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# *Colby Undergraduate Research Symposium*

*April 30 - May 2, 2008*

*Colby College, Waterville, Maine*

## *Abstracts - Research Symposium*

### **THE EFFECTS OF CHOLINE SUPPLEMENTATION THROUGHOUT THE LIFESPAN ON ANXIETY AND REACTIONS TO ACUTE STRESS IN THE RAT**

**Raven Adams ('08) and John Swain ('08), Psychology**

Choline is a crucial nutrient that contributes to several biological functions and serves as a precursor molecule to the neurotransmitter acetylcholine. Choline is involved in prenatal development and is integral to the development and function of the central nervous system. Researchers have found that prenatal choline supplementation in the rat has several beneficial effects in adulthood, including enhanced spatial learning and memory, reduction of age-induced memory decline, and protection against various stressors to the neural environment. Yet little research has investigated the effects of choline supplementation during stages of life other than prenatal development. The present study examined the effects of choline supplementation, administered during different stages of life, on anxiety-like behaviors and reactions to acute stress. Rats were either supplemented with choline during a select period (prenatal development, adolescence, or adulthood) or received no supplementation. Reactions to stress were then investigated by exposing rats to a forced swim paradigm, which is used to measure behaviors representative of depression, and an acute-stress open field paradigm. To investigate the neural basis for behavioral effects, levels of Brain-Derived Neurotrophic Factor in the hippocampus were analyzed. Behavioral measures investigated differences in anxiety-like behaviors and reactions to stress. In the open field, rats supplemented in adolescence were less anxious compared to all other groups, however both the prenatal-supplemented and the adolescent-supplemented groups were less impacted by the forced swim test. These findings provide evidence that choline supplementation during periods of heightened developmental plasticity impacts anxiety-like behaviors.

### **THE EFFECTS OF PRENATAL CHOLINE AVAILABILITY ON BEHAVIORAL AND NEURAL REACTIONS TO SOCIAL ISOLATION REARING IN THE RAT**

**Raven Adams ('08), Psychology**

Choline is a crucial nutrient that contributes to several biological functions and serves as a precursor molecule to the neurotransmitter acetylcholine. Choline is involved in prenatal development and is integral to the development and function of the central nervous system. Researchers have found that prenatal choline supplementation in the rat enhances learning and memory processes later in life and also protects against a number of physical stressors to the neural environment, such as prenatal alcohol exposure, induced seizures, and chronic stress-induced exposure to corticosteroids. The present study examined the effects of prenatal choline supplementation on behavioral and neural reactions to social isolation rearing, which typically produces a number of behavioral and cognitive deficits in the rat. Rats were exposed to either a choline-sufficient (control) or a choline-supplemented diet during prenatal development, and were then weaned into standard (pair) housing or social isolation (single) housing. When these rats reached adulthood, behavioral measures investigated anxiety, exploratory behavior, spatial learning and memory ability, and object recognition memory. In analyzing these behavioral measures we failed to detect significant effects of housing in control-fed rats, but did detect an effect of housing in choline-supplemented rats in measures of both anxiety and learning and memory. These novel findings suggest that the benefits of choline supplementation may depend on experiences such as social rearing. To investigate the neural basis for behavioral effects, levels of hippocampal neurogenesis were measured by immunohistological staining for Doublecortin.

## **PREDICTING PRESIDENTIAL PERFORMANCE: WHAT MUST A VOTER KNOW?**

### **Randi Arsenaault ('09), Government**

A great deal of research has been done in the field of presidential studies. Yet, an important question-- how do we know what candidate is likely to be the most effective president-- has rarely guided systematic inquiry. This study uses historical information to explore the characteristics of effective leadership in the White House. The analysis examines the relationship between the pre-presidential experiences and the success in office of modern presidents. By examining the elements of effective leadership and the relevant pre-presidential experiences related to these elements, we seek to provide a better understanding of what characteristics Americans should look for in presidential candidates, and where they can find this information.

## **MALE SEXUAL SELECTION BASED ON IMMUNE FUNCTION IN THE ZEBRA FINCH *TAENIOPYGIA GUTTATA***

### **Christine Avena ('08), Biology**

Zebra finches are a popular model species for research on sexual selection because they form monogamous pairs and select mates based on a wide variety of criteria. Mate choice, part of Darwin's theory of sexual selection, is generally understood as females choosing males with desirable traits. Several hypotheses have been presented to describe how a female selects a male, including the "sexy son" hypothesis, that females become choosy for males with flashy ornaments, and the "good genes" hypothesis, which suggests that females select for traits that indicate a disease-resistant, fit male. Recent studies have shown that female zebra finches prefer males with particular traits, including symmetrical chest plumage, high song rates, and bright red beaks. These studies also revealed that males might be choosy when looking for a female, especially when comparing two individuals with different levels of fitness. This study will examine whether or not male zebra finches prefer certain characteristics, such as beak color or body weight, when courting a female. If the male prefers one female over another, this female is injected with a drug to temporarily suppress the immune system and the test is repeated. The initial results from this experiment will indicate that males may switch preferences for a female if her fitness is compromised. These findings might lend support the "good genes" hypothesis and could provide new information on the role of male sexual selection in zebra finches

## **GENDER AND MATURITY OF A FACE INFLUENCE PERCEPTIONS OF ITS COMPETENCE, INTELLIGENCE AND HONESTY.**

### **Sakshi Balani ('10), Martha-Gail Biddiscombe ('10), Meghan Guay ('10) and David Way ('09), Psychology**

The purpose of this experiment is to further enhance our knowledge in the field of gender stereotypes and perceived personality characteristics. In conjunction with previous research, it is believed that maturity of a face influences perception of characteristics. However, it is also believed that the gender of a face provides a social cue to perceptions of personality traits. It is important to investigate how maturity of facial features interacts with these perceptions when gender cues (that might provide social biases) are removed. Therefore, this experiment manipulates faces based on maturity and gender cues, in order to determine their combined effect on perceived characteristics, namely, intelligence, competence and honesty.

## **THOU SHALT NOT KILL... THYSELF: THE EFFECT OF RELIGIOUS PARTICIPATION ON SUICIDE**

### **Ivan Balbuzanov ('09), Economics**

Individual religious preferences are expected to have an effect on the probability of committing suicide both according to the utility-maximizing theory of suicide (Hamermesh and Soss 1974) and the sociological theory of suicide advanced by Durkheim (1951). Despite these theoretical implications, there have not been any econometric studies examining this theory. In this paper, I estimate the effects of religious participation on the probability of committing suicide. Using the 1993 National Mortality Followback survey and controlling for age, race, gender, level of education, urban residence, and marital status, I find a statistically-significant negative relationship between religious participation and the probability of committing suicide. The results are robust to other known correlates of suicide, including income, region of residence, mental health problems, alcohol and drug abuse, firearm ownership, as well as to alternative specifications of the dependent variable.

## **SYNTHESIS OF COPPER(I) COMPLEXES WITH NS2-CYCLODECANE LIGANDS BEARING PHENYL AND 2-NAPHTHYL PENDANT ARYL GROUPS IN QUEST OF COPPER(I)-ARENE COMPLEXES**

### **Chantal Balesdent ('08), Chemistry**

Copper(I)-arene complexes are relatively rare and therefore their chemistry is not well explored. We are currently expanding our previous work in which we found Cu-naphthyl binding to a coordinated 1-naphthyl-appended NS2-cyclodecane ligand. Thus, we have synthesized the analogous 2-naphthyl-appended as well as a phenyl-appended NS2-cyclodecane ligand. The synthesis of these ligands and the Cu(I) complexes of these ligands will be discussed. In addition, evidence for any Cu-arene binding in these complexes will be presented.

## **THE GLOBAL NATURE OF THE ORIGINS AND DISPOSAL OF ELECTRONIC WASTE**

### **Anna Barnwell ('08), Environmental Studies**

Recent attention has been brought to the global transfer of electronic waste and the lack of regulation that exists regarding disposal of electronic commodities. In the United States alone over 1.5 million tons of TVs, computers, cell phones, VCRS, and other electronics are disposed of in one year. As the high-tech industry continues to increase efficiency and product desirability, consideration must be taken into how older products can be disposed of when new purchases are made. Many electronics contain materials which are hazardous for landfills, incinerators, and the people who dismantle electronics for their valuable parts. The pressing issue of environmental justice must be considered as we examine both the unfair concept of shipping waste from developed nations to developing countries, as well as considering the complex and large process of producing electronics, which is often harmful to human health. Several electronic items were analyzed in this research from the perspective of production, disposal, and regulations that apply. This poster is oriented towards the human health repercussions for the Waterville community by describing the global process of electronic production to disposal, and then goes into detail about how community members can dispose of their electronic and hazardous waste in an ecologically and socially responsible manner.

## **COPING WITH RACE AND WEIGHT STIGMA**

### **Angela Barrett ('08), Psychology**

In recent years, research on stigma has expanded to include how various groups manage their stigmatized identities. Despite the well documented prejudice towards African American women in the obese community, there is currently little research examining how overweight and obese African American women manage the combined stigmas of race and weight. Many negative stereotypes of overweight African American women are prominent in popular media. These images go beyond the usual stereotypes associated with overweight women such as the clown and the caretaker. Instead, the portrayal of overweight African American women heightens negative qualities and depicts them as aggressive, unfriendly, unattractive, and intellectually inferior. Overweight African American females must manage the intertwined stigmas of race and weight. Despite the many numbers of people affected by these stigmas few researchers have examined the ways in which obese African Americans cope with bias and discrimination. This literature review will examine how membership in a defined group, the African American community, aids in coping and buffering self-esteem against the negative effects of stigma. Effective stigma management for this particular group lies in strength of affiliation with a collective and redefining what it means to be a member of a stigmatized group.

## **THE EFFECTS OF PRIMING COLLEGE STUDENTS WITH PARENTHOOD AND CAREER CUES**

### **Ashley Beaulieu ('09), Michael Schwartz ('10), Carolyn Thomas ('10) and Emily Wenzel ('10), Psychology**

Women today continue to face tension between their career goals and traditional motherhood expectations. Many studies have shown that women have postponed starting a family in order to fulfill their academic and career goals. Studies have also shown that exposure to motherhood cues can manipulate implicit academic identification. This study explores 71 student's implicit occupational status and parenthood identification by manipulating participants with high or low occupational status cues combined with high or low parenthood saliency cues. The parenthood and occupational identification of men is also explored in this study. Results suggest that priming participants with different levels of occupational status and parenthood saliency have little effect on their implicit identification with both.

## **OSMOTIC FRAGILITY OF EMBRYONIC AND ADULT ERYTHROCYTES IN EKLF-DEFICIENT MICE**

### **Jacqueline Beaupre ('08), Biology**

The erythroid-specific transcription factor, Erythroid Krüppel-Like Factor (EKLF), controls the expression of critical red blood cell (RBC) genes. It mainly regulates B-globin gene expression by binding to the CACCC box in the B-globin promoter, and participates in the switch from embryonic/ fetal B $\alpha$ -globin to adult B-globin expression during development. Loss of EKLF leads to B-thalassemia, a deficiency of B-globin protein chains, and EKLF-deficient mice die around day 14 of embryonic development (dE14). The lethality of EKLF-deficiency has been attributed to hemolytic anemia caused by inadequate levels of adult B-globin expression. In addition to regulating the B-globin genes, EKLF also controls the expression of several proteins structurally critical to the formation and stability of the RBC membrane skeleton. Decreased levels of these proteins, such as ankyrin, spectrin, and Band 3, causes RBC membrane instability and may contribute to the lethal hemolytic anemia characteristic of EKLF-deficiency. We hypothesized that EKLF-deficient RBCs would be more fragile than wild type RBCs due to the down-regulation of critical membrane skeleton proteins. Using an EKLF knockout (KO) mouse model, we performed osmotic fragility assays to test the strength of the RBC membrane in blood samples obtained from wild type and KO embryos at dE13.5 of development. The release of hemoglobin (Hb) due to hemolysis was analyzed spectrophotometrically. To further differentiate between lysis of embryonic and adult RBCs, the globin chains were separated via acetic acid-urea-Triton polyacrylamide gel electrophoresis. The amount of each protein released was then quantified by densitometry, indicating the relative osmotic fragility of embryonic and adult RBCs, either in the presence or absence of EKLF.

## **THE CARDIOPROTECTIVE EFFECTS OF MELATONIN ON REPERFUSION INJURY IN *UCA PUGILATOR***

### **Jacqueline Beaupre ('08), Biology**

Previous studies using vertebrate models and in vitro methods indicate that reperfusion after an ischemic episode causes further tissue damage due to oxidative stress. Because cardiovascular disease is a leading cause of death in developed nations, reducing reperfusion injury following a myocardial infarction is an increasing concern to the field of emergency medicine. Proposed treatments include antioxidant cocktails, which would scavenge the free radicals linked to oxidative stress. Past studies have identified melatonin, an amphiphilic and endogenous terminal antioxidant, as an extremely effective free radical scavenger. The following experiments were designed to assess the damage to cardiac tissue of the invertebrate fiddler crab *U. pugilator* exposed to elevated levels of reactive oxygen species and whether this damage could be prevented by treatments of melatonin. Electrophysiology was used to monitor fiddler crab heart rate and amplitude during exposure to hydrogen peroxide and melatonin treatments. Hemolymph glucose levels were measured as a secondary indicator of stress. Assays for malondialdehyde and 4-hydroxyalkenal were used to quantify the extent of lipid peroxidation, a hallmark of oxidative stress, in lobster cardiac tissue exposed to similar treatments. Though electrophysiology methods alone caused a significant amount of stress, exposure to hydrogen peroxide triggered a variety of negative effects on cardiac tissue and function. The observed changes in heart rate, amplitude, and beat quality under these toxic conditions were likely due to oxidative stress.

## **THE CARBON EMISSIONS OF THE BOSTON RED SOX**

### **Rosalind Becker ('08) and Alaina Clark ('08), Environmental Studies**

The Boston Red Sox emit a great deal of carbon throughout the regular baseball season because of flights to the home fields of their opponents. Knowing that air travel is one of the biggest transportation-based contributors to global climate change, the Boston Red Sox (and all major league teams) should be encouraged to offset their carbon emissions from regular season travel. Using ArcGIS to map the flight paths along great circle routes, the distance of flights to opponents' cities was calculated to total the number of miles traveled in the 2008 season. The price of offsetting this carbon was estimated using the calculators of carbon offset retailers, such as Native Energy, a Vermont-based retailer. This project provides the potential costs of offsetting the carbon emitted from Red Sox air travel. To take the lead in the future of the Northeast, the Red Sox should begin to consider their contribution to climate change.

## **RABIES VIRUS**

### **Emily Beckwitt ('10), Biology**

Rabies virus belongs to the order Mononegavirales, family Rhabdoviridae, and genus Lyssavirus. Its primary hosts are wild carnivores and bats, but humans are also at risk. Once contracted, the virus infects the central nervous system. This

can lead to encephalopathy and death. Characteristic symptoms of rabies infection include partial paralysis, anxiety, insomnia, hallucinations, and hydrophobia. In the recorded history of the disease, only one person has survived symptomatic rabies without treatment. The nucleocapsid is enveloped and bullet-shaped. It is elongated, with helical symmetry, and many glycoprotein spikes project from the surface, except at the planar end. Matrix protein is found between the membrane and nucleocapsid. Rabies belongs to the Baltimore Class V group of single-stranded, negative-sense RNA viruses. The unsegmented genomic RNA is tightly coiled and encased by the nucleocapsid. The first step in viral replication is adsorption. The virion binds to receptors on the cell, then enters the cell via endocytosis. The envelope is removed and the nucleic acid is released. Transcription, translation, and genomic replication can then proceed. The various proteins and nucleic acid come together to assemble progeny virions, which bud from the cellular membrane. Rabies is most often transmitted via bite wounds from an infected animal. Rabies infections can be prevented by use of the rabies vaccine. It can be treated with post-exposure prophylaxis before the onset of the later symptoms. However, after this point, no antiviral treatments have proven effective.

## **A MACRO-SOCIOLOGICAL PERSPECTIVE ON THE NO CHILD LEFT BEHIND ACT OF 2001: WHY REAUTHORIZATION IS NOT THE ISSUE**

### **Sara Benjamin ('08), Sociology**

There has been extensive scholarly debate about the potential benefits and detriments of the No Child Left Behind Act of 2001. However, much of the debate has been at the micro level, focusing on the immediate effects facing our country's schools. Such discourse usually focuses on high-stakes testing, teacher training and retention, and school funding, among other topics. While a micro-level discussion of No Child Left Behind is important, a macro-level approach may serve to better illuminate the long-term effects of this policy. This project will do just that, examining the history of education policy in the United States in conjunction with general value shifts in American society. Ultimately, it will argue that American values have changed in recent times, placing individualism and competition above those of community and cooperation. This project will then demonstrate how these value changes have informed contemporary education policy and thus why much of the impacts of No Child Left Behind will sustain regardless of whether the bill is reauthorized this year.

## **ANTICIPATING REGRET OR DEVALUATION?: AN INVESTIGATION OF THE CAUSES OF INACTION INERTIA**

### **Logan Berg ('08), Psychology**

Inaction inertia describes one's tendency to forgo attractive opportunities after having missed similar opportunities of greater attractiveness. The literature on this decision-making phenomenon yields two distinct and conflicting explanations. Anticipated regret theory argues that individuals maintain inaction in attempts to avoid anticipated counterfactual regret, or the regret that follows a comparison of actual outcomes to more attractive "would have been" outcomes. Conversely, valuation theory holds that individuals forgo attractive opportunities because they infer a low product value from a product's initial bargain price and compare this low value with a higher, bargain price. The present study aimed to distinguish between these causes by examining the inaction inertia effect when valuation processes were controlled and regret processes were potentially affected. An "offer-recipient" manipulation was used, in which participants were asked to predict the likelihood of accepting a less attractive second offer after they, or their acquaintance, had missed out on an initial better offer. The findings suggest that inaction inertia stems from an individual's anticipated regret. Additionally, the results provide a greater understanding of individuals' predictions of inaction in others.

## **COALITIONS FOR VICTORY: THE NECESSITY OF ALLIANCE CREATION FOR PROGRESSIVE BALLOT INITIATIVE CAMPAIGNS**

### **Julie Bero ('08), American Studies**

In 2006, ballot questions played a major role in American politics. The policy measures enacted by voters created change not only at the state level, but also influenced the actions of the United States Congress. This project outlines the significance of ballot questions throughout the history of the United States and closely studies three questions from the 2006 election season. I specifically examined the effect of progressive coalitions on ballot question campaigns and the necessity of grassroots work to achieve victory. The study concludes that although money is at the center of American politics, coalition building and grassroots work are necessary to win elections.

## **CLIMATE CHANGE AND LOBSTER (*HOMARUS AMERICANUS*) CONSERVATION IN MAINE**

**Michael Bienkowski ('10), Caitlin Dufraine ('09) and Jamie O'Connell ('08), Environmental Studies**

The American Lobster (*Homarus americanus*) is the most economically valuable marine species in Maine and is one of the largest commercial fisheries on the Atlantic Coast. Due, in large part, to current management practices, lobster populations are abundant and stable throughout the Gulf of Maine. Climate change and warming water temperatures, however, may effect Maine's lobster populations. As water temperatures increase Maine's management practices may need to be adapted to maintain healthy lobster populations.

## **NITRATE REMOVAL IN NITREX(TM) PERMEABLE REACTIVE BARRIERS: INVESTIGATING DENITRIFICATION USING A $^{15}\text{NO}_3$ TRACER**

**Lauren Bizzari ('09), Environmental Studies**

Eutrophication from anthropogenic nutrient loading (particularly nitrate) to aquatic systems is a growing problem. The Nitrex(TM) Permeable Reactive Barrier (PRB) is a system for removing nitrate in groundwater. I investigated the nitrate removal processes and hydrology of a PRB in Waquoit Bay in Cape Cod, Massachusetts. Denitrification is assumed to be the primary removal process in Nitrex(TM) medium barriers, but there are several other possible processes such as dissimilatory nitrate reduction to ammonium (DNRA) that could be removing nitrate. I attempted to quantify the importance of denitrification to overall nitrate removal using a  $^{15}\text{NO}_3$ - tracer experiment. An injection solution containing  $500\mu\text{M}$   $^{15}\text{KNO}_3$ , 100ppm fluorescein and 40mM KBr (as a conservative tracer) was injected into the barrier and a nearby section of beach as a control. Groundwater samples were collected at several time points before and after the injection and were subsequently analyzed for a suite of nutrients and  $\text{N}_2$  content. Bromide and nitrate concentrations were used to investigate the differences in groundwater flow patterns between the two treatment areas and to calculate dilution of the injection. Using membrane inlet mass spectrometry, groundwater samples from the barrier showed higher  $^{30}\text{N}_2$  signals than samples from control area, indicating that denitrification had occurred. Surprisingly, percent denitrification was very low, ranging from 1-14% and averaging 5%. This was inconsistent with some previous findings from similar studies in freshwater systems. Denitrification data from this study, combined with evidence of other biological processes in downgradient groundwater samples, implies that one or more of the other possible nitrate removal processes is at work in the barrier.

## **THE EFFECTS OF PRENATAL CHOLINE SUPPLEMENTATION ON AGGRESSIVE BEHAVIOR IN RATS**

**Kristina Boman ('08), Kelly Brooks ('09) and Zoe Ray ('09), Psychology**

Prenatal choline supplementation has been shown to have effects on behavior, neural structure and function, and brain plasticity. Choline has also been shown to modulate the hypothalamic-pituitary-adrenal (HPA) axis, which has been linked with aggressive behavior. In order to determine whether there is a relationship between these two findings, the current investigation examined aggressive behavior across four different choline diet conditions (control, prenatal supplement, prenatal/adolescent supplement, and prenatal/adult supplement) in thirty two female Sprague-Dawley rats. Aggressive behavior was measured using the Resident Intruder Paradigm (RI), where rats who had not been previously housed together were introduced and assessed for specific aggressive and submissive behaviors. Immediately following the RI test rats were perfused and brains removed. Immunohistochemistry techniques were used to stain for c-fos, a marker for neuronal activation to see if there might be differences in amount or pattern in structures that respond to and mediate aggression. C-fos expression was primarily examined in the amygdala; however, subnuclei within the hypothalamus were also studied as a means for looking at overall HPA axis activation. It was hypothesized that prenatal choline supplementation would increase aggressive behavior as well as decrease c-fos expression in the amygdala.

## **THE EFFECTS OF PRENATAL CHOLINE SUPPLEMENTATION ON INFANT RAT EXPLORATION**

**Kristina Boman ('08), Psychology**

Past research has shown that differences can be seen early on in development between neophobic (fear of novelty) and neophilic (novelty seeking) rats. This difference seems to remain stable throughout a rat's lifetime. Activity and exploration of open field in early life is a predictor of adult stress behavior and life outcomes. Choline is an essential nutrient in development, has cognitive and memory enhancing effects, decreases the decline in age-related spatial memory, and enhances attention function. Prenatal choline supplementation increases the activity of adolescent rats. When supplemented, they made more visits to the center of the exploration field as well as spent more time in the center as compared to the control animals. This study examines whether prenatal choline supplementation has an effect on the exploration of male and female infant Sprague Dawley rats and whether the care provided by the mother effects the

exploration behavior of her rat pups. The experiment also examines whether the sex and prenatal diet of the rat play a role in determining whether they are neophilic or neophobic. Results show that there is a large maternal care effect on activity in response to novelty; however it is inconsistent with the generally accepted idea that offspring of high mothers are neophilic. The effect of maternal care was greatest in control males and prenatal choline supplementation attenuated it.

## **FEASIBILITY STUDY: SOLAR WATER HEATING AT COLBY'S HAROLD ALFOND ATHLETIC CENTER**

### **Noah Bonnheim ('11) and Caitlin Dufraine ('09), Science, Technology, and Society**

Solar water heating at Colby's Harold Alfond Athletic Center would significantly reduce Colby's carbon footprint. By installing photovoltaic solar panels on the roof of the athletic center, Colby would be able to heat both the pool and the domestic hot water, including showers, sinks, and washing machines, with primarily solar energy. This project would not only notably reduce Colby's annual emissions and energy bill, but it would send a message to colleges and universities nationwide, and the Maine state government, that Colby is interested and deeply invested in reducing its carbon footprint and operating more sustainably. We are working with PPD to conduct a pre-feasibility study that will help to determine what the scope, cost and benefits of the project might be.

## **A CITY AT WAR: DAILY LIFE AND SOCIETY IN ORLÉANS DURING THE 1428-1429 ENGLISH SIEGE**

### **Adam Boss ('08), History**

English and French forces used sieges to gain territory in France with increasing frequency during the late stages of the Hundred Years War. In 1428, an English army laid siege to Orléans, a city that served as a strategically critical crossing point on the Loire River. Scholars have frequently analyzed the military events that allowed the French to lift the siege and turn the course of the war in their favor, but they have rarely explored the seven-month struggle's effects on the city's inhabitants. Drawing from the rich body of chronicles and treasury accounts related to Orléans and the siege, this study examines the challenges that the city faced in preparing a defensive system, treating wounded soldiers, repairing walls and buildings, and distributing food resources limited by English fortifications positioned around the city. The city's survival depended on the efforts of citizens from all social ranks, along with the cooperation of the population with professional soldiers, whom they traditionally detested. By specifically examining the ways in which the demands of defending Orléans affected the religious life, gender roles, and mentalities of the city's inhabitants, this project assesses the various levels on which a military crisis shaped an urban community.

## **IN THE ABSENCE OF FAMILY: HOW PRIVATE HONDURAN CHILDREN'S HOMES MEET THE NEEDS OF AT-RISK YOUTH**

### **Stephanie Bowman ('08), Latin American Studies**

Through an interdisciplinary analysis of children's homes in San Pedro Sula, Honduras, this project reflects on how conceptions of family affect the prioritization of the needs of the homes' beneficiaries. One consequence of the impoverished nature of Honduras are orphaned, abandoned, mistreated, malnourished, abused, neglected and disowned children who have come to live in group children's homes that, for the most part, meet their short-term physical needs. But what about children's developmental, social and educational needs? In this study, we analyze what needs homes meet according to the kind of familial substitute they provide as either a group home or a family-based home. Conscious of the limited financial resources these small NGOs have available, each home has chose a particular structure that meets some children's needs, while ignoring others. How well do these homes provide for the spectrum of short and long-term needs of Honduran children? How does their conception of family and organization affect their efficacy? What conclusions can be drawn about the most effective allocation of all available resources?

## **THE PENGUINS' REVOLUTION: AN ANALYSIS OF STUDENT RESPONSE TO THE MULTI-DIMENSIONAL CHILEAN EDUCATIONAL CRISIS**

### **Abigail Hall ('08), Latin American Studies**

Through exploration and analysis of economic, historical and political factors stemming from the authoritarian period (1973-1990) to the present day, this project offers an interdisciplinary explanation of the emergence of the "Penguin's Revolution" in Chile. In May-June 2006, 700,000 high school students paralyzed the Chilean education system by protesting in the streets, taking over schools and not attending classes. Students organized under the Coordinating Assembly of Secondary Students (ACES) demanded that the government take responsibility for providing universal



high quality and equal education. The roots of student discontent lie in the multi-dimensional education crisis, generated by the semi-privatized, decentralized educational system created by Augusto Pinochet in 1980 and the failure of subsequent democratic administrations to alter the model. A breakdown of the government's response to the student movement will also be presented along with implications for the future.

## **CLIMATE CHANGE EDUCATION AND ACTION IN LOCAL HIGH SCHOOLS**

### **Megan Browning ('10) and Alice Evans ('10), Science, Technology, and Society**

As the service learning component to the History of Climate Change class, Megan Browning and Alice Evans partnered with Maine Energy Education Program (MEEP) to spread environmental awareness and education within two local high schools. The goal of this project is to promote action among a younger generation that will be largely responsible for mitigating effects of climate change in the future. The Environmental club at Messalonskee High School, and a Physical science class at Waterville Senior High School were the two student groups they worked with for the project. Alice and Megan first focused on the idea of a Carbon footprint by teaching the students how to both calculate and reduce their own emissions. The project progressed with an introduction to energy audits. Using tools provided by MEEP, students were guided in collecting data on lighting, heating, water use, food consumption, electrical use, waste, and transportation in their respective schools. Although they were two very different learning environments, both high schools provided a forum for educated discourse about climate change and energy reduction. As the project continues, the students are becoming more enthusiastic and involved in reducing their individual energy use and that of their schools.

## **EFFECTS OF CLORETAZINE, AN ANTICANCER AGENT, ON HUMAN APURINIC ENDONUCLEASE-1 ACTIVITY**

### **Jennifer Bushee ('08), Chemistry**

The carbamoylating activity of Cloretazine, a novel anticancer prodrug, modifies protein function and in combination with the synergism from the choroethylating species, alkylates DNA. The reactive subspecies responsible for carbamoylating activity is methyl isocyanate, a carbamoylating species that reacts with sulfhydryl groups and amines. DNA repair enzymes have been identified as a potential target for the synergism with the methyl isocyanate. Base excision repair enzymes are premium targets for Cloretazine's carbamoylating activity. Enzymes in DNA base excision repair include DNA polymerase beta (Pol  $\beta$ ) and apurinic/apyrimidic endonuclease-1 (APE/Ref-1). APE/Ref-1 hydrolyzed the 5'-phosphodiester DNA backbone from an abasic DNA template, where the base was excised by a DNA glycosylase. The entire nucleotide is then re-inserted by the nucleotidyl transferase activity of Pol  $\beta$ , which also cleaves the 5'-deoxyribose phosphate via lyase activity. Previous research investigated the inhibition of Pol  $\beta$ 's AP lyase and nucleoside transferase activity. Cloretazine's carbamoylating activity inhibits the nucleotidyl transferase activity of Pol-beta, but not its lyase activity. An efficient enzymatic assay was developed and employed to determine the anticancer drug's effect on APE/Ref-1's hydrolytic activity. The endonucleolytic activity of APE-1 is not significantly inhibited by Cloretazine.

## **MOVEMENT COORDINATION IN JOINT ACTION**

### **Walter Campbell ('08), Psychology**

Dynamical systems researchers have understood the stable patterning of interpersonal and non-biological environmental rhythmic limb coordination to be constrained by the self-organized entrainment processes coupled oscillators. Recently, it has been demonstrated that an individual's rhythmic limb movements exhibit greater variability when viewing spatially incongruent biological limb movements, but not when viewing spatially incongruent non-biological movements. Some researchers have concluded that a 'mirror-neuron system' might mediate the intrinsic bidirectional link between perception and action underlying interpersonal, but not environmental, coordination (e.g., Kilner et al., 2003; Tognoli et al., 2007). The current study aimed to: 1) contest this recent finding; and 2) demonstrate that the self-organized entrainment processes of coupled oscillators can explain the differing influences of biological and non-biological movements. In the first experiment, participants intentionally coordinated arm movements with spatially congruent and incongruent arm movements of a confederate, a robotic image with computer generated movement, and a robotic image producing pre-recorded human movement. Results revealed more stable coordination for congruent and biological movement than incongruent and robotic movement, respectively. The second experiment investigated the influence of biological and non-biological movement on unintentional coordination. Consistent with dynamical systems theory, coordination was found in both biological and non-biological conditions.

## **AN ANALYSIS OF CARBON SEQUESTRATION POTENTIAL IN MAINE**

### **Charles Carroll ('08), Environmental Studies**

Carbon sequestration as a concept has been accepted by the global community, but remains in its infant stage of implementation worldwide. What remains to be seen is the impact that carbon sequestration will have on the future levels of greenhouse gases. The most common sequestration method is biosequestration, in which atmospheric carbon is absorbed into the biomass of growing plants. The most significant biomass producers are trees, yet different species of trees sequester different amounts of carbon at varying rates. An understanding of the variability of sequestration potential of tree species is essential to the prospect of future carbon sequestration programs because the effects of climate change are expected to significantly alter the composition of temperate forests. This study uses two different emissions forecast models to predict the changes in carbon sequestered in tree biomass in Maine over the next century, and then extrapolates the changes in carbon sequestered over the same time period. While there will be significant changes to the character of the ecosystem, there will not be significant changes to the amount of sequestration, indicating that the natural forest sequestration will not offset increases in global greenhouse gas emissions. In addition, an economic analysis was performed to determine the role of sequestration through afforestation projects in mitigating the effects of climate change in Maine. Due to the high costs of converting developed land to forests, investing in afforestation in Maine seems unlikely to hold the key to controlling climate change. This study suggests that while sequestration is an important method for offsetting emissions, it will not play a large role in Maine's future, and significant reductions in future global emissions will be necessary.

## **ATLAS OF MAINE: CARBON SEQUESTRATION AND POPULATION CENTERS IN MAINE**

### **Charles Carroll ('08), Environmental Studies**

This Map depicts the standing level of carbon sequestered in tree biomass in various bioregions of Maine, as well as major population centers. The results demonstrate that the highest level of standing carbon is located in the north and northwest regions of Maine, areas farthest away from the population centers. Calculations of the carbon sequestered were generated by manipulating data from US Forest Service Reports entitled Forest Statistics for Maine 1971 and 1982, and Forest Statistics for Maine, 1995. Census data used for the population centers is found at the Maine Office of GIS.

## **MODELING POTENTIAL TIGER HABITAT IN HUPINGSHAN-HOUHE AND MANGSHAN-NANLING NATIONAL NATURE RESERVES, CHINA**

### **Charles Carroll ('08) and Courtney Larson ('08), Environmental Studies**

After declining steadily for several decades, the South China tiger (*Panthera tigris amoyensis*) is now thought to be extinct in the wild. However, there is some hope of reintroduction, with Hupingshan-Houhe and Mangshan-Nanling National Nature Reserves in southern China seeming to hold the most promise. Our study used slope, elevation, vegetation, and landcover variables to construct a rough habitat suitability index for tigers in these two parks. According to our model, there are areas of suitable habitat within both parks. However, there are some important variables that we were unable to include in our model, such as human population density and prey availability. Considerable in-depth research will be necessary to evaluate the suitability of these locations before reintroduction is considered.

## **JEAN-HONORÉ FRAGONARD: A SENTIMENTAL AFFAIR**

### **Laure-Helene Caseau ('10), Art**

Jean-Honoré Fragonard is, for a famous French rococo painter, relatively unknown. Or more precisely, he is recognized as an incomparable painter of leisure and erotic scenes but the extent of his achievements and the aspirations behind them remain mysterious to many. Through the study of his life and work, I sought to understand his ability to create the pleasant and witty scenes he is known for. The ultimate purpose was to apply the gained understanding and create two paintings myself; a copy of one of his works and an inventive piece inspired by his style and set in modern times. Fragonard's clever and easy brushstrokes are the result of years of learning and practice and so for me to expect to create a piece comparable in quality would have been presumptuous. However, my method as a student is validated, as Fragonard himself copied paintings of masters he admired to learn from them.

## **A COMPREHENSIVE EXAMINATION OF NEW IMMIGRANTS: THE REVERSE DIASPORA OF ARGENTINEAN JEWS TO ISRAEL**

### **Julie Casper ('08), Religious Studies**

**A COMPREHENSIVE EXAMINATION OF NEW IMMIGRANTS: THE REVERSE DIASPORA OF ARGENTINEAN JEWS TO ISRAEL** This project investigates the reverse Diaspora, or trend, of Argentinean Jews who have immigrated to Israel, a movement called in Hebrew Aliyah, literally "the rising up" of a Jewish person to the land of Israel. I spent the month of January in Israel exploring absorption centers and conducting interviews with new immigrants who have made Aliyah in the past eight years since the collapse of Argentina's economy. I examined to what extent their desire to immigrate was a financial decision brought about by the recession, and questioned whether the economic collapse served as a catalyst for fulfilling the goal of Aliyah. How have events in Israel, and specifically the Israeli- Palestinian conflict, played a role in the decision to immigrate? Furthermore I researched how Argentinean Jews navigate their sense of space in Israel. Is the land of the Jewish people at once a homeland and a foreign country? Has the immigrant experience been as economically or religiously fulfilling as had been expected? Has the level of Jewish religious practice been affected by the immigration?

## **MIFEPRISTONE REDUCES HPA-AXIS RESPONSIVITY AND INCREASES NEURONAL ACTIVATION IN PREFRONTAL CORTEX FOLLOWING ACUTE STRESS**

### **Aynara Chavez-Munoz ('08), Chemistry**

Dysfunction of the hypothalamo-pituitary-adrenocortical axis (HPA-axis) is associated with a number of psychopathologies including depression. A hallmark feature of depression is HPA-axis hyperactivity, characterized by elevated glucocorticoids and a decrease in glucocorticoid mediated negative feedback. Because excess glucocorticoids are associated with depressive-like features in humans, glucocorticoid receptor antagonists are currently being tested for antidepressant efficacy in clinical trials. The current study is designed to test the efficacy of mifepristone (RU486), a glucocorticoid receptor antagonist, in mitigating behavioral, endocrine and CNS responses in a test of helplessness in rodents. This was accomplished by measuring behavioral helplessness, HPA-axis responses to stress as determined by adrenocorticotropin releasing hormone (ACTH) and corticosterone (CORT) release, and c-Fos expression (marker for neuronal activation) in the medial prefrontal cortex (mPFC), an area associated with both depressive-like behavior and HPA-axis inhibition.

## **THE BLACK NAPOLEON: POST-COLONIAL FIGURES OF TOUSSAINT LOUVERTURE**

### **Nathalie-Claire Chiavaroli ('08), French/Italian**

An oppressed black slave turned soldier, only to become a revolutionary political leader, Toussaint Louverture represented an 'ouverture' or opening for fellow slaves in St. Domingue (modern day Haiti) to revolt against French colonial rule. With Napoleon threatening to reestablish slavery, which had been abolished in 1794, Toussaint's allegiance shifted toward his own people, as did his image. Initially depicted by French politicians, writers and artists as a cultural liaison, Toussaint came to incarnate a barbaric Negro, threatening France as a colonial power. Artistic portraits and literary accounts of Toussaint Louverture capture not only the rise and fall of the Black Napoleon, but also exemplify colonial racism.

## **PATTERNS OF PHAGOCYTIC ACTIVITY IN ZEBRAFISH (*DANIO RERIO*) KIDNEY LEUKOCYTES**

### **Ryan Chrenek ('08), Biology**

**PATTERNS OF PHAGOCYTIC ACTIVITY IN ZEBRAFISH (*DANIO RERIO*) KIDNEY LEUKOCYTES** The physiological and behavioral processes of living things follow regularly oscillating patterns called circadian rhythms. Biological rhythms are regulated endogenously and can be entrained by environmental cues ('zeitgebers'), the most important of which is light. These oscillating cycles influence many processes in vertebrates, including the innate immune system. This study aimed to measure daily patterns in phagocytosis of *E. coli* and *S. aureus* in zebrafish kidney cell preparations. Phagocytosis was analyzed by FACScalibur flow cytometry, using the pH-sensitive, rhodium-based pHrodo phagocytosis indicator. This is a fluorescent indicator that only fluoresces in acidic pH (inside a phagosome). The following two parameters were used to measure phagocytic activity: %M (the percentage of cells within a gated myelomonocyte population endocytosing labeled *E. coli* and *S. aureus*), and MFI (mean fluorescence intensity, a measure of the number of bacterial particles ingested per myelomonocyte) It has been observed that the percentage of phagocytic cells endocytosing labeled *E. coli* varies significantly in a daily pattern, while the percentage of cells

endocytosing *S. aureus* does not. Additionally, a significantly lower percentage of phagocytic cells endocytose labeled *S. aureus* than *E. coli*.

## **HORSING AROUND: QUADRUPEDAL GAITS AND INTERPERSONAL COORDINATION**

### **Michele Chu ('09) and Veronica Romero ('09), Psychology**

Past research has indicated that the leg movements of two individuals, who have a perceptual connection, will tend to become coordinated. In the current experiment, we examined how different types of coupling influence the extent and type of such coordination. In particular, whether mechanical coupling—a 26" length of foam that connected the two people, front-to-back, as a quadruped—would increase the strength of the visually coupled coordination that occurs between the gait patterns of two individuals. Pairs of participants completed three coupling conditions, visual only, mechanical only, and visual-mechanical. In each condition, participants were instructed to walk and then run at a self-selected, comfortable pace. The emerging patterns of coordination were categorized in terms of different quadrupedal gaits. It was found that mechanical–visual coupling produced the highest level of coordination and that the visual only coupling showed the least amount of coordination. Also, different gait patterns were observed across the different coupling conditions and were consistent with the stable gait patterns observed in quadrupeds.

## **WHICH EVENTS DO WE REMEMBER BEST? THE SALIENCE OF ACHIEVEMENT AND INTERPERSONAL MEMORIES**

### **Michele Chu ('09), Nicholas Lehman-White ('10) and Christiana Lumbert ('10), Psychology**

Previous correlational research has suggested that when individuals are asked to recall an event where they felt especially good, they usually recalled a positive achievement memory. In contrast, when individuals are asked to recall an event where they felt especially bad, they usually recalled a negative interpersonal memory. In the current study, we examined whether this pattern would emerge in an experimental setting. Twenty-four sentences, which described events that were categorized as positive achievement, negative achievement, positive interpersonal or negative interpersonal, were presented to thirty participants. These sentences were written in either second person, to mirror autobiographical memories, or third person, to mirror general memories. It was found that individuals remembered more sentences categorized as positive achievement and positive interpersonal than any other type of sentence in either the second or third person point of view.

## **THE LONELY CHAMELEON: DO NEEDS FOR INDIVIDUATION AND ASSIMILATION AFFECT MIMICRY?**

### **Lana Ciociolo-Hinkell ('09) and Guy Sack ('09), Psychology**

This study sought to determine the effect of assimilation and individuation needs on mimicry. Participants were informed that they had achieved a score on a personality test that led them to believe that their score was uniquely poor among their classmates, average among other students their age, or average among their classmates but unique among other students. The participants then watched a film of a student fidgeting while she studied. Half of the participants were informed that she was a classmate and half that she was a student at another school. No significant findings were found, however, it is likely that this is mostly due to procedural error.

## **ATLAS OF MAINE: WETLANDS AND DEVELOPMENT IN MAINE**

### **Alaina Clark ('08), Environmental Studies**

Wetlands are important areas for wildlife. This map shows the threat of development on Maine's wetlands by presenting the areas of development in reference to the wetland locations. It also provides a closer view of Waterville, showing that wetlands have disappeared in the center of town and currently exist along the fringes. This map provides a general idea of how people can change the distribution of wildlife habitats.

## **DESIGNING A GREEN GRADUATION AT COLBY COLLEGE**

### **Alaina Clark ('08), Environmental Studies**

Public awareness about climate change has increased due in large part to the efforts of colleges and universities. Colby College can make a statement that we believe that the mitigation of climate change is an important process to protect the future by holding our first Green Graduation in 2008. This project maps out the planning and design of Colby's Green Graduation and helps to show the constraints and difficulties of becoming more environmentally friendly. It also

provides background information about climate change and ideas for future graduations. Graduation is an important event where Colby has a great opportunity for education. By holding a Green Graduation, Colby will show the public that it is possible to have a high quality celebration with minimal impact on the planet. After this pioneer year, hopefully the Green Graduation and other 'green' events will become standard practice. Colby College is leading us toward a more sustainable and environmentally conscious society.

### **ESTABLISHING TAPHONOMIC TRENDS OF COLEOPTERA USING THREE DIFFERENT CARABID SPECIES IN A LABORATORY FLUME SYSTEM**

#### **C. Clark ('08), Geology**

Beetles (Insecta: Coleoptera) have an extensive fossil record dating back the Permian (Moore et al., 1952). Heavily sclerotized, highly diverse, mobile, and abundant, they can today be found living in almost all terrestrial and freshwater environments, resulting in easy burial and consequent preservation. Quaternary Coleoptera, are commonly found as subfossil, disarticulated fragments in unconsolidated sediments. Exoskeletons are most likely preserved within anoxic water-laden sediments, mixed with organic detritus (Elias, 1994). Because most Quaternary taxa are of modern species, identification is possible by comparison of the fragments to complete museum specimens. This, and their generally highly restricted ecological tolerances, has given rise to their widespread use in paleoclimatic and paleoenvironmental studies. Coleopteran remains are useful in characterizing numerous physical and chemical parameters of deposition including; water flow rates, temperature, and water pH, trophic status, substrate characters, and vegetation density. Little is known about the taphonomic biases that are reflected in coleopteran assemblages. This study was undertaken in hopes of providing at least a beginning towards initial understanding of transport factors influencing the dispersal and deposition of coleopteran remains in a fluvial setting, using known numbers of individuals in a controlled laboratory environment. Data are supported by visual markers, indicating the prevalence of particular coleopteran body parts within any particular segment of the channel.

### **THE IDENTIFICATION OF A CHLORAMPHENICOL INDUCIBLE MULTIDRUG EFFLUX PUMP IN *FLAVOBACTERIUM JOHNSONIAE*-LIKE ISOLATES**

#### **Sarah Clark ('08), Biology**

In this study the resistance mechanisms of *Flavobacterium johnsoniae*-like isolates obtained from fish hatcheries in Maine were characterized. *Flavobacteria* are common in aquatic environments, and several species, including *F. johnsoniae*, cause disease in fish. The isolates used in this study are resistant to a wide range of antimicrobial agents, which represents a potential threat to the aquaculture industry. While some  $\beta$ -lactamases have been identified in *Flavobacterium* species, the presence of these genes only accounts for part of the multidrug resistance phenotype observed. In this study the contribution of efflux pumps to the antibiotic resistance of *F. johnsoniae*-like isolates was investigated. The best characterized multidrug efflux pump systems are the Mex efflux pumps present in *Pseudomonas aeruginosa*. Genomic analysis revealed the presence of several Mex homologs in *F. johnsoniae*, several of which were amplified in an *F. johnsoniae*-like strain. Using qRT-PCR analysis, the expression of one of the Mex homologs, named FmeABC1, was found to be inducible by exposure to chloramphenicol. This inducible expression is similar to that of the MexXY pump in *P. aeruginosa*. In addition, an efflux pump inhibitor, PA $\beta$ N, was shown to decrease the resistance of an *F. johnsoniae*-like isolate to a number of different antibiotics, suggesting the presence of efflux pumps with multiple substrates in this system. This represents the first report of a multidrug efflux pump in the genus *Flavobacterium*.

### **JEANE KIRKPATRICK, THE COMMITTEE OF SANTA FE, AND THE ORIGINS OF THE REAGAN ADMINISTRATION'S COMPLICITY IN THE NICARAGUAN COUNTERREVOLUTION**

#### **Hannah Coleman ('08), History**

In the late 1970s and early 1980s, Jeane Kirkpatrick and the Committee of Santa Fe proposed preemptive action against Nicaragua because they believed that the Sandinistas were a threat to U.S. national security. They maintained that the left-of-center Sandinista government would inevitably provide the Soviet Union with a foothold in Latin America. Thus, they sought to rekindle the patronizing and culturally insensitive U.S.-Latin American patron-client relationship of the nineteenth and early twentieth centuries. Kirkpatrick, and the Committee of Santa Fe, a privately funded right-wing think tank, were significant because of their influential writings. Kirkpatrick's article "Dictatorships and Double Standards" and the Committee of Santa Fe's policy recommendation "A New Inter-American Policy for the Eighties" provided the foundation of the Reagan administration's policies toward Central America. Throughout the 1980s, the Reagan administration focused its attention on the anti-Sandinista counterrevolutionary efforts in Nicaragua. In pursuit

of its Nicaraguan policy, the administration overlooked facts, human rights violations, and both national and international law. In doing so, the Reagan administration erased the progress of twentieth century U.S.-Latin American relationship initiatives such as the Good Neighbor Policy, the Alliance for Progress, and the Carter administration's human rights policies.

## **RHETORIC AND REALITY: CHANGING PRINCIPLES AND AMBIVALENT IMPLEMENTATION OF COLONIAL POLICY IN FRENCH INDOCHINA**

### **Amber Collins ('08), French/Italian**

The relationship between the French administration and its empire in Indochina was often imperialist and oppressive, even though French values have emphasized the ideals of liberty and resistance to oppression since the time of the French Revolution. What were the elements of French colonial policy during that time period? Did the colonization of Indochina conform to this policy, or did colonial administration contradict the rhetoric? What were the real reasons for colonization? To answer these questions, it is necessary to consider the history of French expansion in Indochina, the development of colonial policy in theory, and how the principles of this theory were put into practice in the region from the late 1800s through the turn of the century.

## **THE EFFECTS OF STIGMA ON INDIVIDUALS' EXPRESSION OF SEXUALITY AND SEXUAL ORIENTATION**

### **Jennifer Corriveau ('10), Loretta Biss ('10), Sara Cameron ('10) and Pollee Hruby ('09), Psychology**

The purpose of the present study was to better understand the relationship between stigma and expression of sexuality and sexual orientation. Previous research has found that individuals are not as likely to openly express their sexual orientation in public situations (Ragins, Singh, & Cornwell, 2007). Once the immediate threat of social stigma is removed, individuals are more likely to be honest about their preferences and experiences (Frank & Leary, 1991). Additional research has shown that men harbor stronger anti-gay attitudes and are less likely than women to express a fluid sexuality (Herek, 1998). 121 students from Colby College were recruited and asked to read a vignette and respond to several questions regarding it, complete the Attitudes Toward Lesbians and Gay Men Survey (Herek, 2004), and answer several questions about their sexuality. The vignette included a description of either a private or a public romantic encounter with an individual of the same or opposite sex. It was hypothesized that individuals who read the private situation would be significantly more likely to respond with more fluidity on the continuum of sexuality expression. It was additionally hypothesized that women would be more open than men to homosexual encounters and homosexuals in general. The results revealed that women are more likely than men to return same-sex affection. However, the scenario type did not affect the likelihood of returned affection; there was no significant difference between public and private settings.

## **SELF-DESTRUCTIVE BEHAVIORS OF ADOLESCENT BOYS AND GIRLS**

### **Carolyn Curtis ('08), Sociology**

From a social constructionist perspective linked with a feminist standpoint, I examine three forms of adolescent self-destructive behaviors: eating disorders, self-mutilation and substance abuse. The social construction of norms, values, and beliefs in adolescents, as based upon their interactions with their family, peers, and the media, helps explain self-destructive behaviors. In addition to a comprehensive literature review, I interviewed five adults who work with adolescents in the state of Maine, and used these professional experiences and knowledge to support the current theories pertaining to these self-destructive behaviors. To better understand what drives some adolescents to harm their own bodies, I examined the sociocultural influences, personality traits, and the effects of gender on adolescent interactions and experiences.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: HUMAN TOXICITY OF BISPHENOL-A AND ITS PRESENCE IN HOUSEHOLD PRODUCTS**

### **Sarah Dallas ('10), Sarah Hart ('10) and Emily Kissner ('08), Environmental Studies**

Bisphenol-A is synthetic chemical that is most often used as an additive in polycarbonate plastic. It gives plastics their strength, rigidity, and transparency. It is found most often in polycarbonate plastics, such as hard plastic water bottles, metal food-can linings, baby bottles, and other household items. However, there are significant human health effects of exposure to Bisphenol-A. Bisphenol-A is easily hydrolyzed out of the plastic and ingested by humans. The chemical structure of Bisphenol-A is similar to estrogen. When it accumulates in the human body, it acts as an estrogen thus

disrupting the endocrine system. In adult males it is linked to sexual dysfunction, and lower sperm count. If a male fetus or infant is exposed it leads to genital deformities. In females it is linked to breast cancer and early onset of puberty. Human exposure to Bisphenol-A is currently regulated in both Canada and Europe, and is currently being phased out of many consumer products. In the United States, individual states are beginning to regulate the presence of Bisphenol-A in many of these products. New alternatives have been found and there has recently been an upsurge in the amount of research into these safer options. For the future, this toxic chemical requires regulation or elimination from consumer products.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: ALTERNATIVES TO THE U.S. APPROACH TO CHEMICALS REGULATION**

### **Bethany Darling ('08), Caroline Allison ('08) and Anna Kelman ('08), Environmental Studies**

Current United States toxics legislation is seen as inadequately protective of human health by some individual states, as well as some international governments. Most chemicals in the U.S. are regulated under the Toxic Substances Control Act (TSCA) which was implemented in 1976. Since then, both Europe and individual states have enacted more protective and thorough legislation. The European Union created REACH (Registration, Evaluation, & Authorization of Chemicals) which is based loosely on the precautionary principle. The comprehensive registration has been more transparent and effective than the registration and regulation under TSCA. Several states, such as California, Maine, and Washington have implemented similar chemical laws to enhance protection above the requirements and realities of TSCA. As chemical toxicity becomes more of a public policy issue, other states have chosen to take measures to create more protective legislation, creating a positive feedback mechanism that may encourage further federal legislation.

## **ATLAS OF MAINE: CHANGING PROPERTY VALUES IN MAINE, 1999-2008**

### **Bethany Darling ('08), Environmental Studies**

Property values have been rising rapidly in Maine over the past decade, but these effects are not spread evenly throughout the state. This map represents the geographical distribution of property value change over the past nine years, based on average municipal property value data obtained through the Maine State Planning Office.

## **USING GIS NETWORK ANALYST TO IDENTIFY SUPPLIERS FOR A PRODUCE CO-OP IN WATERVILLE, ME**

### **Bethany Darling ('08) and Jamie O'Connell ('08), Environmental Studies**

The idea for organizing a cooperative market on Waterville Main Street was proposed by Aime Schwartz in the fall of 2008. The Co-op would entail an open market located on Main Street to provide fresh, local produce and crafts to town locals. Through shorter delivery distances and agreements with local farmers, the co-op theoretically will offer consumers lower prices on produce than can be found in conventional grocery stores, as well as an opportunity to support local agriculture. One of the tasks involved with organizing the Co-op is to source all of the produce from among the hundreds of farmers located in Maine. The purpose of this project is to show how Geographic Information System (GIS) tools can be used to help the Co-op and other business a) site nearby farms that carry desired produce and products, and b) determine which farms are closest to the business site. Using GIS for this purpose will make it easier and more efficient to source produce suppliers, and reduce the workload on business planners. GIS Network Analyst is a tool that provides network-based spatial analysis, and can be used in conjunction with traditional GIS technologies to determine not only the geometric distance between points, but also distance over existing networks (like roads). We will show how Network Analyst can be used to find the several closest produce suppliers to the Co-op for specific produce items, and compute how far they are over existing roads. This will enable business planners to source potential suppliers by distance before contacting individual farmers, allowing for more efficient use of their time and a faster planning process.

## **BLACK CARBON IN TAYLOR POND, MAINE**

### **Morgan Davies ('08), Environmental Studies**

Black Carbon is a continuum of combustion products that range from slightly charred, degradable biomass to highly condensed refractory soot. It is an important sink in the global carbon cycle because it is difficult to be redoxidized to carbon dioxide. This study evaluates the flux of black carbon into Taylor Pond, Auburn, Maine to determine if anthropogenic sources may have increased the concentration of black carbon since the late 19th Century. The sediment analyzed for this study was taken from a piston core recovered at one end of the lake. The sediment character is that of a

massive organic rich homogenous gyttja that was deposited during the last 150 years. Although black carbon can be weathered and eroded from rocks, it is principally the result of atmospheric deposition due to forest fires and the burning of fossil fuels. This study has compared the concentration of black carbon to the concentration of lead, previously determined by Dylan Eberle and Dr. Beverly Johnson of Bates College, to see if there is a significant correlation that links its concentration to atmospheric pollution.

## **THE EFFECT OF IDEAL AND OUGHT DISCREPANCIES OF A PROFESSOR ON AFFECT**

### **Megan Dean ('09) and Zoe Ray ('09), Psychology**

This study looked at the effect of discrepancies between one's ideals and oughts for another person and that person's actual self. Self-discrepancy theory (Higgins, 1987) was used as a framework for the study, with affect used to measure the effect of the discrepancy. 90 Colby College students ranging in age from 18-22 were tested. A 2(discrepancy: ideal, ought) x 3 (prime: ideal, ought, none) design was used, and participants were randomly assigned to one of the six conditions. Participants were initially primed for ideal or ought, or were given no prime. After reading a scenario discussing a professor who was either discrepant from a pretested set of ideals or ought, participants completed a mood questionnaire. Participants who read the ideal-discrepancy scenario felt significantly more disappointed and significantly less happy and cheerful (dejection-related emotions) than those who read the ought-discrepancy scenario, while participants who read the ought-discrepancy scenario felt significantly more worried (an agitation-related emotion) than those who read the ideal-discrepancy scenario.

## **ATLAS OF MAINE: FRAGMENTATION AND CLEARING OF MAINE FOREST HABITATS**

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

This map of the fragmentation of Maine's forests was created using data from the Maine Office of GIS, National Atlas and the US Fish and Wildlife Service. It shows the degree of degradation of forest habitats due to the development of roadways and Maine's logging industry.

## **DEMOGRAPHICS OF NATURAL DISASTER HOTSPOTS IN MAINE**

### **Lindsay Dreiss ('09) and Caitlin Dufraine ('09), Environmental Studies**

Natural disasters can cause extensive damage to communities and infrastructure. The state of Maine is fairly lucky, because natural disasters are relatively infrequent. Maine does, however, experience earthquakes, flooding, hurricanes and landslides. Certain areas of the state are more prone to experience natural disaster than others. Using GIS analysis, we are analyzing natural disaster hotspots in Maine to determine if there is a statistically significant relationship between natural disaster susceptibility and socioeconomic variables including income and population.

## **STEREOTYPE THREAT AFFECTS FALSE MEMORY SUSCEPTIBILITY IN OLDER ADULTS**

### **Stacey Dubois ('08), Psychology**

Stereotype threat describes a situation in which 'one is at risk of confirming, as self-characteristic, a negative stereotype about one's group' (Steele & Aronson, 1995). This threat is enough to impair performance on relevant tasks. For example, women are stereotyped as being worse at math than men. When given a difficult math test and informed that women are expected to underperform in comparison to men, women perform worse than if they are given the same test and told that no gender differences are expected (e.g. Spencer, Steele, & Quinn, 1997). My study looked at the effects of stereotype threat on false memory susceptibility of older and younger adults, as older adults are stereotyped as having poor memories. Results suggest that older adults perform better when the task is framed as being a measure of verbal ability. Thus, stereotype threat effects may exaggerate age related differences in memory, and researchers should look for ways to reduce threat in laboratory tasks in order to provide a more accurate picture of the memory deficits associated with aging.

## **THE EFFECTS OF NOISE DISTRIBUTION ON UNINTENTIONAL INTERPERSONAL COORDINATION**

### **Pamela Dudley ('08) and Carrie Potter ('09), Psychology**

Previous research has shown that a person may become unintentionally coordinated with environmental stimuli or the rhythmic movements of another person. It has also been demonstrated that the amount and possible occurrence of such unintentional coordination is influenced by the difference between the natural periods of the rhythms—the greater the difference in period the weaker the coordination observed. The variability of the rhythmic movements involved can also



operate to constrain the amount of unintentional coordination between two interacting individuals, with natural amounts of movement variability sometimes operating to increase the possible occurrence of unintentional coordination. The present study thus examined the effects of both variability and period difference on unintentional coordination among dyads. Participants were asked to swing a variety of pendulums differing in natural frequency and movement stability while performing an interpersonal problem-solving task. Eight pairs of participants completed eight trials, during four of which they looked at each other and four they looked away from each other. It was expected that: 1) pairs of participants would unintentionally coordinate more when swinging non-detuned pendulums with a low and more stable natural frequency than non-detuned pendulums with a high and less stable natural frequency; and 2) that pairs of participants would unintentionally coordinate more when swinging detuned pendulums with a high and less stable natural frequency than detuned pendulums with a low and more stable natural frequency. The present findings build upon previous research about unintentional coordination to a biological rhythm.

## **ATLAS OF MAINE: FAULT LINES AND EARTHQUAKES OF MAINE 1568-2005**

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

Though people may not realize it, there are earthquakes in Maine. Using GIS, this map was created to show the fault lines in the state of Maine, and the locations and magnitudes of all of the earthquakes that have occurred in the state of Maine from 1568 to 2005.

## **MOVING TOWARD A SUSTAINABLE WATERVILLE**

### **Stephen Erario ('10), Science, Technology, and Society**

In recent months and years, a growing number of Maine municipalities have proactively taken the lead in addressing local climate and sustainability concerns. The City of Waterville has been a regional leader in the field of climate action. This presentation outlines government and community-at-large greenhouse gas emissions in Waterville, as well as previously enacted and proposed actions by the local government to address climate and sustainability issues.

## **TO CUT OR NOT TO CUT: INDIVIDUAL AND SOCIETAL PERSPECTIVES ON COSMETIC SURGERY**

### **Lacey Favreau ('08), Psychology**

The literature review presented here discusses research on both the factors affecting women's decisions to undergo cosmetic surgery as well as individual and societal attitudes towards those who decide to proceed with the surgery. The impact of feminism, media, body image, and personal attitudes about natural aging on women's perceptions is presented. Studies have found that personal and vicarious experience with cosmetic surgery and increased exposure to media correlates to increased acceptance of cosmetic surgery. Individuals who place a higher importance on appearance are also more likely to be accepting of and consider having cosmetic surgery. There is little research on others' attitudes towards the individuals who undergo cosmetic surgical procedures and more research is needed to understand the depth of the experience of those undergoing the surgery and others around them.

## **STRESS, COPING AND MINDFULNESS: RELATIONS TO SOCIAL SATISFACTION AND TRENDS AMONG DIFFERENT POPULATIONS**

### **Rebecca Feldman ('08), Psychology**

Several studies investigate coping and stress on college campuses, but these studies focus mainly on gender differences, and students with specific ailments. Little to no research has looked for trends among different races. People's identities have been shown to relate in a variety of ways to how people live, so it would sensibly follow that these qualities may also effect how people cope. In addition, research on college students often concentrates on alcohol use while neglecting the many other coping skills used by college students. Initially, semi-structured interviews of college students were run to shed light on the complexity of college students' coping skills, and also to determine how mindfulness practice is spontaneously used by college students. Mindfulness is a cognitive based practice. It has existed for years, but is increasingly being accepted by westerners as a useful form of engaging with stress. The interviews aimed to determine if students spontaneously use mindful coping skills, and they showed that many coping skills used by students are either characteristic of or contradictory to mindfulness practice. The interviews as well as previous research also suggested that college students most often report stress related to social conflict. After the interviews, a more specific questionnaire was developed to further investigate the relationship between social stressors and coping skills. Using the interview responses and past research, we created a list of coping skills characteristic of or contrary to mindfulness. Because of the focus on social stress, this study used social satisfaction as an outcome measure. The study aimed to

show differences in coping skills used by different races and also how mindful coping skills are positively correlated with social satisfaction

## **MICROFINANCE THROUGH A GOVERNANCE LENS**

### **Christina Feng ('08), Government**

In this presentation, I explore the role of the state with regard to public and private institutions in combating poverty, specifically concentrating on the act of providing microcredit in the field of microfinance. In the first part of my presentation, I provide international case studies and explain the theories behind microcredit. In the second part of my presentation, I reflect on why microcredit has not taken shape in the U.S. and whether or not it would be beneficial for U.S. citizens.

## **COLOURED IDENTITY AND EXPERIENCE IN SOUTH AFRICAN THEATRE (GOLDFARB CENTER STUDENT RESEARCH)**

### **Annelene Fisher ('08), African Studies**

Coloured Identity and Experience in South African Theatre: Examining the existence of a distinct 'Coloured Theatre' and its role in the changing milieu of a new South Africa. A detailed look at the nature, evolution and role of a distinct Coloured South African theatre. Drawing from primary research and expanding upon a previously-presented paper, this presentation will propound an exploration of representations of Coloured identity and experience in South African theatre by Coloured playwrights and/or works having as their target audience South Africa's minority Coloured population and their significance in post-Apartheid state-building, collective ethnic/racial self definition and a national healing process.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: HUMAN TOXICITY OF LEAD AND ITS PRESENCE IN CHILDREN'S TOYS**

### **Emily Fogg ('08), Kimberly Bittler ('11) and Alexander Farmer ('09), Environmental Studies**

The presence of lead in children's toys is a topic that has attracted much recent media attention. Lead is a potent neurotoxin, most seriously impacting the health of the youngest members of our population. Lead has been phased out of many products, including paint and gasoline, but high levels still remain in some products such as children's toys. There is no safe level of exposure to lead, however United States' policies still set limits above zero. There is strong scientific evidence that the levels of lead found in some children's toys are unsafe. We recommend that these policies be modified to set and enforce health-based standards for lead.

## **KUNG FU FIGHTING AND MASCULINITY**

### **William Fong ('08), American Studies**

My research explores the representation of Chinese men in Hollywood films and the way a Chinese American masculinity emerges among such representations. It will expose the oppressive masculine culture that currently prevails in American society and examine how, in the midst of such hegemony, Bruce Lee and Jackie Chan use their martial arts movies to construct a Chinese American masculinity that allows Chinese men in America to participate in the dialogue on masculinities. Furthermore, my analysis will demonstrate the way this dialogue is actually a transnational dialogue that is continued by other martial arts movies, such as "Crouching Tiger, Hidden Dragon," "Hero," and "Shaolin Soccer." By deconstructing these martial arts films, we, as Americans, come to a better understanding of America's masculine traditions, race-relations in America, and the transnational narrative in today's era of globalization.

## **REVENGE, RELOCATION, INTEGRATION, AND RECOVERY: THE EXPULSION OF GERMANS FROM EASTERN EUROPE AND THEIR ROLE IN WEST GERMANY'S POST-WWII RECONSTRUCTION**

### **Daniel Franklin ('10), German/Russian**

Between 1944 and 1950, as revenge for the atrocities perpetrated by Nazi Germany and its allies during World War II, the Soviet Red Army led the way with Czechoslovakia and Poland at its side in expelling and causing the flights of approximately fifteen million ethnic Germans and German nationals from eastern and central Europe. They did so largely without interference by the United States and Great Britain, who asked in their sanction only for the expulsions to occur in "an orderly and human manner." But the expulsions were carried out under anything but humane conditions

and three million Germans died during the flights and expulsions. However, twelve million of those who fled or were expelled from their homes survived their harrowing journey to the west. While four million people ended up in East Germany under Soviet influence, fully twice as many settled in West Germany in what were the zones under American and British influence until the founding of the Federal Republic of Germany in 1949. Between 1950 and 1957, the newly created Federal Republic bore the brunt of the economic, social, and political burden of taking such a large number of people needing at least food, work, and shelter into a war-torn and down-trodden land. Unexpectedly, however, through integrative measures in all aspects of life, the new Germans who had once been expelled from their homelands in the most brutal and life-changing ways helped to shape a new common identity and homeland as citizens of West Germany and in doing so contributed to the coming of the Economic Miracle of the late 1950s. Through the integration of the expellees, the West German people worked together to rebuild their land and to dramatically raise their standard of living.

#### **ATLAS OF MAINE: POPULATION DENSITY AND DAMS IN MAINE, 2000.**

##### **Frederick Freudenberger ('09), Environmental Studies**

This map is designed to show a correlation between the population density, river systems, and dam placement in the state of Maine. The population data was gathered for the year 2000 from US Census information and each randomly placed dot represents a 100 person density per square mile. The dams shown are those whose main purpose is the production of hydroelectric power. Evident in the map is a pattern of population density closer to rivers and dam clusters around the population centers.

#### **MISATTRIBUTION OF AROUSAL AND STEREOTYPE THREAT**

##### **Jessica Frick ('10), Benjamin Mickle ('10), Laura Schaefer ('10) and Annie Tak ('10), Psychology**

In our study we investigated the affect of misattribution of arousal and anxiety in a nonacademic arena by means of a chopstick task on stereotype threat. Previous studies focused on stereotype threat and misattribution in math and science areas where women and various races are stereotyped. We looked at the stereotype that Asians are better at using chopsticks than non-Asians. We also informed participants of a presence of a subliminal sound for the participant to misattribute their stereotype arousal. Participants in the control condition were told the sound would have no effect on their performance and the participants in the misattribution condition were told that the sound would cause temporary anxiety. Participants were paired with either an Asian confederate to introduce a stereotype threat condition or a non-Asian participant for a control condition. We found evidence that performance and emotions were affected by stereotype threat and misattribution of arousal.

#### **HAMILTONIAN CONSTRAINT ANALYSIS OF VECTOR FIELD THEORIES WITH SPONTANEOUS LORENTZ SYMMETRY BREAKING**

##### **Nolan Gagne ('08), Physics and Astronomy**

Dirac's Hamiltonian constraint analysis is used to study vector theories with spontaneous Lorentz violation known as bumblebee models. In certain of these models, the Nambu-Goldstone sector has properties similar to those of photons in classical electromagnetism. A preliminary analysis of the different types of constraints and resulting number of degrees of freedom is presented here for models with different kinetic and potential terms, and the results are compared with electromagnetism.

#### **ECOTOURISM AS A MEANS OF CONSERVATION IN EASTERN AFRICA: ECONOMIC, SOCIAL, AND ENVIRONMENTAL IMPACTS**

##### **Emma Gildesgame ('10), Suzanne Merkelson ('09) and Megan Schafer ('09), Environmental Studies**

Ecotourism has been touted as an effective way to conserve and protect the natural environment and combat poverty in developing countries where both poverty and biodiversity conservation are central issues. This project seeks to examine the legitimacy of ecotourism on ecological processes, economic realities, and the preservation of local cultural heritage, focusing on case studies in Uganda and Tanzania.

## **LESSONS ON LABOR AND LOSS: ORGANIZATION, EDUCATION, AND THE WOMEN'S TRADE UNION LEAGUE OF AMERICA, 1900-1930**

### **Lucia Giordano ('08), History**

The early twentieth century was marked with crucial developments in American labor conditions and policies. The industrialization of East Coast cities and expansion of capitalism, migrations from rural locations to urban centers, and influx of emigrants converged to create social, economic, and political circumstances that demanded alterations to the relationships between the family and workplace. From the 1900-1930s, the Women's Trade Union League employed a series of educational projects to protect the needs of female workers as both family members and wage-earners. Despite the perceptions of many historians, the League founded many local and national programs that closely considered the ethnic differences of immigrant and native-born workers and bridged the class-based divisions of its membership. The programs presented a multi-faceted attack on the American labor industry demanding reform and accountability from employers, public officials, and workers. Many of the League's programs failed to endure lasting success because of contextual circumstances, but the spirit of activism and social awareness cultivated by the Women's Trade Union League's work altered the development of the modern American labor industry.

## **THE ROLE OF GENDER IN FRENCH COLONIAL INDOCHINA**

### **Sarah Goldstein ('08), French/Italian**

The 19th century bore witness to the ascension of colonial France and the propagation of its culture, language, and ideals to outposts around the world. Indochina became an important focus for France from 1887 until Japanese intervention in World War II, as the government sought to establish not only colonial authority, but also “une image bienveillante” in several of its colonies. While political and economic issues underlie colonial rule in France, social effects – witnessed through gender roles – are equally important to examine. Indochina was conceived as a male haven – “un ailleurs revé” – and both Indochinese women and French women settlers, each representing contrasting values and ideals, influenced this exotic, masculine experience in Indochina. The Indochinese woman supported the masculine colonial endeavor, serving as an image of the fantastic that was easily attainable in the Southeast Asian utopia, while the later arrival of French women settlers opposed the original conception of Indochina's masculine identity, as the administration relied on women to spread French nationalism and culture through the creation of families in these “Nouvelles Frances”. Colonial contact in Southeast Asia was strongly influenced by divisions of sex, realization of traditional roles, and women representing the exotic and the familiar. Conflicting conceptions of Indochina grounded in gender identity exhibit the social aspect of colonization and provide a different framework within which to understand the French colonial project, both in the past and in modern culture today.

## **COLONY COLLAPSE DISORDER AND THE WESTERN HONEYBEE**

### **Leah Gourlie ('09), Zachary Ezor ('10) and Katharine Sirianni, Biology**

Most Americans are unaware of the important role honeybees play. As pollinators, honey bees are responsible for servicing approximately 4-20 billion worth of crops and seeds annually—without bees, many of our favorite fruits and vegetables would be absent from US agriculture. The recent decline of honeybees, both feral and domesticated, should, therefore, be alarming. While some winter losses are expected each year, the recent epidemic—known generally as Colony Collapse Disorder (CCD)—has caused losses of up to 50% of hives in recent years. Several factors are being investigated as possible culprits, namely: new or reemerging pathogens, new bee pests and parasites, environmental or nutritional stress, pesticides, and transgenic or Bt crops. One pathogen, the Israeli Acute Paralysis Virus (IAPV), has drawn a considerable amount of attention for its striking correlation to CCD hives. A single causative factor, however, has yet to be discovered; CCD is most likely the result of several factors working against bees. In Maine, bees are an integral part of blueberry production, and while CCD has yet to occur in the state, we must acknowledge the significant and often undervalued services performed by bees. The US government has already begun steps to address CCD: the USDA recently announced a CCD Research Action Plan, set to begin in July 2007. Additionally, companies whose products are directly affected by honeybee losses—Häagen-dazs in particular—have provided funding for much needed research. If CCD continues, we may see a dramatic shift in the prices and availability of agricultural products across the United States and around the world.

## **DECISIONS TO ABROGATE PERSONAL LIBERTY: THE ETHICS OF CONSCRIPTION IN THE UNITED STATES**

### **Jacqueline Grady ('08), Government**

The military draft in the United States has been a controversial public policy in the past. Conscription has been used for six different wars; each draft has differed from the others because of the circumstances of the war for which it was enacted and because of the way in which it was implemented. Today, because of the wars the United States is fighting in Afghanistan and Iraq, a new public policy has developed, called stop loss. Stop loss affects only those people who have already served in the military, forcing them to remain in military service after the originally contracted date of their retirement. This paper looks at the draft historically and at the justifications posed for each draft in order to compile a set of criteria to judge when conscription in democracy is ethical. These principles are then applied to the current stop loss policy to determine whether or not it is ethically sound. The conclusion holds that stop loss is not an ethical public policy.

## **EXPERIMENTAL AND THEORETICAL INVESTIGATIONS OF 2-ALKOXYETHYLIDENES**

### **Kimberly Graves ('08), Chemistry**

The mechanistic study of the rearrangement of 2-acetoxyethylidene to vinyl acetate prompted this investigation of a direct alkyl oxygen shift during carbene rearrangement. The photochemical generation of the 2-alkoxyethylidenes from phenanthrene-platform precursors allowed experimental quantification of the possible rearrangement pathways to alkyl vinyl ethers. Findings show that a hydrogen shift greatly overshadows the possible alkyl oxygen shift. Theoretical investigation into the stability of the carbenes and the corresponding transition states was also performed, confirming the preference for a hydrogen shift in 2-alkoxyethylidene rearrangements.

## **GENDER DIFFERENCES IN FACIAL EMOTION EXPRESSION**

### **Madison Gregor ('09), Colin Hutzler ('10) and Amanda King ('08), Psychology**

The perception of emotions through facial expression plays a vital role in daily social interactions and shapes the way a person is seen by those around them. Based on stereotypes, preconceptions, and societal influence, however, the emotions of certain groups of people are perceived in a specific manner. Plant, Kling, & Smith (2004) stipulated that subjects would perceive female faces, for instance, as generally being sadder and less angry than similarly posed male faces. However, previous research fails to acknowledge that there may be a difference in perception of facial expressions based on observer gender. Therefore we surveyed 60 college-aged students (30 males, 30 females) and hypothesize that there will be a marked difference between observer gender and gender of the posed face across the expressed emotions, anger, happiness, sadness, and neutrality. The findings of our experiment will be discussed further in the results and discussion sections.

## **MEASURING OUTCOME EXPECTANCY IN INTELLECTUAL AND PHYSICAL TASKS**

### **Benjamin Gross ('10), Timothy Brettingen ('10) and Amanda Ivey ('10), Psychology**

There has been ample research pertaining to the general area of outcome expectancy. Studies ranged from those measuring the credibility of superstitions to those measuring the influence home court advantage. However, few studies make task type an independent variable and compare outcome expectancy scores across the different task types. This study compares outcome expectancy scores from 60 Colby College students in both physical and intellectual tasks after participants have been placed in a high or low self efficacy state in performing either a physical or intellectual task. It was predicted that those people put in a high self efficacy group would show high outcome expectancy scores across both task groups no matter what task group they were put into, and it was, for the most part, confirmed. Yet, it was found that in the low self efficacy intellectual group, low self efficacy did not affect confidence levels in an unrelated physical task. The study shows that high self efficacy in either area leads to high confidence in both conditions, and low self efficacy in a physical task leads to low confidence in both conditions, but low self efficacy in an intellectual task leads to low confidence in a different intellectual task, but not a physical task.

## **PROCRASTINATION: WHEN MISSED OPPORTUNITIES RETURN AND WHEN THEY WILL BE COMPLETED**

### **Jessie Guild ('08), Psychology**

When people miss an opportunity they are less likely to take future opportunities that are not as good. However, what happens when the same opportunity returns and there is time available to complete it among other activities? This study focuses on procrastination and when people are likely to complete activities that should have been completed earlier. To examine when people will choose to complete certain activities, this study presented participants with one target activity, the Odd One Out, that they learned was supposed to have already been completed at the start of the study. Because the activity was not completed, the activity was compiled into a group of six different activities of which the participant looked over and ranked the order in which to complete each activity. Following this ranking of the six activities, each participant rated how much they wanted to complete each activity and how enjoyable it would be for them. From these rankings and ratings, it can be determined when the target activity would be completed. Thus, these assessments will show if the missed opportunity conditions alter the time of completion and the enjoyableness of the target activity.

## **GENDER DIFFERENCES IN THE EFFECTS OF SOCIAL CONTEXT ON EMOTIONAL RESPONDING**

### **Cheryl Hahn ('08), Psychology**

This study compares the effects of social cues on emotional experiences of men and women. Literature suggests that emotional responses are influenced by the presence and expressiveness of other individuals (Hess, Banse, & Kappas, 1995; Jacobs, Manstead, & Fischer, 2001; Fridlund, 1991). We examined whether social cues influence the experience of emotions differently for men and women. Research on gender differences in self-construal (Cross & Madson, 1997) led us to expect that women's own emotional reactions would be more sensitive to emotional cues from other individuals than men's. We examined this hypothesis by asking perceivers to watch a split screens showing amusing and sad film clips and the faces of targets videotaped while watching the films. Participants were randomly assigned to view inexpressive or expressive targets of the same ethnicity and gender. Across cultural groups, women reported experiencing more intense positive and negative emotions in response to the films in the inexpressive condition as compared to the expressive condition. In contrast, across cultural groups men tended to experience more intense positive and negative emotions in response to the films in the expressive condition as compared to the inexpressive condition. Since men and women responded differently in the presence of emotionally expressive strangers these results have implications for clinical contexts.

## **THE EFFECTS OF REPRODUCTIVE EXPERIENCE AND MATERNAL BEHAVIORS ON MOTHER RATS' COGNITIVE ABILITIES AND ANXIETY REPOSESES**

### **Cheryl Hahn ('08), Psychology**

Motherhood in mammals involves a constellation of hormonal, neural, experiential, and behavioral changes that accompany pregnancy, birth, lactation, and the care of young through weaning. An emerging literature reveals that there is a lasting impact on mother, in neural function and behavior. As examples, rats that give birth to and rear a litter are, after weaning and compared to virgin females, less anxious, more exploratory, and show enhanced spatial memory (Wartella et al., 2003; Byrnes & Bridges, 2006; Love et al., 2005). In the present study we investigated anxiety, exploration, and spatial memory in female rats that gave birth to and reared one litter, two litters, or never gave birth. This study also contained a novel, within-subjects variable to examine how these behaviors changed with reproductive experience by studying females before and after they became mothers. A second aim of the study was to explore whether levels of anxiety or spatial memory could be linked with quality or quantity of maternal care. We hypothesized that motherhood would attenuate anxiety while enhancing exploration and spatial memory and that spatial memory would be negatively correlated with levels of anxiety. We also hypothesized that anxious females would be more likely to display low levels of maternal care behaviors compared to less anxious females and may be less likely to show, post weaning, positive changes in anxiety or spatial memory as a consequence of motherhood. This study will not only add new data to a growing field of research investigating the behavioral and neural consequences of motherhood, it will also yield novel information about the relationship between anxiety and cognition.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: MAINE'S BRAND NEW CHEMICALS LAW**

### **Eric Hansen ('08), Jessica Harold ('08) and Kiira Heymann ('08), Environmental Studies**

This spring the students in the Environment and Human Health course conducted a civic engagement project focused on a bill before the Maine legislature; An Act to Protect Children's Health and the Environment from Toxic Chemicals in Toys and Children's products. This bill, now codified into law, identifies priority chemicals and creates an inter-state clearinghouse of chemical toxicity data. It also requires that safer alternatives are used in children's products. This will protect Maine's children while encouraging innovation. Maine has an extraordinarily accessible legislature as we discovered while watching this bill traverse the legislative system. This bill was introduced by Rep. Hannah Pingree and voted on by the Natural Resources Committee. After approval by both chambers of the legislature, Governor Baldacci signed the bill into law. As a result, Maine now has one of the most stringent laws in the US regulating chemicals in children's products.

## **ATLAS OF MAINE: ELECTRICAL HOOKUPS AND SERVICE PROVIDERS IN MAINE**

### **Eric Hansen ('08), Environmental Studies**

The electrical hookup layer was provided by the Maine State Planning Office and shows the number of commercial and residential electrical hookups in 2004. These data were provided by Central Maine Power Company and Bangor Hydro-Electric Company, and only shows data in their distribution area. All other layers were downloaded from the Maine Office of GIS. These layers show all the electrical service providers in Maine and major roads, another indicator of development.

## **MODELING ICE COVER ON TRAILS AT GRAND CANYON NATIONAL PARK**

### **Eric Hansen ('08), Environmental Studies**

This project used data from the National Park Service, the SRTM data set, and recorded weather conditions to predict snow deposition and snow and ice melt in the Grand Canyon National Park. This model, a simplified version of previous research, shows the location of persistent ice and snow on the Canyon slopes in March.

## **PERCEPTIONS IN GONDOLA CENTRIFUGES PREDICTED BY A WHOLE-MOTION MODEL**

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

When a person is traveling through a curve in a vehicle without visual cues, perceived motion does not always match actual motion. This can be demonstrated in a tilting gondola centrifuge. Though models have been designed to predict subject perception, there are several discrepancies between current models of and perceived motion reported by subjects. These include a difference in perceived roll tilt during forward and backward facing centrifuge runs, and perceived pitch during centrifuge deceleration. We have compared the classic Component-wise model, which assumes motion is perceived independently and then combined to form a three-dimensional perception, with a new model we call the Whole Motion model. The Whole Motion model assumes a basic "familiarity of motion" principle with regard to perception. With respect to the discrepancies mentioned above, the Whole Motion model more accurately predicts subjects' perceived motion. This demonstrates that accurate perception models must take the familiarity of motion concept into account.

## **THE SEVEN YEAR VIRUS: RECURRING POGOSTA IN FINLAND**

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

Pogosta disease, or August-September disease, is an epidemic rash-arthritis caused by viral infection. The pathogen responsible is not your normal virus; Pogosta occurs primarily in Finland, causes joint pain and inflammation that can persist for years, and only in very select regions of the country is the seroprevalence of antibodies against the virus high. In 2004, the causative agent of Pogosta was discovered to be Sindbis virus (SINV), an alphavirus first isolated in Egyptian mosquitoes in 1952. Perhaps the most curious fact about this version of SINV is the cyclic nature of the disease: an outbreak occurs only every 7 years, a sequence that was first noticed in 1974. However, it has been determined that the disease is transmitted to human hosts through mosquitoes of the Culex and Culiseta genera, which are abundant in Finland every year in the late summer months. Uncovering the epidemiology of the virus is a difficult, ongoing process, which has instigated theories ranging from the depth of snow in the winter to the migration patterns of birds.

## **HYDROGEN PEROXIDE PRODUCTION IN DEEP, SUBOXIC LAKE WATERS**

**Kathlyn Harris ('08), Alison Brandeis ('10) and Brian DiMento ('10), Chemistry**

Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>) has long been known to be an important species in the redox cycling of metals and the oxidation of organic compounds in natural waters. In lake systems, a vast majority of H<sub>2</sub>O<sub>2</sub> is produced via photochemical (euphotic zone) processes involving dissolved organic carbon. However, laboratory and field studies have indicated a steady state concentration of H<sub>2</sub>O<sub>2</sub> can be produced from reactions involving Fe (II) and oxygen in deep water of temperate lakes. Past and recent studies of Great Pond and Snow Pond in the Belgrade Lakes chain have shown a significant plume of H<sub>2</sub>O<sub>2</sub> at the thermocline and sediment-water interface that can be directly connected to the oxidation rates of Fe (II). The production of kinetically reactive H<sub>2</sub>O<sub>2</sub> in the deep water of lakes has the potential to drive metal speciation to new dynamic steady state concentrations that are no longer in equilibrium with dissolved oxygen.

## **HOW MUCH DO I WANT THOSE SHOES? THE EFFECTS OF SOCIAL COMPARISON ON VALUATION, ANTICIPATED, AND EXPERIENCED REGRET IN INACTION INERTIA**

**Margaret Hayes ('09) and Kelly Brooks ('09), Psychology**

Inaction inertia, as first defined by Tykocinski, Pittman, and Tuttle (1995), is the forgoing of a current opportunity when one has missed a previous opportunity within the same action domain. This effect is magnified if the difference between the first and second offer is big rather than small. The current study investigated experienced regret, anticipated regret, and valuation as mediating factors of inaction inertia within a social context. We investigated whether a participant's likelihood of taking a second, but less appealing offer, after having missed the primary sale is impacted by whether a similar or dissimilar other took the initial sale. 120 Colby College participants were asked to identify their levels of action likelihood, valuation, experienced regret and anticipated regret. No effect of other in the scenario was found. However, a significant inaction inertia effect was found, such that participants in the small difference condition were more likely to take advantage of the second opportunity than those in the big difference condition. While valuation and anticipated regret were found to mediate the majority of the inaction inertia effect, they do not account for the entire phenomenon, suggesting other mediating factors may be present.

## **WESTERN MISSIONARY PERSPECTIVES OF THE TAIPING REBELLION (1850-1864)**

**Jason Hayes ('08), History**

This project is an investigation of the responses and perspectives western missionaries held in regards to the Taiping rebellion, a self-proclaimed native Christian rebellion in China. This rebellion won missionary support in the early years which then turned to opposition by 1864, when western military forces aided the Qing court in destroying the rebel forces. This shift from support to opposition illuminates the goals and boundaries missionaries set for themselves in China during this time. It is clear that missionaries hoped to convert China to Christianity and their support and subsequent opposition to this native rebellion exposes their commitment to this goal. Why was the rebellion preferable to the established Chinese government, but then bitterly opposed only a few years later? What, in the eyes of missionaries, was the best course for the Chinese people, and who did it conflict with? This project seeks to better understand the position and desires of western missionaries in China between 1850 and 1864 through their perspectives and opinions on the Taiping rebellion.

## **THE LANGUAGE OF SEX: MORAL SOCIALIZATION AND REPRODUCTIVE EDUCATION IN PUBLIC SCHOOLS**

**Melyn Heckelman ('08), Anthropology**

After spending a semester observing and participating in three sex education classrooms in the Waterville area, I have compiled an ethnographic account of the ways in which sex education, or reproductive education in the public school setting, provides the moral socialization of adolescents, though it purportedly serves public health functions. Given the multiple audiences that monitor the language and structure of the classes, educators are forced to maintain a conservative approach to human sexuality which effectively alienates almost all students, particularly women and homosexuals, from their bodies and their sexualities. Unable or unwilling to incorporate the messages of the class into their own sexual experiences, students find the information inaccurate, inapplicable and hyperbolic. In short, if our goal as educators, parents and concerned citizens is to instill within adolescents an internal dedication to abstinence, delayed sexual onset, or the limiting of partners and necessity of safer sex practices, the current methodology fails. Additionally,



the current approach to sex education does nothing to provide students with an arena wherein they can begin asking themselves under what circumstances they will be able to ensure that their sexuality plays a psychologically healthy, physically safe, and emotionally fulfilling role in their lives.

### **'DER REIGEN ALS KRITISCHES BILD DER WIENER GESELLSCHAFT' (DER REIGEN AS A CRITICAL IMAGE OF VIENNESE SOCIETY)**

#### **Michael Hempel ('11), German/Russian**

Vienna was at the turn of the 20th century the political and cultural center of the Habsburg Dynasty. Yet despite its outward appearance as a thriving imperial capital, it was clear among many that a change was underway, and that the end of an age had come, a Fin-de-Siècle. This study seeks to reveal how Arthur Schnitzler, a writer of the period, through his masterwork *Der Reigen*, sought to critically reflect this place and time of change by putting to light its dichotomy of tradition and old values on the one hand and political, individual, and sexual emancipation on the other, and the attempt of this society to conceal its fall to immorality with a façade of respectability. Presentation in German.

### **STABILITY OF BIOCHEMICAL ANALYTES IN BLOOD SPECIMENS SUBJECTED TO DELAYED PROCESSING**

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

Blood specimens from astronauts onboard the International Space System (ISS) and from aquanauts living underwater in Aquarius are studied to learn how nutrition is affected by long-term exposure to extreme environments. The blood specimens are processed by centrifugation and freezing as quickly as possible after collection. In the event of hardware or schedule anomalies, this processing may be delayed. This is a ground-based study to determine the effects of delayed processing on analyte stability. Volunteers donate blood samples that are processed after multiple time periods to see if the concentration of analytes has changed. The conditions on the ISS and Aquarius are replicated during sample storage. Accurate analysis of blood specimens, and understanding implications of any delays in processing, provides information that will be used to optimize the health of astronauts on ISS and for future exploration missions.

### **REGULATORY FOCUS AND DIETARY RESTRAINT**

#### **Colin Hutzler ('10), Kaitlyn Conway ('10), Rebecca Julian ('09) and Catherine Nix ('10), Psychology**

Previous research successfully highlights the effect of regulatory focus and regulatory fit on eating and dietary restraint. Sengupta and Zhou (2007) hypothesized that impulsivity and regulatory focus cause people to select more “hedonic” food consumption, even if the nutritional value is knowingly non-existent. However, these studies use people's actual regulatory focus states instead of manipulating the focus. The current study differs because of the way subjects are placed into experimental conditions where focus is manipulated, not based on their personal focus state. Four fit/non-fit, promotion/prevention conditions were created. Eighty college students participated, twenty of which were randomly assigned into each of the four conditions. After creating the initial regulatory focus, filler tasks were used before observing food selection and finally dietary restraint based on a restrained eating scale. Hypotheses were created for each of the four conditions, which included expected food selection. The findings of our experiment are discussed in depth in the results and discussion sections.

### **REVOLUTIONARY HIJACKERS IN RUSSIA AND IRAN: HOW LENIN AND KHOMEINI SEIZED CONTROL OF THEIR RESPECTIVE REVOLUTIONS**

#### **Evan Kaplan ('08), History**

The 1917 October Revolution in Russia and the 1979 Revolution in Iran began as popular movements advocating for greater political and social freedoms. Within months, these ideas were subverted by astute revolutionaries benefiting from favorable circumstances within their post-revolutionary countries. This project explores a two part, interrelated question: how did Vladimir Lenin and Ruhollah Khomeini seize control of their respective revolutions, and why did the people follow them? Three different perspectives will be used to answer this question. First, the historical context enabling Lenin's Bolshevik Party and Khomeini's followers to overthrow their provisional governments will be examined. Second, the vast pre-revolutionary writings of Lenin and Khomeini will be discussed to reveal their early intent to sidetrack the democratic movements in their countries in favor of regimes dominated by their parties. Finally, the propaganda both leaders used to transform their abstract ideas into tangible visions the masses could understand, associate with, and then support will provide the concluding evidence for how they were able to seize their revolutions with popular approval.

## **THE EFFECTS OF MOOD AWARENESS ON LIKING AND CATEGORIZATION OF FACES.**

**Anuj Kapur ('10), Jennifer Gelda ('10), Hannah Holbrook ('10) and Emily Merrell ('10), Psychology**

Much research has been done regarding the effects of mood on perception and liking of stimuli. Several studies have used faces as stimuli and show a tendency for individuals to selectively attend to and prefer mood congruent faces to mood incongruent faces. This study expands upon the previous research and explores the effects of mood awareness on categorization and liking of faces. Participants were induced into either a happy or sad mood, and half of the participants in each of those groups were told to be aware of their mood for the remainder of the experiment. All participants were then given a set of 24 faces (happy, ambiguous, and sad) and were asked to categorize them as happy or sad, and rate how much they liked each face (7-point Likert scale). It was hypothesized that participants in the unaware categories would categorize more faces as being congruent with their mood and would prefer these faces to mood incongruent faces. It was also hypothesized that these effects would be eliminated when the participants were told to be aware of their mood.

## **WAR ON THE SEAS: FRANCO-BRITISH SCRAMBLE FOR MAURITIUS ISLAND**

**Alexandra Kenyon ('08), French/Italian**

Situated in the Indian Ocean to the east of Madagascar, the island of Mauritius was colonized for the first time by the Dutch who named it in honor of Prince Maurice of Nassau, but were unsuccessful in founding a stable establishment and soon abandoned it. At the same time, the expansion of commerce and colonialism attracted the other European powers to the Indian Ocean. In 1715, the first Company of Oriental India took possession in the name of King Louis XIV of France and renamed it "Ile de France." It was during the 18th century that the rivalry between France and England began; when France entered the American war for independence, the colonists of the island organized several naval expeditions against British commerce ships in the Indian Ocean. The government of Louis XVI approved the financing of corsair expeditions, furnishing them with "lettres de marque" or legal instructions so they did not appear as though they were committing acts of piracy. The frequent attacks aggravated an antagonism that would continue throughout the course of the wars of the Revolution and the Empire, ending to the advantage of the British in 1810, after which the island would remain a British possession. How did the Franco-British rivalry for the island of Mauritius manifest itself through the acts of these French corsairs? First, it is necessary to examine the importance of the island to understand why these two large European powers fought with such ferocity for it. Second, it is imperative to study the corsair phenomenon, an ancient French tradition, encouraged and glorified by the government. Finally, there remain the issues surrounding the battles on the seas: the role played by the corsairs in the ultimate combats that determined the destiny of this precious island.

## **GENDER DIFFERENCES IN ANXIETY RESULTING FROM THOUGHT SUPPRESSION.**

**Katherine Klepinski ('08), Jessica Emerson ('08) and Kirstin Miller ('09), Psychology**

This study explores the link between suppression, stress and anxiety. In addition, it investigates the relationship between coping mechanisms and gender. It was predicted that females would suppress more than men and therefore experience higher anxiety. People who suppress also exhibit higher anxiety and stress levels.

## **RELATIONSHIP BETWEEN MIMICRY AND SYNCHRONY**

**Katherine Klepinski ('08), Psychology**

People generally have an affinity for people that coordinate or imitate their actions. This study investigated the relationship between mimicry and synchrony. A confederate participant rocked with participants to control three conditions: unilateral synchrony, mimicked-synchrony and non-synchrony. Each participant completed three trials to evaluate focal, peripheral and random coordination. It was predicted that participants in the mimicked-synchrony condition would coordinate more with the confederate than participants in the unilateral-synchrony and non-synchrony conditions. It was also predicted that participants would coordinate more when they considered the confederate to be an in-group member.

## **VIBRIO BINDING PROTEIN: GPBA AND HUMAN INFECTION**

### **Julianne Kowalski ('11) and Andrew Hardigan ('10), Biology**

*Vibrio cholerae* is the bacterial pathogen responsible for the infectious disease cholera in humans. Although practically eliminated in the United States this disease remains prominent in developing nations, especially where water purification is a problem. *Vibrio cholerae* binding protein GbpA allows the bacterial cell to bind to epithelial cells in the mammalian large intestine, and causes many gastrointestinal symptoms including severe indigestion, diarrhea and dehydration. Our research has involved a survey of *vibrio* bacteria in swab samples taken from the exoskeletal surfaces of various chitinous aquatic organisms, which were chosen as a study system because cells comprising chitinous shells and human intestinal cells possess the same binding compound for the GbpA protein. Using varying environments based on three different incubation temperatures and three types of culture media, we isolated and partially catalogued over 80 bacterial isolates and have begun screening for *vibrio* and evidence of GbpA. Initial results have yielded at least 4 possible *Vibrio* species and further work will be done to identify all remaining isolates and to obtain evidence of GbpA in isolated *vibrio* and related bacterial species.

## **CELLULAR MECHANISMS OF MELATONIN-INDUCED AND CALMODULIN-INHIBITED NEURITE GROWTH IN *UCA PUGILATOR* X-ORGAN CELLS.**

### **Escar Kusema ('09), Kirsten Duda ('09) and Jennifer Myers ('09), Biology**

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 by melatonin may be a mechanism of increased neuritogenesis; we also explored the influence of a calmodulin antagonist on neuritogenesis. We found that melatonin increased neuritogenesis versus controls in the first 24 hr of culture but not at 48 hr. Physiological levels of melatonin (1 nM, 1 pM) had a significantly greater effect on neuritogenesis than pharmacological levels (1 μM). The calmodulin antagonist similarly caused an increase in neuritogenesis. Therefore, melatonin exerts its greatest effects at physiological concentrations and the calmodulin antagonist has similar effects on neuritogenesis. This may perhaps give insight into the cellular mechanisms of melatonin.

## **DNA REPAIR EVENTS TRIGGERED BY CLORETAZINE IN CULTURED LEUKEMIA CELLS**

### **Kristina Langenborg ('09), Chemistry**

Cloretazine is a sulfonylhydrazine prodrug that decomposes *in situ* into a chloroethylating and carbamylating agent. The chloroethylating agent alkylates and subsequently crosslinks DNA while the carbamylating agent modifies protein thiols and these two agents produce Cloretazine's synergistic effect in killing cancer cells. DNA damage is repaired by direct repair and/or recombination repair mechanisms. The potential of Cloretazine to affect homologous recombination by direct modification of the enzyme is assessed using Rec A as a model for Rad51 in an *in vitro* three strand exchange assay. Also, sister chromatid exchange spreads from cells treated with Cloretazine will reflect the extent to which homologous recombination is involved in the repair of DNA damage caused by Cloretazine. The quantity of sister chromatid exchange will be measured by staining hemi BrdU labeled chromatids with Hoechst and Giemsa. Another integral protein is poly (ADP-ribose) polymerase which is an enzyme that signals for repair by generating ADP polymers onto a number of substrates including itself, histones, and other repair enzymes. A colorimetric assay will be used to measure the amount of active PARP in cell lysates that were treated with Cloretazine.

## **SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS**

### **Kristina Langenborg ('09) and Rebecca Thorburn ('09), Biology**

Severe Acute Respiratory Syndrome first emerged in China in 2003 and the causative agent was determined to be a novel corona virus, designated SARS-CoV. By the Baltimore classification system, it is a class IV virus because it is an enveloped, positive sense, linear, ssRNA virus. Though the pathology is mainly characterized through massive damage to the lung epithelial tissue, SARS-CoV is shown to infect the gastrointestinal tract, liver, spleen, brain, kidneys, and white blood cells. Viral entry is mediated primarily through the spike protein that causes the virus to be endocytosized in a clathrin and caveolae independent mechanism. Once inside the host cell, important virulence factors such as

nonstructural protein 1, help the virus to take over the host cell and suppress the innate immune system. Patients with SARS-CoV initially present with fever, dry cough, headache, hypoxemia, low white blood cell count. Diarrhea is also common and aside from coughing, it is believed to be another form of transmission. Normally in patients with a very low white blood cell count, decreased by 50%, their symptoms deteriorate until they go into respiratory failure from the lung tissue damage. The tissue damage is caused by an “overreaction” of the immune system, so the symptoms worsen after the viral load actual decreases, which is on average around 10-12 days after symptoms present. This is a serious threat because it is high contagious and has a 10% fatality rate. The current treatment is corticosteroids to control the immune response, but no antiviral or vaccines have been made to date

## **ATLAS OF MAINE: IMPERVIOUS SURFACES OF MAINE**

### **Courtney Larson ('08), Environmental Studies**

This map of impervious surfaces in Maine was created using data from the Maine Office of GIS. Impervious surfaces include objects like buildings, roads, parking lots, and other surfaces that water cannot pass through. Pervious surfaces are mainly natural areas, such as forests and wetlands, but can also include human-modified areas such as crop land. The spatial pattern of impervious surfaces is closely tied to that of developed areas and can therefore be used as a surrogate variable for development.

## **SEPARATING PEOPLE AND WILDLIFE: ZONING AS A CONSERVATION STRATEGY FOR LARGE CARNIVORES**

### **Courtney Larson ('08), Environmental Studies**

Large carnivores are some of the most difficult species to conserve because of their large space requirements, low population density, and high potential for conflict with humans. However, large carnivores are valuable for ecological, cultural, and ethical reasons. Carnivore management can take a variety of forms, including translocation, sterilization, livestock compensation programs, regulated hunting, improved livestock husbandry practices, and zoning, among others. In this paper, I carried out a comparative analysis of examples of zoning from around the world to explore whether it is an effective carnivore management strategy. Analysis of twelve case studies showed that zoning systems vary widely based on species characteristics and factors specific to the location. I identified four broad categories of zoning: density-driven, core area, game species, and pest species zoning. Furthermore, several factors stood out as the most important in a successful zoning system: large amounts of space available for carnivores, low level of conflict with humans, relative abundance of the species, and public support for the zoning system. I conclude that zoning has the potential to be used successfully as a carnivore management policy where these characteristics are present.

## **ANATOMICAL REVIEW AND STANDARD OPERATING PROCEDURE FOR THE ATLANTIC HAGFISH (*MYXINE GLUTINOSA*)**

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

The literature currently lacks a concise and complete overview of the anatomy of the Atlantic hagfish (*Myxine glutinosa*). In this compilation, I have briefly reviewed the major anatomical and physiological characteristics of the Atlantic hagfish, and have prepared a standard operating procedure for future examination. Included is a sample dissection report with a number of labeled diagrams of the major internal structures. Contributors include: G. Russell Danner (Russell.Danner@maine.gov), Andrew Clark (aclark@uci.edu), Christopher Cutler (ccutler@georgiasouthern.edu).

## **THE RELATIONSHIP BETWEEN UNREALITY AND STRENGTH IN 'KAFKA ON THE SHORE'**

### **Yin Li ('08), East-Asian Studies**

人間は現実のことに非現実なことを分けている。でも、海辺のカフカで、村上春樹は現実のことに現実じゃない

ことをわけていなくて、この境界線があいまいにした。大島は責任を想像力の中から始まると言った。その上、強さも想像力から始まる。想像力を欠く人間は個

人の責任を果たせない。一方、カフカとナカタは想像力で強くなってきて、責任お負う。ナカタは現実じゃないことから強さを受ける。 Humans separates reality and unreality but in 'Kafka on the Shore', Murakami Haruki

blurred the line between the two. 'In dreams begin responsibility,' strength also comes from the power of imagination. Presentation will demonstrate that, in 'Kafka on the Shore,' those who lack imagination do not have the ability to fulfill their responsibility and those with imagination will become stronger. Presentation will be in Japanese

### **MANGROVE DESTRUCTION: AN OVERVIEW OF MANGROVES AND A COMPARISON OF THEIR NATURAL AND HUMAN-FACILITATED RECOVERY**

**Joshua Lord ('08), Samantha Buck ('09) and Cara Whalen ('09), Biology**

Mangrove forests are vitally important ecosystems that are located along the coast and are comprised of subtropical and tropical trees. They provide many essential ecological services, human benefits, and natural products. Shrimp aquaculture and other hazards such as climate change, agricultural and commercial development, natural disasters, and alterations in water flow threaten mangrove ecosystems. The success of natural recovery varies with the degree of destruction, the amount of biotic interactions, and the dynamics of the surrounding area. The four main human-facilitated techniques are the use of propagules, seedlings, saplings, and stem cuttings. Both natural and human rehabilitation vary in success, cost, and suitability for restoration sites. Solutions to mangrove destruction lie in environmental education, sustainable exploitation, and community-based management practices.

### **MOVEMENT PATTERNS AND FEEDING BEHAVIOR IN THE LIMPET *TECTURA TESTUDINALIS* ALONG THE MID-MAINE COAST**

**Joshua Lord ('08), Biology**

*Tectura testudinalis* is a limpet that lives in the mid-intertidal zone along the coast of Maine and grazes on a variety of encrusting algae. A previous study asserted that *T. testudinalis* preferred to feed and rest on the encrusting alga *Clathromorphum circumscriptum* and that this species of limpet displayed homing behavior. However, I show that *T. testudinalis* does not home or return to any specific substrate while resting. Conclusive evidence was found for nocturnal movement. I show that *C. circumscriptum* was the preferred food source for this limpet, closely followed by *Hildenbrandia rubra*, another encrusting alga. Field and lab experiments showed that *T. testudinalis* individuals feed and search for food at night and then move to vertical surfaces and become stationary during the day.

### **THE EFFECT OF THE PHILLIPS STATE FISH HATCHERY ON WATER QUALITY AND AQUATIC LIFE IN MEADOW BROOK**

**Joshua Lord ('08), Biology**

The Phillips State Fish Hatchery in Phillips, ME has been a common scapegoat for the water quality problems that plague Toothaker Pond. Meadow Brook runs through the hatchery and used to flow into the pond, which is currently battling problems with eutrophication and algal blooms. This study examined the present-day impact that effluent from the fish hatchery has on the water quality and aquatic life in the stream below. Both stream flora and fauna were found to be impacted by the raised levels of nutrients and particulate matter leaving the hatchery.

### **PHOSPHORUS LOADING IN THE SOUTH BASIN OF LONG POND, KENNEBEC COUNTY, MAINE.**

**Kristyn Loving ('08), Jamie O'Connell ('08) and Claire Thompson ('08), Biology**

During the summer and fall of 2007, Colby College collected data on physical, chemical and biological parameters in Long Pond, South Basin. This water body has been placed on a list of impaired lakes established by the Maine Department of Environmental Protection due to a declining trend in water quality. DEP used decreasing levels of dissolved oxygen and transparency as criteria for their decision, a trend also consistent with data collected during the summer months of 2007. Based on a GIS analysis of land use in the watershed and the summer and fall data, a phosphorus model was constructed for the watershed. Sources of phosphorus loading were studied and projections for the future were made. Buffer strips between residences and the shoreline were evaluated as well as the condition of roads in the watershed. The largest watershed contributors of phosphorus to the lake are agricultural land (22%), mixed forest (13%), and successional land (12%). However, 79% of the water and 63% of the phosphorus comes directly from the North Basin of Long Pond and lakes upstream. Thus Long Pond's water chemistry status is largely dependent on factors outside of the direct watershed. Despite negative trends, Long Pond South is still a relatively healthy lake but actions must be taken to preserve its current state.

## **FROM THE KUNSTKAMMER TO THE ART MUSEUM**

### **Justine Ludwig ('08), Art**

The Kunstammer (art chamber), an exhibition space found in Europe from the sixteenth through the eighteenth century, aimed at embracing all reality and thus allowed for the juxtaposition of cultures and time periods. Objects were not organized according to era, but rather arranged as to create an aesthetic conversation that would reveal greater truths about the universe. In its structure and philosophical implications, the Kunstammer can be considered a precursor to the art museum. Both the Kunstammer and the museum offer sanctified spaces in which a certain type of ritual takes place. Through commonalities with religious structures, both the Kunstammer and the art museum take on the role of upholding the moral codes and values of the collection's owner (an individual in the case of the first, a community for the modern museum). Objects are carefully chosen in order to relate to these societal values, and those that do not, are censored and/or rejected. Both Kunstammern and the art museum hold structural similarities with the practice of pilgrimage—they constitute a liminal experience that fosters a sense of *communitas*. The existence of Kunstammern and art museums as sanctified spaces speak to their importance in society.

## **MICROHABITAT SELECTION BY THE TORTOISESHELL LIMPET, *TECTURA TESTUDINALIS*, IN TIDE POOLS ON THE MID-MAINE COAST.**

### **Emily Lyczkowski ('08), Biology**

Microhabitat selection of the limpet *Tectura testudinalis*, an important grazer on the rocky Maine coast was examined using both mensurative and manipulative experiments. *T. testudinalis* substrate selection is essential to its survival in the unpredictable and harsh regime of the intertidal zone. *T. testudinalis* selectively inhabits tidal pools and vertically oriented substrates at three sites in the Gulf of Maine. Both of these behaviors reduce the degree of environmental stress (desiccation, extreme temperature, and hypersaline conditions) and predation experienced by individuals. Between site differences are common, indicating the importance of varying environmental factors in regulating and influencing habitat selection in this species.

## **ATTRACTION: THE EFFECTS OF ENVIRONMENTAL AND PERSONAL SECURITY ON PERCEIVED ATTRACTIVENESS AND RELATIONSHIP LENGTH**

### **Duy Lyford ('10), Alexander Fenstermacher ('10) and Charles Shumaker ('10), Psychology**

It has been suggested that attraction for the preferred mate can be influenced by the environment. The Environmental Security hypothesis proposed by Pettijohn II and Tesser (1999) indicates that the desirability of a person with neotenous features (baby face features) should increase as the threat in the environment increased. The threat that Pettijohn and Tesser examined was done using a large scale correlation study, a contrast to this study, in which an empirical study was done to test the hypothesis. There were other key differences that were examined such as the affects of environmental threat on a more personal level and also the affects of threat on perceived relationship lengths. The methodology is discussed in the methods section. The threats are more detailed in the introduction and methodology section but generally threats were external (economic) and internal (personal). Results and future research are discussed.

## **MODELING CONTRADICTING PERCEPTIONS OF MOTION DURING DECELERATION IN A CENTRIFUGE**

### **Michael MacNicoll ('09), Mathematics**

The project studied published results from experiments on perceived motion of subjects in a centrifuge. Previous research indicates that many subjects experience paradoxical motion perceptions during deceleration. The paradox is a perceived downward pitch to a final, nose-down orientation during deceleration, and a simultaneous and longer-lasting downward tumble. Subjects consistently report confusion because forward tumbling persists after the pitch forward perceptions have stopped. This paradox was modeled using various programs to generate data and create graphics. The challenge in attempting to graphically model this paradox is that the same figure must be made to move in two contradicting ways. To deal with this, a previously generated computer graphic of a subject was modified to include a series of rotating, longitudinal stripes on the head. With this modification, the subject moves as desired, while the stripes rotate around the head to represent tumbling. The long-term goal of the project is to use the graphical model to assist subjects in follow-up evaluations.

## **ANTIMICROBIAL PROPERTIES OF TWO PURIFIED SKIN PEPTIDES FROM THE MINK FROG (*RANA SEPTENTRIONALIS*) AGAINST *A. HYDROPHILA* AND CHYTRID FUNGUS (*BATRACHOCHYTRIUM DENDROBATIDIS*).**

### **Timothy Maguire ('08), Biology**

Amphibian populations have been on the decline globally since the 1970's. Two of the major pathogens responsible are chytrid fungus, *Batrachochytrium dendrobatidis*, which causes disease of the skin; and *Aeromonas hydrophila*, the bacterial etiologic agent of red-leg disease. Amphibians secrete natural skin peptides as an immune defense mechanism against these natural pathogens and other infectious agents found in their natural habitat; understanding the antimicrobial properties of these peptides is essential in determining the risks faced by amphibian populations. Two peptides, a brevinin-2 related peptide and temporin-1SPb, isolated previously from Mink Frog, *Rana septentrionalis*, secretions were tested for antimicrobial activity against *B. dendrobatidis* and two *A. hydrophila* isolates (one from the American Type Culture Collection and one confirmed pathogenic strain isolated from a Wyoming toad). These specific amphibian skin peptides have not been previously tested on strains potentially pathogenic to the frog. Isolates were treated with peptides at concentrations from = 490nm)λ0.8μM to 1000μM. Based on the change in optical density (relative to negative control heat-killed pathogens, the minimum inhibitory concentration (MIC) of the tested peptide that inhibits microbial growth was determined. The chytrid, *A. hydrophila* Wyoming, and ATCC isolates were inhibited by the brevinin-2 related peptide within the peptide concentration limits at 250uM, 50uM, and >1000uM respectively; the Wyoming *A. hydrophila* strain was inhibited by temporin-1SPb at 100uM. Results demonstrate the efficacy of these peptides potentially conferring immunity to *R. septentrionalis* as part of its innate defense system against serious amphibian pathogens endemic to the frog's environmental range.

## **MOOD OVER MIND: HOW MOOD AFFECTS DECISION MAKING**

### **Darshini Mahadevia ('10), Savina Balasubramanian ('10) and Tara Brian ('10), Psychology**

This study seeks to investigate how an individual's mood and the nature of the decision to be made (trust of a product or the choice to purchase it) interact to affect which frame of information (gain or loss frame) is preferred. Of the 60 participants tested, half were induced into a positive mood, and the other half into a neutral mood. Within each group participants were asked to make a decision based either on trust or choice. Drawing from prior research, it was expected that participants in a positive mood would prefer the gain frame irrespective of decision type. In contrast, for participants in a neutral mood, the frame preferred would differ based on the decision type. Results confirmed the hypothesis for participants in a positive mood, but did not support the prediction for participants in a neutral mood.

## **EINE ZU GROBE ROLLE: ZUFALL IN 'DAS VERSPRECHEN: EIN REQUIEM AUF DEN KRIMINALROMAN' UND DÜRRENMATT'S WARNUNG, IHN IN DER WIRKLICHKEIT ANZUERKENNEN (TOO GREAT A ROLE: CHANCE IN DÜRRENMATT'S 'DAS VERSPRECHEN')**

### **Gretchen Markiewicz ('08), German/Russian**

Reality can only be partially explained through logic. On this basic message, Dürrenmatt centers his novel 'Das Versprechen: ein Requiem auf den Kriminalroman,' [The Pledge] an attempt to provide a 'requiem' for the detective novel, a genre that traditionally ignores the significant role of chance in the reality we experience and in our imperfect attempts to rationalize and explain it. This paper investigates Dürrenmatt's message that chance plays too great a role in reality to be ignored, and furthermore, that disregarding it can have dangerous consequences, as evidenced by the protagonist Matthäi's absolute faith in logic and his consequent descent into madness when this method fails him. Matthäi's resemblance to the traditional detective - his genius ability to reason - illuminates Dürrenmatt's criticism of the genre. To highlight Dürrenmatt's message, this paper compares the novel with the film 'Es geschah am helllichten Tag' (It Happened in Broad Daylight). Representing the traditional genre in which reason turns the detective into a successful hero, the film, and the implausibility of its plot, led to the creation of Dürrenmatt's novel. In contrast, the American movie 'The Pledge' takes inspiration from 'Das Versprechen,' and while chance plays a role in the film's story, its Hollywood nature takes over Dürrenmatt's philosophical note, and we are not compelled to contemplate just how essential this role is in reality. Presentation in German.

## **MODULATION OF SPATIAL LEARNING AND CELL MORPHOLOGY IN THE BASAL FOREBRAIN CHOLINERGIC SYSTEM BY DIETARY CHOLINE INTAKE IN ADULT FEMALE RATS**

**Lauren McClurg ('09), Daniel Dewey-Mattia ('08) and Lacey Favreau ('08), Psychology**

Prenatal dietary choline supplementation has been shown to enhance spatial learning and memory in rats. This study investigated whether a critical period exists in order for these beneficial effects of choline supplementation to occur, or if adult supplementation alone can improve performance in spatial learning measures. Female Sprague-Dawley rats were separated into four different feeding regime groups: control (CON), adult supplemented, life supplemented and adult deficient. CON rats received a choline sufficient diet and the life supplemented group received a choline supplemented diet throughout their lives. Choline content was manipulated in the other two groups starting at four months of age and continuing through the end of the study, with one receiving a choline supplemented diet and the other a choline deficient diet. Rats were given three consecutive days of training in the Morris Water Maze, with four trials each day, followed by a training probe task on day 3 (30 second probe and two additional trials). One week later the rats were retested with a 30 second probe trial followed by four trials of a platform reversal task. After behavioral testing, the animals' brains were tested for levels of Nerve Growth Factor Receptor p75 (NGFR) reactivity in the basal forebrain to investigate potential differences in the cholinergic system that may contribute to the behavioral effects.

## **ATLAS OF MAINE - ELECTRIC POWER SERVICE AREAS, ENERGY LINES AND HYDROELECTRIC DAMS OF MAINE**

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

This map displays the locations of hydroelectric dams, electric power service areas, power lines and pipelines in Maine. All of these elements are related to one another since hydropower is an important energy source in the state of Maine. Data came from the Maine Office of GIS.

## **ECOLOGICAL EFFECTS OF WOLF REINTRODUCTION IN THE GREATER YELLOWSTONE ECOSYSTEM**

**Ian McCullough ('10), Anders Nordblom ('10) and Patrick Roche ('09), Environmental Studies**

Reintroduced to Yellowstone National Park (YNP) in 1995, gray wolves (*Canis lupus*) have demonstrated the ecological importance of keystone species. Ninety-two percent of the wolves' diet consists of elk and the wolves' return has reduced the overgrown elk population, which subsequently reduces soil erosion and increases young riparian vegetation that serves as food for beavers. Reduced elk populations enhance grazing conditions for bison. Elk carcasses also provide consistent energetic benefits to scavengers including grizzly and black bears, ravens, eagles, magpies and 57 known specialist beetle species. Coyotes also scavenge elk kills, but have been reduced in numbers since wolf reintroduction. Based upon the principles of conservation biology, we found that the reintroduction program has furthered overall conservation efforts within the park.

## **HABITAT SUITABILITY ANALYSIS OF THE CRITICALLY ENDANGERED FLORIDA PANTHER**

**Ian McCullough ('10) and Andrew Young ('09), Environmental Studies**

The purpose of this study was to conduct a habitat suitability analysis of the critically endangered Florida panther (*Felis concolor coryi*) in Florida. We gathered land cover, population and road data from the Florida Geographic Data Library and performed map algebra using ESRI's ArcGIS to compile a suitable habitat map. We found that there is 20381.7km<sup>2</sup> of highly suitable habitat and 557124.4km<sup>2</sup> of less desirable but usable habitat for the Florida panther. The highest concentration of highly suitable habitat is in Big Cypress National Park, with smaller patches in Tates Hell State Forest and along the southeast portion of the panhandle. Due to extensive fragmentation, however, and without establishment of habitat linkages to the existing southern population, there is little chance of survival of additional panther populations in much of northern Florida.

## **THE EFFECTS OF ALCOHOL AND TRAINING ON EXERCISE RECOVERY METABOLISM AND SPRINT PERFORMANCE IN THE BROWN ANOLE (*ANOLIS SAGREI*)**

**MaryClaire McGovern ('08), Biology**

Experiments on reptiles, specifically lizards, in the field of exercise physiology have shown that most species tested are highly anaerobic, which reflects a primarily sit-and-wait predator strategy. It is not surprising, therefore, that many lizard species have developed a physiological mechanism to efficiently use excess lactic acid to replenish glycogen



stores depleted during exercise. In this study, I investigated the effects of training and chronic alcohol ingestion on this recovery process using the brown anole (*Anolis sagrei*) as a model. To assess these effects, I measured running performance, leg muscle and liver glycogen levels, and activity levels of the catabolic enzyme citrate synthase (CS) in leg muscles of lizards from each treatment group. The treatment groups consisted of a three-way factorial of training, alcohol, and recovery variables. I exercised the trained groups to exhaustion each night for fourteen days, as opposed to sedentary lizards that only ran on the fourteenth night. One group of trained anoles was given 15-20 minutes post-exercise recovery time before sacrifice, and I euthenized and dissected the other half of the lizards immediately following exercise. Results show a trend of greater performance (running speed and distance covered before exhaustion) in the legs of trained lizards than in sedentary lizards. Results of the alcohol treatment and comparisons of muscle and liver glycogen levels will be discussed.

## **NATIVE POLYACRYLAMIDE GEL ELECTROPHORESIS ASSESSMENT OF DNA BENDING**

### **Erin McGowan ('08), Chemistry**

Bifunctional alkylating agents such as diepoxybutane (DEB) and the epihalohydrins have the potential to form DNA interstrand cross-links. In order for the short tether of such agents to span the 9-Å distance between distal deoxyguanosines at the GGC consensus sequence for DEB cross-linking, DNA distortion is likely. We have been investigating DNA bending upon reaction of these agents with DNA duplexes containing a central GGC site. The strands of interest for this semester included a 42-mer complex and two 31-mer strands with adenine tracks 5 and 10 nucleotides away from the central GGC cross-link. We used denaturing polyacrylamide gel electrophoresis to purify cross-linked DNA and then ligated the products for analysis via native polyacrylamide gel electrophoresis. Cross-linked samples had a retarded electrophoretic mobility compared to ligated, unmodified DNA of the same sequence, suggesting that cross-linking does indeed result in bending. The degree of bending was then calculated using an established empirical relationship between gel mobility and bending. Our goal is to provide insight into the structures of the cross-linked lesions, including the direction of the bend.

## **ECOLOGICAL PERCEPTION OF SPACES**

### **Charlotte Morse-Fortier ('08), Psychology**

The ecological approach to perception, founded by J.J. Gibson, is a newer approach within the history of the study of sensation and perception. This approach holds that people receive an already rich, meaningful and complex signal from their environment. In this view, the environment needs only detection, not elaboration. Thus, perception is the process of registering the already meaningful structure in the environment. This theory places the perceptual unit as an animal in an environment, rather than an animal unit who processes his or her environment. Gibson discusses at length the importance of affordances, or our perception of what actions the environment enables for us as perception-action systems (e.g. that structure of wood affords sitting for me, that surface affords walking for me). The work done in this direct realist philosophy involves an ecological study of perception and action considered together. To date, much of the research done has focused on distance and size perception, social action, and coordination. I studied space and size perception. The aim of my study was to examine how the perception of a room's size changes when we alter its possibilities for action. For instance, does an empty room seem bigger if I am standing still than if I walk around in it? What about for an individual acting in a group as opposed to alone? Will I expand my perception-action system to include people other than myself, and thus judge the room to be smaller? What about when my motion around the room is on a scooter instead of on foot? By altering the contents of the room (and thus, its affordances) and observing the changes in space and size judgments, I investigated how a perception-action system operates and assesses the environment.

## **THE CRISIS OF LIBERALISM IN EGYPT: WORKERS AND THE WAFD PARTY (GOLDFARB CENTER STUDENT RESEARCH)**

### **Gautam Nair ('08), International Studies**

This study investigates the reasons behind the collapse of liberal parties in Egypt. By examining the political fortunes of the Wafd Party, it will show that this collapse is principally due to a failure to appeal to an increasingly politically conscious working class. Two periods, 1919-1924 and 1978-1984, will be compared in order to demonstrate that the ideology, character, and the leadership of the Wafd did not undergo significant change. However, by 1978, workers had developed a strong political consciousness that led them to reject the Wafd's liberal economic ideology. Without this integral component of its mass base, the Wafd was unable to secure a large share of political power within the system,

or to challenge Egypt's authoritarian regime from outside it. The analysis is extended to the recent history of Egypt in order to demonstrate the political implications of the decline liberal parties.

## **IF IT'S THE DEVIL'S MUSIC, SATAN MUST BE AWFULLY PROUD**

### **Grant Netzorg ('08), Art**

For a virtual art exhibition entitled 'If it's the Devil's Music, Satan Must be Awfully Proud,' I have chosen a handful of works from the Northern Renaissance by painters such as Hieronymus Bosch, Martin Schongauer and Albrecht Durer that each feature demons and devils. Each painting I have selected will be accompanied by an appropriate contemporary musical composition, ranging from bluesmen like John Lee Hooker to metal heads like Slayer. Each piece will be projected on a screen during my presentation, and I will play brief clips from the songs in order to achieve the intended feel of my virtual exhibition.

## **THE WEST'S IMPACT ON THE EAST: PERCEPTIONS OF WOMEN THROUGH TIMES**

### **Nahita Nishmin ('08), East-Asian Studies**

Onnazaka - the original name for Fumiko Enchi's novel presents a most appropriate picture of the progress of Japanese women from the advent of the Meiji period to the present times. The word was constructed from the characters that represent "women" and "hill" in the Japanese language. Onnazaka describes a woman's never-ending struggle against society for her rights. From the literature and the films analysed in this paper, it will be evident to readers that Japanese women still face discrimination, albeit to a different degree. In writing about the changes in the conditions of Japanese women from the late 19th century to the late 20th century, the impact of Western ideals needs to be treated as a necessary and important component. The advancement of the status of women from the Meiji period and under the influence of the West can be represented by a valley- conditions deteriorated before improving to its present stature. Hence, the aim of this paper is to take a closer look at this particular valley, and see how women have reacted to the forces of change and how applicable feminist theory may be in describing female characters through the decades of Meiji restoration and the modern era.

## **CARBON NEUTRALITY AT COLBY COLLEGE**

### **Jamie O'Connell ('08), Environmental Studies**

Climate change is arguably the largest challenge facing today's world. Carbon neutrality is a goal that is becoming popular among colleges and universities through the American College and University Presidents Climate Commitment (ACUPCC). To be carbon neutral, an institution must have a net greenhouse gas emissions level of zero. While over 500 colleges and universities have signed the Commitment, College of the Atlantic is the only school that has reached neutrality. This research investigated the feasibility of carbon neutrality at Colby College and found that carbon neutrality could be achieved within five years at a low cost.

## **MORAL PHILOSOPHY IN TWENTIETH-CENTURY LEGAL DRAMAS**

### **Emily Parker ('08), English**

This essay investigates numerous ethical issues dramatized by plays dealing with legal decisions, while referring to a wide range of philosophies. The modern legal dramas including *Inherit the Wind*, *Judgment at Nuremberg*, *Twelve Angry Men* and *A Walk in the Woods* possess striking ethical dimensions which provide its readers with sharpened moral insight and new perspectives about important truths. This reflection of drama in relation to moral philosophy communicates ethical dilemmas in narrative form, thereby granting moral insight for an audience. Moral philosophy, or ethics, concerns the values or customs of a group or of an individual, which influence conduct, and ultimately guide human life. The four twentieth century legal dramas explored here are narratives which correspond closely to how the human mind makes sense of experience, as opposed to the conventional, conceptual rhetoric of law. These compelling plays are influential and in many respects, their ethical revelations transcend time and place. *Inherit the Wind*, *Judgment at Nuremberg*, *Twelve Angry Men* and *A Walk in the Woods* do not study, in a meta-ethical way, the "meaning" of moral judgments, but rather how ethics can be applied in a dramatic situation.

## **FASHIONING AN IDEAL: CONSTRUCTIONS OF HONOR LEADING UP TO THE ENGLISH CIVIL WAR**

### **Laura Perille ('08), History**

In early modern England, society placed great significance on the ideal of honor, encouraging people to align their actions according to what they understood as ethical and suitable to their social positions. Notions of honor maintained a striking influence on everything from personal etiquette to religious reforms to political maneuverings. Honor, which had for so long been relegated to martial exercises and physical competitions, became internalized and nurtured as an inner virtue. My research focuses on honor's role in the transformation of sixteenth- and seventeenth-century English society, as the Protestant Reformation, transfer of rule to the Stuarts, power struggles with other nations, and the development of new ideas regarding government increased uncertainties and bred energies tuned towards specific ends. Throughout these transformations, honor came to center stage, as men incited others to action based upon some noble ideas regarding what it meant to serve one's nation and appear as a virtuous gentleman. As the second Stuart king, Charles I inherited a celebrated honor tradition, yet failed military expeditions and religious tensions undermined the Crown's honor. Such a fall from grace left Charles determined to restore the Crown's dignity, and he turned to a new model of honor in order to do so, proclaiming the man of honor as a guardian of the peace rather than as a perpetrator of war. Charles enacted this revised construction of honor on a figurative and literal stage, propagating a harmonious reign in which love, order, and peace radiated from the person of the king. Despite these royal attempts, the meaning of honor came into question, dividing the nation as gentleman made their own interpretations and forged new alliances.

## **A PHOSPHORUS PRIMER FOR MAINE'S LAKES**

### **Lindsay Philips ('08), Environmental Studies**

The state of Maine contains over 2,000 lakes that offer many forms of recreation. Human practices like development, agriculture, and waste generation can have deleterious effects on lake ecosystem health. Phosphorus is an essential nutrient found in many forms, but one that is most often limiting in biological communities because it is bioavailable only as orthophosphate. Large influxes of phosphorus into a lake system result in eutrophication and depletion of dissolved oxygen. Algal blooms are associated with the summer months and are easily recognized in lakes as a large deterrent to recreation and as detrimental to the viability of lake biota. This study examines the factors, both natural and anthropogenic, that impact phosphorus levels in freshwater aquatic systems. Lake phosphorus concentration data were obtained from the University of Maine's PEARL database and ArcGIS was used to examine the changing trophic status of Maine's lakes over time. The study concludes with a Primer for phosphorus cycling, chemistry, and origin that intends to serve both the general and scientific communities, with the hope that it can be understood by and be useful to all to some degree.

## **REACTIVITY OF SUPEROXIDE IN NATURAL WATERS**

### **Leanne Powers ('08), Chemistry**

Superoxide ( $O_2^-$ ) is a radical anion that is produced in surface waters by the photooxidation of dissolved organic matter. Because of its intermediate redox potential, superoxide participates in the oxidation of dissolved organic materials and the redox cycling of dissolved metal ions like iron and copper. Due to the reactivity of  $O_2^-$ , steady state concentrations are in the pM to nM range in natural waters and require a sensitive chemiluminescence system for detection. Superoxide standards are produced by the photolysis of acetone in a saturated ethanol solution or enzymatically by the xanthine/xanthine oxidase system. The chemiluminescence system has been calibrated with these standards for both the reaction of superoxide and the 2-Methyl-6-(4-methoxyphenyl)imidazo[1,2-a]pyrazin-3(7H)-one (MCLA) and the reaction of superoxide and 1,10-phenanthroline in a cetyltrimethylammonium bromide micelle. Using these systems we have studied the photochemistry of superoxide in natural waters. A surprising outcome of these studies is the reaction of superoxide with dissolved  $CO_2$  ( $O_2^- + CO_2(aq) \leftrightarrow CO_4^-$ ) to form the peroxy carbonate radical and/or other radical dimers. Using the chemiluminescence system, we have investigated the reactivity of the peroxy carbonate radical and will report on the significance of this reaction for the fate and reactivity of  $O_2^-$  in Maine lakes.

## **ATLAS OF MAINE: SUITABLE HABITATS FOR WILDLIFE AND CONSERVATION AREAS IN MAINE**

### **Michelle Presby ('09), Environmental Studies**

This map shows suitable habitat values based on 91 priority trust species of the U.S. Fish and Wildlife Service in relationship to Maine's conservation lands. The conservation lands have been separated into public and private sectors, each showing easements and owned lands.

## **GROUP DECISION MAKING IN THE DICTATOR GAME: THE EFFECT OF GENDER AND OFFER METHOD**

### **Madeline Ragan ('08), Psychology**

The present study investigated the effect of gender and offer method on group decisions in the dictator game. In the dictator game, individuals or groups allocate a sum of money between themselves and a passive recipient. Researchers were particularly interested in how the context of the group modulated offers in terms of fairness and utility. Fairness is defined as an offer that falls above the mean offer, whereas utility is defined as an offer that falls below the mean offer. Participants were placed in either same gender or mixed gender groups and allocated money as either a group or a representative of the group to either a male or a female. Prior research suggested that females tend to be more utilitarian, particularly when making offers to other females. The results of study one in this investigation indicate that although offer method did not have a significant effect on the amount given, as the femaleness of the group increased, offers actually became more fair, especially offers to other females. This unexpected result contradicts what prior research would suggest. Study two further investigated the effects of gender in three person groups to see how a gender bias within a group would affect utility and fairness. Results of study two do not suggest the same effect. Overall, this investigation suggests that gender is not a significant factor in determining behavior in the dictator game and that context suggests a better explanation in the variability of offers.

## **WRITTEN ON THE FACE: THE GROTESQUE PHYSIOGNOMY IN NORTHERN RENAISSANCE ART**

### **Virginia Robbins ('09), Art**

The art of the Renaissance in Northern Europe is filled with images of stunningly grotesque and misshapen humans. This paper considers the connection between depictions of monstrous people in art with the prevailing medical theories of the time, most specifically the theory of physiognomy. Physiognomy consisted in the analysis of a person's outward appearance as a reflection of both his inherent moral character and as an indicator of his humoral balance. Thus, in pre-modern Northern Europe, a person's character and temperament was quite literally written on his face. To show the influence of such beliefs on the art of the time, I first explore the late medieval theory of physiognomy and its implications for the average individual. It was held that ugly, exaggerated features denoted wickedness while beautiful, regular features indicated righteousness. Therefore, generally, the worse a character was, the less pleasant that person would appear. I then apply this theory to a series of Northern Renaissance visual works that deal with grotesque physiognomy as it was understood in this period—as an indicator of virtue or vice. This paper also tracks the depiction of the grotesque physiognomy from its earlier use in religious contexts such as in Schongauer's Betrayal of Christ and Bosch's Garden Of Earthly Delights to its emergence as practically its own secular genre with Massys' Old Woman.

## **A VISIBILITY ANALYSIS OF THE CAPE WIND PROJECT**

### **Patrick Roche ('09) and Caitlin Casey ('09), Environmental Studies**

Cape Wind has proposed a wind farm of 130 turbines on Horseshoe Shoal in the center of Nantucket Sound. A prominent concern about the project is the impact the visibility of the turbines will have on the region's tourism industry and property values. It is feared that their presence will diminish the value of the pristine coastline that has attracted vacationers to Cape Cod for generations. In this project, we assess the extent to which Cape Cod, Martha's Vineyard, and Nantucket will be visually affected by the wind farm. It was completed using a Viewshed Analysis in the GIS program, ArcMap, from the surface, mean, and maximum height of the towers. These Viewsheds were combined to give a comprehensive perspective of which areas are able to see the highest percent of the wind farm. Finally, a weighted land use value was applied to the Viewshed to account for the impact of land use on the ability to see the project. The objective of this analysis is to provide a visual representation of how great an influence the wind farm will in fact have on Cape Cod.

## **ATLAS OF MAINE: MAINE'S FAST FOOD**

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

This map displays the number of fast food restaurants per town in Maine. The map highlights the relationship between the number of major road intersections and the number of fast food restaurants per town. Restaurants included in the 'fast food' designation are McDonald's, Wendy's, Burger King, Taco Bell, KFC, Papa John's Pizza, Pizza Hut and Dominos Pizza.

## **BANCO PALMAS: TOWARDS A CONCEPT OF "SOLIDARITY ECONOMICS" - RESEARCH REPORT ON A GOLDFARB STUDENT RESEARCH GRANT**

### **Andrei Roman ('08), Government**

In January 1998, the community of Conjunto Palmeiras, one of the impoverished peripheral neighborhoods of the Brazilian city of Fortaleza, launched Banco Palmas - a community bank aiming to end the cycle of poverty through an innovative use of financial products and educational programs. The bank gained national recognition for its highly successful micro-credit program and, even more so, for the launching of a social currency circulating in the neighborhood in parallel to the official currency. Through its innovation, the bank has tested the limits of national financial legislation. At the same time, it has contributed to the emergence of a new economic ideology: 'solidarity economics'. This report analyzes the evolution of the bank's projects and ideology, the complex interaction with state and non-state actors, and the community dynamics underlying its current development. It suggests that while 'solidarity economics' remains a vague and contested platform for socioeconomic change, grassroots movements are contributing to a profound transformation of leftist economic ideology within Brazil.

## **BOM CONSELHO? - A CASE STUDY OF COMMUNITY INVOLVEMENT MECHANISMS IN THE FUMAC DESIGN OF THE WORLD BANK RURAL POVERTY ALLEVIATION PROJECT (RPAP) IN PERNAMBUCO, NORTHEASTEN BRAZIL**

### **Andrei Roman ('08), Government**

The World Bank and Brazilian state governments in Northeastern Brazil have implemented during the past decade community-driven development programs focused on rural poverty alleviation. These programs are broadly regarded to have achieved through the community participation mechanisms employed superior results compared to the practice of previous rural development projects in the region. The study provides an assessment of community involvement articulated through the community associations and the development municipal council (FUMAC) in the municipality of Bom Conselho in the state of Pernambuco, while providing related examples and insights regarding other municipalities in the same state. Focusing on the idea of substantive participation, the discussion is grounded in the field research of poor rural communities displaying various types and degrees of associative organization, a series of interviews with experts of Projeto Renascer, the state agency administering the program, and the World Bank, as well as a review of relevant documents and articles. Certain norms of the FUMAC design regarding the functioning of the municipal councils (or the lack thereof), the lack of consistent assistance and access to information for the communities not represented in these councils, politicization and clientelism, a weak tradition of associative organization, poor accountability, and insufficient technical assistance emerge as major challenges for the objectives of the program. However, specific advances achieved during the past few years provide a strategic platform for addressing these complex challenges in the future.

## **DEVELOPING RELIABLE ESTIMATES OF POVERTY AND INEQUALITY FOR CHILE'S ETHNIC GROUPS**

### **Andrei Roman ('08), Economics**

This study is motivated by the lack of reliable estimates of poverty and inequality for the eight officially recognized indigenous peoples in Chile. In the past, studies have attempted to use data from the national socio-economic survey (CASEN) in order to calculate poverty estimates. However, the lack of representative samples for each indigenous group has rendered the obtained estimates impractical, due to very large standard errors. The study addresses this problem by matching survey and census indicators that allow for the estimation of total income for every household in the country. Thus, the method of geographical disaggregation of poverty indicators developed by Hentschel et al. (1999) and Elbers, Lanjouw, and Lanjouw (2003) is extended to the study of clusters defined on the basis of ethnicity rather than location. The obtained estimates point out with a high degree of confidence that all indigenous groups in Chile are poorer than the non-indigenous population. Among them, the two largest groups - the Mapuche and the Aymará - have

the largest poverty and indigence rates. At the same time, the results indicate that the Mapuche are the most equal ethnic group in Chile. It is hoped that the poverty and inequality estimates hereby available can provide relevant information for policy-makers designing programs for alleviating indigenous poverty in Chile.

## **LIVING ARRANGEMENTS AND SUBJECTIVE WELL-BEING OF OLDER ADULTS: A COMPARISON BETWEEN CHINA AND JAPAN**

### **Andrei Roman ('08), Economics**

Employing data from the 2000 China Longitudinal Healthy Longevity Survey (CLHLS) and from the 1990 National Survey of Japanese Elderly (NSJE), the paper compares the effects of living arrangements with children for the subjective well-being (SWB) of older people in China and Japan. Disaggregating living arrangements with children by marital status, we find that living with an unmarried son can have a negative effect on elderly SWB in both countries. At the same time, living with a married daughter and not with a married son is the most advantageous living arrangement. These results suggest that conforming to strong cultural traditions emphasizing co-residence with adult sons does not yield the expected benefits.

## **MEN'S FEARS OF INTIMACY: DISMISSIVE ATTACHMENT, MASCULINE IDEOLOGY, AND ALEXITHYMIA**

### **Sarah Romeo ('08), Psychology**

While intimacy, defined as the quest for close connection with another is seemingly important to the maintenance of a romantic relationship, many couples struggle to develop a strong, emotional connection. Little research has been devoted towards uncovering and understanding men's expressions of and fears towards intimacy, and the contributing factors. It was reasoned that men who avoid intimacy in romantic relationships might do so because of masculine ideology, adult attachment styles, and Alexithymia. The goal of this study is to prove that (1) men's fear of intimacy in romantic relationships will be associated with (a) dismissing attachment style, (b) masculine ideology, and (c) alexithymia and (2) men's experienced emotional intimacy in romantic relationships will be explained by (a) dismissing attachment style, (b) masculine ideology, and (c) alexithymia. Results supported the first hypothesis that the theorized variables accounted for significant proportions of variance in participants' reported fear of intimacy. Alexithymia was the sole unique predictor of men's fear of intimacy. The second hypothesis, referring to levels of emotional intimacy was not supported. One covariate, relationship satisfaction was a unique predictor of emotional intimacy and fear of intimacy. With regard to experienced emotional intimacy, alexithymia, masculine ideology, and dismissing attachment were not significant predictors. It was concluded that men often avoid counseling to avoid delving into their feelings, but prefer to take a logical, problem-solving approach to dealing with problems, either individually or within relationships.

## **ONE BITE AT A TIME: AN ANALYSIS OF EATING DISORDER INTERVENTIONS**

### **Sarah Romeo ('08), Psychology**

Eating disorders affect a large portion of the population. There are many theories as to the cause of eating disorders, including the Objectification Theory (Fredrickson and Roberts, 1997) which suggests that due to increasing societal pressures, females frequently internalize an outsiders view of their body, making them at an increased risk of disordered eating. Because this problem is prevalent, it is essential that there are effective interventions for treating and preventing eating disorders. Much research has been done on these interventions, with mixed results. The most common, and seemingly the most effective interventions focus on an interactive media-literacy component, where participants are actively engaged in breaking down media images and messages. Other effective interventions include those with an exercise component, either yoga or aerobic. An analysis of many interventions led to the conclusion that the most effective intervention technique should be a mandated school based yoga program that incorporates a media-based literacy program as an interactive component.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: STUDENT EFFORTS TO BUILD LOCAL SUPPORT FOR SAFER CHEMICALS POLICY**

### **Nicholas Ruocco ('10), Naiff Bethoney ('08) and Leah Gourlie ('09), Environmental Studies**

The regulation of toxic chemicals is a primary concern for the current and future generations. Recently, in Maine, a bill to control toxic chemicals in toys and other children's products has been signed by Governor John Baldacci. Aiding in this achievement was local support raised by civic engagement activities conducted by Colby students enrolled in

Professor Gail Carlson's The Environment and Human Health class. Activities included attending the public hearing for the bill, writing letters to legislators and the Morning Sentinel, and discussing the issues with their legislators in person at the Statehouse. Awareness and support were also raised in the community by designing an informational brochure and a pre-printed postcard for local residents to sign to show support for the bill. Additionally, students went door-to-door, tabled outside of the Waterville Starbucks store, attended a church meeting, visited the AP chemistry class at Waterville High School, and raised awareness on the Colby campus and at their workplaces. In addition to raising awareness a public forum on the Maine bill and the issue of toxic chemicals in children's products, was held March 19 at the George J. Mitchell School in Waterville, and featured a panel discussion with Waterville Representatives Canavan and Pamela Trinward, Michael Belliveau, Executive Director of the Maine-based Environmental Health Strategy Center, and two Colby students, Beth Darling and Jessica Harold, both seniors.

## **EFFECTS OF VARIABILITY ON ENTRAINMENT WITH AN ENVIRONMENTAL STIMULUS**

### **Jennifer Rutherford ('08), Psychology**

Previous research has found that an individual's rhythmic movements can become unintentionally entrained to the rhythmic movements of another individual or visual stimulus. Previous research has also demonstrated how the strength of such entrainment is mediated by (1) the amount of visual tracking—more visual tracking results in stronger coordination—and (2) the difference between the natural periods of the two rhythms—the greater the difference the weaker the coordination. It has also been found that human movements are less influenced by non-biological movements. While this is most often explained using the human mirror neuron system, because these neurons are argued to respond more to biological rather than non-biological movements, these observed differences are also consistent with the theory of the self-organized entrainment of coupled oscillators. More specifically, the noise present in biological motion should operate constructively to increase the coordination between two systems compared to a artificial (non-biological) system with no noise, because the dynamical model predicts that small (natural) levels of movement noise lead a system to convergence towards stability. Small amounts of noise present in the stimulus may actively increase its attentional salience leading to increased amounts of coordination. The current study investigated whether the variability present in the observed environmental rhythm affected visual tracking, and how this facilitated the coordination that emerges in dynamically organized systems. Consistent with the theory of self-organized coupled oscillators the results suggest that the participants were not influenced differently by biological and non-biological movements and exhibited unintentional coordination with both.

## **FAILING WOMEN AND THE FAILURES WHO DRESS THEM: HOW GAY MALE HOSTS OF LIFESTYLE MAKEOVER SHOWS FAIL TO ADDRESS THE TRUE FAILURE, HETERONORMATIVITY**

### **Patrick Sanders ('08), Women, Gender, Sexuality**

Carson Kressley and Clinton Kelly are successful, on-air television personalities who host, or with regards to Kelly, co-host, popular lifestyle makeover shows for women. The television shows they host, 'How to Look Good Naked' and 'What Not to Wear,' respectively, follow a basic format with each female guest: introduction, assessment and evaluation, remodeling, and the reveal. While these men take different approaches—cynical to supportive—when breaking the woman down before “reDressing” her, they all make clear the woman has 'failed' to look like a 'real' woman should. In this capacity, these prominent gay men figure in to a hetero-normative, masculine pedagogy which narrowly defines female beauty and femininity. In looking at these makeover shows, I am going to argue (a) gay men have agency to the male-gaze yet are socialized as effeminate, thus creating a cuckold relationship between the gay host and the female guest's male partner or family member, (b) Kelly participates in reinforcing a homogenous, and ultimately, limiting femininity, while Kressley is doing more for women but still falls short, ultimately because he cannot escape from encouraging his female guests to go out and find men, 'hotties,' who can affirm their new normalized looks, and (c) why gay men should care more about expanding, as opposed to limiting, femininity and beauty.

## **THE PURIFICATION OF THE ABSCISIC ACID RESPONSE ELEMENT-BINDING FACTOR, TAABF1**

### **Talia Savic ('09), Biology**

The protein TaABF1 may function, through an interaction with the protein kinase PKABA1, as a component of the signal transduction pathway that abscisic acid uses to suppress the induction of gibberellin-induced genes. TaABF1 has also been suspected to be involved in the abscisic acid induction of genes through its proposed ability to bind to the promoters of abscisic acid-induced genes. In order to determine the precise role of TaABF1 in abscisic acid induction and suppression of genes, it was purified. The p15/TaABF1 plasmid was transformed into E. coli cells [BL21(DE3)pLysS] and production of the TaABF1 protein fused to a glutathione S-transferase (GST) tag was induced

by IPTG. The GST:TaABF1 fusion protein was then purified by glutathione affinity chromatography. Purified TaABF1 protein is necessary to further investigate the ability of TaABF1 to bind to segments of the promoters of abscisic acid-induced genes. Knowledge of the role of TaABF1 will provide a greater understanding of abscisic acid's ability to allow plants to prevent germination and maintain dormancy through the induction and suppression of particular genes.

## **MALADAPTIVE ATTENTION TO EMOTION AND THE PERSONALIZATION OF OBJECTIVE, NEGATIVE STIMULI**

### **Kaila Saxe ('08), Casey Lynch ('09) and Guy Sack ('09), Psychology**

Participants in the experimental group were manipulated to pay attention to their emotions through a writing exercise in which they were primed to use emotional words to describe a past negative experience. In the control group, participants were primed to pay attention to facts and situational details (rather than emotions) when recalling a negative experience during the writing exercise. Expected results are that those participants who are induced to pay more attention to a negative emotion are more likely to report having more negative mood on the PANAS affective inventory scale after viewing objective unpleasant images. It is also expected that participants in the experimental group will rate the pictures as less pleasant than those in the control group. The internalization of objective, negative stimuli is discussed.

## **THE HYPERSENSITIVITY TO AND MORAL PANIC OF FEMALE RELATIONAL AGGRESSION**

### **Kaila Saxe ('08), Psychology**

In the past several years, researchers have begun to pay closer attention to the increasingly publicized phenomenon of female aggression. Previously, the majority of research on aggression was male oriented and focused on overt forms of aggressive behavior. However, research involving gender differences in aggression has generally concluded that girls use more forms of relational aggression. The impact of media and peers on gender typical and atypical behavior is discussed; there are seemingly strict guidelines for males and females to abide by and deviance from these norms has social consequences. Anxiety about one's status in social networks, jealousy and threats to one's pride were significant across studies of female aggression. Implications of perceived threats and jealousy as a cause for female aggression directed towards both females and males are reviewed. While many early theories on female aggression are male-centered and sex-specific, newer feminist theories of aggression generate interesting discussions about power, intra-sexual competition and gender stereotypes that create guidelines for female expression of frustration, anger, fear and jealousy through aggressive acts. In addition, I will address private anxieties that become public when females deviate from the behavioral guidelines that have been deemed normative and acceptable. Although relational aggression is overwhelmingly attributed to females, there is evidence for, as well as a sense of fear of, girls' participation in overtly aggressive behavior.

## **INHIBITION OF CELLULAR THIOREDOXIN REDUCTASE BY THE ANTICANCER PRODRUG CLORETAZINE**

### **Tyler Schleicher ('08) and Christopher Buros ('09), Chemistry**

Thioredoxin reductase (TrxR) catalyzes dithiol-disulfide exchange reactions on thioredoxin (Trx), which in turn catalyzes other reductive processes such as deoxyribonucleotide biosynthesis. The thioredoxin system, which also includes thioredoxin peroxidase, is also an endogenous antioxidant system. We demonstrate here that TrxR activity is strongly inhibited by the anticancer sulfonylhydrazine Cloretazine. Furthermore, this inhibition is specific to Cloretazine's carbamoylating activity, which originates from one of the two reactive subspecies generated in situ by this preclinical agent. The other electrophilic molecule yielded by Cloretazine results in cytotoxic DNA crosslinks. Methylisocyanate, the carbamoylating species, modifies nucleophiles such as primary amines and thiols and synergizes with the DNA crosslinking activity to kill actively dividing cells. The magnitude of the inhibition of TrxR in vitro is the most potent yet observed by Cloretazine's carbamoylating activity. This inhibition extends similarly to enzyme originating from the lysates of mammalian leukemia cells treated with the experimental agents. This pattern differs from that of a related oxidoreductase, glutathione reductase, which while inhibited potently in purified form, showed little susceptibility to carbamoylation in a cellular context. These results suggest that the mode of inhibitory action against TrxR and glutathione reductase differs inside of cells. Given the overexpression of TrxR in neoplastic cells and its involvement in DNA metabolism, the inhibition of TrxR by Cloretazine may prove to be critical to the mechanism of action for this promising anticancer agent.



## **GROUP INTENTIONAL AND UNINTENTIONAL INTERPERSONAL COORDINATION**

### **Emily Schofield ('09), Madison Gregor ('09) and Mary Snediker ('09), Psychology**

Previous research has demonstrated that the rhythmic movements of limbs or body movements of two individuals can become coordinated both intentionally and unintentionally and that such coordination is constrained by the self-organized entrainment processes of coupled oscillators. This study investigated whether such intentional and unintentional coordination can occur at the group level. In this experiment six participants rocked in identical rocking chairs that were arranged in a circle facing each other. Participants were instructed to focus their attention on a center target and rock at their own preferred tempo. Two unintentional and two intentional trials, each three minutes long, were completed to measure the coordination as well as the type of coordination that emerged. As expected, coordination existed in both the unintentional and intentional trials. The strength of coordination, as well as the type and pattern with which the coordination emerged is discussed.

## **CONJUGATIVE TRANSFER OF ANTIBIOTIC RESISTANCE IN BACTERIA ISOLATED FROM THE PRE-ANTIBIOTIC ERA IN MAINE SPHAGNUM BOG CORE SAMPLES**

### **Justine Scott ('08) and Sarah Bartels ('08), Biology**

Previous studies have found that antibiotic resistance can be transferred between bacteria even in the absence of direct antibiotic pressure. It is hypothesized that environmental mercury may provide a selection pressure that selects for both mercury resistance and antibiotic resistance. Genes for this resistance are often coded on transposable elements, and thus antibiotic resistance may be disseminated throughout ecosystems as a result of pervasive mercury contamination. Our objective was to show that bacterial strains isolated from bog core samples could transfer antibiotic resistance to *Escherichia coli* DH5?. Using conjugation methods and selective antibiotic media, we isolated transconjugants and tested their resistance on antibiotic Minimum Inhibitory Concentration susceptibility assay panels. We found that *Pseudomonas putida* RP4 from Round Pond Bog effectively transferred heritable resistance to several antibiotics. These results show that antibiotic resistance can be transferred by bog bacterial strains and suggests that this conjugation experimental system could be used to determine that bacteria isolates dating back to the pre-antibiotic era have the ability to transfer antibiotic resistance, supporting our hypothesis that environmental mercury can indirectly select for antibiotic resistance in bacteria.

## **HOW WIDELY WATCHED STOCK MARKET INDEXES PREDICT FUTURE ECONOMIC ACTIVITY: TWO CENTURIES OF EVIDENCE SINCE 1800 UNTIL PRESENT**

### **Yauheniya Sidarchuk ('08), Economics**

This study examines the ability of widely quoted stock market indexes to predict future economic activity. While stock prices from the recent past are found to contain information about future economic activity, the relationship is found to be weaker compared to earlier periods. The study also investigates the predictive power of different indexes during the 19th and 20th centuries, performing stability analysis of the obtained estimates. In the times when the stock market is found to predict future economic activity, the Dow Jones Transportation Index outperforms the predictive ability of the other stock market indexes.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: HUMAN BODY BURDENS OF SYNTHETIC CHEMICALS**

### **Emily Sinnott ('08), Jessica Ruthruff ('08) and Michael Veidenheimer ('10), Environmental Studies**

A body burden is the measure of the amount of exogenous chemicals present in the human body. We all carry a body burden of potentially hundreds of unnatural synthetic chemicals of questionable toxicity that are ubiquitous in the environment today. There are approximately 80,000 synthetic chemicals used in the United States and 6,000 of these are high volume chemicals produced in extremely large quantities. These chemicals may be carcinogens, reproductive or developmental toxicants, DNA mutagens, endocrine disruptors, or they may disrupt normal immune and neurological functions. We are all exposed to dozens of these chemicals through routine contact with cosmetics, plastics, paints and pesticide residues on food, and while the body is able to break down and secrete some of these chemicals, many more are sequestered for extended periods of time. We know how to measure several hundred of these chemicals or their metabolites in people's bodies by sampling blood serum, urine, breast milk, hair, nails, or more invasive areas like fat or bone. This process, called biomonitoring, is important in assessing a population's exposure to these potentially dangerous chemicals. More knowledge is required about the effects of synthetic chemicals on human health, and additional policies that are more protective of human health than the current ones should be enacted.

## **AN INCUMBENT'S GUIDE TO REELECTION: ECONOMIC VOTING BY STATE IN U.S. PRESIDENTIAL ELECTIONS**

### **Kyle Smith ('08), Economics**

This study builds an econometric model capable of forecasting the results of presidential elections by state. Drawing from established economic voting theory, which predicts that the public will hold incumbent parties responsible for economic performance by punishing or rewarding them at the ballot box, this generalized model can be used to make forecasts for any of the 50 states. Following an analysis of the model's theoretical foundations, data from a pooled cross-sectional sample of elections from 1972 to 2004 is used to regress the share of the two-party vote in a given state. The explanatory variables include state economic conditions, national economic conditions, controls for state partisan and ideological leanings, and national political variables. The model is then used to make preliminary predictions for the 2008 presidential election.

## **LOGGING'S EFFECTS ON MAINE FOREST HABITAT: A CASE STUDY OF THE AMERICAN MARTEN**

### **Sarah Stevens ('09), Caitlin Casey ('09), Lindsay Dreiss ('09) and Amy Weinfurter ('08), Environmental Studies**

A historical and contemporary look at the ecological effects of Maine's logging industry provides insight into the importance of preserving Maine's northern territories. The majority of the North Woods are privately owned, and primarily managed for timber extraction. Forest roads are ubiquitous in the state, and present several management issues. This project examines the regulatory structure for these unorganized territories and its implications for several wildlife populations. Timber harvesting affects the habitat suitability of the northern forest, particularly for the American marten. The ecological background of martens becomes important, especially as their habitat preferences relate to stand ages and timber practices. Conservation strategies to protect the North Woods from fragmentation and conserve the species are discussed.

## **THE INFLUENCE OF EXERCISE- AND BODY IMAGE- RELATED COGNITIONS ON EATING BEHAVIOR**

### **Chelsea Stillman ('10), Brittany Tasi ('10), Meredith Tumilty ('10) and Alexandra Wesnousky ('10), Psychology**

In a society that constantly bombards people with images and ideas of what the "ideal" body is, it is necessary for people to understand the consequences of the stimuli. The experiment sought to determine the effects of activation and/or combination of body image and differentiation of exercise type on dietary restrictions in females ages 18-22. Participants were randomly assigned to one of four groups having each group fill out varying versions of the survey to provide comparable data. 60 participants each completed one version of the survey including a taste test of nutritional bars. Differences in sampled bar weights were analyzed and compared across groups. The analysis revealed a main effect for body image only. This data supports the hypothesis that being primed to think about body image increases dietary restraint, but does not support the hypothesis that being primed to think about exercise, either obligatory or recreational, impacts dietary restriction. The success of this study builds upon previous information about dietary restriction, body image and exercises in female populations by creating combinations of the three the later two topics to create an affect on the third.

## **'A SYSTEM OF SILENCE': PHILADELPHIA ORPHANAGES AND THE LIMITS OF BENEVOLENCE, 1780S-1830S**

### **Brian Sweeney ('08), History**

In 1831, Mathew Carey, a well-known Philadelphia economist, wrote a city official describing the situation of black children in the city. He called for the creation of an orphanage to aid these children and described the motives for this action as not only the "humanity and benevolence" of Philadelphians, but also "personal interest" as this class could otherwise turn "lawless". Unknown to Carey, the Association for the Care of Coloured Orphans had been established in 1822 by a group of benevolent Quaker women dedicated to aiding this destitute class in an effort to promote compensatory justice for generations of oppression under slavery. The founders of the association were not concerned with personal interest, and operated under "a system of silence" for years. Marked by a political, controversial, and sometimes violent debate over the abolition movement and the rights of freed African Americans, the 1830s proved a tumultuous time for the Association for the Care of Coloured Orphans. Despite these challenges, the female Friends who ran the organization held firm to their mission of caring for black orphans despite little support from the state and monetary donations from only a limited number of Philadelphians; progress was measured by the "humble indicator" of

differences made in the lives of individual children. Unlike the Association for the Care of Coloured Orphans, the Orphan Society of Philadelphia, established in 1814, saw “extensive liberality” from all corners of Philadelphia. Their asylum, which did not admit black orphans, was heralded as one of the most benevolent institutions in the city. A comparison of these two orphanages illuminates entirely different motivations, mindsets, and frameworks through which the history of humanitarianism and benevolence can be explored.

### **'BETWEEN TRADITION AND MODERNITY: RECONFIGURATION OF PUBLIC SPACES IN URBAN CHINA'**

**Jessie Tang ('08), Robert Ferriter ('08), Thomas Huff ('08), Hye Kim ('08) and Keane Ng ('08), East-Asian Studies**

Based on a four week field trip to four Chinese cities in the summer of 2007, this panel of five students will give a presentation on how public spaces have been reconfigured in urban China as China is on a fast track to emerge as a major global power. Each presenter will focus on a different aspect of China's rapidly changing urban landscape: the new park scenes and their social and cultural meanings; the sharp contrast between the construction boom with glittering office towers, modern sports facilities, and luxury residential high-rises, and the box-like living quarters of construction workers and the disappearing traditional courtyard homes and alleyway neighborhoods; the transformation of city traffic and the transportation system from bicycles to private cars and mass high-speed transportation; the jostling between street vendors and newly emergent franchised fast food restaurants; and the impact of the emergence of new found wealth and purchasing power of Chinese consumers as evidenced in the mushrooming luxury department stores, shopping malls and outdoor antique markets.

### **CONSEQUENCES OF BIOFUEL PRODUCTION IN THE AMAZON RAINFOREST**

**Hannah Taska ('09), Courtney Chilcote ('09), Robert Dillon ('09) and Emily Kissner ('08), Environmental Studies**

Biofuel production is a fast growing method for reducing greenhouse emissions by serving as a substitute for traditional fossil fuels. There is a growing market for biofuels in developing countries because of the large amounts of undeveloped land, such as the Amazon rainforest. The growth of sugarcane, palm, and soybeans for ethanol and biodiesel, in areas such as Brazil, Columbia, and Ecuador, could cause many problems to present ecosystems. The deforestation necessary to grow the biofuel crops causes loss of ecosystem services such as the regulation of water balance and river flow, the modulation of regional climate patterns, and the amelioration of infectious diseases. The Amazon Rainforest is also one of the world's major centers of both plant and animal biodiversity, which will suffer with the loss of habitat. The loss of carbon storage in the native biomass will take a long time to recover through the growth of biofuels, negating the positive effects of removal of rainforest for its growth. Although biofuels are still a useful tool in fighting climate change, their growth in the Amazon Rainforest is not recommended.

### **CULTIVATING URBAN ECOLOGICAL CITIZENSHIP: NGOS AND ENVIRONMENTAL PERCEPTION IN QUITO, ECUADOR**

**Nicole Terrillion ('08), International Studies**

There is a strong divide between environmental perception in the global north and environmental perception in the global south. Environmentalism is not a cross-cultural experience as many northern environmental groups assume. This study analyzes the historical development of environmental perspectives in Quito and closely examines the relationship between large international NGOs based in the global north and smaller, local organizations in the global south, paying particular attention to funding restrictions and the broad biodiversity preservation agenda that international organizations impose on southern member groups. The Quito-based organizations Acción Ecológica, the Institute of Third World Ecological Studies, and Quito Para Todos serve as case studies for this project. I analyze and discuss how each group has worked to cultivate environmental perceptions in Quito and how each has responded to the influence of northern environmental groups. I conclude that Acción Ecológica, the Institute, and Quito Para Todos have been able to more successfully influence environmental perceptions because of their decisions to not accept restrictive funding and to remain autonomous from northern environmental groups.

## **DEMOGRAPHIC DIFFERENCES AS EVIDENCED IN HOUSEHOLD EXPENDITURE - A LOOK AT LOW-INCOME FAMILIES IN THE UNITED STATES (2004-2006)**

**Joerose Tharakan ('08), Economics**

DEMOGRAPHIC DIFFERENCES AS EVIDENCED IN HOUSEHOLD EXPENDITURE - A LOOK AT LOW-INCOME FAMILIES IN THE UNITED STATES (2004-2006) Despite being one of the world's most prosperous countries, the United States of America was home to roughly 7.7 million households living in poverty in 2006. Of this figure, 53% percent of households were headed by a single mother. What is more disturbing is that a significant majority of these households were those of full time workers, unable to meet the basic needs of their families at federally mandated minimum wage rates. Researchers and activists from a multitude of disciplines have repeatedly called for an overhaul of the current method of estimating poverty in the United States, and further proposed a variety of tools for its reevaluation. This study makes use of some of those tools to motivate an analysis of demographic differences in household expenditure on basic necessities as a way of bringing the plight of these families into the spotlight being cast on issues of poverty. Using data from the Panel Study of Income Dynamics 2005, this project looks at the how certain demographic characteristics affect household expenditure and which categories of expenditure put a family at risk of falling (albeit unnoticed) below a more realistic measure of poverty than the one currently in use.

## **DEMOGRAPHIC DIFFERENCES IN HOUSEHOLD EXPENDITURE FOR LOW INCOME FAMILIES: EVIDENCE FROM THE UNITED STATES**

**Joerose Tharakan ('08), Economics**

Despite being one of the world's most prosperous countries, the United States of America was home to roughly 7.7 million households living in poverty in 2006. Of this figure, 53% percent of households were headed by a single mother. What is more disturbing is that a significant majority of these households were those of full time workers, unable to meet the basic needs of their families at federally mandated minimum wage rates. Researchers and activists from a multitude of disciplines have repeatedly called for an overhaul of the current method of estimating poverty in the United States, and further proposed a variety of tools for its reevaluation. This paper makes use of some of those tools to motivate an analysis of demographic differences in household expenditure on basic necessities as a way of bringing the plight of these families into the spotlight being cast on issues of poverty. Using data from the Panel Study of Income Dynamics 2005, this paper looks at the how certain demographic characteristics affect household expenditure and which categories of expenditure put a family at risk of falling (albeit unnoticed) below a more realistic measure of poverty than the one currently in use.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: U.S. POLICY GAPS FOR CHEMICALS REGULATION**

**Amanda Theberge ('08), Megan Browning ('10) and Jason Hayes ('08), Environmental Studies**

In 1976, the US established the Toxic Substances Control Act (TSCA) in order to regulate the use of synthetic chemicals in consumer products as a response to growing health concerns. Although TSCA was thought to be innovative at its inception, in the last 40 years, the act has proven ineffective. The lack of amendments and absence of supporting legislation have resulted in major policy gaps in US chemical regulation. The fact that regulatory action under TSCA has only occurred five times exemplifies the inadequacies of this legislation. Many problems exist with the structure and language of the act. By taking a risk-benefit approach, TSCA not only fails to take a precautionary stance but also places the burden of proof on underfunded government agencies. When TSCA entered into force, all existing synthetic chemicals were grandfathered, and therefore approximately 85% of chemicals, including most so-called High Production Volume chemicals, are not regulated. Furthermore, there is no requirement for health and safety data for new chemicals. As a result of gaps in federal legislation some states have enacted stricter policies to address these failures.

## **IDENTIFICATION OF SURFACE ATTACHMENT FACTORS IN VIBRIO RELATED BACTERIA**

**Brittany Thomas ('10), Biology**

IDENTIFICATION OF SURFACE ATTACHMENT FACTORS IN VIBRIO RELATED BACTERIA *Vibrio cholerae* is the gram-negative aquatic bacillus that is the causative agent of the severe diarrhoeal disease cholera. It has been shown that the secreted GlcNAc binding protein (GbpA) mediates *V. cholerae* attachment to epithelial cells in the small intestine and chitin via interactions with GlcNAc residues. Furthermore, it has also been shown that a GbpA homolog is present in other *Vibrio* species. Our research is focused on determining if a GbpA homolog can be found in bacterial

isolates obtained from Maine aquatic environments. Bacteria will be isolated from crustaceans and other chitin sources in both the commercial and native environment. An available anti-GbpA polyclonal antisera will be used to determine if GbpA is present in isolated strains via western blotting analysis. If GbpA is present in isolates, the allelic exchange system developed for *V. cholerae* will be adapted to obtain clean gene deletions of *gbpA* in select isolates. Deletion strains obtained will then be important for experiments involving in vitro attachment assays to sugars, such as GlcNAc chitin beads, as well as shell substrates. These will indicate that such proteins are involved in the processes of surface attachment.

## **A CIVIC ENGAGEMENT PROJECT TO ADVANCE ENVIRONMENTAL HEALTH IN MAINE: HUMAN TOXICITY OF PHTHALATES AND THEIR PRESENCE IN HOUSEHOLD PRODUCTS**

**Claire Thompson ('08), Emily Griffoul ('10) and Daniel Heinrich ('09), Environmental Studies**

Phthalates are an additive used to soften polyvinylchloride (PVC), and are found in various household products including children's toys and building materials. Phthalates are also used to bind scent in cosmetics and personal care products. Children can be exposed to phthalates by chewing on plastic toys and through the use of personal care products like shampoo and body lotion, which facilitates direct skin contact. Current regulations do not require that phthalates be listed on the ingredients panel of any product, and the FDA considers phthalates "safe as currently used". The European Commission voted to remove phthalates from toys in 1999 and personal care products in 2002, but no similar action has been taken in the U.S. Phthalates have been shown to have estrogenic effects on lab animals, and they may contribute to neurological damage, declining sperm count, hypospadias and undescended testicles (birth defects), testicular cancer, and DNA damage in adult male sperm. Male neonates exposed to vinyl medical products are a high-risk population as phthalates may impede normal reproductive system development. Despite doubts about phthalate safety, phthalates are ubiquitously used and regulation has proved difficult. However, some states such as Maine, Washington, and California, have passed legislation to help regulate phthalate use.

## **'I'M A CARRIE' BECOMES 'I'M A CUTTER': SELLING GIRLS SELF-HARMING BEHAVIOR IN YOUNG ADULT 'ISSUE LIT'**

**Lindsay Tolle ('08), Women, Gender, Sexuality**

In an age when young girls are being sold one-dimensional 'identities' in their clothing, accessories, and media - Diva. Princess. Boy Crazy. - this paper will argue that the genre of 'issue' books in young adult literature are offering the same limited representations of girlhood. In a genre that seems fundamentally 'good,' structural and storyline archetypes are being created that not only limit young female subjectivity, but in fact offers the promise of identity in these self-harming behaviors - the 'diva' becomes the 'bulimic,' the 'princess' becomes the 'drug addict.' This paper will argue that several of these books construct girls as fundamentally hysterical and irrational; cross-generational communities of women are seen as impossibilities; and often, our afflicted female protagonist is forgotten in the name of fetishizing and glamorizing the symptoms and the disease. The paper will end by analyzing two novels in which the genre can succeed: 'Crank' and 'Second Star to the Right.'

## **SEEING THROUGH COLOR-BLINDNESS: NEGOTIATIONS OF MULTIRACIAL RELATIONSHIPS ON 'SIX FEET UNDER,' 'THE L WORD,' AND 'UGLY BETTY'**

**Lindsay Tolle ('08), American Studies**

Building upon Eduardo Bonilla-Silva's sociological theory of 'color-blind racism' and cultural work about representations of race, this project analyzes whether or not the multiracial relationships on three popular serial melodramas - 'Six Feet Under,' 'The L Word,' and 'Ugly Betty' - rely on racial tropes and stereotypes in their constructions, or if any text creates a 'new race cinema:' where the relationship is both equitable and cognizant of racial differences. This project will also analyze the fundamental 'queerness' of new race cinema and argues that the fundamentals of queer theory are essential in both recognizing and creating racial representations that 'undo' the pervasive effects of (white) hegemony.

## **CORRIDORS FOR WOLF REINTRODUCTION TO MAINE**

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

Maine has been identified as holding potential for the reintroduction of wolves. Due to the long ranges of wolves, it is beneficial to map potential corridors of movement. This project analyzes the best routes for movement from suitable habitats in New York to suitable habitats in Maine. It shows the paths likely to be taken by wolves, based on their

affinity for mixed and coniferous forest and their avoidance of areas of high road density. These corridors are identified using least cost path analysis and take into account topography as well as forest and road densities.

## **ADVOCATING AT THE MARGINS: WOMEN'S NGOS IN CHINA**

### **T. U ('08), East Asian Studies**

The development of non-governmental organizations (NGOs) in China has been unprecedented in the past fifteen years. The 1995 Fourth World Conference on Women (FWCW) and parallel NGO Forum in Beijing, China, opened the door for the first time for the establishment of women's NGOs in China. This paper examines the development of Chinese women's NGOs with a particular focus on two organizations in Beijing for marginalized female populations: one focusing on lesbians and the other helping women with HIV/AIDS. I examine the structure and growth of each NGO; however, on a more personal level and perhaps more importantly, I use the interviews I conducted with volunteers and clients of both organizations to analyze the importance of such organizations for lesbians and women living with HIV/AIDS. How have the lives of these women changed as a result of these particular organizations? What is their view regarding the support for lesbians and female HIV patients in China? These two case studies will shed light onto lesbians and women with HIV/AIDS in Beijing and the significance of such NGOs which function as the only support channels available for these two socially taboo communities.

## **DIE FRAUEN IN SCHNITZLERS 'REIGEN': WIDERSTEHEN GEGEN STEREOTYPE GESCHLECHTSROLLEN UND GESELLSCHAFTLICHE HEUCHELEI (THE WOMEN IN SCHNITZLER'S 'REIGEN': RESISTING STEREOTYPICAL GENDER ROLES AND SOCIETAL HYPOCRISY)**

### **Melanie Ungar ('08), German/Russian**

Arthur Schnitzler's play 'Reigen' depicts the development of ten sexual relationships. Each of the play's ten characters, who come from a variety of social backgrounds, participate in two of these affairs, so that the prostitute who appears in the first scene also appears in the last. Criticism of the play often centers around how its circular structure proves the equality of all people—even in a class-conscious society like Schnitzler's, since everyone is connected through sex. However, the play's structure is also noteworthy for having a similar effect on the equality of the sexes, with the female characters often taking on the stereotypically masculine role in a relationship. Despite such forward-thinking and unconventional gender behavior, the men and women of 'Reigen' ultimately show themselves to be equal primarily through their shared banality and immorality. Presentation in German.

## **THE RUSSIAN WORKER THROUGH PHOTOGRAPHS: 1926-1938**

### **Catherine Vieth ('10), German/Russian**

The image of the Russian worker changed from the start of the first Five-Year Plan to the end of the second. In a nine-year span, the worker changed from a member of the masses to an individual hero. Throughout this time period, photography became the art of the state, reflecting political ideology as merged with daily life. While restrictions were placed on photographers, they were still able to select different aspects of life to highlight. These decisions, along with noting what the censors cut out, create a picture of life for the average Russian worker. This study will trace these two distinct perceptions of the worker through images from mass media photography, and note how the photographers chose different ideas to emphasize.

## **THE EFFECTS OF CONTEXTUAL BACKGROUNDS OF NATURAL AND ARTIFACTUAL IMAGES ON ERPS**

### **Linsey Walker ('08), Psychology**

Categorization of animals and vehicles in different contexts was investigated in three experiments using event related potentials (ERPs). The presence of a background, and how congruent a background is in relation to the object, were manipulated in order to determine the effects of context on visual processing. In Experiment 1, adults were presented with images of animals and vehicles in two conditions: situated in a congruent context (e.g. an animal in a field) and in the absence of a context (an animal in a white homogeneous background). In experiment 2, adults were presented with images of animals and vehicles in two conditions: situated a congruent context, and situated in an incongruent context (e.g. an animal in a parking lot). Experiment 3 served as a control, in order to test for effects of the images in the incongruent condition having been photoshopped and therefore looking less natural than the images in the congruent condition. Adults were presented with images of animals in two conditions: situated in a congruent context, and situated in a manipulated congruent context (e.g. an animal photoshopped out of the field in which it was originally

photographed and placed in a background depicting a forest). The findings show that processing of animals and vehicles is facilitated by the presence of a context.

### **PERVASIVENESS OF HEAVY METAL AND ANTIBIOTIC RESISTANCE DUE TO CO-SELECTION IN SPHAGNUM CORE SAMPLES DATING BACK 2000 YEARS**

#### **Leslie Wardwell ('08), Biology**

Efficacious treatment of microbial infections is becoming more difficult due to the increasing spread of antibiotic resistance. The global antibiotic resistance gene reservoir includes not only antibiotic resistance observed in clinical settings, but also in environmental bacteria. The pervasiveness of antibiotic resistance in bacteria indigenous to antibiotic-free environments has led to the co-selection hypothesis in which selection for mercury (Hg) resistance indirectly selects for antibiotic resistance. The mer operon and integrons, which code for Hg resistance and antibiotic resistance respectively, are commonly located on the same plasmids and mobile genetic elements. To investigate the co-selection hypothesis, core samples were extracted from two sphagnum peat bogs in Maine. Carbon dating revealed that these samples dated back approximately 2000 years, and Hg analysis showed detectable concentrations throughout the columns. 58 bacterial isolates were recovered from the sphagnum cores. Bacterial mercury resistance was observed throughout both cores at all depths. In support of the co-selection hypothesis, these Hg-resistant isolates were found to be multiply antibiotic resistant, despite originating in core samples dating back to the pre-antibiotic era. Mercury and antibiotic resistances at the genome level were assessed through amplification of the merA gene of the mer operon and the integrase gene of class I integrons. The mer operon was present in 30 of the isolates, and class I integrons were positively identified in 3 isolates. The passage of class I integrons in an environment void of antibiotics but rich in Hg suggests that resistance is being conferred indirectly by Hg.

### **CYTOTOXICITY OF DIEPOXYBUTANE AND EPICHLOROHYDRIN IN RELATION TO STAGES OF THE CELL CYCLE**

#### **Megan Watts ('08), Biology**

Studies conducted in the Millard Biochemistry Research Laboratory examine the double nature of molecules as carcinogens and anti-tumor agents through the molecular mechanisms of duplex DNA damage by bifunctional alkylating agents. Diepoxybutane (DEB) and epichlorohydrin (ECH) are relatively polar molecules that form covalent DNA interstrand lesions by cross-linking the N7 position of deoxyguanosine residues. Interstrand cross-links interfere with replication fork progression during DNA synthesis and may potentially disrupt transcription if not repaired. A recent experiment indicated that ECH preferentially targets nuclear DNA over mitochondrial DNA, whereas DEB shows similar rates of lesion formation for both loci. We hypothesize that preferential targeting of nDNA involves the inability of ECH to effectively cross the mitochondrial membrane. The objective of my honors research project is to determine if the cytotoxicities of DEB and ECH vary according to the presence of the nuclear envelope. 6C2 chicken erythro-progenitor cells serve as the model cell line; exposure to many bifunctional alkylating agents corresponds to an increased risk of hematopoietic cancers. The cytotoxicity of DEB and ECH will be compared between cells randomly distributed throughout the cell cycle (G0/G1 and S >> G2/M) and cells enriched at G2/M. LD50 plots will be constructed for each bifunctional alkylating agent at concentrations of 0 mM, 2.5 mM, 10 mM, 25 mM, 100 mM, and 250 mM for various incubation times. It is our hope that investigating the role of the cell cycle in relation to DEB and ECH will aid in the creation of highly targeted, effective chemotherapeutic agents.

### **CREATING PIP: CONVEYING THE FEMINIST MOVEMENT TO THE NEXT GENERATION**

#### **Laura Webb ('08), Women, Gender, Sexuality**

By learning from the strengths and weaknesses of mainstream & alternative publications as well as feminist history and theory, it is possible to create a magazine for young women that acts as a vehicle for the expression of the contemporary feminist movement.

### **CATHOLIC MISSIONNARY EFFORTS IN THE ANTILLES AND FRENCH GUYANA UNDER COLONIAL RULE: HISTORY, MOTIVATION, AND METHODS**

#### **Kristin Weigle ('08), French/Italian**

Today Catholicism is the majority religion in the Antilles and French Guyana, but other religions dominated these Caribbean countries until the arrival of Europeans in the seventeenth century. Since then, the evolution of religion in Guadeloupe, Martinique, and French Guyana has been inseparable from the period of colonization and slavery. But

exactly how and why did these three former French colonies, today overseas departments of France, make the transition from indigenous religions to Catholicism under the French colonial regime? To answer this question, I will examine French colonial ideology, Catholic missionary efforts in these countries, and their current influence on French Caribbean society.

## **THE IMPACT OF DEVELOPMENT AND CHANGING LAND-USE PATTERNS ON THE WATER QUALITY OF LONG POND SOUTH BASIN**

### **Kerry Whittaker ('08), Eva Gougian ('08) and Jessica Harold ('08), Environmental Studies**

In the fall of 2007, Colby College analyzed land-use and development patterns in the Long Pond South watershed to determine their impact on lake water quality. Recently, the Maine Department of Environmental Protection has observed a decreasing trend in the water quality of Long Pond. We imported 2003 Digital Orthophoto Quadrangles from the Maine Office of GIS into ArcGIS 9.2 to quantify the various land-use types found in the Long Pond South watershed. Land use patterns in 1966 were also digitized from aerial photographs. Although there has been a decrease in agricultural land (4.3%) and forested land (6.0%), there has been an increase in residential area in the watershed (2.0%). Current residential development is less than in the north basin with only 126 versus 239 shoreline homes. However, with a projected population increase in the surrounding towns of 65% by 2030, the potential for shoreline and watershed development in Long Pond South Basin is high. There are roughly 50 undeveloped lots along the shoreline, as well as large blocks of land in the watershed that could be developed in the future. Although current water quality is good (Total phosphorus concentration = 9.1 ppb), future development in the watershed poses a threat to the water quality of Long Pond South Basin.

## **USING VARIABLE STOMATAL SENSITIVITY TO CO<sub>2</sub> IN CONIFERS TO RECONSTRUCT ANCIENT ATMOSPHERES AND PREDICT FUTURE IMPLICATIONS OF CLIMATE CHANGE**

### **Kerry Whittaker ('08), Environmental Studies**

With accumulating evidence linking a rise in atmospheric carbon dioxide (CO<sub>2</sub>) since the industrial revolution to global climate change (Houghton et al. 1991), the link between CO<sub>2</sub> and Earth's temperature underpins much of paleoclimatology and our predictions of future global warming. This study investigates the linear and non-linear relationships between conifer stomata and atmospheric CO<sub>2</sub> concentration using three modern species of Maine Pinus and three genera of relic conifers. The results of this study show varied response of stomatal frequency (SF) between the relic species Athrotaxis, Callitris, Araucaria, and Agathis on both the species and genus levels in relation to fluctuating levels of CO<sub>2</sub> over the past 200 years. The Athrotaxis species display a non-linear response rate in atmospheres with CO<sub>2</sub> concentrations above 370ppm, where the plants became more reactive to CO<sub>2</sub> rates above this concentration. The modern Maine conifers display limited significant stomata reduction in higher CO<sub>2</sub> environments. Pinus banksiana demonstrates an increase in stomata with rising CO<sub>2</sub>, providing evidence for other ecological selection pressures that may elicit stomatal response. Many previous studies examine the response of angiosperms to decrease stomata with elevated CO<sub>2</sub>. Knowledge of stomatal responses in conifers is less clear. Conifers are more prolific in time and space than angiosperms; therefore, our understanding of stomatal responses in extant fossil analogues and modern species may elucidate the relationship between the fossil stomata record and paleo-atmospheric conditions. Furthering our knowledge of conifer SF sensitivity allows for a broader understanding of future shifts in biotic efficiency in an age where concentrations of atmospheric CO<sub>2</sub> reach levels unprecedented in 60my

## **EMBRYONIC INBREEDING DEPRESSION IN *WITHERINGIA SOLANACEA***

### **Emily Wilson ('08), Biology**

A pollen chase experiment was performed on three Costa Rican populations of *Witheringia solanacea* to examine the breakdown of genetically enforced self incompatibility (SI) and the extent of embryonic inbreeding depression. Self-pollen was applied in the bud, with outcross pollen applied one day later, and outcross pollinations at both intervals as a control. A variety of responses were found among the populations. The Bohs population readily accepted self pollen and experienced very low inbreeding depression. The Monteverde and Las Cruces populations both have lower fruit set with self-pollination precedence indicating that bud pollinations can overcome the self-incompatibility response and that embryonic death due to inbreeding depression causes fruit failure. Self-precedence seeds from the Las Cruces plants are likely to be outcrossed, while self-precedence seeds from Monteverde are likely selfed. Present research is focused on growing and genotyping the progeny to determine the rate of survival of selfed and outcrossed seeds. Genetic evidence has been found to support the prediction that Las Cruces offspring have a high outcrossing rate. Monteverde parents are



not different enough to distinguish parentage at this locus, so there is no evidence for more selfed or outcrossed offspring.

### **THE ANTIBIOTIC CHLORAMPHENICOL INDUCES BACTERIAL SLIME AND BIOFILM FORMATION IN *PSEUDOMONAS PUTIDA***

#### **Victoria Work ('08), Biology**

The production of exopolysaccharide (EPS) by bacteria is well documented as a non-specific protective mechanism against environmental threats. It is produced notably by members of the *Pseudomonas* genus including *Pseudomonas aeruginosa*, the bacterium responsible for many infections in cystic fibrosis patients. The hydrophobic polymers of EPS are highly viscous and virtually impenetrable by many non-volatile toxic compounds, providing an effective barrier between the cell and potentially lethal substances such as antibiotics. Often, slime production is a precursor to the formation of biofilm, as it promotes cell-to-cell contact as well as adherence to biotic and abiotic surfaces. As a structured, heterogeneous community, biofilm not only provides physical protection via its mucoid matrix, but also promotes horizontal gene transfer (HGT) and physiological changes resulting in heightened capabilities of antibiotic resistance. One protective mechanism of microorganisms capable of making EPS may be to induce slime production and biofilm formation upon exposure to environmental stressors, and conditions of subinhibitory antibiotic concentrations may actually promote and sustain the production of slime and biofilms. Here, the production of slime and biofilm by *Pseudomonas putida* was shown to be induced under conditions of subinhibitory chloramphenicol, and an efflux pump inhibitor was shown to decrease the organism's minimum inhibitory concentration of chloramphenicol, indicating that efflux may be important to slime and biofilm induction. This system provides insight into how *Pseudomonads* react to the inhibitory effects of antibiotics, and may have applicability to pathogenic systems including *P. aeruginosa*.

### **ATLAS OF MAINE: MEDIAN HOUSEHOLD INCOME IN MAINE**

#### **Andrew Young ('09), Environmental Studies**

This map is a visual representation of the Median Household Income in the State of Maine by tract, using income data from the 2000 United States Census. Data collected and compiled by the Institute of Urban and Regional Development at the University of California, Berkeley. United States interstate highways data compiled by ESRI and major roads in Maine data provided by Maine Office of GIS.

### **PLASMID-MEDIATED TRANSFERABLE MERCURY AND MULTIPLE ANTIBIOTIC RESISTANCE IN THE FISH PATHOGEN *AEROMONAS SALMONICIDA* SUBSPECIES *SALMONICIDA***

#### **Zachary Zalinger ('09), Lauren Baard ('08), Alexandra Sadanowicz ('08) and none DCE account, Biology**

A novel *Aeromonas salmonicida* subsp *salmonicida* strain (AS03) was isolated during an outbreak of furunculosis in juvenile Atlantic salmon (*Salmo salar*). This strain was initially shown to be multiply antibiotic resistant and resistant to mercuric chloride. Plasmid analysis indicates that the AS03 strain possesses the three cryptic plasmids that are common to this species. Additional data are presented showing strong evidence of a mega-plasmid harbored in this strain. PCR analysis of plasmid DNA identified genes for *floR*, *tetA*, *bla*CMY2-2 and *strA/strB* in two separate sequenced regions. A third region of 15,914 bp shows strong similarity to plasmids characterized from *Salmonella enterica* SL254 plasmid pSN254 and *Klebsiella pneumoniae* plasmid pRMH760. In comparison to a recently reported plasmid from another strain of *A. salmonicida*, the AS03 mer operon region indicates that these two plasmids are not similar and suggests that these respective plasmids have different origins. Phenotypic and genotypic evidence is provided showing that the mer operon (*merRTPABDE*), several antibiotic resistance genes, and the Tn 1696 transposition module were located on a single plasmid in AS03 that could be transferred to *Escherichia coli* DH5a by conjugation when using either chloramphenicol or mercury as the selective agent for transconjugants. Additionally, the presence of low-level mercury or chloramphenicol in the mating media exposed to the donor AS03 during pre-incubation was found to stimulate conjugation significantly as measured by conjugation frequency analyses. These data provide evidence that mercury can stimulate the dissemination of the antibiotic resistance genes in *A. salmonicidasalmonicida* AS03.

## **TULIP BREAK VIRUS**

**Zachary Zalinger ('09) and Jonathan Lefcheck ('09), Biology**

Tulip break virus (TBV) is responsible for the beautiful striations in color observed in many species of tulips (*Tulipa* spp.). We present a brief overview of TBV, including a description of the viral infection, symptoms and treatment, as well as a historical background of 'tulipomania'. A number of pictures are also included.