2004

Abstracts of Presentations

Colby College

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Abstracts - Research Symposium

THE EFFECTS OF MELATONIN ON THE METABOLISM OF FIDDLER CRABS

Naomi Appel ('04), Biology

In order to determine the effects of melatonin on the metabolism of fiddler crabs of the genus *Uca*, crabs were injected with solutions of saline or of varying concentrations of melatonin. The crabs were then subjected to different stresses such as false injection, exercise, and placement in hot and cold environments. Hemolymph samples were taken and glucose and lactate levels measured as an indication of metabolism. It was found that melatonin works as a stress-reliever, reducing the drop in glucose levels that occurs after subjection to some type of stress. There was no general trend observed for the effects of melatonin on lactate levels after stress. However, injection of a solution with a low melatonin concentration had opposite effects on glucose and lactate levels than did injection of a solution with high melatonin concentration. Also, in general, females had a much larger and more varied response to stress than males did.

CHARACTERISTICS OF DOWNY, HAIRY AND PILEATED WOODPECKER FORAGING EXCAVATIONS

Anna Sommo ('04) and Emily Arell ('04), Biology

An assessment of Downy (*Picoides pubescens*), Hairy (*P. villosus*) and Pileated Woodpecker (*Dryocopus pileatus*) excavation sites was conducted in the Perkins Arboretum and Bird Sanctuary at Colby College (Waterville, ME). Trees were chosen at random based on the presence of rectangular foraging excavations and roosting excavations were excluded from the study. Data for the three types of woodpeckers were pooled due to an inability to distinguish the excavations without observing their construction. Aspect, volume and diameter at breast height were analyzed (n=108) to determine the characteristics of woodpecker foraging excavation sites. The data show a preference for excavations at 21-30 cm dbh ($p<.001$). The majority of trees studied contained multiple smaller excavations with the most common volume of woodpecker excavations in the range of 0-500cm3 ($p>.001$). The foraging cavity aspects were varied, but a non-significant orientation to the south was observed ($p<.10$). The study concluded that location and availability of wood-boring insects is likely the main determinant in the excavation characteristics.

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

Thomas A. Rogers ('04), Andrew A. McKenna-Foster ('04), Anna Sommo ('04) and Emily C. Arell ('04), Biology

Colby College conducted a comprehensive watershed study of Threemile Pond, Kennebec County, Maine during the summer and fall of 2003. Physical and chemical parameters were

analyzed to determine lake water quality. Threemile Pond is a eutrophic lake and algal blooms have been a problem for over 50 years. Mean phosphorus levels were approximately 30 ppb during the fall of 2003, well above the 15 ppb threshold for algal blooms. The mean transparency in September 2003 was 2.9 ± 0.4 m and there was a slight decline in dissolved oxygen below 6.0 m. The mean phosphorus concentration in the hypolimnion shows a gradual increase with several extreme increases in the past decade. Internal nutrient loading is a significant problem contributing an estimated 34% of the total phosphorus load. Anoxic conditions increase internal nutrient loading and impact the Threemile Pond fishery, and 46.32 % of the lake surface is above anoxic water. Reducing the nutrients entering Threemile Pond is also necessary for successful remediation. Properly maintaining camp roads, buffer strips and septic systems, preventing shoreline erosion, reducing the impacts of shoreline development, including use of fertilizer and phosphorus containing detergents are important. In-lake remediation techniques that should be considered include hypolimnetic aeration, fish stock manipulation and phosphorus inactivation. Action must be taken to improve water quality for the watershed residents and to protect the native flora and fauna within Threemile Pond.

WEALTH EFFECTS ON CONSUMER SPENDING IN THE US ECONOMY

Andriy Avramenko ('04), Economics

This paper investigates the effects of wealth on consumer spending in the United States. A traditional life-cycle model is estimated first. Although it does find a statistically significant wealth effect, its findings are unusable due to the presence of autocorrelation and non-stationarity. Variables in logarithmic forms are found to be cointegrated. Thus, a logarithmic model with the Stock-Watson adjustment and an AR(1) term is estimated instead. Three extensions to this model are offered. First, wealth is divided into stock market and non-stock components; second, into liquid and illiquid components. Finally, a new approach to the wealth division is introduced, with consumers' wealth segregated into liquid stock market, illiquid stock market, liquid non-stock market and illiquid non-stock market wealth. The findings show that wealth effects on consumption do exist but their size depends on the type of wealth and the length of the decision horizon. Most estimates of the marginal propensity to consume out of different types of wealth are in line with previous research. An important implication of this paper's results is that conventional studies of wealth effects on consumption, that do not disaggregate wealth and do not analyze long-run versus short-run changes, may give potentially incorrect estimates.

HEARING OUR VOICES: THE CREATION OF A GIRLS MAGAZINE AS A MEANS OF SOCIAL ACTION

Laura Barrow ('04), Karima Ummah ('04) and Megan Williams ('04), Education and Human Development

The magazine is a social action project linking girls and women in the community. Fourteen eighth grade girls worked with three Colby mentors and one Colby professor to create a magazine highlighting issues of importance to the girls. The girls involved are part of a girls' group that met weekly over the course of the 2003-2004 academic year and thus wrote about issues covered during the girls' group. Articles range from stories about friendship to cartoons about sexual harassment to poems to interviews with women working toward a better future in Maine. While the magazine is the final project, it is the journey of the creation of the magazine

that is important-working together to come up with topics, learning about women's rights, and realizing the challenges and opportunities girls today experience. In the end these girls have a coalition on which they can depend. The magazine is physical proof of how far they have come and how far they can go.

EXAMINING SPECIES DIVERSITY IN THE PROPOSED MAINE WOODS NATIONAL PARK USING GIS

Steve Bayes ('04), Biology

The Maine Woods National Park and Preserve is a proposed park in north western Maine that surrounds, but does not include Baxter State park. The Maine Woods National Park would be 3.2 million acres of wilderness protected from logging and unsustainable use. This project examined the species diversity, land use, and land ownership in the proposed Maine woods national park using a geographic information system (GIS). Species range data obtained from the Gap Analysis Program was used to calculate areas of high and low species diversity. Areas of high species diversity are more important to conserve from a preservation stand point. The Maine Woods National Park and Preserve would succeed in protecting almost 200 species of mammals, herps, and birds, in addition to numerous plant, fish, and invertebrate species. However, the park is far from a reality as only 17% of the land is currently secured for the park.

SUSTAINABILITY OF FISHING PRACTICES IN THE GULF OF MAINE

Stephen Bayes ('04) and Isabelle Reining ('05), Environmental Studies

Fishing is a vital industry in the Gulf of Maine. Unfortunately, populations of many species have declined drastically in the last thirty years and the complex ecology of this region has been disrupted due to the exploitation of marine resources. Recent efforts have been made to maintain fish populations in order to continue the economic productivity of Maine fisheries. However, more needs to be done in order to protect the biodiversity of this valuable ecosystem on an evolutionary time scale. We have examined the current threats and problems related to fishing in order to determine the best practices with which fisheries can be made sustainable in the Gulf of Maine. By-catch, over-fishing, fishing down, and habitat destruction are all continuing problems in the Gulf of Maine. We have recommended low impact fishing methods, ecology based policies, and intelligent consumerism that can help reduce the negative effects of these problems.

THE EFFECT OF PROCESSED FOOD ON ACTIVITY AND BODY MASS IN LABORATORY MICE

Steve Bayes ('04), Biology

Natural selection favors traits that enhance reproductive fitness, and many traits respond to certain environmental conditions. Artificially altering the environment can often have detrimental effects on individuals with these traits. Processed foods are now present in many environments in which animals live. Processed foods often have more toxins and calories, and fewer nutrients. I hypothesized that eating these processed foods decreases voluntary activity and increases body mass in laboratory mice *Mus musculus*. In addition, I hypothesized that mice would choose to eat more processed foods because they have higher caloric value. The results showed that mice on the processed food diet gained more weight than any other group, however these results were not significant. Mice did not show a preference for either processed or more

natural food, but mice on the healthy, more natural diet showed significantly higher levels of voluntary activity then those on any other diet. This study shows that mice on a healthy diet have increased activity. It also suggests that a diet of processed food results in increased weight gain.

A GEOSPATIAL INVESTIGATION OF WATER AVAILABILITY AND WATER STRESS IN INDIA

Lorraine M. Beane ('04), Geology

According to the United Nations Environment Programme (UNEP), India depends on groundwater resources for 53% of its irrigation and 80% of its drinking water needs. Such demand places a high burden on these resources and leaves many people at risk of inadequate water supply. In this study, an investigation was made into the relationship between groundwater availability and water stress, with a focus on irrigation withdrawals. This is done by first developing a GIS-based map of the major aquifers and parameters (i.e., yield, transmissivity, etc.) in India with which an estimation can be made about groundwater availability and yields. This information is coupled with GIS-based climate, hydrologic, and socioeconomic datasets to develop indicators of natural water availability and human-induced water stress in India using contemporary and projected future populations. An attempt is then made to delineate sustainable from unsustainable irrigation withdrawals by comparing modeled water availability indicators with satellite observations.

ENVIRONMENTAL AND HORMONAL INFLUENCES ON ACTIVITY PATTERNS IN FREE-RANGING GRAY SQUIRRELS (*SCIURUS CAROLINENSIS*)

Miranda R. Bertram ('04), Biology

Temperature and day length are used by many species as cues for the onset of new environmental conditions. Day length information, for example, is processed by the pineal gland and conveyed to the rest of the body through the hormone melatonin. In this study, I tested the hypothesis that these environmental and hormonal cues influence activity patterns in free ranging animals, using the gray squirrel, *Sciurus carolinensis*, as the model species. Gray squirrels are active year-round, and previous research reports a change from a bimodal pattern of activity in spring through autumn to a unimodal pattern of activity in winter. I conducted field observations at feeding stations established in the Perkins Arboretum and at a residence near the Colby College campus, and recorded behaviors, such as foraging and hoarding, from October through March. Squirrels were trapped, weighed, and marked with a commercial hair dye for individual identification. Squirrels were also voluntarily fed exogenous melatonin to test its effects on foraging behavior; melatonin was administered in a piece of peanut butter suet placed at the feeding station during each observation period. Temperature and light intensity were recorded continuously from January through March. Squirrels in the study showed a unimodal pattern of activity throughout the study, with an afternoon active period October through December, switching to a morning active period January through March. Squirrels exposed to exogenous melatonin were more active immediately following the treatment, but the difference was not significant. More squirrels were active for longer periods on warm and sunny days than on cold or overcast days, though there was no significant influence of temperature or light intensity on levels of activity.

DR. SEUSS AND ADOLF: THE GOOD DOCTOR'S TAKE ON FASCISM

Emily R. Brostek ('06), Education and Human Development

The world of Dr. Seuss, well-known children's author, while at the surface populated only with silliness and absurdity, in actuality deals with quite serious and complex issues such as anti-semitism ('The Sneetches and Other Stories'), fascism ('Yertle the Turtle and Other Stories'), nuclear war ('The Butter Battle Book') and consumerism ('How the Grinch Stole Christmas', 'The Lorax') (MacDonald 1988). Because of the undeniably adult nature underlying so many of Seuss's works, there has been an amount of skepticism concerning whether his messages may be comprehended by his audience, which is typically young children. In my work with kindergarten-aged children, I have found that many children do possess the ability to grasp the problems and resolutions offered by Seuss, not because these issues are easily understood by children of this age group, but because Seuss skillfully presents them in terms these children may understand.

PASSENGER CAR SALES IN THE PEOPLES REPUBLIC OF CHINA: WHAT ARE THE MACROECONOMIC FACTORS AFFECTING AUTOMOBILE DEMAND IN CHINA?

Katherine Brown ('04), Economics

The automobile market in China is quickly growing in terms of both the number of consumers and the number of producers. The exponential growth of the number of passenger cars in China during the past fifteen years attracts new firms to the market and encourages existing firms to expand production. This paper analyzes this increasing demand for privately owned vehicles in China to assess what has caused the exponential growth in the market and to determine whether this elevated growth is sustainable. National income, individual's wealth levels as well as price levels for the economically advanced urban areas are all important factors of demand, whose own patterns of growth must be maintained in order to sustain China's increasing automobile market.

MANUFACTURING VISIBILITY

Adelin Cai ('05), International Studies

This paper will examine the interconnectedness of environmental protection and human rights, and the assertion of indigenous identity through holistic conservation. Primarily from a non-governmental organization's point of view, case studies from Peru and the Congo Basin will be presented to demonstrate practice of holistic conservation theory.

THE BUDDY STUDY: AN EXAMINATION OF COLLEGE STUDENT'S ATTITUDES TOWARDS INDIVIDUALS WITH INTELLECTUAL DISABILITIES.

Katherine Caldwell ('04), Psychology

Within the last couple of decades great strides have been taken to deinstitutionalize individuals with mental retardation and integrate them into society. However, there has been little current research on people's attitudes towards individuals with mental retardation, something that would seem integral to their acceptance into our society. Such existing studies tend to focus on family, caregivers, professionals in this field, or manufactured relationships between study participants. This study examines the attitudes of college students at nineteen Massachusetts colleges as they

participated in Best Buddies. Best Buddies is a program that matches a college student participant with an individual in the community who has an intellectual disability. They build a friendship and interact closely with that person, his or her Buddy throughout the academic year. Participant attitudes towards the mentally retarded in general were gauged by administering the Mental Retardation Attitude Inventory (MRAI). Their attitudes towards their buddies were assessed using the Buddy Specific Survey (BSS). Both of these measures were taken across the span of the year to indicate whether or not the participants' attitudes were positive or negative, and to what extent, if any, they changed as a result of participation in the program and interaction with their buddy. Results of this study are pending.

DETERMINING THE EFFECTS OF MELATONIN ON IN VITRO NEURAL REGENERATION FROM *UCA PUGILATOR* X-ORGAN NEURONS

Gregory A. Cary ('04), Biology

One of the major ways in which neurons differentiate from other cells during development is their ability to grow long processes such as axons and dendrites. Many vertebrate peptide growth factors that are essential for the growth of immature vertebrate axons and dendrites (collectively called neurites) have been identified. However, in many cases it remains unclear what growth factors influence the developing neurites in invertebrate nervous systems. Although vertebrate neurotrophic factors affect growing invertebrate neurites, to date, no homologous hormones have been identified. Therefore the search for invertebrate neurotrophic factors must be broadened to include other potential growth factors. One such growth factor is the neurohormone melatonin. Not commonly considered a growth factor, melatonin is better known for its effects as a transducer of circadian and seasonal rhythms in vertebrates. It has also been shown that melatonin has a wide variety of other effects as well – such as a potent antioxidant, an immunostimmulant, and a neuromodulator. However, melatonin is also known to interact with cytoskeletal proteins and stimulate neurite outgrowth in mice. Within the past 20 years, it has been shown that melatonin is also present in a wide variety of non-vertebrate organisms. This research has also shown a conserved role for melatonin among many of the organisms that have been investigated. The goal of this research was to asses the ability of melatonin to influence in vitro neurite outgrowth of neurons from the fiddler crab, *Uca pugilator*. Peptidergic neurons from the x-organ of the eyestalk were chosen as a model for simple invertebrate neurite outgrowth in culture. Once in culture, the response of these cells to melatonin in the culture medium was assessed.

TECHNIQUES OF SUSTAINABLE AGRICULTURE: IMPLICATIONS FOR BIODIVERSITY

Alice Torbert ('05), Sarah Kelly ('06) and Caitlin Cleaver ('06), Environmental Studies

As populations grow in developing counntries, attempts to implement high-technology approaches to agriculture impact the natural and human environments more severely and threaten the future fertility of the soil. Fortunately, there are more sustainable approaches to growing crops that offer long-term food security and harmonize with conservation efforts. Sustainable agriculture benefits the environment, but not at the expense of human beings. Practices like polyculture shade coffee and cover cropping with legumes maintain high levels of biodiversity and ensure future soil fertility. Because they require an intimate knowledge of the local environment, they are also most effective on a small scale, allowing farmers in developing

countries to maintain their food supply and their independence.

ELEMENTAL ANALYSIS OF CRICKETS AND CRICKET DIETS AS SUITABLE FOOD FOR CAPTIVE ANIMALS

John Cole ('05), Chemistry

Feeder insects such as crickets (*Acheta domesticus*) are a major diet component of captive amphibians, birds and reptiles. These feeder insects are a poor dietary source of calcium and require supplementation to achieve the optimum nutritional calcium-to-phosphorous ratio of 2:1 for captive animal diets. In this study, various commercial products for enriching the calcium content of such feeder crickets were evaluated. Crickets were cultivated on various commercial food and water sources that claim or suggest an increase in calcium content of feeder insects. Cultivated crickets, as well as the food and water sources upon which they were cultivated, were analyzed for moisture, calcium and phosphorus content. Moisture content was determined by mass difference following complete dehydration and elemental composition (calcium and phosphorus) was determined by atomic emission spectroscopy of acid-digested samples. A significant increase in the calcium level of crickets was only observed for a non-commercial dry food source that was fortified with 40% (w/w) calcium carbonate. Commercially available calcium-enriched food and water sources were ineffective at increasing cricket calcium levels and phosphorus levels were unaffected in all crickets studied.

RETURN TO THE WOMB

Cassandra Cote ('04), Religious Studies

'Return to the Womb' is one of the primary mantras of western feminists at this time. It seems to reflect a desire to deconstruct the West's preoccupation with death and morbidity by refocusing our attention on life and birth. In their desire to return to the womb and destabilize the ideology of death, female feminists have become obsessed with the themes of birth, the womb, motherhood and mensturation, themes that are traditionally disregarded by male philosophers and scholars. They believe that by simply recentering the West on birth and life, motherhood and women will be validated. I question their assumption. I will investigate how, within Hindu culture, these same themes and images have a negative impact on women. Through my cross-cultural study, I want to examine how the negative reality of Hinduism can be transformed into a positive validation for women. With the help of french feminist philosopher Luce Irigaray, I will look at how such vital female images can be repossessed and affirmed by women themselves.

DEVELOPMENT OF A RADIOLIGAND BINDING ASSAY FOR THE IDENTIFICATION OF [3H] MELATONIN BINDING IN THE CRAYFISH, *PROCAMBARUS CLARKII*

Meredith Crane ('04), Biology

Melatonin and its receptors have been well characterized in vertebrate systems. Identified receptors include two membrane-bound G protein-coupled receptors and one quinone reductase. Additionally, melatonin may bind the RZR/ROR subfamily of nuclear receptors. The effects of melatonin in invertebrate systems are less understood, though in crustaceans melatonin has been shown to affect numerous processes including cardiac activity, locomotor activity, hemolymph glucose and lactate levels, and limb bud growth. Melatonin receptors have never been identified

in invertebrate systems; however, their characterization would be useful in understanding the mechanisms by which melatonin exerts its varied influence on invertebrate physiology. Using crustacean model systems, I have taken molecular and biochemical approaches to identify melatonin receptors. Due to poor conservation among melatonin receptor sequences, molecular approaches have been inconclusive. Radioligand binding assays using 3H-melatonin have proven successful in identifying potential binding in crayfish, *Procambarus clarkii*, claw muscle and heart tissue. These assays are currently being developed to improve binding with the hope of determining binding saturability and kinetics.

ENVIRONMENTAL ATTITUDES OF COLBY STUDENTS

Kate Ennis ('04), Environmental Studies

Campus 'greening' is a fast growing aspect of college student concerns across the country. At Colby, greening the campus and educating students about environmental issues is quickly becoming a priority. With these thoughts in mind a study of student attitudes on campus was developed in order to help to understand and inform Colby students about their everyday actions and guide new research projects as well as new environmental intiatives on campus. The project started as a greening proposal for Colby as part of an Environmental Studies senior seminar class, but developed into a independent project to help Colby determine the most effective means of greening the campus through greater understanding of student opinions. A survey of all Colby students was held online for about a month. The results and the analysis will be given to Colby's Environmental Advisory Group (EAG) to help guide future environmental actions at Colby.

DEVELOPMENT OF MICROSATELLITE MARKERS FOR EVALUATION OF PLANT MATING SYSTEMS

Rebecca Evans ('04), Biology

Self-fertilization has been observed as an effective method of breeding for many plant species. The species *Witheringia solanacea* (Solanaceae) has shown variance in its mating system, producing offspring through both self-fertilization and outcrossing. To determine the rate of self-fertilization for individuals of *W. solanacea*, we are developing microsatellite markers. Microsatellites are short nucleotide repeats that are interspersed throughout non-coding regions of the genome. Microsatellite probes were used to tag specific repeated DNA sequences within digested DNA. These segments were then replicated and stored as plasmid clones. Polymerase chain reactions were then performed to amplify the microsatellite library. Currently, the microsatellite fragments are being analyzed using a DNA sequencer to determine sequences of flanking regions that can be used as a basis for primers, so that microsatellites can be amplified directly from genomic DNA.

A THEORETICAL MATHEMATICAL MODEL OF FISHERY ECONOMICS

Andre Garron ('04), Economics

This paper presents a theoretical mathematical model of supply and demand forces in fisheries. The model is based on the Schaeffer Model of renewable resources and uses differential equations to identify the dynamics in fisheries. The presentation will include a discussion of the economic theory of renewable resource consumption, the assumptions in the model, the derivation of the model, and conclusions drawn from the model, including analysis of the

response to shocks to the model.

POWER, POSITIONALITY, AND CONCEPTIONS OF STEWARDSHIP AND OWNERSHIP IN THE CLEANUP OF NOMANS LAND ISLAND, MASSACHUSETTS.

Michael B. Greenberg ('04), Anthropology

In this presentation of my honors thesis, I will examine recent developments in the Nomans Land cleanup effort through multiple perspectives: tribal, town, environmental, and military. Located off the coast of Massachusetts, Nomans Land is an island which the United States Navy has used for many years as a bombing training site. Recently, the Wampanoag Tribe on Aquinnah have campaigned to have Nomans Land restored, as it occupies a significant place in their cultural history. Specifically, I will look at how notions of land ownership and stewardship used by the parties involved in the conflict have influenced attitudes surrounding the future of Nomans Land. How have these ideas shaped land transfer and the current disputes over the expected level of cleanup? Furthermore, I will also examine Nomans Land from a spatial-temporal perspective, particularly looking at how the various representations of the island used by the conflicting parties have changed over time. How does control over this small island affect the complex power relations between the Wampanoag and local, state, and national governmental institutions? Finally, I will view this dispute in the context of relations between tribal and non-tribal governments across the US and examine the possible theoretical implications through parallel case studies and theorists.

CONTEMPORARY ORANGE ROBES: BUDDHISM AND THE MONASTIC COMMUNITY IN MODERN LAOS

Lindsay Grossman ('04), Religious Studies

In the world today, as the modern collides with the ancient, many religions are facing changes. For the month of January 2004, I spent my time living and breathing Buddhism in Laos, South-East Asia, investigating the collision of modernity and Buddhism. I visited numerous temples throughout Vientiane as well as southern Laos, established relationships with many of the temple residents, monks and novices, and interviewed and questioned informally all those I could, all of which complied to construct my current understanding of modern Buddhism in Laos. This paper presents my own personal research and experience, interspersed with a general overview of Buddhist philosophy. Together my research and field experience combine to paint the peaceful yet vibrant picture that is the reality of Buddhism in Laos today.

SYNTHESIS OF A TETRADENTATE SULFUR LIGAND AND NEW BIOMIMETIC NICKEL COMPLEXES OF THAT LIGAND

Jessica H. Hayward ('04), Chemistry

The syntheses of novel biomimetic sulfur-ligated complexes that are potential models for metalloenzymes, such as the nickel hydrogenases are being pursued. These complexes can be used to determine the basic inorganic chemistry of a metal ion in a similar ligand environment to the appropriate metalloenzyme. The target complexes will incorporate the new tetradentate bisthiolate, bisthioether ligand L that also contains two biphenyl groups. The synthesis of L takes five steps and begins with biphenyl. The synthesis and characterization of L will be discussed, along with any nickel complexes of this ligand that have been prepared.

SCHUMANN'S ROMANCE NO.3, OP. 94; A SCHENKERIAN ANALYSIS

Kathryn E. Heidemann ('04), Music

Heinrich Schenker (1868-1935) – musician, theorist, analyst and teacher – developed a style of music analysis that focuses in particular on details of melody, counterpoint, harmony, and form in music. This analysis of Schumann's Op. 94 Romance No. 3 illustrates main elements of his graphing style, showing Schenker's approach to musical structure in three levels of foreground, middleground, and background. In any specific work, the contents of these graphs progress simultaneously, but each structural level by itself provides a different and meaningful perspective. Together, these graphs explain how each note of a specific piece stems from the composition's fundamental structure or Ursatz, showing the various methods of prolongation and elaboration upon this very basic structure. The Ursatz consists only of a simple melody line (usually a 3-2-1 or 5-4-3-2-1 descent to the tonic) harmonized by an elaborated tonic-dominant-tonic. This means that depending on the piece, an entire composition can be condensed into a structure as simple and elegant as three notes and three harmonizing chords.

ENZYME ACTIVITIES OF MUSCLES USED FOR LOCOMOTION AND SOUND PRODUCTION IN THE CATFISH, *TRACHELYOPTERUS GALEATUS*

Lauren E. Henderson ('04), Biology

The tropical driftwood catfish, *Trachelyopterus galeatus*, uses both swimbladder and pectoral spine stridulation sound producing mechanisms (SPMs). These sounds are used for communicating in several contexts, including disturbance (stridulation) and aggression or courtship (swimbladder drumming). These SPMs broaden the complexity of acoustic signals, allowing for a flexible communication system. Males and females may exhibit morphological, physiological, and biochemical differences contributing to functional differences in relevant muscles. We tested the hypothesis that differences in muscle biochemistry are related to functional properties in muscle adaptations. We measured activities of two enzymes indicative of the aerobic capacity of muscle: citrate synthase (CS) and 3-hydroxyacyl-CoA dehydrogenase (HOAD); and one enzyme important in the glycolytic pathway, lactate dehydrogenase (LDH). Enzyme activities were assayed in five muscles that contribute to locomotion and sound production in *T. galeatus*: the elastic spring apparatus (ESA), pectoral fin abductor (AB) and adductor (ADD), axial (AX), and fin ray adductor (FIN). The ESA had significantly higher CS and HOAD activities, and the ADD had significantly higher LDH activity in both males and females than other muscles. CS activity in the AB differed significantly between the sexes, and was higher in females. This suggests that the ESA has high aerobic capacity, and can support long periods of swimbladder drumming. In contrast, the ADD can support brief, strong contractions that may be important in the stridulation SPM. Finally, patterns of stridulation may be sexually dimorphic because females have a higher capacity for aerobic ATP production in the AB than males.

MORPHING MASTER STATUS AND THE TORMENTED MIND, BODY, AND SOUL: RECONSTRUCTING IDENTITY AS AN EX-ATHLETE

Michael Hildebrandt ('04), Sociology

Athletics and their impact at Colby have come under review in the last few years. While athletics

can offer many educational benefits, they also can create negative impacts on the student body, and academic culture at Colby College. In realizing this, many athletes discontinue their athletic participation in College, but where does this leave them? This study will encompass twelve in-depth interviews that explore the difficulties of retirement from sport at Colby College as well as the processes by which ex-athletes reconstruct their identity. The subjects interviewed will have either been forced to leave athletics by being cut from a Colby varsity team or injured, or will have left voluntarily to pursue other interests. Sociological theory in the area of athletics and identity is extensive. My literature review will help to focus my study as well as help ground my research in that of professional theorists and researchers. The final paper will couple the topics that arise in the interviews with those covered in my textual research.

RESEARCHING HOW MATHEMATICS IS TAUGHT IN JAPAN

Ryan G. Holben ('07), Mathematics

This January semester, myself and eight other students from our second-year Japanese class traveled to Maine's sister state in Japan, the Aomori prefecture. Some of us studied subjects that were often related to our majors, and some took part in internships. In conjunction with my mathematics major at Colby, I chose to study how Japanese teaching methods of mathematics in the public school system compared and contrasted with ours in America. To do this, I was given the opportunity to observe several math classes at the local high school and to interview a math teacher. Through this, a fundamental difference between Japanese and American teaching philosophies became apparent, which I will discuss in my presentation.

KARATE AND KENDO: MARTIAL ARTS AND EXPERIENCES FROM JAPAN

Jia Chen ('06) and Michael Howard ('06), Biology

Jia and I will do a short presentation in which each of us will speak for about 5 minutes a piece on what we did while in Japan. We will talk about the practice and experiences that we each underwent while studying our two Martial Arts. I will be speaking on Karate and Jia on Kendo.Once we have each given our part of the talk about our separate experiences, we would like to give a short presentation of the website that we helped to design to describe the trip. We will show the website and explain the pictures that are there.

THOUGHT MADE VISIBLE

Kathryn Hulick ('04), Art

Mind and world are two spaces, two different yet reflective landscapes through which I move. As I breathe in air, I also breathe in perceptions of the world—outside images, ideas, and air come to dwell inside me. Then I exhale, I express, letting out both inner air and inner meaning through speech or painting. My Senior Scholar’s project combines my art and my writing in an exploration of perception, expression, landscape, and creativity that connects the diverse worlds of painting, linguistics, anthropology, philosophy, and cognitive science. Beginning in the fall of 2003 with Ferdinand de Saussure’s linguistics and with landscapes painted from observation, my exploration moved ever inwards, to landscapes painted from an inner world filled with memories and concepts, to Maurice Merleau-Ponty’s phenomenology and the space of gathering landscapes. Here, tendrils of meaning set out to explore, through gesture and utterance, vaguely formed areas of mind, twisting and twining together into ever more solid ties of recognition and

similarity, until structural forms emerge from the amorphous unconscious. This process is the making visible that happens conceptually as I read a new kind of philosophy, orally as I learn a new language, or even visually as I make a single painting. In this project, through visual images and metaphorical written descriptions, I attempt to make visible the emergence of ideas—the forming of landscape—from dancing tendrils to complete fluency of understanding.

ARE NORTH AMERICAN ZOOS EFFECTIVE TOOLS FOR CONSERVATION?

Laura Walker ('04) and Todd Hunsdorfer ('04), Environmental Studies

The debate over the effectiveness of North American zoos dates back their inception in the 1700's. Zoos in North America were originally created for entertainment purposes through the exploitation of exotic animals like the African Elephant (*Loxodonta africana*). Since that time, many zoos in North America have evolved to serve as educational resources, research centers, and tools for the protection and conservation of endangered species. Another positive aspect to current North American zoos is the ability to raise awareness and financial support for numerous wild animals and their habitats. Along with these benefits come various problems including poor animal health, morality issues and unsuccessful breeding programs. Some zoos are creating new and innovative ways to raise awareness among many people through the use of audio and visual technology. Numerous zoos have created websites, which consist of general zoo information, interesting animal facts, interactive games, and live animal cameras. These advancements along with other benefits zoos provide have the potential to create effective tools for conservation.

DISSEMINATION OF MERCURY RESISTANCE GENES AND ANTIBIOTIC RESISTANCE GENES BY HORIZONTAL GENE TRANSFER AMONG TROUT GASTROINTESTINAL TRACT FLORA.

Molly Hyde ('04), Biology

Mercury (Hg) pollution, mainly from anthropogenic sources such as industrial emissions, is a problem worldwide. Exposure to Hg can be toxic to many organisms, including bacteria. Increased levels of environmental Hg, due to pollution, has resulted in the evolution of Hg resistant bacterial strains. Reduction of the toxic mercuric ion (HgII) to less toxic elemental mercury (Hg0) is the proposed mode of Hg resistance in most bacterial species. The enzyme responsible for Hg reduction, mercuric reductase, is encoded by the mer A gene, which is part of the mer operon. Many Hg resistant bacteria are also antibiotic (Ab) resistant, and Hg and Ab resistance genes are closely linked. Bacterial gene transfer mechanisms enable plasmids encoding Hg and Ab resistance to be transferred from one bacterial species to another. I hypothesize that environmental Hg is directly selecting for bacteria that are Hg resistant and indirectly selecting for bacteria that are multiply Ab resistant. Hence, horizontal gene transfer (HGT) can further increase the reservoir of Hg and Ab resistant bacteria in the environment. This study examined HGT of Hg and Ab resistance genes in trout microflora. I used plasmid DNA from a Hg and Ab resistant Pseudomonas sp. to transform Gram-negative and Gram-positive Hg and Ab susceptible bacteria. The results from these experiments show that the mer A gene was located on a plasmid in the donor, and this plasmid was transferable and expressed in Hg susceptible bacteria. In addition, these experiments indicate that transformation with plasmid DNA also resulted in an increase in Ab resistance in some previously susceptible strains. It is possible that these Ab resistance genes were linked to the plasmid encoded mer A gene, and these resistance genes were cotransferred via transformation.

CONTAGIOUS YAWNING AND SELF-MONITORING

Jeremy Jamieson ('04), Psychology

This experiment examined the effects of self-monitoring on contagious yawning. Self-monitoring is defined as the degree to which one is attuned to the way one presents oneself in social situations and the degree to which one adjusts one's performance to create a desired impression. High self-monitors more frequently perceive and react to social cues than low self-monitors. The researchers hypothesized that contagious yawning is a socially functional behavior and those scoring high in self-monitoring more frequently yawn after viewing another's yawn. The results of this study illustrate that high self-monitors do, in fact, respond more often to contagious yawns than low self-monitors. These data support the researchers' hypothesis that contagious yawning is a socially functional behavior.

CRAZY, BEAUTIFUL, CLUELESS AND AT THE CROSSROADS: REPRESENTATION OF REALITY IN CONTEMPORARY TEENAGE FILM

Kristan D. Jiggetts ('04), American Studies

An analysis of the patterns in comtemporary teenage film. An indepth analysis of the reality that is constructed in these films as it pertains to race, class, gender, romance and place.

S-RNASE GENE TRANSFORMATION AND OVER-EXPRESSION IN *E. COLI*

Christine F. Jones ('04), Biology

Self-incompatibility (SI) systems recognize and reject self pollen and accept non-self pollen. The stylar ribonuclease (S-RNase) in the angiosperm Witheringia solanacea is believed responsible for a SI response. The purpose of this study is to transform the plasmid which contains the S-RNase gene into *E. coli* and over-express it in order to sequence the S-RNase gene in another plasmid and to yield enough of the protein to characterize the properties of S-RNase mutants. The S-RNase gene was transformed into chemically competent *E. coli* cells. The vector plasmid contains a lacZ gene and kanamycin resistance. If the S-RNase gene was inserted correctly, it would interrupt the lacZ gene which would inhibit the production of beta-galactosidase. Beta-galactosidase forms a blue precipitate when it cleaves the substrate X-gal. *E. coli* colonies were grown-up on plates containing X-gal, and all colonies were white indicating that the S-RNase gene interrupted the lacZ gene. Rapid disruption of the bacteria colonies was performed in order to test the size of the plasmid. Gel electrophoresis displayed a marker at the correct number of base pairs indicating that the plasmid containing the S-RNase gene was within the bacteria cells. Several small-scale preparations of plasmid DNA were attempted to over-express the S-RNase gene. These methods proved successful. Analysis by gel electrophoresis displayed bands at the correct number of base pairs indicating that the S-RNase gene had been over-expressed. Restriction enzyme digests were performed which successfully linearized the plasmid. More restriction enzyme digests will be performed in order to cut the gene out of the plasmid and ligate it into an expression plasmid.

STUDY OF VIDEO GAMES IN JAPAN

John G. Jones ('06), Computer Science

During the past 'Jan Plan' term, I had the great fortune to travel to Japan and conduct research

there on a topic of particular interest to me: video games. Japan is a vital point in the gaming world--somewhat of a Mecca in its own way. Though many people would scoff at the notion of video games as a valid study, they have somehow become integrated into modern culture, particularly among the younger generations. They are closer akin to an movie in which the viewer becomes an active member, or a novel brought to life on the television screen; and few would scoff at the study of movies or novels. Certainly the United States has its own game developers, and certainly they have demonstrated great skill, but those with greater understanding of the gaming industry know that Japan has the best game designers alive, and that many of their games never even make it into the American market. By traveling to Japan I was able to see, first hand, what the market conditions in Japan were like. I visited local gaming centers, and examined the conditions there—what games were popular, and what made them so.

MAPPING OF DIEPOXYBUTANE DAMAGE IN THE CYTOCHROME B DOMAIN OF MITOCHONDRIAL AND THE B-GLOBIN DOMAIN OF GENOMIC CHICKEN DNA USING QUANTITATIVE PCR

Justin E. Juskewitch ('04), Chemistry

Diepoxybutane (DEB), a known industrial carcinogen, reacts with DNA primarily at the N7 position of deoxyguanosine residues and creates a variety of DNA adducts, including interstrand cross-links at the sequence 5'-GNC. We are using a quantitative polymerase chain reaction (QPCR) to measure the amount of DEB damage (lesion frequency) within three different targets â€“ mitochondrial (unpackaged) DNA, an open chromatin region, and a closed chromatin region. Initial measurements of DEB damage within these three targets were not consistent because the template DNA was not the limiting reagent in the PCR. Follow-up PCR trials using a limiting amount of DNA are still in progress although initial experiments looks promising. Sequencing of these three targets to confirm the primer targets has only been successfully performed for the closed chromatin target and does not match the sequence from NIH used to design that primer pair. Further sequencing trials need to be conducted on all three targets to assure that a mitochondrial, open chromatin, and closed chromatin region are actually being amplified in this experimental series.

THE LOCATION OF IL-4 PRODUCING CELLS IN FSN MUTANT MICE BY IMMUNOHISTOCHEMISTRY

Jenny Kalman ('04) and Kristin Putnam ('05), Biology

Fsn mutant mice exhibit pathology similar in some respects to humans suffering from the autoimmune disorder systemic lupus erythematosus (SLE). For this reason, fsn mice are used as a system to study disease progression in the hope of gaining insight into the pathogenesis of SLE. Mice homozygous for the fsn mutation show marked abnormalities which include flaky skin, abnormal histology in the spleen and lymph nodes, and a significant increase in immune system cells (most notably B cells and macrophages). The role that cytokine IL-4 plays in disease progression is not clearly understood, although it has been suggested to play a major role in the development of the fsn phenotype. Using enzyme immunohistochemistry we attempted to locate IL-4 producing cells in the spleens of fsn mice of different ages. A protocol for combined IL-4/germinal center staining and IL-4/T cell staining was optimized. We found that the majority of IL-4 producing cells in the spleen overlap either with germinal centers or T cell zones. In addition, we found a dramatic increase in IL-4 producing cells associated with age in the fsn

mice, supporting previous evidence that IL-4 levels become elevated as fsn mice mature. Further staining is necessary to determine exactly which cells are responsible for the high levels of IL-4 observed in fsn mice, a preliminary step in deducing the role of IL-4 in disease progression.

THE MUSICAL MONDO

Sarah Kaminshine ('04), Mathematics

What is the sound of one hand clapping? While this may seem like an illogical question, it is one that every student of Zen Buddhism must come to understand as he travels the path to enlightenment, or satori. In trying to realize the reality of this question, the student both reflects inwardly to the space within his mind as well as engages in an outer, ontological space, often represented by dialogues with his master, called mondos. It is through these two spaces that the student experiences the absolute truth that is so fundamental to Zen Buddhism. Equally essential to the practice of Zen is the music of the shakuhatchi. With origins in the Fukeshu sect, the playing of this instrument has become another means by which on moves to satori. Through the analysis of the shakuhatchi piece, Reibo one will see that the musical space created by the shakuhatchi player closely parallels the ontological space, as seen in the mondos between Zen master and student, that the disciple moves through in his journey towards enlightenment.

BINDING AFFINITIES OF HMUTS-ALPHA FOR 6-THIOGUANINE AND 6-METHYLTHIOGUANINE BASE PAIRS IN DNA: A BASIS FOR LESION TOXICITY

Clara Z. Koh ('05), Chemistry

Cytotoxicity of thioguanine (6SG) is believed to involve incorporation into DNA, methylation to form methyl-6-thioguanine (Me6SG), recognition by the post-replicative mismatch repair system, and persistence of G(2)-M cell cycle arrest leading to cell death. The protein hMutS-alpha is responsible for mismatch recognition, and its relative binding affinities to various thiopurine mismatches were studied. Six variations of 20-mer oligonucleotide duplexes were prepared, in which the central G, on one strand, was substituted with either 6SG or Me6SG and paired with either C or T on a biotin-labeled complementary strand. Single-stranded oligonucleotides were characterized with ESI MS and HPLC analysis of enzymatic digestions. Surface Plasmon Resonance (SPR) Spectroscopy was used to measure their relative binding affinities with hMutS-alpha. These results revealed that, within this DNA sequence context, hMutS-alpha has a preference in the order of 6SGT > GT > Me6SGC > Me6SGT >>> GC > 6SGC.

MORAL TREATMENT AT THE MAINE INSANE ASYLUM

Allison B. Kolkhorst ('04), Psychology

During the early and middle of the 19th century, a vast amount of progress was made in the psychiatric treatment of the mentally ill, followed by a rapid deterioration of the mental health system in America. This paper will look at some specific factors that triggered this collapse of 'moral' psychiatric treatment in Maine during the 1840's. The subjects addressed include: Social reform movements in Europe spreading to the United States; the building of the Maine Insane Hospital; Isaac Ray, a graduate of Bowdoin Medical School; and Irish immigration to Maine. The interconnection between each topic will be explained in relation to the failure of ethical treatment for the mentally ill in Maine.

NEUROPATHOLOGY OF THE AUDITORY HALLUCINATION IN SCHIZOPHRENIA

Allison B. Kolkhorst ('04), Psychology

This study explores the most current research on the neuroanatomical and neurochemical pathology of schizophrenia. Topics covered will include: structural abnormalities in schizophrenic brains, the role of neurochemical pathways in symptomology, and the psychopharamacology of antipsychotic treatments. Emphasis will be placed primarily on the neurobiology of positive symptoms such as hallucinations, delusions, and other bizarre behaviors. Implications for future research will be discussed.

'BIG TEAM, LITTLE ME:' A SOCIAL PSYCHOLOGICAL STUDY OF SOCIAL IDENTITY PLACEMENT FOR COLLEGIATE ATHLETIC TEAM MEMBERS

Brittney Lazar ('04), Sociology

Sports have the unique power of bringing people together in a forum of intense emotion and dedication. In a quest for meaning, individuals often join sports teams to acquire social identity placement and to harness the powerful impact of athletics. This study combines a theoretical analysis of identity theorists and sport psychologists with 16 qualitative interviews of college athletes to argue that athletic team membership provides social identity placement for college athletes within the college community. Social psychological theories on identity state that individuals seek meaning through identification within a community and as members of a group. Within the college community, athletic teams provide a 'second family' in which the self becomes associated with a team, and an individual's identity is largely based on his or her team membership. When asked 'who am I?' every athlete interviewed stated athlete as one of the most salient three roles that they identify with. Although stereotypes are abudant and often negative surrounding team membership, those who experience this aspect of social life have an idealistic approach to their team identity and experience athletics as one of the most influential impacts on their lives. This study reveals the intricate relationship between the self and the team in creating an athletic identity for college athletes.

THE EUGENICS MOVEMENT IN AMERICA: THE CASE IN MASSACHUSETTS, 1920-1940.

Margaux Leonard ('04), History

In the 1920s and 30s scientists from Massachusetts sought to improve the human race through the use of eugenics. In a struggle to prove the superiority of the white man, academics from Harvard and other prestigious institutions advocated the sterilization of those 'unfit' for society, which included blacks, immigrants, criminals, the “feeble-minded,” and individuals from the lower classes. Several states passed laws regarding sterilization, anti-miscegenation, and restricting immigration in an attempt to purify the white race and decrease the economic burden the inferior races had on society. Ultimately, the theories and ideas of Massachusetts eugenicists directly contributed to the eugenics movement in Nazi Germany, which resulted in the deaths of over 6 million Jews.

CAN WE SAVE THE GREAT WHALES: A REVIEW OF PAST, PRESENT, AND FUTURE THREATS TO CONSERVATION

Nick Gambino ('04), Emma Lynch ('05) and Ken Pitter ('05), Environmental Studies

A comprehensive review of why great whales are at risk. The thirteen largest species of whales, known collectively as the "great whales," have historically been the target of the whaling industry. These whales have many commercial uses, such as food and precious whale oils. However, they also possess a variety of intrinsic values that are not as easily quantifiable. We examine the current conservation status and threats facing whales, in addition to some ecological characteristics that make them vulnerable to extinction. We also present some specific case studies of great whales and their response to human exploitation, as well as the current attempts of regulation, such as the International Whaling Commission (IWC). Finally, we examine some of the challenges that complicate whale conservation and provide several suggestions to overcome these challenges.

ISOLATION AND CHARACTERIZATION OF MERCURY AND ANTIBIOTIC RESISTANT BACTERIA FROM THE GASTROINTESTINAL TRACTS OF HATCHERY GROWN BROOK TROUT, *SALVELINUS FONTINALIS*

Nicholas O. Markham ('04), Biology

Atmospheric deposition of mercury (Hg), generated primarily from anthropogenic pollution, has resulted in increasing levels of Hg in Maine waterways. In an effort to investigate the nature and extent of Hg's presence in the ME environment,I focused on a unique microbial environment, the microflora of the gastrointestinal (GI) tract of brook trout, *Salvelinus fontinalis*. A positive correlation between microbial Hg resistance (HgR) and antibiotic (Ab) resistance (AbR) has been observed by previous studies. This correlation presumes that the genetic determinants responsible for HgR and AbR are closely linked. In order to elucidate the specific transfer capabilities of these genes, the microflora must be characterized for HgR and AbR. Bacterial isolates were obtained from the ingesta and epithelium of 3 GI tracts from 22-29 mo old brook trout that were reared in the Dry Mills Hatchery, Gray, ME. Genomic DNA was purified from 36 bacterial isolates and used to amplify a portion of the 16S rDNA gene by PCR. These amplicons were characterized by denaturant gradient gel electrophoresis, and sequenced for genera determination. BLAST analyses show that representative sequences have 100% similarity to *Pseudomonas, Salmonella, Acinetobacter, Carnobacterium, Arthrobacter, Dietzia, Serratia, Aeromonas, Enterococcus, Micrococcus, Staphylococcus*, and *Bacillus*. Variable AbR was observed through minimum inhibitory concentration testing. The *Micrococcus* sp. exhibited no resistance, while some *Pseudomonas* sp. isolates showed resistance to 12 out of 22 tested Ab. PCR probing for the mercuric reductase gene merA amplified putative genes in 18 of the isolates.

RESTRICTED ENVIRONMENTS: REFORMATTING SPECIAL AND SPECIALIZED EDUCATION TO EFFECTIVELY TEACH CHILDREN WITH LEARNING DISABILITIES.

Ariel Martin-Cone ('04), Education and Human Development

This thesis looks at the current state of special education in the U.S. The historical legislation and organization of special education is described, and the norms and belief structures contributing to the problems and successes in special education are discussed. I present an overview of Montessori and Quaker education as comparitive systems, and provide case studies to two such

schools for real-life examples and practice. Based on the state of public education today, I use the legacy of special education alongside Montessori and Quaker philosophy to design a hypothetical classroom that would better address the needs of todays learning disabled children. The project is intended to move beyond the current limitations of public education and draw upon other frameworks for guidance, support and innovation.

THE AESTHETICS OF ADAPTATION: PLAIN JANE GOES TO THE MOVIES

Emma McCandless ('04), English

An examination of Charlotte Bronte's 'Jane Eyre' and several prominent film adaptations of the novel, focusing on filmmakers' treatment of Bronte's aesthetic themes and how these elements have been manipulated and/or altered for the medium of film.

RETHINKING ISRAHEL VAN MECKENEM'S ENGRAVED OEUVRE

Josh McConnell ('04), Art

This paper looks at the works of the fifteenth-century German engraver, Israhel van Meckenem. Scholars traditionally scorn Meckenem, considering him an overly prolific plagiarizer and often present his entire artistic career as little more than a slew of mass-produced copies of other artists' engravings. The primary goal of this paper is to look at examples of Meckenem's "plagiaristic" engravings and to compare them to the originals. This exercise demonstrates, in fact, the broad range in Meckenem's use of preexisting models: from mere reissuing of other engraver's plates under his own name, to examples where appropriated images drastically alter the original. In order to properly assess Meckenem's oeuvre the paper will consider changing conceptions of artistic "originality." Particular attention is given to the importance placed, during the Northern Renaissance, on the practice of copying the works of one's contemporaries and predecessors as a necessary means of constructing and affirming artistic tradition and establishing individual prominence within this tradition.

VIEWING RACE: DECONSTRUCTING 'BLACKNESS' IN AMERICAN SITUATIONAL COMEDIES, 1969-1992

Kelly McGowan ('04), American Studies

Television is an integral part of our media culture, and like all forms of social discourse, helps to shape not only our values, beliefs, and attitudes, but also people's sense of themselves and their place in the world. Consequently, television productions are valuable texts for cultural analysis. This work seeks to understand the ways in which three American situational comedies—Room 222, Good Times, and The Cosby Show—operate as sites for the negotiation and dissemination of ideologies regarding racial construction. Approaching the topic from a historical standpoint provides important context for articulating the relationship between racial ideology, culture, and the construction of 'blackness' during the rise of American conservatism.

SEQUENCES OF ATTACK MODES AND PREY HANDLING BEHAVIOR FOR THE SPIDER *NUCTENEA PATAGIATA*

Andrew A. McKenna-Foster ('04), Biology

The attack behaviors and the prey handling behavior in the common spider *Nuctenea patagiata*

(Family Araneae) were investigated using live baby crickets (*Acheta domesticus*) and live fruit flies (*Drosophila melanogaster*). Specific behaviors with a focus on the prey wrapping were recorded for single and double prey introductions. Flowcharts were created to display the findings and the silk wrapping behavior was quantified and compared between prey types and single and double prey densities. *N. patagiata* wrapped the crickets significantly more times than the fruit flies. The handling behavior for a prey item was shown to be of a shorter sequence if a second prey item was present in the web.

DNA-BINDING STUDIES OF POTENTIAL ANTICANCER RHODIUM COMPOUNDS.

Szymon Mikulski ('05), Chemistry

The DNA-binding properties of a series of dirhodium acetate compds., Rh2(CH3COO)4(H2O)2, [Rh2(CH3COO)2(CH3CN)6]2+, and Rh2(CF3COO)4(H2O)2 were studied in reactions with double-stranded salmon testes DNA at various compd.-to-DNA ratios. Each reaction was arrested and analyzed at regular intervals over a period of 100 h. Unbound rhodium compd. was then removed via centrifiltration. The retentates were analyzed for [DNA] by using UV-vis spectrophotometry, and rhodium content was detd. by graphite furnace at. absorption spectroscopy (GFAAS). The resulting DNA-binding curves generated for the three dirhodium compds. indicate that each compd. does bind covalently to duplex DNA and that Rh2(CF3COO)4(H2O)2 has the highest DNA-binding affinity and rate of reaction. Denaturing PAGE expts. have confirmed these DNA-binding results and also indicate that a significant portion of the covalent rhodium-DNA adducts are interstrand cross-links.

WHO COMES OUT TO PLAY? OPPORTUNITY AND INTEREST IN COLLEGE SPORTS: A CRITICAL ANALYSIS OF TITLE IX AND ITS EFFECTS ON INTERCOLLEGIATE ATHLETICS 1972-2004

Laura Mistretta ('04), Government

There has been ample research on the impact of Title IX on Intercollegiate Athletic programs and on the social influences of the law in changing norms about women athletes. The law has undoubtedly led to increased opportunity and participation in sports for women over the past thirty years. However, the way the law is currently being enforced presupposes that men and women have equal interest in participating in college athletics. This study focuses on identifying opportunity and interest levels for both men and women to participate in sports at the college level, focusing mainly on the NESCAC. The study will look at whether or not interest levels differ for men and women and whether or not the law is in fact flexible enough to reflect those differences. The study concludes that while opportunity levels are more or less equal, participation in college sports has still not reached parity—women are still participating at lower rates than men. While some might argue that this suggests discrimination, there may be evidence to the contrary, implying that women are, in fact, less interested in participating in college sports than men.

SEQUENCING AND OVEREXPRESSION EFFORTS OF THREE ABSCISIC ACID-MEDIATED CEREAL GRAIN PROTEINS -TAABF, TAWD40 AND AFN1-3

Jennifer A. Mojo ('04) and Michael J. Molloy ('04), Biology

PKABA 1 is a protein kinase located within the abscisic acid (ABA) signaling pathway

responsible for ABA-suppressed gene expression in cereal grains. Three proteins have been found that interact with PKABA1. TaABF and TaWD40 directly interact with PKABA1 in wheat cells. AFN1-3, an oat protein, is believed to signal and initiate the early steps of seed germination. In order to study the functional roles of these three proteins, large quantities of each protein needs to be produced. Partial cDNAs for each protein were obtained. Previous attempts to sequence the full length TaWD40 cDNA were unsuccessful. Therefore, a cDNA similar to the TaWD40 gene was acquired in hopes that it may be full length, providing us with the necessary template for sequencing. Approximately 1000 nucleotides of the (+) strand and 700 nucleotides of the (-) strand were sequenced; however, it appears approximately 400 nucleotides on the 3' end are missing. Colonies of E. coli containing plasmids with the partial cDNA inserts of each protein were used to overexpress each fusion protein. Nickel affinity columns were used to separate the fusion proteins from the *E. coli* proteins. During the purification procedure, the 6x His-tag fusion proteins adhered to the column, while the *E. coli* proteins were removed with washes of various pHs. In theory, the majority of the *E. coli* proteins are removed during the washes. However, the purification and overexpression technique still need some improvement.

KINETICS OF PLASMA CELL PRODUCTION DURING THE PRIMARY IMMUNE REPONSE IN LANDLOCKED SALMON (*SALMO SALAR*)

Pat Slipp ('05), Joel Morash ('05) and Elizabeth Mayhall, Biology

Far less is known about the immune system of fish than of higher vertebrates. Many differences exist between the adaptive immune systems of fish and mammals. While fish have a spleen, thymus, and gut-associated lymphoid tissue, they lack bone marrow. Instead, the anterior (head) kidney appears to serve as site for both lymphocyte development and activation in fish. Before we can understand memory cell production, a more complete picture must be drawn of the normal course of fish B cell responses. Our study focuses on the location and kinetics of antibody secreting cell (plasma cell) production during the primary response to protein antigens. We immunized groups of 9-10 month old hatchery-reared landlocked salmon i.p. with dinitrophnyl conjugated keyhole limpet hemocyanin (DNP-KLH) in complete Freund's adjuvant (CFA), or an equal volume of phosphated-buffered saline in CFA as a control treatment. Fish were sacrificed at days 14 and 21. DNP-specific plasma cells in the spleen and head kidney were enumerated by ELISpot assay. At day 14 we have detected significantly more DNP-specific plasma cell in both the spleen and head kidney of DNP-immunized fish versus controls. Interestingly, the number of antigen specific plasma cells per million lymphocytes in the head kidney outnumber those in the spleen by a factor of 5 at day 14. No significant differences were found on day 21. To locate the specific antibody secreting cells in tissue sections we biotinylated DNP-BGG. This reagent should bind to DNP specific antibodies and allow those cells to be visualized in immunohistochemistry. This process will help us get an understanding of the distribution of plasma cells in both the spleens and the head kidneys.

ANTI-SEMITISM: THE PAST AND PRESENT OF THE JEWISH COMMUNITY OF BUENOS AIRES, ARGENTINA

Meredith Needle ('04), Anthropology

This paper uses a historical approach to look at the Jews of Argentina and their battle with anti-Semitism. When I first began this project, I was hoping to pick a specific event in the history of the Argentine Jewish community and delve further into that area. However, the more research I

did, the more I realized how little has actually been said about this community. It would have been impossible to pick one or two events to try and analyze. Instead, I have chosen what seem to be the most important events or time periods in the history of this community: la Semana Tragica, Peron's Nazi-friendly government, the dirty wars of the 1970's, the terroist bombings of Jewish centers in the 1990's, and the economic crisis of today. These historical events will illustrate the struggle of Jews living in the context of the Argentine state. The power of the state to control the laws, the means of both symbolic and actual violence, and, in theory, represent the collective will and common interest of all Argentine citizens, has been influential in shaping the way broader Argentine society views this community as well as the way that members of this community view themselves.

JAPANESE CHRISTIANITY

Tu-Quyen Nguyen ('06), Religious Studies

A predominantly Western religion, Christianity has permeated different societies around the world. Japan is no exception. Although the lifestyles of Buddhism and Shinto are deeply embedded into the Japanese culture and society, Christianity, a 'foreign' religion has had a significant impact in the nation. Japanese Christians comprise of 1% of the total population, however, this percentage is not indicative of the influence that Christianity has had. During this past January I was given the opportunity to study in Aomori, Japan and while there I was able to research Christianity in Japan, and perhaps more specifically the influence that traditional Japanese culture has had on the Western religion. In addition to this, I will be presenting my predictions on the future of Christianity in Japan and other interesting discoveries that I made while abroad.

NEUROGENESIS IN FIDDLER CRABS: IS NEURONAL PROLIFERATION REGULATED BY TIDAL RHYTHMS?

Aubris L. Pfeiffer ('04), Biology

Neurogenesis, or the growth of new neurons, has been documented in a variety of species but the regulation behind such neural proliferation is not well understood. This study documents adult neurogenesis in fiddler crabs, *Uca pugilator*, and verifies the presence of new neuronal cell growth. To investigate the mechanisms underlying the neurogenesis, crabs were tidally entrained and acclimated to a 24-hour light period. Crabs were injected with the nucleic marker, Bromodeoxyurindine, their brains were dissected and immunocytochemically prepared, and finally analyzed with fluorescence microscopy. Are fiddler crabs differentially growing new neurons depending upon tide cycle?

ESTIMATING THE IMPACT OF STATE POLICY INCENTIVES ON WIND POWER DEVELOPMENT.

Kellie K. Phelan ('04), Environmental Studies

Wind power has recently become a viable alternative to conventional fossil fuels for electricity generation because of decreasing costs and the presence of various policy incentives. Pressing environmental issues and concerns about energy security have also prompted interest in wind power as an alternative fuel source. Though less than one percent of the United States electricity supply currently comes from wind power, state policy incentives have the potential to influence

the development of the significant wind resources found throughout the United States. This paper estimates the effectiveness of various policy incentives on state wind power development. It tests the hypothesis that the presence of policy incentives will have a positive influence on a state's decision to install wind energy capacity, as well as on how much capacity a state installs. The combination of empirical work bolstered with case studies demonstrates not only that state policies are important to supporting wind power development, but also that all polices are not equal in their impact. Understanding the determinants of success and failure will be a key for designing effective polices in the future. This is a critical time because effective policies can lead to a significant amount of wind power generation and states have the opportunity to make wind power a reality, but they must have effective policies to capitalize on that opportunity.

DEFENSE AND DEFIANCE: THE RUSSIAN OLD BELIEVERS OF THE 1660S

Karen Prager ('04), History

In Russia's history, the government and the Russian Orthodox Church often tolerated instances of paganism or beliefs that diverged slightly from Orthodox Christianity. If a group of people practiced outside the canon, as long as they were quiet they were allowed to continue their worship. This practice of condoning different behavior because it happened far away from the capitol continues throughout Russian history. However, in the story of the early Old Believers there is a clear departure from this old policy of tolerating difference. This departure was tied to the goal Tsar Alexis Michalovich set for his reign over Russia—that she would become one unified nation in both Church and State. Tsar Alexis's desire to unify all of Russia under one faith and government would not allow for mulitple liturgies for the Church. His reforms to the Church altered what many Russians saw as the most important aspect of the Russian Orthodox Church—its traditions. When the Old Believers asked to be allowed to continue their practices apart from the Church, Alexis refused to comply to their wishes. To back up his words, Alexis committed military resources to the periphery—an area many tsars would have ignored. Alexis's decisions left Russia weaker and more divided than it had been at the beginning of his reign.

POLYETHYLENE IN PROESTHETIC KNEES

Peter J. Rice ('04), Physics and Astronomy

The Dartmouth Biomedical Engineering Center over the last 25 years has conducted research in the world of prosthetic joints. During January of 2004 I worked with them specifically in the area of knee joints and bearings. I was involved with the study of retrievals from patients. Through the use of Fourier Transform Infrared Spectroscopy and Mechanical tests on an Instron machine we were able to determine that tests done in the lab match up with the results that occur within the human body. A set of experiments to determine the effects of a Xylene marker on the polyethylene bearings was also initiated while I was there due to some data which I collected. The preliminary results showed no effect by the marker on the polyethylene but research has been continued since then in the area. The majority of my time was spent studying the Miller-Gallante II knee design searching for evidence of backside wear. Backside wear is considered to be the cause of osteolysis in many patients and therefore finding a way to prevent it, if it is happening, is a goal of the DBEC. Data was found that supported backside wear and creep in the polyethylene inserts and my research will continue in this area over the summer.

DEVELOPMENT OF GENETIC MARKERS IN THE ENDANGERED UTAH PRAIRIE

DOG (*CYNOMYS PARVIDENS*)

Thomas Rogers ('04) and Patrick Ely ('05), Biology

This research is part of an ongoing effort to develop genetic primers for variable microsatellite loci in the Utah prairie dog, *Cynomys parvidensis*. The Utah prairie dog is a threatened species found in three major sites in Southern Utah and exists in isolated populations. Because of the extreme isolation and small population size, there is thought to be high levels of inbreeding that has decimated the genetic diversity of alleles within the species. We are looking at the effects that this isolation may have on the level of inbreeding in the species by using the primers to determine paternity of multiple-sired litters. To develop primers, we created a DNA library enriched for microsatellites, sections of repetitive nucleotide sequences (for example GATGATGAT…). We are currently amplifying the samples using PCR and then sequencing the DNA to isolate microsatellites. These markers will eventually be used for an ongoing behavioral study comparing differences in social systems among several prairie dog species. This research will also aide in current conservation management of the Utah prairie dog.

EDUCATION AND PARTICIPATION AS VEHICLES TO EMPOWERMENT: THE IMPACT OF NON GOVERNMENTAL ORGANIZATIONS ON STREET CHILDREN IN LATIN AMERICA

Melissa Rosales ('04), Latin American Studies

This paper investigates the role street children's non-governmental organizations can play in empowering their beneficiaries. Four areas serve as vehicles to empowerment: the combination of short and long-term needs, access to primary and secondary schooling, as well as vocational skill workshops, and opportunities for active participation. Four projects in La Paz, Bolivia are the case studies for this paper. Membership in these programs can result in greater empowerment of the street children in the areas examined: former street children experience a heightened self esteem and level of happiness; a bridge is often forged from the informal to the formal economy through education and vocational skill training; many gain control of their money and chose how to save or spend it; and, they now have a greater hope for the future. Empowerment indicators in active participation were not as clear as the children either did not understand how to participate or they were not given the opportunity. In the conclusion, best practices are looked at, as well as suggestions for improvement and increased effectiveness.

FUJI ECO PARK VILLAGE: AN ORGANIC FARM IN JAPAN SEEKING SELF-SUSTAINABILITY

Anna Royer ('04), East-Asian Studies

I will be presenting on my experiences farming at Fuji Eco Park Village in Japan during the summer of 2003. This will be a reflection on environmental solutions suggested by Fuji Eco Park Village Founder Imai Masuhara, the practicality of the sustainable living conditions practiced on the farm, as well as a general discussion of some current social perceptions of organic food in Japan. The presentation will include research by Sonia Rupcic, an undergraduate student at University of Chicago.

ALTERNATIVE SITES OF MISREPRESENTATION: GOING FROM BORDERLAND TO HOMELAND IN A TRANSNATIONAL SETTING

Adam Saltsman ('04), Anthropology

In this study I focus on the transnational migration of Vietnamese, particularly the process of establishing space for oneself in the United States, the place of diaspora for a variety of peoples. Rather than focus on the patterns of adaptation or assimilation that many scholars study, however, I have decided to step back and look at two alternative sites of cultural production that influence public representation of Vietnamese Americans. I first examine popular conceptions of Vietnamese and Vietnamese Americans by drawing connections between attitudes and patterns of behavior among Western tourists in Vietnam and their sources in the United States film and literature industry. I then look toward a cross section of the history of academic literature regarding Vietnamese refugees in the United States emphasizing the tendency to impose a notion of textualized, unified cultural identity in a binary opposition between the cultural and traditional against the modern, capitalist neoliberal, and assimilated. Throughout the whole project I suggest the rootedness of these sites of cultural production in the theoretical framework of Edward Said's Orientalism.

EVALUATIONS AND PROJECT EFFECTIVENESS

Kristin Saucier ('04), International Studies

An investigation of how evaluation processes of small-scale development projects in Bolivia affect a project's effectiveness and sustainability. Specifically, it compares Peace Corps projects to projects implemented by other international development agencies.

THE ROLE OF THE PARIETAL EYE IN THERMOREGULATION AND LIGHT SENSITIVITY IN THE GREEN ANOLE, *ANOLIS CAROLINENSIS*

Wendy A. Sicard ('05), Environmental Studies

The parietal eye is a photosensory organ connected to the pineal body in the vertebrate brain. The parietal eye of the lizard is located on top of its head, with the lens immediately below a transparent cornea-like skin. In this study, I explored several behaviors previously associated with the reptilian parietal eye, such as thermoregulation and light and dark sensitivity, through laboratory experiments on the green anole, *Anolis carolinensis*. Specifically, I tested the hypothesis that lizards with the parietal eye covered up, or “ablated”, show decreased ability to properly thermoregulate, and decreased sensitivity to light and dark, as in response to a predator.

RELIGIOUSLY MOTIVATED COMMUNITY DEVELOPMENT IN UTTAR PRADESH

Nathan J. Sigworth ('06), Physics and Astronomy

In the third century BC, King Asoka enacted sweeping societal transformation motivated by his Buddhist faith. Many of the hospitals in India were founded by missionaries during British colonialism. How do such religiously motivated projects separate their religious work from secular work? For Kachhwa Christian Hospital, a tiny one-hundred year old hospital near Mirzapur, India, there is no such separation. By reaching villages in Uttar Pradesh with agricultural development, education and health care, Raju and his team of young doctors and agriculturalists hope to initiate a massive movement of villagers to become followers of Jesus while remaining part of their Hindu communities.

THE EFFECTS OF EAVESDROPPING ON THE AGGRESSIVE ABILITY AND

TESTOSTERONE LEVELS OF THE JAPANESE QUAIL (*COTURNIX JAPONICA*)

Christina E. Sinnamon ('04) and Christin N. P. Reckman ('04), Biology

Eavesdropping is a technique used by many species for strategic purposes, and has been demonstrated as a plausible technique used by male swordtail fish and anoles. Female Japanese quail (*Coturnix japonica*) use eavesdropping as a technique for choosing a male, usually choosing the less aggressive looser of the match, as he is less likely to hurt her during courtship and copulation. Testosterone is closely associated with aggressive behavior, particularly in males vying for territories and mates. Our study determined if male Japanese quail benefit in battles with other males, if they eavesdrop upon the previous match. We also tested whether changes in testosterone levels had any correlation with eavesdropping results. Eavesdropping was found to make no difference in the success of the eavesdropping male over the control male in their battles. Testosterone levels were also found to be unaffected by eavesdropping. Our results do not suggest that eavesdropping affects the outcome of male-male competition in Japanese quail, so would not be a technique used in the wild.

COLBY'S ROLE IN GLOBAL CLIMATE CHANGE

Brandon Smithwood ('06), Environmental Studies

Colby College's Green House Gas Emissions Inventory was created so as to give Colby an overall sense of its consumption and emissions trends. This presentation will explain where we are, how we got there, and why by examining trends of consumption and the emissions of methane, nitrous oxide and methane. The presentation will discuss the effects of several 'green' initiatives adopted by Colby and close with a few suggestions as to how the college can further reduce its impact on the earth's climate.

THE COURSE OF THE EMPRIRE: THE HUDSON RIVER SCHOOL AND THE LANDSCAPE OF PROGRESS

Karsten Solberg ('04), History

The Hudson River School of artists painted during an era of unprecedented change. When the group began painting in the early nineteenth-century, their landscapes consciously captured the American scenery as it adopted to the pressures of progress and the Industrial Revolution. Using Hudson River painter Thomas Cole's 'The Course of the Empire' landscape series as a guideline for the study, the research spans the course of the century and investigates how the developing needs and reactions of the patron effect the artists' landscapes. The study looks at five stages of human civilization through landscape: the primordial wilderness, the pastoral or arcadian state, the height of civilization, its destruction, and the final reemergence of nature over ruins. By looking at different Hudson River paintings in social, political, and technological contexts, the research shows the breadth of American reactions to progress. Reactions ranged from a welcoming embrace of technological advancements to an all-out disdain for any progress that would destroy God's created land. As the paintings show, Americans used the landscape as either a gauge of deterioration or an indicator of their successes.

EXPLORATION OF IMPLIED LINE AND MOTION

Alan Stimpson ('04), English

During January I spent between six and eight hours a day in the studio laminating plywood and then carving and sanding until the surface was uniform and smooth. The project yielded six individual pieces, four of which are in the Student Art Show, and led up to a seventh piece finished as my first project for Sculpture IV. The pieces themselves are organic in shape and draw on geographic features revealed by erosion, plant forms, and human forms. They are not for the most part modelled after any one object, but rather have a variety of influences and are more abstract than purely representational.

KANT'S ARGUMENT FOR THE IMMORTALITY OF THE SOUL

Chris W. Surprenant ('05), Government

Immanuel Kant's argument for the immortality of the soul, which he refers to as a postulate of practical reason, plays a fundamental role in his philosophical theory. It is surprising, however, that little attention has been given to this argument in the secondary literature, at least in comparison to the arguments for the existence of God and human freedom, the two other postulates of practical reason. This paper examines this argument for immortality in detail, not only analytically examining the argument itself, but also showing how this argument relates to Kant's philosophical theory in general.

GIS ANALYSES OF LAND USE PATTERNS AND CHARACTERISTICS IN THE THREEMILE POND WATERSHED KENNEBEC COUNTY, MAINE

Jenn Tackaberry ('04), Laura Walker ('04) and Kelly Welch ('04), Biology

The land use patterns and characteristics of the Threemile Pond watershed were analyzed in the summer and fall of 2003 by students and faculty in the biology department at Colby College. Recent algal blooms and community concerns led to the study of this particular watershed. Land use patterns and residential development, combined with natural watershed characteristics, are major factors in current lake health. A Geographic Information System (GIS) was used to model watershed characteristics and patterns. Aerial photographs from 1956 and Digital Orthophoto Quadrangles (DOQ) from 1998 were analyzed using Arc View 8.2TM. Land use maps were created for 1956 and 1998, allowing for a determination of the percent land use change. Major changes in land use patterns included a decline of mature forest from 47 percent of the watershed in 1956 to 16 percent in 1998. The land use maps, along with soil and slope maps of the watershed were used to create septic suitability and erosion potential models. Residential surveys were conducted to assess the conditions of the roads and buffer strips within the watershed. Paved state and municipal roads contribute approximately 45.12 kg per year to the phosphorus load, while camp roads contribute 29.75 kg per year to the load. This information can be used to plan for future development and to initiate community involvement in the maintenance of watershed health.

STEAM RISING : INNU ENVIRONMENTAL STRUGGLE IN NITASSINAN (LABRADOR), CANADA

Josiah J. Taylor ('05), Anthropology

Innu people live in Nitassinan, on the Labrador peninsula in northeastern Canada. Due in part to their extreme isolation they currently face great violations of their land by resource extraction corporations. These take the forms of mining (primarily nickle), forestry, and intensive

hydroelectric damming projects. Furthermore, the Canadian government and NATO use a military base in the center of Innu territory for low-level supersonic aircraft flight training. Through poetry and image we will begin to address the spiritual, cultural and environmental impacts of these largely unheard of human and environmental rights violations.

WORD & IMAGE IN THE CONTEMPORARY ARTIST'S BOOK

Rachel Tobie ('04), Art

Artists' books have a long tradition, appearing in every major movement in art and literature. However, a single definition of the term 'artist's book' remains elusive. Perhaps this is due to the wide variety of formats and purposes among artists' books; an artist's book may be made out of any material and contain any message, as long as the book has been (in Ulises Carrión's words) 'conceived as an expressive unity,' cohesive both in physical structure and content. Artists' books offer an ideal embodiment of the multifarious interactions between words and images This paper closely examines the relationships between words and images in several artists' books; it accompanies the exhibition 'Word & Image in the Contemporary Artist's Book,' on view at the Colby College Museum of Art, April 29-May 23, 2004. The exhibition includes a diverse group of artists' books dating from the 1960s through the present day. Artist's books displayed in the exhibition and examined in this paper include works by Martha Hall, Ann Kalmbach and Tatana Kellner, Nancy Ruth Leavitt, Jan Owen, Dona Seegers, Scott Vile, and David Wolfe. This paper and the corresponding exhibition are the culmination of Rachel Tobie's Senior Scholars Project as an independent major in Word & Image Studies.

HOW NATURAL HISTORY MUSEUMS FELL FROM GRACE AND WHY THEY SHOULDN'T HAVE OR, DEFENDING MUSEUMS DURING THE AGE OF HYPERSENSITIVITY

Vanessa L. Verri ('04), Anthropology

Natural history museums have been subjected to harsh criticism and condemnation from outside critics who claim that representations of material culture in museums have failed to accurately portray the people, practices and cultures of the world. Museums have been charged with misrepresenting the very groups that they wish to bring to light, and therefore have been deemed by some as unworthy of their title as educational institutions. I confront the relevant histories and present-day status of natural history museums, explaining and defending the practices and exhibits reviewed throughout the course of my study. I argue that most, if not all, museums embrace the educational mission and thus serve as invaluable resources to the public, indigenous peoples, academe, and even the critics who wish to condemn the institutions. My conclusion is founded upon the idea that all museum representations contribute knowledge and encourage onlookers to assume different and varied observational perspectives.

CAPTIVE BREEDING AS A TOOL FOR CONSERVATION

Lauren B. Wolpin ('05), Emily L. Weiser ('04) and Jennifer E. Tackaberry ('04), Environmental Studies

Captive breeding for reintroduction has been an important tool for the conservation of endangered or threatened wildlife. However, many factors inhibit the effectiveness of this method. This study identifies areas that need consideration and improvement: habituation to

captivity, disease susceptibility, genetic viability, financial constraints, and administrative continuity. These factors influence reintroduction success of all species. This study reviews cases of successful and failed reintroduction programs for birds, mammals, and reptiles and presents a review of the most effective methods. While specific guidelines are necessary to improve captive breeding success, the most important consideration remains habitat degradation and loss. This study also presents general recommendations to ensure long-term success in the wild of a broad range of species.

CONSERVATION ISSUES OF THE GREAT BARRIER REEF

Kate Ennis ('04), Dana Wheeler ('04) and Greg LaShoto ('06), Environmental Studies

An examination of the conservation issues currently affecting the Great Barrier Reef. The Great Barrier Reef Marine Preserve is one of the largest preserved areas in the world, spanning almost 350,000 Km^2, but it is also in grave peril and many scientists believe it will not exist in its current form long into the future without drastic changes in the way it is treated by humans. This project attempted to summarize many of the problems currently facing the reef, and also to try to offer practical solutions to these complex, multidisciplinary issues. Areas of focus include: coral bleaching and global warming, coastal runoff and water pollution, and the detrimental effects of the growing tourism industry.

PATTERNS OF RELATEDNESS AMONG TERRITORIAL ADULT MALE NORTHERN FUR SEALS

Courtney Zecher ('06), Biology

Northern fur seals (*Callorhinus ursinus*) exhibit natal and territorial site fidelity that may lead to increased levels of relatedness among individuals at a breeding site (rookery). As a result, the chances of males having interactions with kin increases and creates the potential for nepotism. This nepotistic behavior may play an important role in establishing and maintaining breeding territories. In a previous study, 68 males from three different breeding sites within a rookery on Saint Paul Island, Alaska were screened at 5 microsatellite loci. One site is densely populated and used for background allele frequencies and the other two are low-density areas in which primary and secondary males were sampled. Primary males are those that hold territories with females and secondary are those who are on the periphery without females. Data confirmed that many males within the coves are closely related. These findings suggest that there is a potential for nepotism within the fur seal rookeries. To augment this study and determine whether high levels of relatedness are typical across rookeries, the purpose of this study is to measure relatedness among seals from a neighboring rookery. We have DNA from 37 male and 37 female seals. We are including female seals in this study for comparative purposes. Females also exhibit natal site fidelity. By comparing their relatedness levels we can determine if the high levels of relatedness among males is due only to their site fidelity or if they are potentially seeking out and clustering with kin. If that is the case we should find that male relatedness is higher than female relatedness. We are using the same five loci from the earlier study and are currently in the process of screening the seals at each microsatellite locus.

A LASER FLASH PHOTOLYSIS STUDY OF DIHALOCARBENES IN ROOM TEMPERATURE IONIC LIQUIDS

Jeffrey H. Goldberg ('04), Chemistry

There appears to be no report to date of the photochemistry of dihalocarbenes in room temperature ionic liquids (RTIL). This work will describe the results of time resolved laser flash photolysis (LFP) studies of selected dihalocarbenes, generated in RTIL, from the photolysis of precursors. To understand the effect of the ionic media, carbene lifetimes determined in RTIL will be compared with known lifetimes obtained in conventional organic solvents.