE**

**Kimberly Bittler ('11), Environmental Studies**

This map illustrates the water resources of Maine in the context of human presence and protected areas, the emphasis placed on wetlands. Wetlands, rivers, streams, ponds and lakes are projected onto layers showing population density on a logarithmic scale and the conservation lands of Maine. A hill shade layer is also displayed on the map to provide a backdrop for the topography surrounding the displayed water resources.

## **ATLAS OF MAINE: CELL PHONE TOWER LOCATION AND SIZE IN MAINE**

**Andrew McEvoy ('09), Environmental Studies**

Cell phones are quickly becoming a necessary tool for personal and commercial use. Shown here is the distribution, as well as the relative sizes, of towers located in the state of Maine. The population information illustrates these towers' relation to high densities of people. The roads on the map indicate major state roads, and they illustrate the proximity of towers to these roads. The patterns of distribution and location have direct implications for the movement of peoples, the expansion of development, and growth of business in Maine.

## **ATLAS OF MAINE: MEDICALLY UNDERSERVED AREAS AND POPULATIONS IN MAINE**

**Hannah Lafleur ('11), Environmental Studies**

This map shows Medically Underserved Areas and Populations in Maine in 2008. According to the Health Resources and Services Administration Shortage Designation Branch of the U.S. Department of Health and Human Services, Medically Underserved Areas (MUA) may be a whole county or a group of contiguous counties, a group of county or civil divisions or a group of urban census tracts in which residents have a shortage of personal health services. Medically Underserved Populations (MUPs) may include groups of persons who face economic, cultural or linguistic barriers to health care. These federal designations are supplemented by state designations which cover areas or populations that do not meet the federal designation criteria. The Health Resources and Services Administration Shortage Branch also designates Health Professional Shortage Areas (HPSAs, not shown on this map) in the categories of primary care, mental and dental health. Medically Underserved Areas and Populations data is available from the Maine Office of GIS (<http://megis.maine.gov>) and was compiled by the Maine Office of Rural Health and Primary Care in 2008. Data for counties were also provided by the Maine Office of GIS. Roads and Cities data were provided by ESRI Inc. 9.3. North American Datum 1983 coordinate system. Universal Transverse Mercator Zone 19.

## **BEHAVIORAL TRAITS MAINTAIN A PHYSICAL BOUNDARY BETWEEN TWO MORPHS OF THE ROUGH PERIWINKLE (*LITTORINA SAXATILIS* L.) IN THE GULF OF MAINE ROCKY INTERTIDAL ZONE**

**Jonathan Lefcheck ('09), Biology**

The rough periwinkle *Littorina saxatilis* exists as two separate phenotypes: a high intertidal morph (H) characterized by a larger shell with sharp, well-defined ridges, and a mid-intertidal

morph (M) characterized by a smaller shell with rounded, ill-defined ridges. In this study, I propose that behavioral traits exhibited by the H morph serve to actively maintain a physical boundary between the two morphs. Using digital image analysis, I show that the H morph is physically capable of controlling its distribution by quickly traversing large distances relative to its size. Through lab experiments, I show that the H morph exhibits a strong preference against submersion and thus the lower intertidal, but fails to respond to light cues which mimic the contrast created by the sea and the coast. These results are corroborated by distribution and mark-and-recapture data collected from the field. Taken together, these findings suggest that the physical differences between these two morphs are in part due to a separation by distance maintained by the H morph. This separation may contribute to the incipient speciation that has been previously proposed for *L. saxatilis*. Further research will be necessary to fully evaluate the role of behavior as a mechanism for divergence in this species of littorinid.

## **BERNHARD SCHLINKS 'DER VORLESER' UND DEUTSCHE VERGANGENHEITSBEWÄLTIGUNG**

**Sommer Engels ('09), German/Russian**

Bernhard Schlink's 'Der Vorleser' (The Reader), is a controversial novel in which a young man struggles to come to terms with his older lover's role in the Holocaust as a member of the SS. Critics argue that the novel seeks to pardon the woman's crimes by presenting her as an illiterate who had no other choice but to join the SS. I will argue, however, that the novel focuses less on the woman and her crimes and more on the dilemma her young lover encounters as he seeks to rationalize his love and compassion for her with his desire to condemn her for her actions. As a representative of Germany's "Second Generation", the young man's struggle represents that of many Germans working through 'Vergangenheitsbewältigung', or, the process of coming to terms with the past.

## **BEYOND THE STANDARD MODEL: SUPERSYMMETRY AND LARGE EXTRA DIMENSIONS**

**James Jones ('09), Physics and Astronomy**

I will discuss major problems with the Standard Model of Particle Physics, including the Hierarchy Problem, Dark Matter, and the model's inability to accommodate a Grand Unified Theory. I will describe the theory of Supersymmetry, and explain in an approachable and qualitative capacity how it is a possible solution to these issues. I will also talk about the Wess-Zumino model, the simplest comprehensive realization of Supersymmetry and some of the mechanics of Quantum Field Theories. If time permits, I will also introduce the theory of extra dimensions being a solution to the Hierarchy Problem, and the possibility for the existence of extra dimensions, as large as a millimeter.

## **BRUSHING UP ON FUNDRAISING: MAINE'S KENNEBEC VALLEY DENTAL COALITION**

**Kirsten Duda ('09), John Campbell ('09) and Stephanie Kramer ('10), Sociology**

The Kennebec Valley Dental Coalition (KVDC) is a nonprofit community dental center located in Waterville, Maine that provides services to low income, uninsured, underinsured, and Medicaid eligible community members. In recent years the KVDC has faced serious financial

problems and the current state of the economy has introduced an entirely new set of financial problems. Over the past decade, The Kennebec Valley Dental Coalition has relied predominantly on federal and private grants and fees for services for revenues. In order to assist the KVDC in addressing the financial needs of the organization, our team has researched ways to launch an effective annual fundraising campaign. We focused on using the KVDC's annual giving campaign as a starting point for a new fundraising and donor relations strategy. Our efforts focused on the creation or modification of the KVDC brochure, an annual appeal, a revised and unified donor base, and an open house invitation. Through this research, we hope to create positive donor relations, increase the existing donor base, and increase annual funding for the KVDC.

## **BUSINESS-TIME**

### **Prabhav Rakhra ('09), Economics**

An Analysis of How Changes in Business-Hours-Overlap Affect Foreign Direct Investment (FDI): Using OECD data on bilateral FDI from 1981-2005, I explore the extent to and manner in which changes in the length of the effective window for conducting international business affect FDI. My findings agree with previous research conducted in the the field documenting the adverse impact of time-zone differences on FDI and attempt to demonstrate how an changes in the former can similarly affect the latter. In addition, by looking at the historical implementation of Daylight Savings Time (DST), I further investigate whether there are any benefits from coordination and alignment with one's major trading partners in the form of additional FDI.

## **BYZANTINE PATEN AND CHALICE**

### **Whitney Lynn ('09), Art**

A silver paten and chalice of the sixth century, today in the Walters Art Museum, serve as excellent representations of traditional liturgical objects used in the Early Christian mass. Part of the treasure found at the Church of St. Sergios of the village of Kaper Koraon in modern day Turkey, these liturgical tools represent the power of the developing church during the early Middle Ages. These two objects tell much about their history through their inscriptions and richness of material. Although Christian rituals were practiced secretly in the first years after Christ's death, by the sixth century, the Church's power was growing. In order to stress its legitimacy, the Church increasingly invested in Church accoutrements. Thess included objects used in the most important ceremony of the mass: the Eucharist. Although these objects from the Walters are not rich in ornamentation, their material and size tell a story about their importance in relation to both their donor and the church for which they were made. Through liturgical objects, members of the Church were not only able to stress the importance of the Mass to lay people, but also to place greater significance on the symbolic acts of Christianity. The paten and chalice were especially critical because of their use for the most sacred part of the liturgy and because they contained Christ in bloody and body.

## **CLARITY**

### **Michael Trottier ('12), Theater and Dance**

CLARITY is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. CLARITY is one of

nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **CAN PREDATORY-PREY ARMS RACES INTENSIFY DURING A MASS EXTINCTION EVENT? STROMBID GASTROPODS FROM LATE NEOGENE OF FLORIDA**

**Rachel Guest ('09), Geology**

Mass extinctions often are triggered by environmental stress, including changes in physical conditions or food supply. During such times, a taxon's energy is directed towards survival, with opportunities for morphological change and adaptation supposedly suppressed. Any ongoing 'arms race' should be halted in favor of survival. The present study examines the evolution of anti-predatory traits in strombid gastropods of the genus *Macrostrombus* from the Late Neogene of Florida in the context of a regional mass extinction event roughly 1.8 Ma. We focus on the fossil record of shell repair and the expression and occurrence of the dorsal knob, a large spine on the dorsal surface of the final whorl that functions in helping the snail right itself after accidental overturning and exposure to predators, such as crabs, turtles, fish, and other gastropods. Nineteen morphological features were measured and assessed in 300 *Macrostrombus* specimens from museum and new collection efforts. Changes documented include a 50% increase in the average dorsal knob height from the Pliocene to the Pleistocene, in addition to a significant number of specimens acquiring this feature (4% vs. 94%). Evidence of shell repair due to durophagous predators also increased during the same time interval from 22% to 37%. The development of a large dorsal knob over the examined time periods is interpreted as an adaptive response to predation and is consistent with repair frequencies suggesting intensifying predation immediately after the extinction event.

## **CELLULAR MECHANISMS OF MELATONIN-INDUCED NEURITE GROWTH IN CRUSTACEAN X-ORGAN CELLS.**

**Escar Kusema ('09), Biology**

Kusema, E., Duda, K., Meyers, J., Tilden, A. Hypothesis Melatonin is a lipophilic hormone produced in the pineal gland in vertebrates. It affects the immune system, reproduction and circadian rhythms. It has also been shown to prevent lipid peroxidation and to have an antioxidant effect on -OH, O<sub>2</sub> and NO free radicals. Three types of melatonin g-protein-coupled receptors have been found in vertebrates: MT<sub>1</sub>, MT<sub>2</sub>, and MT<sub>3</sub>. Nuclear receptors for melatonin also exist and may be of the ROR/RZR family. However, little is known about the production, roles, and mechanisms of melatonin activity in invertebrates. In this study, we explored the cellular effects of melatonin on neurite growth in cultured crustacean x-organ cells. Inhibition of calmodulin (CaM) by melatonin may be a mechanism of increased neuritogenesis; we also explored the influence of a CaM antagonist (CaMa) on neuritogenesis. Methods We dissected cells from the eyestalk of the crab and cultured dissociated cells in poly-d-lysine-coated glass-bottom culture dishes with modified Leibovitz L15 culture medium. Cells were treated with 1 μM, 1 nM, and 1 pM melatonin versus untreated controls. The first 30 neurite-extending cells per dish were analyzed with a Zeiss Axiovert 200 microscope and Axiovision 4.5 software to determine neurite area (μm<sup>2</sup>) and the length of the longest neurite (μm). Cells were also treated with the CaMa (n-(6-aminoethyl)-5-chloro-1-naphthalenesulfonamide hydrochloride), g-protein antagonist (PTx), and luzindole in separate experiments. Conclusions Melatonin exerts its

greatest effects at physiological concentrations. CaMa has similar effects on neuriteogenesis to melatonin. Luzindole and PTx inhibit growth. These cells showed fluorescence of MT2 receptors. This gives insight into the melatonin's mechanisms.

## **CENTRAL BANK INDEPENDENCE: THE MISSING LINK IN CYCLICALITY OF MONETARY POLICIES**

**Ling Zhu ('09), Economics**

In this paper we analyze the role of central bank independence regarding cyclicality of monetary policies and how those policies interact with fiscal policies. To answer this question we construct a novel dataset that includes real gross domestic product, real government spending, policy-controlled interest rate, inflation and central bank independence for 50 countries over more than a century. Using Taylor rules we find that higher central bank independence increase counter-cyclicality of monetary policies, especially when governments pursue pro-cyclical fiscal policies. That is to say, while independent central banks pursue counter-cyclical monetary policies (decrease policy-controlled interest rate during booms and reduce it during busts), less independent central banks pursue pro-cyclical monetary policies (decrease policy-controlled interest rate during booms and reduce it during busts). This difference is significant only when fiscal policy is pro-cyclical (increase government spending during booms and reduce it during busts).

## **CHARACTERIZATION OF THE INCOMPATIBILITY GROUP A/C CONJUGATIVE PLASMID *AEROMONAS SALMONICIDA* SUBSP. *SALMONICIDA***

**Zachary Zalinger ('09), Biology**

The spread of antibiotic resistance among bacteria and the discovery of multi-resistant mobile genetic elements have made understanding the mechanisms of horizontal gene transfer critically important. Multiply drug resistant pathogens continue to be a serious problem both for medicine and agriculture, but the pathways by which resistance spreads, and the environmental conditions that affect this rate, have only begun to be elucidated. Here we characterize the conjugation system of a fish pathogenic strain of multiply drug resistant *Aeromonas salmonicida*. Originally isolated during a furunculosis outbreak at New Brunswick, Canada aquaculture facilities in 2003, the strain displays high levels of antibiotic resistance and can readily transfer its plasmid-encoded resistance profile to other bacteria. Using PCR and gene sequencing we determined that the strain's drug resistance is due to possession of an Incompatibility Group A/C conjugative plasmid. The plasmid is most similar to the SN254 plasmid harbored in the human pathogen *Salmonella enterica*, is roughly 180,000 base pairs in size, and contains numerous antibiotic and heavy metal resistance genes. It has been found in many species of bacteria, including several human pathogens. We are currently optimizing a quantitative PCR system that will allow changes in copy number of the plasmid to be detected. Having hypothesized that exposure to sub-lethal levels of antibiotics might enhance the rate at which *A. salmonicida* transferred the plasmid we conducted extensive experiments to quantify and compare transfer frequency rates. While previous data suggested that this may be the case, attempts to refine the conjugation rate assay and introduce statistical rigor have resulted in increasingly equivocal results.

## **CHINA'S ENVIRONMENTAL CHALLENGES**



**Amy Lu ('09), East-Asian Studies**

China's miraculous economic growth has been a burden to the environment. In 2004, the World Bank generated a list of the most polluted cities in the world and China has sixteen of the top twenty. Currently, 190 million Chinese are exposed to contaminated water. There are challenges that exist to exacerbate these environmental problems. There are tensions between economic development and environmental protection. As China moves toward a market economy, the central government has devolved authority to the provincial and local jurisdictions to engage in environmental management. This decentralization causes a structural weakness of national environmental institutions. Because Chinese leaders are worried about environmental issues, the State has evolved in its environmental bureaucracy to give green NGOs, individuals, and the media a more prominent role in environmental protection. This presentation presents an analysis of the causes of environmental problems in China, challenges to improve the environment, and explores the growing environmental civil society.

**CHRONIC UNPREDICTABLE STRESS INCREASES ANXIOUS AND DEPRESSIVE-LIKE BEHAVIOR, BUT ONLY A TEMPORARY HEDONIC DEFICIT IN MIDDLE-AGED FEMALE RATS**

**Lauren McClurg ('09), Psychology**

Stressful life events are considered a significant contributing factor in depression. Animal models used to study the underlying behavioral and neural mechanisms of stress-related disorders are substantially varied, with discordant findings. We subjected rats to chronic, unpredictable, mild stress (CUMS) using a model thought to mimic the everyday, low-grade yet unexpected stressors humans often experience. After several weeks of CUMS, rats lose their normal preference for sucrose-sweetened water, an effect that is compared to human anhedonia and can be reversed by antidepressants. However, this effect is not always observed, possibly due to complex interactions between body weight, hunger, and hedonic changes. We assessed anhedonia during CUMS using the non-nutritive sweetener, saccharin, and evaluated behavioral despair and anxiety using the forced swim and open field tests, respectively. Hippocampal neurogenesis was measured to assess alterations in hippocampal plasticity. CUMS rats underwent 5 weeks of varied, randomized stressors. Saccharin preference assessments showed a significantly lower preference in CUMS rats than in CON rats during the first three weeks of stress, providing support for CUMS-induced temporary anhedonia with a non-nutritive sweetener. Consistent with depressive-like behavior, in the forced swim test CUMS rats were significantly more immobile than CON rats. Consistent with anxious behavior, CUMS rats took longer than CON rats to enter the center of the open field. Together, these findings confirm that our CUMS procedure produces robust outcomes in female rats that are consistent with features of human depression. In neurological data currently being gathered, we expect to find decreased neurogenesis in CUMS rats and aim to correlate these measures with our behavioral findings.

**CIRCADIAN FLUCTUATION OF CLOCK GENE EXPRESSION IN THE ZEBRAFISH (*DANIO RERIO*) KIDNEY**

**Catarina Ruksznis ('10), Biology**

Circadian rhythms are cyclic, daily patterns in the behavior and physiology of an organism which are regulated through environmental cues, most importantly light/dark cycles. The Clock

gene is a well known circadian oscillator whose expression regulates the transcription of other cyclically expressed genes. In this study, zebrafish (*Danio rerio*) were kept on a daily light-dark cycle, (LD 14:10) with the light period beginning at 8:00 and ending at 22:00. Kidneys were harvested at 4 hour intervals, beginning at 2:00 hours. RNA extraction was performed using the RNeasy kit according to the manufacturer's protocols, and RNA concentration determined through UV-Vis spectrophotometry. RT-PCR was performed to approximate the amount of Clock mRNA present using the delta-delta CT method between the non-cyclically expressed reference gene Beta-Actin and Clock. The ratio between the fold changes for each time and the chosen reference time, 2:00 were evaluated to determine the relationship between Clock expression and time. The Clock gene expression in the kidney was found to fluctuate in a circadian pattern, the lowest level of expression occurring at 14:00 hours and the peak at 22:00 hours.

### **COGNITIVE DISSONANCE IN TRUST-CHOICE INCOMPATIBILITY**

**Elisabeth Grasser ('11), Emma Harrington ('11) and Kelsey Stratton ('11), Psychology**

The purpose of this study is to investigate the effects of trust-choice incompatibility caused by different framing effects. We speculate that cognitive dissonance might occur in response to choosing to buy something from someone a participant has stated he trusts less than a competitor. This tension might be relieved by a "derogation of the victim" method, in which the participant attempts to relieve psychological tension by attributing negative qualities to the more trustworthy person (the person he did not buy from). Therefore, he justifies his actions by convincing himself the person he bought from was the better person. We aim to detect this derogation of the victim method by presenting the participant with a choice that will most likely cause an incompatibility between trust and choice. We will present the participants with the opportunity to remember "bad," or derogating, information about the butcher they trusted more but did not purchase meat from, and good information about the butcher they did not trust but purchased meat from. They will also be presented with situations or traits of an ambiguous butcher, and will be asked to assign the trait or scenario to the butcher they think it most applies to. This will present the opportunity for "good" situations to be assigned to the less trustworthy butcher (the butcher they bought meat from), and for "bad" situations to be assigned to the more trustworthy butcher (the butcher they did not buy from). This study aims to determine whether or not the incompatibility causes dissonance in the first place. If it does, this dissonance may influence later actions which could be explored in the event that this study produces significant results.

### **COLORING CLASS LINES**

**Ruth Langton ('09), Danielle Carlson ('10), Alyssa Kavanagh ('10), Ozzy Ramirez ('10) and Aleah Starr ('11), Education and Human Development**

This project aimed to examine the relationship between student perceptions of class and their own class backgrounds within the context of schooling through illustrations. We asked students at two schools, one public and one private, in kindergarten, third grade, and sixth grade classrooms first to draw a self-portrait with the things that they consider to be the most important in their lives. We then asked them to illustrate a dichotomy relating to social class: kindergartners were asked to draw a rich person and a poor person, third graders to draw a successful person and an unsuccessful person, and sixth graders to draw an upper class person

and a lower class person. The children's drawings were collected and compiled to demonstrate the way in which elementary school students perceive and then illustrate the stereotypical class markers that align and divide them within their school communities. We wanted to see if there is a correlation between the way that students perceive difference and the standards of difference that exist within their schools.

## **COMPARATIVE ANALYSIS OF BROAD-HOST-RANGE MULTI-DRUG RESISTANCE INCA/C PLASMIDS**

**Olena Marchenko ('10), Biology**

The IncA/C plasmids are efficient agents of antibiotic drug and metal resistance genes transfer in bacterial community. Multiple studies have been conducted examining the conjugation transfer rate, replication stability and maintenance of IncA/C plasmids in various bacterial species. The host range of IncA/C continues to expand, however the mechanism underlying the plasmid stability and transfer efficiency is yet to be elucidated. This study used in silico sequence analysis methods to identify the adaptive mutation sites enhancing the maintenance and promiscuity of IncA/C plasmid in commonly occurring IncA/C isolates from *Photobacterium damsela subsp. piscicida*, *Salmonella enterica*, *Yersinia pestis*, *Vibrio cholerae*, *Yersinia ruckeri* and *Aeromonas salmonicida subsp. salmonicida*. The comparative sequence analysis revealed a subset of genetic elements conserved within common IncA/C isolates: *ParA/B*-like partition systems, group of transcription regulation factors, non-coding sequence regions and *merE* transcription factor in mercury-resistant IncA/C plasmids. Furthermore, the IncA/C isolates that carry the mercury resistance cassette are of particular importance due to their enhanced ability to propagate and persist in the bacterial population

## **CONFUSIONS OF SUFFIXES IN BILINGUAL CONTEXTS**

**Claudia Sanchez Gutierrez, Psychology**

Determining whether languages are stored separately or not is a main issue in research on bilingualism. The cognate facilitation effect (i.e., faster responses to words that are formally and semantically similar compared to translation equivalents, which share semantic content but are formally dissimilar; Caramazza & Sebastian-Galles, 2000) points to an overlap between languages when some of their linguistic units share semantic and formal characteristics. This experiment aimed to determine whether this effect occurs at the word-level or at the morphemic-level, by making native Spanish speakers decide whether a Spanish target preceded by an English prime was a word or not. Half the targets were modified either by matching their roots (e.g., resemblance/ semejanza: RESEMBLANZA) or their suffixes (e.g., impressive/ impresionante: IMPRESIVO) with the ones of the English prime. Accuracy for suffix modifications was lower than for root modifications (i.e. higher error rate for IMPRESIVO than for RESEMBLANZA), suggesting that suffixes in both languages might be stored together while roots might be stored independently in each language.

## **CONSUMPTION OF ENDANGERED ANIMAL PARTS AS FOOD AND MEDICINE**

**Katherine Orrick ('10), Hannah Lafleur ('11) and Kersten Vasey ('10), Environmental Studies**

The consumption of endangered animals as a food source or medicine is exerting increasing

pressure on wildlife populations. Species already affected by habitat fragmentation and degradation are being further reduced by hunting. We investigated uses of endangered animal parts, including bushmeat and traditional Chinese medicines. The cultural, economic, and environmental implications of wildlife consumption increase the difficulty of solving this crisis. The complications that arise when examining this problem include poverty, property rights, nutrition, land use, cultural acceptance, and local traditions. The inclusion of all stakeholders is important in the solution to this crisis. Education, substitution, and enforcement of regulations are critical to reduce endangered wildlife consumption around the world.

## **CONTRIBUTIONS TO THE UNDERSTANDING OF GLACIAL LAKE BIGELOW BETWEEN EUSTIS AND COBURN GORE, NORTHWESTERN MAINE**

### **Geoffrey Malick ('09), Geology**

A newly found Gilbert-style delta indicates a Pleistocene shoreline of Glacial Lake Bigelow in the Flagstaff Lake (Bigelow) Basin of 1280 ft above sea level. A contact of foreset and topset beds at this elevation was located in a sand and gravel pit north of Eustis, Maine and appears to correspond to the 1280-ft lake level suggested by Thompson et al. (2006), nearly 100 feet higher than estimated by 20th-century workers. This shoreline and the extensive local esker system within the Flagstaff Lake (Bigelow) Basin and adjacent North Branch Dead River Valley were mapped on USGS 7-1/2-minute quadrangles. Although neither lacustrine beds overlying esker deposits nor shoreline features have thus far been found in the uppermost part of the river valley, the 1280-ft contour should approximate the Glacial Lake Bigelow shoreline and has been tentatively mapped all the way to and around the Chain of Ponds. Dip directions in sand and gravels from multiple sites are consistent with a meltwater source stream to the north-northwest. Thompson et al. (2006) stated that Glacial Lake Bigelow at the 1280-ft stage was merged with Glacial Lake Langtown to the southwest, making the present study area the extreme upvalley end of a very large proglacial lake system. This conjoined body of water was apparently dammed by an active ice margin to the east. As this margin retreated, the ice dams were breached, spillways were opened, and Glacial Lake Bigelow stabilized at a lower level. Patchy diamict atop deltaic sands and gravels at one site may be till from a minor readvance following the drop in level or, more likely, ice-rafted debris deposited en masse in shallow waters during the 1280-ft lake stand.

## **CURRENTS OF AGGRESSION: THE AMERICAN AGRARIAN DREAM AND MEXICAN LAND GRANTS IN ALTA CALIFORNIA**

### **Shelley Payne ('09), History**

The history of land in California is a history of repeated conquests. Governor Pedro Fages, acting in the place of the monarch, made the first private land grants in Alta California when gave three or four of the men under his command land for grazing their cattle. For the forty years following the first land grants made by Fages, less than twenty private land grants were made in California. With Mexican Independence came a substantial shift in the execution of land policy in California. In 1826 Governor Jose Maria Echeandia led a group of prominent citizens in agitating for the restoration of mission lands to the public domain. Officials in Mexico City supported the idea and passed the Secularization Act of 1833. The sparse population and the disorganization of the Mexican government following independence meant that many grants, often huge holdings ideal for large scale ranching, were poorly defined and undocumented or only partially documented under the Mexican system. The culmination of the Mexican War in

1848 and the annexation of California as delineated in the Treaty of Guadalupe-Hidalgo posed a unique challenge to United States land policy and created a situation in which several levels of legal, moral, and pragmatic stances operated among both the Mexican and American constituents as they struggled to understand and profit from a period of uncertainty surrounding the validity and nature of land titles. The creation of the Land Commission in 1851 to adjudicate claims and issue patents signaled an effort to sort out disputed titles in an objective manner, but this effort was soon hijacked by land hungry, popular sovereignty settlers. By the late 1860s almost all of the large land holdings in California had either been broken up or had passed into American hands.

## **CYCLICALITY OF STATE BUDGETING: A POLITICAL-ECONOMY ANALYSIS**

**Ian Cummins ('09), Economics**

This paper examines how partisanship has interacted with state balanced budget constraints to produce varying degrees of fiscal procyclicality among state governments. Using panel data from 1963-2006, liberal state governments are found to be substantially less procyclical than conservative governments. The impact of balanced budget constraints, meanwhile, is contingent upon the partisanship of the state in which they are imposed. While, the constraints imposed by strong balanced budget rules are not binding upon conservative states, liberal state governments with less stringent balanced budget constraints are found to be significantly less procyclical than their peers.

## **DNA CROSS-LINKING AND APOPTOTIC POTENTIAL OF (1-CHLOROETHENYL)OXIRANE**

**Brian Wadugu ('09), Jordanne Dunn ('09) and Rebecca Kamins ('09), Chemistry**

Chloroprene is a large-scale industrial chemical used in the manufacture of polychloroprene, a solvent-resistant elastomer. Correlation between occupational exposure to chloroprene and lung cancer has been noted, leading to the compound's classification as a possible human carcinogen. Chloroprene metabolites have been implicated in its carcinogenicity, with evidence that the bifunctional metabolite (1-chloroethenyl)oxirane forms DNA adducts. With the goal of elucidating the molecular and cellular mechanisms of chloroprene toxicity, we synthesized (1-chloroethenyl)oxirane for studies of its potential DNA cross-linking and ability to induce apoptosis in comparison to the structurally similar compounds diepoxybutane (DEB) and epichlorohydrin (ECH). We used denaturing polyacrylamide gel electrophoresis to monitor possible formation of interstrand cross-links by (1-chloroethenyl)oxirane within synthetic DNA duplexes containing central d(GGC) sites. Our data suggest interstrand cross-linking at deoxyguanosine residues, with the efficiency of cross-linking depending on pH (pH 5.0 > pH 6.0 > pH 7.0). Relative efficiencies of cross-linking followed the order DEB > (1-chloroethenyl)oxirane > ECH. Apoptotic potential was determined both in chicken 6C2 cells and in human HL-60 cells via caspase-3/7 assays. Apoptotic potential followed the order DEB > (1-chloroethenyl)oxirane ~ ECH. Further work is underway to assess up-regulation of specific genes involved in the (1-chloroethenyl)oxirane-induced apoptotic pathway via reverse-transcriptase real-time PCR.

## **DAVID VS. GOLIATH: WHOSE SIDE ARE YOU ON ANYWAY?**

### **Michele Chu ('09), Psychology**

Past research has indicated that circumstantial factors surrounding a particular crime influence desires for retributive justice. In study 1, to evaluate the effect of relative victim power on desires for retributive justice, participants (n = 92) read a brief scenario in which point of view and relative victim power were manipulated, and then participants filled out a retributive justice scale. Participants assigned more punishment if they took the point of view of the victim than the perpetrator and if the victim was of relatively low power than high. In study 2, the effect of relative victim power was evaluated further by manipulating system justification using the same paradigm as study 1. Overall, participants (n = 110) assigned more punishment when the victim was of relatively low power than high; however, high system justification, basically, eliminated this effect while low system justification increased it. Social dominance orientation and preference for social hierarchies are discussed.

### **DIE DARSTELLUNG DES ANDEREN UND DES BEKANNTEN: RASSENVORURTEIL, MENSCHENRECHT UND PHILOSOPHIE IN HEINRICH VON KLEISTS 'DIE VERLOBUNG IN ST. DOMINGO'**

#### **Nicole Veilleux ('09), German/Russian**

Heinrich von Kleist (18 October 1777 – 21 November 1811) is a very important German literary figure, even if only posthumously. He was a troubled man and led a shaky existence for most of his life, which ended in a scandalous suicide pact between him and a lady friend. His short story, 'Die Verlobung in Santo Domingo,' was a controversial story in Kleist's time, and the meaning of the tale has continued to be debated by literary critics and Kleist experts. Like a majority of his works, this story is complicated and filled with dark, tortured themes like violence and illicit sexuality, and is written in a very modern, original, Kleistian style. What is unique about this story, however, is its preoccupation with race. The historical setting of the plot is the island of St. Domingo, where the only successful slave revolt took place against their white plantation owners and the French imperialist power in the late 18th to early 19th century. The argument of this symposium presentation is that Kleist used this story to criticize and break through the established stereotypes and preconceived notions of white, 'civilized' Europeans against their black 'barbaric' colonists, to show that nothing is as simple as black and white. Further, it is quite possible that Kleist looked to the successful natives of St. Domingo as a sort of call to arms to his fellow Germans to throw off the imperialistic chains of the greedy Napoleon, who at the time Kleist wrote his story still controlled most of Europe. Hidden behind clever nuances, plot twists, and a biased narrator who does not share the same sentiments as the author, Kleist subtly violates the conventions of early 19th century European thought, and seems to champion the cause of the unequivocal rights of all men.

### **DIE DARSTELLUNG MODERNER IDENTITÄT IN DORIS DÖRRIES „BIN ICH SCHÖN?“**

#### **Justin Mohler ('09), German/Russian**

An analysis of the various methods of creating an identity showcased in Doris Dörrie's collection of short stories 'Bin ich schön?'. I argue that the resulting identity is necessarily and constantly in flux. The problems faced by Dörrie's characters arise from their inability or unwillingness to recognize the nature of their own identity. Only by embracing these new identities are they able

to move beyond their old habits and find happiness.

## **DIET MANIPULATION IN PAINTED LADY BUTTERFLY LARVAE, *VANESSA CARDUI*: EFFECTS ON LARVAE, ADULT MORPHOLOGY, AND FLIGHT PERFORMANCE**

**Kimberly Cohen ('09), Biology**

Nutrients acquired during the larval stages can influence resource allocation and, subsequently, parameters such as growth, morphological characteristics, and flight performance. In this study, I altered the feeding regimes of *Vanessa cardui* larvae during the last instar to test the hypothesis that the diet of larvae affects both larval and adult life history traits. Larvae in the control treatment were fed an artificial mash diet ad lib, while larvae in experimental treatments were fed organic lettuce, a restricted diet of artificial mash, or leaves of *Plantago lanceolata*, a native host species that produces iridoid glycosides. I monitored larval stage duration, body mass at the pupal stage, time to eclosion, body mass at eclosion, flight duration, wing loading, and adult lipid content for animals in all four groups. *Vanessa cardui* life stage durations, body masses, wing loading, and lipid content were affected by diet manipulation. Despite significant variation in wing loading and lipid content, only butterflies of the lettuce and restricted diets significantly differed in flight ability. The results of this study indicate that dietary modification can induce changes in larval and adult characteristics, but not necessarily at the expense of the maintenance of energetically costly flight machinery. Future studies should investigate the effects of larval diet on resource allocation and tradeoffs between adult reproductive output, lifespan, and flight capability.

## **DISNEY'S DAUGHTERS: THE REPRESENTATION OF GENDER IN POPULAR ANIMATED DISNEY FILMS**

**Jamie Quine ('09), American Studies**

This talk analyzes two popular Disney movies: *Snow White* (1937) and *Enchanted* (2008). I argue that *Snow White* establishes a standard narrative of gendered behavior for its female characters that Disney has repeated unvaryingly from its first films in the 1930s until the present. In film after film, the mothers of the central female characters are missing or dead. This project argues that the absence of mothers in Disney films promotes a patriarchal culture of male dominance in which girl characters are shaped wholly by their relationships with their fathers. Each film shows how girls make the transition from being good daughters to good wives. By not representing mothers, the films allow the father's (and husband's) dominance to be uncontested, and banish all forms of female authority from the family. *Enchanted*, which is an explicit re-writing of *Snow White*, is Disney's most recent iteration of this formula. Though on the surface *Enchanted* seems to offer a more updated set of options for its female characters, I demonstrate that its juxtaposition of animation and real-life actors simply shows children how to translate the fairy-tale values Disney has repeated so often into reality. Taken together, these films suggest that deviating from the gendered norms that were first represented in *Snow White* will result in empty and unsatisfying lives for women, while following in traditional gender roles will promote happiness and fulfillment.

## **DISRUPTION OF THE THIOREDOXIN SYSTEM BY THE ANTICANCER PRODRUG LAROMUSTINE**

**Christopher Buros ('09), Christopher Lapointe ('09) and V. Praggastis ('10), Chemistry**

The thioredoxin system, which includes thioredoxin (Trx) and Trx reductase (TrxR), is involved in cellular antioxidant defense and metabolic redox events. These processes involve the dithiol/disulfide chemistry of cysteine residues. Proteins and enzymes relying on active-site cysteines are often inhibited by carbamoylation. The preclinical anticancer prodrug Laromustine (VNP40101M; Cloretazine) yields the carbamoylating species methyl isocyanate upon activation in situ and is reported here to inhibit thioredoxin-mediated processes. TrxR, which reduces oxidized Trx using reducing equivalents from NADPH, is strongly inhibited by Laromustine. This inhibition is limited to Laromustine's carbamoylating activity and not its 2-chloroethylating activity, which causes DNA crosslinks. TrxR inhibition is observed against purified enzyme as well as enzyme within the lysates of mammalian leukemia cells. This pattern differs from that of a related oxidoreductase, glutathione reductase, which was inhibited in a purified form, but showed little susceptibility to carbamoylation in a cellular context. In addition, Laromustine is shown here to affect redox processes mediated by the Trx system. Several transcription factors that are associated with cell proliferation require reductive activation that involves Trx, including AP-1. The sequence-specific DNA-binding activity of AP-1, measured using electrophoretic mobility shift assays, is diminished by exposure to Laromustine. A diminishment in the expression of the genes for cyclin-D and E2F1, which are upregulated by AP-1, supports this finding. Given the overexpression of TrxR in neoplastic cells and its involvement in DNA synthesis, the inhibition of the Trx system by Laromustine may help explain the mechanism of action of this agent.

**DO GOSSIP GIRLS LIKE CATS AND DOGS?**

**Sara Field ('11) and Claudia Sanchez Gutierrez ('11), Psychology**

Semantic priming refers to the tendency to have a faster response time in lexical decision tasks when words are semantically related, which is defined as words that have overlap in meaning (i.e. shared semantic features). The purpose of this investigation is to determine if words which are unrelated semantically can cause semantic priming when they co-occur repeatedly in different contexts. Whereas CAT and DOG are semantically related, words like GOSSIP and GIRL are not. Nevertheless, these words are associated in real life as we are exposed to them frequently. As a result of this exposure, these new associations do show a similar priming effect as semantically related words.

**DOES AROUSAL EXPLAIN THE EFFECTS OF SUPERIOR RECALL AFTER SURVIVAL PROCESSING COMPARED TO OTHER TYPES OF PROCESSING?**

**Tory Gray ('11), Dana Breakstone ('10), Nicole Raheja ('10) and Grace Shanks ('10), Psychology**

We have seen that survival processing has a greater effect on memory recall and recognition than many other types of processing. Nairne et.al (2007) demonstrated that participants are much better on recall and recognition tasks when asked to rate words in terms of survival relevance, rather than pleasantness or relevance to moving. While it has been suggested that humans possess an innate ability for survival-processing (Nairne et al, 2008), another variable which could influence memory is the emotional arousal that people feel when they imagine being in a life-threatening situation. The research on arousal has shown a variety of results. Talarico et.al



(2004) asked participants to generate memories that pertained to different emotions and found that intensity had a larger effect on memory than emotional valence. The role of arousal in memory has not yet been clearly defined. We would like to investigate the role of arousal in survival processing. Husain et.al (2002) showed that arousal through music improved participants' performance on spatial tasks. In the present study, we will also manipulate the mode and tempo of background music in order to generate a high or low arousal state in participants. We would like to test whether or not arousal explains the effect of superior recall after survival processing by comparing it to processing words based on pleasantness. If the previous effect on survival processing is due to high arousal, then recall will be highest in the survival processing/high arousal and lowest in pleasantness/low arousal condition. It is also possible high arousal/pleasantness will also produce high amounts of recall.

### **DOPPLER-FREE DIODE LASER SPECTROSCOPY OF THE BALMER-ALPHA TRANSITION IN ATOMIC HYDROGEN**

**Jennifer Dahnke ('10), Shehan Don Talagala ('09), Nathan Hill ('09), Tatenda Mahlokozera ('09), Joseph Meyer ('09) and Katherine Nelson ('09), Physics and Astronomy**

Historically, the spectrum of atomic hydrogen has been a critical tool in the development of quantum theory, and it still plays a pre-eminent role in research on the fundamental constants of nature. In PH334 (Experimental Atomic Physics) in spring 2009, we have built an external cavity diode laser (ECDL) spectrometer which emits tunable, narrow bandwidth light around 656 nm. We have used this light to excite the Hydrogen-alpha (H-alpha, Balmer-alpha) transition, and have obtained Doppler-free spectra covering the full frequency range of the fine-structure components of this multiplet. In particular, we have been able to resolve the  $n=2$  Lamb Shift, a Quantum Electrodynamics (QED) effect. The resolution of these experiments is limited by electric fields and the high frequency of atom-ion collisions in the 2.45 GHz discharge used to dissociate hydrogen molecules to provide the atomic sample needed for these experiments.

### **DUST BETWEEN TWO FIRES: CIVILIAN MILITIAS IN AYACUCHO, PERU AND MIDDLE MAGDALENA VALLEY, COLOMBIA IN THE LATE TWENTIETH CENTURY**

**Catherine Coffman ('09), History**

During the 1980s and 1990s, powerful leftist guerilla insurgencies shook Peru and Colombia. In Peru, Sendero Luminoso was a viable political threat while wreaking havoc in the countryside. Colombia had several guerilla groups seeking to incite sociopolitical rebellion, most importantly the Fuerzas Armadas Revolucionarias de Colombia, commonly known as FARC. In response to the guerilla threat, both countries employed armed civilian militias as part of their counterinsurgency strategy. In Peru, these civilian militias, known as rondas campesinas, were autonomously created, surprisingly effective, and after the threat of Sendero Luminoso was neutralized, successfully disarmed. In Colombia, paramilitaries were formed by the army and by the cocaine cartels and rampaged the country, causing more damage than their guerilla counterparts. To this day they have refused to disarm. What accounts for the differences between civilian militias and the outcome of the conflicts in these two nations?

### **DUTCH FOOD AND IDENTITY IN 17TH CENTURY STILL LIVES**

### **Brittany Canniff ('09), Art**

Innumerable still lives were painted in the Netherlands during the 17th century, with painters specializing in game, breakfast, or flower pieces. Nearly every one of these still life paintings includes food. In addition to food that was produced and consumed on a daily basis in Holland, Dutch painters depicted a plethora of exotic and imported items including tea from Ceylon, pepper from India, grains from the Mediterranean, and many more. Artists also included luxury objects in their still lives, for instance Chinese porcelain. All of these imported goods indicate the trading prowess of the Dutch merchant marine throughout the 17th century. With the growth of the Dutch trading empire, emerged a wealthy middle class who, in turn, created a demand for secular still life paintings to decorate their homes, taverns, offices, and even brothels. Patrons communicated their current or desired social standing through the objects and the food included in their still lives. The food represented in 17th-century still lives provides us with important information about Dutch daily life, cultural values, worldly indulgences, and insecurities.

### **ECOAGRICULTURE**

#### **Rachel Baron ('11), Bryan Brown ('09) and Brooke Wanlass ('11), Environmental Studies**

Ecoagriculture is a relatively recent movement in which biodiversity conservation, rural livelihood enhancement, and sustainable agriculture development are achieved simultaneously. These goals are attained by modifying traditional land use practices to maintain ecosystem services. By examining several case studies, we elucidate the tenets of ecoagriculture. We found that ecoagriculture helped to mitigate poverty in rural areas and provided a means for integrating economic development with the goals of biodiversity conservation.

### **EFFECTIVENESS OF CONSERVATION LANDS IN THE STATE OF MAINE PROTECTING THE HABITATS OF FEDERALLY AND STATE LISTED ANIMALS**

#### **Kimberly Bittler ('11) and Michael Ambrogi ('09), Environmental Studies**

Maine GAP data on suitable habitats for 13 federally and state endangered and threatened species were compiled to show the number of listed species that an area had suitable habitat for. This data was tested to determine if the average representation of these habitats is different between conservation lands and non-conservation lands, between private and public conservation lands, and between lands protected under easements and lands protected fee simple.

### **ENGRAILED AND OTHER PAX-2 TARGETS**

#### **Katharine Harmon ('09), Biology**

The transcription factor D-Pax2, the *Drosophila* homolog of the vertebrate Pax2 gene, plays an essential role in the development of the sensory and nervous systems. While its role within external sensory organ development has been documented (Kavaler et al., *Dev.*, 126:2261-2272, 1999), relatively few genes have been identified as D-Pax2 targets. Using an in silico approach, we have identified engrailed (*en*), hibris (*hbs*), quick-to-court (*qtc*), comatose (*comt*) and sequoia (*seq*) as putative targets of D-Pax2. Several studies have shown a relationship between Pax2 and *en* homologs in other organisms (Song and Joyner, *Mech. Dev.*, 90:155-165, 2000; Song et al., *Dev.*, 122:627-635, 1996; Picker et al., *Dev.*, 129, 3227-3239, 2002). However, no one has reported a connection between any of these genes and D-Pax2 in *Drosophila*. Using *in situ*

hybridization, we have investigated whether these target genes are expressed in sensory organ cells and whether such expression is dependent upon D-Pax2 function. In addition, we are attempting to assess the relevance of D-Pax2 binding sites near these target genes in vivo through the generation of transgenic reporter constructs. Our evidence suggests that several of the putative targets, including *en*, may be regulated either directly or indirectly by D-Pax2 during sensory organ development.

## **ESTIMATION OF POPULATION REDUCTION AND GENE FLOW IN THE RARE ORCHID *ISOTRIA MEDEOLOIDES***

### **Philip Crystal ('09), Biology**

*Isotria medeoloides* (Pursh) Raf. is a threatened orchid species in an Appalachian distribution in the eastern United States with all populations having greater than 50 individuals occurring in Maine and New Hampshire. The United States Fish and Wildlife Service is attempting to preserve the species by protecting populations and potential colonization sites. Previous microsatellite analysis of fifteen populations throughout the species revealed high inbreeding and low interpopulation genetic diversity. This study focuses on the use of four microsatellite loci to determine gene flow, effective population sizes, and population size reductions among eighteen genotyped populations in the hope of identifying genetically important sites. Results indicate that populations in the southern range of the species are severely reduced. The genetically diverse northern populations also show signs of population decline. A coalescent genealogy sampler revealed low gene flow with most populations sending and receiving less than one migrant per generation. Gene flow was especially low among small southern populations.

## **FACTORS INFLUENCING CONSERVATION SUCCESS OR FAILURE IN TIGER RANGE STATES**

### **Megan Saunders ('09), Environmental Studies**

Tigers are currently found in 13 countries. Three of eight recognized subspecies are extinct and the other subspecies are considered endangered throughout their range. Major threats to tigers include poaching and habitat and prey loss. Most studies of tiger decline, to date, have explored direct threats. This study uses a range-wide approach to explore possible underlying drivers of tiger decline. I used recent tiger population estimates and identified six biological measures and 20 socioeconomic measures to ask why some countries are more successful in conserving tigers than others. Data were analyzed using correlation and regression analyses in SPSS. Higher rates of education, greater democracy, and lower levels of poverty were significantly associated with successful tiger conservation. These factors likely promote more successful conservation due to increased levels of citizen support, greater local participation, increased scientific and implementation capacity, and increased funding for conservation. Furthermore, countries with an internal commitment and external non-governmental involvement, such as Nepal, can succeed at tiger conservation even without good measures of the identified factors. The factors found to significantly contribute to successful tiger conservation are also likely to impact conservation of other species throughout the world.

## **FANTASIES: STAGING FEMINIST PERFORMANCE ART**

### **Ashlee Holm ('09), Women, Gender, Sexuality**

Performance art is used throughout our society to make points, to further causes, and to simply motivate people to react. At Colby, however, inflammatory pieces intended to incite responses are few and far between. The goals in staging such a provocative and controversial performance piece are to elicit strong reactions to the subject matter and create a discourse surrounding what we see as appropriate and effective methods for engaging ourselves and others.

## **FAçADE RELIEF WITH TWO BIRDS**

### **Thomas Winter ('09), Art**

John Ruskin's landmark *The Stones of Venice* serves as foundation for an examination of the famed lagoon city as seen through the lens of a thirteenth-century roundel. From its beginnings as a refuge from the Germanic invasions, Venice has stood as a city apart. Even as it grew from Byzantine tributary to successful trading empire, it was the stones of Venice that would come to define the city for later generations. This stone, depicting two birds flanking a stylized tree, says much about the city and the time in which this work was produced. While a fairly straightforward artifact, the roundel rewards those who might give it a closer look. Astragal from ancient Greece, birds from the Bestiary, and stone from a faraway peninsula all lie behind its simple design. From the Byzantine to the Gothic, from Istria to the Levant, the journey of this stone is the journey of Venice itself.

## **FORECASTING COMMODITY PRICES WITH PARALLEL EXCHANGE RATES**

### **John Roberts ('09), Economics**

Commodity price uncertainty imposes large costs on society. On the macro level, it results in sudden and unexpected shifts in current account imbalances and real GDP volatility. While on the micro level, it leads to allocation inefficiencies. Removing some of this uncertainty with accurate price forecasts allows for a more efficient distribution of resources, and thus, an increase in social welfare. Despite the obvious gains to be had from accurate commodity price forecasts, few models have been able to deliver these results. Chen, Rogoff and Rossi (2008) were the first to find a promising link between exchange rates and commodity prices for commodity-currency countries. Their study shows that exchange rates can be used to accurately predict commodity prices; however, they only analyze countries with floating official exchange rates, which is an unnecessarily narrow approach. This restriction eliminates all of the emerging markets that possess a fixed official exchange rate, despite the simultaneous existence of a flexible looking parallel exchange rate. This paper incorporates Reinhart and Rogoff's (2003) exchange rate classification scheme to identify commodity-currency countries that have periods in which their official exchange rate is fixed, but the simultaneous existence of capital or exchange controls creates a flexible looking parallel exchange rate. During these periods, we use a modified version of Chen, Rogoff and Rossi's (2008) model to predict commodity price movements for five countries. This expansion allows the model to be applied to many more non-OECD countries, which suffer significantly more from commodity price uncertainty than their OECD counterparts.

## **FRIEND OR FOE? EXAMINING THE IMPACT OF FACEBOOK AND SOCIAL NETWORKING ON MODERN AMERICAN SOCIETY**

### **Hope Rosenfeld ('09), American Studies**

Facebook, and other social networking sites, too, have recently become some of the most highly trafficked websites on the internet. Though these sites vary in content and purpose, one thing they all have in common is that they allow their users to seamlessly connect with other users. For example, through these sites, a user can reconnect with long lost friends, find new friends with similar interests, communicate with current acquaintances, friends, family and colleagues, share pictures, write messages, start interest groups, play games, and more. As Facebook continues to grow in popularity, the possibility for connection and public outreach is suddenly boundless, and the roles that Facebook plays in the lives of Americans continues to evolve every day. Although it is impossible to predict how we will use Facebook in the future, by examining the short history of social networking in general, and then examining a few of the many different impacts that these sites have had on our lives, it becomes easier to speculate what sort of consequences the development of these new social mediums may have on America's ever-changing society.

## **FROM COLONIZATION TO CIVIL WAR: GENDERING THE GUATEMALAN COUNTERINSURGENCY**

**Sarah DeLiefde ('09), Latin American Studies**

The Guatemalan Civil War is largely understood as a war against the Maya. I argue that during the Guatemalan Civil War the government adopted increasingly harsh counterinsurgency tactics but, when unable to defeat the insurgency, the government turned to strategies like state terror and violence against women in an effort to suppress potential guerilla supporters. I find that counterinsurgency did not set out to specifically target women, but that was the effect. Through testimonios, human rights documents, and other war-time accounts we are able understand how counterinsurgency violence targeted women in very different ways than it did men. Historical trends in gendered violence offer further clues as to why the Guatemalan government resorted to extreme brutality against Maya women in order to defeat the insurgency. I find that historical scripts of violence against women, centuries of counterinsurgency battles, and the extreme militarization of Guatemala can help explain why the government turned to violence against women. Testimonios show that Ladino male dominance persisted through centuries and came to characterize the Civil War. Mayan women became strategic targets of the government and were victims of especially brutal and unique forms of violence, rape, and torture. This paper examines the Civil War violence against women and traces its roots back to the colonization of Guatemala.

## **FUN FOR ALL AGES: KICKING OFF THE ALFOND CENTER'S NEW 50+ CLUBHOUSE**

**Laura Bisbee ('09) and Guy Sack ('09), Sociology**

In tough economic times, the Boys and Girls Club has experienced an increased demand on their services. In order to continue offering high quality services, the Alfond Center has been looking for new ways to bring money into the organization. One of the ways in which they plan to do this is by implementing a new, fee-for-service program for active older adults. Our role is to generate interest in the new program by planning and organizing a kick-off event offering similar activities to those that will be offered in the program. The 50+ Clubhouse Reception will include physical activities, such as water aerobics, Pilates, volleyball, and yoga, as well as informational classes on subjects including Social Security, defensive driving, computer basics, and nutrition. To conclude the event, there will be a cooking class and luncheon, followed by speakers sharing their experiences with other cultures. The Colby College radio station, WMHB, will be

broadcasting live from the event, as well as promoting it both on the air and on their website. The event will take place on Tuesday, April 28, 2009 from 8 AM until 2 PM.

## **GHOSTS**

### **Lucy Dotson ('12), Theater and Dance**

GHOSTS is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. GHOSTS is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **GEOCHEMICAL ANALYSIS OF MILL CREEK SEDIMENTS, BERMUDA**

### **James Beltran ('09), Geology**

Geochemical analysis was performed on 1.6 meters of core composed of peaty sediments taken in 1968 from Mill Creek, Bermuda. As the creek drains the municipal landfill for the City of Hamilton, Bermuda, the local Ministry of Environment was concerned about hazardous leachate from the landfill site. To evaluate this hazard, the sediments were run on an ICP-OES (inductively coupled plasma-optical emissions spectrometer) instrument to determine the concentration of fifty-two elements in the samples. Of the fifty-two elements that were analyzed, heavy metals such as Cu (copper), Pb (lead), Zn (zinc), Cr (chromium), Cd (cadmium), and As (arsenic), were the focus of this investigation because of health hazards associated with prolonged exposure. Maximum concentrations of these elements ranged from 48 parts per billion (ppb) for arsenic; 3.6 ppb for cadmium; 104 ppb for chromium; 358 ppb for lead; and 5500 ppb for zinc. For all these elements, concentrations increased in the upper 0.4 meters of the core. Below that point, concentrations decreased significantly. Na (sodium), Mg (magnesium), Ca (calcium), Cl (chlorine), and Fe (iron) occurred in extremely high concentrations ranging from 160,000 ppb for calcium; 10,000 ppb of iron; 22,000 ppb for sodium; 53,000 ppb for magnesium, and 400 ppb for chlorine. Calcium, sodium, chlorine, and magnesium are high because of their high concentrations in the surrounding seawater, while iron is high due to its high concentration in the soil. Of the remaining elements, concentrations occurred only in minute amounts (less than 5 ppb). As a result, these elements were not considered in this investigation. This investigation indicates an anthropogenic cause for the occurrence of hazardous chemicals in the sediments in close proximity to the landfill.

## **GESTATIONAL STRESS INDUCES PERSISTENT INCREASES IN ANXIETY AND ALTERATIONS IN MATERNAL CARE BEHAVIORS IN FEMALE RAT DAMS**

### **Olivia Bordiuk ('09), Psychology**

Motherhood in rats, including pregnancy, lactation, and rearing a litter of pups, leads to enhanced hippocampal-mediated cognitive abilities and plasticity. In accordance with these changes in neural function it is possible that the maternal brain is more sensitive to a variety of external factors. We hypothesized that since the hippocampus is particularly vulnerable to stress, gestational stress may have an even more devastating and persistent outcome for the mother. In the present study we assessed the effects of gestational stress on mothers' anxiety, maternal care behaviors, and cognition. We also looked at anxious behaviors in the offspring as an outcome measure associated prenatal stress and maternal care. A group of pregnant dams underwent 60

min of restraint stress (STR) twice daily from day 15 to 19 of gestation. These rats were compared with pregnant dams that were not stressed (CON), and groups of STR and CON virgin female rats. An open field was used to assess anxiety 1 day and 2 months after STR; offspring were tested just prior to weaning. We also evaluated mothers' and virgins' reactions to and memory for novel objects and spatial memory. Consistent with our hypothesis, we found that pregnant CON rats were significantly less anxious than virgin CON rats. STR had little impact on virgin females, however, the capacity for pregnancy to be anxiolytic was completely prevented by STR. Interestingly, STR dams tended to lick and groom pups more than CON dams. This may be related to a sexually dimorphic effect in the offspring, with males, but not females, being more anxious if they experienced prenatal STR. We continue to analyze data, but will seek evidence that STR may also prevent a motherhood-induced enhancement in spatial memory as further support for our hypothesis.

## **GREENING THE COLBY LIBRARIES**

### **Sarah Stevens ('09), Environmental Studies**

Greening projects have garnered attention recently as society has realized that we need to reduce our footprint on the planet. Colby has undertaken numerous targeted sustainability projects in the last several years. This project focuses on the greening the Colby libraries in a variety of ways. I identified several areas of focus in the libraries by consulting green reports from other institutions and by speaking with Colby librarians. Those areas are: computing, printing, lighting, and recycling. I performed an experiment on ways to reduce paper usage from the printers in the Olin libraries, and have measured the energy usage of library computers. Other suggestions for greening come from best practices in various libraries and from the Colby librarians. Overall, Colby's libraries have strong recycling programs and good power-saving practices on public computers. Overuse of printer paper is the largest sustainability problem in the libraries, but the implementation of a print release station would help reduce paper use.

## **HIGH MASS STAR FORMATION AND MODELING HIGH MASS PROTOSTAR IRAS 18151-1208**

### **Katherine Nelson ('09), Physics and Astronomy**

In this poster we examine the current theory of high mass star formation and study a specific example. Following a brief summary of low mass star formation, we discuss the issues and theory regarding high mass star formation. We then use the Whitney Monte Carlo radiative transfer code (WMC) to model high mass protostellar object (HMPO) IRAS 18151-1208. A model was fit to a 8.0-13.0 micron MIRS grism spectrum and photometric data. Since the WMC was originally written to model low mass protostars, we examined the proposition that high mass stars form by similar process to their low mass counterparts by modeling an HMPO. We find that the WMC is capable of creating both an overall spectral energy distribution (SED) that fits the observational spectral and photometric data of IRAS 18151-1208 as well as images that agree well with low resolution images at three mid-infrared (mid-IR) wavelengths. Moreover, we found that an accretion disk and a high accretion rate were necessary to achieve a reasonable fit to IRAS 18151-1208. Consequently, we concluded that the WMC, and therefore current high mass star formation theory, is able to describe accurately the formation process of IRAS 18151-1208 and possibly other high mass stars.

## **HIPPOCAMPAL CELL SURVIVAL AS A FUNCTION OF ENRICHMENT AND LEARNING IN PERIADOLESCENT AND ADULT MALE RATS**

**Hanna Schenk ('09), Psychology**

Adult neurogenesis can be modulated by a variety of factors, including hormones, stress, depression, diet and genetics. Environmental enrichment and hippocampus-dependent learning tasks have both been found to upregulate neurogenesis and increase cell survival in the dentate gyrus of the hippocampus. The goal of the present study was to address these factors from a developmental perspective as to whether or not experiences are more or less beneficial at different developmental stages. This was addressed by implementing a four-week enriched environmental experience during either adolescence or adulthood in male Sprague-Dawley rats. Fifty-three days after the completion of enrichment rats were injected with the cell division marker, bromodeoxyuridine (BrdU), and seven days later were given a hippocampus-dependent learning task using a Morris water maze. Immunohistochemistry was used to quantify the number of new cells which survived over the ten days between BrdU injection and sacrifice. Behavioral data have partially supported the hypothesis with an interaction between age and enrichment condition, such that on the second day of the learning task, adults in the control condition performed the most poorly on the learning task. Contrary to the hypothesis, neurological data show that among animals who performed the learning task, adolescents showed a greater number of cells compared to adults, regardless of environmental condition. Further studies will be needed to identify the source of this difference among age groups. This research has implications within the field of neurogenesis in terms of broadening our understanding of the function of enrichment but could also be linked to work in child development and education by identifying positive outcomes of experiences at different ages.

## **HOLLYWOOD'S DEPICTION OF IRISH SOLDIERS IN THE AMERICAN CIVIL WAR**

**Matthew Quinlan ('10), History**

During the time span in which the American Civil War took place, large numbers of Irish immigrants flooded the country in search of freedom and religious tolerance. Many of these immigrants, along with the Irish-American men already in the country, were recruited to fight for the Union. Numbering nearly 150,000, some Irish men served in all-Irish units in the Union army, such as the Irish Brigade and Corcoran's Legion, while others served in regiments whose enlisted men came from a variety of different backgrounds. Hollywood has already given its own interpretation of what Irish soldiers in the Civil War experienced, and of how they behaved. Many films feature at least one Irishman who plays a prominent role or depicts a stereotype. Such films include "The Red Badge of Courage", "Shenandoah", "Glory", "Gangs of New York", and "Andersonville". My ultimate goal will be to compare the stereotypes and experiences of Irish soldiers in these films to the memoirs of both James P. Sullivan of the Iron Brigade and William McCarter of the Irish Brigade to decipher which Hollywood films most accurately depict the experiences and attitudes of Irish soldiers serving in both all Irish regiments, and in mixed regiments.

## **HORSING AROUND**

**Veronica Romero ('09), Psychology**



Past research has shown that the movements of two or more individuals can become unintentionally coordinated when there is a visual or auditory connection between them; and that such unintentional coordination is consistent with the self-organizing principles of coupled oscillators. Coordination studies adopting a similar 'dynamical systems' perspective have suggested that quadrupedal locomotion patterns are also constrained by the dynamics of coupled oscillators principles; and that the symmetry and stability of an animal's quadrupled gait is influenced by the strength with which the animal's legs are coupled, as well as the speed of locomotion. In this study I seek to broaden these two sets of knowledge by: (1) examining the intrapersonal coordination that occurs when two people are not only visually coupled, but also mechanically coupled; and (2) by turning pairs of human beings into locomoting quadrupeds examining whether the patterning and stability of quadrupedal gaits can be explained in terms of a coupled oscillator dynamic. To achieve this, three pairs of participants were connected together via a foam appendage and asked to locomote at speeds ranging from 3 to 13 km/h. Of interest were the specific quadrupedal gaits that arose at the different locomotion speeds, as well as the gait transitions that occurred as the speed of locomotion was increased or decreased over time.

### **HOW ECO-FRIENDLY ARE WIND FARMS?**

**Jordan Schoonover ('10), Jessica Balukas ('10) and Margaret Schroth ('09), Environmental Studies**

Since the 1970s wind energy has been pursued as a technology to help combat rising oil prices and foster more environmentally friendly practices. In the current economic recession, the benefits and costs of wind power are being weighed in an effort to find solutions to the rising financial stresses and unemployment faced around the world. This poster provides information about the benefits of wind power as well as the negative environmental impacts. It explores the effects of the economic recession and the stimulus plan on the wind power industry. We also present the current state of wind power development in the state of Maine and discuss the challenges it will face in the future.

### **HOW PORN HAS BEEN NORMALIZED INTO SOCIETY: A CLOSER LOOK AT ITS EFFECT ON COLLEGE CAMPUSES**

**Danielle Crochiere ('09), Women, Gender, Sexuality**

The institution of porn has become normalized and is no longer obscene. It has been taken out of the confines of the private and brought into greater society as normative. America has ultimately become desensitized to porn, and accustomed to instant gratification. There are many aspects of present day society that have contributed to the normalization of porn. With the evolution of the Internet it has become increasingly easy and inexpensive to access porn. Porn is no longer only created for the male gaze or male pleasure, but is frequently viewed and enjoyed by women and couples. Those that were once upset with the institution (groups such as anti-porn feminists) are now looking at porn as a means of academia and understanding of sexuality rather than the oppression and objectification of women. Although porn is not fully accepted and welcome in society, its progression from dark back rooms in sex shops and the ultimate taboo to a topic of conversation and a public phenomena is beginning to be clearly seen in society, especially in environments that have more relaxed sexual expectations and mores; for instance on college campuses. The presence of porn on college campuses has increased in even the last few years. Campuses promote free spirit values, and the opportunity to experiment without commitment.

Students are able to act sexually without severe consequences. They are constantly bombarded with pop culture images reinforcing the emphasis on the body and sexuality, and as most students have computers they have easy and fast access to porn. By looking at the amount of porn watched and the attitudes towards porn on Colby campus it was possible to evaluate the effects of this porn phenomena on the campus community and on the students social life style.

## **HUMAN PERCEPTIONS OF SELF-MOTION AND ORIENTATION DURING ACCELERATION AND DECELERATION IN A CENTRIFUGE**

**Sarah Harmon** ('12), **Mathematics**

To understand how the human neurological system works, it is useful to examine how subjects perceive (and in some cases, misperceive) their surroundings. To this end, studies have been performed in which a human's perception of self-motion and orientation relative to the Earth is compared with the actual position and motion of the subject. In this investigation, perceptions from subjects who underwent changes in acceleration and deceleration in a centrifuge were analyzed. Perceptions at each stage were compared and contrasted in terms of linear and angular motion. Models depicting both individual subject perceptions and the actual motion and orientation of the subject were developed for further insight and inquiry.

## **HUMAN TIGER CONFLICT IN SUMATRA AND PENINSULAR MALAYSIA**

**Aurore Anastassiadis** ('11) and **Li Chan** ('11), **Environmental Studies**

Peninsular Malaysia and Sumatra are home to two subspecies of tigers: the Malayan tiger and the Sumatran tiger. Yet, the high rate of human-tiger conflicts in these regions is a major contributing factor to the decline of these subspecies. Although many have explored the nature and extent of these conflicts, an effective way to compile, manage and present data and trends is not yet available. By using GIS and spatial analysis tools, we were able to represent tiger habitat locations, land cover, human-tiger conflict distribution and population density within a 5km zone of specific human-tiger conflicts in Sumatra and Peninsular Malaysia. Unfortunately, because of the lack of specific data on these conflicts, we were only able to carry out our analysis at the provincial level (with the exception of Riau). Although this data is not very specific, our analysis was inconclusive. This project calls for an online spatial database in order to appropriately compile data to facilitate the urgent conservation needs of these areas.

## **IBN KHALDUN (1332-1406): THE MEDIEVAL DAR AL-ISLAM'S GREATEST "RENAISSANCE MAN", HIS HISTORICAL AND SOCIOLOGICAL CONTRIBUTIONS, AND HIS ENCOUNTER WITH THE MONGOL CONQUEROR TAMERLANE**

**Daniel Franklin** ('10), **History**

Often remembered as a historian, sociologist and philosopher of significant genius, ibn Khaldun's achievements and activities extended far beyond these appellations and count him amount the few people of the Medieval Islamic world who can be characterized as "Renaissance Men." He was a wise and learned teacher, a chief justice in the Egyptian High Court, and a political advisor to some of the most powerful members of the ruling elite during his time. His greatest work was the Kitab al-'Ibar, the Universal History, in which his first volume, the Prolegomena or al-Muqaddimah, and his last volume, his "autobiography" or ta'rif, are the most

prized. It was these works and particularly the Muqaddimah that consumed most of ibn Khaldun's life, including his nearly 25 years living in Egypt, and that laid out for posterity certain principles of history and sociology and above all, the geographical, chronological and interpersonal connectedness of all social phenomenon and their results. His Kitab al-'Ibar helped set the foundation for methods of historical research that departed from historians of the medieval period and the distant past, who had relied more on the oral accounts passed on or shared with them by contemporaries, what some historians call the annalistic method, and relied less on the sources to be found in libraries and archives, which ibn Khaldun more than anyone utilized to the fullest extent possible to build his work upon a foundation of evidence. While he lived a long, complex life, we can gain some insight into ibn Khaldun's life as well as his time and place in history by exploring his historic 35 day long encounter with Tamerlane at Damascus in 1401, which, it can be argued, helped prevent the Mongol conqueror from continuing his rampage into Egypt and elsewhere to the West.

## **IDENTITY POLITICS IN POST-GENOCIDE RWANDA: OBSTACLES TO RECONCILIATION AND STABILITY**

### **James Goldring ('09), Government**

Since the genocide, the Rwandan government has undertaken several formal approaches, both traditional and innovative, to addressing its violent history. Despite the implementation of these methods of post-conflict traditional justice and official policy banning the use of ethnic identifiers in public discourse, divisions in post-genocide Rwanda remain strong and animosities ripe. Indeed, the government of the Rwanda Patriotic Front (RPF) has promoted, perhaps inadvertently, the further polarization of Rwandan identity since the genocide. In light of the regime's failure to acknowledge persistent ethnic prejudices and its particularly pernicious efforts to cast Rwandan Hutus as the sole perpetrators of crimes against humanity during the 1990s, the current Rwandan government has created a potentially dangerous post-conflict climate rife with fear, resentment, and social and economic inequality. The government's self-aggrandizing version of recent history and its enduring strategy of authoritarian rule may yet foster social conditions conducive to the outbreak of violence or civil war. What are the prospects for continued peace and stability in Rwanda should the regime's complete control of public discourse prove unsustainable?

## **IMAGING FOR BIOLOGICAL APPLICATIONS**

### **Daniel Nolan ('10) and Allyson Cheever ('11), Computer Science**

This study will establish a functional tool, portable to multiple platforms written primarily in Python, that will be able to capture images of growing plates from a specially designed light box and run several image processing algorithms effectively analyzing the plate for several factors including color, size, shape, reflectivity, transparency, and three dimensional morphology with minimal user involvement. The program will also be able to control its own lighting environment to effectively subject the growth plates to multiple lighting scenarios, gathering data from each and combining them for final analysis. Furthermore the project is designed to be cost effective potentially eliminating the need for larger more expensive arrangements with similar functionality. Testing this system will be made possible by the Colby College Biology Department, especially Brittany Thomas and Frank Fekete and the Henry Luce Foundation.

## **IMPROVING LIPSTICK QUOTIENTS: THE MEDIA'S CONSTRUCTION OF GENDER AND ROMANCE IN THE COLBY ECHO DURING THE 1950S**

**Emma Anastos-Wallen** ('11), **Women, Gender, Sexuality**

During the 1950s, the advertisements in the college newspaper, along with the literature from Colby, served as forms of social indoctrination that worked to appropriately prepare Colby students for the world beyond college. The advertisements in the Echo demonstrate the importance of commercial culture in creating and perpetuating normative gender roles for men and women. Furthermore, the advertisements are historical texts that reveal a great deal about society's gender expectations at Colby College in the 1950s. I will explore the ways in which these advertisements presented appropriate ideas about gender roles to Colby students while similar ideas were reinforced through the administration's own literature and guidebooks.

## **INTRAMOLECULAR REARRANGEMENTS OF CARBENES**

**Jonathan Guerrette** ('09), **Chemistry**

The intramolecular rearrangement of beta-acetoxycarbene (1) to vinyl acetate (2) has been observed in our laboratory, and three possible mechanistic pathways have been considered. Experiments with deuterium labeled precursors clearly show that while the 1,2-H shift is the predominant route to vinyl acetate from the carbene, the acetoxy group does move, albeit to a minor extent (~10%). It is not clear, however, whether the acetoxy group moves directly by a 1,2-OAc shift or if a five-membered cyclic transition state, involving the carbonyl oxygen, plays a role in the rearrangement of 1 into 2. To answer this subtle mechanistic question, this work discusses generating the carbene using an oxygen-18 label at the carbonyl position.

## **IS IT ALL ABOUT YOU?: INVESTIGATING ESSENTIAL COMPONENTS OF STORIES TO AROUSE SURVIVAL PROCESSING**

**Catherine Stewart** ('11), **Emma Anastos-Wallen** ('11), **Samantha Gillies** ('11) and **Kelley Overlander** ('11), **Psychology**

A great deal of research has been done on the effects of survival processing on memory. This investigation is a continuation of a previous Adaptive Memory study by Nairne, Pandeiranda, and Thompson (2008). They used a scripted story to elicit survival processing. Therefore, questions arise about what components of this survival story induce survival instincts, which result in better retention of survival words. We hypothesize that the individualistic nature of this scenario elicited self-preservation instincts, which were responsible for the higher memory recall. However, by altering the subject of the story from the individual to a relative or stranger, we predict that the survival instincts will not be as strong and thus, memory recall will be lower. Another component of the original story involved a predator, which we suspect also played a role in increasing survival processing. Therefore, by eliminating the predator from the story, we expect that survival processing will decrease resulting in lower word recall. Our study will build on the Adaptive Memory study to further determine what component of their story makes survival processing have such a powerful effect on memory.

## **ISOLATION AND CHARACTERIZATION OF COLONIZATION FACTOR GBPA IN *VIBRIO CHOLERAE* AND RELATED MARINE SPECIES**

**Andrew Hardigan ('10), John Brainard ('10), Trevor Hardigan ('09) and Julianne Kowalski ('11), Biology**

*Vibrio cholerae* is the bacterial pathogen responsible for the infectious disease cholera in humans. The pathogenesis of *V. cholerae* has been positively linked to the binding protein GlcNAc Binding Protein A, or GbpA. GbpA mediates attachment of the bacterium to GlcNAc (N-acetylglucosamine), which is found as a monomer chitin, the major component of aquatic zooplankton exoskeletons, as well as associated with mammalian epithelial cells. Interestingly, the *gbpA* has been identified in other bacterial species (via BLAST searches). Our research is directed towards identifying the prevalence and role of GbpA among environmental isolates of bacteria, particularly those isolates that are similar in phylogeny or virulence to *Vibrio* spp. Utilization of Gram staining, motility analyses, and 16S rRNA gene amplification and sequencing, we have identified over 20 bacterial species cultured from the chitinous exoskeletons of crayfish native to the Florida coast. Recovered isolates include both Gram-positive and Gram-negative species representing a wide phylogenetic spectrum. Of particular interest are *Myroides odoratimimus*, *Proteus vulgaris*, and a putative *Shewanella* spp, all Gram-negative with similar aquatic habitats to those in which *Vibrio* spp. are found. BLAST analysis of the *gbpA* gene from *V. cholerae* identifies that several of our isolated species contain genes with significant homology to the *V. cholerae* *gbpA*. Currently, we are utilizing western blot analyses with anti-GbpA *V. cholerae* antiserum to determine the presence of GbpA expression in these isolates. Continuing research aims to identify GbpA in additional spp. and characterize the role of GbpA of these isolates in mediating attachment to environmental and intestinal substrates, via a variety of in vitro attachment assays.

**IVORY DIPTYCH WITH NATIVITY, ADORATION OF THE MAGI, CRUCIFIXION, AND LAST JUDGMENT**

**Megan Conroy ('10), Art**

An ivory diptych from the Walters Art Museum is an excellent example of small-scale devotional art from the last quarter of the fourteenth century. Undoubtedly privately owned, it would have been used originally for meditation and prayer. The scenes depicted are the Nativity, Adoration of the Magi, Crucifixion, and Last Judgment. For private devotion, the life of Christ was the most popular and virtually standardized theme for the period. This standardization was conducive to the mass production of devotional objects. Most workshops were located in France near Paris, and the Parisian style became the most desirable among collectors, which meant all over Europe artists were trying to copy the Parisian style. This added to the similarity among devotional diptychs. Meditation on the Life of Christ, a text written in the same period by a Franciscan monk, stressed exploration of narrative scenes. In meditation guided by writings on the Life of Christ, the writer asks you to walk through scenes in your mind and experience them with all your senses. This approach fits perfectly with a diptych like this one. The diptych acts as a visual guide through the scene, so you can explore the Life of Christ with visual cues that encourage your sensual experience.

**KEYS AND ORCHARDS: MEMORY AND THE PALESTINIAN DIASPORA, 1948-PRESENT**

**Daniela Andreevska ('09), International Studies**

Extensive literature exists on the First Arab-Israeli War of 1948, which became the War of Independence for Israel and the Catastrophe for the Palestinians. Very little of the available literature concentrates on the memories of the Palestinian refugees about this defining moment in their national history. Based on twenty interviews with refugees in London, the UK and Michigan, the US and secondary sources, this project explores what memories about the events of 1948 and everyday life in Palestine prior to that Palestinians constructed and preserved six decades later. The research also addresses the questions of how the collective memory about al-Nakba shaped Palestinian national identity and personal self-determination, what potential and just solution to the current refugee crisis the expatriates proper envision, and why there has been no methodical efforts in the past to collect, organize, and publish narratives by Palestinian refugees despite the indisputable significance of memory-preservation for the formation and development of national identity, a socially-constructed value which acquires fundamental importance in the absence of and struggle for a national state in one's homeland. By suggesting answers to the above questions, the project not only explains the Palestinian present through the past but also gives the possible implications of 1948 for the future of the Arab-Israeli conflict and its potential solutions.

## **LAND USE PATTERNS IN THE BELGRADE LAKES**

### **Ian McCullough ('10), Environmental Studies**

Past research has concentrated on the effects of shoreline development on the six Belgrade Lakes individually, but this study focuses on the combined effects of all kinds of development throughout the entire Belgrade Lakes watershed on water quality of the Belgrade Lakes as a whole, especially the nutrient flow among the lakes. Build-out data, including information on time of construction and utilities, was acquired from the municipal offices located within the watershed. Digital maps of development history since the mid-eighteenth century by individual lake watersheds, the regional watershed and townships were created using a Geographic Information System (GIS) in ArcGIS 9.2 and 9.3. Land cover data was obtained from aerial photographs provided by the National Agricultural Imagery Program (NAIP) (2007 photos) and the Maine Office of GIS Data Catalog (2003 photos). Digital maps of land cover were digitized and categorized in ArcGIS. Water samples were taken at inlets and outlets of the six Belgrade Lakes to compare nutrient flow among the lakes during summer 2008. Modeling of the impacts of regional development on water quality of the Belgrade Lakes, utilizing the build-out history and land cover data and also incorporating slope, soil characteristics and municipal regulations to predict the location of future regional development and the additional nutrient load will occur during summer 2009.

## **LEARNING THE LAY OF THEIR LAND: DATA COLLECTION BY MAINE LAND TRUSTS**

### **Patrick Roche ('09), Environmental Studies**

Land trusts have led the recent, rapid expansion in private land conservation in the US. It is currently unclear what conservation values they protect, due to the large number of land trusts, their diversity of priorities, budgets, and operational scopes, and myriad conservation easement restrictions. Prior studies have evaluated easement restrictions and the characteristics of land under land trust protection. I take a novel approach by investigating the data that land trusts record about their protected properties and its impact on their capacity to protect conservation

values. I surveyed 55 land trusts operating in Maine about data they record in baseline reports. A majority (82%) had a baseline report, and a majority (55.6%) of those applied it to both conservation easements and fee owned land. Land trusts required very different types of data to be recorded on baseline reports: no variables were recorded by all and only 3 were recorded by more than 75%. Land trusts also tended to record ecological variables at coarse, landscape level resolution more often than specific, population or community level resolution. Land trusts that identified “wildlife habitat or important biodiversity features” as their primary priority recorded ecological variables slightly more often than other types of trusts; however, the trend of decreased recording with increased resolution remained. This suggests that land trusts, regardless of priority, are not well suited to conduct landscape scale analyses that require synthesis of standardized ecological data. Recording of invasive species was particularly unlikely. Land trusts now collectively protect enough land to influence landscape scale phenomena, and their influence is growing. My study suggests land trusts should reconsider current recording practices.

## **MAINE: CROPLAND AND AQUIFERS**

### **Michael Ambrogio ('09), Environmental Studies**

This map shows cropland in Maine in relation to the state’s aquifers. Cropland is displayed as the percentage of land covered by crops and pasture within a 2.5 km radius of any point. It combines data from the Maine Office of GIS, the National Map, ESRI 9.3 and Gulf of Maine Council on the Environment.

## **MEASURING AND MODELING THE KINETICS OF BULK ANTIOXIDANT ACTIVITY IN NATURAL WATERS**

### **Zachary Helm ('09), Chemistry**

In lakes and oceans biological species produce antioxidants, free-radical scavengers, in response to environmental stressors. The bulk antioxidant activity from many different species is characterized by the aggregate reactivity of each class of antioxidants with superoxide and hydroxyl radicals. The reaction of superoxide with antioxidants results in the oxidation of the antioxidants and the reduction of superoxide to hydrogen peroxide. We have developed new analytical methods for superoxide and hydrogen peroxide in order to measure the bulk antioxidant activity in natural waters. In our analytical system the chemiluminescence reagent MCLA competes with antioxidants for superoxide. The MCLA reaction produces light where reaction with the antioxidant quenches chemiluminescence. By carefully adjusting MCLA and superoxide concentrations to promote antioxidant chemiluminescence quenching it is possible to measure antioxidant activity at concentrations as low as one nanomolar. As a result of the bulk antioxidant activity there is a stoichiometric increase in hydrogen peroxide concentration from superoxide. Using known antioxidant reactivity we are now able to estimate the relative importance of antioxidants compared to disproportionation and metal redox cycling, the other mechanisms of superoxide removal, on superoxide decay in natural water samples. Using all of this gathered data we have successfully modeled the kinetics of the reaction of various antioxidants with superoxide and been able to predict their reactive rate constants as well as model an environment harboring many versatile superoxide quenching molecules.

## **MEAT IN EUROPEAN ART**

### **Fiona Braslau ('10), Art**

Food is largely represented in the arts, at times becoming the dominant subject matter, and sometimes revealing hidden meanings. This presentation will explore the various representations of meat in European art, from the sixteenth through the twenty-first century, and analyze their signification. I will address issues of artistic choice, individual style expression, and influence.

### **METHOD FOR THE PHOTOCHEMICAL PRODUCTION OF SUPEROXIDE RADICALS IN WATER-ETHANOL SOLUTIONS**

#### **Brian DiMento ('10), Chemistry**

Superoxide ( $O_2^-$ ) is a paramagnetic free radical formed by the one electron reduction of oxygen or the one electron oxidation of hydrogen peroxide. It is produced by photochemical reactions in the surface water of lakes and oceans, and is also released from the cells of marine plankton. Superoxide decay occurs on a time scale of seconds to minutes, and this rate is further increased by the presence of metals, making it impossible to prepare traditional standards to calibrate instruments for analytical work. This work focuses on developing an ultra-clean, well-defined system for the photochemical production of superoxide standards in aqueous media. Alkaline solutions of acetone and ethanol were irradiated to produce a ketone triplet, which then reacts with ethanol to produce two carbon-centered radicals. These radicals can then react with dissolved oxygen, producing superoxide and regenerating acetone, continuing the cycle. Absorbance measurements were used to measure superoxide concentrations during and after photolysis. We have measured superoxide production and decay rates as a function of pH, ethanol concentration, and irradiation time. We have also determined the effects of the ethanol concentration on the molar absorptivity and pKa of hydrogen peroxide and superoxide. These measurements were necessary in order to accurately predict and correct for the concentrations of superoxide and hydrogen peroxide throughout the photolysis. Using our reaction rates, we have determined the optimal conditions for the production of a superoxide standard.

### **MIDWIFERY IN THE USA: AN EXPLORATION OF THE DECLINE AND RISE IN MIDWIFE USE.**

#### **Abigail Sussman ('09), Sociology**

'We do not see childbirth in many obstetric units now. What we see resembles childbirth as much as artificial insemination resembles sexual intercourse.' --Ronald Laing, Psychiatrist. For the vast majority of world history, parturition has been a uniquely woman-centered phenomenon. The one exception to this norm is the contemporary state of childbirth in the USA, where it has become an increasingly medicalized field. This project explores the historical and contemporary states of midwifery in the USA. It places specific emphasis on the historical use of midwifery, the medicalization and professionalization of childbirth and the subsequent rise of the AMA, the marginalization and survival of the craft of natural childbirth despite this development, and the women's health movement of the 1970's and its assistance in the revitalization of midwifery. The demographics of the contemporary profession and community are examined, using the specific geographical community of midwifery in Maine.

### **MORE SHELTER WITH LESS MONEY: FUNDRAISING FOR THE MID-MAINE HOMELESS SHELTER**



### **Rebecca Lipson ('09) and Carley Millian ('09), Sociology**

Becky Lipson and Carley Millian are working with the Mid-Maine Homeless Shelter whose mission is to “to provide emergency food and shelter to homeless and displaced persons in Central Maine.” The homeless shelter temporarily houses guests, strives to find them affordable housing, and refers them to other necessary services. With the recent economy, Becky and Carley decided to focus on fundraising by grant writing. In order to take on this project they had to study how the homeless shelter is run, the demographic they serve and the financial needs of the shelter. They have learned why grant writing is essential to the fundraising for the Mid-Maine homeless shelter, how to find foundations for grants, and how to write a grant. In addition to grant writing, Becky and Carley are creating an online newsletter to better connect the community with the activities of the homeless shelter. Since Becky and Carley realize that they are only working with the homeless shelter for one semester, a portion of their project will be a suggestion on how to make their project of grant writing and newsletter writing a sustainable program offered at Colby.

### **MORPHOLOGICAL FLUCTUATIONS OF THE SAHARA DESERT: AN OVERVIEW OF QUATERNARY CLIMATE CHANGE AND GEOMORPHOLOGY WITH SPECIAL ATTENTION TO WATER.**

#### **Frederick Freudenberger ('09), Geology**

The Sahara Desert is the worlds largest aeolian system. However, it has not always been as dry as it is now. For thousands of years the Sahara has gone through multiple cycles of arid and humid climates. In the Quaternary, these cycles start to become noticeable around a shift from Pleistocene aridity, around 40,000 bp, towards Late Pleistocene and Holocene humidity, around 16,000 bp. However, near 6,000 bp, the humid period ended and North Africa began to follow a trend of increasing aridity. The process of desertification is intertwined in these climate cycles. During humid phases, water eroded southern sandstone, moving sediment to more northern lakes that would dry up when an arid climate returned. Then, aeolian forces would take the sediments from the dry basins and form them into dunes. The dunes would then stabilize when vegetation became present in more humid times, only to mobilize when aridity re-emerged and the plant life died off. The climate cycles of North Africa are tied to global climates as well. Saharan climates would shift with glacial periods and world climatic events. However, currently the Sahara is rapidly expanding beyond the natural aridification process, due to anthropogenic causes. By looking at the ways in which the Sahara has changed in the past, perhaps the ways in which it is changing now, and will change in the future, can be better understood.

### **NOETHER'S AND GOLDSTONES THEOREM IN PARTICLE PHYSICS**

#### **David Connick ('09), Physics and Astronomy**

Symmetries are common throughout nature and are important in the field of physics. In particle physics we can look at symmetry transformations and spontaneously broken symmetries. It is important to keep in mind that in physics we can have both Global and Local symmetries each of which acts differently under the transformations and when the symmetry is spontaneously broken. These considerations are especially important when dealing with the two very important theorems of symmetries in physics, Noether's theorem and Goldstone's theorem.

## **ONLY A THEORY**

### **Frederick Freudenberger ('09), Theater and Dance**

ONLY A THEORY is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. ONLY A THEORY is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **OCCUPATIONAL AND GEOGRAPHIC MOBILITY OF ARMENIAN IMMIGRANTS**

### **Gregory Zartarian ('09), Economics**

When Armenian men first arrived in the Northeastern United States, they worked in the mills and factories to save money with the dream of sending for their families and moving to Fresno, California. Once in Fresno, the Armenians tended to move into the higher class occupations such as farming or small business owning. In order to further explore the historical pattern of Armenian immigration, this paper provides an empirical analysis of the geographic and occupational mobility of Armenian immigrants using individuals linked from the 1900 through the 1930 census records. Although this was the desired goal for a number of immigrants, not all were able to move westward geographically or upward occupationally. An education increased the probability of moving west as well as the probability of moving to a higher class occupation. Education also decreased the probability that an individual would lose ground in the labor market by moving to a lower occupational class. In addition, those who moved west were more likely to be upwardly mobile than those who remained in the Northeast. Ultimately, leaving the Northeast tended to pay off as those who moved west or lived in California in 1900 held higher class occupations than the Northeast persists.

## **ORANGUTANS, PALM OIL, AND FOREST DESTRUCTION IN INDONESIA**

### **Emma Balazs ('09), Seth Chanin ('09), Stephen Erario ('10) and Erin Maurer ('11), Environmental Studies**

Forests in Indonesia are being illegally logged and converted to palm oil plantations at an alarming rate. These activities are intruding into Indonesian national parks, the only suitable orangutan habitats remaining. Palm oil is used as a substitute for vegetable oils and as an additive in biofuels; demand for this commodity has increased substantially in past years as a result of its relatively low price and broad variety of uses. The effects of forest degradation have severely impacted orangutan populations, which are endemic to Indonesia and are already endangered. Forest degradation leads to declines in food resources, shelter, and nest availability, forcing orangutans to move into suboptimal habitats. Unfortunately, efforts to establish additional palm oil plantation in grasslands will only marginally lower the market price of this commodity and will therefore do little to reduce incentives for conversion of forest habitats. However, recent efforts to certify sustainable palm oil, encourage stakeholder approaches to forestry, educate consumers of palm oil, and remove palm oil subsidies may serve to lessen threats posed to orangutans.

## **OUTDOOR LIGHTING ON COLBY COLLEGE CAMPUS**

**Francis Gassert ('11) and Meghan Cornwall ('11), Environmental Studies**

Outdoor lighting is an essential component for nighttime safety on college campus. Outdoor lighting on Colby College campus is uneven, leaving some areas with minimal light. The purpose of this project is to analytically evaluate if and where major walkways on Colby College campus have inadequate light levels. We found that most paths on campus do have adequate lighting, while in general wide open spaces on campus have the lowest light levels.

**PAST AVAILABILITY OF DIETARY CHOLINE MODULATES SUBSEQUENT CHOLINE INTAKE AND ADULT CHOLINE LEVELS MEDIATE THE ANXIOLYTIC EFFECTS OF ENRICHMENT**

**Jennifer Corriveau ('10), Psychology**

Choline is an essential nutrient with many biological functions, including the production of the neurotransmitter acetylcholine. While there has been a good amount of research examining the outcomes of prenatal and adolescent choline supplementation, the field lacks sufficient research looking at the implications of supplemental or deficient choline levels on adults. The present study consisted of two experiments designed to explore questions related to adult choline intake in rats. In the first experiment we explored the hypothesis that rats may selectively consume choline rich diets over diets lacking choline on the basis of an increased demand for choline induced either by a metabolic imprinting with prenatal supplementation or a prolonged deficiency experienced in adulthood. In the second experiment we examined the hypothesis that adult choline supplementation would enhance the beneficial effects of an enriching maze experience on anxiety levels in an open field test.

**PERSONALITY: DO MAGAZINE QUIZZES CORRELATE WITH THE BIG FIVE INVENTORY?**

**Meredith Tumilty ('10) and Brittany Tasi ('10), Psychology**

The purpose of our study was to assess if Cosmopolitan measured all aspects of personality as defined and measured by John & Srivastava's (1999) Big Five Inventory. Our study is important because no previous research had examined personality quizzes in any pop-culture magazine targeting college-aged females. Sixty college-aged females (M=20.12 years) completed a compilation survey of Cosmopolitan personality quiz questions as well as the Big Five Inventory (John & Srivastava, 1999) and a brief demographic questionnaire. As predicted, our results indicate that Cosmopolitan personality quiz questions more often target Extraversion than any other Big Five domain. The only significant overall correlation was found between the Cosmopolitan measures of Extraversion and the Big Five Inventory measure of Extraversion,  $r(58) = .38, p < .01$ . Also as expected, females placed less importance on Cosmopolitan quiz scores than established measure scores. The implications of our study are that personality quizzes published by Cosmopolitan magazine are not comprehensive measure of personality and should not be relied upon to assess a person's personality.

**POSTNATAL CHOLINE AVAILABILITY MODULATES THE BEHAVIORAL CONSEQUENCES OF CHRONIC MILD STRESS IN MALE RATS**

**Kelly Brooks ('09), Psychology**

Emerging research shows that the dietary choline may protect against the maladaptive effects of stress on brain and behavior. It is well known that an organism's exposure and reaction to stressful situations play a key role in the onset and progression of depressive symptoms and related disorders. The current study looked at the effects of chronic mild stress (CMS), an animal model of depression, in male rats supplemented with (SUP) or completely deficient (DEF) in dietary choline during a period of high neural plasticity, in this case just before and including adolescence, on behavioral, physiological, and neural measures. CMS is used to induce the anhedonia characteristic of depression in rats, such that they display little interest in otherwise appetitive activities and low levels of activity and exploration. The present report focused on the effects of 3 weeks of CMS on measures of despair and anhedonia, forced swim and saccharin preference tests respectively, and measures of exploration/activity and anxiety in an open field test. We observed only modest changes in the behavior of control-fed rats (CON) undergoing CMS compared to CON rats that did not. DEF rats were less active and more anxious in the open field. However, both SUP and DEF rats showed no significant effects of CMS on forced swim whereas CON rats did. These intriguing new data are consistent with diet-induced alterations in stress reactivity but future research is needed to firmly distinguish between positive and negative outcomes. Continuing research on neural outcomes in these rats will provide insight into the neural mechanisms underlying the interaction between CMS and dietary choline.

## **POWER FITNESS**

**Veronica Romero ('09), Jeffrey Jarnot ('10) and Catherine Nix ('10), Psychology**

Regulatory fit theory was applied to power in this study. The experiment investigated whether power status (high vs. low) predisposes people to tackle tasks by a specific mean as proposed by regulatory focus theory (promotion vs. prevention). The obtained results show that when people in a high power status are presented with a listing task using promotion vocabulary they will perform better than when presented with a prevention listing task. People in a reduced power position, however, were more productive when the listing task was presented in a prevention fashion than in a promotion one. These results support our hypothesis that people in high power solving promotion tasks and people in low power solving prevention tasks experience regulatory fit. Conversely, people in high power presented with a prevention task and people in low power presented with a promotion task experience regulatory nonfit instead.

## **PREFERENTIAL PHAGOCYTOSIS OF GRAM-NEGATIVE BACTERIA BY ZEBRAFISH LEUKOCYTES**

**Corey Martin ('10), Biology**

Two primary cell types, macrophages and neutrophils, are responsible for the phagocytosis and elimination of bacteria and other pathogens which enter the body. These cells are components of the innate immune system, the body's first line of defense against infection and disease.

Leukocytes, white blood cells including macrophages and neutrophils, target bacteria by recognizing common pathogen associated molecular patterns (PAMPs) located exclusively on the exterior of prokaryotic cells. This study uses zebrafish leukocytes to investigate whether or not macrophages and neutrophils preferentially target a particular pattern over another. To do this, a competition assay was established in which fluorescently labeled gram positive bacteria (*S. aureus*) was introduced to leukocytes simultaneously with gram negative bacteria (*E. coli*) marked with a different fluorescent label. Preliminary results have found that *E. coli* is

preferentially targeted by the zebrafish leukocytes. The percentage of macrophages and neutrophils phagocytosing *E. coli* has been found to be relatively independent of concentration of *S. aureus*, whereas the phagocytosis of *S. aureus* has been found to be inversely proportional to the concentration of *E. coli*.

## **PROTECTING MAINE'S MAMMALS: A MODEL OF HUMAN FOOTPRINT AND BIODIVERSITY IN THE NORTH WOODS**

**Lindsay Dreiss ('09), Environmental Studies**

The Maine North Woods, at over 4 million hectares (10 million acres), is the largest tract of undeveloped forest land east of the Mississippi River. It is also an area of crucial habitat for many large mammal populations which act as focal species to the region. Recent rapid changes in land ownership have caused an increase in parcelization, fragmentation, and raised questions over proper management. Emerging trends in climate change are also taking their effect on the ecoregion. Using ArcGIS 9.3, I established an appropriate boundary to define “the North Woods.” ArcGIS was also used to conduct analyses on current and future trends in human footprint and climate change to assess focal species distributions and biodiversity hotspots. The species of focus were large mammals, which may be particularly vulnerable to large-scale change; *Alces alces* (Moose), *Canis latrans* (Eastern Coyote), *Lynx canadensis* (Canada Lynx), *Lynx rufus* (Bobcat), *Martes americana* (American Marten), *Martes pennanti* (Fisher), *Odocoileus virginianus* (White-tailed Deer), and *Ursus americanus* (Black Bear). Due to projected increase in human activity along the southern territory of the North Woods as well as warming climates and contraction in conifer stands, Lynx, Marten, and Moose population distributions are projected to retract northward in winter months. However, Bobcat, Fisher, Deer, and Coyote ranges are likely to expand. Biodiversity hotspots in the North Woods will be located in the northern and western areas of the North Woods by the end of the century. To protect the future of these focal species in the North Woods, conservation efforts and land use regulations should be implemented accordingly.

## **PUBLIC GOODS PROVISION AND LOCAL GOVERNANCE IN CHINA: EVIDENCE FROM RURAL GANSU PROVINCE**

**Yilin Xu ('09), Economics**

Using data from the Public Policy and Rural Poverty Survey 2004 and 2007 waves, this paper studies both the political economy of rural governance and the relationship between local governance characteristics and public goods provision in rural Gansu Province, China. The paper finds that the Communist Party branch is more powerful than the administrative branch of the rural governance structure. Incumbent village leaders concentrate public investment projects in years immediately before scheduled elections, and rural elections have not resulted in the concentration of power in large clans in villages. Stricter absentee ballot regulations and more democratic party head election processes contribute to better education and healthcare infrastructure. Predominately Han villages experienced faster education infrastructure improvement between 2003 and 2006, while minority villages enjoy better healthcare infrastructure. Lastly, larger villages are disadvantaged in terms of providing public goods and should receive more assistance from upper level governments.

## **RACIAL IDENTITY, DOUBLE CONSCIOUSNESS AND THE AFRICAN DIASPORA**

## **IN THE 2008 U.S. PRESIDENTIAL ELECTION**

### **Danielle Sheppard ('11), Anthropology**

The 2008 presidential election served to completely alter the pattern of politics that has existed in our country since George Washington became the first president in 1789. For the first time in the history of the United States of America, a non-white citizen was chosen as the presidential nominee of a major party. This archive analyzes the election by comparing the influence of the different physical identities of the candidates, focusing primarily on racial identity and politics. I examined racial identity through the idea of 'double consciousness', as explained in Paul Gilroy's book, *THE BLACK ATLANTIC*. The concept of double consciousness is that, for blacks, there is a constant inner-struggle between understanding one's self-identity while dealing with the identity expectations and stereotypes of a society. First, I looked at the extent to which racial identity is inescapable for political candidates despite their intentions. Second, I observed how such racial identities affect voters-either passively or through the actions of the candidate. This study on the duality of racial identity in the American political sphere demonstrates a significant encounter with the African Diaspora and is extremely representative of the Diaspora dynamic.

## **RE-IMAGINED COMMUNITIES: GLOBAL CLIMBING ON LOCAL MOUNTAINS**

### **Eitan Green ('09), Anthropology**

This thesis explores the global climbing community as an open, unbounded community of individuals involved in climbing mountains, boulders, cliffs, and frozen waterfalls of all sizes. This global climbing community has centers all over the world though its participants are highly mobile. This research explores the concept of unbounded transnational community construction through the climbing community. The global climbing community is a process, performance, and negotiation. Its material and social networks span across the globe and facilitate a sense of community. Communications technologies as well as systems of mobility are the material foundations for the construction of this community. These networks demonstrate the ways that international capitalism, through corporate websites and international tourism is intertwined with the construction of the global climbing community. These networks are fundamental to the creation of a sense of a shared experience among participants who will never know one another. Unlike many studies of global communities, the landscape is an essential symbol for the construction the climbing identities that make up the climbing community. Within the climbing community landscape is deployed as a symbol both nostalgically and restrictively according to ethnic stereotypes and hegemonic norms proliferated in climbing media. After an exploration of the global climbing community, this study deconstructs the hegemony of that community by examining the negotiation of climbing identities historically and contemporarily. The history of mid-Victorian mountaineering sets the stage for the contemporary negotiation of women's roles in the climbing community. Finally this study examines how, in India, ethnic identity limits or expands climber's professional opportunities.

## **REACTION LATENCY PERIOD IN RESPONSE TO TACTILE STIMULI**

### **Daniel Heinrich ('09) and Dylan Perry ('09), Biology**

Last year we conducted a research project on reaction latency period across the human body. Reaction latency period can be defined as the time it takes for a subject to receive a tactile

stimuli and then press a button. The time between these two actions is the reaction time of the individual. Previous research conducted last year measured latency periods from four stimulus locations on the body: top of the foot, back of the hand, lower back, and back of the neck. It was determined that the fastest reaction times were at locations on the body that were closest to the brain. The reaction times, in order from fastest to slowest, were the back of the neck, back of the hand, lower back, and top of the foot. This year, we continued our research to further examine latency period in the human body. One of the objectives of this project was to explore the 'priming' effect seen last year. The order in which subjects were tested was kept constant last year, and by doing so we believe that subjects became better, or 'primed,' at these reaction time tests. By randomizing the order of tactile stimuli across the body, we measured if priming had an effect on the subjects. Another objective of the project was to take physical measurements of subjects to develop a crude model relating physical neuronal distance and reaction time. This formula can be used to estimate reaction time for persons that are 18-22 years old. Our presentation will show our results from these experiments and additionally we will show our compiled data from the last two years.

### **READING JOYCEAN COMEDY AND FAULKNERIAN TRAGEDY: EXPLORING THE SIGNIFICANCE OF LOCATION, LITERARY INFLUENCE AND THE POSSIBILITIES OF HEROISM WITH LEOPOLD BLOOM IN JOYCE'S ULYSSES AND QUENTIN COMPSON IN FAULKNER'S THE SOUND AND THE FURY AND ABSALOM, ABSALOM!**

**Colin Cummings ('09), English**

The distinct similarity between Joyce's and Faulkner's philosophical concerns (the affirmation of life in spite of its myriad difficulties), and the striking disjuncture between their aesthetic approaches (comedy for Joyce and tragedy for Faulkner), is where my interest in this project began. I sought to explore the lives and works of both writers in order to get a sense of how two artists could attempt to convey a similar message through such different means. The first thing I explore is a number of similarities between Joyce's and Faulkner's personal worlds (particularly their intimate connections to location) and their sources of literary influence (of particular interest here is the possibility of Joyce's influence on Faulkner). Second are the ways in which Joyce came to comedy and Faulkner came to tragedy as the organizing principle of the worlds they went on to create. Finally, I explore the ways in which Joyce's and Faulkner's projects are carried out with the characters of Leopold Bloom and Quentin Compson, and the ways in which these characters embody a number of qualities of the classical hero in spite of the manifold difficulties that come with living in the modernist world.

### **RECONNAISSANCE FABRIC ANALYSES OF THE NORTHERN MYLONITE ZONE, MEDICINE BOW MOUNTAINS, WYOMING**

**Jacob Schwarz ('09), Geology**

This study reports reconnaissance quartz c-axis-fabric and microstructural analyses of part of the northern mylonite zone, Cheyenne Belt, Medicine Bow Mountains, southeastern Wyoming. Quartz c-axis and oblique-grain-shape fabrics were measured in three epidote-amphibolite-facies mylonitic quartzites to determine the nature and slip direction of the fault system. Strike-and-dip of foliations for the three samples range from 037 to 072 and 69 to 76 NW, and trend-and-plunge of elongation lineations range from 353 to 012 and 56 to 67. Samples collected at the outer edge

of the shear zone exhibit single-girdle quartz c-axis fabrics with only faint outlines of a second girdle, indicating simple-shear-dominated flow. A third sample from the interior of the shear zone yields an asymmetric cross-girdle c-axis fabric, indicating a large component of pure-shear. No previous studies report significant pure-shear flow in this shear zone system. The oblique-grain-shape fabrics indicate the same sense of shear as the asymmetric quartz c-axis fabrics. However, pervasive grain-boundary-migration dynamic recrystallization resulted in large variability in the long-axis orientation of recrystallized grains, making the oblique-grain-shape fabrics unsuitable for quantitative kinematic vorticity analyses. All samples from this study show S-side-up motion verging to the NNW. In present-day coordinates, this indicates an apparent normal sense of shear. There are two possible deformational scenarios that fit these data: (1) this shear zone may represent a reverse fault, later rotated through vertical (Duebendorfer, 1986), and (2) This shear zone may record subvertical extrusion with the simple-shear-dominated samples representing a stretching fault at the zone margins.

## **REGULATION OF D-PAX-2 BY PRONEURAL GENES**

### **Seth Johnson ('10) and Frances Still ('10), Biology**

Sensory organ development in *Drosophila melanogaster* is a complex and dynamic process. It involves the specification of a sensory organ precursor cell (SOP) which then undergoes three asymmetric divisions resulting in the four cells that comprise each bristle (neuron, shaft, sheath, and socket). D-Pax2 is a transcription factor known to act within this differentiation process. Expression of D-Pax2 has been shown in both early stages (SOP) and later stages of development, yet it is unknown how this gene is activated at either time. We suggest that proneural gene proteins, which are known to encourage a cell to adopt a neurogenic fate early in development, activate the early expression of D-Pax2. The proneural genes encode basic helix-loop-helix (bHLH) proteins which bind to a consensus E-box sequence. We have identified E-box sequences in multiple areas in the putative bristle enhancer element of D-Pax2. It is our hypothesis that the proneural proteins activate D-Pax2 via direct binding to these enhancer elements. We have tested this hypothesis by generating transgenic flies bearing a reporter construct containing the bristle enhancer coupled to GFP. We have created two such sets of constructs; one containing a wild type D-Pax-2 enhancer and another with a mutated E-box site. Through a comparison of the expression patterns D-Pax-2, visualized with immunofluorescent staining, and our construct via GFP, we show that our bristle enhancer construct is sufficient to drive D-Pax2 expression in vivo.

## **REGULATION OF D-PAX2 BY PRONEURAL GENES**

### **Seth Johnson ('10) and Frances Still ('10), Biology**

Sensory organ development in *Drosophila melanogaster* is a complex process. It involves the differentiation of a sensory organ precursor (SOP), in which three asymmetric cell divisions result in four cells that comprise each bristle (neuron, shaft, sheath, and socket). The genetic pathways that regulate this process are complex, and only a few parts of this process are well understood. D-Pax2 has a role in this differentiation process, and is expressed early in the SOP and its progeny cells, but has been shown to act later in the differentiation of the shaft cell as well. Proneural genes act in the division of the SOP, but are not present in the progeny cells. Proneural genes encode for basic helix-loop-helix (bHLH) proteins which bind to a consensus E-box sequence. We have found several E-box sequences in the putative bristle enhancer element



of D-Pax2. We hypothesize that the direct binding of these proneural proteins activate D-Pax2 through direct binding to the enhancer elements. We have generated transgenic flies bearing a reporter construct containing the putative bristle enhancer coupled to GFP. Through analysis of these flies, we show that the reporter construct is sufficient to drive D-Pax2 expression in vivo.

## **RELATIONSHIP BETWEEN PRESCHOOL CHILDREN'S NUMERICAL CAPABILITIES AND UNDERSTANDING OF AGE**

**Tara Brian ('10), Nina Gold ('09) and Rebecca Julian ('09), Psychology**

A study on 3 to 5-year-old children's understanding of absolute and relative number and whether it explains difficulties children have in judging people's ages.

## **REPRESENTING HARVEY MILK IN THE MEDIA 1973-1988**

**Qainat Khan ('11), Women, Gender, Sexuality**

With the recent release of Gus Van Sant's film, Harvey Milk has entered the consciousness of a large audience who perhaps would have been untouched by the history of gay political activism and the gay movement's "first martyr." In a similar vein, my project seeks to understand how public memory in the specific case of Harvey Milk is produced, manipulated and utilized strategically. By analyzing mainstream and gay newspapers' coverage of Milk's campaigns, election, death and remembrances from 1973-1988, and situating these within the historical context and social climate of the time, I seek to show how Milk's legacy was constructed strategically in order to serve as a symbol, a larger than life representation of the man, for the mobilization of the gay rights movement.

## **ROMANTIC REPRESENTATIONS: THE INTERCULTURAL TRANSLATION OF BODY AND COMMODITY IN ORIENTALIST DISCOURSE**

**Ellen London ('09), English**

Using Thomas de Quincey's *Confessions of an English Opium Eater* and Charles Montesquieu's *Persian Letters* as my primary texts and Jia Zhangke's *The World* as my comparative film, I analyze the role of language as an imperial force in Romantic literature and contemporary film. By providing the historical background and cultural contexts for each time period, I suggest the role of these works in creating a Western "Self" identity and an Eastern "Other" identity, the former privileged over the latter in both content and practice. I identify the main tropes of Romantic literature—including representation, penetration, and commodification—and then analyze the way in which they create a decidedly Orientalist discourse among both Romantic writers and modern-day filmmakers. The Orientalist themes that I follow most closely are the eroticization of people and landscape and the continual dismantling of these two entities by "synecdoche," in which one part is made to stand for the whole, and "hyperbole" and "digression," which reduce people and landscape into their individual parts. For a theoretical framework, I draw upon Lawrence Venuti's studies of language in translation and Michel Foucault's theories of "the gaze" and the "panopticon" as subjugating forces between object and subject. I also employ observations by travel writing theorists, including Chloe Chard, Carol Crawshaw, John Urry, and David Spurr to redefine the role of the tourist in commodifying the Oriental landscape. I conclude my study of the historical linguistic interplay between East and West with the assertion that intercultural translation is hardly a subject reserved for the Romantic

time period; rather, that Oriental tropes and their global impact are promulgated by literature and film well into the present day.

## **SEXUAL DEBUT**

### **Kathleen Brzozowski ('09), Theater and Dance**

SEXUAL DEBUT is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater.

SEXUAL DEBUT is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **SWORD AND SHIELD**

### **Kris Miranda ('09), Theater and Dance**

SWORD AND SHIELD is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. SWORD AND SHIELD is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **SELF, SCHOOL, SPORTS: THE RELATIONSHIPS AMONG GENERAL PERSONALITY, ROLE SPECIFIC PERSONALITIES, AND ROLE-SPECIFIC OUTCOMES**

### **Megan Dean ('09) and Sara Cameron ('10), Psychology**

Relationships among general personality, two role-specific personalities (academic and athletic), and role-specific outcomes were investigated in the present study. Participants, volunteers from Colby College, will complete one 20-item Big Five Inventory questionnaire for their general personality, one for their academic personality, and one for their athletic personality. They will also complete questionnaires about academic and athletic performance outcomes. The collection of this information has three main objectives. First, it will examine whether the general personality or the relevant role-specific personality is a better predictor of the role-specific outcomes in academic contexts and athletic contexts. Second, it will examine the strength of the correlation between general personality and each role-specific personality. Finally, it will examine the strength of the correlation between the academic and athletic personalities. Analyses suggest that role-specific personalities, both academic and athletic, are better predictors of performance outcomes in their domain than is general personality. Analyses also suggest that the relationship between general personality and academic personality is stronger than either the relationship between general personality and athletic personality or academic personality and general personality.

## **SEXUALITY, GENDER AND THE LAW IN THE UNITED STATES**

### **Naomi Smith ('09), Women, Gender, Sexuality**

In 1953, on the day before graduation at Colby College in Waterville, Maine, a dead infant was found concealed within a trunk in the basement of Mary Low Dormitory. The mother of the child

was quickly identified as a Colby Student, Harriet Sart, who was placed under custody of the Waterville Police. Initially, one must understand the environment that forced Sart to conceal her pregnancy and the birth of her child. Also, despite the rawhide cord found around the infant's neck, in the weeks following this event Sart's charge changed from murder to concealment of an illegitimate issue. Due to Sart's eventual acceptance to post-war traditional family roles, the persistence of in loco parentis (in place of parents) on campus, and the pre-sexual revolution gender roles, she was able to construct herself as an acceptable woman. This changed Sart from a fallen woman to an honorable mother. By understanding the legality of the charges, the national mores of the time, and the parallel ideology present at Colby College, one can understand the dramatic change in perception surrounding Harriet Sart.

## **SOCIAL EFFECTS ON THE DYNAMICS OF GROUP SYNCHRONY**

### **Madison Gregor ('09), Psychology**

A number of studies have demonstrated that individuals can both intentionally and unintentionally synchronize to the rhythmic movements of another individual. Richardson et al (2008) found that a group of six individuals can intentionally coordinate their rocking movements in rocking chairs, but there was no emergence of unintentional coordination at the group level. There are two possible reasons as to why these trials were not different. First that the differences between the natural (self-selected) tempos of the participants in a group may have been too big for the (peripheral) visual coupling to overcome. Second, the visual coupling may have been too weak in general, and that unintentional coordination will result if we increase the visual focus (amount of visual movement information attended too). These two experiments replicate the Richardson et al (2008) study, but experiment 1 used a social manipulation to increase visual focus and connect people socially. Experiment 2 aimed to reduce period difference and increase visual focus and social connectivity. Intentional coordination was found in both experiments. However, neither experiment had significant differences between the baseline and the unintentional trials.

## **SPREAD OF VARIABLE LEAF MILFOIL IN MAINE**

### **Katherine Orrick ('10) and Brian Lynch ('09), Environmental Studies**

The spread of *Myriophyllum heterophyllum*, variable leaf milfoil, has been found in Maine since 1970. We created an analysis area including 18 infestation sites and all bodies of water within a 40 mile buffer. We also eliminated all water locations with a size less than 224,578 m<sup>2</sup>, the size of the smallest infestation site, Shagg Pond. Within those specifications we randomly selected 18 un-infested bodies of water and used them as our uncontaminated sample. We looked for a correlation between existence of a boat launch, the number of boat launches at each lake, and if the drive was within an hour of a densely populated area. Comparing the sample size of non-infested lakes to the infested lakes, we found there was no significant difference between an hour drive and infestation, but there was significant difference between whether the lake had a public access boat launch, and number of public access boat launches on a body of water.

## **STORAGE OF IDIOMS IN THE MENTAL LEXICON: A COMPARISON BETWEEN NATIVE AND L2 LEARNERS**

### **Jennifer Corriveau ('10), Claudia Sanchez Gutierrez ('10) and Chelsea Stillman ('10),**

## **Psychology**

The purpose of this study is to clarify the nature of idiom storage in memory for both native and non-native English speakers. We will explore whether idioms are stored as larger lexical units or individual words. Forty participants (20 native and 20 non-native English speakers) will view a list of noun-verb idioms that are either slightly altered or in their intact form. Participants then take a recognition test in which the idioms (either in the same form or altered from study) are presented amongst non-studied foils. We hypothesize that native speakers process idioms as units while non-native speakers engage in word-by-word analysis to obtain the idiom's meaning as they would a sentence. It is expected that in the condition where idioms are altered at presentation and intact at recognition native speakers will make more errors because they rely on a stored semantic unit. When idioms are intact at presentation and altered at recognition native speakers will make fewer errors. Non-native speakers are expected to differ less across conditions in their ability to recognize studied idioms because they process all of them word-by-word.

## **SUB-INHIBITORY EFFECTS OF CHLORAMPHENICOL ON BIOFILM PRODUCTION IN PSEUDOMONADS WITH AND WITHOUT THE PRESENCE OF AN EFFLUX PUMP INHIBITOR**

**Kirby Walker ('09) and Kenneth Flynn ('09), Biology**

The production of exopolysaccharide (EPS) by bacteria is well documented as a non-specific protective mechanism against environmental threats, produced notably by members of the *Pseudomonas* genus including *Pseudomonas aeruginosa*. *Pseudomonas aeruginosa* is an opportunistic pathogen responsible for many infections in cystic fibrosis patients that remain difficult to treat due to antibiotic resistance. EPS production is often a precursor to biofilm formation, promoting cell-to-cell contact, horizontal gene transfer (HGT) of resistance genes and adherence to biotic and abiotic surfaces, all of which contribute to bacterial persistence in chronic infections. Aminoglycoside antibiotics have been shown to induce biofilm production in *Pseudomonas aeruginosa* and exposure to sub-inhibitory antibiotic concentrations may actually promote and sustain biofilm formation. Here, sub-inhibitory levels of chloramphenicol induced the production of slime and biofilm formation by *Pseudomonas aeruginosa* and *Pseudomonas putida*. Additionally, the presence of an efflux pump inhibitor decreased the concentration at which this induction occurred. The results suggest that this induction by *Pseudomonads* is a general defense by members of the *Pseudomonas* genus and that efflux may be important in this induction.

## **SYNTHESIS AND CHARACTERIZATION OF ORGANOMETALLIC COMPLEXES**

**Thora Maltais ('09), Chemistry**

Numerous transition-metal  $\pi$ -arene complexes have been extensively studied and some are useful for industrial or laboratory synthetic applications. However, little information exists about copper-arene complexes and their properties and potential applications. We are continuing to add to the sparse knowledge in this field through the synthesis of Cu(I) complexes containing NS<sub>2</sub>-macrocyclic ligands, one containing a pendant phenyl group and the other a pendant naphthyl group. The synthesis and characterization of these complexes will be discussed, including any Cu(I)-arene complexes with these ligands that we are successful in making.

## **THAT ONE DAMN BUST**

### **Sean Senior ('10), Theater and Dance**

THAT ONE DAMN BUST is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. THAT ONE DAMN BUST is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **THE ELGIN WAR**

### **Kate Vasconi ('09), Theater and Dance**

THE ELGIN WAR is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. THE ELGIN WAR is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **THINGS YOU CAN'T SEE**

### **Kate Tommasino ('09), Theater and Dance**

THINGS YOU CAN'T SEE is a ten-minute play selected to be part of the Colby College New Play Festival, to be performed on April 30, May 1 and May 2 at 7:30 p.m. in Strider Theater. THINGS YOU CAN'T SEE is one of nine winning plays (all by Colby students) selected by a jury made up of Colby faculty, staff and students. All nine plays will be performed each evening of the Festival run.

## **TESTING THE TRANSPRESSION HYPOTHESIS USING QUALITATIVE PORPHYROCLAST ANALYSES: AN EXAMPLE FROM THE SOUTHERN MYLONITE ZONE OF THE CHEYENNE BELT SHEAR-ZONE SYSTEM, WYOMING**

### **Caroline Hunt ('09), Geology**

The Cheyenne belt of southeastern Wyoming is a system of subvertical plastic shear zones with down-dip elongation lineations forming the boundary between the Archean Wyoming craton and the Paleoproterozoic Colorado province. Previously it was interpreted as a series of dip-slip shear zones. However, numerical simulations of deformation indicate that this fabric geometry may record transpressional deformation with a large strike-slip component. This is also coupled with vertical extrusion out of the zone in response to a pure-shear component of deformation. Using samples from the southern mylonite zone of the Cheyenne Belt, and a semi-qualitative porphyroclast analysis, this study is designed to test the transpression hypothesis.

## **THE AMERICAN PORTRAIT AND THE INVENTION OF THE DAGUERRETYPE**

### **Samantha Richens ('11), Art**

In 1839, Louis-Jacques M. N. P. Daguerre patented the daguerreotype, an early type of photograph that became wildly popular in America as a means of artistic portraiture. When the daguerreotype was introduced, portraiture in America was at a peak. Amateur painters all over the country, but

particularly in the North, attempted to create lifelike portraits for a growing middle-class. For a time, the two media were inseparable. Despite the appeal of the fidelity of a photograph, the painted portrait managed to survive—even to thrive—after the invention of the daguerreotype. While the tradition of painted portraits predated photographs, the daguerreotype created competition for primitive portraits; in fact, during the 19th century, daguerreotypes came to influence primitive portraits.

## **THE CONCEPT OF THE MODERN FAMILY IN FASSBINDER'S GROUP FILMS OF 1960S GERMANY**

**Matthew Von Vogt ('11), German/Russian**

Rainer Werner Fassbinder's films are concerned with interpersonal relationships and concept of the family. This paper discusses his group films, which comprise the earliest portion of his career. The link between the group films is that the traditional familial dynamic is cast aside in favor of surrogate families comprised of youthful characters bound together by both creative impulses and rejection of social constructs. The two group films that I will discuss are *Katzelmacher* and *Beware of a Holy Whore*; I will discuss how each of the two films portrays the surrogate family, and how the surrogate family becomes inextricably linked with victimhood and isolation.

## **THE CONSEQUENCES OF CARBAMOYLATING ACTIVITY FROM ANTICANCER SULFONYLHYDRAZINES ON THE ENZYMES OF DNA BASE EXCISION REPAIR**

**Abbie Frederick ('09) and Kristina Langenborg ('09), Chemistry**

The carbamoylating activity of Laromustine (VNP40101M; Cloretazine), an anticancer sulfonylhydrazine prodrug, can modify cellular proteins and affect their function. Carbamoylation enhances Laromustine's primary cytotoxic activity, the DNA crosslinking by its 2-chloroethylating activity. The chemical species responsible for carbamoylation is methyl isocyanate, which is especially reactive with sulfhydryl groups and amines. The subset of cellular lesions caused by methyl isocyanate likely to result in the enhancement of DNA damage includes those against enzymes of DNA repair. Individual enzymes of DNA base excision repair (BER) are reported here to have diverse responses to Laromustine exposure. The nucleotidyl-transferase activity of purified DNA polymerase beta, a BER-specific enzyme, is inhibited by Laromustine at clinically relevant concentrations ( $IC_{50} = 74 \mu M$ ). The cause of this inhibition was due to the agent's carbamoylating activity. The apurinic/apyrimidic endonuclease APE1 catalyzes a hydrolytic cleavage of DNA at an abasic site during BER. Laromustine did not significantly inhibit the endonucleolytic activity of APE1 at any concentration. Also critical to BER, though not acting on the DNA directly, is the protein XRCC1 and the enzyme PARP. In vitro experiments measuring the ADP-ribosylation activity of purified PARP revealed only a modest inhibition by carbamoylating agents, with  $IC_{50}$  values in the  $10^{-4}$  M range, which are of questionable clinical relevance. The effects of Laromustine on PARP and XRCC1-mediated induction of BER events are also reported. The enhanced cytotoxicity exhibited by the carbamoylating and chloroethylating activities of Laromustine is most likely explained by a concomitance of DNA damage and a reduction in the ability to repair that damage.

## **THE EFFECT OF CHLORAMPHENICOL ON THE CONJUGATION RATE OF *AEROMONAS SALMONICIDA* SUBSPECIES *SALMONICIDA***

**Zachary Zalinger ('09), Elizabeth Disney ('10) and Adam SanMiguel ('10), Biology**

A novel strain of *Aeromonas salmonicida* subspecies *salmonicida* (AS03) was previously isolated in juvenile Atlantic salmon, *Salmo salar*, in 2003. Initial studies showed that this particular strain was resistant to both mercuric chloride and multiple antibiotics. This resistance has since been attributed to the rapid spread of several mobile genetic elements including an IncA/C plasmid. Specifically, research has shown that this IncA/C plasmid contains a mer operon (merRTPABDE), several antibiotic resistance genes, and the Tn 1696 transposition module. Our laboratory formerly discovered that this genetic element could be transferred from AS03 donors to *Escherichia coli* DH5a and *Citrobacter* FBT4-10 recipients at an increased rate through exposure to chloramphenicol antibiotic. Additionally, in previous studies, pre-exposure of AS03 to chloramphenicol was also found to stimulate conjugation. Recently, however, we have found variable effects of chloramphenicol on the conjugation rate of AS03, most likely due to changes in the protocol that allowed for replicate experimentation. While this alteration was meant to improve the conjugation assay, new problems have since arisen that have resulted in inconsistent data. Interestingly, preliminary experiments have shown that chromosomal and IncA/C-associated genes can be amplified using qRT-PCR techniques. As such, we have also explored the effects of chloramphenicol and the time of incubation on AS03 plasmid copy number.

**THE EFFECT OF CLIMATE CHANGE ON ARCTIC LANDSCAPES**

**Michael Ambrogi ('09), Lauren Bizzari ('09) and Samuel Brakeley ('10), Environmental Studies**

Climate change poses diverse impacts on arctic ecosystems. Although the tundra and taiga biomes have been exposed to numerous changes in climate throughout geologic history, current changes are expected to be particularly dramatic. The arctic is a high stress environment and plants adapted to this region are particularly sensitive to the direct impacts of changing soil moisture and decomposition, as well as the indirect effects of herbivory, competition and pollination. Forest fires may grow in number and severity. Invasive species and diseases may expand their ranges northwards, harming the fragile Arctic ecosystem. Climate change may also have impacts on human activities in the Arctic, and therefore indirectly, upon the terrestrial ecosystem. Agricultural opportunities may expand, using much of the water, introducing new species, and creating new opportunities for invasive species to move in. However, roads and buildings may be damaged by melting permafrost, making mining, forestry operations, and human habitation more expensive and complex. In sum, any conservation efforts to mitigate the effects that climate change might have on the arctic will have to consider a wide range of variables.

**THE EFFECT OF GLUTAMATE ON NEUROSECRETORY CELLS IN THE CRUSTACEAN NERVOUS SYSTEM**

**Ruth Langton ('09), Biology**

Glutamate is the primary excitatory neurotransmitter in the mammalian central nervous system. It is of particular interest because of its supposed role in the processes of learning and memory, and also because of its potential toxic effects that have been linked to neurodegenerative diseases. Although glutamate is necessary for normal cell functioning, high levels of glutamate

receptor activation can result in cell death, a phenomenon known as excitotoxicity. It has been suggested that glutamate also plays an important role in the insect and crustacean nervous systems, allowing for the examination of excitotoxicity in these organisms. The current study aims to determine the effect of high concentrations of glutamate on the neurite outgrowth of cultured fiddler crab (*Uca pugilator*) cells. Cells were obtained from the x-organ, a neurohemal organ located in the crustacean eyestalk, and were cultured for 24 hours in simple culture medium. After 24 hours, cells exhibiting neurite outgrowth were photographed and treated with one of four concentrations of glutamate. The treatment groups included: control with 0mM glu, 0.1mM glu, 1mM glu, and 10mM glu. After another 24 hours, the cells were photographed a second time and the neurite outgrowth was measured and compared. Higher concentrations of glutamate were found to have a negative effect on neurite outgrowth, causing the neurites to retract or slow their growth. Glutamate receptors were also located in the x-organ cells using immunohistochemistry with fluorescence. This study provides insight into the workings of the crustacean nervous system and shows that fiddler crabs are a model organism in which to examine the effects of excitotoxicity, which may lead to future knowledge about the mechanisms of neurodegenerative diseases.

## **THE EFFECT OF NATURAL DISASTERS: THE INDONESIAN FOREST FIRES IN 1997**

**Po Wong ('09), Economics**

While the economics literature addresses poverty as an outcome of responses to risks, the disaster-management literature specifically considers natural disasters as a source of risk that leads to vulnerability. Few studies have attempted to investigate the link between poverty and vulnerability with respect to natural disasters. By applying a utility model to panel data from Indonesia, this paper estimates and analyzes households' vulnerability in total and food consumption. The relationship between vulnerability and household characteristics is then determined using OLS and seemingly unrelated regression models. By differentiating individuals who live in areas affected by fires from others, this study finds that the 1997 forest fires in Indonesia affect vulnerability via the channel of poverty instead of aggregate risks.

## **THE EFFECT OF SEA STAR PREDATORS ON THE RETRACTABILITY OF THE WHELK *NUCELLA LAMELLOSA***

**Lisa Portis ('09), Biology**

Several studies have indicated that the whelk *Nucella lamellosa* displays phenotypic plasticity in response to predation threat from the predatory crab *Cancer productus*. *Less research has been performed on the phenotypic plasticity of N. lamellosa in response to another major predator, the sea star Pisaster ochraceus. This study looked to expand upon this body of research. It was found that the presence of waterborne cues from P. ochraceus induces changes in the retractability of N. lamellosa. N. lamellosa held in the presence of sea stars had greater retractability than those held without sea stars. Further, N. lamellosa exposed to sea star cue were less likely to be preyed upon by P. ochraceus than those not previously exposed to cue. Greater retractability in N. lamellosa was correlated with less mortality in the predation experiment, suggesting that retractability is an inducible defense against sea stars.*

## **THE EFFECTS OF EXOGENOUS INSULIN AND EXERCISE ON GLUCOSE AND**



## **LACTATE METABOLISM IN THE BROWN ANOLE, *ANOLIS SAGREI*.**

**Kristen Hitchcox ('09), Chemistry**

Glucose transport into muscle tissue by the protein GLUT4 is stimulated by insulin secretion from the pancreas and by muscle contractions. The mechanisms of the insulin-stimulated signaling pathway have been well documented in mammals, but the contraction-stimulated pathway has not yet been identified in mammalian studies; this study therefore focuses on glucose metabolism in a reptile, *Anolis sagrei*. *Individuals in control, exercise, injection, and combined treatment groups were immediately sacrificed after treatment. Blood, muscle, and liver were dissected and analyzed for blood glucose and lactate levels, muscle glycogen levels, and GLUT4 activity in muscles. Blood lactate levels were higher in all exercised anoles and highest when exercise was paired with insulin injection; blood glucose levels did not differ significantly. Muscle glycogen levels were lower in exercised anoles than in sedentary anoles, except when anoles received insulin. These results suggest that insulin and exercise cause increased transport of glucose into myocyte tissue, resulting in anaerobic production of lactate. Anoles in the combined treatment group had higher levels of muscle glycogen; high glucose transport may have optimized gluconeogenesis and activated glycogenesis.*

## **THE EFFECTS OF MORTALITY SALIENCE AND REGULATORY FOCUS ON SURVIVAL PROCESSING**

**Julia Engelsted ('11), Gillian Conly ('11), Amy Dunlap ('11) and Sara Field ('11), Psychology**

The purpose of this study is to gain a better understanding of the impacts of mortality salience, and prevention vs. promotion on memory. Our study is based off of Nairne's Adaptive Memory: The Comparative Value of Survival Processing, which examines the enhancing effect of survival scenarios on memory retention. By integrating the Terror Management Theory, which justifies that humans have a unique, implicit fear when confronted with the knowledge of mortality, or knowing that they will die, this experiment aims to discover whether the salience of mortality enhances memory retention.

## **THE EFFECTS OF N-ACETYL SEROTONIN AND PRAZOSIN ON FIDDLER CRAB (*UCA PUGILATOR*) X-ORGAN CELL NEURITE GROWTH**

**Jennifer Myers ('09), Biology**

Many factors affect the growth of axons and dendrites (neurites). Fiddler crabs are a good model system for studying neurite growth because their neuronal X-organ cells grow well in simple medium at room temperature. We cultured X-organ cells and incubated them with either of two endogenous chemicals, melatonin or n-acetylserotonin (NAS) and measured the neurite growth 24 and 48 hours after being cultured using Axiovision software. We found that they both enhanced neurite growth, but on a different time scale, indicating different mechanisms of action. NAS has a higher affinity than melatonin for the MT3 receptor. We then used prazosin, a specific MT3 receptor antagonist, in conjunction with NAS to determine if the antagonist would diminish the enhancement induced by NAS. Prazosin is also a specific  $\alpha$ -adrenergic antagonist, so we used fluorescent antibodies to determine if inhibitory effects were related to the presence of norepinephrine receptors on the X-organ cells.

## **THE EFFECTS OF OUTCOME DEPENDENCY ON STEREOTYPE PROCESSES IN AN EXTRINSIC MOTIVATIONAL CONTEXT**

**Alexandra Wesnousky ('10) and Christiana Lumbert ('10), Psychology**

Current research in outcome dependency indicates that when individuals are dependent on another person, they utilize fewer stereotypes. The current study aimed to determine how the relevancy of the stereotype to the outcome influences attention to individuating information. Participants expected to work with a partner on an emotion or math task for a prize that they could win alone or with their partner. After reading a description of a female partner that contained stereotype-inconsistent math and emotion information, participants evaluated their partner and performed a free recall task. A marginally significant effect revealed that when individuals are outcome dependent they recall more information that is relevant to the task than irrelevant,  $F(1, 56) = 1.84, p = 0.18$ . This demonstrates that dependent individuals are not always motivated to avoid stereotypes, which has many implications for collaborations in real-world settings.

## **THE EFFECTS OF STIMULUS VARIABILITY ON SPONTANEOUS RHYTHMIC COORDINATION**

**Amanda Ivey ('10), Matthew Clunan ('10) and David Way ('09), Psychology**

Previous research has found that when participants are engaging in a rhythmic motion that they will spontaneously coordinate with an oscillating stimulus. Other research has found that the amount of coordination participants show is affected by whether the stimulus is a biological movement or a computer generated movement. Two possible mediators for this are the variability associated with a biological movement and the potential differences in degree of focus. Our study will examine the effects of stimulus variability and participant focus on spontaneous coordination with the stimulus.

## **THE EFFECTS OF SURVIVAL AND SELF-PROCESSING ON READING COMPREHENSION**

**Alessandra Welker ('11), Hilana Bernheimer ('10) and Kaitlyn Billington ('11), Psychology**

Our study will investigate the effect of survival processing on reading comprehension. Thus, we want to look at survival versus self-reference processing in the context of causal versus semantic passages by using a combination of procedures from these articles in order to see whether subjects remember sentences involving self or survival and if they are semantically or causally related. If the interaction between these two variables showed the same trend as found in the research done by Wolfe and by Nairne, we would expect recall to be highest for the survival/causal pairing and lowest for the self-related/semantic pairing.

## **THE EFFECTS OF THOUGHT SPEED AND LEVEL OF THOUGHT ON PERCEPTIONS OF POWER**

**Sharonda Bradley ('10), John DeAscentis ('11), Anna Kelemen ('10) and Peter Serafini ('11), Psychology**

The goal of this experiment was to see if thought speed and thought content influence perceptions of power and ratings of liking. Participants viewed a short video of a confederate

speaking fast or slow in either the concrete or abstract condition. Following the video they answered questions intended to gauge their perceptions of the confederate's power as well as how much they liked the confederate.

## **THE HIGGS MECHANISM AND THE SEARCH FOR THE HIGGS BOSON**

### **Nathan Hill ('09), Physics and Astronomy**

The Standard Model of particle physics explains how different elementary particles obtain their masses through the Higgs Mechanism. This mechanism, which is based on the theory of spontaneous symmetry breaking, can simultaneously predict the correct masses of W and Z bosons while still predicting that photons are massless. However, in so doing, it predicts the existence of a new particle known as the Higgs boson which has yet to be discovered experimentally. A new research project based at the European facility, CERN, called the Large Hadron Collider will soon begin taking data which has the ability to determine whether or not the Higgs boson exists. This talk will briefly explain the theory behind the Higgs Mechanism and document the efforts at CERN to find the Higgs boson. Also the talk will describe some of the consequences of whether or not the Higgs boson is found.

## **THE HUMAN LANDSCAPE OF POTENTIAL WOLF HABITAT IN THE NORTHEASTERN UNITED STATES: A SPATIAL ANALYSIS OF THE POLITICAL AND SOCIAL SUITABILITY OF WOLF RE-COLONIZATION**

### **William Tyson ('09), Environmental Studies**

Many previous studies have discussed the potential for wolf reintroduction to the northeastern United States. These studies almost exclusively focus on identifying habitat that can currently meet the biological needs of wolves. Largely missing from this conversation is analysis of the human features that are already on the landscape. This study seeks to address this information gap by focusing on human aspects of wolf habitat, such as conservation land and development risk, which need to be understood in order to maintain viable wolf populations, following their reestablishment. Analysis is applied not only to potential core wolf habitat, but also to a potential corridor for dispersal between populations. This is an important facet of the study, as understanding the human landscape of a potential corridor may be necessary in order to facilitate wolf movement and gene flow between core habitats. By identifying the human landscape of potential core habitat and dispersal corridors, this study highlights the non-biological factors, such as development threat, that will play an integral role in wolf reintroduction to the northeast. Understanding these factors may aid in directing conservation efforts to ensure the social and political viability of wolf reintroduction to the northeast.

## **THE IDITAROD TRAIL AS A MODEL FOR CONSERVATION**

### **Blair Braverman ('11), Environmental Studies**

Not only does the Iditarod trail in Alaska have a fascinating cultural history, its designation as a National Historic Trail has provided extensive benefits to the state. This study examines the careful construction of the legislation that protected the trail, the process of reaching compromise between stakeholders, and the uses of the trail today. It also discusses how the Iditarod Trail Dogsled Race has brought economic stimulus to trailside communities and Alaska as a whole, and served as an important tool for environmental literacy through a nationwide education

program. Furthermore, it isolates specific aspects of the Iditarod trail that have made its continued preservation appealing to bipartisan legislators, as the Republican party is typically opposed to increasing the size of public lands and limiting growth. Finally, it discusses the implications that this example holds for the interests of environmental protection, and how the connection between wilderness and cultural heritage can serve as a model for land conservation efforts in the future. (Note- I researched and wrote this paper in the fall to submit it to a national contest for innovative ideas in conservation finance, and was one of 12 students from around the country selected to bring my research to an international conference in Chile. I have since presented on it for a 'webinar' run by the Harvard environmental studies program, and will be presenting in May at the Maine Land Trust Conference in Portland. Although I did not have a faculty mentor for this project, Professor Nyhus has reviewed the paper and is familiar with my ideas.)

## **THE IMPACTS OF GOLF COURSES ON STREAM WATER PH AND DISSOLVED OXYGEN IN THE UPPER PIEDMONT, GREENVILLE, SC**

**Megan Saunders ('09), Environmental Studies**

Golf courses are an increasingly prominent feature across the southern U.S. landscape. Most courses contain streams that pass through the course grounds. The impact that these courses have on a stream's aquatic ecosystem is an area of active research. In this study a comparative analysis of stream water pH, dissolved oxygen, and temperature was conducted at four different golf courses in Greenville, South Carolina. Courses were selected that had continuous, tributary free and lake free reaches that passed through the golf course grounds. At each course, one YSI sonde was placed just upstream of the golf course and a second was placed in the same stream just downstream of the golf course for somewhere between three to six days. The sondes were secured to cinder blocks on the stream bottom and synchronized to make simultaneous readings every 5 minutes for pH, dissolved oxygen, and temperature for the period of deployment. There were distinct differences in pH, dissolved oxygen, and temperature between the up and downstream sites at each course, although relative differences among sites were not consistent, with some sites having higher pH and/or dissolved oxygen downstream and other sites exhibiting the opposite. All sites downstream of the courses exhibited markedly larger diurnal ranges for all three parameters compared to their upstream counterparts. The exact reasons for the observed differences are an area for further study, but are presumed to be related to the lack of riparian cover along the golf course stream reach and the consequent increase in sunlight exposure and associated biological activity in stream. Regardless of the causes, the differences are significant and suggest that most golf courses are likely having a measurable impact on the stream physical parameters.

## **THE INFLUENCE OF ANTHROPOGENIC FACTORS ON TRACE METAL CONTENT IN BERMUDA POND SEDIMENTS**

**Amanda Smith ('09), Geology**

Cores were taken from four bodies of water in Bermuda, including Warwick Pond, Spittal Pond, Evans Pond, and Lover's Lake. An ICP instrument was used for geochemical analysis of sediments from each of the cores. Cores were sampled every five centimeters to a depth of 27 centimeters with the exception of Warwick Pond, which was sampled to a depth of 92 centimeters. The purpose of this study is to correlate heavy metal content in the sediment with

anthropogenic factors on the island of Bermuda and identify whether trends are island-wide. Anthropogenic influence includes the introduction of motor vehicles post-WWII and the switch to unleaded fuel use (c. 1989). It is expected that a rise in metal levels, particularly lead, will be seen in the sediments following the introduction of motor vehicles. Metal levels will then decrease with the onset of unleaded fuel use. More specific results will be presented. Findings will also be shared with researchers at the Bermuda Zoological Society, who have run similar analyses on sediments from Pitman's Pond in Bermuda. The Society is interested in these results because several of the ponds tested contain killifish, an endangered species endemic to Bermuda. Heavy metals in the ponds impact the livelihood of the killifish, as well as other pond dwelling organisms, and the quality of groundwater. Results of this study will aid in the development of water improvement methods by providing an historical account of metal levels in the ponds.

## **THE NEUROLOGICAL PHENOTYPING OF METHYLMALONIC ACIDEMIA**

**Colin O'Shea ('10), Biology**

The spectrum of methylmalonic acidemia (MMA) disorders comprises a genetically heterogeneous group of disorders characterized by defective methylmalonate metabolism and failure to generate succinyl CoA. These disorders are associated with a wide range of abnormalities from developmental delay to end-stage renal failure. Additionally, precise correlations between different genotypes and phenotypes are naturally incomplete. Mutations of various genes can result in MMA, including mutation of the methylmalonyl CoA mutase (MUT), which causes either partial (mut-) or complete (mut0) deficiency of the protein. In addition, mutations of the MUT coenzyme adenosylcobalamine (AdoCbl), due to mutations of MMAA or MMAB can also result in MMA (cblA, cblB, respectively). Combined MMA and homocystinuria are denoted as complementation groups cblC, cblD and cblF. To better define genotype-phenotype correlations in these disorders, we retrospectively collected various measurements of intelligence quotient from intelligence tests given to 67 of these patients across 5 years. Full Scale IQ (FSIQ) and indices of specific areas of intelligence were compared. The patients did not show any significant differences among any of the subscales of intelligence. However, FSIQs did differ significantly between mutations. The mut- and cblA variations showed the highest FSIQs, at 108.6 and 92.7, respectively. In contrast, the mut0 and cblC variations showed the lowest FSIQs, at 65.7 and 53.5, respectively. These data match the clinical pictures, as mut- is known to be a less severe disease, compared to mut0. Likewise, cblC is known to be more severe. These data could help countless parents of children with MMA in knowing what to expect.

## **THE PKABA1-INTERACTING FACTOR TAABF1 MEDIATES BOTH ABSCISIC ACID-SUPPRESSED AND ABSCISIC ACID-INDUCED GENE EXPRESSION IN WHEAT GRAINS**

**Talia Savic ('09), Matthew Appleby ('11), Sarah Martinez ('11) and Jennifer Sim ('11), Biology**

The hormones abscisic acid (ABA) and gibberellin (GA) have opposing effects in imbibing cereal grains. To investigate the crosstalk of ABA and GA signaling in wheat (*Triticum aestivum*), we have focused on the transcription factor TaABF1. TaABF1 (a member of the ABA response element binding factor family) physically interacts with PKABA1, a signaling component in the ABA-suppression of GA-induced gene expression in cereal grains.

Constitutive expression of TaABF1 in aleurone cells of imbibing grains completely eliminated GA-induced expression from the Amy32b promoter. In addition to its effect on Amy32b, TaABF1 strongly stimulated expression from the ABA-inducible HVA1 and HVA22 promoters. Overexpression of TaABF1 fully substituted for exogenous ABA in the induction of these two promoters. Although TaABF1 mRNA is downregulated during imbibition of afterripened grains, transcript levels were not significantly altered by exogenous GA or ABA, suggesting that upregulation of TaABF1 at the mRNA level is not required for its role in ABA signaling. We hypothesize that TaABF1 may be regulated by ABA at the protein level. We are currently investigating the effects of ABA on the phosphorylation, stability, and abundance of TaABF protein in order to determine the mechanism by which ABA leads to TaABF1 activation during grain imbibition.

### **THE PERCEPTION OF PERSONALITY BASED ON SES NAMES AND FACIAL IMAGES**

**Aimee Sheppard ('10), Natasha Atkinson ('11), Hannah Bisgyer ('11) and Jessica Bushee ('11), Psychology**

Previous research has shown that people can accurately form judgments of personality based on novel facial images alone. Research has also shown that people associate names with specific characteristics such as personality and SES (socioeconomic status). The current study investigates how an individual's name and facial image may influence the perception of personality, based on their categorization as belonging to high-or-low SES. We hypothesized that names would have a significant effect on personality judgments, so that those with high SES names matched with high SES photos would be associated with the most positive traits and those with low SES names matched with low SES photos would be associated with the least positive traits.

### **THE RELATIONSHIP BETWEEN JOINT ATTENTION AND SYNTAX DEVELOPMENT IN PRESCHOOLERS**

**Jessica Frick ('10), Hannah Holbrook ('10) and Duy Lyford ('10), Psychology**

Joint attention is the ability of two people to attend to the same object or event. Often, one person initiates it and another follows the person's line of gaze. In children, the ability to initiate joint attention is related to aspects of language development, particularly vocabulary acquisition. This poster looks investigated the link between joint attention and syntactic development.

### **THE RISE OF SECOND-WAVE FEMINISM AT COLBY COLLEGE: THE WOMEN'S ORGANIZATION AND WOMEN'S HEALTH ON MAYFLOWER HILL, 1973-1980**

**Amy Dunlap ('11), Women, Gender, Sexuality**

This research paper examines how second-wave feminism began at Colby and the influence of the Women's Organization on this movement. Particular attention is paid to student-administration relationships and fight for certain constructs related to the Health Center.

### **THE ROLES OF AROUSAL AND THOUGHT SPEED ON AFFECT**

**Stephanie Berger ('11), Alyssa Lepore ('11) and Lauren Tracy ('11), Psychology**

Many people experience the phenomenon of accelerated thoughts and elevated mood. Previous studies suggest a link between accelerated thought and positive affect. Arousal's effect on thought processes has yet to be directly explored; however, the fact that activities such as exercise, near-death experiences, fast tempo music, and stimulants such as coffee tend to increase arousal and positive affect indicates a possible link between the two. The purpose of this study is to further explore the link between arousal and thought speed and the subsequent change in affect.

### **THE SELFISH VERSUS THE LAZY: INTRA-RACIAL RELATIONSHIPS IN AARON MCGRUDER'S 'THE BOONDOCKS'**

**Tiffany Martin** ('09), **American Studies**

The animated series 'The Boondocks' will be used in an ethnographic study of viewer response to explore the racial complexities associated with upward mobility, identity, and discrimination between middle-class and poor Black-Americans.

### **THE SYNTHESIS OF A BIOMIMETIC MO COMPLEX WITH A NEW BIDENTATE SULFUR LIGAND**

**Nichole Schmidt** ('09), **Chemistry**

Functional analogs for molybdenum and tungsten oxotransferase enzyme active sites are of interest to understand their reactivity, including that which mirrors the relevant enzymes as well as the scope of the reactivity towards non-biological substrates. We are synthesizing mononuclear molybdenum and tungsten complexes with bidentate sulfur ligands, such as a molybdenum(V) complex previously reported (Conry, RR; Tipton, AA. *J Biol Inorg Chem*, 2001, 6, 359-266). Current research seeks to synthesize molybdenum and tungsten complexes of the other biologically relevant oxidation states, IV and VI with the new bidentate sulfur ligand biphenyl-2-thiolato-2'-mercapto-alpha-(para)-xylene. The synthesis of this ligand will be reported along with progress towards the synthesis of a new molybdenum complex containing this ligand.

### **THE VETERINARY CARE OF RETIRED RACING GREYHOUNDS: THE MEDICAL ASPECTS OF THE TRANSITION BETWEEN THE RACETRACK AND THE ADOPTION HOME**

**Cara Whalen** ('09), **Biology**

Greyhounds require specialized veterinary care due to their specific needs before, during and after their racing careers. The transition between the racetracks and the adoption homes is especially important to consider. The veterinary aspects of this transition were studied through hands-on work at Maine Greyhound Placement Service, a greyhound adoption center in Augusta, Maine. Greyhounds have specific medical needs during each stage of this transition, beginning with the admittance of newly retired greyhounds from racetracks and ending with post-adoption care. This knowledge is important because it can shed light on improvements that be made to both the greyhounds racing careers as well as their lives in adoption homes.

### **THE RDNA CLUSTER REGIONS ITS-1 AND ITS-2 CAN BE USED TO DISTINGUISH NATURAL POPULATIONS OF THE SEA ANEMONE *METRIDIUM SENILE***

### **Soren Craig-Muller ('09), Biology**

The sea anemone *Metridium senile* is widely used in cnidarian research, but little is known about this species' population genetics. The ongoing purpose of this research is to identify genetic markers that will allow us to characterize the population structure of *M. senile*. Attempts to generate a microsatellite library for *M. senile* were unsuccessful so we are investigating the intraspecific variability of internal transcribed spacer (ITS) loci of the nuclear ribosomal RNA cluster in *M. senile* and in another *Metridium* species. ITS regions consist of highly conserved DNA regions, interspersed with DNA regions that are highly variable, even from one population to another (at least in anthozoan cnidarians). We are currently sequencing the ITS regions of several east coast populations of *Metridium senile* and a west coast population of *M. senile* and the congener *M. farcimen*. Using previously developed primers, we have isolated and amplified the ITS-1 and ITS-2 regions, and we are assessing the intraspecific and interspecific variability of both ITS regions. Sequence alignment analysis has revealed genetic variation among *M. senile* populations that may be appropriate to reliably distinguish those populations.

### **THREE-DIMENSIONAL MODELING OF VERTIGO SENSATION IN PATIENTS SUFFERING FROM BENIGN PAROXYSMAL POSITIONAL NYSTAGMUS.**

#### **Lauren Harris ('10) and Michael MacNicoll ('09), Mathematics**

Vestibular disorders affect the inner ear, which is responsible for hearing, balance, and self-orientation. The inner ear is composed of three semicircular canals that detect angular acceleration, and otolith organs that detect linear acceleration and gravity. Therefore, when patients have a disorder in one of these organs they suffer from vertigo, imbalance, nausea, and fatigue. These symptoms are potentially devastating to a person's quality of life. Benign paroxysmal positional nystagmus (BPPN) is a vestibular disorder in which calcium crystals become dislodged from the otolith organs and enter the semicircular canals, altering the individual's perception of angular acceleration. Consequently, the patient suffers from attacks of vertigo when performing simple movements. We attempted to model the effects of the BPPN pathology on the semicircular canals. We then created 3-dimensional simulations of the sensation that the BPPN patient feels when performing a simple movement, due to the effect of the displaced crystals. Creating more of these models, based on different provocations, will demonstrate how vestibular pathologies alter perception in different ways and thus give further insight into how the vestibular system functions.

### **TOXICITY OF PLASTIC LURES**

#### **Brian Huntington ('09), Biology**

A recent study described the toxic effects of certain plastics towards humans and the environment by leaching hazardous chemicals into the water. In a study by the Dept. of Inland Fisheries and Wildlife, it was determined that fish tend to ingest soft plastic lures that have been lost, and that these lures are then unable to be digested or regurgitated. In this study, the focus will be to test the combination of these findings by determining if soft plastic lures release harmful chemicals while in an aqueous environment. This will be determined using an ISO protocol for water quality testing using water fleas (*Daphnia*), which are known to be a confident indicator species. Though data and analysis are still in progress, it is believed that findings will show a positive correlation between concentration of leachate and mortality of water fleas.



## **TRANSFER OF A MULTI-DRUG RESISTANCE MEDIATING MEGAPLASMID TO *VIBRIO CHOLERAE***

**David Brazel ('12), Biology**

Mobile genetic elements, including plasmids, are known to be one of the most significant factors in the continuing spread of antibiotic resistance. Plasmids allow for the transfer of resistance between populations and between species, in a diverse range of environments. AS03 is a strain of *Aeromonas salmonicida*, a virulent pathogen of freshwater and marine fish. AS03 carries an IncA/C class megaplasmid (>100 kbp) that carries a *mer* mercury resistance operon and multiple antibiotic resistance gene cassettes. Members of the IncA/C plasmid class have been found in both non-pathogenic and pathogenic species of humans and other animals. It is believed that IncA/C plasmids are readily transferred both between species and between the aquatic and terrestrial compartments. We find that at 20 degrees Centigrade in liquid BHI media, AS03 can successfully transfer the IncA/C plasmid to O395, a pathogenic strain of *Vibrio cholerae*. The O395 transconjugant acquires a much higher level of resistance to multiple antibiotics. Transfer was further confirmed through 16S rRNA gene sequencing and PCR amplification of *RepA*, a conserved plasmid region not found on the chromosomes of AS03 or O395. As *Aeromonas salmonicida* and *Vibrio cholerae* are endemic to the same ocean habitats, at conditions similar to those in this experiment, it is likely that *Vibrio cholerae* is capable of acquiring a promiscuous plasmid mediating multi-drug resistance in the environment.

## **UNDERSTANDING SELF-EFFICACY IN OTHERS: CHILDREN'S KNOWLEDGE REGARDING THE EFFECTS OF VERBAL PERSUASION AND VICARIOUS EXPERIENCES ON PERCEPTION OF ABILITY**

**Ashley Beaulieu ('09) and Amanda Ivey ('10), Psychology**

Self-efficacy is one's belief in their own abilities. This project addressed whether preschool-aged children understand another person's self-efficacy, conveyed either via a vicarious experience or verbal persuasion.

## **WARTIME ATTITUDES AND MORALE OF UNION AND CONFEDERATE WOMEN**

**Jennifer MacDowell ('09), History**

This project will look at the Civil War from the viewpoint of an audience that is often overlooked. Men fought in the battles and controlled the politics behind the war, but women, too, were largely affected by the events of 1861-1865. While their husbands, sons, brothers, and fathers were away from home, women not only worried about the safety of their loved ones but were also responsible for their own well-being and that of their families on the homefront. As such, women both north and south were greatly informed about the war and developed strong opinions regarding the conflict. This project will consider and compare how women living in both the Union and the Confederacy reacted to the war at its onset and how their opinions, attitudes, and morale changed as the Civil War lasted for four long years.

## **WIND POWER IN MAINE: BALANCING CONSERVATION AND ENERGY PRODUCTION**

**Jordan Schoonover ('10) and Hannah Lafleur ('11), Environmental Studies**

An expedited permitting area has been created to facilitate the development of wind power projects in Maine. The purpose of this project was to investigate the impact of removing areas of conservation interest from the expedited permitting area. We found that the removal of these areas impacts the total wind potential of the state, in an amount proportional to the size of the area removed. The impact on the total wind potential ranged from 0.46-29.0% decrease, depending on the calculation scenario used. These findings may have implications for future policy decisions concerning wind power development.