Francine Abe '03 and Sara Miller '03
Shyril O’Steen, Biology

Sex and Survival: An Evolutionary Approach to the Study of the Guppy, Poecilia Reticulata
Trinidad guppies, Poecilia reticulata, are used as a model system to study the process of evolution because their unique natural environment has allowed variable traits to evolve in separate populations of high and low predation. We are using the guppy to research the evolution of anti-predatory and mating behaviors of fish. While most anti-predator research has assumed that swim speed is a crucial factor in prey-escape performance, many studies stress the importance of behavior over speed. Our experiments test the relative importance of swim speed and escape tactics to survival. One of the theories of sexual selection, a component of natural selection, is that the female mates with a specific male because his good genes will be passed on to her offspring, increasing their chance for survival. Male Poecilia reticulata would signal their good genes to females through their courtship displays. Our experiments test two hypotheses: what are the specific traits, kinematic and behavioral, linking mating displays and predator evasion? And do females prefer to mate with males whose courtship display is linked to successful predator evasion?

Evan Ackerman '05
Gene Clough, Geology and Physics

Using Remote Sensing Data to Compare Impact Craters on Mars and Venus
Impact craters are formed when meteoroids collide with planetary masses. They are important because their structures reveal surface and subsurface properties, such as surface resiliency and lithospheric thickness. In this project, remote sensing data were used to analyze and compare the characteristics of impact craters on Mars and Venus. Crater sizes were measured, and visual observations were made on the characteristics of the craters and the surrounding terrain. Measurements were taken from optical images from the Global Surveyor spacecraft and the Viking spacecraft at Mars, and radar maps from the Magellan spacecraft at Venus. Both visual and statistical analysis of the data supported initial hypotheses about crater type transition. Additional visual analysis showed recent crater-created fracturing and lava flows on Venus, which may be an indication of a relatively thin lithosphere. Craters with fluidic ejecta on Mars may indicate past surface or subsurface water or ice deposits.

Andrew Akre '03
William Pope L, Theater

Inside/Outside
A solo performance thesis that looks at the lives of a few individuals and experiences having to do with fear. The performance contains adult themes.

Stella Aniagyei '03
Tom Wenzel, Chemistry

Carboxymethylated Cyclodextrins as Chiral NMR Shift Reagents
Cyclodextrins are torus-shaped compounds comprised of six or more glucose rings bonded together by 1 4-glycosidic linkages. Beta-cyclodextrin is made of seven glucose units and has relatively poor solubility in water. Attachment of ionic groups is known to enhance the solubility and therefore enhance NMR studies of inclusion formation of beta-CDs. Attempts were made to synthesize primary- and secondary- substituted carboxymethylated beta-CDs. Secondary derivatives with increasing degrees of substitution were successfully prepared. Synthesis of primary carboxymethylated derivatives is currently underway. The effectiveness of the primary- and secondary- substituted carboxymethylated beta-CDs and their lanthanide complexes as chiral NMR solvating agents will be described.

Anthropology Panel
Heather Lindkvist, Anthropology

Lewiston Lead Awareness Project
This past semester, students participated in a service learning project for the anthropology class “Medicine and Culture.” The goal of this project was to determine the reason for the lack of blood lead testing in
children residing in census tracks 201 and 204. The project entailed administering a survey to residents in the aforementioned census tracts. The findings will be presented to the board members of the Auburn/Lewiston Lead Hazard Control Program at the end of the semester. The long term goal is to help the Lewiston/Auburn communities increase lead awareness so that all parents will realize the necessity to get their children’s blood lead levels tested. In addition to the group PowerPoint presentation, each panelist will discuss the research question he/she has developed as part of this project.

- Erin Bednarek '05
- Aron Bell '04 (group leader)
- Jessica Celentano '05
- Stacy Counter '03
- Jason Rafferty '05
- Meghan Thornton '05

Erin Bednarek
Aron Bell
Jessica Celentano
Stacy Counter
Jason Rafferty
Meghan Thornton

Alyssa Asack '04
Margaret Imber, Classical and Medieval Studies

The Aristocratic Athenian Wife

Ancient Athenian society consisted of a highly patriarchal system, marked by explicit competition for male honor. This honor, and obverse dishonor of a man can be analyzed through the very interesting and complex sexual roles within society, particularly within the relationship between husband and wife. “On the Death of Eratosthenes,” written by the great logographer, Lysias, is a case that deals specifically with the roles and relations between husband and wife, as well as the laws and political dynamics that arose when a man’s wife was seduced and his honor was put on the line. A thorough analysis of the case and Virginia Hunter’s book, Policing Athens, provide a challenge to the traditional view of the role of the aristocratic Athenian wife. A careful analysis provides evidence that the ancient aristocratic Athenian wife wielded significant power and control over the household and her husband.

Smadar Baković '03
Mishael Caspi, Religion

Palestinian Poetry in the 20th Century

My presentation will briefly explore Palestinian poetry as it emerged after the creation of the State of Israel in May 1948. I will read two Palestinian poems and discuss their significance. I will then read two Pre-Israeli Jewish poems from the 11th century in order to compare and contrast them with Palestinian poetry. In particular, I will make the point, Palestinian and Pre-Israeli Jewish poems are very similar, especially in the yearning the poets express for the very same plot of land.

Amanda Bellino '03
Charles V. Carnegie, Anthropology

A Documentary Film Entitled Surviving Identity

I would like to submit a documentary film entitled “Surviving Identity” made last year by Eduardo Crespo and myself. This film features the lives of two Bates students, Alake Pilgrim and Taiki Kubota and discusses the concept of ethnic and racial identity in the United States. These two students illustrate their experiences both at home and in the context of the United States and the Bates campus. Most importantly, Taiki and Alake discuss how racial and ethnic identity is a constantly changing aspect of an individual, which may be interpreted differently by different people, depending on different times and in different political, social and economic contexts.

Lesley Boakye-Danquah '03
John Kelsey, Psychology and Neuroscience

An Animal Model of Schizophrenia

Schizophrenia is a psychiatric disorder estimated to affect at least 2 million Americans (Ellenbroek & Cools, 2000). The pathology of the disease may be due to an abundance of dopamine (DA) and an associated decrease in glutamate circulation in the mesolimbic dopamine system of the brain (Andreason & Olsen, 1982). Schizophrenic symptoms can be produced artificially by injections of the glutamate receptor antagonist phencyclidine (PCP). Recent evidence suggests that schizophrenics are at an increased risk of
drug addiction (Chambers et al., 2001). Since drugs of addiction also enhance DA release in the mesolimbic DA system, these findings suggest an overlap in pathophysiology. The logic behind this thesis was to determine if manipulations that enhance drug addiction, e.g. lesion to the medial septum (Kesley & Grabarek, 1999), would also enhance schizophrenia, presumably by enhancing DA activity in the mesolimbic pathway. Consistent with this hypothesis we found that medial septal lesions produced behavioral effects in a hole board apparatus (HBA) set up, similar to the effects of PCP administration. This finding implicates the medial septal area as one of the key neurosubstrates affected in schizophrenic pathology and a useful site of intervention in producing animal models of the disease.

Christina Bouris '03
James Parakilas, Music

Western Music's Other: World Music in Context
This thesis explores how world music is represented and appropriated in Western culture. More specifically, it will be studying the position of world music in local academic and commercial contexts. Encounters with world music are directly shaped by the ways it is presented. Interviews with college professors and commercial world music presenters reveal how world music is represented within the unique context of southern Maine. Edward Said’s approach in his book Orientalism provides the foundation for this analysis. As the Orient has been and continues to be exoticized and labeled as an ‘Other,’ so too have persons, cultures and musics within the world music category. In the end, this thesis points towards better ways to study and present musical cultures from the position Said calls “a libertarian, or a nonrepressive and nonmanipulative, perspective.”

Brandon Breen '03 and Andrew Walsh '03
Shryil O’Steen, Biology

Guppy Escape Behaviors and Athleticism: Avoiding Being an Appetizer
Andrew Walsh and I will be discussing aspects of guppy predator avoidance via a power point presentation. We will introduce the topic with information on guppies and their predators in their natural environment, and present background literature concerning guppy anti-predator behaviors and tactics, guppy swimming performance, and the role of predation on shaping the evolution of guppies. Next we will discuss our research, which looked at the connection between survivorship (in a predator encounter situation) and various behavioral tactics, as well as the connection between survivorship and previously recorded endurance abilities.

Swita Charansomboon '04, Jill Lesser '03, Katie Reinhalter '02, and Hannah Jones, Wheaton College
Kathryn Graff Low, Psychology

Interactive Computer-Based Prevention of Body Image Disturbance
The present study is long term follow up of a trial of Student Bodies, an eight week internet-based interactive program for prevention of body image disturbance. Previous research has demonstrated the effectiveness of such programs when they are used in conjunction with a clinically moderated discussion group (Winzelberg, 2000). The present study tested the effectiveness of the computer-based program with and without an accompanying internet-based group or clinical moderation over a period of eight months. Seventy-two undergraduate women were randomized to four conditions: Student Bodies with a moderated discussion; online intervention with an unmoderated discussion group; online intervention alone; and a control group. At eight month follow up, MANOVA revealed no significant differences on eating or body image measures between groups exposed to the program, although the unmoderated discussion condition tended to have the least concerns across domains. These data suggest that the computer-based program was just as effective without a clinical moderator or adjunct discussion groups. Outcomes for women receiving the Student Bodies intervention were significantly better than for control participants, however. Results suggest that interactive computer-based education about body image, nutrition and exercise may be sufficient to significantly reduce body image disturbance over an eight month period.
Rachel Austin, Chemistry

The Photocatalytic Effect of Silver and Zeolites on Carbaryl
Describes the rate at which different silver catalysts decompose the pesticide carbaryl when exposed to ultraviolet light and how they differ according to percentage of silver loading and catalyst type.

Classical and Medieval Studies Panel
Lisa Maurizio, Classical and Medieval Studies

Everything You Wanted to Know about Psychoanalysis but Were Afraid to Ask Ovid
We, the members of CM/WS 219: Greek Myths and the Psychology of Gender, will present a panel in which we analyze the connection between mythology and the modern discipline of psychoanalysis. In particular we demonstrate how myths from Ovid’s Metamorphoses and the work of Donald W. Winnicott illuminate each other. That is, as Adam Phillips writes, “What distinguishes the creative writer is that—like the dreamer and the playing child—he has found a way of rendering unacceptable desires into shareable form.” Myth is that shareable form par excellence and we will discuss how both Ovid and Winnicott understand and represent unacceptable desires, past and present.

- Michelle Gomperts '05: Winnicott’s Failing Mother-Mirror in Greek Myths
- Jennifer Hanley '05: Compliancy in Arachne as Revealed through Winnicott
- Dara Kidder '03: Winnicott's Artist and Daedalus
- Taylor Miles '05 and Elizabeth Santy '06: Apollo and Daphne: Turning a Woman into an Object
- Kim Neeb '03: Mother-Mirroring in Narcissus and Echo
- Amanda Seadler '05: Introduction to Psychoanalysis and Myth
- Naama Zohn '05: Transformation as Flight

Caitlin Cook '03
Steve Hochstadt, History

Motherhood against the Monstrous: Patterns of Mothers’ Reactions to Concentration Camp Hardships
In “Motherhood against the Monstrous,” I explore individual acts of resistance by mothers to the various threats of concentration camp existence in the Holocaust. Among the most prominent functions of concentration camps were the consistent assaults on both the lives and the moral and social frameworks of prisoners. These violations included separation of family members and the creation of a destructively competitive atmosphere which threatened traditional models of social dependency (e.g., the mother-child relationship). As such, I contend that any effort to counteract methods employed by the Nazis to enforce these purposes constitutes significant resistance. My analysis of oral histories and memoirs of concentration camp survivors shows that mothers frequently made decisions about their lives and those of their children in the camps. These decisions reflected values and expectations which vastly exceeded the limited interest of self-survival often categorically assigned to concentration camp inmates. In order to emphasize the importance of the actual drive to resist, I examine cases with varying outcomes. In addition, I discuss the relevance of the “sheep to the slaughter” stereotype in several of its forms, and how many mothers demonstrated priorities that were influenced but not defined by the Nazis.

Sarah Cremer '03
Shepley Ross, Mathematics

Mind Your P's and Q's
A study of dynamical systems uses the orbit and bifurcation diagrams to examine the long-term behavior of particular sequences of numbers, called orbits. An orbit is the list of numbers generated by repeatedly using the output of a function as its input in a “feedback loop.” We discuss properties, similarities, and differences of orbit and bifurcation diagrams to better understand the complicated nature of these orbits.
Henry Crosby '05
Margaret Imber, Classical and Medieval Studies

Litigation in Ancient Athens
As part of a panel, I will present a paper on the trial of an Athenian citizen. The citizen was charged with murder after he killed his wife’s lover. My paper will examine the Athenian conceptions of honor and revenge, using the homicide case as a reference.

Erika Cyr '03, Aurora Dibner '05, Cara Howieson '05 and Jessica Otis '05
Gregory Anderson, Biology

Land Use Influences a White Pine Population at Range Pond State Park
This poster will present a Biology 270 class project investigating the growth and spacing patterns of a white pine population in a dominantly white pine forest at Range Pond State Park, Poland, Maine. The presentation will address the age and recruitment patterns of the whole pine population, as well as primary and secondary growth characteristics for all the major tree species in the forest.

Benjamin Daggett '03
Baltasar Fra-Molinero, Spanish

The Resurrection of the Word in Eduardo Galeano
In this the much hailed “Age of Information,” human societies have achieved a previously unimaginable capacity to communicate with one another. Although these new technologies of communication hold tremendous promise for dialogue, they all too often serve the interest of the select few who control them and the nature of the information which they present. Eduardo Galeano is a writer and social observer who, with refined eloquence, unabashedly denounces mass-media constructs of the world and exposes them for their falsehoods.

Environmental Studies Poster Session
Curtis Bohlen, Environmental Studies

Mapping and GIS Class Project
Students in ENVR 217, Mapping and GIS, are required to prepare a poster relating to a mapping project. The posters presented at the Mount David Summit represent the products of that effort. The map project offers students the opportunity to tackle the practical problems that crop up as they apply GIS technology to a particular area of interest. Both the subject matter of the project and its form varies from student to student. The mapping and geographical analysis tools students have had to use therefore also vary from project to project. Most students develop one or more maps that take a geographic look at particular environmental, geological, social, or economic phenomena. Others have chosen to collect, annotate, and organize geographic data related to student or faculty research. A few students have chosen to explore GIS technology by developing rather idiosyncratic maps of things that one might not think of showing in map form.

- Lauren Atkinson '04: Geographic Range of the Cog Railway Smoke Emissions
- Andrew Beckington '04: Database and Map of Nanibia's Conservancies and Wildlife
- Erin Beirne '05: Zoning Laws and Geologic Phenomena of Ireland
- Rachel Booty '04: Climate Patterns in New England in Relation to Production of Maple Syrup
- Mike Buffo '04: Whitebark Pine Seedlings in North Cascades National Park
- William Cartun '05: Average Gas Prices across the United States (Including GDP Figures)
- Tayler Clarke '06: Map of Land Use of La Selva Biological Reserve in Costa Rica (OTS)
- Daniel Fraiman '03: Reforming Russia
- Daniel Frost '05: Sandy River and Rangeley Lakes Railroad
- Hannah Gaines '03: The Impact of Patch Retention on Ground Beetle Communities in Western Maine
- Isaac Lowenthal '03: Cigarette Butt Receptacles on the Bates Campus
- Elisabeth Markus '03: The Evolution of Ditches on Morse River Marsh
- Karen Moore '04: A Study of Callahan Mine and the Progression of Soil Pollution and Water Quality in Hancock County, Maine
- Brian O'Reilly '03: U.S. Military Presence and Economic Stability
Sarita Fellows '04 and Meredith Mennitt '05
Ellen Seeling, Theater

Costume Designs
We will present our costume designs and design process from our “Costume Design” class and “Introduction to Design” class.

Jesse Fox '03
Music

Composer Concert, Olin Concert Hall

Hannah Gaines '03
Curtis Bohlen, Environmental Studies

The Impact of Patch Retention on Ground Beetle Communities in Western Maine
Increasing living standards and world population place greater demand on natural resources, such as forest products. Current forest harvest practices can cause habitat degradation and loss of diversity. Researchers at the Manomet Center for Conservation Sciences are studying the potential of a method called “patch retention,” for preserving biodiversity on commercial forestry land in western Maine. This thesis examines the effectiveness of patch retention by comparing the diversity of ground beetle (carabid) communities in mature forests, patches, and harvested areas. Carabids are a good indicator of environmental variation due to their species-specific habitat requirements. This study shows that 60-meter diameter forest patches support the same species of carabids found in mature forests, as well as a number of additional transient species. Thus, mature forest communities contain overall fewer species, but with a more even distribution of species abundance; whereas patches and harvested areas support more species, but with a less even abundance distribution. Although the patches support all species found in a mature forest, a 60-meter diameter patch may be the smallest effective forest remnant patch able to do so, as only the community in the very center of the patch resembles that of an undisturbed, mature forest.

Lyle Gerety '03
John Kelsey, Psychology and Neuroscience

Nicotine Addiction: The Effects of Selective Nucleus Accumbens Core and Shell Lesions on Context-Specific Locomotor Sensitization to Nicotine
Drug addiction is a chronically relapsing brain disorder that causes the addict to compulsively administer drugs. Nicotine, like all other drugs of reward, increases mesolimbic dopamine release, which has been argued to produce the perception of reward in rats and humans. Sensitization of locomotion in response to repeated injections of nicotine is thought to reflect neuroadaptations that have made such reward pathways that environmental cues associated with drug taking play a significant role in addiction, we examined the locomotor sensitizing effects of nicotine on nucleus accumbens core- and shell-lesioned rats in two distinct environments. Compared to controls, core lesions increased locomotion to a greater extent than shell lesions, but abolished sensitization when nicotine was administered in an environment distinct from the
locomotor testing environment. These results suggest that the nucleus accumbens core and shell are differentially involved in mediating reward.

**Jennifer Guillaume '03**  
Peter Rogers, Environmental Studies  
**The Social Constructions of Organic Agriculture**  
The presentation explores the social constructions of organic agriculture in terms of the consumer, government policy, and organic farms. Each of these aspects of organic agriculture has formed different working definitions of “organic” from history, media images, and other cultural outlets. The consumer section will be presented by showing the results of consumer surveys that were distributed in several venues of organic products. A discussion of government regulation and legislation of organic agriculture will follow. Finally, a farming systems analysis will be presented on New Leaf Farm, which is a small organic farm in Durham, Maine.

**Elizabeth Hoagland '03**  
Loring Danforth, Anthropology  
**Male Homosexualities in Oaxaca: Rituals and Celebrations**  
“Homosexuality” is not a concept universal to all cultures. Homosexual behavior exists in all cultures, but a specific “homosexual” identity associated with people who engage in homosexual acts does not exist in all cultures. The concept of “homosexuality” does exist in Oaxaca as do homosexual identities. However, the ways in which homosexuality is understood and homosexual identities are constructed are unique to Mexico and more specifically to Oaxaca. My thesis examined the social construction of homosexualities in Oaxaca and the role of global cultural exchanges in this process. My presentation will examine the role of the homosexual community’s appropriation of *la vela*, which is a traditional Zapotec party in the Isthmus of Tehuantepec in Oaxaca. I look at the celebration as an example of the way in which the homosexual community creates a social space and group identity in the city of Oaxaca.

**Adam Hume '03**  
Rebecca Sommer, Biology  
**The cDNA Sequence of Chick β1-Adrenergic Receptor Is Highly Conserved with Turkey Suggesting That the Regulation of β1-AR May Differ between Chicken and Mammalian Species**  
The avian cardiovascular system is a sensitive target of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity. Research has demonstrated that exposure to 0.24 pmol TCDD/g egg inhibits the ability of isoproterenol, a β1-adrenergic receptor (β1-AR) agonist, to increase heart rate of D10 chick embryos. This reduced response to β-AR stimulation could possibly be mediated at the receptor level. We have cloned a nearly complete cDNA sequence of the chick β1-AR by routine RT-PCR. The cDNA sequence of the chick β1-AR is highly conserved with the turkey, sharing 95% nucleotide identity, and shows 80-83% nucleotide identity to mammalian β1-ARs. However, the turkey β1-AR has an alternative splice variant that is not found in mammals, which encodes an additional 59 amino acids at the carboxyl-terminus that block agonist-promoted endocytosis and down-regulation. Given the importance of β1–AR regulation in cardiovascular disease, differential regulation of β1–AR between avian and non-avian species could possibly result in varying sensitivity to cardio-toxic chemicals.

**Alan Hunt '03**  
Lynne Lewis, Economics  
**Locally Produced Foods from Producer to Consumer**  
Farmland in the Northeast is facing increasing risks of development into non-agricultural uses. In order to maintain the long-term economic viability of farmland, an economically viable market for local agricultural goods needs to exist. Contingent valuation survey data collected at the Portland Public Market, regarding willingness to pay for locally produced agricultural goods, mostly oriented towards beef; issues of consumer demand; and some factors that characterize consumer behavior are discussed. Consumer demand is then related to the interaction consumers have with both producers and retailers. I hypothesize that demand relates to the consumer’s perception of community and identity through the communication process. Wolfe’s Neck Farm in Freeport, Maine and the Portland Public Market serve as case studies of the producer
and retailer marketplace in order to explain the consumer/producer relationship and the role of locality in the consumer decision-making process in an era of globalized markets.

Caitlin Hurley '05, Adrienne Eaton '05, and Jessica Edgerly '06
Rachel Herzig, Learning Associate in Political Science

Facing the Future: Combating Hunger and Homelessness

Throughout the academic year, the Hunger and Homelessness Awareness Committee has been working hard to raise the consciousness of the Bates community regarding the issues of hunger and homelessness. We want to do a presentation that will both explain our mission and share information regarding these critical subjects. Our presentation will be divided into two parts. The first half of our presentation will explain events that we have done to raise awareness and funds for hunger prevention programs, including the hunger fast, a benefit concert, and the dinner modeling class divisions throughout the world. The second half will focus on our second semester efforts regarding homelessness issues. Both parts of these presentations will explain actions that we have taken to raise awareness, while also providing valuable information about the urgency of this issue to listeners.

Owole Josephine Idoko '03
Rachel Austin, Chemistry

The Effect of Filamentous Bulking on Activated Sludge Treatment

This research questions whether the current wastewater treatment process is adequate, by looking at the common operational problem of activated sludge bulking caused by *Sphaerotilus natans*, and analyzes the specific case of the Lewiston-Auburn Water Pollution Control Authority. Using insight from laboratory and fieldwork at LAWPCA, this research analyzes the effect of filamentous bulking on activated sludge treatment. *S. natans* adhere to activated sludge flocs creating large buoyant flocs, and act as parachutes that slow down settling. This bulking allows activated sludge to be carried out into the receiving stream where it can severely impair aquatic life. What is most interesting about *S. natans* is that they are microaerophiles (Holt, 1994). At higher levels of oxygen they are out-competed by other dominant aerobic organisms; therefore, they should not survive the well aerated secondary treatment process. Because of the difficulty in establishing preventative strategies, chlorine, a chemical additive, that targets treatment is being used.

Maria Joachim '03
Pamela Baker, Biology

Susceptibility of Old A/J Mice to Porphyromonas gingivalis-Induced Alveolar Bone Loss during Periodontal Disease

Periodontal diseases are chronic inflammatory diseases resulting in the breakdown of tooth-supporting tissues and resorption of the alveolar bone, leading to increased tooth mobility and tooth loss in the most severe cases. A mouse model in which alveolar bone loss in periodontal disease can be assessed has been developed. In this model, alveolar bone loss is induced after oral infection with the Gram-negative anaerobic bacterial *Porphyromonas gingivalis* which have been identified with human periodontal diseases. Periodontal diseases affect a large percentage of the human population but susceptibility is not equal in all individuals. Previous experiments using the same animal model have provided evidence suggesting that the susceptibility to bone loss is a genetically determined trait. Specifically it was found that young A/J mice are more resistant to bone loss than BALB/cJ mice. In my experiments, I was interested in investigating how that susceptibility to bone loss during periodontal disease changes in old mice of both the BALB/cJ and A/J mouse strains. The results showed non-significant differences between the young and old BALB/cJ mice, but significant differences in bone loss between young A/J mice, previously found to be resistant, and old A/Js, where 5 of 14 sites had bone loss, comparing between the sham and infected mice. These results suggest that susceptibility to bone loss changes with age in A/J but not in BALB/cJ mice. These results could further open the possibility of exploiting this animal model to identify possible genetic loci which could contribute to susceptibility or resistance to periodontal disease and also how genetic components of resistance could be modified with age.
Timothy Jones ’03  
William Ambrose, Environmental Studies  
*A 25-Year Retrospective Study on the Growth Rate of the Soft-Shelled Clam, Mya arenaria, in Relation to Changing Environmental Conditions throughout New England*  
The growth rate of the soft-shelled clam, *Mya arenaria*, has been shown to be closely related to environmental conditions such as temperature, sedimentary grain size, food availability and concentration of sedimentary hydrocarbons. During the 1970’s, Richard Appeldoorn conducted a study on the relationship between the growth rate of this clam species and particular environmental parameters. By modeling the current study after Appeldoorn’s, the purpose of this research was to determine whether or not the growth rate of this commercially important species has changed over the last 25 years and, if so, what environmental factors have been responsible for this change. Clams were collected from five locations along coastal New England and were aged using external lines in the same way as Appeldoorn. Clams were also sectioned to reveal internal growth bands, and were aged on this basis as well. Growth rates at all four sites that could be compared to Appeldoorn’s were found to have changed ($p < 0.0001$). A distinct relationship was discerned between growth rate and latitude ($r^2 = .9049$), with growth rate decreasing with increasing latitude. The next step in this research is to relate the changes in growth rates to the same environmental parameters that were analyzed by Appeldoorn.

John Karass ’05  
Margaret Imber, Classical and Medieval Studies  
*Litigation in Ancient Athens*  
In my oral presentation I intend to emphasize the special relationship between their legal system and their democracy, and articulate how this affected our forefathers when they drafted our Constitution.

Elizabeth Kreischer ’03  
Peter Rogers, Environmental Studies  
*A Benefit Assessment of the Community Gardens in Lewiston through Photographs*  
This poster will be representing a part of my thesis in which I used visual anthropology to assess the benefits the community gardens in Lewiston offer. Cameras were given to gardeners, with their pictures used as props in interviews about the benefits. The result is a few dozen pictures that capture the words of praise that gardeners have for their community gardens.

Janice Lewis ’03  
William Ambrose, Environmental Studies  
*The Growth of Serripes groenlandicus and Mya arenaria in Relation to Environmental Conditions at Kotzebue Sound, Alaska*  
Many bivalves deposit annual growth increments visible in shells as internal and external growth bands. These bands can be used to determine age and interannual variability in growth. The purpose of our study was to assess aging methods for the arctic bivalves *Serripes groenlandicus* and *Mya arenaria*, and to relate the annual growth of each species to environmental parameters such as temperature, precipitation, and ice cover. Clams were collected in July 2002 in Kotzebue Sound, Alaska, and sectioned to reveal internal growth bands. External lines were the most consistent and easily readable growth increments in *Serripes*. *Mya* showed clear internal growth lines that were comparable to annual lines found in other *Mya* worldwide. Annual growth measurements of external *Serripes* and internal *Mya* were used to generate growth curves and Standard Growth Indices (SGI) based on the Von Bertalanffy growth model. Using the SGIs, interannual growth differences were related to interannual differences in temperature, precipitation, and ice cover in Kotzebue Sound. The *Mya* SGI was not related to annual or summer temperatures, or total annual precipitation. *Mya* SGI was negatively correlated with the annual number of ice-free days ($p < 0.052, r^2 = 0.7681$). Although there was no correlation between the *Serripes* SGI and annual temperatures, precipitation, or ice-free days, *Serripes* growth was very closely related to summer air temperatures from June to September ($p < 0.01, r^2 = 0.6241$). This work is part of a larger project that relates environmental change, as reflected in bivalve growth, to traditional ecological knowledge about Kotzebue Sound.
Kristjan Thor Magnusson '03  
Lee Abrahamsen, Biology

*Analysis of the Husavik Health Study*

The Husavik Health Promotion Program was launched in Husavik Iceland in 1995, with a follow up in 2000. This program was designed to assess the general health status of people in the Husavik vicinity, born between 1955 and 1959, by means of questionnaires as well as clinical tests conducted at the Husavik Hospital. The aim of this program was for the health-care works at the Husavik Hospital to get a better idea of “healthy” people’s lifestyles and general health status. A further aim was to investigate whether self-evaluation of health matched clinical tests and if so to help the participants better their lifestyles through education interviews with doctors. The main risk factors for coronary heart disease (CHD) were investigated specifically, and pedagogic health profiles constructed showing overall risk of developing the disease. The poster will include description of the study, methods used, statistical analysis of the variables tested, and a discussion section with a general evaluation and overview of the main results.

Sorubh Mahadoo '03  
Hong Lin, Physics

*Effect of a Spatially Filtered Optical Feedback on a Helium-Neon Laser*

We use a noninvasive feedback control method for the selection of laser modes in an open-box helium-neon (He-NE) laser. The feedback system consists of two lenses arranged in a 4f configuration and a mirror attached to a piezoelectric translator. A mask is used for spatial filtering in the Fourier plane of the 4f-system. By changing the voltage applied to the piezodriven feedback mirror, the relative phase between the output beam and the filtered feedback signal can be changed. Different combinations of mask size and orientation coupled with appropriate phase shifts can enable us to select certain modes when the output pattern is a superposition of two or more transverse modes. Using phase-sensitive spatial filtering we have successfully selected output beam patterns.

Brent Mann '04  
Jennifer Koviach, Chemistry

*Synthesis of 2-deoxyglycosides through Conjugate Addition*

2-deoxyglycosides are ubiquitous among natural products and are key members of many antibiotics and anti-cancer agents. The synthesis of such molecules can be a tricky endeavor due to the lack of a control element at the C-2 position. We have successfully developed two multi-step methods for the preparation of the monosaccharides, D-amicetose and L-axenose. We plan to combine these two sugars through conjugate addition to obtain the 2-deoxysugar, which has never been synthesized.

Kirstin McCarthy '03  
Stacy Smith, Education

*Institutions of Higher Education as Chartering Authorities*

This presentation briefly examines the important role of chartering authorities in authorizing charter schools. More specifically, the possibility of institutions of higher education as chartering authorities will be examined. Based on first hand research the presentation will outline the specific questions an institution of higher education must consider before becoming a chartering authority.

Dennis McGillicuddy '03  
Rachel Austin, Chemistry

*Metalloenzyme Activation of Alkanes*

The activation of relatively inert hydrocarbons is an important biological process. Many bacteria utilize this to metabolize small organic molecules, such as methane, as a source of energy. The specific example that we are looking at is the enzyme Soluble Methane Monooxygenase (sMMO). Using a diagnostic substrate we hope to gain insight into the mechanism of this reaction that could possibly lead to the development of model systems which could perform the reaction by themselves. These model systems would be invaluable in such fields as organic synthesis.
Sarah Merkow '03 and Marieke Slovin '03
Richard Williamson, Classical and Romance Languages and Literatures

La Franco-Americainie à Lewiston
We are focusing on the experience of second and third generation Franco-Americans and the role of the church and school in the preservation of the culture in our historical overview of Franco-American origins in Lewiston today. We include photographs, quotes, and recipes from our independent study project, oral history research on “La Franco-Americainie à Lewiston.”

Sara Montrone '03
Loring Danforth, Anthropology

Constructing National History through Moscow’s Monumental Landscape
This presentation of my senior thesis examines the relationship between the state, monuments of the state, and Russian national identity in the Russian Federation. Monuments are erected by the state to achieve certain goals, whether to propagate a certain ideology or influence the people to some end. However, the meaning of a monument after its construction is continually changing as it becomes a part of the symbolic landscape. The value of monuments to the construction of national identity lies in their ability to create various versions of the past. I will elucidate the different meanings the monuments have for the nation and state. After giving a general overview of the role of monuments as symbols in Russia’s history, I will concentrate on specific monuments in Moscow. Individual monuments that I will analyze are the statue to secret police founder Feliks Dzerzhinsky and Lenin’s mausoleum.

Leona Nordstrom '03
William Ambrose, Environmental Studies

Annual Growth in Macoma Balthica in Kotzebue Sound, Alaska as an Indicator of Environmental Conditions
Various marine organisms periodically deposit annual growth increments or bands that can be used to determine age and inter-annual variability in growth. *M. balthica* shells exhibit ridged external growth rings that usually have a brownish concentric band of periostracal material. *Macoma* were collected in July in Kotzebue Sound, Alaska from four sites, ranging in depths from 2-11m. Growth lines in *M. Balthica* were used to evaluate spatial and temporal patterns in growth in the nearshore arctic community. The distance between successive growth rings were measured and, using Von Bertalanffy growth-function parameters, a growth curve and a standard growth index (SGI) was generated. Sites at deeper depths were older and larger in biomass on average. Sites along transect three, which was more exposed, were found to grow faster than the sites along transect four. Correlations between SGI at each site and mean summer temperature, mean annual temperature and mean annual precipitation showed no significant relationships. The shallowest site (Site B5, 2m) was found to be strongly correlated to number of ice-free days ($R^2 = 0.8507$). This study is part of a larger project that relates environmental change as reflected in bivalve growth to native ecological traditional knowledge in Kotzebue Sound.

Katherine Percarpio '03
Nancy Kleckner, Biology and Neuroscience

The Inhibitory Glutamate Intracellular Signaling Pathway of Helisoma trivolvis
The poster I will be presenting at the Mt. David Summit is on my year-long thesis on the “Inhibitory Glutamate Intracellular Signaling Pathway in Helisoma trivolvis” (the common pond snail). Using intracellular recording techniques, I have attempted to identify the pathway through which the neurotransmitter, glutamate, acts in an inhibitory way. In an attempt to identify the pathway, I have used known blockers of other identified inhibitory pathways to possibly block the effects of glutamate. This investigation is of particular interest because glutamate is primarily an excitatory neurotransmitter when acting in vertebrates. Furthermore, although the pathways through which other neurotransmitters, such as serotonin cause inhibition have been identified, glutamate’s pathway remains unknown.
Robyn Perkins ’03
Robert Thomas, Biology, and Antonio Planchart, Biological Chemistry

Effect of Ultraviolet-B Light on Heat-Shock Protein-70

Heat-shock proteins (HSP) are found in a wide range of organisms. Some are constitutive while others are induced in response to environmental stress. The ectopic expression of HSP-70 in some cell types, e.g. melanoma cells in humans, has been linked with increased resistance to ultraviolet-B (UVB: 290-320 nm) – induced apoptosis. In this study, HSP-70 was isolated for the first time from Thalassiosira pseudonana, a common marine diatom of worldwide distribution. Following electrophoretic separation and Western blot analysis, four HSP-70 isoforms were observed. The intensity of two of the bands increased with increasing UVB dose (312 nm at either 12, 36 or 200 mJ/cm²), whereas the intensity of the other two decreased with increasing dose. These observations suggest that HSP-70 in T. pseudonana is linked with a stress response to UVB radiation.

Alake Pilgrim ’03
William Corlett, Political Science

Love at Home in Exile and Other Political Acts

This thesis is a love-work that theorizes “home” in a Caribbean context, through reading and writing creatively about the 1937 massacre at the Haiti-Dominican Republic border. Within each section, historical accounts of this conflict are put in critical conversation and woven together with my own stories of dislocation in Trinidad and Tobago and the United States. The texts examined cross traditional boundaries of fiction and nonfiction; however, the analysis centers around four stories of the massacre, exploring multiple dimensions of belonging in and between Haiti and the Dominican Republic. These (story) lines separate and connect the people of these countries in fragmented wholes (gap intended). In this way, I contribute to scholarship that traces the links as well as the breaks between trans/national forces and communities.

Mark Prelli ’03
Shepley Ross, Mathematics

Algorithms for the Computer Representation of Julia Sets

In this thesis, we have implemented a method of drawing filled Julia sets using Visual Basic. We have also used methods to analyze them – finding both their attracting and repelling periodic points. We used the function \( f(Z)=Z^2 + C \) to find the orbit of every point represented by a pixel inside the square formed by (-2,-2) and (2,2) on the complex plane. Then, based upon whether the orbits escape the Julia set boundary or whether they remain inside it, we color them different sets of colors. We have used two different methods to find attracting and repelling periodic points. We use a “bull’s eye” method to let the user see an approximation of where the periodic points are. Points \( p \) whose \( n \)th iterates \( f^n(p) \) are closest to \( p \) are colored black because they are very near to the point of period \( n \). The centers of the “bull’s eyes” give rough approximations of the location of points of period \( n \). We can find the periodic points with more certainty by using the “crosshair” method. We again find the points whose \( n \)th iterates are closest to the original points \( p \), but this time we compare in vertical strips, then in horizontal strips. The points which are minima in both directions are very close to the points of period \( n \). So this method draws crosshairs around the points of period \( n \). Using these tools together, we can draw Julia sets for many different values of \( C \), and discover many of their important characteristics.

Andrew Prigodich ’03
Jennifer Koviach, Chemistry

Synthesis of Pyran Rings via Sn’ Epoxide Opening

Our goal is to determine that pyran rings can be formed via nucleophilic epoxide opening through an Sn’ system. As we will see pyrans appear in a wide variety of naturally occurring products with important biological functions. As such, it is useful to have a wide variety of potential methods for the synthesis of these compounds and their derivatives. There are other approaches to reaching the pyran system in a stereospecific manner, which will be discussed below. However, it should be possible to obtain stereocontrol of the product with this new reaction as it is possible with other Sn’ hetero-cyclizations. This new methodology also offers a few advantages. The Sn’ mechanisms should make controlling the size of the
ring formed easier than with previously developed methods. Also, the product will contain an alkene and an alcohol on the side chain, allowing for the addition of more functionality.

**Emily Rand '06**
Margaret Imber, Classical and Medieval Studies

*Hubris: Rhetoric of the Rich and Famous*

My paper explores the Athenian rhetoric of hubris in the context of several important Athenian cases. In this paper, I define hubris by highlighting three themes that appear in three separate Athenian cases. In each case, the disputing men are wealthy, the prosecution feels their honor has been violated and a reputation is at stake. The Athenian notion of hubris is defined through the presence of each of these themes in hubristic cases.

**Ericka Ricaldez '03**
T. Glen Lawson, Chemistry

*Purification of Hepatitis A Virus 3D Polymerase and a Preliminary Evaluation of Its Conjugation to Ubiquitin*

We recently demonstrated that hepatitis A virus (HAV) 3D RNA polymerase is substrate for the ubiquitin/26S proteasome system. Efforts to study 3D polymerase have been hampered since it has not been isolated in a pure, soluble form. We have succeeded in solubilizing and purifying HAV 3D polymerase from expressing *E. coli* (DE3)BL21 cells, transformed with a plasmid containing the 3D polymerase gene. Inclusion bodies recovered were solubilized in high pH buffer, and passed through a Sephacryl S-200 column (pH 7.5). Additional purification was obtained by size exclusion chromatography. Activity of the purified polymerase was evaluated through its ability to catalyze extension of oligoribonucleotide primers hybridized to a complementary template. Incubation of purified protein in ubiquitin-conjugating reaction systems containing 14C-labeled methylated ubiquitin resulted in synthesis of a labeled product with a mass consistent with monoubiquitinated 3D polymerase; demonstrating that the purified polymerase can be used as substrate for ubiquitin conjugation studies.

**Daniel Robarts '04**
Robert Thomas, Biology

*Daylily Tissue Culture*

I will be presenting a poster showing the work I have done for my Biology Independent Study, “Daylily Tissue Culture.” Plants have been propagated, hybridized, and genetically altered for some time in order to improve their qualities (bloom, crop yield, etc.). Tissue culture is a micropropagation practice used to clone specific cells from plant and animal tissues. I will explain my use of tissue involving daylilies. I will also be showing my work involving the conversion diploid daylily seeds (22 chromosomes) into polyploidy, tetraploid plants (44 chromosomes). Certain compounds have been found to impede the work of meiosis, resulting in genetic abnormalities. I will be examining the effects of a commercial herbicide on seed and seedling germination. Controlled experiments such as these could lead to production of vast numbers of vigorously growing plants that will show higher yield, as they would have four copies of each gene and could express things such as color or growth factors in substantially greater amounts.

**Sonia Shariff '03**
John Smedley, Physics

*Experimental Studies of Collision-Induced Absorption in Barium Rare-Gas Vapor*

Our studies of collision-induced absorption in barium–rare gas vapor is studied via laser excitation (wavelength resolved flurosence techniques). The barium sample is heated in a metal vapor oven to a temperature of ~873K, at a pressure of 1Pa. The rare gas samples have a pressure on the order of 13-85 kPa. Excitation of barium rare gas requires a $6s^21S_0 \rightarrow 6s8p^1P_1$, pulsed frequency-doubled dye laser tuned to slightly longer wavelengths than transition at 278.5nm. Replication of previous work showing collision induced absorption features is currently underway.
Banking in Fourth-Century Athens
As Athens relied on an embedded economy, an economy that relied heavily upon social relations, many people have underestimated the importance of banking in ancient Athens. Banking was in fact a lucrative and risky business, make riskier by the limited access to forensic evidence in resolving business disputes. My paper centers on the case “Against Phormio,” a case in which a trading venture went sour and was taken to the Athenian courts. The lack of reliable information makes it nearly impossible to discern what actually happened; however, the case is interesting in that it provides a rich view of both the Athenian banks and legal system. The case illustrates the complex relationship between businesses, banks, and individuals in a time when law was by necessity subjective.

Role of Ribosomal S6 Kinase B (RSKB) in Cell-Signaling
Living cells need to communicate information from the external environment to the internal cellular machinery in order to maintain a healthy interdependent community of cells. Signaling cascades initiated by stress agonists and mitogens (growth factors) are typically distinct. However, there are few proteins involved in cellular signal transduction that are activated both by stress and mitogens, thus allowing some cross-talk between the pathways. Ribosomal S6 Kinase B, a 90 kilodalton protein, is one such protein kinase that gets activated by extracellular-signal regulated protein kinase (ERK) as well p38 stress-activated protein kinase (SAPK). Activation of RSKB requires a series of phosphorylations at several critical sites and upon full activation, RSKB can then phosphorylate downstream targets such as transcription factors like Creb and pro-apoptotic protein Bad. RSKB activation has been associated with cell survival and proliferation response of cells. In this study, we characterized activation of RSBK (what activates RSKB and what RSKB activates) as well as studied effects of mutating the critical phosphorylation sites in RSKB.

Mechanistic Insight into Norcarane Hydroxylation Using Alkane Hydroxylase
My presentation will be a summary of my thesis. Over the past year I have been investigating the mechanism of how alkane hydroxylase, a metalloenzyme, oxidizes alkane to alcohols.

Son Preference in Rural and Urban China
My honors thesis examined patterns of intra-household resource distribution in China. Goods may be allocated in a biased fashion if household members with decision-making power exhibit son preference. Son preference results in greater intra-household resource expenditure on boys than on girls. There are few places where son preference is as prevalent and noticeable as in China. The implications of the combination of son preference and China’s one-child policy are serious. The consequences include both higher infant mortality rates for girls and sex-selective abortions. There is evidence to suggest that Chinese son preference, rooted in Chinese Confucian culture, is sensitive to the economic environment. I hypothesized that the outcomes of son preference are less apparent for higher levels of economic welfare, and after performing a number of tests on a Chinese household data set, I was able to confirm my hypothesis.
**The Effect of Hepatocyte Growth Factor on Cytomegalovirus Infection**

Hepatocyte Growth Factor (HGF) is a cytokine that triggers many cells to replicate and grow. Cytomegalovirus (CMV) is a fairly ubiquitous virus in most populations worldwide that lies latent within cells in the body. CMV has been shown to increase the amount of and rate of development of atherosclerosis, a type of arteriosclerosis known for the formation of fatty plaque, and heart disease that affects many Americans each year. HGF has been found in elevated levels in patients with cases of atherosclerosis as well as within atherosclerotic plaques. This thesis attempts to discover the effect(s) of HGF in a CMV infection, as such information could lead to a better understanding of atherogenesis (the mechanism of atherosclerotic development) and defenses against it.

**Pediatric Palliative Care Initiative**

For my thesis I have spent the past seven months working in collaboration with several staff at Maine Medical Center to develop and implement a Pediatric Palliative Care Program. I have devoted nearly 300 hours to this project researching, meeting with bereaved families, attending conferences, consulting with clients, and writing grant applications.

**Stress Effects of Bax and Bcl-2 Proteins on Rat Hippocampi**

Stress has been shown to cause damage to the hippocampus, and to cause deficits on hippocampal dependent tasks (Conrad et al., 1996; Conrad et al., 1999; Diamond et al., 1999; Beck and Luine, 1999; Blank et al., 2002; Kim et al., 2001; Pavlides et al., 2002; Shors et al., 2001). Bax and Bcl-2 are apoptosis-regulating proteins that can be used as a measure of apoptosis. This study looks at Bax and Bcl-2 levels in the hippocampi of male and female rats with and without chronic stress. My results show that there is a non-significant trend for stress to lower Bcl-2 levels, but no relationship was found to exist between stress and Bax levels. The Bcl-2 data contradicts the behavioral data for the males collected from the same subjects (Moser et al., 2002). Therefore the males’ performance on the hippocampal-dependent maze must be due to activity outside the hippocampus.

**Mapping of Destruction Signals in HAV 3D RNA Polymerase**

We recently demonstrated that the hepatitis A virus (HAV) 3D RNA polymerase is a substrate for the ubiquitin/26S proteasome system. This implies that the protein must contain one or more destruction signal features recognized by at least one E3 ubiquitin-protein ligase. A preliminary mapping of the destruction signal location(s), using 3D polymerase deltion mutants and reaction systems containing reticulocyte lysate, revealed that the portion of the protein from amino acid position 280 through position 351 contains features necessary for recognition of the 3D polymerase as a substrate. Previously, P3 region polyprotein precursors containing the 3D protein were also found to be degraded by the ubiquitin/26S proteasome system. It was determined that polyproteins containing a non-functional 3C protease destruction signal sequence are ubiquitinated and degraded. The similarity in the degradation kinetics of both the mutated and non-mutated polyproteins suggests that the destruction signal in the 3C protease is not available for recognition in the precursor polyprotein molecules.

**Period Doubling Bifurcations of a Periodically Forced Biological Oscillator**

According to Glass et al. (1984), there is convincing evidence that certain types of arrhythmias exhibit chaotic dynamics. Using techniques including finite difference equations, Fourier transforms and Poincaré maps, the heartbeats can be modeled and problems can be predicted. When someone with a heart problem
exercises, the heart rate normally increases; however, occasionally the heart starts beating at abnormal intervals, and chaos has set in. Experimental results have been successful in obtaining results that fit known complicated mappings, such as Poincaré maps. In this paper I explore the mathematics behind chaotic cardiac rhythms and discuss how the mathematics can aid doctors and researchers in their study of the heart.

Elizabeth Wilson '03
Lisa Maurizio, Classical and Medieval Studies

Seneca’s Hercules Furens: Reviving a Classic

For my senior thesis, I have been compiling and editing a second-year college level Latin textbook. For my presentation, I will outline the various steps I have gone through, i.e. picking an appropriate format, and glossing the entire play as well as compiling various grammar and mythological references. Also, I would like to present my work in the form of a mini-workshop including a look at my thesis (or part of it) with an “on-the-spot” translation of the Latin using my book. I will also talk about the difficulties I have encountered as well as changes I will have to make. As visual aids, I will have handouts illustrating my finished product as well as examples of the scholarship I worked with.

David Worhunsky '03
Paula Schlax, Chemistry

The Bacterial Response to Stress: Regulation of rpoS Gene Expression

Survival of all organisms depends upon their ability to respond to the varying conditions of their surroundings, including limited nutrient supplies, changes in extracellular ion concentration and other environmental stresses. The manner in which cells survive such pressures is through altering their pattern of gene expression. As the central paradigm of molecular biology, gene expression refers to the process by which DNA is transcribed into mRNA and the mRNA subsequently translated into protein. σS, the protein product of the rpoS gene, controls expression of over fifty genes in Escherichia coli responsible for cell survival during the bacterial stress response. Translation, and therefore expression of σS is increased during a stress response as a result of changes in the structure of the mRNA. Three non-coding RNA molecules regulate translation of the rpoS gene. My work is focused on the understanding of how one of these non-coding RNA molecules modulates RpoS mRNA structure and thus the efficiency of rpoS translation.