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Colby Undergraduate Research Symposium

2006

May 3-5, Colby College, Waterville, Maine

Abstracts - Research Symposium

EFFECTS OF VARYING LIGHT CYCLES AND TEMPERATURE ON ACTIVITY LEVELS IN MEDITERRANEAN GECKOS: A LOOK INTO ENDOGENOUS CLOCKS

Kali Abel ('07), Biology

Endogenous clocks modulate most activities in animals. Light, seasons, temperature and age, are all cues that can change or initiate activity patterns. These rhythms, however, are different between species depending on adaptations to the surrounding environment. Sometimes these rhythms are flexible enough to track changes in that environment. Most humans, for example, are active during the day and asleep at night. Nocturnal species, however are asleep during the day and are most active at night. The different species-specific patterns may reflect different levels of predation, temperature, or environmental fluctuation. Sometimes these rhythms are so hard-wired that outside factors do not cause the rhythms of the endogenous clock to change. In this experiment I tested the hypothesis that activity patterns, specifically foraging patterns, in Mediterranean geckos are an example of a hard-wire and inflexible endogenous clock. I used nocturnal Mediterranean geckos which have a circadian rhythm shown most clearly by feeding patterns. To observe activity patterns as they relate to an endogenous clock, I manipulated light and temperature conditions. This allowed me to see if these geckos maintain a feeding schedule even when environmental cues change. Results showed that geckos have a hard-wired endogenous clock and their activities are not affected even in the wake of reversed light and temperature schedules, and heavily manipulated temperature conditions.

COMPENSATION IN THE CONTEXT OF REPARATIONS

Gabrielle Adams ('06), Psychology

Researchers demonstrate through a series of studies that time can reduce the punishment inclinations and moral outrage of people asked to judge a situation in which a corporation takes land away from the native people. When asked to take the perspective of the parties involved in the case, judgments changed significantly. Participants were more likely to ask for harsher punishment when taking the perspective of the native people, and a less severe punishment when taking the perspective of the corporation, thus showing that perspective can mediate the effects of time. Expressions of remorse and compensation also change punishment inclinations, but also result in more guilt to be perceived in the part of the perpetrator. Implications and applications of these studies are discussed.

REMORSE AND THE CIRCUMSTANCES SURROUNDING CRIME

Gabrielle Adams ('06) and Steen Sehnert ('06), Psychology

Can a perpetrator's expression of remorse for committing a moral wrong modify perceivers' assignments of punishment? Is this affected by the mitigating or aggravating circumstances surrounding the crime? This study manipulated expressions of remorse and the mitigating circumstances surrounding a crime to determine how these affect judges' responses. Eighty-six participants read one scenario about a man who stole money from another man. Different scenarios described a situation in which the perpetrator expressed remorse or did not, and one of three levels of surrounding circumstances: mitigating (e.g., a need for money for a daughter's operation motivated the crime), a control condition, and aggravating (e.g., the theft was from a person who needed the money for a daughter's operation). Main effects were found for both remorse and mitigating circumstances on both attributional judgments about the perpetrator and punishment assigned, suggesting that the effects of remorse and mitigation operate independently. Participants also reported the degree to which they were morally outraged by the theft. Moral outrage was reduced both when remorse was expressed and when mitigating circumstances existed for the theft, and was increased by aggravating circumstances. A covariance analysis suggested that moral outrage mediated punishments assigned, so, for instance, when the perpetrator expressed remorse, participants were less likely to be morally outraged, and in turn were less inclined to punish as harshly. These results suggest that the respondents were primarily motivated by a concern for assigning a just deserts punishment to the offending individual. This project was presented at the annual conference of the Society for Personality and Social Psychology in January 2006, Palm Springs, CA.

TIME, REMORSE, COMPENSATION, AND REPARATIONS

Gabrielle Adams ('06), Psychology

When might an expression of remorse or an act of compensation change punishment inclinations for a moral transgression? Does the amount of time since the crime occurred matter? These questions are investigated from a psychological standpoint. In 4 separate studies, participants were asked to give their opinions on a situation in which a company takes land away from the natives and uses it for their own gain. The amount of time, expressions of remorse, and acts of compensation were varied in between-subjects designs in this set of studies. Evidence for a perpetrator's dilemma was found, whereby when a perpetrator expresses remorse and/or compensates, he/she is seen as having admitted more guilt, but is also punished less. Statistically significant main effects were also found for other dependent measures, including punishment inclinations, moral outrage, extent of apology, intention of harm, and innocence. The implications of this study for court cases and reparations situations are discussed. Part of this study will be presented at the annual conference of the Association for Psychological Science in New York, May 2006.

THE IMPACT OF TRAIT-MEDIATED EFFECTS ON PREDATOR-PREY INTERACTIONS IN THE ROCKY INTERTIDAL COMMUNITY

Matthew Aschaffenburg ('06), Biology

Indirect interactions are one of many important factors that influence the structure of the rocky intertidal zone. There has been growing interest in trait-mediated indirect interactions recently, in which predator or competitor presence can influence the interaction between two other species, such as a prey species and its resource, by altering a trait of the prey species. This study examined the effect of the presence of two sympatric predatory crab species, two sympatric non-

predatory species, and two allopatric predatory crab species on the feeding rate of an intertidal snail, *Thais lapillus*. Experimental mesocosms were created in which snails were given access to food, barnacles, with some treatments including the presence of a potential predator. Crabs were kept in perforated boxes, which allowed any chemical cues to be emitted into the tank, but kept the snails out of actual harm. *Thais lapillus* in the presence of sympatric predatory crabs consumed significantly fewer barnacles than snails exposed to non-predatory crabs, allopatric predatory crabs, or snails in the control mesocosm. There was no difference in barnacle consumption between snails treated with sympatric non-predatory crabs, allopatric predatory crab, or no crabs. Snails in the presence of sympatric predatory crabs consumed 39% of the barnacles in their tanks, while snails treated with non-predatory crabs and allopatric predatory crabs consumed 67% and 71% respectively. These results indicate that water-borne chemical cues from sympatric predators inhibit snail feeding and increase the time the snails take refuge within their shells. Water-borne chemical cues from sympatric non-predatory crabs and allopatric predatory crabs have no effect on feeding rate and refuge time.

ANTIMICROBIAL PROPERTIES OF SKIN SECRETIONS FROM THE MINK FROG (*RANA SEPTENTRIONALIS*) ON ENDEMIC BACTERIOLOGICAL ISOLATES

Jonathan Ashcroft ('06), Biology

Over the past few years, a number of peptides exhibiting antimicrobial properties have been isolated from hundreds of species of amphibian. These peptides offer a nonspecific chemical defense system against a broad range of microbial agents that may exist in the amphibian's environment. Two peptides (Brevinin-2 and Temporin-15P6) were isolated from secretions of the Mink frog, *Rana septentrionalis*, and synthesized by the Peptide Synthesis Facility - Pittsburgh, PA. Numerous studies have run antimicrobial assays on laboratory standard isolates but have neglected the microbial species/strains that are endemic to the amphibian's natural habitat. Bacterial isolates collected from the Mink's habitat were plated on standard Brain Heart Infusion solid plating media plates and subjected to a disk diffusion assay using the two synthesized peptides at varying concentrations. Growth inhibition was observed for the majority of the indigenous bacterial isolates and a positive correlation between the zones of inhibition and peptide concentrations was noted. Using 16S ribosomal DNA sequencing techniques, several of the bacterial isolates have been identified, including *Serratia*, *Bacillus*, *Aeromonas*, *Bukhoderia*, and *Delftia*. Some of these genera are known to cause infectious diseases in humans. Hence, the bacterial growth inhibition observed by the *Rana* peptides could have possible applications as antimicrobial chemotherapeutic agents.

BRITISH AND FRENCH INTELLIGENCE ON THE "GERMAN QUESTION" AND THE GROWTH OF PACIFIST MOVEMENTS

Jonathan Ashcroft ('06), History

To ensure that the newly formed Weimar Republic did not rearm, Britain and France used their intelligence organizations to keep Germany under constant observation. As Germany began to circumvent conditions set forth in the Treaty of Versailles, this information, along with relative strength, productive capability, and general mood of Germany's populace was relayed to the governments of Britain and France. During the inter-war period, both French and British politicians interpreted the intelligence to formulate their policies with respect to the "German Question," the aim of which was to keep Germany in a state of weakness while at the same time

preclude armed revolts or a communist revolution in Germany. Public opinion was then carefully shaped and cultivated to support these policies via deliberate manipulation of the media. Numerous questions inevitably arise concerning how well informed both politicians and citizens were regarding Germany's slow but steady shift towards rearming and to what extent pacifist sentiments and protests influenced their response to this growing danger. The French and British intelligence communities obtained and reported, on the whole, fairly accurate information regarding the situation in Germany during the inter-war period yet the personal convictions and beliefs of politicians in both governments allowed their judgments, in regards to foreign policy, to be compromised. They actively, officially and unofficially, attempted to shape the press so as to fit their respective foreign policy towards Germany. Ultimately, political pressure exercised by pacifist groups hindered the ability of France and Britain to prepare adequately for German hostilities, the results of which would ultimately plunge Europe into the Second World War.

LPS AND ENVIRONMENTAL STRESS AS FACTORS THAT AFFECT MALE MATE SELECTION IN MICE

Jonathan Ashcroft ('06), Biology

Female mice have demonstrated a preference for males perceived to be healthier and therefore more fit than males exhibiting signs of illness. The purpose of this study was to examine how inducing males with infection-like symptoms and subjecting some of these males to additional environmental stress influences females mate choice. Females given a choice to associate with unmanipulated control males or with manipulated males spent significantly more time with the control males, thus supporting my hypothesis.

PREDICTION SURFACE MAPPING AND ANALYSIS OF CARBON DIOXIDE FLUX AND SURFACE TEMPERATURE AND COMPARISON WITH ALTERATION ZONES ON ELDFELL VOLCANO CONE, ICELAND

Adam Atkinson-Lewis ('06), Geology

Field measurements of carbon dioxide flux, temperature readings, and alteration mapping conducted on the volcano Eldfell of Heimaey, Iceland indicate continued activity in the cone of Eldfell since its initial and only eruption in 1973. The kriging analysis of this data within the GIS environment reveals a correlation between alteration, temperature, and CO₂ flux that can be used to infer fracture zones in the volcanic system and indicate areas of future activity. Prediction surfaces also specify a CO₂ flux of 1.736 Mg/day.

TO BE A GOOD ITALIAN WOMAN

Stephanie Atwood ('06), Anthropology

Italy, the country with the stereotypical image of the large family at the dinner table, is in the midst of a birthrate decline. The trend over the past decade has been one in which Italian families are having, on average, one child. Seen as a crisis to some, a modern revolution to others, the question remains: what is the cause? As it turns out, many (both Italians and non) are looking directly to Italian women for the answer. Part of this stereotypical Italian image is one of woman as mother, wife, and caregiver. As a mother, she must have a special bond with her child. She must be overly concerned with her child's education and nutrition (among other things), as it is her "duty" to reproduce. This has been seen as a standard for many years in Italy, and has aided

in the idea that reproduction and motherhood are the only jobs for women. But if more Italians are having less children, is the role of women changing? Or has it been changing for years?

DIFFERENTIAL HABITUATION OF MALE *BETTA SPLENDENS* TO QUALITATIVELY DIFFERENT STIMULI

Lauren Baard ('08), Biology

Habituation is a learning mechanism that functions to decrease the amount of energy and attention focused on a certain stimuli. Male Siamese Fighting Fish, *Betta splendens*, are territorial animals that defend their territories using a number of aggressive displays. Male Bettas have previously shown the ability to habituate to the presence of a conspecific male when visually exposed to each other. Due to the costly nature of many of the male Betta's displays, I hypothesized that male Bettas should differentially habituate to qualitatively different stimuli. I presented each of three groups of male *Betta splendens* with a different stimulus, each presenting a different level of interactivity. I predicted that the Bettas would be more likely to habituate to a less interactive stimulus than a more interactive one. No significant habituation was observed in any of the groups and no significant differences in latency to display or length of display between all three groups were observed. However, overall data trends suggest that habituation was indeed occurring and that the three different stimuli elicited different levels of display. The limited amount of visual exposure to the stimuli in this experiment might account for why results were insignificant.

TRANSMISSION OF FROG CALLS THROUGH DIFFERENT HABITATS: A TEST OF THE ENVIRONMENTAL SELECTION HYPOTHESIS

Kelly Bakulski ('07) and Jennifer Mizen ('08), Biology

Acoustic signals are produced by male animals during reproductive activity primarily to facilitate mate attraction, and deterrence of male competitors. They must also be effectively transmitted through the environment to a receiver but are vulnerable to degradation (deterioration in call frequency) and attenuation (loss of call amplitude) as sound waves travel. The environmental selection hypothesis proposes that animals using acoustic communication should produce signals that are optimal for the environment in which they are used. In this study we tested the environmental selection hypothesis in a group of closely related treefrogs in the genus *Scinax* that call in a variety of habitats in the Atlantic Forest of Brazil. We measured degradation and attenuation of prerecorded advertisement calls from 10 different species broadcast through an open habitat, closed forest habitat, and over the surface of water. We also compared how well calls propagated when broadcast on the ground and from 1m off the ground. Call degradation was estimated using cross-correlation analysis, and was least when calls were broadcast in the forest from 1m off the ground. Calls from species that perch degraded most when broadcast on the ground while calls from species that typically call from the ground degraded most when broadcast 1m up. Calls broadcast over water and those broadcast in the forest above the ground experienced the least attenuation, but calls broadcast in the forest at ground level had the most attenuation. Results of this experiment, therefore, lend some support to the environmental selection hypothesis.

IDENTITY: CONSTRUCTING IDENTITY IN A MASS MEDIATED AND POSTMODERN SOCIETY

Noah Balazs ('06), American Studies

There is something missing from our daily interactions with one another that we cannot put our fingers on. We do not interact with people in the way or at the frequency that we used to. At every turn, we are given the option to substitute mediated experiences for authentic experiences. We care less about real life and more about MTV's The Real World. We are caught in a reality where the representation had replaced the represented as the locus of meaning. For each of these reasons, it is harder than ever for American's to construct coherent selves. This thesis explores what I conclude to be the three origins of the postmodern subject's crisis of identity: technology, an image saturated culture, and postmodernity. Each of the three aim to complicate the process of identity construction but only when taken as a whole, as three parts of one force, do they catalyze the postmodern crisis of identity. With examples from video games, art, fast food restaurants, The Gulf War, the internet, reality television shows, iPods, BlackBerrys, the corporate job market, ATMs, bakeries, Tommy Hilfiger Co., and more I argue that it is often the things we take most for granted that contribute most to the complication of identity construction. Finally, I propose a way out of the mediated reality that we so often experience and a way back to authentic selfhood.

THE EFFECT OF AMERICAN FILM ON CHINESE YOUTH CULTURE

Lijah Barasz ('06), East-Asian Studies

I will be presenting on the ways in which American cinema has affected Chinese youth culture. Based on interviews, observational research, and group discussions, I will argue that American cinema has encouraged Chinese college age youth to be more individualistic as the American value of the pursuit of personal happiness conflicts with the traditional Chinese value of responsibility to family. Further, I will discuss how the Chinese focus on standardized testing and academics as well as the availability and affordability of pirated films has increased the affect of American cinema on the college-aged generation.

ARE DEBT-FOR-NATURE SWAPS AN EFFECTIVE CONSERVATION STRATEGY?

Anna Barnwell ('08), Courtney Larson ('08) and Ryan Scott ('07), Environmental Studies

ARE DEBT-FOR-NATURE SWAPS AN EFFECTIVE CONSERVATION STRATEGY? Anna Barnwell, Courtney Larson, Ryan Scott Environmental Studies Program, Colby College, Waterville, ME 04901 Debt-for-nature swaps were conceived as a way to promote conservation efforts in developing countries, which have a high percentage of the world's biodiversity, through debt reduction. The swaps typically involve a partnership between an international NGO or foreign country, the government of the developing country, and a local NGO. Swaps have been implemented in many Latin American countries, several African countries, the Philippines, and Poland. A successful swap usually has support from local populations, puts emphasis on inputs instead of outputs, has some kind of enforcement mechanism, and gives most of the responsibility to the local NGO, not the government. Although in many cases the amount of debt cancelled by the swaps is negligible in comparison to the total foreign debt of the country, swaps have been largely effective in promoting conservation in nations that otherwise would not have the funds to do so. Recently, conservation programs in developing countries have been moving in the direction of poverty alleviation and inclusion of local peoples as a necessary condition for conservation of biodiversity.

LOGICAL LIBERATION: PERSPECTIVES FROM THE EAST AND WEST

Jonathan Bastian ('06), Religious Studies

For years, westerners have sought spiritual refuge in east and south east Asia. Religions like Buddhism have always filled an empty religious niche in countries like the United States. But exactly what makes a religion like Buddhism so appealing to a westerner? Or, what exactly is lacking in western culture that makes eastern religions so appealing? One important aspect that differentiates Buddhism from Christianity is the notion that Nirvana is attained through understanding philosophic principles. In other words, there is no 'leap of faith' required in Buddhism. Therefore through understanding and embracing Buddhist philosophy, which is built upon logic and reason, one may attain liberation. But does such a system exist in a country like the United States? While the initial answer to this question is clearly no, I would like examine this idea and propose that 'logical liberation' does indeed manifest itself in western philosophy, literature, and poetry. Specifically, I would like to consider the extent to which T.S Eliot, Seamus Heaney, and Martin Heidegger can be thought of as proposing paths to liberation built upon a similar set of principles found within Buddhist philosophy.

ECOTOURISM IN DEVELOPING COUNTRIES

Sandy Beauregard ('06), Scott Shahverdian ('06) and Jennifer Venezia ('06), Environmental Studies

Tourism is the world's largest industry due to its impact on GDP, employment, and global customer base. International tourism generates over 400 billion dollars annually. Nature-based tourism accounts for nearly 50% of this revenue. Improperly-managed tourism can be disruptive to local communities and degrade the environment. Ecotourism is a niche within nature-based tourism that is defined as travel to natural areas that conserves the environment and sustains the well-being of local people. This can be an alternative to conventional forms of development by utilizing the native ecological and cultural attractions in a sustainable manner. Successful ecotourism projects incorporate local citizens through employment, decision-making and profit-sharing. Vital aspects of ecotourism are the promotion of social and environmental standards, local government involvement, available funding, and the commitment made to meeting long-term conservation and development goals.

PREDATOR SURVIVAL TACTICS AND USE OF HABITAT COVER IN *RANA CATESBEIANA*

Tara Bergin ('07), Biology

Predator-prey relationships are an important aspect of the natural world, and, because of its relevance to survival and natural selection, is an interesting relationship to study. In amphibian larvae, level of activity and landscape use are often what determines the survival as prey. I studied the anti-predator behavior of the North American bullfrog (*Rana catesbeiana*) tadpoles when presented with dragonfly (*Aeshna*) larvae, a known predator of tadpoles. Tadpoles were acclimated to four different habitats with varying degrees of habitat cover, and were transferred to a new habitat with a degree of cover equal to one of the acclimation tanks. A restrained predator, and thus its chemical cue, was introduced, and the behavior, particularly the use of the habitat cover to hide from the perceived risk of predation was observed. A significantly higher frequency of inactivity was found in tank I than in II and III, and inactivity followed a general

trend of decreasing with increasing habitat cover. Difference in tank cover was not found to have a significant effect on swimming behavior, but did have a significant effect on hiding behavior, which increased with higher availability. Foraging decreased significantly with the addition of a predator, but did not vary significantly with different levels of cover. Hiding behavior and reducing conspicuous behaviors (like foraging) are probably the behaviors that afford the tadpole the most success at eluding a predator in their natural environment.

IF LESTER LEAPT INTO SCHENKERIAN ANALYSIS

Garry Bertholf ('06), Music

In my view, music theory pedagogy, up to this point, has (notwithstanding Roman numerical analyses) dealt with Western tonal music in strict literary contexts; using written words to explain or describe what the music is “doing.” Even the most literarily articulate and eloquent music theorists have not been able to elucidate the horizontal- and vertical dimensions of music simultaneously; these individuals have been incapable of illuminating a melody and its counterpoint at the same time. Music theorist and pedagogue—Heinrich Schenker (1868-1935), recognized the challenges posed by trying to explain (or describe) Western music as such, and, as a result, developed a graphing system that attempted to fully meet these challenges. The efficacy of Schenkerian analysis lies in its ability to graphically delineate the salient features (and/or crux) of Western tonal music, i.e., the horizontal- and vertical dimensions of melody, harmony, and counterpoint. While Schenkerian theory is normally applied to the core Western European repertory, this poster/analytical sketch seeks to examine Lester Young’s improvised solo on “Lester Leaps In”(Polygram 549082, 1939)—a Jazz piece—through a Schenkerian lens.

HUMAN TRAFFICKING, IMMIGRATION, AND PROSTITUTION IN ITALY

Sara Booth ('06), French/Italian

A recent boom in human trafficking in women in Italy has generated a great deal of press and public hysteria. However, there have been few studies that attempt to distinguish the way in which depictions of immigration and human trafficking differ from the experiences of individual women. This study explores the complex relationships between national and international legislation, immigrants, victims of trafficking, the media, law enforcement, and the general public. The study is comprised of interviews with immigrants and locals, and legislative research conducted in the port city of Brindisi, Italy over a five month period. In most cases, media portrayals are either romanticized or exaggerated, creating an overwhelmed and thus fearful public opinion. The women themselves are rarely helpless victims when they make the decision to enter the country, but rather they become victimized by the lack of knowledge available to them upon arrival and, consequently, their fragile clandestine state. The study proves that the matter of prostitution among immigrant women requires both better investigation to create effective legislation and more careful representation in the media.

EFFECTS OF CARBAMOYLATION FROM ANTICANCER SULFONYLHYDRAZINES ON HOMOLOGOUS RECOMBINATION DNA REPAIR

Aaron Bradford ('07), Chemistry

Sulfonylhydrazines are a family of compounds with distinct anticancer activities. The combination of chloroethylating and carbamoylating activities of certain intermediates of several

of the compounds cause synergistic inhibition of cancer at a cellular level, and the same products do not have as much toxicity as comparable chemotherapeutic agents that are currently available. While the chloroethylating species are understood to work at a DNA level by crosslinking DNA and making it harder to replicate, the other actions of the molecules are less understood. Carbamylation targets mainly proteins, and can have any number of effects on many different proteins depending on where it attaches a molecule to them. This project involves researching the effects this carbamylation has on proteins involved in homologous recombination, one of the DNA repair mechanisms that cancer cells overexpress. This research primarily uses strand-exchange reactions, reactions similar to homologous recombination but more easily reproduced and quantified outside of cells.

VIDEO GAMES AND SOCIAL ANXIETY: A HISTORICAL APPROACH TO THE FEAR OF YOUTH

Aaron Bradford ('07), **Science, Technology, and Society**

Video games have and often controversial place in modern technological societies. While it is conceivable that video games have a physical affect on the brain and that has caused concern over whether video games can negatively affect children or teenagers, scientific findings on the subject vary greatly. By no means is this concern and anxiety only focused on video games, similar anxiety can be connected to movies, comic books, television, music and other cultural phenomena that are popular among youth. The anxiety over video games is just an extension of the fears previous generations have assigned to youth. It's when the debate is taken in a historical context, that the fear of youth culture has existed as long as freedom during youth has existed, that fearing the media outlets that youth prefer is an unfounded bias. In the end, trying to prevent youth from accessing violent or sexualized media is as futile as trying to stop them from playing games of 'cops and robbers' or 'cowboys and indians'.

EFFECTS OF FEEDING INTERVAL AND MEAL SIZE ON THE SPECIFIC DYNAMIC ACTION OF THE CUBAN TREE FROG (*OSTEOPILUS SEPTENTRIONALIS*)

Daniel Breen ('06), **Biology**

Specific dynamic action is the elevated metabolic rate experienced by animals after feeding. This metabolic flux is due to an increase in digestive organ activity during digestion and has been found to increase both with meal size and meal frequency in many vertebrates. The Cuban tree frog (*Osteopilus septentrionalis*) is a voracious predator whose diverse diet includes many insects and invertebrates. I predicted that Cuban tree frogs fed larger meals over longer intervals would experience a higher specific dynamic action than individuals fed smaller meals over shorter intervals. I also predicted that changes in oxygen consumption would become smaller as the frogs adjusted to a consistent meal size and between-meals interval. Over a four-week period, one group of Cuban tree frogs was fed one cricket every day, another group was fed three crickets every three days, and another group was fed ad libitum. Oxygen consumption rates were measured weekly and varied widely between treatments. A rigorous discussion of the results will be discussed.

IMAGES AND SPECTRA AT MID-INFRARED WAVELENGTHS OF THE HIGH-MASS STAR-FORMING COMPLEX W3

Ryland Brooks ('07), Physics and Astronomy

The region W3 is a massive star forming complex located in a large and active molecular cloud near the constellation Cassiopeia. In a relatively small area it contains numerous infrared sources, radio sources, various types of masers and both compact and ultra compact HII regions. Over January, I worked under Dr. Joseph Hora at the Harvard Smithsonian Center for Astrophysics, processing images and low resolution spectra of infrared sources in the region that he had taken in 2002 at the IRTF using the MIRS camera. The images and spectra were processed using the IRAF image processing package and the IDL development environment and have helped uncover new and exciting features of the region, such as previously unknown quantities of silicates.

SOCIOCULTURAL DEGENERATION AND STATE PATRONAGE OF THE ARTS: MAPPLETHORPE, CULTURAL CRISIS, AND THE NEA

Greyson Brooks ('06), Anthropology

My research explores how the United States federal government, through organizations and bureaucracies such as the National Endowment for the Arts, acts as a patron, with specific analysis of the past decade and a half since the 'art crisis' of the late 1980s and the social backlash against the art community in the 1990s in the form of fear of perceived degenerative arts as a corruption of American culture and values, including the role the state played in "ameliorating" the situation. I investigate how state patronage affects both the concepts behind and the manifestations of art, as well as who is encouraged, sanctioned, or neglected in the production of art. To accomplish this, I cover how the state defines and redefines morality and culture, and how does it express/allow the expressions of these through art.

"THE KIND OF PERSON I AM:" REASSESSING THE AIMS OF COMMUNITY SERVICE AND ITS IMPACT ON COLLEGE STUDENTS THROUGH IDENTITY DEVELOPMENT

Emily Brostek ('06), Education and Human Development

As college students make the transition from adolescence to young adulthood they reach a crucial point in their identity development, for it is here that individuals begin to decide who they are and what they will devote themselves to. The student who engages in community service projects during these critical years comes to see herself as the 'kind of person' who cares enough to act and who is capable of having an impact. We argue that the kinds of identities that we observed students constructing are extremely important to the development of thoughtful moral agents and civically engaged individuals. In addition, this approach to service projects provides an useful way to conceive of the benefits available from service work. This theory is explicated through an examination of the Colby Cares About Kids mentoring program and its impact on mentors.

WRITING STYLES OF MODERN GRAFFITI

Tucker Burr ('06), Art

Graffiti is an act of breaking the rules. It is thus fitting that graffiti writers often deviate from the established rules of writing and calligraphy. However, many correlations can be drawn between

urban graffiti writing and calligraphy, as urban graffiti utilizes a surprising amount of formal conventions and techniques of calligraphy and even typography. I will observe and compare the approaches taken, the tools and writing techniques employed, and finally the written results from urban graffiti and calligraphy. This study will consider this relationship by comparing the stylized signature tags of modern graffiti from around the world with past and present calligraphy and typography from Western, Chinese, and Arabic cultures.

TERROR MANAGEMENT THEORY AND BELIEF IN AN AFTERLIFE

Gillian Butsch ('06), Melissa Crawford ('06), Lauren Erickson ('06) and Cassie Green ('06), Psychology

The authors tested the hypotheses that, consistent with prior research on Terror Management Theory, participants whose mortality was made salient will show increased worldview defense in their ratings of a persuasive article's author and content. That is, they will rate an article consistent with their beliefs more positively and an article inconsistent with their beliefs more negatively than in a control condition. Additionally, for the first time in documented Terror Management Theory research, the authors pre-screened participants to determine whether or not they believed in some form of life after death. They predicted that those who believe in some form of an afterlife will show diminished effects of mortality salience since, theoretically, their belief in the afterlife is less terrifying and less anxiety-producing as it is perceived as a form of literal immortality. A marginally significant 3-way interaction was found between mortality salience, persuasive communication and a belief in the afterlife. When mortality was made salient, participants who believed in an afterlife considered the article that corresponded with their beliefs more truthful and valid than for those whom mortality was not made salient. The observed trend in the data suggests that with more power, there would have been a significant main effect for mortality salience. Further research would increase the number of participants in each condition and strengthen the mortality salience manipulation.

THE IMPACT OF LAND USE PATTERNS AND WATERSHED CHARACTERISTICS ON CHINA LAKE, KENNEBEC COUNTY, ME

Rachel Carr ('06), Jakob Moe ('06) and Caroline Polgar ('06), Biology

A comprehensive study of the China Lake watershed was conducted by the Colby Environmental Assessment Team during the fall of 2005. China Lake is a eutrophic lake that has water quality problems due to high levels of phosphorus and suffers from frequent algal blooms. GIS was an important tool in the analysis of the watershed land use patterns and physical characteristics. Historic and present land use patterns were determined from aerial photographs taken in 1965 and digital orthophoto quadrangles from 2003. Land use patterns, soil erosion, and slope were analyzed using ArcGIS. Models were then created to determine the erosion potential and the septic suitability within the watershed. Major changes in land use included an increase in residential and commercial land and a decrease in agricultural land. A residential survey was also conducted where buffer strips and roads were assessed and residences were counted and classified. There was very little buffer along the shore of China Lake, which contributed to the excess nutrients. Fire roads were also a major contributor to the phosphorus in the lake. Recommendations for removing phosphorus from the lake and reducing additional nutrients were made based on our analysis.

VIVIDNESS AND THE DILUTION EFFECT

Alan Chang ('06), Christine Maloney ('07) and Adam Rafsky ('06), Psychology

The purpose of the current study was to investigate the interaction, if any, between the dilution effect and vividly described information in a predictive task. To date, there has been no research linking these two phenomenon and their possible interactions, leading to the current research. Specifically, it was hypothesized that vivid diagnostic information would mitigate the dilution effect when it was paired with non-vivid non-diagnostic information. A further aim was to investigate whether vivid non-diagnostic information would enhance the dilution effect when paired with non-vivid diagnostic information. The results showed differences ($P = .05$, $P = .03$) between vivid non-diagnostic information and non-vivid non-diagnostic information, as well as between absent non-diagnostic information and non-vivid non-diagnostic information respectively.

EXPRESSION AND PURIFICATION OF HUMAN DNA POLYMERASE BETA AS A TARGET FOR ANTI-CANCER SULFONYLHYDRAZINES

Aynara Chavez-Munoz ('09) and none DCE account ('09), Chemistry

The carbamoylating activity of Cloretazine, a novel anticancer sulfonylhydrazine prodrug, can modify cysteine thiols of cellular proteins and affect their activity. Another electrophillic species generated by Cloretazine has chloroethylating activity and is thought to generate the primary cytotoxic lesion, DNA alkylation and crosslinking. Among proteins potentially modified by carbamoylation, proteins of DNA metabolism are of particular interest, as carbamoylating and chloroethylating activities have synergistic cytotoxicity. The direct repair protein O-6 alkylguanine DNA-alkyltransferase (AGT) can repair the monoadduct created by Cloretazine, O-6 chloroethylguanine, and this activity is inhibited by carbamoylation. However, cultured neoplastic cells devoid of AGT are still susceptible to amplified cytotoxic effects of chloroethylating and carbamoylating compounds. Carmustine, a clinically useful nitrosourea that also generates chloroethylating and carbamoylating species in situ inhibits both DNA synthesis and end-joining activities. DNA polymerase-beta, specific to excision repair processes, would be required to repair alkylated DNA in the absence of AGT. The experiments proposed herein are designed to ascertain effects of carbamoylation on DNA polymerase-beta activity in vitro. In advance of these efforts, the protein is being over-expressed and purified from *E. coli*.

GENETIC BREEDING SYSTEM OF GRAY FOX, *UROCYON CINEREOARGENTEUS*, IN A PROTECTED POPULATION

David Civitello ('06), Biology

Mammalian carnivores are typically solitary. However, social living is common among the Canidae. The single mating pair, sometimes accompanied by nonbreeding helpers, is thought to be the fundamental unit of canid social structure but groups can be strongly sex-biased in composition. Body size and foraging behavior are thought to contribute to the interspecific variation in social structure. Gray fox, *Urocyon cinereoargenteus*, which range from southern Maine through Central America, are basal among canid species and therefore may represent an important evolutionary step toward more complex social systems. 126 foxes, including 23 pups in eight litters, were genotyped at 7 polymorphic microsatellite loci in order to determine the incidence of multiple paternity and to identify the father. I combined exclusion and likelihood

paternity testing with relatedness analysis of littermates to accurately assess paternity status. I found unambiguous multiple paternity in one litter and likely multiple paternity in another. I estimate that multiple paternity occurs in at least 20% of litters. Females may seek multiple fertilizations in order to increase the genetic variability among offspring. This type of mate choice can interact with body size constraints and foraging behavior to influence evolutionarily stable mating and dispersal strategies of males and other aspects of the social system.

THE ISOLATION AND CHARACTERIZATION OF MULTIPLY ANTIBIOTIC RESISTANT STRAINS OF FISH PATHOGENIC *FLAVOBACTERIUM* SPECIES

Sarah Clark ('08), Justin Guay ('08) and JaeHee Yun ('08), Biology

Since the development of the first antibiotics in the 1940's, there has been widespread overuse in both clinical and agricultural applications. Antibiotic resistance has become a significant problem as a result of subsequent dissemination of antibiotics into the environment, and multiply-resistant strains of bacteria are now a major pathogenic threat. In this study eight separate strains of *Flavobacterium* responsible for recent disease outbreaks in fish hatcheries throughout Maine were collected and analyzed. All eight strains were found to be resistant to high levels of a number of different antibiotics, including those used for aquaculture as well as human chemotherapeutic applications. *Flavobacterium* isolates were also shown phenotypically to transfer antibiotic resistance determinants using a conjugation mating system in which *Flavobacterium* was the donor and *Escherichia coli* DH5-alpha was the recipient. This experiment suggests that it may be possible for *Flavobacterium* strains to transfer their multiple antibiotic resistance determinants to human pathogenic bacterial strains. Importantly, none of the hatcheries from which the *Flavobacterium* isolates were obtained had ever used antibiotics to treat their fish stock. It is possible that there is another selective agent responsible for the development of antibiotic resistance in the absence of antibiotic pressure. Mercury is one possible candidate, as all of the strains tested were resistant to mercuric chloride and it is known that genes encoding antibiotic resistance can be carried on the same mobile genetic elements that encode for mercury resistance. Preliminary data also suggest that the majority of the *Flavobacterium* isolates contain genes for mercuric ion reduction, which would confirm the mercury resistance genotype.

FEASIBILITY OF THE REINTRODUCTION OF WOLVES (*CANIS LUPUS LYCAON*) IN MAINE: A GIS STUDY

Caitlin Cleaver ('06), Liza Mitchell ('08), Caroline Polgar ('06) and Samuel Weeks ('06), Environmental Studies

The eastern timber wolf (*Canis lupus lycaon*) once inhabited Maine, as well as the rest of the eastern United States and southern Canada. As a result of human land use and widespread extermination campaigns, wolf numbers dramatically decreased, and by the early twentieth century, no wolves remained in Maine. As large carnivorous and territorial mammals, wolves require contiguous undeveloped areas with abundant prey. This project is a feasibility study that identifies the areas in Maine that are suitable for the reintroduction of wolves. We used GIS modeling to identify contiguous forested areas over 1,000 km², calculate road and population density, and map the presence or absence of prey throughout the state. These variables were combined in a habitat suitability model to determine the location and amount of suitable wolf habitat in Maine. The northwestern part of the state appears most suitable for wolf reintroduction.

as it relatively undeveloped with low road and population densities. There is also a smaller isolated area in Washington county that might be suitable, but further investigation is required.

NARRATIVE STRUCTURE IN KENZABURO OË'S A PERSONAL MATTER: HIERARCHY OF CHATMAN'S KERNELS AND SATELLITES, SUSPENSE AND SURPRISE

Alexander Connors ('08), East-Asian Studies

This paper attempts to view Ooe Kenzaburo's *A Personal Matter* through Seymour Chatman's narrative structure, kernels and satellites. The novel is thus seen to be constructed with its protagonist's choices as the cruxes of narrative path, and intermediary happenings acting to anticipate and recall such choices. The result of this choice-centric layout is a unified sequence of events and the shadows of those events, which must end in the death of the protagonist's child. This narrative structure is reinforced by the author's debunking of more forgiving narrative architecture, such as that of Jorge Luis Borges's *The Garden of Forking Paths*; such alternatives would otherwise treat the authority of protagonist choice as less finalistic. The novel's ending surprises, however, and offers some difficulty to Chatman's model. If the satellites (the intermediary, often anticipatory, happenings) act to foreshadow the certain end for Kenzaburo's protagonist, the structure breaks down in the book's last pages. The end overwhelming foreshadowed does not come about. However, viewing these past choices and recollections as existent in the protagonist's mind (rather than simply occurring on the passing pages), we can see one such past event to move him, to decide his final action.

SCREENING OF MICROSATELLITES FOR ESTIMATION OF SELFING RATES IN *WITHERINGIA SOLANACEA*

Cadran Cowansage ('08), Biology

The evolutionary transition from outcrossing to self-fertilization in flowering plants is important, yet incompletely understood. The Costa Rican shrub *Witheringia solanacea* provides a valuable opportunity to study this transition because it possesses both self-incompatible (SI) and self-compatible individuals (SC), and thus is in the midst of such a transition. The rate at which SC individuals actually self-fertilize is an important parameter in models predicting the evolution of SC. The assembly of a microsatellite library allowed for primers to be designed and used as a tool to compare the varying number of repeats in parent and progeny plants at specific loci. By collecting data on the genetic differences between offspring and parent plants we hope to estimate the selfing rate of SC individuals and understand the genetic and ecological factors that contribute to self-fertilization.

UP-REGULATION AND AMERICAN NATIONALISM IN COLLEGIATE ATHLETES

Benjamin Crane ('06) and Steen Sehnert ('06), Psychology

When people are instructed to try and feel less emotion, they are successful. The literature on emotion regulation has been enriched with a large body of work conducted by James Gross and his students showing the effects of this down-regulation (Gross, 1997, 1998, 1999, 2002). In order to determine whether subjects can instead feel more emotion when instructed to do so, we presented 18 participants with a clip from the film 'Miracle' and instructed half of the participants to try and feel more emotion while watching the clip. We hypothesize that participants in the up-

regulation condition will report higher levels of emotion, and we expect the most common method of accomplishing this will be the reappraising of their emotional situation while watching the film.

USING HISTORIC CLIMATOLOGICAL DATA TO DETERMINE THE HYDROLOGIC SEASONS IN A SMALL WATERSHED

Katherine Curtis ('06), Geology

We are in the process of creating a comprehensive numerical model of the seasonal hydrogeochemical dynamics of the Belgrade Lakes Watershed in Central Maine. Understanding hydrologic seasons is critical to watershed modeling because changes in the seasons define the dynamics of the inputs and outputs to the system. Since seasons are so pronounced in Maine, annual averages of climatological parameters would inadequately represent the hydrological dynamics of the system. We have evaluated historic climatological data and defined six distinct hydrologic seasons for the Belgrade Lakes Watershed. Daily mean temperature, precipitation, snowfall, and snow depth from a 25-year period (1975-1999) were analyzed. Potential evapotranspiration was calculated using Mather's equation and snow storage and melt was examined. Runoff from the watershed was determined by constructing unit hydrographs for the Messalonskee Stream, the outflow of the Belgrade Lakes Watershed, using gauged streams in the area. Six hydrologic seasons were determined and include: a cold season where the ground is mostly covered in snow (Dec-Feb); a rapid snowmelt season (Mar); a high runoff season (Apr); a transition season (May-Jun); a hot, high potential evapotranspiration season (Jul-Aug); and a second transition season (Sept-Nov). The methods by which these seasons were defined and the application of these seasons to the numerical model of the Belgrade Lakes Watershed will be presented.

THE FAMILY NOVEL IN THE EMERGING NATION-STATE: A COMPARATIVE STUDY OF BA JIN'S JIA AND LEV TOLSTOY'S ANNA KARENINA

Adil D'Souza ('06), East-Asian Studies

Ba Jin's *Jia* and Lev Tolstoy's *Anna Karenina* introduce two striking aspects of the family in literature: the theory of the family; and the nexus between the family and the state. In terms of a theory of the family as an institution, both authors follow, relatively speaking, a similar narrative (based upon family interactions, power relationships, the family in the context of society, retreating from society, etc.) but end up with vastly different sensibilities of a new world. Tolstoy advocates for a return to a glorious Russian past while Ba Jin envisions a new and freshly positioned China. Their differing views of progress and of the family's place in society are undoubtedly shaped by their experience of history. Russia in the late nineteenth century and China in the early twentieth century are the sites for political and social discussions about, among other things, the phenomenon of nationhood. Both societies are moving from a traditional-state where the family plays a central political role to a nation-state where the family plays a peripheral, apolitical, and often problematic role. In other words, the changing orientation between the individual, the family unit, and the state forms the context within which Ba Jin and Tolstoy theorise about the family.

'LONG-NECK': PURGATORY ON THE THAI-BURMA BORDER

Michael Deheeger ('07) and O. Orantes ('07), Government

Huay Pu Keng, a village of Kayan refugees from Burma, is a half-hour drive from the Thai town of Mae Hong Son along the Thai-Burma border. Many Kayan are among the hundreds of thousands of refugees who have fled genocide, systematic rape, slavery and pillaging at the hands of the Burmese army. Kayan women are famous for the brass rings they wear around their necks; these have earned them the name 'long-neck' for the area's ethnotourism industry. This 'tourist appeal' provoked the Thai authorities to allow them a chance for life outside of the refugee camps to which their less 'exotic' compatriots are confined, though a few members of other groups have also established themselves in the village. It has not, however, granted them freedom to travel or hold a job. They find themselves caught between oppression by Burma's military junta, the State Peace and Development Council (SPDC) and a systematic denial of their human rights by the Thai government. The villagers of Huay Pu Keng have been on the same riverside hill for fourteen years. Over the course of last summer, we captured 35 hours of interviews and way too much footage of life in this border purgatory. Villagers recounted their experiences at the hands of the Burmese army and Thai police, the hardships they endured during their exodus from Burma, and the life they remember back home. They also shared their opinions of the thousands of tourists who have made their way against the dusty main road, and what hopes they hold for a future which has only become more uncertain. The editing process has only just begun, but a small sample will be selected in time for the presentation.

CARRY EMPTINESS: THE ECOLOGY AND ZEN BUDDHISM OF GARY SNYDER'S POETRY

Erica Dorpalen ('06), English

Gary Snyder is a self-proclaimed spokesperson of the wilderness, a poet, lecturer, and essayist who grew up in rural areas of the Pacific Northwest, became a scholar of Zen Buddhism in Japan and is recognized as a leading activist of the environmentalist movement. Snyder's poetry interweaves Zen Buddhist philosophy and deep ecology with a shared vision of respect for the natural world, emphasizing the capacity of humankind to live consciously and reverently within nature's infrastructure. This project draws from the themes of his environmentalist's social agenda in highlighting the ways in which the language of his poetry tends to refrain from overt judgment, concentrating on the experience of place and the awareness of the countless and continual processes of the phenomenal world. In the timelessness of mountains and rivers, in the echo of a canyon wren's song, Snyder's poetry evokes the energy dancing eternally around us, bringing us out of our individual egos and closer to a Zen Buddhist understanding of how we fit into the interconnectedness of existence.

BRAND MANAGEMENT AND THE WAL-MART MODEL

Chelsea Downs ('06), Anthropology

N/A

THE ECONOMICS OF HIP HOP CULTURE -- MORE THAN MUSIC

Chelsea Downs ('06), Independent Studies

N/A

EXPLORING OPPORTUNITY IN AMERICA: IMMIGRANT ENTREPRENEURSHIP AND RAGS TO RICHES SUCCESS

Anna Erdheim ('06), American Studies

The United States is, indeed, the land of vast opportunity. Continually and repeatedly, people benefit from the luxuries and prospects provided by the nation's intrinsic freedom. In America people of all economic, social, and ethnic backgrounds utilize and enjoy the various opportunities of an egalitarian society to thrive. I will demonstrate how various people have emerged from disadvantaged circumstances to succeed in the United States, realizing that in America the majority of successful individuals are self-made. The concept of the self-made individual reveals the prospects and chances in America. In the United States, individuals have the rare chance to recreate their economic, professional, and social position. Moreover, America's free enterprise system enables social mobility as a result of an individual's effort, ability, or application. Therefore, I suggest that America's social flexibility allow diligent and resolute individuals to advance socially, economically, culturally, and politically despite their family pedigree. Accordingly, in America a determined and proficient individual can economically and socially evolve. Understandably, America's democratic, fair, and free society attracts immigrants. In growing numbers immigrants are becoming entrepreneurs in the United States because of their newly achieved independence and economic self-determination. Undeniably, fundamental economic opportunities for entrepreneurship are accessible to minorities and immigrants in the United States. The free enterprise system enables individuals to create their own profitable businesses. Indeed, it is possible for individuals from disadvantaged backgrounds to create their own businesses in the United States.

FROM BALL OF FIRE TO CATTLE QUEEN: GENDER AND CLASS IN THE FILMS OF BARBARA STANWYCK

Kara Fagan ('06), American Studies

This paper explores the career of film actress Barbara Stanwyck. Stanwyck was an incredibly versatile actress; her career spanning over 4 decades and covering a diverse range of genres from screwball comedies to film noirs to westerns. By situating Stanwyck's films in their specific historical moments, I examine how as cultural texts they either support and/or subvert the dominant social ideologies of the time. I argue that Stanwyck's characters are generally figures of resistance, individuals who openly and actively challenge the constraints of patriarchy and class oppression.

DO BROWN ANOLES, *ANOLIS SAGREI*, HAVE DEAR ENEMIES?

Michael Fleming ('06), Biology

A territory is an area defended by a group or individual. Territoriality is observed when the benefits gained from exclusive access to limited resources exceed the cost of defense. In the present study, it was hypothesized that the Brown Anole, *Anolis sagrei*, will display dear enemy behavior because it is a possible ancestral trait. This is because dear enemy behavior has been found in an extremely diverse range of taxa. Furthermore, it is energetically less costly to not show aggressive behaviors to neighbors, in which a threat is not perceived. Nine pairs of male Brown Anoles were placed in clear plastic tanks with food and water. They were allowed to interact with one another so that territory could be established. The tanks were isolated so that

the only lizards the test subjects could see were the one it was housed with. I will also set up ten additional tanks and house male Brown Anoles in isolation. These will act as the “strangers.” Following this period, trials were set up in which the neighbors were relocated to a new, unfamiliar tank and aggressive behavior was reported. One neighbor was removed, a stranger was added and behaviors were recorded. This was repeated with the other neighbor. Following the experimental period, it seems that the Brown anole does display the dear enemy effect. Statistical analysis will be performed at a later time.

RISK-SENSATIVE FORAGING IN MAINE WOODLAND RODENTS

Michael Fleming ('06), Biology

When resources become available in a new environment, field rodents (those that forage and live in open fields) must decide whether the benefits of access to the abundant resources outweigh the risk of predation in a new, open environment. They are sensitive to the risks of predation as well as the risks involved in finding scarce food and will have to choose the best strategy. The experiment tests the hypothesis that woodland rodents, such as white-footed mouse, *Peromyscus leucopus*, and the eastern chipmunk, *Tamias striatus*, would exhibit a preference for either abundant food resources or familiar habitat. It was predicted that the risk of predation is less than the risk of finding scarce food in their familiar territory and that rodents would go out into the field to consume abundant food. Traps were set up with different total amounts of food with increasing food density with distance from the wood edge. As a control, traps were set with equal amounts of food, despite increasing distance from the forest. Trapped rodents were identified in order to determine their species and primary foraging location: forest or field. Following the experiment, there was not enough evidence to support the hypothesis but suggested that more trials over a longer periods of time would support the hypothesis.

INVESTIGATING THE MECHANISM OF A NOVEL RIBOSOMAL RNA DEGRADATION PATHWAY

Daniel Fowler ('06), Chemistry

Nonfunctional rRNA decay (NRD) is a novel quality control system that eliminates defective ribosomal RNAs (rRNAs) from yeast cells. Plasmid-encoded rRNAs containing single nucleotide substitutions in the peptidyl transferase center of 25S rRNA or the decoding center of 18S rRNA are co-expressed with endogenous rRNAs in *Saccharomyces cerevisiae*. Quantitative northern blots reveal the steady-state levels of the resulting nonfunctional rRNAs are markedly decreased compared to wild-type rRNAs. Further, the decreased expression is not the result of defects in rRNA transcription or processing, but instead is due to decreased stability of the mature, nonfunctional rRNAs. Mutations in other functionally important rRNA regions are being investigated to determine the magnitude and scope of substrates recognized by NRD. Finally, point mutations in intersubunit bridges (ISBs) are being made to determine differences between “functional” and “structural” mutations as they pertain to NRD.

SPINNERS AND LOSERS: LEWISTON'S IRISH AND FRENCH-CANADIAN IMMIGRANTS 1850-1930

Katie Fuller ('06), History

Irish and French-Canadian immigrants came to Lewiston, Maine to escape turmoil in their

homelands. Their need for work forced them to take dangerous, monotonous jobs building and operating the city's many textile mills. Although early immigrants formed many cultural, religious, and social organizations to alleviate stressful mill life, both the textile companies and the immigrants shared an interdependency on one another that allowed the immigrants and the mills to survive in the industrial era.

THE ADEQUACY OF HEALTH CARE SERVICES FOR THE ELDERLY IN CHINA

Alexandra Funk ('06), Economics

This study examines the adequacy of health care services for the elderly in China, specifically focusing on the influence of location, method of payment, living situation, and financial status. The study finds that rural residents, respondents living alone and respondents unable to meet all of their daily costs have a lower probability of reporting the availability of adequate health care. It also investigates the reasons why elderly respondents do not visit the hospital when it is necessary, concluding that financial and distance constraints are main deterrents. Finally, changes in the reported adequacy of health care over time are taken into consideration, and are found to follow a likely pattern given the history of the health care system in China. This is an important investigation given the historical background of health care in China, the current cost problems facing residents, and, consequently, the policy changes that will need to be implemented by the Chinese government in the near future.

MP AND 6CL-TRYPTOPHAN ADMINISTERED TO ATTENUATE SECONDARY PATHOLOGY IN GUINEA PIG SPINAL CORD INJURY

Katharine Gilroy ('06), Psychology

At present, methylprednisolone (MP) is the only drug treatment administered to humans who suffer acute spinal cord injuries. Following trauma to the spinal cord, there is a window of time in which drug treatment can attenuate secondary damage that would otherwise occur to the spinal cord. MP most likely works by preventing one of the secondary pathological processes, the peroxidation of membranes. Researchers have looked at the prevention of another secondary pathological process, the release of the neurotoxin, quinolinic acid (QUIN) by macrophages. 4-chloro-3-hydroxyanthranilate and 6-chloro-D,L-tryptophan have been shown to block the production of QUIN and attenuate secondary deficits in sensory and motor function and tissue pathology in the guinea pig model of spinal cord injury. Using the guinea pig model, this study was the first to combine the administration of MP and a QUIN blocker for the treatment of spinal cord injury. Preliminary analysis of this small-scale design indicates a greater attenuation of functional deficits for those animals receiving both drug treatments compared with receiving either one of the drugs alone.

THE SKELETON IN MAINE'S CLOSET: CONTROVERSY SURROUNDING THE ALLAGASH WILDERNESS WATERWAY

Lora Golann ('06), Geology

In 1966 the Citizens of Maine voted to protect the state's legendary Allagash River, a motion which created the Allagash Wilderness Waterway. Four years later the Allagash would become the first of 17 rivers in the National Wild and Scenic River System to be state-administered. During the latter half of the 20th century, the Maine Department of Conservation continuously

abandoned its mandate to preserve the maximum wilderness character of the waterway, as it either illegally constructed, or looked the other way while others have constructed a growing number of vehicle access points, riverside parking lots, boat launches, and other such structures in the formerly pristine landscape of the Allagash. The culmination of this irresponsible state-management came in 1998 when the DOC demolished a timber crib dam at Churchill lake that had been grandfathered into the Wild and Scenic River system for its historical significance. In its place came an unsightly concrete steel dam that doubles as a bridge for logging trucks. Not only is this dam illegal under Wild and Scenic Rivers Act, but the state failed to apply for a Clean Water Act permit from the Army Corps of Engineers prior to construction, therefore overlooking permission entirely. This paper examines the ongoing conflict between the State of Maine and the Federal government concerning the Allagash Wilderness Waterway. In some sense the case of the Allagash provides a unique view into the policies surrounding America's dwindling untouched land, but on the other hand it demonstrates an archetypical quarrel between national and state government, and local versus outsider views of land and resource use.

MONITORING SURFACE DISPLACEMENT OF THE COLBY GREEN RETAINING POND DAMS

John Goss ('06), Geology

The Colby Green is a campus expansion project which began in October of 2003. The construction would result in three new buildings, additional parking, and an elliptical 75,000-square-foot southeast of Mayflower hill drive. There were also plans for the construction of three run-off management and sediment ponds below the green. The water is retained in the pond by earthen dams composed of cobbles and soil procured from the excavation of the building site. Because the composition of earthen dams is variable depending upon the soil with which it is composed, the structural integrity of the dams is variable as well. The ability of soil on Mayflower hill to retain water and produce frost action raised concerns about the strength of the dams. In order to monitor the surface displacement of the dams I drove 5'0" stakes 2'0" into the ground and in straight lines across the faces of the dams in the fall of 2005. The stakes were placed approximately 3 meters apart and were driven in vertically. I returned to the stakes after the spring thaw of 2006 and looked for any signs of movement resulting from frost-heave, surface creep, or any other form of mass wasting. Fortunately, there was no recordable sign of movement in the stakes across any of the retaining ponds.

GENDER DIFFERENCES IN THE EFFECTS OF SOCIAL CONTEXT ON EMOTIONAL RESPONDING

Cheryl Hahn ('08), Psychology

This study examines the effects of social cues on emotional responding of men and women. Literature suggests that emotional responses are influenced by the presence and expressiveness of other individuals. We examined whether social cues influence the experience of emotions differently for men and women. Gender differences in self-construal led us to expect that women would be more sensitive to emotional cues from other individuals. We examined this hypothesis by asking men and women to watch amusing and sad film clips. On a split screen, participants watched the films and the faces of inexpressive (neutral condition) and expressive (expressive condition) individuals videotaped while watching the same films. Men reported experiencing similar levels of positive and negative emotions in the expressive and neutral conditions. In

contrast, women reported experiencing more intense positive and negative emotions in response to the films in the neutral condition than in the expressive condition. These results suggest that women are more sensitive to expressiveness of other people when reacting to emotional stimuli. Women may allocate their attention to the social cues at the expense of attending to the actual emotional stimulus, resulting in a dampened emotional responding in the presence of emotionally expressive others.

IS BASEBALL STILL AMERICA'S NATIONAL PASTIME, OR HAS FOOTBALL BECOME THE ALL-AMERICAN SPORT?

Tyler Hales ('06), American Studies

Sports have had an undeniable impact on American society, particularly over the past century when baseball became rooted as the 'National Pastime.' For nearly one hundred years, baseball had run into little competition for the hearts of Americans. However, at the turn of the 21st century baseball became less solidified as America's game as the popularity of football in America continued to rise. The beginning of the 21st century has witnessed unprecedented levels of popularity in both football and baseball, as the sports seem to be battling for the country's attention. In my study, I provide a definition for 'National Pastime,' as I research the histories of each sport and their rise in popularity. In addition, I collect data on where average Americans stand on this issue, as the true answer to this question of what is the national pastime lays in what Americans believe. Although I admit football as become a staple in American society, I argue that baseball does indeed remain America's 'National Pastime' through the use of a variety of supporting examples.

WHY DO MEN HATE ANI DIFRANCO? THE CONNECTION BETWEEN WOMEN ROCK MUSICIANS AND THE IMAGE OF FEMINISM

Katherine Hamm ('06), American Studies

'Angry chick rock,' a phrase familiar to most college students, typically invokes a strong response. It may be a defensive one, or one in agreement with such a labeling of a musical genre. Yet the term is very telling about the manner in which women rock musicians impact the way men view women and feminism. Three artists, Ani DiFranco, Fiona Apple and Alanis Morissette, often suffer from this label. As strong, independent, and talented individuals, these women serve as a threat to the societal control men currently hold. The media also aids in suggesting that these women are a threat to men, by portraying them as aggressive and irrationally angry people. These ideas were tested through a survey of Colby College students, which came back with some surprising results. It seems clear that men often have a negative response to this music because of the potential it has to break down gender barriers in place today.

PRE-CIVIL WAR ACTS OF VIOLENCE AND THEIR INFLUENCE ON THE CIVIL WAR

Benjamin Herbst ('08), History

This project looks at the influence of the Caning of Charles Sumner by Preston Brooks and John Brown's Raid on Harpers Ferry on the outbreak of the Civil War.

MAN-MADE MENOPAUSE

Madeline Horwitz ('06), Science, Technology, and Society

The menopause that we think of as an undeniable biological phenomenon is actually a historical product of the medical and cultural manipulation of the female body. Any woman ended her menstruation cycles, is deemed to have entered into menopause. However, what the cessation of periods means and the impact it has on a woman's life is culturally specific. While menopause has occurred for as long as women have reached menopausal age, the onset of the American Victorian Age changed the cultural construction of menopause and adapted it to the societal norms of the time. This new construction of menopause not only incorporated the public perception of women who no longer menstruate, but gave meaning to the effects menopause has on a woman's body, her life goals, and how she was expected to behave after menopause. In this paper I will expose the scientific, historical, and cultural reasons for the medicalization of menopause, and the ways in which menopause has been viewed by individual women, their health care providers, and society on the whole. I will also explore the myth that women must be treated with hormones to 'cure' them of old age.

A COMPARISON OF FOREST TYPE RESILIENCE TO STRUCTURAL AND COMPOSITIONAL CHANGES FOLLOWING BEECH BARK DISEASE INFESTATION

Sarah Hoskinson ('06), Biology

Pathogens change forest composition and structure by selectively eliminating susceptible species and individuals. Caused by a complex between an exotic scale insect and fungi, beech bark disease has infected mature American beech (*Fagus grandifolia*) trees through most of the species range. Before succumbing to the disease, infected trees generate root sprouts, transforming beech from a dominant canopy species into an abundant subcanopy species. Root sprouting can create dense beech thickets that interfere with the regeneration of other species. Excluding species from the understory has ecological and economic implications. This study compares the resiliency of different forest community types to compositional and structural change from beech thickets. The spatial distribution and density of beech sprouts, as well as the density of other species in the thickets were measured in seven different forests in central Maine. Mixed hardwood forests, specifically an ash-birch-maple forest, tend to be most resilient to change, while a hemlock-pine-oak forest was least resilient. This information may be useful for managers to prioritize forest community types in which to control beech thickets.

SCHENKERIAN ANALYSIS OF THE ALLEGRO MOVEMENT FROM BACH'S FLUTE SONATA IN E MAJOR

Barbara Hough ('06), Music

Johann Sebastian Bach composed pieces in the Baroque period that consisted of melodically fluent lines detailed by ornaments and figurations. For this reason, his music is ideal to be analyzed using the ideas of Austrian theorist Heinrich Schenker. Schenker uses intricate graphs that show the important prolongations of scale degrees as well as harmonies. His combining of melody, counterpoint, harmony, and form help the listener develop a clearer understanding of a given piece of tonal music. Schenker places importance on the fundamental structure (Ursatz) of a piece and Bach's music stresses pitches that fit this structure well. I will analyze the first half of

the Allegro movement of Bach's sonata in the style of Schenker; I will demonstrate, with graphs, the prolongations, middleground transformations, background and foreground levels, and details that I hope will help the listener to appreciate my recording of this movement. The graphs are so intriguing because they use limited symbols to explain concepts that could take many words to illustrate.

AN OBSERVATIONAL STUDY OF CAVITY NEST SITE SELECTION IN BLACK-CAPPED CHICKADEES (*POECILE ATRICAPILLUS*)

Malcolm Itter ('07), Biology

Black-capped chickadees, *Poecile atricapillus*, are weak cavity nesters, constructing their nests in decayed hardwood tree species. In most mixed deciduous forests black-capped chickadees tend to favor small diameter quaking aspens and paper birches over other tree species. Further, cavity nest site selection may be influenced by a variety of other factors including mate and food proximity, predation risk, forest structure and successional stage, and the presence of species with similar habitat requirements, such as downy woodpeckers. In this study I identified 5 black-capped chickadee cavity nests in the Colby College Arboretum during the month of April 2006. The nest tree species was identified at each of the nest sites as well as the nest tree's height, age, and density. Additionally, 10-meter radius plots were set up around each nest tree allowing for measurement of the surrounding forest density and composition and observation of general forest characteristics. The data collected at these 5 nest plots was then compared to data collected from 5 randomly selected 10-meter radius sample plots to determine if there were significant differences in the characteristics of nest sites and random sites within the same forest. Preliminary analysis indicates that black-capped chickadees favor heavily decayed paper birches and black cherries in areas of young forest composition with high snag densities and high densities of early successional species. However, a more rigorous analysis of the data found both at the nest plots and the sample plots is still in the process of being completed.

UPREGULATION OF SADNESS DURING FILMS: A SELF-REPORT ANALYSIS

Margaret Jackson ('06), Daniel Osar ('06) and Kathryn Rooney ('06), Psychology

There has been significant research performed on the down regulation of emotions. It has been found in this research that reappraisal is an effective way of stunting negative emotions without physiological repercussions. Additionally, expressive suppression is effective at reducing facial signs of sadness but is physiologically taxing without actually reducing the negative experience. In this experiment we sought to explore upregulation of sadness using a sad film clip. Replicating the methods of prior studies, we asked participants to either exaggerate their facial expressions, reappraise the film such that it was more personally relevant, or to simply watch the film without instruction. Using 30 participants, we found that the reappraisal group reported experiencing more sadness than participants in either the control or exaggeration conditions. This finding remains consistent with the previous literature on down-regulation of emotion with reappraisal being a significantly more effective way of regulating emotions in comparison to facial suppression or exaggeration.

PIERO DELLA FRANCESCA: GEOMETRY IN PAINTING

Julie Jaenicke ('06), Mathematics

TITLE: Piero della Francesca: Geometry in Painting ABSTRACT: Piero della Francesca had two passions - art and geometry. The Renaissance artist was a master of painting and also of linear perspective. Piero wrote what he understood of the math behind perspective in the book A Treatise on Perspective which influenced many Renaissance artists, including Leonardo da Vinci. Discussed is the integration of geometry and art within the works of Piero. Specific paintings are analyzed including his most famous painting, The Flagellation of Christ.

CHALLENGES IN RADIATIVE TRANSFER MODELING - W3 IRS5

Lent Johnson ('07), Physics and Astronomy

In an effort to interpret spectroscopic and photometric data describing the W3 IRS5 high-mass star formation region, we are conducting a program of radiative transfer modeling using a Monte Carlo modeling technique to produce inferred spectral energy distributions (SEDs) of the region. By fitting our model to the observational data, we hope to constrain the physical parameters of the basic system geometry and cloud mass distribution. This data would add to our overall understanding of high-mass star formation processes. I present here our best fit SED to date in an on-going modeling effort. In the process of our research, we have encountered a number of challenges that limit the full interpretation we might make. These limitations include resolution limits of our observations, uncertainty in the multiplicity of protostars in the region, uncertainty about the evolution of protostar's associated accretion disks and jets, and the capabilities of the modeling code we employ. We conclude that there are many aspects of high-mass star formation that remain unclear, exactly because of difficulties like the ones we are facing.

MODELING SPATIALLY EXPLICIT HUMAN-WILDLIFE CONFLICT: GIS AND MOOSE-VEHICLE COLLISIONS IN MAINE

Alexandra Jospe ('06), Environmental Studies

Wildlife-vehicle collisions are one form of human-wildlife conflict with high risk for human health and high cost for property damage. I created a spatial model using ArcGIS to predict the location of moose-vehicle collisions (MVC) in Maine. I used t-tests and chi-squared tests to identify input variables that were statistically robust predictors of MVCs compared to random control sites. To do this, I created 250m buffers around each MVC and an equal number of random control sites generated along state roads. In each buffer, I calculated the percent of each variable class that was filled with various predictor variables. The most significant variables include land cover type, speed limit of the road, class of the road, distance of the accident site from water bodies, presence or absence of moose derived from the state GAP analysis, slope, and road density. The significant variables were used to develop a logistic regression equation, which was used in the final GIS model. The model was validated using MVC data from years not included to create the model, and was found to significantly predict MVCs. These results have implications for MVC mitigation, as well as for understanding how GIS can be used to incorporate landscape data and incident data to predict human-wildlife conflict.

MODELING SPATIALLY EXPLICIT HUMAN-WILDLIFE CONFLICT: GIS AND MOOSE-VEHICLE COLLISIONS IN MAINE.

Alexandra Jospe ('06), Environmental Studies

One form of human-wildlife conflict that has high costs in terms of both money and human lives

is wildlife-vehicle collisions. I created a model using ArcGIS to predict the location of moose_vehicle collisions (MVC) in Maine. For each MVC, I created a 250m buffer, and an equal number of control sites with buffers. In each buffer, I calculated the percent that was filled with various predictor variables. The variables found to be most significant in predicting MVCs included land cover type, speed limit of the road, class of the road, distance of the accident site from water bodies, presence or absence of moose derived from a Gap analysis, slope of the land, and road density. I used t-tests and chi-squared tests to determine which variables were significantly different from the control sites. The significant variables were entered into a logistic regression, which was used to create the GIS model. The model was validated using data from years not included to create the model, and was found to significantly predict MVCs. This has implications for MVC mitigation, as well as further implications for using landscape data to predict human-wildlife conflict.

OFF THE TRACKS

Emily Judem ('06), American Studies

This project is a historical fiction novella, which centers around a Viennese Jew who emigrates to New York in 1938 and ingratiates herself with the 'uptown' German Jewish social circle. The piece follows and intertwines the life journeys of her, her son, and her granddaughter. The work is largely based on the examination of my own grandmother's life, and on research of the historical moment in which she lived. This work intends to offer a unique story that complicates the linear path mainstream history so often ascribes to American Jews.

ENERGY USE PATTERNS AND POTENTIAL AREAS FOR ENERGY CONSERVATION IN DORM ROOMS AT COLBY COLLEGE

Sarah Kelly ('06), Environmental Studies

This study gathered data on Colby students' energy use patterns in dorm rooms. Methods to collect data include a campus wide energy use survey and a dorm energy experiment. The energy use survey was available online and 582 students filled it out. The dorm energy experiment used energy saving technology and energy conservation education to work to lower energy use in dorms. Analysis of Colby students' energy consumption trends and response to energy saving techniques, along with a comparative study of other colleges' energy saving efforts will be used to formulate recommendations for future energy conservation at Colby.

SOLAR PANEL MODELING ON SUITABLE ROOFS AT COLBY

Sarah Kelly ('06) and Scott Shahverdian ('06), Environmental Studies

This study used ArcGIS to assess photovoltaic panel suitability on roofs at Colby College. Spatial data and information on building dimensions were obtained from the Colby Physical Plant. Information for solar calculations was obtained from online resources. We selected three buildings based on direction the buildings faced, angle of the roofs, and the building's energy use. We developed a triangulated irregular network (TIN) model to calculate aspect, area, and slope from edited points. The three roofs are Goddard-Hodgkins (the Green House), Alford Athletic Center, and Lovejoy. By consulting online solar calculators to assess the potential sun radiation in Waterville and opportune angle for panel placement, panels were placed on the roofs and energy gain in kilowatt hours (kwh) was computed through GIS.

SILENCE IN SILENCE: THE TITULAR SIGNIFICANCE OF SHUSAKO ENDO'S NOVEL

John Kester ('08), East-Asian Studies

In his famous novel on Christianity in seventeenth century Japan, *Silence*, Shusaku Endo continually uses silence as a metaphor with multiple contextual meanings. Endo depicts Edo Japan, an era in which discovered Christians were viciously persecuted, and foreign missionary priests, if found spreading the faith, would be tortured; that is, forced to apostatize; and even killed. In such times of brutal prohibition, priests like Sebastian Rodrigues, through many of whose letters the novel reveals its themes, were forced to keep their faith hidden from Hideyoshi's authority. The continuity of the missionaries faith in the seemingly unsuitable culture of seventeenth century Japan depends on concealing it from the government. The priests and Christian villagers cloak their beliefs from the intimidating Tokugawa bakufu, struggling at the same time with the fact that, amid the atrocities committed against Christian followers, amid their strengthening silence, they receive no word from God, no reaffirmation that their unwavering allegiance matters. God is silent. Finally, the novel's existence in and of itself reminds the reader of history's troubling failure in recounting the role of Christianity in Japan; the reader realizes that had Endo not made it his mission to break the silence, such essential history could remain unknown. This essay will focus on the various, changing metaphoric meanings of silence throughout Endo's novel both through Father Rodrigues' letters before he is captured and through the narrator's words in the rest of the novel.

SYNTHESIS AND STRUCTURE OF NOVEL POLYPHENYLENE MACROCYCLES

Hui Kim ('06), Chemistry

The synthesis of fully-conjugated, all-carbon polymers and oligomers is of interest due to their potential use as new materials in a wide variety of photovoltaic applications. In this project, synthetic approaches to novel macrocycles using the Suzuki-Miyaura cross-coupling reaction will be described. The unusual architectures of these target macrocycles, which contain orthogonal aromatic rings, makes them especially interesting molecules for study. The efficiency of various catalysts in facilitating the reaction will also be examined, and the investigation will be complemented by computational study.

WAS HANDEL A PLAGIARIST?

Hye Kim ('08), Music

Borrowing musical materials from earlier works was a common practice during the Baroque era, and many composers, including his contemporary, Johann Sebastian Bach, had reworked earlier compositions. Yet, it has long been acknowledged as that the extent of Georg Frederic Handel's 'borrowing' was unusual even for the time. In the nineteenth century, a serious issue arose regarding this 'borrowing' in Handel's compositions. Although early critics noted that Handel used music by other composers in his compositions, and Handel's 'borrowings' from his predecessors and his contemporaries caused an uproar since they contradicted the romantic idea of a composer creating beautiful music out of nothing. More recently, music historians have become more lenient towards the use of the practice of 'borrowing,' believing that Handel often transformed and improved his materials thoroughly when he reused them in new contexts. This

paper examines Handel's borrowing in two overlooked pieces: The chorus 'Egypt was glad' from Israel in Egypt and the aria 'O voi dell'Erebo' from La Ressurrezione, based respectively on Kerll's canzona and Keiser's aria 'Costante ognor' from Octavia. It will suggest that Handel's borrowing sometimes amounted to outright plagiarism, perhaps diminishing his stature as a composer.

BARBERING: A BEHAVIORAL EXPRESSION OF DOMINANCE AND AGGRESSION IN CAGED MICE (*MUS MUSCULUS*)

Spencer Koury ('06), Biology

Laboratory mice, *Mus musculus*, are the test subjects of thousands of experiments in fields ranging from behavior to oncology. These mice are exposed to increased stress, cage housing and their role in experiments, resulting in behaviors such as barbering. The ultimate causation of barbering is unknown, and some scientist hypothesize this behavior is an individual behavior aimed at establishing dominance, other scientists believe it to be a mutual or cooperative social behavior, and still others think it is an abnormal repetitive behavior. In this study I will test the hypothesis that barbering is a dominance related behavior. I predict that dominant males, as assessed by an observational dominance test, barbering history, and size, will be more likely to exhibit barbering behavior. To test this, eighteen C-57 male mice and eighteen CD-1 male mice were be paired based on their genetic predisposition for and previous experience with barbering, as well as size. In the eighteen C-57 mice no barbering behavior was observed prior to the experimental pairings, thus no barbering exposure could be determined. Because the study behavior was not displayed, even under increased stress, the experimental procedure could not continue. No conclusion could be drawn as to the ultimate explanation of barbering. The hypothesis was not supported, although neither were the alternate hypotheses, as the study behavior was not truly tested.

EFFICIENT ENERGY ALLOCATION IN FORAGING: A TWO MODEL STUDY IN THE ROLE OF LEARNING

Spencer Koury ('06), Biology

Foraging represents one of the largest expenditures of energy for any individual, a number of studies and theories have been developed to predict and model this behavior. This study uses two model species to examine the presence of learning, or spatial and temporal memory formation, and its subsequent role in foraging behavior. Learning can greatly enhance ability to locate food resources, with a significantly decreased search time. To prove the hypothesis that learning is an evolutionary adaptation designed to increase efficiency in energy allocation, this study set out to quantify, and statistically prove there is a fitness benefit to learning and memory formation by describing it in a natural setting using black capped chickadees (*Parus atricapillus*), and recording expenditure in a simulated setting with laboratory mice (*Mus musculus*). It was predicted that black capped chickadees would return to foraging sites found to be abundant in resources. Predicting latency time to first arrival after placement would decrease, while number of visits at a constant foraging site would increase over time. Secondly, laboratory mice would navigate a maze in shorter time with less energy spent. Both experimental designs, field and lab, were inadequate to collect sufficient data to support either the null or alternative hypothesis. The errors in design, confounding variables are here discussed, as well as new proposed experimental designs addressing these errors.

GENETIC BASIS FOR SELF COMPATIBILITY IN *WITHERINGIA SOLANACEA* (SOLANACEAE)

Spencer Koury ('06), Biology

Most plant species have mechanisms to prevent self-fertilization, yet there exist species like *Witheringia solanacea* which have developed the ability to create viable offspring from the recombination of their own gametes. While self-fertilization is possible, it only occurs in certain individuals and populations, the causation and conditions for this is the continued subject of research for Professor Stone. This study is part of that continued research effort, focusing on determining the genetic basis of self-compatibility. The experimental design utilizes a set of genetic crosses and backcrosses to describe and define this gene. The experiment is currently examining the F1 generation, in which the self-compatible individuals must be identified to proceed with the creation of the F2 generations and any necessary backcrosses. This poster presents the general experimental design as well as the specifics of phenotyping the F1 generation.

SPACE AGE LEARNING: EDUCATION REFORM IN THE USSR AND USA IN THE AGE OF SPUTNIK

Courtney Kubilis ('06), History

This project explores the way in which the Cold War permeated every aspect of life in both the United States and the Soviet Union. Using Cold War publications, this thesis examines public education in both countries in order to illustrate how during this period social programs fell under the realm of national defense. Education became a fundamental weapon in the Cold War. In the post-Sputnik era, both the Americans and the Soviets engaged in comparative educational studies of their adversary in order to improve what they perceived to be weaknesses in their own systems while at the same time working to surpass the other. Ironically, while engaged in an intense competition, both countries looked to the other's educational system and took from it in order to strengthen schools at home. Therefore, in the end, in responding to their adversary's advancements and enacting parallel reforms, they became more similar.

AN EVALUATION OF THE GHANAIAN EDUCATION SYSTEM

Christabel Kwabi ('06), Education and Human Development

The focus of this presentation is to evaluate the quality of education that is offered to Ghanaian school children, ranging from primary school education to high school. The first formal education system was instituted by the British during the era of colonization. Since then, some of these colonial influences have remained and continue to impact education. In addition, other historical factors such as the role of Structural Adjustment Programs and the globalization of Ghana's economy have also influenced education. Thus, the goal of this presentation is to analyze the impact of education on the youth that go through it, the reasons for the trends seen, and what can be done to improve the situation.

PRIORITIZING LAND PURCHASES FOR THE BELGRADE REGIONAL CONSERVATION ALLIANCE

Hilary Langer ('06), Karen Prisby ('07) and Rachel Terry ('07), Environmental Studies

The Belgrade Regional Conservation Alliance is an organization that is dedicated to preserving land and water quality in the Belgrade Lakes region in Maine. The BRCA holds land in such towns as Belgrade, Mount Vernon, New Sharon, Vienna, Rome, Smithfield, and Oakland. The BRCA is looking to expand its acreage in and around these areas to better accommodate the public and to promote the ongoing effort to conserve land as part of the Kennebec Highlands Project. The BRCA is currently considering parcels of 50+ acres in New Sharon, Rome, Belgrade, and Mount Vernon. In order to identify possible suitable parcels, we completed a GIS analysis and produced these layered maps, which highlight areas of land that we think might be desirable to the BRCA. Our analysis encompasses human access, wildlife access, and the locations and sizes of parcels.

THE COST OF CONSERVATION: PAYMENTS FOR ENVIRONMENTAL SERVICES ON THE OSA PENINSULA, COSTA RICA

Hilary Langer ('06), Environmental Studies

Costa Rica has benefited from its international reputation as a leader in innovative environmental policy. Central to modern conservation efforts is Pagos de Servicios Ambientales, or Payments for Environmental Services (PES). The PES program provides direct payments to compensate individuals for services that their forests provide. This study examines the land use changes associated with PES and compares these changes to the effects of other conservation initiatives. It focuses on Costa Rica's biologically rich Osa Peninsula.

MARYLAND AND KENTUCKY: HOW ABRAHAM LINCOLN KEPT EACH LOYAL TO THE UNION

Nicole Lavery ('07), History

The Civil War is commonly thought of as a war over slavery between the slave states of the South and the free states of the North. However, the four border states of Delaware, Kentucky, Maryland, and Missouri, do not easily fit into this category. President Abraham Lincoln needed to persuade and force the loyalty of these states to the Union. I will explicitly concentrate on Lincoln's policies in Kentucky and Maryland and how he was able to keep these states in the Union, centered specifically around the suspension of civil liberties.

HYPATIA: THE ORIGINAL WOMAN MATHEMATICIAN

Jane Leary ('06), Mathematics

ABSTRACT: Hypatia is considered by many to be the original woman mathematician. She was raised in the world of education by her father Theon, the leading scholar of Alexandria, Egypt. She is considered one of the most intelligent mathematicians, scientists and philosophers of all time. Her influence on the world of mathematics and specifically the role of women in this field continues today. Discussed are her mathematics and the studies that have developed as a result of her influence.

STATUS AND GENDER IN KOREA

Jane Lee ('06), Anthropology

Korea only recently became a major player in the global economy and they achieved their

economic success in a relatively short time. One explanation for this quick rise to success is that following Korea's independence from Chinese and Japanese rule, Korea wanted to create a new national identity that would separate them from their past of outside domination. Their struggle to achieve a positive national identity includes encouraging consumption, and it is the aim of my paper to explore the ways in which modernization and consumption has affected gender roles, specifically for women across class lines.

VARIATION IN BEACH PROFILES AND SEDIMENT CHARACTERISTICS AT POPHAM BEACH, PHIPPSBURG, ME

Kathryn Lidington ('06), Geology

Beaches are among the most dynamic of geology environments, influenced by wind, waves, currents, tides, and storms. These process agents continually modify a beach's morphology and sediment characteristics, and they are especially important in the changeover from a summer beach profile to a winter profile. The beach profiles and grain size distributions of four sites at Popham Beach in Phippsburg, ME were monitored through the fall to assess some of these changes. X-ray diffraction work was also conducted to determine the mineral constituents of the beach sediments and their maturity. Analysis of the results concludes that Popham Beach does not follow the usual changeover pattern from summer to winter profile. Discussed are the results, the analysis, and a hypothesis offering explanation for the irregularities found at Popham Beach.

GENETIC VARIATION BETWEEN POPULATIONS OF THE RARE ORCHID ISOTRIA MEDEOLOIDES AND IMPLICATIONS FOR CONSERVATION

Patrick Lizotte ('06), Biology

GENETIC VARIATION BETWEEN POPULATIONS OF THE RARE ORCHID ISOTRIA MEDEOLOIDES AND IMPLICATIONS FOR CONSERVATION *Isotria medeoloides* is a rare orchid that is currently threatened in the United States. Three main populations groups exist: one in the southern Blue Ridge Mountains of western North Carolina, one in northern Virginia, and a third in New England extending from southwestern Maine through central New Hampshire and into Massachusetts. Leaf cuttings were taken from individuals from several populations from these three areas and analyzed for genetic diversity using applied fragment length polymorphism. Individuals within populations and between populations exhibit no genetic diversity. They comprise one large population. The low diversity over a large geographic region may be the result of long-range colonization and population foundation and continued gene flow and is consistent with this orchid's life history characteristics.

THE CULTURE OF OPEN SOURCE: COUNTERING HEGEMONY IN A DIGITAL ECONOMY

Jia-Ling Loo ('06), Anthropology

From its beginnings as the product of an anti-authoritarian, anti-government hacker culture to its right wing rhetoric of free market libertarianism, open source remains a highly contentious technical rationality not only because of its philosophy but also because of its apolitical nature that allows for a variety of cultural framings dependent upon necessity and the particularities of various utopian discourses. While open source proponents in the United States have largely viewed government as a barrier to its development, others in nations such as Peru and Argentina

view the open source movement as beneficial in encouraging good governance and more bureaucratic transparency. Thus, open source development, in its lateral organizational structure and non-profit driven dogma, has opened up the possibilities for new modes of thinking about the dynamics of power that has and is shaping society. Likened to 'gift economies', the open source movement has revealed that the notion of intellectual property as indispensable to technological advancement is but an assumption that is non-universal, culturally specific and historically situated. However, that the movement hosts a diversity of opinion - from those who see open source as championing the 'invisible hand' of free market in its non-exclusive and participatory character, to New Left anti-corporate hippie types who view open source in terms of its potentialities in subverting bureaucratic control - only serves to recast the open source movement as more akin to heterotopic discourse rather than anarchic ideal. Thus, the true value of open source lies not in its revolutionary potential, but in its ability to reveal social organizational practices that help maintain economic and political structures of the network society.

INFLUENCE OF BODY SIZE ON STRESS-INDUCED COLOR CHANGE IN THE GREEN ANOLE (*ANOLIS CAROLINENSIS*)

Meredith Lowmaster ('06), Biology

It is well known that stress causes the Green anole (*Anolis carolinensis*) to change color from green to brown. In addition to the entire body changing color, the postorbital skin may darken to form eyespots. This color change has, in fact, been used as an indicator of stress in several studies. However, very little has been done to investigate what influences the rate of color change. In this study, I investigate the effect of body size. An individually housed Green anole was placed in an arena and allowed to acclimate for 30 minutes. The lizard was then chased with a plastic rattlesnake and its color was observed. Chasing was stopped after 30 minutes, or when the individual became completely brown (though this occurred very rarely). Time to formation of eyespots and time to appearance of brown blotches on the individual's sides were recorded. Data collected so far seems to indicate a correlation between smaller body size and faster color change. However, since this study is still in progress, the significance of this correlation will be determined once more data has been collected and analyzed.

BOTCHAN'S TRANSFORMATION IN ACCORDANCE WITH JUSTICE

James Luckenbill ('08), East-Asian Studies

My essay focuses on the development of the protagonist's concept of justice in Natsume Soseki's novel, Botchan. Early in his life, Botchan is engulfed in arrogant selfishness, even lacking appreciation for the person who loves him the most. By the novel's closing, Botchan acts to benefit only others, ignoring consequences detrimental to his own being. Through a series of developmental stages, I wish to show how Botchan's growing concept of justice changes the way he thinks and acts, and enables him to become a selfless hero fighting for what is right.

VIRTUE EPISTEMOLOGY: RETHINKING THE PRESUPPOSITIONS OF KNOWLEDGE

Gregory Lusk ('06), Philosophy

The traditional project of defining knowledge is the result of an antiquated view of the world.

Virtue epistemology, a new flavor of reliabilism has a lot to offer, but still does not extend far enough in revising the derailed philosophical discipline. My suggestion is to widen the epistemic project to include other important cognitive achievements other than knowledge. This move, if I am correct, will allow into the epistemic project new conceptions of how knowledge functions in our lives, and allows the philosopher to create a more accurate account of what one is searching for in their epistemic pursuits.

REALITY AND LIMINAL SPACE IN MURAKAMI HARUKI'S 'DANCE DANCE DANCE'

Katherine MacBain ('06), East-Asian Studies

Late 20th century Japan as presented in 'Dance Dance Dance' is a paradigm for what Guy Debord dubs 'the spectacle'. This world is a blend of Dunkin' Donuts and expense accounts, a world where what is real and what seems not to be often become tangled and interwoven. All of what once was regarded as reality has been sucked up and incorporated into layers of commodities and advertisements so that the real world can no longer be located but exists as a collection of images. In this fractured space, Debord writes, "where modern conditions of production prevail, all of life presents itself as an immense accumulation of spectacles. Everything that was directly lived has moved away into a representation'. In Dance Dance Dance, Murakami's protagonist floats between a life directly lived and one of representation, finally discovering freedom in his own alienation and using the form of the spectacle to authorize his own individual identity.

FROM PRIVATE PROTEST TO PUBLIC PHILOSOPHY: THE DEMOCRATIC SOCIETY OF PENNSYLVANIA AND THE ELECTION OF 1800

Julia Malkin ('06), History

While there has been an abundance of research conducted on Thomas Jefferson's election in 1800, there has been little study of the significance of the Democratic-Republican Societies, the organizations that espoused republicanism seven years before. Focusing on the Democratic Society of Pennsylvania and the city of Philadelphia, this project investigates the crucial link between the Societies and Jefferson's success. Using the theory of origin of the yellow fever epidemic of 1793, the Whiskey Insurrection, and Jay's Treaty as case studies, the project examines the Societies' ideological battles against the Federalists. Although the Societies essentially lost these battles – they survived for only a year, from 1793 to 1794 – it was the groundbreaking forum they provided for popular debate and how they encouraged the common man to discuss the government that allowed Jefferson to defeat John Adams. Without the foundation they laid, Jefferson and his Party would not have been successful in overthrowing the Federalists, who had dominated the American political scene since the Revolution. This project illustrates this critical role the Societies played in setting the scene for a Republican victory.

THE CONFSSIONAL HERO OF THE 'TEMPLE OF THE GOLDEN PAVILION'

Morgan Manoff ('08), East-Asian Studies

The destruction of the Golden Temple was an act of personal and religious rebellion by a young monk in post World War II Japan. Physically deformed, ostracized and confused, the young Buddhist finds refuge in the beauty of Golden Temple and builds a bond with it much like one

would with a close friend or mentor. Through his delusion, however, the monk soon turns against the Temple, which he accuses of betraying him, and becomes intent on its destruction. This paper analyzes the character of the young monk via the idea of the 'confessional hero', and looks at how his acts of external violence and destruction are in fact misplaced acts of internal self-laceration. Over the course of the novel it becomes clear that in the monks mind he and the Temple cannot peacefully coexist, by looking into the character of the monk this paper will show how his love for the Temple made its very existence insufferable.

DENATURALIZING SEX BINARIES: PROFESSIONAL WOMEN OFFICIALS TRANSGRESSING GENDER BOUNDARIES

Jamie Manzer ('06), Anthropology

This study combines ethnographic research and theoretical perspective to denaturalize specific male and female gender roles. I give particular attention to women basketball referees because they transgress their submissive female role by officiating a sporting event. The transgression is significant because sports are a primary space for men to demonstrate their masculinity. So women assuming an authoritative role within the sporting realm threaten men's ability to demonstrate their masculinity. That is, women transgressing their gender roles threaten to force men to do the same, or not fulfill their gender requirements. In order to best denaturalize, one must first establish what is natural. Gender specific examples of transgressions are complicated as the roles are so naturalized; from birth inclusive and exclusive boundaries limit and define acceptable behavior. I spent the past three years informally recording my experiences as a woman basketball official for the Central Maine area; my experiences transgressing my supposed female duties. Maine is a particularly patriarchal and conservative society. This holds true on IAABO Board 20, Central Maine's premiere officiating board. There are 122 total officials on my board, including only nine women. My study seeks to both describe and analyze several specific officiating experiences that demonstrate the implications of transgressing gender roles or merely the threat of it.

UNVEILING DEMOCRACY: THE RHETORICAL AND RITUALISTIC DISGUISES OF REPRESENTATION

Jamie Manzer ('06), Anthropology

Reality versus perception. Constituents of democracy, the represented, rely on the consistency of our checks and balance system and trust this system to ensure individual rights to voters. It is believed that elected officials under a democratic system represent the majority consensus, thereby representing all voters. In reality, it is impossible for voters to actually gain rights through the election process, but yet, we are socialized to think otherwise. Where we give up our power, abstractions and the implications of top down socialization help to maintain and support our pseudo-democracy. Rituals such as voting and basic legislative procedures numb both politicians and voters alike as it streamlines important democratic procedure and forces very different issues discussed throughout a session to be dealt with similarly. Arguably, consistency under the law should strengthen an argument in support of ritual process, but I contend that processes, certainly as I have witnessed at the state house in Maine, contribute to corrupt political moves and insufficient representation. The presentation will focus on rituals and procedures that essentially disguise the many negative attributes of democracy. Voting procedure and scripted session days, voter registration and politician's reelection campaigns (whether clean

or not) are not actually democracy. However, Americans, including Mainers and the politicians themselves, subscribe to democracy as the best form of government, the fair, just and inspiring process of power distribution. What is democracy really? What are some of the hidden processes or abstractions that have helped to define and perpetuate Maine's version of pseudo democracy?

USING GEOCHEMICAL ALTERATION OF SEAFLOOR BASALTS AS A PROXY FOR FLUID FLUX THROUGH THE OCEAN CRUST

Lindsay Masters ('06), Geology

Circulation of seawater through the mid-ocean ridge-flanks plays a vital role in exchanges between the oceanic lithosphere and the hydrosphere. The seafloor is permeated by fluids which act as conductors between the mantle, oceanic crust, and the ocean itself. Global fluxes and geochemical budgets are affected by the behavior of fluids moving through the basement and marine sediment. The hydrogeology of the seafloor affects the fluids themselves, their composition, flow rate, and the fluid charge/recharge zones. Understanding how the fluids modify their environment and how they develop is necessary for understanding how the fluids affect not only other marine systems, but also how larger global questions are approached.

A JOURNEY THROUGH MEMORY AND SELF IN THE WORKS OF EDWIDGE DANTICAT AND JULIA ALVAREZ

Kara McCabe ('06), English

Understanding the interconnectedness of history and literature is especially important in analyzing the works of Caribbean women writers such as Edwidge Danticat and Julia Alvarez, for whom historical fiction has become an important means of creative expression. Many historians criticize the documentation of Caribbean history as being incomplete, sexist, and Eurocentric; in light of such assertions, Danticat and Alvarez integrate female voices into Haitian and Dominican history, respectively. By depicting the female experience on Hispaniola, both writers demonstrate that history's inherent place in individual memory. Alvarez and Danticat use many recurring symbols and images in imagining the Caribbean, and Caribbean-American, experience. Their works are inspired by the religion and spirituality of Hispaniola, and many symbols are drawn from Roman-Catholic and Haitian Vodoun beliefs: the Madonna, butterflies, bogeymen, flying humans. Other images have geographical-historical value, such as the Massacre River, the Atlantic Ocean, sugarcane fields, and the mountains of Haiti and the Dominican Republic. Such symbols capture how politics have permeated cultural and personal life on the island. Motherhood is a major theme for both Alvarez and Danticat; female communal bonds are important in both countries, and are formed strongly within matriarchal lineages. A woman's relationship with her mother often parallels her relationship with her homeland: both connections are characterized by love, beauty, and freedom, as well as pain, tragedy, and oppression. Additionally, Danticat and Alvarez suggest that immigration, because it often leads to separation from the mother/motherland, presents many obstacles—historical, geographical, familial, and personal.

EGO DEPLETION, CONTROL, AND THEIR EFFECTS ON INTRINSIC MOTIVATION

Chelsea McCann ('07), **Michael Dieffenbach** ('07) and **Kristen Russell** ('06), Psychology

EGO DEPLETION, CONTROL, AND THEIR EFFECTS ON INTRINSIC MOTIVATION This experiment explored the effects of ego depletion and controlling behavior on the intrinsic motivation of 62 college students. We manipulated ego depletion by instructing some participants to suppress all emotion while watching a sad movie clip, and then all participants worked on 3-D block puzzles for a ten minute period. During this time, the experimenters controlled some of the participants through their behavior and verbal instructions. After the experimenter left the room under false pretenses, a four minute free choice was recorded. There was a significant main effect of ego depletion, such that participants who were ego depleted spent less time playing with the blocks in the free choice period. There was also a marginally significant effect of controlling behavior, such that participants who were controlled persisted longer during the free choice period. The interaction between ego depletion and controlling behavior was not significant.

A GENOMIC APPROACH TO DETECTING SALINITY-MEDIATED ZINC TRANSPORTER REGULATION IN THE EURYHALINE GREEN CRAB, *CARCINUS MAENAS*

Amanda McGarry ('07), Biology

Zinc is a vital nutrient for all known life forms, and plays an integral role in the functioning of many proteins and enzymes. Because it is such an important nutrient, eukaryotes have evolved several proteins to regulate the uptake, storage, and expulsion of zinc at the cellular level. While most terrestrial species obtain zinc through their diets, marine organisms are also able to obtain zinc through its uptake from sea water. This uptake is often associated with ion transport via transporter proteins in the posterior gills (Rainbow and Black 2005). Further, in many animals it has been observed that the accumulation of zinc increases as salinity decreases (Amiard-Triquet et al. 1991). This study served to identify and sequence the ZIP 1 gene in the crab, *Carcinus maenas*. The expression of this gene was localized to the posterior gills of the crab. The relationship between salinity and gene regulation is still unclear.

EDUCATIONAL OPPORTUNITIES AND AVERAGE INCOME IN MAINE TOWNS

Sharon McMonagle ('06), Environmental Studies

This map was created as part of the Atlas of Maine project completed by the Introduction to Geographic Information Systems class. This map shows the locations of schools and libraries in Maine. Schools include public and private K-12 schools, public and private colleges, as well as vocational and technical colleges. Libraries include local, school, and college libraries. The mean income for each town was obtained from census data and is represented on the map. The goal of the map is to analyze the relationship between economic characteristics of a school district and the availability of resources associated with educational opportunity. All data was obtained from the Maine Office of GIS

LAKE WATER QUALITY ANALYSIS AND POSSIBLE REMEDIATION TECHNIQUES FOR CHINA LAKE, KENNEBEC COUNTY, MAINE

Sharon McMonagle ('06) and Bethany Peck ('06), Biology

Colby College conducted an assessment of water quality and relevant watershed characteristics of China Lake, Kennebec County, Maine during the summer and fall of 2005. Physical and

chemical parameters were analyzed to determine lake water quality. Algal blooms have been a problem in China Lake, a eutrophic lake, for over 20 years. Mean epicore phosphorus levels were approximately 17 ppb during the fall of 2005, slightly higher than the 15 ppb threshold for algal blooms. With the exception of 1985 and 1990, fall surface phosphorus levels have been above 15 ppb in every year since 1984. During the 2005 samplings, hypolimnetic phosphorus levels were as high as 200 ppb. The mean transparency in the summer and fall of 2005 was 2.90 m and in August and September 2005 there was a sharp decline in dissolved oxygen below 10.0 m. Potentially anoxic waters cover 44.8% of the sediment in China Lake during the summer. Anoxic conditions increase internal nutrient loading, which was calculated to contribute 46% of the total phosphorus load to the lake. Maintenance of camp roads, buffer strips, and septic systems is important to reduce external phosphorus loading. However, to successfully reduce phosphorus levels in-lake remediation techniques, such as alum treatment, should be considered.

THE EFFECTS OF CLIMATE CHANGE ON CORAL REEF ECOSYSTEMS

Sharon McMonagle ('06), Alaina Clark ('08) and Jenna Morrison ('06), Environmental Studies

Coral reefs are diverse and fragile ecosystems with very specific habitat requirements. The health of reef systems in Southeast Asia, Belize, and Australia were examined to assess the effects of climate change. Impacts on coral reef systems include increased global sea surface temperatures, changed patterns and intensity of El Niño Southern Oscillation (ENSO) events, hurricanes and other storms, and higher concentrations of dissolved carbon dioxide, which affects sea acidity. These global changes are resulting in an increased occurrence of bleaching events and reduced growth of new corals. Bleaching also increases the susceptibility of corals to disease, which may result in more mortality than the actual bleaching event. The effects of climate change have been observed and quantified on several coral reefs throughout the world. The 1997-1998 ENSO event caused an estimated 18% damage to Southeast Asian reefs, though some reefs experienced more severe bleaching. In Belize, this same event was compounded by the occurrence of Hurricane Mitch and caused the mortality of 48% of the coral reefs. Relatively few instances of coral bleaching associated with climate change have been observed on the Great Barrier Reef system in Australia. Anthropogenic sources of stress inhibit the resilience of corals to adapt and recover from the effects of climate change. Efforts should be made to reduce the impact of human activities on reef systems, and research and monitoring should be continued to identify and protect coral reefs that are more resilient to climate change.

DEVELOPING A MODEL FOR PEDESTRIAN ROUTE SELECTION AT COLBY

Alexander McPherson ('07), Environmental Studies

Millions of unconscious calculations are made daily by pedestrians walking through the Colby College campus. I used ArcGIS to make a predictive spatial model that chose paths similar to those that are actually used by people on a regular basis. To make a viable model of how most travelers choose their way I considered both the distance required and the type of traveling surface. I used an iterative process to develop a scheme for weighting travel costs which resulted in accurate least-cost paths to be predicted by ArcMap. The accuracy was confirmed when the calculated routes were compared to satellite photography and were found to overlap well-worn "shortcuts" taken between the paved paths throughout campus.

CONCOMITANT ANTIBIOTIC AND MERCURY RESISTANCE AMONG GASTROINTESTINAL MICROFLORA OF FERAL BROOK TROUT, *SALVELINUS FONTINALIS*

Matthew Meredith ('06), Biology

Mercury deposition in Maine has potentially selected for both antibiotic and mercury resistance in resident bacterial populations. Twenty-nine bacterial isolates were isolated from the gastrointestinal (GI) tracts of nine feral brook trout, *Salvelinus fontinalis*, caught in Lake Kennebec, Maine. 16S rDNA sequencing identified the isolates in nine distinct genera: one gram-positive genus and eight gram-negative genera. The isolates demonstrated multiple maximal antibiotic resistances, particularly against the penicillin and cephem families. Broad-spectrum mercury resistance to ionic (HgCl₂) and organic mercury (phenyl mercuric acetate) was characteristic to all 29 isolates. Triplicate plate counts of total culturable bacteria from the GI tracts of six *S. fontinalis* exhibited no statistical difference between growth on 0 and 25 μM HgCl₂ by Student's t test. A 1,200 bp fragment of the mercury resistance gene *merA* was PCR amplified in 12 isolates, and a 288 bp *merA* fragment was sequenced in 5 of those 12 isolates. An established positive correlation between antibiotic and mercury resistance is most likely applicable to the Lake Kennebec system. Phenotypic evidence of simultaneous antibiotic and mercury resistance and genotypic confirmation of the presence of *merA* suggests selection for *merA* may have indirectly selected for concomitant antibiotic resistance among the Maine bacterial isolates.

EVALUATION OF IMMUNE CELL INFILTRATION AFTER SPINAL CORD INJURY IN THE GUINEA PIG

Marissa Meyer ('07), Raven Adams ('08), Katherine Lillehei ('07), Monica Phillips ('07) and Danielle Preiss ('07), Psychology

Several candidate mechanisms have been identified that contribute to secondary pathology after spinal cord injury including oxidative mechanisms and toxic molecules such as quinolinic acid (QUIN). QUIN is produced by activated macrophages in several species (human, guinea pig, and gerbil) and accumulates after traumatic CNS injury and in cases of neuroinflammation. The peak of this accumulation in guinea pig spinal cord injury occurs at 12 days post injury. This mechanism is therapeutically available and several studies have shown that blocking QUIN reduces both functional and structural deficits. Blockade of QUIN has been initiated as late as 5 hours post injury without decrease in therapeutic effectiveness, but little is known about the therapeutic window or the length of time that therapy may be required due to presence of macrophages in the tissue. The present study was designed to detail the composition of the inflammatory response at the injury site following spinal cord injury in the guinea pig, and to determine the timecourse of the presence of microglia, macrophages, and neutrophils in the tissue after injury. Preliminary studies have been conducted testing several antibodies in pursuit of this goal. Antibodies to two cell surface markers, cd11b and cd45 can be used to differentiate between macrophages and microglia. Ly6G antibodies can be used to identify neutrophils. These antibodies have been tested for binding in guinea pig spleen and blood and will be used to quantify the cells in injured spinal cord. The authors gratefully acknowledge the INBRE program for funding of this project.

MEDIA COVERAGE AND DISASTER RELIEF

Jessica Minty ('06), Economics

This paper analyzes the effect of media coverage on donations made to relief agencies. Specifically, this empirical analysis examines the effect of the daily volume of domestic newspaper and television coverage devoted to the December 26, 2004 tsunami on daily web donations to U.S. relief agencies. Media coverage, as measured by daily newspaper word and picture counts, and by daily total television minutes, positively and significantly affects the amount of donations relief agencies receive. In addition, media coverage is found to have a significantly different effect on donations for some agencies.

SECRECY, SEXUALITY AND THE COVERT FEMININE POWER IN 'MASKS'

Liza Mitchell ('08), East-Asian Studies

A presentation that explores the central issue of feminine power in the modern Japanese novel, *Masks*, written by Fumiko Enchi. The focus is on Mieko Togano's covert power that drives the action of the novel, the sources of this power—primarily secrecy and sexuality—and the motive behind it—revenge.

FROM HATCHERIES TO AQUACULTURE: A TECHNICAL SOLUTION TO A TRAGEDY IN THE UNITED STATES?

Jakob Moe ('06), Science, Technology, and Society

The emergence of a technical solution to solve the devastation of the world's fisheries serves as a direct contrast to Garret Hardin's assertion in his essay 'A Tragedy of the Commons.' Hardin had asserted that the only solution to a tragedy of the commons should be that of social change, and not in the form of a technical solution. However, in the mid to late nineteenth century, aquaculture emerged through the federal government and subsequently in the form of hatcheries and laboratory facilities across the country. Firmly, the United States had invested in a technical solution, refraining from any social change, as Hardin would assert. Understanding the history of aquaculture, it is possible to judge how the technical promise of aquaculture merited its acceptance in U.S. science and its subsequent value in society. Specifically, case studies of the development of pond aquaculture, and the absence of marine aquaculture will be addressed to judge if aquaculture has historically solved the tragedy of the commons. These histories facilitate understanding of the historical value of aquaculture within the United States. Additionally, investigating aquaculture's current contribution to overall demand in the U.S., it becomes possible to answer if aquaculture is successful as a technical solution to the commons.

POTENTIAL EFFECTS OF DEEP-OCEAN CARBON DIOXIDE SEQUESTRATION ON FORAMINIFERA

Elizabeth Mollo-Christensen ('06), Geology

The current concentration of CO₂ in the atmospheric is approximately 0.037%, and the level is rising every year due to anthropogenic and natural causes. Deep-ocean sequestration is a process proposed to reduce the amount of CO₂ released into the atmosphere and slow down global warming. This study uses *Allogromia laticollaris*, a species of tectinous foraminifera, to examine the potential problems of deep-ocean sequestration on benthic communities. Individual groups of

A. laticollaris were exposed to elevated levels of CO₂, varying from 1.5% to 9.0%, in a controlled chamber. Replicate control cultures were exposed to atmospheric CO₂ at the same temperature and humidity as the chamber. After 10-14 days of exposure, the change in pH of the cultures was recorded and the *A. laticollaris* were examined under a microscope to observe pseudopods as an indicator of survival. The adenosine triphosphate (ATP) was extracted from each individual *A. laticollaris* and analyzed using a luminometer. Two-sample t-tests were run on the data to check for significant differences in the amount of ATP present in the cells exposed to the different treatments. The general trends show that the foraminifera survived better at 1.5% CO₂ than at atmospheric levels. A decline in ATP production appeared between 3.0% and 6.0% CO₂. At 9.0% CO₂, the *A. laticollaris* did not do as well as the replicates exposed to atmospheric conditions, but still rebounded to atmospheric levels of ATP after being left at atmospheric CO₂ for 24 hours, implying they were in some type of dormant state. This data has several implications concerning deep-ocean sequestration, and shows that the concentration and duration of CO₂ exposure seem to be the most important factors in determining the survival of tectinous foraminifer communities.

POPULATION ESTIMATE OF DEER MICE, *PEROMYSCUS MANICULATUS*, IN THE FOREST TYPES OF PERKINS ARBORETUM

**Jenny Mooney ('06), Andrew Johnson ('06), Ethan Payne ('06) and Virginia Raho ('07),
Biology**

Abstract The deer mouse, *Peromyscus maniculatus* has a wide distribution across varied habitats, because of its ability to adapt to different environmental variables. By examining the population density of these mice across several forest habitats, a better understanding of their habitat preference can be obtained, and population densities can be determined to estimate total population sizes. Three trapping sites were established in the Colby Perkins Arboretum within distinct forest types: transitional, climax deciduous, and climax conifer. Trapping was performed over a seven night period, and captured mice were tagged with passive integrated transponders (P.I.T. tags). Using the Schnabel mark-recapture population estimate technique, a population estimate for each of the three sites was calculated. The coniferous and the transitional forest had similar densities of deer mice, and the climax deciduous had a substantially lower number of captured mice. However, the sample size in the climax deciduous forest was too small to calculate a population estimate. The population differences found between forest types are associated with differences in specific environmental variables, such as depth and coverage of leaf litter, more than the overarching forest type. The number and species of non-*P. maniculatus* captures showed some trends, which further distinguished the habitat types. By increasing the number of trapping days, and increasing the area of each of the trapping sites, a more precise estimate of population variation could be performed.

THE LITTLE WHITE LIE THAT COULD SAVE THE WORLD

Jessica Moore ('07), Anthropology

Why must anthropological writing be limited to that which is quantitative, qualitative, verifiable, real? When our discipline has come to be so enamored with the postmodern construct, why can we not take license to do some constructing of our own? Is it possible that a space can be created wherein an anthropologist takes on the role of fictional creator, basing one's characters on observed realities, reforming them to tell the truth that the truth cannot? Can fiction be truth?

Can we borrow a voice? There is a necessity for the recognition of a new method of authorship that takes license to lie—just a little bit. Using the intersection of literature and life, character and reality, the embellishing anthropologist may be the most effective tool we have to bring forth readable knowledge to an audience that extends beyond ourselves. A little white lie may be our passport to the truth.

ENVIRONMENTAL AWARENESS OF WATERVILLE JUNIOR HIGH STUDENTS

Jenna Morrison ('06), Environmental Studies

Waterville Junior High students participated in an environmental awareness survey designed to assess the relationships among outdoor experience, environmental knowledge, and environmental behavior and the influences of gender and grade level. Environmental awareness indicates a fundamental understanding of the natural world which is essential for future sustainable development and resource use. At Waterville Junior High there are few opportunities for students to learn about environmental topics in the classroom. It is essential to gauge the foundation and acquisition of environmental knowledge to determine the ability of students to address local and global environmental problems. A total of 125 sixth graders and 136 eighth graders were surveyed and indicated that their most common sources of environmental information are school, television, and outdoor activities. While only 32% of adult Americans can pass a similar environmental knowledge test, 22% of sixth graders and 46% of eighth graders answered more than half the environmental knowledge questions correctly. A weak but positive correlation was identified between outdoor experience and pro-environmental behavior and between environmental knowledge and pro-environmental behavior. Mean scores on environmental knowledge questions were significantly higher for boys and mean scores on questions indicating pro-environmental behavior and concern were significantly higher for girls. The results of the survey are encouraging in terms of acquisition of environmental knowledge by junior high students. However, gender discrepancies in knowledge and concern should be considered when designing environmental curricula and teaching strategies.

USE OF DEVOTIONAL ART IN THE PUBLIC AND PRIVATE SETTING IN RENAISSANCE ITALY

Caroline O'Connor ('06), Art

Recently, the study of the function of art has become an increasingly large field of art history research. The purpose of a work of art in the location it was made for is one of the major questions art historians are now asked. It is widely written that the use of devotional art was to make the written word physical, a way of making the bible and preaching of the church accessible to the masses. However, the art produced for public and private devotion were very different in their uses and design. Using two works of art found in the Colby Art Museum, this study examines these differences and how they apply to the uses of devotional art during the Renaissance period.

GLIMPSES OF HOPE, LAUGHTER, AND SADNESS: STORIES FROM BURMESE WOMEN REFUGEES IN THAILAND

O. Orantes ('07), History

Breadwinners, educators, wives and mothers, the Burmese refugee women in the village of Huay

Pu Keng, Thailand are examples of dedication and relentless hope for a future that may or may not bring closure to their tumultuous lives. Last summer, some of them and their families allowed me to spend time with them and ask: What does it mean to be a woman in the context of your village? Their answers were surprising and touching and often challenged my preconceived notions of womanhood and identity. The women communicated their fears and hopes collectively during three women-only meetings and individually during home visits and casual interactions. Through laughter, tears, and touch, we were able to transcend a language barrier that at its worst appeared insurmountable and at its best humorously bearable. Their patience and attitudes towards our communication problem were testimony to a much larger way of looking at life that was both influenced and had influenced each woman's life-story. By the end of my time in Huay Pu Keng, it was clear to me that the answers to my original question were complicated by a much larger question: What is it like to be you? Through our conversations, I realized that these women view themselves as women in the context of their many identities (e.g. race, religion, familial connections, etc.) and fairly never in spite of them. Thus, the few times when they do separate woman-identity from other identities become monumental moments in their lives which they see as the exceptions that prove the rule. In this presentation I explore the different roles that women play in the village and the way these play on their varied identities. Thus, I suggest that these different roles allow them to constantly negotiate their position and the identity 'woman.'

EXPLORATION OF COMPOSITION IN MIXED MEDIA: FABRIC, STEEL, AND MAGNETS

Courtney Page ('06), Art

Fabric, steel, and magnets are materials with distinct functional purposes quite different from one another. During the course of the 2005-06 school year I brought them together to explore sculptural form and composition, each material becoming an integral part of the object. Forms rely on steel for support and line, fabric for mass and texture; the magnets add elements of motion, suspension, and visual interest. Experiments in composition resulted in forms of various dimension, color, weight, texture, balance, and stability, progressing from early solutions to more complex renderings and uses of the given materials.

MERCURY RESISTANCE IN A MULTI-DRUG RESISTANT STRAIN OF THE FISH PATHOGEN, *AEROMONAS SALMONICIDA*

Erin Parry ('06) and Kimberly Mukerjee ('06), Biology

Aeromonas salmonicida NB, a fish pathogen that caused an outbreak of furunculosis, was isolated from Atlantic salmon, *Salmo salar*, during a routine hatchery inspection in 2003. This strain was found to be resistant to 1000 mM HgCl₂ and >32 mM phenylmercuric acetate as well as multiple antibiotics. Mercury (Hg) and antibiotic resistance genes are often located on the same mobile genetic elements, so the genetic determinants of both resistances and the possibility of horizontal gene transfer were examined. Specific PCR primers were used to amplify and sequence distinctive regions of the mer operon. *A. salmonicida* NB was found to have a pDU1358-like broad-spectrum mer operon, containing merB as well as merA, merD, merP, merR and merT, most similar to that of a *Klebsiella pneumoniae* plasmid pRMH760. To our knowledge, the mer operon has never before been documented in *Aeromonas* spp. PCR and gene sequencing were used to identify class I integron associated antibiotic resistance determinants

and a tetracycline resistance gene typical of many tetracycline-resistant *Aeromonas* spp. The transposase and resolvase genes of Tn1696 were also identified through PCR and sequencing with Tn21 specific PCR primers. We provide phenotypic and genotypic evidence that the mer operon, the aforementioned antibiotic resistances, and the Tn1696 transposition module are located on a plasmid or conjugative transposon that can be transferred to *E. coli* DH5a through conjugation in the presence of low level Hg and absence of any antibiotic selective pressure. This research demonstrates that mercury indirectly selects for the dissemination of the antibiotic resistance genes of *A. salmonicida* NB.

THE EFFECTS OF CLIMATE CHANGE ON POLAR BEARS

Bethany Peck ('06), Alexandra Jospe ('06) and Emily Sinnott ('08), Environmental Studies

Anthropogenic emissions of greenhouse gases have caused global warming. Global temperatures are predicted to rise the most in polar areas, making the arctic one of the most vulnerable areas to climate change. Sea ice is melting earlier and forming later every year, a process that has grave consequences for arctic wildlife. Polar bears are dependent upon a stable ice system for foraging, resting, and reproduction. The melting ice leaves the bears with considerable less time for hunting. Polar bears do almost all of their winter hunting on the Arctic ice surface. They retreat to dry land, often fasting for months at a time, when the ice breaks up. The warming of the arctic and consequently the thinning of the sea ice have reduced the number of weeks mother polar bears have to feed and build the fat that enables them to sustain themselves and feed their young. When female polar bears are food stressed, they will not reproduce. Climate change can also affect polar bears through disease and anthropogenic affects. The synergistic nature of the effects of climate change on polar bears could cause their extinction in the near future.

'A SCHENKERIAN ANALYSIS OF BEETHOVEN'S PIANO SONATA NO. 8, 2ND MOVEMENT'

Stephen Planas ('06), Music

Using Heinrich Schenker's theories of tonal music, I will analyze the second movement of Beethoven's Piano Concerto No. 8. From Mozart and Haydn to Beethoven and Chopin, Schenker's concepts have often been used to shed light on some of classical music's greatest masterpieces. His techniques have been the source of controversy over time, for some disagree with his ideas about the underlying background structure of a piece. Conversely, many believe that Schenkerian analysis is the most elegant means of studying tonal compositions. In my analysis of Beethoven's work, I hope to discover the most fundamental structure of the piece, the most reduced form of the composition. From this point, I will use Schenker's techniques of prolongation and transformation to determine how each note serves that fundamental structure. In the end, Schenkerian theory will hopefully give me a greater understanding of Beethoven's piano masterpiece.

ECONOMETRICALLY MODELLING ALUMNI GIVING TO COLBY AND OTHER NESAC SCHOOLS

Michael Poplaski ('07), Economics

\$ 1,600,073,000. Over one and a half billion dollars will catch the attention of almost anyone dealing with money. But this number is not out of some government budget or from a big

corporation, but rather the amount alumni from 10 NESCAC institutions contributed in donations to their alma maters during the period of 1993-2005. While there has been an academic focus on the individual alumni and their decision making process of whether to donate at all and if so, how much they will give, little work has been done to model aggregate donations received by the institution from their alumni. Since many institutions base their budget projects partly on expected donations from their alumni, having a model that will help them predict that amount is a worthwhile and important tool for them to have.

AN DIE MUSIK

B. Pruitt ('06), Music

A Schenkerian analysis of Franz Schubert's song 'An die Musik'.

A SPATIAL ANALYSIS OF IMPERVIOUS SURFACES AT COLBY COLLEGE IN 1965 AND 2006

Katherine Renwick ('07), Environmental Studies

Roads, parking lots, buildings, and other impervious surfaces do not allow rainwater to infiltrate the ground. As a result, they can lead to an increase in runoff to nearby ditches and streams, as well as a greater influx of pollutants such as motor oil that can often be found on paved surfaces. For this project, GIS was used to find the total area covered by impervious surfaces on the Colby campus, and to show how this area has grown in the past 40 years. It was found that new development on the campus has led to a 56% increase in impervious surfaces at Colby since 1965.

GRAY WOLF REINTRODUCTION IN THE GREATER YELLOWSTONE AREA

Katherine Renwick ('07), Charles Carroll ('08) and Liza Mitchell ('08), Environmental Studies

In 1995, the Gray Wolf (*Canis lupus*) was reintroduced to Yellowstone National Park as part of a plan to restore the natural ecosystem of the Yellowstone area. Once ranging throughout most of the US, Gray Wolf numbers had been drastically reduced due to hunting and habitat loss, until in 1973 it was listed on the endangered species list. Gray wolf reintroduction was remarkably successful, and has led to a self-sustaining population of wolves, which in turn restored many of the original ecosystem dynamics that had been altered by the disappearance of this important top predator. In 1993, the Gray Wolf was downlisted from endangered to threatened, representing a major victory for conservationists.

LET US NOW PRAISE FAMOUS WOMEN

Erin Rhoda ('06), English

For my presentation, I will tell the stories of three remarkable women who have experienced tragedy. After Hurricane Katrina, one woman was stranded on an overpass for four days with prisoners. A woman from Zambia takes care of twenty-seven children, eight of whom are her own and the rest of whom are the children of her dead brothers and sisters. Another woman is a Somalia refugee, making her way in Lewiston, Maine as a nurse. These women have shown me that everything we own can be lost in an instant, that life—family, freedom, happiness—is more

precious and more fragile than we think. While they have lost, each woman has also gained a new, deeper perspective on life; they have gained wisdom. I want people to hear these stories so that they may learn about both suffering and endurance. We must not forget the often-forgotten.

MOTION TRACKING AND PREDICTION USING FUZZY LOGIC

Patrick Rodjito ('06), Computer Science

With the increasing need for flexibility and adaptivity in computerized systems, the application of fuzzy expert systems is becoming increasingly commonplace in today's industry. Fuzzy logic expert systems often improve performance by allowing knowledge to generalize without requiring the knowledge engineer to anticipate all possible situations. Thus, for many types of applications, "soft computing" such as Fuzzy logic can incur lower overhead in terms of representing and engineering task knowledge. Our project investigates the application of fuzzy expert systems to motion tracking. Previous research showed that Fuzzy Logic can be used to track the motion of a brightly colored object against a dark background, with relatively low development and run-time costs. The system we are developing identifies, tracks, and predicts the motion of multiple objects using unique identification patterns against a dark background. Our poster will describe the fuzzy inference systems for tracking and motion prediction of such objects. An essential step to obtaining the fuzzy inputs for the motion tracking fuzzy inference system is to use convolution correlation data to obtain the centers of mass of the objects. Image processing information from the region around the center of each object provides good fuzzy inputs for recognizing object patterns and determining orientation. We are investigating various fuzzy inference systems for motion tracking and prediction in order to identify their strengths and weaknesses.

SPATIAL ANALYSIS OF COLBY COLLEGE TRAILS: PERKINS ARBORETUM AND RUNNALS HILL

Jacqueline Roller ('06), Environmental Studies

I created an updated map of trails at Colby College using global positioning system data that were then edited in ArcGIS. The map background, obtained from the Maine Office of GIS, was created from digital orthophotographs produced from aerial photos collected over southwest Maine in Spring 2003. Trail difficulty was determined by creating a slope layer and taking other factors into consideration such as ground surface and path width. The map will eventually be available online, enabling interactive selection of trails where users can access additional trail information.

SPECIFICITY AND AFFECTIVE VALENCE OF AUTOBIOGRAPHICAL MEMORIES IN DEPRESSION

Kathryn Rooney ('06), Psychology

This study examines memory distortions relating to specificity and affective valence in the memory of depressed individuals. 31 non-depressed, and 29 depressed participants were brought into the lab on two occasions. On one occasion they were asked to write about four memories of events from their own lives, on the other, they were asked to write about events that happened to their family members. After the memories for specificity and affective valence were coded, tests showed that non-depressed participants were more specific in their events and talked about them

with a positivity bias, whereas depressed participants wrote with less specificity and with more negatively charged words. Implications for the findings and future directions are discussed.

ESTIMATING THE IMPACT OF CATASTROPHIC SEA LEVEL RISE IN MAINE

Christopher Russoniello ('06), Randa Capponi ('06), Gregory LaShoto ('07) and Sharon McMonagle ('06), Environmental Studies

Maine's 3,500 miles of coastline is the longest coastline in the continental US. The goal of our study was to use GIS to estimate the impact future global sea level rise could potentially have on our state. We show the area of coastline and some of the economic and social impacts that would result from a rise of one meter and six meters. We used roads to estimate the impact on infrastructure, and public building, including schools, libraries, hospitals, police and fire stations, as a measure of social impact. A sea level rise of six meters would result in a loss of over 650 km² from coastal communities and cost the state of Maine over 3 million in repaving costs. Through our study, we hope coastal communities will be able to prepare for and react to the predicted changes in global sea level.

SEASONAL FLUID FLUX THROUGH THE SERPENTINE BOG, BELGRADE LAKES REGION, MAINE

Christopher Russoniello ('06), Geology

Wetlands serve as both sources and sinks for water and chemical species. As a result, quantifying the role wetlands play in watershed dynamics is important in assessing local, regional, and even global water and chemical cycles on a variety of temporal scales. Of particular interest to those hoping to manage watersheds are seasonal-scale dynamics (on the order of months). Understanding the role wetlands play in a watershed may provide insight into how water moves through watersheds and how we might effectively manage both the water resources and water quality within watersheds. The Belgrade Lakes Watershed in south-central Maine (Fig. 1) provides an ideal opportunity for the investigation of the role wetlands play in watershed dynamics. The watershed is simple, but complex—manageable, but interesting. This study is part of a larger-scale attempt to understand and numerically model the hydrogeochemical dynamics of the entire Belgrade Lakes Watershed. My research has focused on a portion of the Serpentine Bog, which is located in the Northern Belgrade Lakes Watershed (Fig. 2), and lies between East and North Ponds. The primary goal of this project is to determine groundwater flux (Q) through this corridor to test whether the bedrock ridges do confine ground-water flow to the peat and whether the flux through the peat can be numerically predicted as a function of recharge to the system. A simple 3-D numerical model of the “corridor” has been constructed and calibrated using groundwater and surface-water level data collected at high temporal resolution (hourly) from August 2005 to November 2006.

OMISSION AND COMISSION IN THE INACTION INERTIA PARADIGM

Steen Sehnert ('06), Psychology

Inaction inertia results when failing to act on an initial opportunity reduces the likelihood of taking a similar subsequent opportunity. Does a missed opportunity resulting from action cause different effects? Maybe not. In two scenario studies students missed an initial opportunity that was either slightly better (small difference) or much better (large difference) than a current

opportunity. Participants were less likely to take the current opportunity in the large difference condition, replicating the inaction inertia effect. This effect was identical in both the inaction and action conditions, contrary to expectations based on previous research comparing action to inaction. Mediational roles and implications for three varieties of regret are discussed for their potential to explain inaction inertia as well as null action findings within this paradigm

THE PERCEPTIONS AND REALITIES OF PORNOGRAPHY ON COLBY COLLEGE CAMPUS

Jessica Seymour ('06) and Elizabeth Wyckoff ('06), Women, Gender, Sexuality

Inspired by readings and discussions from Lisa Arellano's Feminist Theory class, we created a survey that was made available to the Colby student population in order to explore the presence and effect of pornography on Colby's campus. Through our survey, we have attempted to determine how sexuality is defined as a result of the influence of certain types of pornography among this demographic. As a result, we have found that there exists a hidden discourse in relation to sex and pornography among college-aged men and women. We discovered a significant rift between the realities and perceptions of porn consumption that takes place on campus, as well as the real and perceived emotional responses to pornographic issues that were addressed in the survey. The disparities between male and female survey responses reflects the different ways that young men and women are currently being educated about sex, sexuality, and their bodies in today's society.

A LEADER'S PLACE IN REVOLUTION: HOW ONE INDIVIDUAL EMBODIES THE MANY VOICES OF DISSENT

Lauren Simmons ('06), Anthropology

Within a society the process of creating and maintaining power structures often operates to the disadvantage of one group and to the benefit of another. Everyday, civilians participate in power structures that operate to their disadvantage. Revolution is the summation of this disadvantaged group's dissent into verbal and physical resistance in order to create change. However, this change is motivated at specific time, and often, organized under the direction of a solitary voice. How is it, if these structures have been operating over an entire population, that one voice openly acknowledges the existing societal abuses and/or needs of which all individuals in the same position are more subtly experiencing? How do one person's ideas manage to be heard, and, how do they create a following?

MOBILIZED MOTHERS AND WOMEN WARRIORS: WOMEN'S POLITICAL PARTICIPATION IN SRI LANKA AND CHILE

Laura Snider ('06), International Studies

Though mobilizing the identity of mother or revolutionary woman is not a novel concept; in Sri Lanka and Chile, four distinct groups of women involved with separate political organizations defied their status as second-class citizens and challenged an oppressive state. In each country, one group of women took the "acceptable" path of non-violence and the other took the radical path and used armed resistance to articulate their goals. Despite the fact that there was almost certainly no communication between the groups, each one developed along a strikingly similar course and was a crucial part in active resistance that eventually saw the downfall of their

respective governments. In both countries and both organizations, they were drawn into an evolving negotiation of expectations of gender and political agency with respect to their roles in society and their protests. Above all, the notably similar paths these Sri Lankan and Chilean women forged as they challenged both state and patriarchal repression illustrates a common way in which these women became activists.

TRAVESTI RIGHTS ARE HUMAN RIGHTS

Laura Snider ('06), Anthropology

People—whether they identify as lesbian, gay, bisexual, transgender, transsexual, all-sexual, travestí, women-loving-women, man-loving-man, intersexed, Tom, Dee, nádleehí, or heterosexual—have the right to have control over their bodies and to have autonomy over decisions related to their sexual life, and the right to engage in that sexual life free from discrimination, violence or coercion. Perhaps one of the most powerless groups whose rights have been systematically violated by judicial, police, and state authorities in addition to public condemnation are travestís. The complex travestí identity is beginning to take on legal and public significance as activists in Argentina and Chile have begun to form organizations to demand basic human rights for travestís.

RESPONSES TO PLAYBACK CALLS IN A BRAZILIAN TREEFROG: *SCINAX RIZIBILIS*

Colby Souders ('07), Biology

Communication is essential to successful reproduction in many animals, and acoustic signals are an important avenue for conveying relevant information. Frogs exhibit remarkable diversity in acoustic signals, and typically use a broad repertoire of species-specific advertisement and aggressive calls. The advertisement calls of treefrogs in the genus *Scinax* have been well-studied and described, but other call types and the acoustic criteria used for mate attraction, mate choice, acoustic competition, and heterospecific discrimination have yet to be explored. One way to accomplish this is through playback experiments. Frogs respond readily to conspecific calls, and male frogs have been shown to respond to, and even their own modify vocalization patterns, conspecific calls broadcast to simulate a potential rival male. In this study, we tested the hypothesis that male *Scinax rizibilis*, which produce one of the most complex calls of any species in the genus, respond differentially to the different components of the advertisement call and to aggressive calls. These responses may be given to minimize energy expenditure or to maximize information transfer. Playback experiments were directed at calling males in the field; initial natural calling activity was recorded, a stimulus call was played, and the focal male's response was recorded. This procedure was repeated on the same individuals using using different stimulus calls during each phase. Males responded immediately with a short aggressive call to all six stimulus call types, and continued to produce this call type for at least five minutes after the stimulus call.

OVERCONFIDENCE AFTER EXPOSURE TO MISLEADING POST-EVENT INFORMATION

Rebecca Reisman ('06) and Meredith Stauffer ('06), Psychology

Numerous studies have found that when presented with misleading post-event information,

people often inaccurately remember originally witnessed events (see Ayers & Reder, 1998 for review). This effect, known as the misinformation effect, clearly demonstrates that individual's eyewitness memory can easily be compromised (Mudd & Govern, 2004). The goal of the present research was to examine conditions that might lead to a reduction in the misinformation effect. Utilizing the multiple testing procedure (Erdelyi & Becker, 1974), the present study examined whether subjects would be less susceptible to misleading post-event information if first given a memory test. Secondly, we investigated how confidence in answers would be affected by repeated testing and exposure to both correct and misleading post-event information. The findings demonstrate that repeated testing did not reduce the misinformation effect but instead increased the effect, suggesting that repeated testing does not inoculate one from the suggestive influences of post-event information. In addition, the relationship between confidence and accuracy was significantly better on Test 1, prior to misleading post-event information than on Test 2. Finally, participants' confidence in incorrect answers significantly increased following the presentation of misleading post-event information, which led them to change a correct response to an incorrect response that incorporated the misinformation. The results remind us of the fallibility of memory and that subjective confidence is not an error free determinate of accuracy.

ANALYSIS OF A PROXY OF SUICIDAL IDEATION IN THE MAINE YOUTH DRUG AND ALCOHOL USE SURVEY/YOUTH TOBACCO SURVEY

Chad Stecher ('08), Mathematics

Determining the predictors of suicidal ideation within teenagers has been the focus of many psychology studies. These studies have typically concluded that females are more likely to think about suicide at a young age than males. This study analyzes the responses to a question about students' feeling of hopelessness in the Maine Youth Drug and Alcohol Use Survey/Youth Tobacco Survey. Using both the Mantel-Haenszel test for homogeneity of odds ratios with the Woolf weighting method and logistic regression to statistically analyze the data, this study will identify a complicating factor to the general conclusion of female suicidal ideation being higher than male suicidal ideation. In our analysis we found that females are more likely to identify themselves as having thought about suicide, but males are more likely to not respond. We also stratified across age and found a significant age effect. These results suggest that females are more willing to ask for help while males are not comfortable or willing to express their feelings. This should lead researchers and policy makers to pay equal attention to both males and females when trying to address the issue of suicidal ideation within today's adolescents.

THE TAKING OF MAYFLOWER HILL: THE VIETNAM ANTIWAR MOVEMENT AT COLBY COLLEGE

Timothy Stenovec ('06), History

Despite today's relatively apathetic student body, the college's remote location, and small size, Colby College had a remarkably active antiwar movement during the Vietnam War. In this project, I have sought to trace the movement's evolution from several individuals gathered outside of Miller Library standing "in silent protest" to the majority of students successfully shutting down the college in 1970. Using the New Left's anti-Establishment rhetoric as a vehicle for this analysis, I argue that the roots of Colby's antiwar movement lie in other social movements, namely the fight to end institutionalized racial and gender discrimination, as well as

movements of a smaller scale to increase student rights on Mayflower Hill. Colby College's mission, firmly bound to the liberal arts tradition, also fostered an intellectual environment where students could freely question the Establishment. Finally, regarding Colby's lack of activism today despite American military operations in Iraq and Afghanistan, I conclude that popular culture has perpetuated myths and stereotypes that have successfully discourage us—the aptly named Google Generation—from becoming antiwarriors.

BEN BUTLER AND THE WOMAN ORDER: HARD WAR DIPLOMACY OR INHUMANE TREATMENT OF THE CITIZENS OF NEW ORLEANS?

Nathaniel Stone ('06), History

Ben Butler was branded with the nickname 'Beast' upon issuing the Woman Order in the captured Confederate city of New Orleans. The infamous order, as it came to be known in the South, proclaimed to the women of New Orleans behaving in a disrespectful manner that if those actions continued they would be treated as women of the street by Union soldiers. In my paper, I wanted to examine how the North reacted to this order. I am hoping to uncover whether the North felt justified in the way Butler acted or if they thought there was a certain line even their own commander could cross that was deemed unacceptable during the Civil War.

THE RACIALIZATION OF FEMALE BODY IMAGE PERCEPTION IN THE UNITED STATES

Christina Terrell ('06), American Studies

Within the American culture, there are distinct body types characteristic of each racial group. For dominant culture the preferred white body of small buttocks, small hips, small waist, and larger than proportional breast. However, the black body is in direct contradiction, as larger buttocks, larger hips, small waist, and proportional breasts are the ideal. The acceptance of this deviant body is easily traced back through the black church system and can be credited to the rich slave diet and the naturally large features of the African ancestry. While her naturally larger body, with emphasis on the hips and buttocks, is desirable to her peers, the black female body is exoticized and objectified by white male gaze and this degradation is imitated by black males. Currently, in what is becoming the Age of the Black Booty, black women have unwillingly lost ownership and control of their bodies. By looking at the representation of black female bodies in popular culture and texts presented from the black perspective and white perspective, we see the distinct differences in body type acceptability and desirability.

RESTRAINT STRESS AND AGGRESSION IN FAMILIAR MICE (*MUS MUSCULUS*)

Rachel Terry ('07), Biology

Restraint stress, which commonly occurs in the laboratory during certain procedures, induces increased levels of glucocorticoids, decreased food intake, hypoactivity and decreased aggressive and defensive behavior. The goals of this study are to test the hypotheses that restrained mice will be subordinate and hypoactive toward an unstressed cagemate and that when no fasting occurred and the fasted, restrained mice will exhibit more dominance than non-fasted mice. Male mice were housed in pairs and preliminary observations established a baseline for all social behaviors. For the first experiment, the test mice were exposed to 30 minutes of restraint and reintroduced to their home cages with the other mouse twenty-four hours later and behaviors

were recorded for 15 minutes. In experiment two, both test mice and cage-mate mice were deprived of food for 24 hours, starting when restraint stress was induced in the test mouse. When the test mouse was reintroduced into the home cage, a piece of food was placed in the cage and behaviors were observed for 15 minutes. There was no significant difference between the frequencies of dominance in the stressed and non-stressed mice. There was also no significant difference between frequencies of dominance between the fasted and non-fasted mice. There were significantly more incidences of dominance post-treatment in both stressed and non-stressed mice as compared to preliminary observations.

THE EFFECTS OF THE HERBICIDE ATRAZINE ON MALE FIDDLER CRAB (*UCA* SPP.) TERRITORY DEFENCE AND AGGRESSION

Rachel Terry ('07), Biology

Atrazine is an herbicide that targets monocot crops such as corn and sorghum, and is the most heavily used pesticide in the world today. Atrazine is a known endocrine disrupter, having specific effects on vertebrate testosterone, leading to reduced testosterone levels, feminization, and in some cases, hermaphroditism. Although much work has focused on amphibians and mammals exposed to atrazine, relatively little has been done to test the effects of the herbicide on crustaceans. In the present study, fifteen adult male fiddler crabs (*Uca pugilator*) were each provided with a private tank and artificial burrow and allowed to acclimate as tank “residents.” An additional fifteen crabs were housed in smaller tanks with no burrow, and were termed “intruders.” Intruder crabs were placed in the resident tanks, and aggressive interactions were noted. Ecologically relevant atrazine concentrations of 0.5 ug/l, 1ug/l and 2 ug/l were then added to the resident tanks. Intruders were again introduced to each tank, and the behavioral interactions were again observed. It is hypothesized that fiddler crabs exposed to atrazine will display less aggression toward intruders as a result of reduction in production and binding of vertebrate-like androgens.

THE ROLE OF HOME EQUITY IN RETIREMENT SAVING: BUILDING YOUR NEST (EGG)

Caroline Theoharides ('06), Economics

This study examines the role of home equity in retirement saving. Previous work on home equity has not specifically dealt with retirement saving and is confined to data from the late 1980's. Using data from the 2001 and 2003 Panel Study of Income Dynamics, this study first updates the existing literature by regressing active saving on real housing capital gains using median regression techniques. Consistent with theory, an increase in housing capital gains results in a decrease in active saving. In order to deal more specifically with retirement saving, a level of retirement saving is regressed on home equity, yielding a positive relationship. Finally, a share variable is created by dividing home equity by retirement saving plus home equity. This variable enables a closer look at portfolio allocation decisions with regards to the home. When retirement savings are regressed on this share variable, the resulting relationship is negative, indicating that when households place more emphasis on the home in the retirement portfolio, they reduce the level of other retirement savings.

RESIDENTIAL ENVIRONMENTAL DESIGN: 'A HOUSE FOR AN ECOLOGIST' DESIGN COMPETITION ENTRY

James Thompson ('06), Art

This architectural design project was entered into a design competition sponsored by the American Institute of Architects entitled "A House for an Ecologist". The primary purpose of the competition was to merge the notions of sustainable design and design excellence. Placed on a site in rural West Virginia along the Potomac River, the program calls for a residence for an ecologist working for the U.S. Department of Fish and Wildlife. Following the design criteria which provided specific site and program constraints, a design was developed incorporating several sustainable architecture practices of the vernacular. One of the chief efforts of the design was to limit the environmental impact during construction, during use, and following demolition. This dictated many important decisions including the house's placement, orientation, form, materials, construction, and mechanical systems. The result is a home that functions self-sufficiently with a low impact on its surroundings. Furthermore, the structure is socially sustainable as it relates to its region's architecture through its basic form and local construction methods.

RELIGION AND HAPPINESS AMONG CHINA'S OLDEST-OLD

Brian Tierney ('06), Economics

This paper analyzes the effect of religion on an individuals' self-perceived quality of life among the oldest-old in China. Previous studies have found religion to have significant and positive effects on individuals' well-being. However, these studies have primarily focused on Western societies and on younger people. Using Probit and Ordered Probit models, this paper finds that religion does not have a positive effect on self-perceived quality of life, and that in fact the relationship may even be negative. These findings suggest that the relationship between religion and well-being may be different among the most elderly populations and in societies with predominantly Eastern religious traditions.

BE THE CHANGE YOU WISH TO SEE: NATIONAL ATTITUDES AND CLIMATE CHANGE POLICY

B. Tjernstrom ('06), Economics

A multitude of views characterize what should or should not be done about climate change, and in the past decades, nations have acted very differently in the face of climate change. This study explores variables that affect individuals' attitudes and concerns towards the environment and how those attitudes ultimately affect climate change policy. One model identifies a number of political, socio-economic and demographic characteristics that matter for people's attitudes towards climate change. A second model investigates the link between individual attitudes and countries' actions on climate change, and the results show that attitudes indeed matter in the implementation of policy. Different measures of democracy such as freedom of the press also prove to be important as channels for these attitudes.

NOMAD'S LAND - PARKS PROTECTION IN MONGOLIA: STRUCTURAL AND HUMAN OBSTACLES

B. Tjernstrom ('06), Economics

In Mongolia, steppe ecosystems, mountains, taiga forests, and vast deserts interconnect. These

diverse and fragile ecosystems exist closer to each other, and in healthier states, in Mongolia than anywhere else. Nature has been important in Mongolia since the time of Chinggis Khan's environmental laws in the 13th century. The past few decades, however, have a very mixed record. On the one hand, industrial excesses have led to severe ecological and environmental damage. On the other hand, concerns about rising environmental pressures have placed more than 13% of the country's landmass under special protection. The Mongolian government has announced a long-term goal of giving protected-area status to at least 30% of the country. This research was conducted in Mongolia during the summer of 2005, and identifies problems that Mongolia encounters in connection with this ambitious task. The paper introduces the aims and structures of the national park system, and examines its main administrative issues: a lack of resources, unclear legal structures, and the difficulty of disseminating information in a vast nomadic country. The interplay of the traditional Mongolian nomadic lifestyle, external economic advice, and Western conservationist goals is also scrutinized, and the results put into question Western conservationist principles.

OVEREXPRESSION AND PURIFICATION OF THE OAT (AVENA FATUA) PROTEIN AFN1 AND CONSTRUCTION OF A PMAL/AFN1 EXPRESSION PLASMID

Tenzin Tsewang ('07), Biology

Abscisic acid (ABA) is an important phytohormone with regulatory roles in many physiological processes. ABA expression is induced by environmental stresses such as drought and it is known to be an inhibitor of seed germination. A wild oat (*Avena fatua*) called AFN1 has been hypothesized to initiate the early stages of germination as its mRNA accumulates in nondormant seed embryos during imbibition. The polypeptide sequence of AFN1 suggests that it is an ABA glucosyl transferase. Glucosylation by AFN1 and thereby inactivation of ABA could lead to seed germination. In order to understand the role of AFN1 in germination, an ample quantity of AFN1 polypeptide is needed to test for enzymatic ABA glucosylase activity. My work has been to overexpress recombinant AFN1 containing a (His)₆ tag using a pRSETC E.coli expression system followed by purification of the AFN1 protein by means of a nickel-affinity column that bind to the (His)₆ tag. Due to the insufficient yield of AFN1 fusion protein obtained with this procedure, another method using a pMAL-c2x vector is now being employed. The pMAL expression system provides a method for expressing and purifying protein by tagging proteins with maltose-binding protein (MBP). It is anticipated that MBP tag will be advantageous as it can make the fusion protein more soluble and thereby yield a larger quantity of protein. Currently, work is underway on the construction of pMAL/AFN1 plasmid.

ISOLATION AND CHARACTERIZATION OF MERCURY AND ANTIBIOTIC RESISTANT BACTERIAL STRAINS FROM ATLANTIC SALMON, *SALMO SALAR*

Elizabeth Turner ('06), Emily McClure ('07) and Emily Mosites ('06), Biology

Environmental mercury from non-point sources has been theorized to be indirectly selecting for increased bacterial antibiotic resistance in many diverse habitats in Maine and New England. Studies involving bacterial isolates of Atlantic Salmon, *Salmo salar*, from Casco hatcheries were conducted in order to characterize the mercury and antibiotic resistance profiles of indigenous microflora. There is no history of antimicrobial chemotherapy at these hatcheries. Seventeen culturable isolates were collected from each of three fish, both from the external slime scraped from the epidermis, as well as the ingesta from the large intestine. The isolates were plated on

trypticase soy agar (TSA) plating media amended with inorganic mercuric chloride (HgCl₂; 0 - 250 μM) and organic phenylmercuric acetate (PMA; 0 - 16 μM). Plates of each isolate and each concentration were incubated at 6°, 12°, 18°, and 22°C. All samples exhibited significant growth on high levels of PMA and most exhibited significant growth on high levels of HgCl₂. Isolates were identified phylogenetically using 16S ribosomal DNA sequencing techniques. Out of the eight ingesta samples, six were identified as *Aeromonas salmonicida*, as well as five out of the nine slime samples. Species of *Pseudomonas*, *Acinetobacter*, and *Carnobacterium* were also identified. *Aeromonas salmonicida*, a punitive pathogen of *Salmo salar*, exhibited maximal antibiotic resistance to 16 antimicrobials out of a total of 22 assayed.

CATALYZING CHANGE: TOWARDS ACCELERATED AND EXPANDED U.S.-EU-RUSSIAN ACTION TO REDUCE THE THREAT OF NUCLEAR TERRORISM

Jessica Varnum ('06), Government

On September 11, 2001, Islamist terrorism became the defining threat of the new security order. Despite expert consensus that Islamist terrorists are actively seeking nuclear weapons and would not hesitate to use them, 9/11 and subsequent terrorist attacks have catalyzed only limited changes in U.S.-EU-Russian cooperation to address the threat of nuclear terrorism through programs to secure vulnerable nuclear materials and weapons at the source. Unfortunately, these vital programs have run into major constraints, including insufficient elite support and lingering Cold War suspicions. Historically catalytic events, defined as disasters or crises, have spurred states to support more cooperative policies by increasing their sense of the urgency of particular threats. While 9/11 and subsequent terrorist attacks did lead the U.S., the EU, and Russia to overcome some of the constraints to accelerated and expanded nuclear threat reduction efforts, they did not precipitate truly dramatic changes of policy. In explicating the degree to which these attacks overcame pre-9/11 program constraints, this thesis will seek to explain why they failed to lead to a strengthening of cooperation commensurate with the nature of the threat. Analysis of key national and intergovernmental program constraints pre- and post-9/11 demonstrates that the primary limitation of catalytic events vis-à-vis nuclear threat reduction has been the inability of elites to make the right conceptual linkages (e.g. between nuclear terrorism and threat reduction programs). I suggest that advocacy efforts can positively harness the power of catalytic events by helping elites to make conceptual linkages that will lead them to support accelerated and expanded cooperative action to prevent nuclear terrorism at the source.

PREPARATION FOR PROTEIN EXPRESSION STUDIES ON THE WHEAT GRAIN PKABA1-INTERACTING PROTEIN TAWD40

Natalie Wayne ('06), Biology

Abcisic acid (ABA)-mediated gene expression is a critical component of plant responses to this important hormone, which affects plant growth, development, and responses to environmental stresses. Plant responses to ABA are mediated by a number of factors including PKABA1, an ABA-induced protein kinase involved in ABA-suppressed gene expression in cereal grains, and TaWD40, which has previously been shown to physically interact with PKABA1. A full-length 1.9 kb TaWD40 cDNA, CK210682, was sequenced as part of this project. Based on the deduced protein sequence, it is thought that TaWD40 may belong to the family of E3 ubiquitin ligases, possibly targeting PKABA1 for destruction. Construction of expression plasmids for overproduction of the TaWD40 polypeptide in *E. coli* is currently underway. The TaWD40

cDNA has been successfully amplified from the source plasmid and inserted into an intermediate plasmid, pCR2.1. The TaWD40 cDNA is currently being cloned from the pCR2.1 intermediate plasmid into two different expression vectors, pRSET-A and pMAL-c2x, for future protein production and purification.

ANALYSIS AND INTERPRETATION OF A TRIASSIC-AGED REEF COMPLEX, WALLOWA TERRANE, NORTHEASTERN OREGON

Samuel Weeks ('06), Geology

The Triassic-aged outcrop of Martin Bridge Formation at Summit Point (near Halfway, Oregon) is indicative of shallow carbonate deposition on the flanks of an ancient volcanic island arc system, known as the Wallowa terrane. Microfacies analysis of hand samples resulted in the identification of three depositional environments at the locality. The first, characterized by bedded marl-like limestones, reflects deposition at the interface of a near-reef shelf and a shallow subtidal slope environment. The second, characterized by bioclastic wackestones and in situ sponge, coral, algal, and spongiomorph framestones, is a central- and flank-reef complex, considered to be the result of sea-level regression. Spatially and temporally distributed patch reefs, ranging from 1 to 7 m in height and 5 to 30 m in length, constitute the framework. The third depositional environment, characterized by a coarse neomorphic micrite, suggests sedimentation during a transgressive cycle on a distal subtidal slope. Statistical analysis of the paleontology reveals that the invertebrates occur in a determined rank order of sponges, corals, and algae, similar to other Norian-aged reefs, including ones in the Alps and at Lime Peak in the Yukon.

THE NEWSPAPER REDESIGN PROJECT

Steven Weinberg ('06), Art

Imagine a story such as the recent controversy over the Maine human rights law concerning homosexuals as a line. Along this line there are points, or specific events. Newspaper articles often capture these events, giving the reader a momentary understanding of the news. This redesign tries to tackle the impossibility of understanding the timeline through only the selective points (newspaper articles) provide. I have taken Michael Heath, director of the Christian Civic League and vociferous opponent to the human rights law, to allow for this recontextualizing of the news. Through his comments, I have reconstructed what was a year of events into a small book. Follow the ebb and flow of of an innumerable people's actions by one man's words and attributed actions. Is it possible?

WHAT IS THE ROLE OF SEED BANKS IN PRESERVING BIODIVERSITY?

Kerry Whittaker ('08), Joel Alex ('08) and Sarah Hoskinson ('06), Environmental Studies

Seed banks are a collection of seeds, preserved in a viable state, used for future conservation, agricultural, and genetic purposes. Seed banks have a role in ex situ conservation of endangered plants, conservation of crop and genetic diversity, and as a useful tool in scientific research and poverty mitigation. For example, the Center for Plant Conservation has been active in the preservation of seeds for conservation. The Millennium Seed Bank is used as a genetic base of seed evolution for future research. The Israel Gene Bank has been used for preservation of seeds for agricultural diversity. The Zambian Program Against Malnutrition has used seed banks for

the mitigation of poverty and to increase nutritional variation in the local communities. As a relatively new tool, more research is needed to assess their effectiveness and identify the associated benefits and challenges of seed banks.

ANALYZING THE DETERMINANTS OF OBESITY IN MAINE

Jonathan Wong ('06), Economics

America's obesity epidemic has garnered much attention in recent years, with 65% of adults either overweight or obese in 2002. This paper analyzes the possible determinants of obesity in Maine using data from the 2001 to 2003 Behavioral Risk Factor Surveillance System. Other works have focused on obesity on the national level without focusing on individual states. Variables such as income, education, and marital status were considered, with binary year variables. Individual effects of the determinants will be discussed, as well as potential policy implications.

MICROBIAL MERCURY AND ANTIBIOTIC RESISTANCE IN THE SOIL SYSTEMS OF AVERY PEAK, MAINE

Victoria Work ('08) and Lee Kozakiewicz ('07), Biology

In Maine, the presence of mercury in otherwise pristine ecosystems comes from emissions released into the air by industries in the Midwest. Carried by the jetstream, mercury is deposited over the Northeast via precipitation. Contamination by mercury in aquatic systems has been widely studied, but only recently has research focused on mercury's impact in terrestrial systems. Previous and ongoing research in this laboratory has both studied mercury and antibiotic resistance in the microbial flora of salmonid gastrointestinal tracts, and has shown a distinct linkage of genes for mercury resistance with those for antibiotic resistance on mobile genetic elements. This correlation, perpetuated by horizontal gene transfer, is the basis for this parallel study in soil systems, an environment rich in microbial diversity. The objective of this study was to characterize bacterial isolates obtained from five separate locations on Avery Peak in northwestern Maine. Serial dilutions of five-gram portions of each sample were plated onto trypticase soy agar plates amended with 0, 25, or 50 μM HgCl_2 . Morphologically unique colonies were isolated and characterized by their 16S ribosomal DNA sequences. Resistance to both antibiotics and synthetic antimicrobial compounds was observed using Sensititre minimum inhibitory concentration assays. Several of the isolates represent *Bacillus* and *Pseudomonas* genera, as well as *Microbacterium* and *Rahnella*. Particularly high antibiotic resistance was seen in a *Stenotrophomonas* isolate, which showed maximal resistance to 17 different antibiotics. A *Pseudomonas* relative, the *Stenotrophomonas* species *maltophilia* has been identified as a human pathogen. Several gram-positive isolates showed reduced levels of resistance, with maximal resistance to one or two antibiotics.

EPICHLOROHYDRIN CROSS-LINKING OF SYNTHETIC DNA OLIGOMERS

Rami Zahran ('06), Chemistry

Epichlorohydrin (ECH), an important chemical in the synthetic polymer industry, is a bifunctional alkylating agent with the potential to form DNA interstrand cross-links. Occupational exposure to this suspect carcinogen leads to chromosomal aberrations, and ECH has been shown to undergo reaction with DNA in vivo and in vitro. We are using denaturing

polyacrylamide gel electrophoresis to assess cross-linking of synthetic DNA oligomers by both ECH and the related compound, epibromohydrin (EBH). Both epihalohydrins produce a low-mobility band on denaturing gels consistent with an interstrand cross-link. Moreover, the efficiencies, sequence preferences, reaction kinetics, and pH dependence differ for the two compounds, suggesting different mechanisms of reaction. Understanding these alkylation reactions may help explain the role of the epihalohydrins in cancer development.

MONITORING THE HEALING TIME OF BAITFISH WITH SKIN ULCERATIONS USING FLUORESCEIN

Courtney Zecher ('06), Biology

Baitfish quality concerns both bait dealers and the anglers buying bait. Baitfish may grossly appear to be healthy, but may have a damaged epithelial layer, leaving fish vulnerable to osmotic stress and infection. The ability to detect epithelial lesions before gross fungal or bacterial infections occur could prevent morbidity and mortality in many species. Fluorescein (3',6'-dihydrospiro [isobenzofuran-1(3H),9'-[9H]xanthen]-3-one) sodium is a yellow, nonlethal dye which penetrates any break in the epithelium and shines an intense green color under UV light. In this experiment, we measured the healing time of a manually debrided area for six fish species, brook trout (*Salvelinus fontinalis*), rainbow smelt (*Osmerus mordax*), white suckers (*Catostomus commersoni*), fathead minnows (*Pimephales promelas*), emerald shiners (*Notropis atherinoides*) and golden shiners (*Notemigonus crysoleucas*). Fish were anesthetized, scraped with a scalpel blade and recovered in aerated coolers. At 24-hour intervals over 96 hours, fish were anesthetized in a fluorescein solution for 6 minutes, rinsed in clean tap water, and examined under UV light; select fish were photographed. Lesions were considered healed when they no longer fluoresced. Rainbow smelt were extremely sensitive to handling and debriding, and all died before the experiment was complete; many of the white suckers healed within 72 hours. The other four species healed within 96 hours with lesions progressively decreasing in size and fluorescence. In some instances, there was visible damage after 96 hours, such as scales missing, but the area had ceased to fluoresce, suggesting that the protective epithelial barrier grew back before the scales. Fluorescein is an effective means of assessing the epithelial condition of baitfishes.

PILOT ANALYSIS OF GRAY FOX, *UROCYON CINEREOARGENTEUS*, MAJOR HISTOCOMPATIBILITY COMPLEX (MHC)

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Heartworm disease is a common affliction throughout the family Canidae and yet gray foxes, *Urocyon cinereoargenteus*, are resistant to the parasite. Our hypothesis is that the resistance of gray foxes to heartworm lies in the major histocompatibility complex (MHC) and sequence variation that might exist among gray fox and other canids. This has been shown in hairy-footed gerbils in which there is a correlation between certain alleles of DRB exon 2 gene and a decrease in cestode and nematode load. Samples of gray fox along the East Coast including South Carolina, New Hampshire, Vermont and New York were amplified at a class II MHC gene (DRB1), exon 2. The amplification products were then sequenced and analyzed. MHC sequencing thus far has proved to be a difficult endeavor and we currently have not produced results about which we are confident and satisfied. However, we have compared published MHC

sequences of coyotes (*Canis latrans*), gray wolves (*Canis lupus*), dogs (*Canis familiaris*) and island fox (*Urocyon littoralis*). Island fox exhibit unique mutations in their MHC not seen in the coyote, wolves and dogs, suggesting that we might be able to find similar sequence differences in gray foxes that we can associate with resistance to heartworm disease.